Republic of Croatia

Croatian Energy Regulatory Agency

ANNUAL REPORT FOR 2021

Zagreb, June 2022

CROATIAN ENERGY REGULATORY AGENCY
ANNUAL REPORT FOR 2021

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1 INTRODUCTION

Dear Readers,

It is my pleasure to present the Annual Report on the Activities of the Croatian Energy Regulatory Agency for 2021 (hereinafter: Annual Report) and the Report on the Execution of the Budget of the Croatian Energy Regulatory Agency for 2021, which the Croatian Energy Regulatory Agency (hereinafter: HERA) submits to Croatian Parliament in accordance with the provisions of the **Act on the Regulation of Energy Activities**. This obligation refers to: the results of monitoring the execution of the obligations of energy entities arising from the **Act**, laws regulating the energy sector, and other laws regulating individual energy markets; the analysis of the energy sector; observations significant to the development of the energy market and public services in the energy sector; the realisation of HERA's budget for the previous year; and the implementation of legally binding decisions of the Agency for the Cooperation of Energy Regulators (hereinafter: ACER) and the European Commission (hereinafter: EC)**.**

The Annual Report is a complete document that fulfils all the reporting standards established by the Council of European Energy Regulators (CEER). It includes data, information, illustrations, the results of analysis, and conclusions tied to the energy sector and energy markets in the Republic of Croatia (hereinafter: RH). The Annual Report also includes useful, significant information for a broad group of stakeholders, and is an important expression of the public nature of HERA's work. The dominant contents and topics of the Annual Report include HERA's regulatory obligations, tasks, and activities, an assessment of the energy sector, the wholesale and retail markets, competition including final customer participation, key components to the work, development, and operation of energy system operators, a rating of the approach to energy networks, the implementation of cross-border energy exchange mechanisms, implementational issues related to the status of eligible producers, an assessment of the availability of energy sources and energy services, an assessment of the state of consumer rights protection, an assessment of and indicators of the quality, safety, and stability of supply of all sources of energy, and the protection of energy entities, as well as business entities in the energy market.

This Annual Report provides significant insight into the state of the use of renewable energy sources and high-efficiency cogeneration, the fulfilment of obligations and implementation of energy savings measures, the improvement of energy efficiency and energy management, the introduction and implementation of smart meters, the achievement of prescribed energy quality and service standards, and the security of energy supply.

In Croatia, all energy systems are functional in organisational, energy, and operational terms and are functioning within the prescribed frameworks (operational rules and standards); they are included in international energy flows and exchanges, i.e. they are an integral part of the respective connected European energy systems and networks, and the energy market and all its segments are an integral part of the European market system and market space. Croatia built and launched a liquefied natural gas (LNG) terminal, which proved to be an exceptionally successful and useful facility for strategic security and gas supply stability. For this and all other key infrastructure systems (transport, transmission, distribution, and storage), HERA adopted and defined all important elements of the business and operational framework in a timely manner, including access and connection rules, operational rules, capacity allocation, and capacity usage tariffs. Sufficient capacities for modern operational demands have been ensured in all electricity and gas transmission and transport systems.

In the past three years, the world, the European Union (hereinafter: EU), and Croatia have unfortunately been met with great challenges and threats, from risk to human health caused by the Covid-19 pandemic, to energy market disruptions and exceptionally high growth in energy prices (electricity, gas, oil and petroleum products, coal, and CO_2 emission allowances). In addition to all this, Croatia also fell victim to powerful earthquakes.

First, the world and European space were impacted by the Covid-19 pandemic. EU members were forced to introduce numerous measures to protect the lives and health of their residents, including limitations on mobility, which led to a drop in business activities in numerous sectors of the economy. This was followed by a decline in the consumption of all forms of energy. Croatia shared the fate of the EU and followed the practices and actions of other EU members, introducing a series of measures to protect the health and life of

its residents. The Croatian government also introduced measures to protect jobs and maintain the business operations of numerous business entities.

In March and December of 2020, parts of Croatia suffered destructive earthquakes. To protect people and property, as well as to prevent the further risk of loss of life and property under such difficult circumstances, the Croatian government urgently took appropriate decisions and implemented aid measures involving food, accommodation, and energy supply. All households in earthquake-stricken municipalities and cities, regardless of the degree of damage they suffered, were freed from paying the cost of electricity. Within its scope and authority, HERA ensured the conditions and legal basis for gas and electricity transmission and distribution system operators to react exceptionally quickly, take decisions, and undertake action to prevent further damage to buildings, equipment, and plants, resolve life-threatening situations, ensure energy supply, and then begin to repair earthquake damage as quickly as possible. HERA also adopted decisions ensuring funds to renovate damaged and destroyed energy facilities and plants through the long-term plans of network operators.

In early 2021, when the pandemic began to wane and measures against Covid-19 were relaxed, signs of economic recovery began to appear; the mobility of people and goods increase, and energy demands along with them. However, in mid-2021, a global disruption began on the gas, oil, petroleum products, electricity, and coal markets, which saw a drastic increase in the price of all forms of energy, as well as of CO_2 allowances. Additionally, in early 2022, due to the war in Ukraine, an even larger crisis began with energy supply from established supply routes. The consequences of all this were felt throughout the EU.

To alleviate all these difficult situations, which also carried a number of added risks, the EU and its governing bodies and agencies have undertaken and are undertaking a number of measures and activities with far-reaching, long-term strategic importance. In all of these efforts, the EU continues to support the single European energy market, advocating the application of market principles and competitiveness, the freedom of entrepreneurship, smooth cross-border trade and exchange of energy, free energy flows, significant increases in the use of renewable energy sources and high-efficiency cogeneration, the reduction of all forms of emissions and negative environmental impacts, environmental and climate protection, the rights of customers to choose energy products and suppliers, and the assistance and protection of vulnerable customers. Even under such circumstances, the EU continues to implement public policies through strategic guidelines and content from the Clean Energy for All Europeans Package, the European Green Deal, the Fit for 55 package, and the Recovery and Resilience Facility. Croatia is an active participant in all these policies, and actively contributes to their realisation using sources of funding ensured by these packages or facilities.

Croatian government has adopted numerous measures to mitigate rapid, high increases in energy prices. First, in October 2021, it limited the growth of retail prices of petroleum products on the domestic market. Following EC policy, in February 2022, the Croatian government adopted a package of measures to mitigate the rise in energy prices worth HRK 4.8 billion. These measures included changes in the compensation system for socially disadvantaged customers and one-off benefits for pensioners to help pay for energy costs. The scope of electricity and gas voucher users was significantly expanded, and the monthly voucher amount was doubled for a period of one year. A special one-off allowance (energy allowance) was provided for over 700,000 pensioners.

Under these circumstances, HERA began urgent refinements of appropriate methodologies, adapting the regulatory framework and mechanism to market dynamics and large price spikes in the electricity and gas markets. It also adopted decisions on new tariff item amounts in the framework of the guaranteed electricity supply service, public gas supply service, and guaranteed gas supply service. This ensured continuity of supply to final customers of energy whose suppliers might suffer financial difficulties or become unable to ensure gas or electricity supply. Household consumers and SMEs were also protected from large price shocks in the short-term.

As a Croatian national independent regulatory body, HERA regulates energy activities in Croatia in accordance with the national legal framework; independent from the executive branch and from the interests of business entities in its decision making, it cooperates with the Croatian government and other relevant national authorities. It also participates in the work of European regulatory bodies and their associations as a full member, and consistently monitors EU energy and regulatory policy. HERA will continue to promote the principles of transparency, impartiality, openness, ethics, and accountability in its activities. It will also support the economically sustainable, transparent, and efficient performance of energy activities in Croatia

in the spirit of the basic principles of European energy policy, long-term security of energy supply, and benefits for end customers in terms of prices, quality, and security of energy supply. It is HERA's lasting obligation to constantly improve itself and ensure the transparency of its work, and to advance the professional and scientific knowledge of its employees in order to best perform regulatory tasks in the field of its jurisdiction.

Danijel Žamboki, MS
President of the Board of Commissioners
Croatian Energy Regulatory Agency

2 SUMMARY OVERVIEW OF THE ENERGY SECTOR

2.1 Electricity

Total electricity consumption in Croatia amounted to 18,495 GWh in 2021. After two consecutive years of a decline in consumption, consumption rose in 2021. As compared to 2020, 2021 saw a 7.1% increase in the total consumption of electricity. The majority of electricity consumption in Croatia in (14,153 GWh, 76.5%) was covered by power plants located in Croatia, while the remainder was covered by physical net imports (4,342 GWh, 23.5%). Electricity production in Croatia and a part of the production of Krško Nuclear Power Plant, which belongs to HEP d.d., covered 91.6% of the total consumption of electricity in Croatia. Electricity produced from renewable energy sources (in the amount of 10,113 GWh) covered 54.7% of total electricity consumption. Growth in electricity production from distributed energy sources[1] continued in 2021, with 1,661 GWh of electricity was produced, 17.4% more than in 2020. Roughly 99% of electricity from distributed energy sources was produced using renewable energy sources. The share of delivered electricity from distributed energy sources in the total consumption of the electricity system in 2021 amounted to 9%. The increase in the production of high-voltage hydroelectric power plants at the beginning and end of 2021, along with production from wind farms and distributed energy sources, resulted in the Croatian electricity system being a physical net exporter of electricity on certain days. 2021 saw a decline in net imports, an increase in the production of hydroelectric power plants and other renewable energy sources, while production from fossil fuels remained at the same level as 2020. Croatia thus continued to move closer to the indicative national target of 63.8% of renewable energy in gross direct electricity consumption by 2030, as stated in the *Integrated National Energy and Climate Plan for the Republic of Croatia from 2021 to 2030* (hereinafter: NECP).

The connection capacity of all power plants in Croatia at the end of 2021 was 5,534 MW (2,202 MW hydroelectric power plants, 2,049 MW fossil fuels, 981 MW wind power plants, etc.), of which 3,485 MW or 63% was produced from renewable energy sources. Of the total connection capacity of all power plants in Croatia, 503 MW was from distributed energy sources. At the end of 2021, 1,570 final customers had the status of self-supply plants in the distribution network (as compared to 851 in 2020), all with solar power plants within their installations, with a total connection capacity of roughly 9 MW when injecting into the grid (4 MW more than in 2020). In 2021, users of self-supply plants injected over 5 GWh of electricity into the grid (3 GWh more than in 2020, which is a significant increase). There was thus significant growth in this segment as compared to 2020, and especially as compared to 2019 (a tenfold increase in all amounts). During 2021 223 customers with self-supply lost this status because they injected more electricity into the grid on an annual basis than they took up from the network.

The maximum load of the Croatian transmission system amounted to 3,072 MW; it took place on 16 August 2021. The minimum load was 1,237 MW and took place on 2 May 2021.

The security of supply reports of the Croatian transmission system operator Hrvatski operator prijenosnog sustava (hereinafter: HOPS) and Croatian distribution system operator HEP-Operator distribucijskog sustava d.o.o. (hereinafter: HEP-ODS), as well as currently available data delivered to HERA by HOPS and HEP-ODS, lead to the conclusion that security of electricity supply in the Croatian electricity system is at a satisfactory level.

Hrvatska elektroprivreda d.d. (hereinafter: Hep d.d.) and its subsidiaries dominate in the installed capacity of power plants, produced electricity, and electricity sold on the wholesale market. The total trading volume on the Croatian market in 2021 was 65.3 TWh; HEP d.d.'s share amounted to 41.2 TWh (market share of trading volume).

In 2021, the trading volume on the Croatian Electricity Exchange d.o.o. (hereinafter: CROPEX) amounted to 5,967 GWh, which is at the same level as 2020. On the CROPEX intraday market, registered members purchased 197.6 GWh and sold 294.3 GWh. Additionally, the Slovenian exchange bought 594.7 GWh from

[1] *Distributed sources and/or distributed generation is a term indicating sources/production facilities of electricity or some other useful form of energy that are connected to the distribution network; they are most often located in the immediate vicinity of energy users and places of consumption i.e., they are decentralised as compared to "large" energy grids and the "large" sources attached to them.*

CROPEX on an intraday basis in the same year, while the Hungarian exchange bought 632.1 GWh. In terms of day-ahead market integration, market integration based on the core flow-based market coupling (CORE FB MC) is expected in mid-2022. On 13 January 2021, an incident took place that resulted in the Croatian trading zone decoupling from the single day-ahead coupling market on the border with Slovenia due to technical issues on the Italian exchange. Market decoupling also took place on the borders between Italy and Austria, Italy and France, Austria and Slovenia, and Greece and Italy. As Croatia is connected to the SDAC market exclusively via the Slovenian border, CROPEX operated in isolated mode, which resulted in a small trading volume and significant deviation of prices from usual values.

In the second half of 2021, there was a manifold increase in wholesale electricity prices associated with a manifold increase in natural gas and coal prices and emission allowance prices in Europe. Electricity prices remained high in the first part of 2022. Considering the extremely high electricity prices from futures contracts in the first part of 2022, electricity prices are expected to remain at high levels in the coming period.

The retail electricity market in Croatia is completely open and there are no regulated prices. The exception in terms of price regulations is guaranteed supply, which is activated when a non-household final customer is left with no supply agreement with a market supplier of electricity, to ensure that consumers have a continuous supply of electricity. Guaranteed supply is performed by HEP ELEKTRA d.o.o. Household final customers who have not chosen a supplier on the electricity market are supplied by HEP ELEKTRA D.O.O. as part of the universal service at a price freely determined by the company.

Total electricity sold to final customers in 2021 amounted to 16,827 GWh,[2] which is 8.3% more than in 2020. As compared to sales in 2020, sales of electricity in the high-voltage non-household category increased by 14.7% in 2021, 8.6% in the household category, and 6.6% in the low-voltage non-household category. The share of subsidiaries of HEP d.d. (HEP-Opskrba d.o.o. and HEP ELEKTRA d.o.o.) on the Croatian electricity market in the overall supply of electricity to all consumers amounted to 90% in 2021, as compared to 84% in 2020. The three largest suppliers had a 99% market share in household final customer supply. The three largest suppliers had a 93% market share in non-household final customer supply, which represents a decrease in concentration compared to 2020, when the share was 94%. Of the total electricity sold to households in 2021, 88% was sold by HEP ELEKTRA d.o.o. within the framework of the universal service. Non-household final customers amounted to 9% of guaranteed supply.

The average total sale price of electricity on the retail market (including transmission and distribution network charges and the price of electricity, net of tax and other fees) was higher in 2021 than in 2020 (HRK 0.63/kWh as compared to HRK 0.60/kWh for medium voltage, HRK 0.79/kWh as compared to HRK 0.77/kWh for the low-voltage non-household category); however, the low-voltage household category remained the same at HRK 0.79/kWh.[3] Prices for household consumers using the universal service did not change. Despite manifold increases in wholesale electricity prices in the second half of 2021, prices did not increase for household category final customers. However, non-household final customers whose long-term price-fixed supply contracts expired were offered new contracts with electricity prices many times higher than before. Household final customers were not impacted by price jumps on the wholesale market in Q1 2022. However, the total sale price of electricity also increased for household final customers as of 1 April 2022. The expenses of the average household final customer in the universal service increased by HRK 15 per month on average for the "Blue" tariff model, or HRK 28 for the "White" tariff model, HRK 133 for the "Red" tariff model, and HRK 8 for the "Black" tariff model.

In late 2021, on the basis of a request from systems operators, HERA took a decision on tariff amounts for electricity transmission and distribution, which increased the yearly planned revenues of systems operators in 2022 (HOPS by 5.8%, and HEP-ODS by 4.9%). Increases in tariff items for electricity transmission and distribution were needed due to the large increases in electricity prices on the wholesale market, forward contracts for 2022, and increases in planned expenses for energy purchases to cover losses in 2022 (the coming regulatory year). According to the new tariff items, increases are expected in the average monthly cost of network charges for the household category in the amount of HRK 6.51 (an increase of 8.1%), and for

2 *The amount of electricity sold also includes energy for pumping and compensation mode, PSH Velebit (148 GWh).*

3 *Prices are calculated on the basis of average prices determined by applying tariff items for electricity transmission and tariff items for electricity distribution, as well as according to the supplier data.*

the low-voltage non-household category of HRK 23.12 (an increase of 3.9%). In order to ease the position of electricity final customers, new tariffs will only be implemented as of 1 April 2022.

On 16 February 2022, the Croatian government adopted a package of measures to mitigate the rise in energy prices worth HRK 4.8 billion. These measures included changes in the compensation system for socially disadvantaged customers and one-off benefits for pensioners to help pay for energy costs. The scope of electricity and gas voucher users was significantly expanded, and the monthly voucher amount was increased from HRK 200 to HRK 400 for a period of one year. A special one-off allowance (energy allowance) in the amount of HRK 400 to HRK 1,200 was provided for over 721,000 pensioners with a monthly pension HRK 4,000 or less.

HEP-ODS scores for quality of connection services are significantly below the required general standard of service quality, and HERA will insist that these indicators improve in the coming period. The score for timely connections in the case of simple grid connections of buildings is especially unsatisfactory. The number of written complaints concerning continuity of supply reduced from 24 to 11, while those concerning quality of supply reduced from 83 to 58. Other service quality indicators of HEP-ODS improved as compared to the previous year.

The earthquakes that occurred in 2020 caused damage to many distribution facilities in DA Elektra Sisak, DA Elektra Zagreb, and DA Elektra Karlovac; of larger installations, the 110/20 kV Petrinja transformer station suffered significant damage. In 2020 and 2021, HEP-ODS managed to secure a significant share of the funds needed to renovate damaged facilities and plants in earthquake-affected areas. HERA has approved a change in the financial framework of HEP-ODS's *Ten-year development plan for the HEP-ODS distribution network (2021-2030) with a detailed elaboration of the initial three- and one-year periods* related to the one-year period for 2021 in the amount of HRK 75.5 million for the purpose of earthquake damage repair.

As regards earthquake-affected areas, on 18 January 2021, the Croatian government adopted the *Decision of the government of the Republic of Croatia regarding the write-off of claims and compensation for claims for energy delivered to final customers in earthquake-affected areas* (hereinafter: Croatian government Decision) for the period from January to March 2021; on 25 March 2021, it adopted the Decision of the government of the Republic of Croatia for April 2021. On the basis of these decisions, all households in earthquake-stricken municipalities and cities, regardless of the degree of damage they suffered, were freed from paying the cost of electricity. These are the cities of Petrinja, Glina, Sisak, and Hrvatska Kostajnica, and the municipalities of Lekenik, Sunja, Donji Kukuruzari, Majur, Dvor, Topusko, Gvozd, Jasenovac, Hrvatska Dubica, Martinska Ves, Pokupsko, and Kravarsko. In accordance with the aforementioned government decisions, the Shareholders Assembly of Hrvatska elektroprivreda d.d. adopted a Decision on the write-off of receivables for energy delivered to household final customers from earthquake-stricken areas (hereinafter: *Decision on the write-off of receivables*) on 18 January 2021.

Cross-zonal capacities on the borders of Croatia are allocated in all time frames in accordance with market principles. *Joint allocation offices* (JAOs) for the borders with Slovenia, Hungary, and Serbia, and the *Coordinated Auction Office in Southeast Europe* (SEE CAO) for the border with Bosnia and Herzegovina are tasked with organising annual, monthly, and daily auctions. An implicit capacity allocation regime has been established at the border with Slovenia through the day-ahead coupling of the Croatian and Slovenian markets. HOPS carries out bilateral allocation of total intraday capacities in both directions on the border with Bosnia and Herzegovina, while the transmission system operator in Serbia (Elektromreža Srbije) is in charge of organising intraday allocations at the border with Serbia. Since November 2019, Croatia's borders with Slovenia and Hungary have been included in the coupling of the intraday markets of EU countries through the *Cross Border Intraday Market Project* (XBID).

According to Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (hereinafter: Regulation (EU) 2019/943), transmission system operators are not allowed to limit the interconnection capacity they make available to market participants to resolve congestion within their own bidding zones, or to manage flows that are the result of transactions within bidding zones. A minimum of 70% of capacity must be ensured for cross-zonal trading. At the end of 2021 HERA granted HOPS a request to postpone the implementation of this condition until the adoption of an action plan to address structural congestion. The action plan is adopted by the Ministry of Economy and Sustainable Development (hereinafter: the Ministry) in cooperation with HERA on the basis of data from HOPS; its adoption is expected in mid-2022.

HERA approved the *Ten-year development plan for the transmission network 2022-2031, with a detailed elaboration of the initial three- and one-year periods* and the *Ten-year development plan (2021-2030) for the HEP-ODS distribution network with a detailed elaboration for the initial three- and one-year periods*. In the ten-year period, HOPS plans to invest roughly HRK 4.2 billion of its own resources, HRK 1.6 billion of already secured EU funds (primarily from the National Recovery and Resilience Plan, hereinafter: NRRP), HRK 942 million for which EU funds will be requested, and HRK 2.6 billion of investments to create technical requirements in the network that are to be financed from connection charges or EU funds. Total planned financial investments into distribution network development across a ten-year period amount to roughly HRK 12.7 billion. Investments conditional upon the connection of new users to the network and increasing the connection capacity of existing users amount to roughly HRK 4.5 billion.

Power losses in the distribution network in 2021 amounted to 1,212 GWh, or 7.2% of total electricity taken up, amounting to 16,877 GWh. The total cost of electricity purchased to cover losses in the transmission network amounted to HRK 521.9 million. In order to procure energy to cover losses in the distribution network for 2021, 2022, and 2023, HEP-ODS conducted three public tenders in 2020, after which two agreements were concluded. One of these agreements defined the base product (base energy) at a fixed price, while the other defined the purchase of a variable quantity of electricity at a price 25% of which depends on the price on the short-term markets, which moderated the effect of short-term electricity market price increases on the realised cost of purchasing energy to cover losses in 2021.

Energy losses in the transmission network in 2021 amounted to 478 GWh, or 2% of the total transmitted energy, which amounted to 24,199 GWh. Based on the results achieved in 2020, HOPS continued to increase the share of energy purchased on the short-term markets to cover losses in the transmission network in 2021. However, in the second half of 2021, electricity prices on wholesale markets unexpectedly increased many times over, which led to an increase in realized energy procurement costs to cover losses (HRK 287 million) compared to plan (HRK 184 million).

HERA issues decisions on the status of eligible electricity producer for a period of 25 years, granting the producer the rights and obligations of an eligible producer for a given plant. However, eligible producer status does not imply the right to incentivised prices for delivered electricity; is only one of the conditions to qualify for state incentives. State incentives are obtained based on a contract concluded with HROTE. HROTE collects funds for the payment of incentives from three main sources: fees for promoting electricity production from renewable sources and cogeneration which are paid by final customers, regulated sale of a portion of electricity to suppliers and commercial sale of a portion of electricity on the market.

At the end of 2021, there were 1,365 plants with a connection capacity of 1,049 MW in the incentives system, which produced around 3.5 TWh of electricity in 2021, for which eligible producers in the incentives system were paid around HRK 3.3 billion. The average incentivised price amounted to HRK 0.95/kWh. For comparison, the annual average price of electricity on the CROPEX day-ahead market in 2021 amounted to HRK 0.86/kWh.

In 2021, as a balance responsible party of the EKO balance group, HROTE[4] was able to sell 60% of the total electricity produced by the EKO balance group (2.1 TWh of a total of 3.5 TWh) on the
electricity market. In late 2021, a Croatian government decree reduced this share to 40% with the intent of mitigating the consequences of price increases on the wholesale markets.

The new **Electricity Market Act**, which entered into force on 22 October 2021, changed the previous deep approach to calculating new network user connection charges increasing the connection capacity existing network users on grid with a hybrid approach. The system operator is obligated to create technical requirements in the network, in accordance with the ten-year plans for the development of the transmission or distribution network, which must be in line with Croatia's current spatial development strategy and spatial plans. In accordance with this, HERA develops new methodologies for establishing charges for connection to the electric power network for new network users and for increasing the connection capacity of existing network users.

4 The members of the EKO balance group are production plants using renewable energy sources and high-efficiency cogeneration, whose net electricity is supplied by the eligible producers under purchase contracts with HROTE (through incentives and guaranteed purchase prices), which is responsible for their production plan, imbalances, and sale.

According to HOPS' data, interest has been expressed in connecting new power plant projects with a total connection power of 12 GW to the transmission network (mainly solar and wind plants). Of the planned plant capacity, 87% is located in the Adriatic Croatia national strategic region,[5] while 70% of the connected capacity is planned in three counties: Zadar County, Šibenik-Knin County, and Split-Dalmatia County. The new **Electricity Market Act** changes the connection procedure and the issuance of energy approvals, with the aim of the achievable, sustainable addition of renewable energy sources into Croatia's power system.

Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (hereinafter: *Directive 2012/27/EU*[6]), *Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency* (hereinafter: Directive 2018/2002),[7] and the **Energy Efficiency Act** generally define HERA's obligations regarding energy efficiency. HERA primarily fulfils these obligations by adopting by-laws that direct HOPS, HEP-ODS, and grid users to behave in accordance with energy efficient principles. When determining costs in the process of adopting tariff items for electricity transmission and distribution, the quantity of energy losses in the grid is taken into account; when approving ten-year development plans, investments, and measures to reduce technical losses in the transmission and distribution networks are taken into account. It must be noted that technical losses cannot be eliminated completely due to the limitations of the laws of physics; as losses become smaller, the investments required to reduce them further increase. The implementation of measures must also take into account plant safety, technical regulations, and the development of the grid.

With the aim of contributing to the achievement of national indicative energy efficiency targets, the **Energy Efficiency Act** sets mandatory cumulative energy saving targets in energy end-use. Mandatory cumulative objectives are achieved through a combination of energy efficiency obligation systems established by the **Energy Efficiency Act** and alternative policy measures defined in the NECP. The energy efficiency obligation system requires electricity suppliers to save energy when supplying to consumers.

According to the **Energy Efficiency Act**, measures to improve energy efficiency achieved in the transmission and distribution of electricity are considered alternative policy measures by which to achieve part of the mandatory cumulative energy savings goal. The NECP and the ten-year grid development plans containing measures that HOPS and HEP-ODS will implement in the coming periods as alternative measures.

The Ministry takes an ex officio decision defining the energy savings requirement in kWh for a particular year, and obligated parties are required to deliver reports on realised savings to the Ministry and enter data on implemented measures into the System for Monitoring, Measuring, and Verification of Energy Savings (hereinafter: SMIV). According to the statements received by HERA from active electricity suppliers, nearly all active electricity suppliers who were obligated parties in 2021 fulfilled their requirements and reported them to the Ministry.

In 2021, HROTE calculated deviations for the balance groups in the amount of HRK 161 million, which represents a significant increase in comparison to 2020 (around HRK 45 million). The calculation for the EKO balance group amounted to HRK 53.6 million, HRK 46.1 million of which pertained to imbalances in energy procurement to cover losses in the transmission network.

The need for Automatic Frequency Restoration Reserve (aFRR) in 2021 amounted to an average of ±59 MW per hour. The needed energy reserves for Manual Frequency Restoration Reserve (aFRR) for system balancing amounted to an +120 MW and -100 MW per hour, while reserves for mFRR for system safety amounted to +130 MW per hour. HOPS also used energy frequency containment reserves (FCR) amounting to ±15 MW per hour, which it obtained from HEP-Proizvodnja d.o.o at no charge. Ancillary services and balancing energy were paid for based on unit prices and realised quantities. In 2021, HEP-Proizvodnja d.o.o. was the largest provider of ancillary system services;[8] it was the only provider of balancing energy for aFRR and mFRR. Grid

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5 According to the National Classification of Statistical Regions 2021 (HR_NUTS 2021) (Official Gazette no. 125/19).

6 Directive 2012/27/EU or Energy Efficiency Directive 2012/27/EU.

7 *Directive 2018/2002/EU or the Directive amending the Energy Efficiency Directive 2018/2002/EU.*

8 *Ancillary services are services and products in the electricity system which are used to regulate the frequency and power of exchanges with other energy systems in order to keep the system in balance, regulate voltage and control reactive power, and restart the energy system following a power failure. They are also used to operate the system when one of its sections is functioning separately from the rest of the electricity system.*

users outside of HEP d.d. also offered mFRR system safety services as part of a pilot project. The total costs of providing ancillary services amounted to HRK 295.2 million, of which 82% was related to power reserves for system balancing. The total cost of the purchase of electricity to cover losses in the transmission network in 2021 amounted to HRK 135 million. Pursuant to *Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing*, HOPS will procure energy via three EU energy balancing platforms in the upcoming period: the IN platform (for imbalance netting), aFRR platform, and mFRR platform.

On 8 January 2021, an incident separated the Continental Europe synchronous area (CE SA)[9] in two. The incident is being analysed by the European Network of Transmission System Operators for Electricity (ENTSO-E). The initial event was a trip at a 400 kV substation at TS Ernestinovo caused by an overload. In less than five minutes, the synchronous area was completely separated in two. The system separation resulted in a deficit of power and a frequency decrease in the western part of the synchronous area, and a surplus of power and a frequency increase in the eastern part. Due to this incident resulting in the separation of the synchronous area of continental Europe, which was classified as an extensive incident, an expert group was formed in accordance with applicable rules to conduct an analysis of the incident and draw up a report. The main conclusions of the report were that transmission system operators reacted quickly and in a coordinated manner to stabilise the system, return frequency to a nominal state, and resynchronise the area. Consequently, there was no major impact on the security of supply for final customers. It was also discovered that the reasons for the separation were an unexpectedly large exchange of electricity between Eastern and Western Europe and poor system stability at the moment. As additional increases in cross-border trading are expected in the future, the report concludes that it will be necessary to conduct more precise calculations regarding system security, as well as to continue coordination among all transmission system operators in Europe. The report lists 22 suggestions for consideration and further implementation.

2.2 Natural gas

The natural gas market in 2021 was marked by a strong increase in natural gas purchase prices on European gas markets; in a number of European countries, including Croatia, this resulted in the launch of a series of measures aimed at mitigating gas price increases, minimising the price impact on the economy and on households, protecting vulnerable customers, and combating energy poverty.

During 2021, epidemiological measures were relaxed and the economy gradually began to recover after the Covid-19 pandemic, which resulted in increased demand for natural gas in Europe. Additionally—taking into account the time and dynamics of gas consumption, limited gas supply, storage capacity, the thin global LNG market, and geopolitical factors—the second quarter of 2021 saw a record increase in wholesale gas prices on European markets, which also affected the Croatian gas market.

The significant increases in prices on European wholesale gas markets resulted in exceptionally high gas price hikes in 2021 in Croatia as compared to 2020; this primarily affected non-household final customers, while the price for household final customers on the public gas supply service was defined by HERA decisions and did not change significantly until 31 March 2022.

The average wholesale price of gas in Croatia (net of VAT) in 2021 amounted to HRK 0.2813/kWh, which was 109.0% higher than in 2020, when it amounted to HRK 0.1346/kWh. Simultaneously, in Q4 2021, the average wholesale gas sale price (net of VAT) amounted to HRK 0.4899/kWh, which was 229.6% higher than the same period a year earlier.

The total average retail price of gas in Croatia (net of VAT) for non-household final customers in 2021[10] was HRK 0.2934/kWh, which is an increase of 79.9% compared to 2020. Simultaneously, in Q4 2021, the average retail gas sale price (net of VAT) amounted to HRK 0.4404/kWh, which was 151.2% higher than the same period a year earlier.

9 *A synchronous area is a single, unified, interconnected energy system (including power plants, electricity networks, their users and consumers...) and an area with maintained default synchronous operation parameters, primarily a synchronised frequency. The synchronous area of Continental Europe covers most of the European Union and is among the largest in the world.*

10 *Non-household consumers are all final customers who are not household consumers. The Gas Market Act (Official Gazette no. 18/18 and 23/20) defines non-household final customers as consumers buying gas not intended for use in their own household.*

In 2021, the average gas sale price for household final customers using the public gas supply service[11] in Croatia was HRK 0.2709 kWh, which represents an increase in the average price of 0.3% as compared to 2020. This is the result of the implementation of the *Methodology for setting tariffs for public service gas supply and guaranteed supply* (Official Gazette no. 108/20 and 20/22) as a protective measure for household final customers by regulating gas supply conditions on a yearly basis.

The final gas price for non-household end consumers (net of VAT) in Croatia in 2021 was 5.7% higher than the EU average, while the final gas price including taxes for non-household consumers in Croatia was 1.9% lower than the EU average.

The final gas price for households (net of VAT) in Croatia in 2021 was still significantly lower than the EU average (35.5%), while the final gas price for households including taxes in Croatia in 2021 was 45.6% lower than the EU average.

In the 2021/2022 gas year, capacity reservations on an annual basis at the entrances to the Croatian transmission system increased by roughly 26%. In 2021, transmission system users expressed significant interest in capacity reservations at the entrance (Omišalj metering station) to the liquefied natural gas terminal (hereinafter: LNG terminal), which resulted in a reduction of capacity reservations at entrances at the interconnections with Slovenia (Rogatec metering station) and Hungary (Dravaszerdahely metering station) as compared to 2020. The highest maximum used capacity at an individual entrance to the transmission system in 2021 took place at the LNG terminal entrance in the amount of 2.94 GWh/h, which was 6.1% higher than the maximum used capacity in 2020, which was measured at Dravaszerdahely metering station. Compared to 2020, there was a significant reduction in the maximum used capacity at the Rogatec metering station (by 78.2%). Capacity usage continued to fall at entrances from domestic production, by 27.4% as compared to the same entrance in 2020.

The LNG terminal began commercial operations on 1 January 2021. The LNG terminal operator, energy entity LNG Hrvatska d.o.o., concluded a lease agreement for LNG terminal capacities from 2021-2040 with five terminal users; the full capacity of the LNG terminal was leased for the first three gas years. In 2021 a total of 19 LNG transport ships from 7 different countries arrived at the LNG terminal.

The shares of the total capacity of the LNG terminal for the period 2021-2040 contracted by users of the LNG terminal, as of the end of 2021, were: MWM CEEnergy Croatia d.o.o. 41.53%; HEP d.d. 29.88%; MET Croatia Energy Trade d.o.o. 16.43%; INA d.d. 12.15%; and PPD d.o.o. 0.01%.

The total quantity of natural gas measured at the entrance to the transmission system in 2021 was 31,712 GWh (domestic production 5,775 GWh, imports at interconnections 6,225 GWh, imports from the LNG terminal 15,703 GWh, and the entrance from the storage facility 4,009 GWh), which was 2.4% less than in 2020. At the LNG terminal entrance to the Croatian transmission system, the transmitted quantity of gas amounted to 15,703 GWh, or 49.5% of the total transmitted quantity of gas. The total quantity of gas transmitted from the group of entrances from the transmission system in Croatia in 2021 amounted to 31,674 GWh, which was 2.5% less than the same quantity in 2020.

The total transported quantity of natural gas delivered to final customers in Croatia on the retail market in 2021 amounted to 27,486 GWh (non-household on the transmission system 14,319 GWh, household 6,557 GWh, non-household on the distribution system 5,580 GWh, and exports at interconnections 1,030 GWh), which was 2.1% less than in 2020.

Natural gas in Croatia was procured from multiple sources: from domestic production, from imports from at interconnections and from the LNG terminal, which is an indicator of diversified supply sources and security of supply.

In 2021, a total of 14 suppliers and traders sold gas on the wholesale market. A moderate level of competition was maintained on the wholesale gas market, dominated by several major suppliers. A market concentration index—the Herfindhal-Hirschmann Index (hereinafter: HHI)—on the Croatian wholesale gas market (not including sales for supply in the public service) amounted to 2,160 in 2021, while it amounted to 2,699 in 2020, which is still an indicator of the moderate domination of a small number of suppliers on the wholesale gas market. In terms of the share of balance groups in the overall delivered quantity of natural gas at entries

[11] *The weighted average by delivered gas quantities for household final customers using the public service, for each particular public service gas supplier.*

to the transmission system, the dominant parties are MVM CEEnergy Croatia d.o.o., PRVO PLINARSKO DRUŠTVO d.o.o., and GEOPLIN d.o.o. Ljubljana.

The HHI score for the retail market for non-household final customers in 2021 was 2,056, which is somewhat lower than in the previous year.

In 2021, retail natural gas market liberalisation continued for household final customers, with certain gas suppliers offering gas supply contracts to households on an unregulated market basis. A significantly higher number of gas supplier switches took place in 2021 as compared to 2020. In 2021, 76,755 gas supplier switches were carried out by customer request. The Register of Billing Metering Points (hereinafter: RBMP) is a unified electronic database of final customer billing metering points for all transmission system operators and distribution system operators in Croatia; it is operated by the gas market operator, which is energy subject Hrvatski operator tržišta energije d.o.o. (hereinafter: HROTE), enabling high-quality, speedy implementation of gas supplier switches.

Suppliers in the public service obligation in Q1 2021 were allowed to buy gas for household final customers in the public gas supply service from wholesale market suppliers under regulated conditions, which did not exclude the possibility of also buying gas from gas suppliers or traders on the gas market. Taking into account the provisions of the **Gas Market Act**, after 31 March 2021, the role of the wholesale market supplier was abolished; the reference price of gas, which was the highest price at which a wholesale market supplier was allowed to sell gas to suppliers in the public service obligation, was no longer prescribed. As of 1 April 2021, the wholesale component of the gas price for household final customers using the public service—i.e. the cost of gas procurement—fully reflected the price of gas on the reference gas market, and was based on the realised price of seasonal futures (winter and summer) for gas delivery in the regulatory year on the European Title Transfer Facility (TTF) within the 11 months previous to the regulatory year.

A public tender conducted by HERA from October to December 2020 resulted in the public gas supply for household final customers being performed by 14 gas suppliers from 1 April 2021 to 30 September 2024 for all distribution areas in Croatia, as compared to 32 prior to 31 March 2021. The public tender to select gas suppliers in the public service obligation implemented a step foreseen to gradually deregulate the Croatian gas market, as defined by the current **Gas Market Act**. Since the decision on selecting the gas supplier under the public service obligation in December 2020, which required suppliers in the public service obligation to maintain indicators of legal, technical, professional, and financial qualification, as well as other conditions on the basis of which they were chosen in the public tender, HERA continuously informed suppliers in the public service obligation of the requirements of the implemented decisions and monitored the execution of these obligations through required actions and the delivery of documentation.

A significant increase in the number of supplier switches were carried out for customers who have the right to gas supply in the public service obligation; 72,729 supplier switches were carried out for this category of customer, which amounts to 95% of all gas supplier switches. This was particularly pronounced in March and April 2021 in distribution areas where new suppliers were designated in the public service obligation.

In order to remove obstacles to the development of the retail gas market, HERA implemented a number of measures and activities, the most important of which were:

- informing gas market participants of their rights and obligations, in particular as regards the contracting of gas supply to final customers, with more detailed information published on the HERA website and available at the following links:
  https://www.hera.hr/hr/html/odgovori_plin.html
  https://www.hera.hr/hr/docs/2022/Obavijest_2022-03-11_02.pdf,
- continued improvement of procedures and activities in providing information to gas market stakeholders through the Register of Billing Metering Points (hereinafter: RBMP),
- improving by-laws regulating price calculation and billing for gas delivered on the basis of the upper gross calorific value (GCV) as of 1 October 2022, and
- collecting opinions and recommendations from the interested public and energy entities through a public consultation within the framework of the adoption of the following relevant by-laws and the *Amendments to the Methodology for setting tariffs for gas transport* (Official Gazette no. 79/20 and 36/21); *Amendments to the General terms and conditions of gas supply* (Official Gazette no. 50/18, 88/19 and 39/20); *Amendments to the Network Code for the gas distribution system* (Official Gazette Nos. 50/18, 88/19, 36/20, and 100/21); *Methodology for setting the price of non-standard services for*

gas transmission, distribution, storage, the unloading and send out of liquefied natural gas, and gas supply as a public service (Official Gazette no. 48/18, 25/19, 134/21, and 9/22); and the *Methodology for setting tariffs for gas supply as a public service and guaranteed supply* (Official Gazette no. 108/20 and 20/22).

In order to protect final customers, throughout 2021, HERA continuously reminded and asked all gas suppliers to ensure that their final customers are protected from unfair and misleading sales methods, that the provisions of gas supply contracts are fair to final customers, and that they clearly, easily, and unambiguously describe the rights and obligations of both the supplier and the customer. From July 2021 to January 2022, HERA undertook an analysis of offers, standardised contracts, and conditions offered by gas suppliers who supply household final customers; if certain gas suppliers were subject to an especially high number of supplier switches, HERA sought insight into the ways they ensured their final customers were informed of gas supply conditions prior to the signing of a supply agreement, as well as asking for documentation gas suppliers deliver to final customers when offering market-based supply agreements. These activities resulted in gas suppliers harmonising standardised supply agreements and conditions, of which they also were required to inform their customers.

In July of 2021, in accordance with the *Amendments to the Storage Code* (Official Gazette no. 58/21), the gas storage system operator Podzemno skladište plina d.o.o. allocated 32 available standard bundling units (hereinafter: SBU), which were placed on the market for the contracting period from 1 April 2022 to 31 March 2027. SBUs were allocated through an auction, which was a new model of allocation enabling the more efficient allocation of SBUs; the available number of SBUs was allocated to 5 users who submitted requests for allocation on the basis of the highest offered auction premium.

In December 2021, in accordance with the provisions of the *Methodology for setting tariffs for gas storage* (Official Gazette no. 48/18), HERA adopted a *Decision on gas distribution tariffs* (Official Gazette no. 141/21 and 32/22), which defined the amounts of tariffs for gas distribution for the third regulatory period, which began on 1 January 2022 and will end on 31 December 2026 for 33 distribution system operators. This *Decision* resulted in a reduction in the average tariff for gas distribution in 2022 as compared to 2021 of roughly 7.9%; gas distribution tariffs decreased in 23 distribution areas and increased in 8 distribution areas.

According to the *Methodology for setting tariffs for gas supply as a public service and guaranteed supply* (Official Gazette no. 108/20 and 20/22), the gas price for final customers using the public service consists of the reference gas price, the cost of gas distribution, and the cost of gas supply. Related to this, due to a change in the cost of gas distribution, the *Decision on tariffs for gas supply as a public service for the period from 1 January to 31 March 2022* (Official Gazette no. 141/21 and 147/21) was adopted in December 2021, defining the price of gas for household final customers in the public gas supply service for all 14 suppliers in the public service obligation, who operate in 33 distribution areas in Croatia.

In March 2022, HERA adopted the *Decision on tariffs for gas storage* (Official Gazette no. 36/22, which defined the amounts of tariff items for gas storage for the third regulatory period from 1 April 2022 to 31 December 2026. The tariff for contracted SBUs on an annual basis for 2022 was 3.9% lower than in 2021. The established tariffs for gas storage in the third regulatory period are based on the calculation of the anticipated allowed revenues of the gas storage system operator, which include the difference identified after the regular revision of revenues for the 2016 and the years of the second regulatory period in 2017, 2018, 2019, and 2020, which is also founded on planned investment projects for the third regulatory period. The most important investment project the gas storage system operator is planning for the period from 2022-2026 is the first phase of construction of the new Grubišno Polje peak storage facility, which involves research work and initial investments into purchasing and installing equipment for the project, which HERA has accepted as part of the approval for the investment plan for the third regulatory period.

Given the current situation on the European wholesale gas market and manifold price increases, which has resulted in an increase in the sale price of gas for non-household final customers beyond the guaranteed supply price range foreseen in the *Methodology for setting tariffs for gas supply as a public service and guaranteed supply* (Official Gazette no. 108/20) in Q4 2021, in February of 2022, HERA adopted the *Amendments to the Methodology for setting tariffs for gas supply as a public service and guaranteed supply* (Official Gazette no. 20/22). *The Amendments to the Methodology for setting tariffs for gas supply as a public service and guaranteed supply* prescribe a new way of determining the final price of guaranteed supply for non-household final customers by reflecting current market trends on a three-month basis. As a result of the

Amendments to the Methodology for setting tariffs for gas supply as a public service and guaranteed supply, which changed the conditions under which guaranteed supply is provided, a public tender to determine a new guaranteed supplier of gas was undertaken. On the basis of a public tender conducted by HERA from 18 to 25 February 2022, in March 2022, HERA adopted a *Decision to designate the guaranteed gas supplier*, which designated HEP-PLIN d.o.o. as the guaranteed gas supplier in Croatia from 10 March 2022 to 30 September 2024.

Due to financial problems in the operations of gas suppliers, and in the aim of ensuring continuous gas supply to end customers, in March and April 2022, HERA identified suppliers in difficulty, and took a decision to begin to provide guaranteed gas supply to the final customers of two gas suppliers (IVAPLIN d.o.o. and BROD-PLIN d.o.o.). During this same period, HERA's supervision of the gas supply resulted in a decision to temporarily revoke the license of one gas supplier (ZELINSKE KOMUNALIJE d.o.o.) due to the supplier's inability to supply sufficient quantities of gas to its final customers and its failure to fulfil financial qualifications; this fulfilled the conditions for guaranteed gas supply, which was initiated for the final customers of this gas supplier in early May 2022.

HERA continues to monitor the retail and wholesale gas markets and carry out activities under its jurisdiction; as a result, from November 2021 to March 2022, HERA supervised the implementation of the *General Terms and Conditions of Gas Supply of GRADSKA PLINARA ZAGREB – OPSKRBA d.o.o.* As a result, a decision was taken requiring GRADSKA PLINARA ZAGREB – OPSKRBA d.o.o. to not prevent its final customers from switching suppliers in the case of disputed increases in gas prices, nor to issue orders suspending the supply of gas.

2.3 Oil, petroleum products, and biofuels

In 2021, the oil, petroleum products, and biofuel sector was marked by a decrease in the production of petroleum products, an increase in petroleum product imports, and an increase in quantities of crude oil transported via the oil pipeline system.

During 2021, the Rijeka Oil Refinery refined only 63,000 tonnes of crude oil, 32,000 tonnes of domestically produced condensates, 713,000 tonnes of other raw materials (domestic and imported), and 1.76 million tonnes of imported crude oil from Azerbaijan, Nigeria, Libya, and Kazakhstan. Total demand for raw materials for the production of petroleum products amounted to 2.57 million tonnes.

Petroleum product production in 2021 amounted to 2.4 million tonnes, which is a relative decrease of 4% as compared to 2020. A total of 1.6 million tonnes of petroleum products were imported, which is an increase in imports of 0.06 million tonnes, or 3.7% compared to the quantities imported in 2020. This increase in imports is primarily attributable to the increase in economic activities after the cessation of restrictions due to the Covid-19 pandemic.

The total production of liquefied petroleum gas in 2021 amounted to 118,000 tonnes, which is a decrease of 68,000 tonnes (37%) as compared to 2020.

Biofuel production in 2021 amounted to 390 tonnes, which represents a significant increase of 128% as compared to 2020, when 171 tonnes of biofuels were produced.

Significant events on the petroleum products markets in 2021 included the shuttering of CRODUX PLIN d.o.o., the entry of multinational oil company Shell plc into the Croatian market through the purchase of APIOS d.o.o. by CORAL CROATIA d.o.o., and continued growth in the price of petroleum products.

During 2021, driven by the recovery of the world economy from the Covid-19 pandemic as well as other significant announcements, changes, and events tied to energy in Europe and worldwide, the prices of all energy products began to rise significantly, including petroleum products. As a response and mitigation measure of the situation for consumers of petroleum products, the Croatian government adopted the *Decision determining the maximum retail price of petroleum products* (Official Gazette no. 112/2021) on 15 October 2021, which limited growth in the retail price of petroleum products on the domestic market.

2.4 Thermal energy

The Thermal Energy Market Act introduced substantial changes to the regulation, organisation, and functioning of the thermal energy sector and the development of the thermal energy market. **The Act** introduces the concept of a free thermal energy market, in which only the distribution of thermal energy remains a public service monitored by a regulatory body, while the production and supply of thermal energy is left to market laws of supply and demand.

However, the national thermal energy market did not take off, and the expected effects in terms of the development of competition in thermal energy supply and thermal energy purchasing were lacking. The thermal energy market did not develop in terms of price competitiveness, and the entire sector is burdened with the issue of how to distribute and bill for thermal energy in multi-unit residential buildings.

In centralised and closed heating systems, thermal energy buyer activity and all energy activities related to the thermal energy sector are performed by the same vertically integrated energy entities. As far as independent heating systems are concerned, thermal energy buyer activity is most often undertaken by energy entities performing energy activities in the thermal energy sector in a specific area, although other thermal energy buyers do operate in some towns. According to data from the Register of Thermal Energy Buyers, the six largest energy entities (HEP-TOPLINARSTVO d.o.o., Zagreb; GRADSKA TOPLANA d.o.o., Karlovac; Tehnostan d.o.o., Vukovar; GTG VINKOVCI d.o.o., Vinkovci; BROD-PLIN d.o.o., Slavonski Brod; ENERGO d.o.o., Rijeka) purchase thermal energy for more than 97% of end consumers in Croatia. Of the 47 entities in the Register of Thermal Energy Buyers, 72% actively undertook thermal energy buyer activity in 2021. Two new businesses were recorded in the Register of Thermal Energy Buyers in 2021, while one business was deleted from the register.

In 2021, HERA issued two licences for thermal energy production and three licences for thermal energy supply. Similar to the previous year, the new licences issued in 2021 are primarily a result of the construction of cogeneration facilities participating in the incentives system for electricity production from renewable energy sources and high-efficiency cogeneration.

In 2021, HERA issued nine decisions granting eligible electricity producer status to new biogas, biomass, and landfill gas cogeneration plants. The majority of cogeneration facilities participating in the incentives system for electricity production from renewable energy sources and cogeneration use produced thermal energy for their own needs, or supply it to a single energy entity (wood processing company or farm). A significant portion of thermal energy used for own needs pertains to the preparation of the primary energy source (wood chip drying or production of biogas).

Although the plants in the incentives system for electricity production from renewable energy sources and cogeneration are subject to energy efficiency conditions, the plants are mostly built to produce electricity in locations where there is no significant demand for thermal energy. However, there is a trend towards the improved use of thermal energy in cogeneration plants with eligible electricity producer status, mainly through the construction of wood-drying kilns next to cogeneration plants.

With the exception of the construction of cogeneration facilities participating in the incentives system for electricity production from renewable energy sources and high-efficiency cogeneration, there were no significant changes in the development of district heating systems. The total number of final customers of thermal energy, network length, and the installed plant capacity of existing energy entities essentially did not change as compared to the previous year.

Energy entities engaged in thermal energy production and thermal energy distribution in district heating systems requested a change in tariffs for thermal energy production or thermal energy production in 2021 in accordance with the *Methodology for setting tariffs for thermal energy production* (Official Gazette no. 56/14). Requests to change tariffs for thermal energy production due to natural gas price increases were submitted by Tehnostan d.o.o. for the Borovo Naselje and Olajnica district heating systems. These requests resulted in an increase in tariffs for energy in the household tariff group (31.42% increase for CHS Borovo Naselje and 30.93% for CHS Olajnica) and for the industrial and commercial tariff group (32.35% increase for CHS Borovo Naselje and 31.61% for CHS Olajnica).

The Methodology for setting tariffs for thermal energy production provides for a simplified procedure for changing tariffs in case of changes in the price of fuel used for thermal energy production of more than ±5%

as compared to the price of the fuel for which the energy tariffs have been approved. In 2021, HERA received five such requests for changes in tariffs for energy: three requests from Gradska toplana d.o.o. and two requests from Brod-plin d.o.o. As a result of two requests from Gradska toplana d.o.o., in early 2021, tariffs for 2021 were reduced for the household tariff group (decrease of 10.46%) and for the industrial and commercial tariff group (decrease of 25.81%). Due to an increase in the price of natural gas, HERA received one request from Gradska toplana d.o.o. to increase the tariff for the industrial and commercial tariff group and two requests from Brod-plin d.o.o. to increase tariffs for the household tariff group and the industrial and commercial tariff group. These requests from Gradska toplana d.o.o. and Brod-plin d.o.o. were received in late 2021. As a result of the request from Gradska toplana d.o.o., energy tariffs were increased for the industrial and commercial tariff group (increase of 28.49%) as of 1 March 2022. Likewise, as a result of the request from Brod-plin d.o.o., energy tariffs were increased for the household tariff group (increase of 26.77%) and the industrial and commercial tariff group (increase of 31.86%) as of 1 April 2022.

There were no significant legislative activities or changes regarding the thermal energy sector in 2021.

In late 2021, the **Renewable Energy Sources and High-Efficiency Cogeneration Act (Official Gazette no. 138/21)** entered into force; it introduced mandatory increases in the share of renewable energy sources in the heating and cooling sector of roughly 1.1% as a yearly average calculated for the period from 2021 to 2025 and from 2026 to 2030 as compared to the share of renewable energy sources in the heating and cooling sector in 2020.

Likewise, related to the renewable energy electricity production incentives system, the *Regulation on promoting electricity production from renewable energy sources and high-efficiency cogeneration* (Official Gazette no. 116/18) and the *Regulation on amendments to the Regulation on promoting electricity production from renewable energy sources and high-efficiency cogeneration* (Official Gazette no. 60/20) provide a detailed elaboration of the manner and conditions under which new models of incentives for energy production from renewable energy sources and high-efficiency cogeneration are to be implemented. Directly related to this, the *Regulation on quotas for promoting electricity production from renewable energy sources and high-efficiency cogeneration* (Official Gazette no. 57/20) defines quotas for biomass and biogas cogeneration facilities, however cogeneration facilities using natural gas are lacking, as are quotas for liquid biofuel power plants (which are in essence cogeneration plants), cogeneration plants using waste and other renewable fuels, and cogeneration plants using industrial waste heat.

After HROTE's first public tender for market premiums and guaranteed purchase prices to incentivise the production of electricity from renewable energy sources, in late 2020, the systematic distribution of state aid for the production of electricity from renewable energy sources and cogeneration continued after the expiry of the *Tariff system for the production of electricity from renewable energy sources and cogeneration* (Official Gazette no. 133/13, 151/13, 20/14, 107/14, and 100/15) in late 2015. With regard to the thermal energy sector, four contracts for the purchase of electricity produced from renewable energy sources and cogeneration were activated in 2021—two for biomass power plants and two for biogas power plants.

In early 2022, on the basis of the Support Program approved by the European Commission, HROTE issued a public tender for offers to incentivise the production of electricity using RES through a market premium system with a defined total quota of 630 MW for new projects, including biomass, biogas, and geothermal power plants with a capacity of over 500 kW.

Related to the incentives system for the production of electricity from renewable energy sources, the *Regulation on the Amendments to the Regulation on promoting electricity production from renewable energy sources and high efficiency cogeneration* (Official Gazette no. 60/20) allowed the extension of previously issued eligible electricity producer status due to circumstances caused by the Covid-19 pandemic. Developers were specifically able to request an extension of eligible producer status issued for plants under construction no longer than six months from the date the status was to expire.

As concerns eligible producers of electricity, the **Renewable Energy Sources and High-Efficiency Cogeneration Act (Official Gazette no. 138/21)** entered into force in late 2021. Article 41 of the **Act** foresees the adoption of a regulation that delineates the manner and conditions for gaining and revoking eligible electricity producer status, as well as the technical and plant conditions for power plants and/or production units that have attained eligible electricity producer status. The adoption of said regulation is of exceptional significance to HERA due to the need to improve procedures for the issuance of decisions on eligible producer status, to clarify the technical requirements of plant use, to significantly elaborate upon the issue of affirming

the efficiency of cogeneration, and to regulate other implementation issues related to eligible electricity producer status.

In early 2021, the **Act on Amendments to the Energy Efficiency Act (Official Gazette no. 41/21)** entered into force. Although the amendments introduced by the **Act** are primarily related to the transposition of several EU directives, changes in the energy savings obligation system are of significance to energy entities in the thermal energy sector. Specifically, provisions were adopted for a new cumulation period (the period in which the implementation of measures is monitored) from 1 January 2021 to 31 December 2030. Likewise, the entry into force of the Act repealed the **Ordinance on the energy efficiency obligation system (Official Gazette no. 41/19)**. The provisions of the *Ordinance* were included in the **Energy Efficiency Act** and in the *Ordinance on the system for monitoring, measuring, and verifying energy savings* (Official Gazette no. 98/21), which was adopted in September 2021.

The energy efficiency obligation system requires suppliers to implement energy efficiency measures in final consumption as prescribed by the *Energy Efficiency Directive 2012/27/EU* and the *Directive amending the Energy Efficiency Directive 2018/2002/EU*. The **Energy Efficiency Act** foresees the gradual implementation of the energy efficiency obligation system, according to which obligated parties in 2019 were energy suppliers and related persons who supplied a total of more than 300 GWh of energy in 2017; this limit was reduced to 100 GWh in 2020, and was finally lowered to the limit of 50 GWh in 2021. Entities in the heating sector subject to the obligation in 2021 were: HEP-Toplinarstvo d.o.o., Zagreb; Energo d.o.o., Rijeka; and Brod-plin d.o.o., Slavonski Brod.

Due to the consequences of earthquakes in 2020, the Croatian government adopted a *Decision declaring a natural disaster in earthquake-affected areas* (Official Gazette no. 1/21), which declared a natural disaster caused by earthquakes in Sisak-Moslavina, Zagreb, and Karlovac counties; it also adopted three decisions related to the use of heating systems in earthquake-affected areas.

A Croatian government decision on 18 January 2021 required Hrvatska elektroprivreda d.d. to write off all claims for energy delivered and other claims or charges in the amount of a single bill for energy delivered and corresponding charges for January, February, and March 2021 for household final customers in Sisak-Moslavina and Zagreb County whose buildings were damaged in a series of earthquakes beginning 28 December 2020. On the basis of this *Decision*, HEP-Toplinarstvo's expenses in this area were written off.

A Croatian government decision on 11 March 2021 required the Ministry to refund claims in the amount of bills for delivered thermal energy issued during January, February, and March of 2021 to all household final customers whose properties were damaged in the earthquakes in Sisak-Moslavina and Zagreb counties; a decision on 25 March 2021 also suggested the write-off of claims and charges for energy for April 2021. The cost of thermal energy will be reimbursed out of the Croatian state budget.

A Croatian government decision on 23 February 2021 required Hrvatska elektroprivreda d.d. to write off all claims for household final customers in Sisak-Moslavina and Zagreb County whose buildings were damaged through its subsidiaries by connecting a replacement plant to the grid, as well as write off other claims in the amount of a single bill for delivered electricity and hot water, including charges for distribution and transmission of electricity and thermal energy distribution and corresponding charges for September, October, November, and December 2021. On the basis of this *Decision*, HEP-Toplinarstvo's expenses in this area were written off.

3 ORGANISATIONAL STRUCTURE, AUTHORITY, AND ACTIVITIES OF HERA

HERA is an independent, autonomous and non-profit legal person with public authority over the regulation of energy activities that was established in 2004 pursuant to the **Act on the Regulation of Energy Activities (Official Gazette no. 177/04)**.

HERA's activities are carried out in the interest of the Republic of Croatia and in accordance with its official authority.

HERA's work is public, and all of its activities are conducted according to the principles of transparency, objectivity, and impartiality.

3.1 Organisation

The structure of HERA is defined by the **Act on the Regulation of Energy Activities (Official Gazette no. 120/12 and 68/18)** and the *Statute of HERA* dated 16 October 2013. The structure of HERA was modified by the Amendments to the Statute of HERA dated 29 April 2019.

HERA consists of a Board of Commissioners, Office of the President of the Board of Commissioners, Independent Internal Audit Department, core operations divisions, administrative and support services.

HERA is governed by its Board of Commissioners, which is responsible for its professional work.

The President of the Board of Commissioners manages the board's work and represents HERA, he represents HERA in all proceedings before courts, administrative and other state authorities, and before legal entities vested with official authority. The President of the Board of Commissioners also takes all legal actions on behalf of and for the account of HERA, organises and manages HERA's operations, and is accountable for legal compliance of HERA's operations. The President of the Board of Commissioners has a deputy.

The divisions and services are in charge of HERA's core operations, and provision of administrative and support services.

HERA's organisational chart is shown in Figure 3.1.1.

The divisions and services are managed by directors who are appointed by the President of the Board of Commissioners in accordance with public calls for applications. The directors are appointed to a term of four years with the possibility of re-appointment.

The directors of divisions and services manage the professional operations of the divisions and are accountable to the President of the Board of Commissioners.

Pursuant to the *Decision of the Government of the Republic of Croatia on the amount of charges for the regulation of energy activities* (Official Gazette no. 155/08, 50/09, 103/09, and 21/12), HERA's operations are funded from the following sources:

- a charge amounting to 0.05% of the total annual revenue from the sale of goods and/or services generated in the previous year by energy entities involved in energy activities conducted based on licences for performing such energy activities, and
- charges for issuing licences for performing energy activities, charges for acquiring eligible producer status, and charges for the settlement of claims, complaints, and requests.

In March 2022, the Croatian government adopted a new Decision on the amount of charges for the regulation of energy activities (Official Gazette no. 38/22), which reduced certain charges for submitting requests to HERA and abolished charges for submitting appeals.

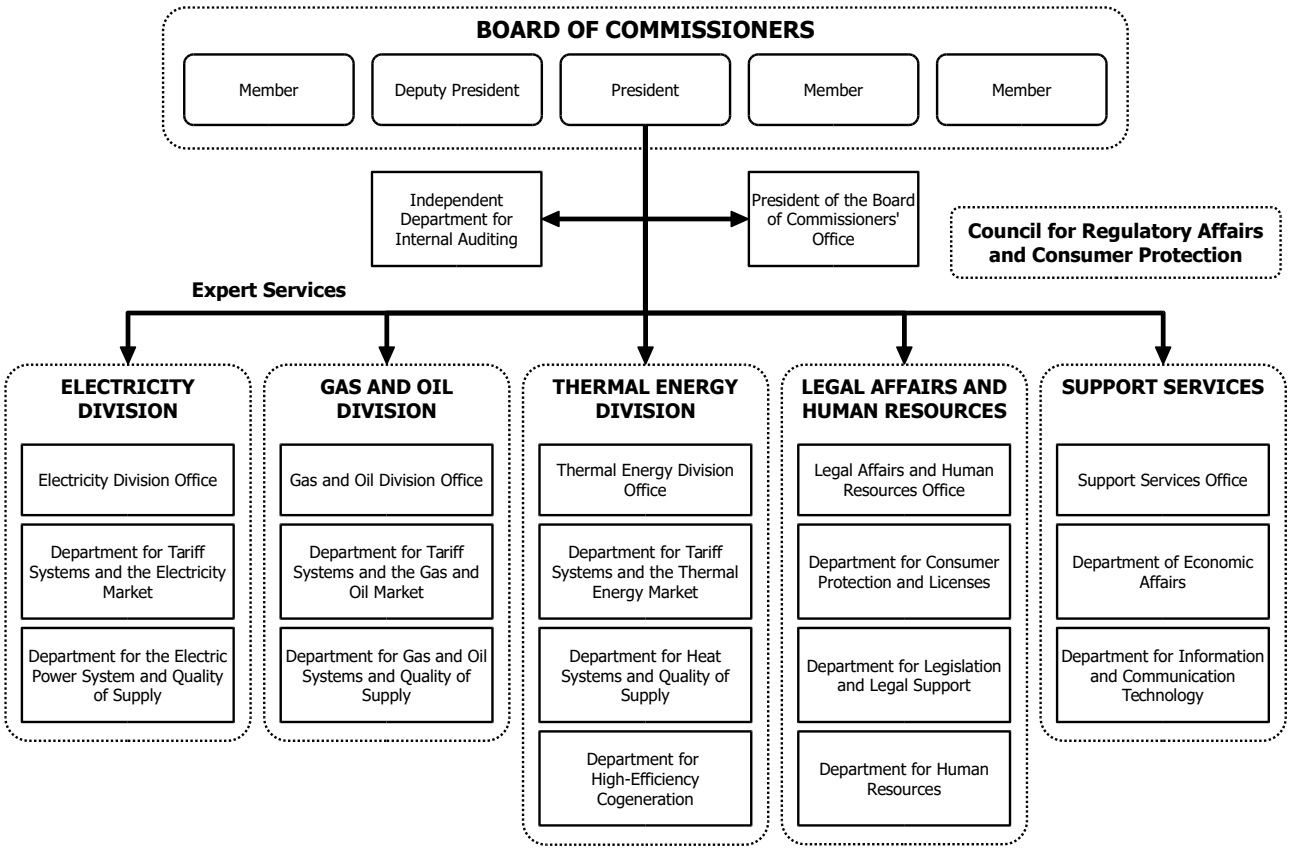

Figure 3.1.1. HERA organisational chart

Pursuant to the provisions of Article 8 **of the Act on the Regulation of Energy Activities (Official Gazette no. 120/12 and 68/18)**, HERA is accountable to Croatian Parliament for its operations.

3.2 Legal framework

The legal framework regulating activities within HERA's area of competence includes of the following regulations:

- **Act on the Regulation of Energy Activities (Official Gazette no. 120/12 and 68/18)**,
- **Energy Act (Official Gazette no. 120/12, 14/14, 102/15, and 68/18),**
- **Electricity Market Act (Official Gazette no. 22/13, 102/15, 68/18, and 52/19),**
- **Electricity Market Act (Official Gazette no. 111/21)**,
- **Gas Market Act (Official Gazette no. 18/18 and 23/20)**,
- **Thermal Energy Market Act (Official Gazette no. 80/13 and 14/14)**,
- **Oil and Petroleum Products Market Act (Official Gazette no. 19/14, 73/17, and 96/19)**,
- **Act on Biofuels for Transport (Official Gazette no. 65/09, 145/10, 26/11, 144/12, 14/14, 94/18, and 52/21)**,
- **Renewable Energy Sources and High-Efficiency Cogeneration Act (Official Gazette no. 100/15 and 111/18),**
- **Renewable Energy Sources and High-Efficiency Cogeneration Act (Official Gazette no. 138/21)**,
- **Energy Efficiency Act (Official Gazette no. 127/14, 116/18, 25/20, and 41/21)**,
- **Deployment of Alternative Fuels Infrastructure Act (Official Gazette no. 120/16),**
- **Liquefied Natural Gas Terminal Act (Official Gazette no. 57/18),**
- **Act on the Ratification of the Energy Community Treaty (Official Gazette – International Agreements no. 6/06 and 9/06)**,
- **General Administrative Procedure Act (Official Gazette no. 47/09 and 110/21)**,

- *Ordinance on licences for performing energy activities and maintaining registers of granted and revoked licences for the performance of energy activities (Official Gazette no. 88/15, 114/15, and 66/18)*,
- *Decision on the amounts of charges for the regulation of energy activities (Official Gazette no. 155/08, 50/09, 103/09, and 21/12)*, and
- other by-laws adopted pursuant to the **Energy Act** and other legislation regulating particular energy markets.

One of the most important obligations arising from European legislation is Regulation (EU) No 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency (hereinafter: Regulation (EU) No 1227/2011 or the REMIT Regulation), which charges the national regulatory authorities with additional tasks related to monitoring the transparency and function of the European energy market. The 2018 **Act on Amendments to the Act on the Regulation of Energy Activities** has provided HERA with the powers necessary to perform these tasks.

3.3 Activities

HERA's activities are defined in the **Act on the Regulation of Energy Activities**, and include the following tasks:

- granting, renewing, and transferring licences for the performance of energy activities, and revoking and suspending of licences,
- supervision of energy entities in their performance of energy activities,
- supervision of the implementation of provisions on unbundling pursuant to the law governing the energy sector and the laws governing the performance of particular energy activities,
- supervision of the keeping of separate accounts, as provided by the law governing the energy sector and other laws governing specific energy markets,
- supervision of compliance with the provisions ensuring that there are no cross-subsidies between energy activities pursuant to laws governing specific energy markets,
- supervision of compliance with the principles of transparency, objectivity, and impartiality in the work of energy market operators,
- approval of general acts that organise the electricity market and general acts that organise the natural gas market,
- adoption of decisions on eligible producer status and the suspension and revocation of eligible producer status,
- issuing methodologies and tariff systems in accordance with the **Act on the Regulation of Energy Activities**, the law governing the energy sector and other laws governing particular energy markets,
- setting or approving prices, amounts of tariff items and charges in accordance with methodologies and tariff systems under Article 9, paragraph 1, item 11 of the **Act on the Regulation of Energy Activities**,
- approval of investment, development and construction plans for energy systems pursuant to the laws governing specific energy markets,
- supervision of the compliance of investment, development, and construction plans of transport system and transmission system operators with ENTSO-E and ENTSOG development plans,
- supervising the transport, transmission, and distribution system operators, i.e. the system owners, and other energy entities or system users, with respect to their compliance with the obligations defined in the **Act on the Regulation of Energy Activities**, the law governing the energy sector, and other laws governing particular energy markets, as well as *Regulation (EC) No. 2019/943 and Regulation (EC) 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005* (hereinafter: Regulation (EC) No. 715/2009),
- cooperation with the regulatory authorities of EU member states and the neighbouring countries, as well as with the *Agency for the Cooperation of Energy Regulators* (hereinafter: ACER),
- cooperation with the regulatory authorities and other authorities in the Energy Community pursuant to the **Act on the Ratification of the Energy Community Treaty**,

- implementation of the legally binding decisions of ACER and the European Commission,
- submitting annual reports to Croatian Parliament, comprising information on activities taken and results achieved in relation to the scope of activities under Article 11, Paragraph 1, Items 1 through 8 of the **Act on the Regulation of Energy Activities**,
- reporting to other competent national authorities, ACER, the European Commission, and other European Union bodies, i.e. submitting annual reports to ACER and the European Commission, comprising information on activities undertaken and results achieved in relation to the scope of activities under Article 1, Paragraph 11, Items 1 to 8 of the **Act on the Regulation of Energy Activities**,
- laying down the requirements for the quality of energy supply in accordance with applicable regulations governing specific energy activities,
- laying down general requirements for energy supply,
- specifying and supervising the methodology for setting network/system connection charges for new consumers and for increasing the connection power/capacity for energy entities and final customers,
- conducting cost-benefit analyses and obtaining opinions from representatives of consumer protection bodies with respect to introduction of smart metering devices for final customers,
- supervision of the quality of energy supply pursuant to applicable regulations governing specific energy markets,
- supervision of the transparency of the energy market,
- supervision of the level of openness, competition, and misuse on the energy market and in consumer supply,
- supervision of restrictive contracts, especially those restricting the number of suppliers, and informing the national competition regulator when required,
- supervision of free contracting in terms of supply contracts with the possibility of termination and long-term contracts, provided that they comply with EU legislation and policies,
- supervision of the time needed by transport, transmission, and distribution system operators for connection and repair works,
- providing assistance, together with other relevant authorities, to ensure the implementation of efficient and prescribed consumer protection measures,
- adopting recommendations related to the pricing of energy supply performed as a public service, at least once per year,
- providing consumers with the right to access information on their energy consumption, i.e. designing a format for presenting consumers with consumption data that is easy to understand and standardised at the national level, and establishing procedures by which consumers and suppliers may exercise their right to access consumption data such that consumers can enable the registered suppliers to obtain access to data on their consumption, whereas the parties responsible for managing their own consumption data shall provide such data to the suppliers; all these services shall be free of charge for consumers,
- supervision of the confidentiality of consumer energy consumption data,
- monitoring investments in electricity generation facilities with regard to supply security,
- issuing certificates to transport and transmission system operators in accordance with the provisions of the law governing the electricity market and the law governing the natural gas market,
- supervision of the application of the requirements for access to the gas storage system,
- monitoring the implementation of measures stipulated by the Croatian government for emergency situations pursuant to the provisions of the law governing the energy sector,
- encouraging the harmonisation of data exchange in the most important market processes at the regional level, and
- other activities.

All statements and decisions of the Board of Commissioners are published regularly on HERA's website.

In 2021, the Board of Commissioners held 28 meetings, at which a total of 388 agenda items were discussed.

3.4 A general overview of HERA's activities and operations in 2021

3.4.1 Consumer protection

Within the area of its competence, HERA actively participates in consumer protection in a number of ways:

- by supervising the energy entities, the quality of their services and by collecting and processing data related to the energy entities' activities in the field of consumer protection, pursuant to the provisions of the **Energy Act** and the laws governing the performance of particular energy activities, and by co-operating with ministries and competent inspectorates, pursuant to the provisions of relevant laws, and
- by resolving individual consumer complaints and objections, by virtue of public authority pursuant to the **Act on the Regulation of Energy Activities** and other laws and regulations governing individual energy markets.

In order to protect their rights, energy consumers may submit to HERA appeals, complaints and other submissions related to energy entities in the fields of electricity, thermal energy, natural gas and oil. During 2021, HERA received a total of 985 submissions from energy consumers, which included 298 inquiries and 90 other submissions, as well as 597 energy consumer complaints.

The most common reasons final customers contacted HERA are:

- in the electricity sector: records on network users - electricity customers; loss of customer status - right to use network; quality of electricity supply, billing, unauthorised consumption of electricity, temporary disconnection of electricity supply, and connection to the grid and connection conditions (a detailed statistical overview is found in chapter "4.4.4. Protection of network users and other subjects" in this report,
- in the gas sector: billing, disconnection of gas supply, and unauthorised gas consumption (a detailed statistical overview is found in chapter "5.3.6. Consumer protection" in this report),
- in the thermal energy sector: billing, disconnection from a central heating system or disconnection of an entire building from a central heating system, quality of thermal energy supply (a detailed statistical overview is found in chapter "8.2.4. Consumer protection" of this report").

Upon receiving complaints and other requests from final customers, HERA took decisions either accepting or rejecting said complaints, appeals, or other requests, or rejected the submissions due to a lack of legal foundation to act upon them, directed applicants to bodies with jurisdiction over the matters concerned, instructed energy entities to harmonise their procedures with the relevant legal framework, or indicated regulations regulating the subject matter of the submission.

When taking decisions on customer submissions, HERA especially took into account the importance of continuous supply of electricity or energy products, as well as quality of supply of energy products, which the Consumer Protection Act has recognised as an exceptionally important element in protecting the rights of consumers. HERA considers it important to reduce the number of energy supply suspensions used by suppliers as a method of enforced collection of overdue receivables; it holds that the primary tool used to this end should be the legally prescribed measures (enforcement of overdue bills). In support of this, at the recommendation of the Ombudsman, HERA added provisions to the general terms and conditions of electricity supply requiring suppliers to directly contact household final customers upon the first signs of difficulties in settling bills, to allow for individualised advice and assistance in settling bills and to attain an optimal level and schedule of energy consumption.

The second half of 2021 was marked by significant increases in the price of all forms of energy on the international market; these unfavourable trends continued in 2022 alongside significant turbulence caused by political instability and international conflicts, and the inherent significant increase in risk to access to and the price of natural gas, oil, and petroleum products. This situation could easily result in a supply crisis of certain energy products. All of this obliges HERA to act and implement measures and harmonise actions with other state bodies and institutions to reduce, and potentially eliminate possible supply risks, and then to ensure safe, stable supply of energy and energy products to all energy consumers in Croatia. It is entirely possible that, under circumstances of significant risk or crisis on the international energy markets, risk to energy supply routes would result in the activation of mechanisms and instruments of cooperation and joint

action among European bodies and institutions, especially regulatory bodies tied to the internal European energy market, in order to mitigate the negative consequences of energy supply disruptions to energy consumers.

A total of 10 court proceedings were initiated against HERA in 2021 through the filing of suits to the competent administrative court; some proceedings are also still underway from the earlier period. As of 31 December 2021, 19 court proceedings against HERA decisions were underway.

Of these 19 proceedings active as of 31 December 2021, 18 were being heard before the administrative court with jurisdiction over such matters, while one was a civil proceeding before the Commercial Court in Zagreb for damages due to HERA's actions; the latter ended with a final judgment of the High Commercial Court which dismissed the plaintiff's claim, after which the plaintiff filed an appeal to the Croatian Supreme Court.

The court proceedings launched in 2021 are administrative disputes filed before the Administrative Court in Zagreb. These are: two (2) administrative disputes against HERA decisions defining suppliers in the public gas service obligation (IVAPLIN d.o.o. i Komunalije d.o.o.); two (2) administrative disputes filed by interested parties against the same HERA decision (issued at the request of a party) issuing a license for the performance of energy activities; two (2) administrative disputes filed by interested parties against the same HERA decision approving the request of a party to transfer rights and obligations from a decision awarding eligible electricity producer status; one (1) administrative dispute against a HERA decision accepting the status of a party in an administrative procedure; one (1) administrative dispute against a HERA decision rejecting a request to accept the status of a party in an administrative procedure; and two (2) administrative disputes against HERA decisions on a complaint regarding the actions of the transmission system operator.

HERA was also actively involved in the work of the National Consumer Protection Council, as well as in the drafting of the National Consumer Protection Programme for 2021-2024, with the aim of familiarising consumers in the energy sector with their rights and obligations, as well as to introduce HERA as an authority that can be contacted in case of a violation of any right guaranteed by regulations governing the energy sector.

HERA also closely cooperated with other public and legal entities in 2021, as well as with various consumer protection associations. HERA will continue this cooperation in the future, and maintain its contact with consumers by replying directly to inquiries, resolving matters related to consumer rights and protection, etc.

3.4.2 Statistical data on the time period within which HERA resolved requests

In addition to the **Act on the Regulation of Energy Activities** and sectoral laws and by-laws, HERA applies the provisions of the **General Administrative Procedure Act** in its actions in administrative matters related to permits for the performance of energy activities and eligible producer status. Article 101.1. and 2. of the **General Administrative Procedure Act** stipulates that, in cases of direct settlement at the request of a party, an official person is obligated to issue a decision and submit it to the party without delay, no later than 30 days from the date of submission of a regular request; in the case of an investigation, the official person is obligated to issue a decision at the request of the party and submit it to the party no later than 60 days from the date of submission of a regular request.

HERA issued an average of 1.2 decisions per request for licenses for the performance of energy activities, through which it sought the elimination of problems in the requests or the delivery of evidence without which the request could not be processed. Procedures initiated under such requests lasted an average of 23.74 days.

HERA issued an average of 1.09 decisions per request for the eligible producer status, through which it sought the elimination of problems in the requests or the delivery of evidence without which the request could not be processed. Procedures initiated under such requests lasted an average of 18.55 days.

A detailed elaboration of the administrative procedures in which HERA took decisions in 2021 is presented later in the text of this Report, in the chapters related to electricity, natural gas, and thermal energy, as well as in the chapter "11 APPENDIX – PERMITS FOR THE PERFORMANCE OF ACTIVITIES".

3.4.3 Electricity

In 2021, HERA's activities in the electricity sector mainly involved the following:

- drafting and adopting by-laws governing the electricity market,
- implementing EU regulations,
- issuing decisions on tariffs based on the methodology applicable to energy entities performing electricity-related activities as a public service,
- approving and monitoring the implementation of ten-year development plans for transmission and distribution networks,
- monitoring electricity losses in the transmission and distribution network,
- regular monitoring of the implementation of rules on managing and allocating interconnection capacities, as well as compliance with the capacity allocation regime,
- regular monitoring of balancing energy settlements and imbalance settlements in order to improve the regulations concerning balancing energy settlements and imbalance settlements, including the implementation of standard load profiles,
- collecting and processing data on the quality of electricity supply and participating in the drafting of *Council of European Energy Regulators* (CEER) reports on the quality of electricity supply,
- implementing *Regulation (EU) No 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency* (*REMIT Regulation*) in order to prevent insider trading and market manipulation in cooperation with ACER,
- monitoring the separation of energy-related operations and unbundling of accounts for entities performing electricity-related activities as a public service (HEP-ODS),
- issuing 15 licences to perform energy activities (five licences for electricity generation, one licence for electricity supply, and four licences for electricity trade), and one procedure cancelled at the submitter's request,
- extending 13 licences to perform energy activities (eight licences for electricity generation, one licence for electricity supply, four licences for electricity trade), and one rejected request for extension,
- issued seven decisions granting eligible electricity producer status, three decisions amending decisions granting eligible electricity producer status, two decisions issuing prior approval for planned changes to conditions of plant use,
- resolved 659 appeals, complaints, inquiries, and other submissions related to electricity.

HERA issued the following decisions on tariffs:

- *Decision on tariffs for guaranteed electricity supply (Official Gazette no. 24/21) (for the period from 1 April to 30 June 2021),*
- *Decision on tariffs for guaranteed electricity supply (Official Gazette no. 65/21) (for the period from 1 July to 30 September 2021),*
- *Decision on tariffs for guaranteed electricity supply (Official Gazette no. 100/21)* (for the period from 1 October to 31 December 2021),
- *Decision on tariffs for electricity distribution for 2022 (Official Gazette no. 138/2021)*,
- *Decision on tariffs for electricity transmission for 2022 (Official Gazette no. 138/2021)*,

HERA gave prior approvals for the following by-laws:

- prior approval for the *Draft Rules on congestion management in the Croatian electricity system, including interconnectors* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Rules for the intra-day allocation of cross-border transmission capacities between the regulation areas of Hrvatski operator prijenosnog sustava d.o.o. (HOPS) and Nezavisni operator sistema u Bosni i Hercegovini (NOSBiH)* of Hrvatski operator prijenosnog sustava, d.o.o., Zagreb,
- prior approval for the *Harmonised rules for the allocation of long-term transmission rights and Special addendum to the harmonised allocation rules for the border between the Croatian and Serbian bidding zones* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Rules for the daily and intra-day allocation capacities for the border between the Croatian and Serbian bidding zones* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,

HERA gave approval or prior approval for the following documents:

- prior approval for the *Draft ten-year (2021-2030) development plan for the HEP-ODS distribution network with a detailed elaboration of the initial three- and one-year periods* of HEP-Operator distribucijskog sustava d.o.o., Zagreb,
- prior approval for the *Annual report on security of supply for 2020* of Hrvatski operator prijenosnog sustava d.o.o, Zagreb,
- prior approval for the *Annual report on security of supply in the distribution system for 2020* of HEP–Operator distribucijskog sustava d.o.o., Zagreb,
- prior approval for *Amendments to the financial framework of the approved Ten-year (2021-2030) development plan for the HEP-ODS distribution network with a detailed elaboration of the initial three- and one-year periods* of HEP-Operator distribucijskog sustava d.o.o., Zagreb,
- approval for the *Annual energy procurement plan to cover losses in the transmission network for 2022* of Hrvatski operator prijenosnog sustava d.o.o.,
- approval for the *Annual energy procurement plan to cover losses in the distribution network for 2022* of HEP-Operator distribucijskog sustava d.o.o., Zagreb,
- prior approval for the *Draft ten-year (2022-2031) development plan for the HEP-ODS distribution network with a detailed elaboration of the initial three- and one-year periods* of HEP-operator distribucijskog sustava d.o.o., Zagreb.

HERA gave prior approval to the following draft agreements:

- prior approval for the *Draft Agreement on the connection of Korlat Solar Power Plant to the transmission network no. N-64/20* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the conclusion of *Addendum no. 1 to the Cross-border redispatching agreement for 2021* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the conclusion of *Addendum I. to the Agreement on mutual relations regarding the calculation and collection of transmission network charges* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Real estate exchange agreement and draft Annex to the Agreement establishing easement rights* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Addendum 2. to the Business premises lease agreement* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Agreement on the connection of Sukošan Solar Power Plant to the transmission network no. N-69/21* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval accepting the *Offer (Agreement) on relocation and cabling works* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Agreement on connecting Zelovo wind power plant to the transmission no. N-83/21* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Electricity supply agreement for a period of one year* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Agreement on the provision of ancillary services* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Agreement on the connection of Konačnik Solar Power Plant to the transmission network no. N-123/21* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the conclusion the *Cross-border redispatching agreement for 2022* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- prior approval for the *Draft Long-term loan agreement for the financing of investment projects for 2021* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb.

HERA took a decision to adopt reports or decisions approving the following documents:

- decision approving the *Joint proposal of all Central European transmission system operators establishing regional coordination centres in accordance with Article 35 of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,

- decision approving the *Additional FCR characteristics in accordance with Article 154.2. of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation*,
- decision approving the *Draft Rules on connection to the distribution network* of HEP-Operator distribucijskog sustava d.o.o., Zagreb,
- decision on the reference price of electricity for low-voltage final customers and the reference price of electricity for medium- and high-voltage final customers in accordance with Article 62.2. and 62.3. of the *Conditions for the quality of electricity supply (Official Gazette no. 37/17, 47/17, 31/18, and 16/20),*
- decision adopting the *Report on the use of revenues of Hrvatski operator prijenosnog sustava d.o.o. from the allocation of cross-border transmission capacities in 2020*,
- decision approving deviations from the obligations prescribed by Article 20 and 21 of *Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- decision approving the *Structural congestion report* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- decision issuing an opinion on the *Draft Proposal of the Regulation on the share of net electricity delivered by eligible producers that electricity suppliers are obligated to take up from the electricity market operator*,
- decision approving the *Draft ten-year (2022-2031) development plan for the distribution network with a detailed elaboration of the initial three- and one-year periods* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- decision approving the *Draft Regional addendum to the Harmonised rules for the allocation of forward transmission rights for the Core region for the capacity budget in accordance with Article 52 of Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- decision approving the *Proposal for contributions to the costs of establishment, changes, and operation of unified day-ahead and intra-day coupling for 2022* of Hrvatski operator prijenosnog sustava d.o.o., Zagreb,
- decision approving deviation from obligations prescribed by Article 16 Paragraph 8 of *Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity* for energy entity Hrvatski operator prijenosnog sustava d.o.o., Zagreb.

3.4.4 Natural gas

HERA's activities in the gas sector in 2021 were aimed at fulfilling its obligations under the provisions of the **Gas Market Act.** After public consultations in 2021 and early 2022, HERA adopted the following by-laws:

- *Amendments to the Methodology for setting tariffs for gas transport (Official Gazette no 36/21),*
- *Amendments to the General terms and conditions of gas supply (Official Gazette no. 100/21),*
- *Amendments to the Gas Distribution System Network Code (Official Gazette no. 100/21),*
- *Amendments to the Methodology for setting the price of non-standard services for gas transmission, distribution, storage, the unloading and send out of liquefied natural gas, and public service gas supply (Official Gazette no. 134/21 and 9/22) and*
- *Methodology for setting tariffs for public service gas supply and guaranteed supply (Official Gazette no. 20/22).*

HERA approved the following by-laws:

- *Amendments to the Rules on gas storage system use (Official Gazette no. 58/21),*
- *Rules for LNG terminal use (Official Gazette no. 87/21), and*
- *Amendments to the Network code for the gas transmission system (Official Gazette no. 106/21).*

HERA adopted the following decisions:

- *Decision on public service gas supply tariff amounts for the period from 1 April to 31 December 2021 (Official Gazette no. 28/21),*

- *Decision on selecting the gas supplier under the public service obligation for the distribution area of the distribution system operator IVAPLIN d.o.o. for gas distribution and supply, Ulica Krešimira IV 10, Ivanić-Grad, Croatia for the period from 1 April 2021 to 30 September 2024 (HERA 3/21),*
- *Addendum to the Decision on public service gas supply tariffs for the period from 1 April to 31 December 2021 (Official Gazette no. 33/21),*
- *Decision appointing the guaranteed gas supplier for the period from 1 October 2021 to 30 September 2024 (HERA 7/21),*
- *Decision approving the Draft Conditions for guaranteed gas supply agreements with final customers (HERA 8/21),*
- *Decision on a request to define tariffs for gas distribution for the third regulatory period 2022-2026 (HERA 12/21)* for 33 distribution system operators,
- *Decision on tariffs for gas distribution (Official Gazette no. 141/21 and 32/22),*
- *Decision on public service gas supply tariffs for the period from 1 January to 31 March 2022 (Official Gazette no. 141/21),*
- *Decision on charges for connection to the gas distribution or transmission system and on an increase to connected capacity (Official Gazette no. 141/21),*
- *Decision determining connection charges for the cost of ensuring technical requirements in the distribution system of PLINARA, d.o.o., Pula (HERA 12/21),*
- *Decision determining connection charges for the cost of ensuring technical requirements in the distribution system of EVN Croatia Plin d.o.o., Zagreb (HERA 12/21),*
- *Decision determining connection charges for the cost of ensuring technical requirements in the distribution system of ENERGO d.o.o., Rijeka (HERA 12/21),*
- *Decision determining connection charges for the cost of ensuring technical requirements in the distribution system of PLIN-PROJEKT d.o.o., Nova Gradiška (HERA 12/21),*
- *Decision on the cost of non-standard services of the liquefied natural gas terminal operator (Official Gazette no. 141/21),*
- *Decision on the cost of non-standard services of the transmission system operator (Official Gazette no. 141/21),*
- *Decision on the cost of non-standard services of gas storage system operators (Official Gazette no. 141/21)*
- *Decision on the cost of non-standard services of distribution system operators (Official Gazette no. 141/21),*
- *Decision on the cost of non-standard services of gas suppliers in the public service obligation (Official Gazette no. 141/21),*
- *Correction to the Decision on public service gas supply tariffs for the period from 1 January to 31 March 2022 (Official Gazette no. 147/21),*
- *Decision on tariffs for guaranteed gas supply for non-household final customers for March 2022 (Official Gazette no. 21/22),*
- *Decision appointing the guaranteed gas supplier (HERA 3/22),*
- *Decision on tariffs for guaranteed gas supply for non-household final customers for the period from 1 April 2022 to 30 June 2022 (Official Gazette no. 32/22),*
- *Decision on public service gas supply tariff amounts for the period from 1 April to 31 December 2022 and for the period from 1 January to 31 March 2023 (Official Gazette no. 32/22), and*
- *Decision on tariffs for gas storage (Official Gazette no. 36/22)*
- *Decision affirming the conduct of GRADSKA PLINARA ZAGREB-OPSKRBA d.o.o., Zagreb, regarding changed conditions to gas supply agreements with non-household final customers (HERA 3/22),*
- *Decision on the basis of the state confirmed in a Decision on implemented supervision dated 16 March 2022, CLASS: 040-10/21-01/6, REG.NO.: 371-06-22-10, misdemeanour proceedings will be filed against GRADSKA PLINARA ZAGREB-OPSKRBA, Zagreb (HERA 3/22).*

HERA adopted the following decision:

- *Decision issuing a certificate to the transmission system operator, PLINACRO d.o.o. for natural gas transmission, Savska cesta 88a, Zagreb, Croatia* (HERA 7/21).

In 2021, HERA:

- issued nine licences for gas trading activities,
- issued four licences for gas supply activities,
- issued two licenses for the management of liquefied natural gas and/or compressed natural gas supply points,
- extended three licences for gas trading activities,
- extended four licences for gas supply activities,
- extended nine licences for gas distribution activities,
- extended one licence for natural gas production,
- took a decision on the expiry of two licences for gas supply, and
- resolved 120 complaints, 105 inquiries, and 30 other submissions from final customers.

3.4.5 Oil and petroleum products

In 2021, HERA carried out the following activities in the oil and petroleum products sector:

- issued eight licences for energy activities (six licences for wholesale trade in petroleum products and two licences for oil and petroleum product storage),
- extended 27 licenses for energy activities (four licences for oil and petroleum product storage, two licenses for liquefied petroleum gas storage, and, 18 licenses for wholesale petroleum product trade, and three licenses for wholesale liquefied petroleum gas trade), and
- took a decision on the expiry of one license for oil and petroleum products storage.

3.4.6 Biofuels

In 2021, HERA carried out the following activities in the biofuel sector:

- extended three licenses for energy activities (one license for biofuel production and two licenses for biofuel storage),
- extended one licence for biofuel storage, and
- took a decision on the expiry of one license for biofuel storage.

3.4.7 Thermal energy

As regards regulations applicable in the thermal energy sector, HERA provided expert opinions *Draft Regulation amending the Regulation on promoting electricity production from renewable energy sources and high-efficiency cogeneration.*

Energy entities engaged in thermal energy production and thermal energy distribution in district heating systems requested a change in tariffs for thermal energy production or thermal energy production in 2021 in accordance with the *Methodology for setting tariffs for thermal energy production (Official Gazette no. 56/14).* Requests to change tariffs for thermal energy production were submitted by Tehnostan d.o.o. for the Borovo Naselje and Olajnica district heating systems. *The Methodology for setting tariffs for thermal energy production* provides for a simplified procedure for changing tariffs in case of changes in the price of fuel used for thermal energy production of more than ±5% as compared to the price of the fuel for which the energy tariffs have been approved. In 2021, HERA received five such requests for changes in tariffs for energy: three requests from Gradska toplana d.o.o. and two requests from Brod-plin d.o.o.

In addition to the above, HERA undertook the following in 2021:

- issued five licences for energy activities (two licences for thermal energy production and three licences for thermal energy supply),
- extended four licences for energy activities (once licence for thermal energy distribution, and three licences for thermal energy supply),
- recorded two new entities in the Register of Thermal Energy Buyers, deleted one, and updated records on thermal energy buyers,
- issued decisions related to awarding the status of eligible electricity producer status for cogeneration plants; five decisions were issued awarding eligible electricity producer status (two for biomass

cogeneration plants, two for biogas cogeneration plants, and one for a landfill gas cogeneration plant); one decision was issued declining to issue eligible electricity producer status, two amending decisions awarding eligible electricity producer status, two decisions transferring the rights and obligations from a decision awarding eligible electricity producer status, and one decision rescinding a decision awarding eligible electricity producer status,
- resolved requests related to previous decisions awarding eligible electricity producer status for cogeneration facilities, as well as issuing one decision extending a previous decision awarding eligible electricity producer status, and two decisions halting a process to amend previous decision awarding eligible electricity producer status,
- issued six prior approvals for planned changes to conditions for the use of power plants submitted by eligible electricity producers for biogas and biomass cogeneration facilities, as well as one decision rejecting a request for prior approval for planned changes to conditions for the use of a power plant,
- supervised eligible electricity producers in achieving prescribed energy efficiency conditions, as well as issuing seven decisions defining primary energy savings for high-efficiency cogeneration using natural gas, and five decisions defining the total yearly energy efficiency of biomass and biogas plants,
- resolved 71 cases – two appeals, 24 complaints, 39 inquiries, and six other submissions from thermal energy end consumers, authorised owners' representatives, energy entities, institutions, and other parties.

3.4.8 REMIT

The REMIT regulation (Regulation on wholesale energy market integrity and transparency) defines the rules for active participants in the wholesale electricity and natural gas markets in the EU. REMIT prohibits insider trading and market manipulation.

In accordance with the *REMIT Regulation*, all active participants in wholesale electricity and/or natural gas markets in the EU are obligated to register with the regulatory authority of one EU member state. Market participants with headquarters in Croatia and those with business establishments outside of the European Union that are active on the wholesale market within Croatia must register with HERA. Participants in the wholesale electricity market must register via the application of the Centralised European Register of Energy Market Participants (CEREMP). HERA has enabled the registration of market participants with CEREMP since 2015. As of the beginning of 2022, more than 110 participants on the electricity and/or natural gas market had been registered.

ACER monitors the wholesale electricity and natural gas markets at the EU level on the basis of data collected from market participants, systems operators, and organisers of organised wholesale markets. Transmission and transport system operator data on the state of transmission networks and the allocation of cross-zonal transmission capacities, as well as transaction data and transaction orders, are aggregated in order to gain full insight into wholesale markets in the EU.

In order to assist market participants in fulfilling their obligations under the *REMIT Regulation*, HERA allows market participants to report suspicious transactions on wholesale markets on its website, to report exceptions to the insider trading prohibition, and to report the subsequent publication of privileged information.

In order to provide timely information to relevant market participants, in 2021, HERA published its "REMIT HERA newsletter", which serves to inform market participants electronically.

3.4.9 Implementation of European public policy

Clean energy for all Europeans package

The most important documents for the electricity market in the "Clean Energy Package" (*CEP*) are *Regulation (EU) 2019/943* which has been implemented since 1 January 2020, and *Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU* (hereinafter: *Directive (EU) 2019/944*). Aside from these documents, *Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources* (hereinafter: *Directive (EU) 2018/2001*) also has a

certain impact on the electricity market; its provisions have been transposed into Croatian legislation through the new **Renewable Energy Sources and High-Efficiency Cogeneration Act**, adopted in December 2021, which regulates the production and consumption of electricity produced by power plants that use renewable energy sources and high-efficiency cogeneration.

The adoption of the new **Electricity Market Act** in October 2021 transposed the majority of Directive (EU) 2019/944**;** the full transposition of its provisions will be completed with the adoption of by-laws on the basis of this **Act**, particularly through the adoption of an ordinance on the general terms and conditions for network use and electricity supply, which will adopt the provisions of Annex I *of Directive (EU) 2019/944* 'Minimum requirements for invoicing and billing information' by the end of the year.

Pursuant to the new **Electricity Market Act**, a string of by-laws are to be adopted, whereby HERA is obligated to adopt some acts and approve others.

European Green Deal and the Fit for 55 package

In December 2019, the European Commission presented the European Green Deal, a new growth strategy intended to transform the EU into a fair and prosperous society with a modern, competitive resource-efficient economy with zero net greenhouse gas emissions by 2050. The EU's "green transition" must be fair and inclusive for all citizens. The European Green Deal will also allow economic recovery after the Covid-19 pandemic. One third of the EUR 1.8 billion from the NextGenerationEU recover plan and the EU's seven-year budget will serve as the funding source for the European Green Deal.[12]

The goals of the European Green Deal became legally binding for all EU member states with the adoption of *Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999* ("*European Climate Law*").

To reach the goal of climate neutrality, the current level of greenhouse gas emissions must be lowered significantly in the coming decades. In the transitional phase towards climate neutrality, the EU has increased its climate ambitions for 2030, committing to reducing greenhouse gas emissions by at least 55% as compared to 1990 levels by 2030. The EU is thus working on revising its climate, energy, and transport legislation within the framework of the Fit for 55 legislative package *to* align existing regulations with the ambitions for 2030 and 2050. In addition to a number of proposals to revise and update EU legislation, the Fit for 55 package also proposes a number of new initiatives.

The Fit for 55 package contains the following legislative proposals and initiatives (a total of 13 proposals, of which 8 are for the revision of existing regulations and 5 are for new proposals):

revisions:

- revision of the EU Emissions Trading System,
- the revision of member states' emission reduction targets through the revision of the Effort Sharing Regulation, which currently sets binding annual greenhouse gas emission targets for member states in sectors not covered by the EU Emissions Trading Scheme or the Land Use, Land Use Change and Forestry Regulation,
- revision of the Land Use, Land Use Change and Forestry Regulation,
- revision of the Renewable Energy Directive by increasing the current EU-wide target of at least 32% of renewable energy in the overall energy mix to at least 40% by 2030,
- revision of the Energy Efficiency Directive by increasing the current EU energy efficiency target from 32.5% to 36% for final energy consumption and 39% for primary energy consumption,
- revision of the CO_2 Emissions Regulation for cars and vans, which introduces increased emission reduction targets at the EU level for 2030 (55% reduction in average CO_2 emissions for new cars from 2021 to 2030) and sets a new target of 100% by 2035,
- revision of the Alternative Fuels Infrastructure Directive with a view to speeding up the introduction of infrastructure for charging or supplying vehicles with alternative fuels and ensuring the supply of alternative fuels for ships in ports and stationary aircraft;

12 COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS (COM(2019) 640 final), Brussels, 11/12/2019.

- revision of the Energy Taxation Directive, which seeks to align the taxation of energy products and electricity with EU energy, environment, and climate policies,

new initiatives:

- the new EU Forest Strategy for 2030, adopted in July 2021 with the aim of improving the quality, quantity, and resilience of forests in the EU, ensuring the sustainable use of biomass and sustainable forestation and reforestation, with a plan to plant three billion additional trees in the EU by 2030,
- the Carbon Border Adjustment Mechanism, which aims (in full compliance with international trade rules) to prevent the EU's efforts to reduce emissions from being neutralised by shifting production outside the borders of the EU (where policies to combat climate change are less ambitious than those of the EU) or by increasing imports of high-carbon products,
- the Social Fund for Climate Policy, which seeks to respond to the social and distribution impacts of the proposed new emissions trading scheme for buildings and road transport. It will allocate a total of EUR 72.2 billion from 2025 to 2032 using an allocation methodology that seeks to address the uneven impact of the proposed separate emissions trading scheme for these two sectors (which is to be implemented between and within member states) on sustainable aviation fuels (the ReFuelEU Aviation Initiative)
- , which seeks to reduce the environmental footprint of the aviation sector (significantly reduce emissions from aircraft through the use of advanced biofuels and synthetic aviation fuels) and contribute to the achievement of EU climate objectives, and
- the FuelEU Maritime Initiative, which proposes to promote the use of renewable and low-carbon fuels in maritime transport with the aim of reducing by the greenhouse gas intensity of the energy used on board ships by 75% by 2050.

In December 2021 a proposal was made to revise the Energy Performance of Buildings Directive, as part of the EC work programme on the Fit for 55 package. This revision complements the other components of the Fit for 55 package, which set out the vision of establishing a zero-emission building stock by 2050. The main objectives of this revision are to reduce greenhouse gas emissions from buildings and final energy consumption by 2030, as well as to establish a long-term vision for buildings on the path to climate neutrality across the EU by 2050.

In early 2022, as part of the European Green Deal, the EC adopted new *Guidelines on State aid for climate, environmental protection and energy for 2022*.[13] The EC has implemented these guidelines to assess the compatibility of all registered climate, environmental, and energy aid, which have been granted or will be granted as of 27 January 2022.

The Fit for 55 package does not only apply to the energy sector, but a large part of it will certainly have a significant impact on the EU energy sector, and therefore on the energy sector in Croatia.

Recovery and Resilience Facility

As part of a comprehensive response, the Recovery and Resilience Facility aims to mitigate the economic and social consequences of the Covid-19 pandemic and make European economies and societies more sustainable, resilient, and prepared for the challenges and opportunities of the green and digital transition.

The Recovery and Resilience Facility is a temporary recovery instrument that allows the EC to raise funds to help member states implement reforms and investments. These reforms and investments must be in line with EU priorities and aimed at overcoming the challenges identified in the country-specific recommendations of the European Semester for economic and social policy coordination. To this end, EUR 723.8 billion (at current prices) has been made available to member states to implement reforms and investments, of which EUR 385.8 billion are loans and EUR 338 billion are grants.

The facility, which entered into force on 19 February 2021, is built on six pillars: the green transition; the digital transition; economic cohesion, productivity, and competitiveness; social and territorial cohesion; the resilience of health, economic, and social sectors and institutions; and policies for the next generation. It will fund reforms and investments in member states from the beginning of the Covid-19 pandemic in February

[13] *COMMUNICATION FROM THE COMMISSION – Guidelines on State aid for climate, environmental protection and energy 2022 (2022/C 80/01), SL C 80, 18/2/2022.*

2020 until 31 December 2026. In this regard, each national plan establishes reforms and investments to be implemented by the end of 2026, ensuring that at least 20% of total funds in the plan are directed towards meeting digital transition objectives, and at least 37% of total funds are earmarked for achieving green transition objectives. Member states may receive financial resources up to the value of the previously agreed-upon amount.

In 2021, Croatia submitted the *National Recovery and resilience* Plan (https://planoporavka.gov.hr/) to the EC for review, which positively assessed it in July 2021; after this, it was confirmed by the EU Council, enabling the disbursement of an advance to Croatia from the Recovery and Resilience Facility in the amount of EUR 818.4 million or HRK 6.14 billion.

3.4.10 Regulatory Affairs and Consumer Protection Council

Pursuant to the Statute of HERA and the *Rules of operation of the Regulatory Affairs and Consumer Protection Council of HERA*, the Regulatory Affairs and Consumer Protection Council (hereinafter: Council) undertakes the following activities:

- providing opinions on regulations and methodologies adopted by HERA,
- participates in providing opinions to HERA on proposals for legislation and other public policies relevant to the energy sector, upon request from the President of the Board of Commissioners,
- monitoring the implementation of regulations and methodologies adopted by HERA and proposing changes to the Board of Commissioners, and
- providing opinions to the Board of Commissioners on matters of significance to the energy sector in accordance with HERA's powers and responsibilities.

On 14 December 2021, a Council session was held at which Council members were presented with the procedure for determining gas distribution tariffs in the coming regulatory period, followed by the contents of the new **Electricity Market Act**, which entered into force in October 2021. A discussion was also held on both topics.

3.4.11 Cyber security

In 2015, the Croatian Government adopted the *National Cybersecurity Strategy and Action Plan for the Implementation of the Strategy*[14] (Official Gazette No. 108/15), aimed at achieving a balanced and coordinated response to security threats in contemporary cyberspace. The term "cyberspace" means "*a virtual space within which communication between network and information systems takes place, and which encompasses all network and information systems, regardless of whether they are connected to the Internet*".[15]

Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union (hereinafter: *NIS Directive*) and the **Act on the Cyber Security of Key Service Operators and Digital Service Providers (Official Gazette no. 64/18)** (hereinafter: **Cyber Security Act**) are of especial importance to the energy sector, as is the corresponding *Regulation on the cyber security of key service operators and digital service providers (Official Gazette no. 68/18)* (hereinafter: *Cyber Security Regulation*), which transposed the *NIS Directive* into Croatian legislation.

The NIS Directive affirms the obligation of member states to introduce measures ensuring a high level of cyber security in key service sectors, which includes the energy sector (electricity, oil, and gas). The aforementioned *Cyber Security Regulation* defines criteria that measure the effect of incidents on the continuity of provision of key services: The criteria are as follows:

- the number of users affected by the interruption of key services,
- the length of the incident,
- the geographical extent of the incident, or

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14 *Decision implementing the National Cyber Security Strategy and the Action Plan for the Implementation of the National Cyber Security Strategy (Official Gazette no. 108/15).*

15 *Act on the Cyber Security of Key Service Operators and Digital Service Providers (Official Gazette no. 64/18)*

- other sector criteria, such as economic effects and the dependence of other regions or businesses on the service.

Key Service operators, as defined by the **Cyber Security Act**, are "any public or private entity that provides any of the key services from the List in Annex I. of the **Cyber Security Act**, in which the key services offered by said entity depend on network and information systems, and an incident would have a significant negative impact on the provision of key services".

The **Cyber Security Act** regulates procedures and measures by which to attain a high common level of cyber security for key service operators and digital service providers, outlines the jurisdiction and authorities of competent sector bodies, defines a single national contact point, defines bodies responsible for incident prevention and protection (hereinafter: competent CSIRT) and the technical body for conformity assessment, regulates the supervision of key service operators and digital service providers in the implementation of the **Act**, and prescribes misdemeanour provisions. The goal of the **Act** is to ensure the implementation of measures by which to achieve a high common level of cyber security in the provision of services that are of particular importance to key social and economic activities, including the functioning of the digital market.

Annex I of the Cyber Security Regulation sets out criteria and thresholds for assessing the importance of the negative impact of an incident by sector (eight sectors) and key service sub-sector. Table 3.4.1. lists the criteria and thresholds for assessing the negative impact of an incident on a key service – energy sector.

Table 3.4.1. Criteria and thresholds for assessing the negative impact of an incident on a key service – energy sector.

Sector	Sub-sector	Key service	Criteria	Thresholds
Energy	Electricity	Electricity production	Reduced production	60 MW
		Electricity transmission	Transmission interruption	Without exception
		Electricity distribution	Power interruption	More than 20,000 billing metering points
	Oil	Transmission of oil through pipelines	Transmission interruption	Without exception
		Oil production	Reduced oil field production	10,000 t/yr
		Production of petroleum products	Reduced production of petroleum products	Petrol: 40,000 t/yr
				Diesel fuel: 40,000 t/yr
				Fuel oils: 20,000 t/yr
		Storage of oil and petroleum products	Reduced oil storage capacity at the terminal	200,000 m^3
			Reduced petroleum product storage capacity at a particular storage facility	12,000 m^3
	Gas	Gas distribution	Interruption of distribution to final customers	More than 20,000 billing metering points
		Gas transmission	Transmission interruption	Without exception
		Gas storage	Reduction in storage capacity	5% of gas consumption in Croatia in the previous year
		Unloading and send out of LNG	Reduced LNG regasification capacity in m^3/h	More than 100,000 m^3/h
		Natural gas production	Reduced gas production delivered to the transmission system at each entry point	20%

In accordance with the aforementioned definition, the **Cyber Security Act** distinguishes between a few competent authorities for key service operators, as defined in Annex III of the **Cyber Security Act** (Table 3.4.2.). These are, in order:

- competent sector bodies (the state body with jurisdiction over the energy sector is the Ministry of Environmental Protection and Energy),
- single national contact point (Office of the National Security Council - UVNS),

- competent *Computer Security Incident Response Teams* (CSIRT) (IT System Security Department, hereinafter: ZSIS) and the *National Computer Emergency Response Team* (CERT), and
- technical conformity assessment bodies (ZSIS and the National CERT).

Table 3.4.2. List of competent bodies for key services – energy sector

Sector of key services	Competent sector body	CSIRT	Technical conformity assessment body
Energy	State body with jurisdiction over the energy sector (Ministry)	IT System Security Department	IT System Security Department

One of the requirements of Key Service Operators arising from the **Cyber Security Act** and the *Cyber Security Regulation* is reporting to the competent CSIRT (ZSIS for the energy sector) on incidents that have a significant impact on the continuity of the services they offer. In accordance with the prescribed criteria for identifying incidents that have a significant impact on the provision of a key service, two Croatian CSIRTs (ZSIS and the National CERT) have developed *Guidelines for the submission of reports on incidents with significant impact on key service operators and digital service providers*,[16] which contain a protocol for reporting to the competent CSIRT, criteria for defining significant impact, incident reporting forms, and other key information for successful communication between key service operators and the competent CSIRTs.

In June 2020, CEER published a document[17] on cybersecurity in the Clean Energy Package, highlighting that the EU has set out priorities for addressing several cybersecurity topics in five legislative acts[18] in the framework of the CEP. The Clean Energy Package identifies all actors with a role to play in cybersecurity for the electricity sector, all of whom have been provided with responsibilities and assignees that will take part in work and discussions regarding the new branch of energy regulation. The EU has set a high priority on security for the "smart" part of new grids and protecting the grid through good planning for crises that may emerge and become tangible risks. CEER states that, while national regulatory authorities do not play an explicit role in cybersecurity topics in the CEP, they can influence the way forward, depending on their national power, by influencing the financing and definition of objectives, and through CEER's involvement in the development of the *Network Code on Cybersecurity*, in agreement with other competent authorities responsible for this process.

The process of developing network rules for cybersecurity is defined by *Regulation (EU) 2019/943* in Chapter VII; the objective of the *Regulation* is to establish network rules for cybersecurity covering aspects such as automation and data flow related to cross-border electricity flows, common minimum cybersecurity requirements applicable to all electricity market actors, planning for future developments, monitoring the implementation of all measures, reporting obligations (if necessary and justified), and crisis management in the event that cyber risks materialise.

At the invitation of the EC, as part of the further implementation of the European Union Cybersecurity Strategy, ACER published its non-binding *Framework Guideline on sector-specific rules for cybersecurity aspects of cross-border electricity flows*)[19] in July 2021; it provides general principles and provides the basis for the development of binding cybersecurity network rules that will contribute to maintaining the security

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16 *Available at: https://www.zsis.hr/UserDocsImages/Prijava_incidenata/Smjernice%20za%20dostavu%20obavijesti%20o%20incidentima%20sa%20znatnim%20učinkom%20operatora%20ključnih%20usluga%20i%20davatelja%20digitalnih%20usluga.pdf.*

17 *CEER Cybersecurity Work Stream (CS WS): CEER Paper on Cybersecurity in the Clean Energy for All Europeans Package, Ref: C20-CS-58-03, 4 June 2020, Available at: https://www.ceer.eu/documents/104400/-/-/d70764d8-9cab-9f4a-848b-6c3a4e1bd6b0.*

18 *European Parliament and Council Directive on energy performance of buildings, 30 May 2018, Ref: 2018/844/EU; (2) European Parliament and Council Directive on energy efficiency, 11 December 2018, Ref: 2018/2002/EU; (3) European Parliament and Council Directive on common rules for the internal market in electricity, 5 June 2019, Ref: 2019/944/EU; (4) European Parliament and Council Regulation on the internal market for electricity, 5 June 2019, Ref: 2019/943/EU; (5) European Parliament and Council Regulation on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC, 5 June 2019, Ref: 2019/941/EU.*

19 *European Union Agency for the Cooperation of Energy Regulators (ACER): Framework Guideline on sector-specific rules for cybersecurity aspects of cross-border electricity flows, 22 July 2021, Available at: https://documents.acer.europa.eu/Official_documents/Acts_of_the_Agency/Framework_Guidelines/Framework%20Guidelines/Framework%20Guideline%20on%20Sector-Specific%20Rules%20for%20Cybersecurity%20Aspects%20of%20Cross-Border%20Electricity%20Flows_210722.pdf.*

of the electricity system across Europe. The topics covered by this Framework Guideline are: cybersecurity management in the field of electricity; the assessment and management of cross-border risks; a common framework for cybersecurity in the field of electricity; information sharing and essential information flows; incident management and crisis management (including data collection); a framework for cybersecurity exercises in the field of electricity; protection of information exchange in data processing; and monitoring, evaluation, and reporting. The end of the document states that the network rules for cybersecurity, which will be created on the basis of the Framework Guideline, must be designed such that they are neither an obstacle to electricity market entrants, nor to the subsequent use of innovative solutions to contribute to the efficiency of the electricity system, all while promoting the safe digitisation of the electricity sector and discouraging and penalising any action that fails to duly consider security aspects, including cybersecurity.

4 ELECTRICITY

4.1 Regulation of the Legal Framework for the Electricity Market

Legal framework for the Electricity Market in Croatia

In March 2021, following HERA's approval, HEP-ODS adopted the Network Code for the distribution system (HEP-ODS, 3/2021), which harmonised the connection procedure with Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (hereinafter: RFG Regulation) and Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection (hereinafter: DCC Regulation).

In April 2021, after receiving prior approval from HERA, HOPS adopted the Rules on congestion management in the Croatian electricity system, including interconnectors (HOPS, 4/2021), which prescribe procedures for eliminating congestion in the Croatian electricity system, including interconnectors, the requirements of the transmission system operator regarding eliminating congestion in the Croatian electricity system, and the requirements of distribution system operators and transmission network users.

In May 2021, Croatian Parliament adopted the new **Electricity Market Act**, which adopts Directive (EU) 2019/944 into Croatian legislation. This **Act** prescribes common rules for the production, transmission, and distribution of electricity, energy storage, and electricity supply, along with consumer protection provisions, in order to make the Croatian electricity market integrated, competitive, flexible, fair, and transparent, as part of the EU energy market.

In addition, this **Act** ensures the implementation of a number of EU acts.

The most significant novelties and improvements introduced in the new **Electricity Market Act** are:

- new energy activities performed as market activities (aggregation, organising citizen energy communities, energy storage, closed distribution system operator),
- new energy entities (aggregators, citizen energy communities, energy storage operators, closed distribution system operators),
- active buyer (individual or group of final customers who jointly act as an active buyer),
- provisions regarding the sharing of energy between final customers in a group of final customers acting jointly as an active buyer,
- provisions regarding citizen energy communities, including the sharing of energy between shareholders and/or members of the citizen energy community,
- the right to contracts with dynamic electricity pricing,
- tools by which to compare the offers of electricity suppliers for household final customers and non-household final customers with an expected annual consumption of less than 100,000 kWh,
- more precise definitions of certain electricity markets,
- the right of final customers to act on the electricity markets either independently or through aggregation,
- consumption management through aggregation,
- incentives for the use of flexibility in distribution networks,
- the integration of electromobility into the electricity network, including provisions regarding the ownership of electric vehicle charging points by distribution system operators,
- incentives for the construction of energy storage facilities in the electricity system,
- provisions regarding the ownership of energy storage facilities by the transmission system operator or distribution system operators,
- congestion management, including the use of flexibility, and redispatching in the transmission and distribution system; cooperation and mutual obligations between the transmission system operator and distribution system operators as regards congestion management,
- data management in the distribution and transmission network,
- the right to a collective supplier switch,
- the obligation that, as of 31 December 2025, the supplier switching procedure shall last no longer than 24 hours, and it must be able to be carried out during any working day,
- minimum requirements for issuing invoices and billing information.

In addition to the new **Electricity Market Act**, the new **Renewable Energy and High-Efficiency Cogeneration Act** was adopted at the end of 2021; among other things, it ensures the implementation of *Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action*, as related to Croatia's participation in the EU renewable energy financing mechanism and *Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics*.

The most significant novelties and improvements related to electricity introduced by the new **Renewable Energy Sources and High-Efficiency Cogeneration Act** are:

- the previous national renewable energy target framework, which was based on the national renewable energy action plan, is replaced with an NECP-based framework in accordance with *Regulation (EU) 2018/1999*,
- new definitions are introduced aimed at empowering final customers, as follows: "renewables self-consumers" and "jointly acting renewables self-consumers"; "renewables power purchase agreement"; "peer-to-peer trading of renewable energy"; "renewable energy community",
- the incentives system for producing electricity from renewable energy sources and high-efficiency cogeneration is improved; a provision has been added whereby an eligible producer with a market premium contract is obligated to pay HROTE the difference between the market price and the reference price when the monthly market price is higher than the reference price established by the market premium contract,
- improvements related to the issuance of permits for the construction and renovation of plants using renewable energy sources, in particular the following:
  - the ministry responsible for energy is designated as the point of contact for guidance throughout the permitting process, as well as guidance on grid connection procedures,
  - HROTE will prepare a manual providing complete information on the permitting procedure for plants using renewable energy sources, especially taking into account small projects and projects of renewables self-consumers,
  - legal provisions are introduced with the aim of speeding up administrative procedures related to plant construction,
- the "Simple Network Connection Notification Procedure" is introduced for plants or aggregated production units of renewables self-consumers and demonstration projects with a connection capacity equal to or less than 10.8 kW,
- expanding the sources from which funds are raised for payments to eligible producers in the system of encouraging the production of electricity from RES&C,
- the uptake of electricity from final customers who are self-consumers or users of self-supply facilities (which meet the requirements of the **Act**) is extended to renewable energy communities and multi-apartment buildings,
- all eligible electricity producers, not only those who have concluded repurchase agreements or guaranteed price incentive agreements, are allowed to join the EKO balance group.

In December 2021, HERA adopted the *Decision on electricity distribution tariffs* (Official Gazette no. 138/21) *and the Decision on electricity transmission tariffs* (Official Gazette no. 138/21), which increased tariffs for the period following 1 April 2022.

In December 2021, the Croatian government adopted the *Regulation on the share of net electricity delivered by eligible producers that electricity suppliers are obligated to take up from the electricity market operator* (Official Gazette no. 147/21). According to this *Regulation*, beginning on 1 January 2022, electricity suppliers are required to take up 60% of the net delivered electricity produced by eligible producers from the electricity market operator. As compared to 2021, this share was increased from 40% to 60%.

Implementation of network codes and guidelines

The network codes and guidelines related to the electricity sector are:

- *Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management* (hereinafter: *CACM Regulation*),
- *Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (hereinafter: RFG Regulation)*,

- *Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocations* (hereinafter: *FCA Regulation*),
- *Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a network code on demand connection* (hereinafter: *DCC Regulation*),
- *Commission Regulation (EU) 2016/1447 of 26 August 2016 establishing a network code on requirements for high voltage direct current system and direct current-connected power park module grid connections (*hereinafter: *HVDC Regulation*)
- *Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation* (hereinafter: *SOGL regulation*),
- *Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing* (hereinafter: *EBGL Regulation*), and
- *Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration* (hereinafter: *ERNC Regulation*).

HERA continuously works to adopt and improve refined or new acts and cooperates with other energy regulatory authorities of EU member states through ACER to create a fully interconnected European electricity market.

In 2021, the most significant activity under the *CACM Regulation* was the approval of amendments to the methodology for calculating cross-zonal capacities for the day-ahead market in the Core Capacity Calculation Region. Said approval was given by HERA and all energy regulatory authorities in the Core Capacity Calculation Region. Regional capacity calculation is expected to begin during 2022.

In November 2021, ACER adopted a methodology to calculate long-term cross-zonal capacities in the Core Capacity Calculation Region in accordance with the *FCA Regulation*. The implementation of cross-zonal capacity calculation founded on power flows is expected in late 2024 for capacities in 2025, considering that this innovative calculation method and the allocation of long-term cross-zonal capacities is currently not being implemented in Europe.

The most significant activities in accordance with the *SOGL Regulation* in 2021 were:

- the issuance of an opinion on a draft amended *Operational Agreement of Load Frequency Control Block Slovenia Croatia and Bosnia and Herzegovina* (LFC BLOCK SHB).[20] This Agreement regulates cooperation between transmission system operators to establish an appropriate mechanism enabling the efficient operation of electricity systems, resulting in the efficient operation of the Load Frequency Control Block Slovenia Croatia and Bosnia and Herzegovina.
- granting approval for the *Proposal of all Continental European transmission system operators to supplement the decision on LFC blocks in the Continental Europe synchronous area with regard to LFC Denmark west*,
- granting approval for the *Proposed Data exchange rules between transmission system operators, distribution system operators, and production modules connected to the distribution system*, which regulate the exchange of data between transmission system operators, distribution system operators, and production modules connected to the distribution system at the national level as regards the delivery of structural data, planned data, and the real-time data of production modules connected to the distribution system, applying the principle that production modules deliver data to the competent transmission system operator through the competent distribution system operator.

The most significant activities in accordance with the *EBGL Regulation* were:

- granting approval for HOPS's request to delay connection to the European aFRR platform (for activating balancing energy from reserves to automatically re-establish frequency) and the European mFRR platform (to activate balancing energy from reserves to manually restore frequency) from 24 July 2022 to 24 July 2024. During this delay, HOPS must meet the basic technical prerequisites to connect to the aFRR and mFRR platforms, including adjusting HOPS' business processes and testing the operations of HOPS' IT system with these platforms in accordance with the planned development and implementation of HOPS IT system,

[20] https://www.hops.hr/page-file/iKHTOjbHhKcSAwvl08Yny2/so-gl-metodologije/Sporazum%20o%20radu%20LFC%20bloka%20SHB.pdf, *accessed 19/4/2022.*

- the adoption of ACER's decision on the *Methodology for a market-based allocation process of cross-zonal capacity for the exchange of balancing capacity or sharing of reserves for the CORE region*,[21]
- the adoption of ACER's decision on *Amendments to the Methodology for determining the price of balancing energy and cross-zonal capacities used for the exchange of balancing energy or imbalance netting*. This *Methodology* regulates how the price of balancing energy is determined resulting from the activation of balancing energy, as well as determining the price of cross-zonal capacities used for the exchange of balancing energy or imbalance netting. The *Amendments to the Methodology* relate primarily to the determination of the highest and lowest prices of balancing energy.

4.2 Regulated network activities and the technical function of the electricity system

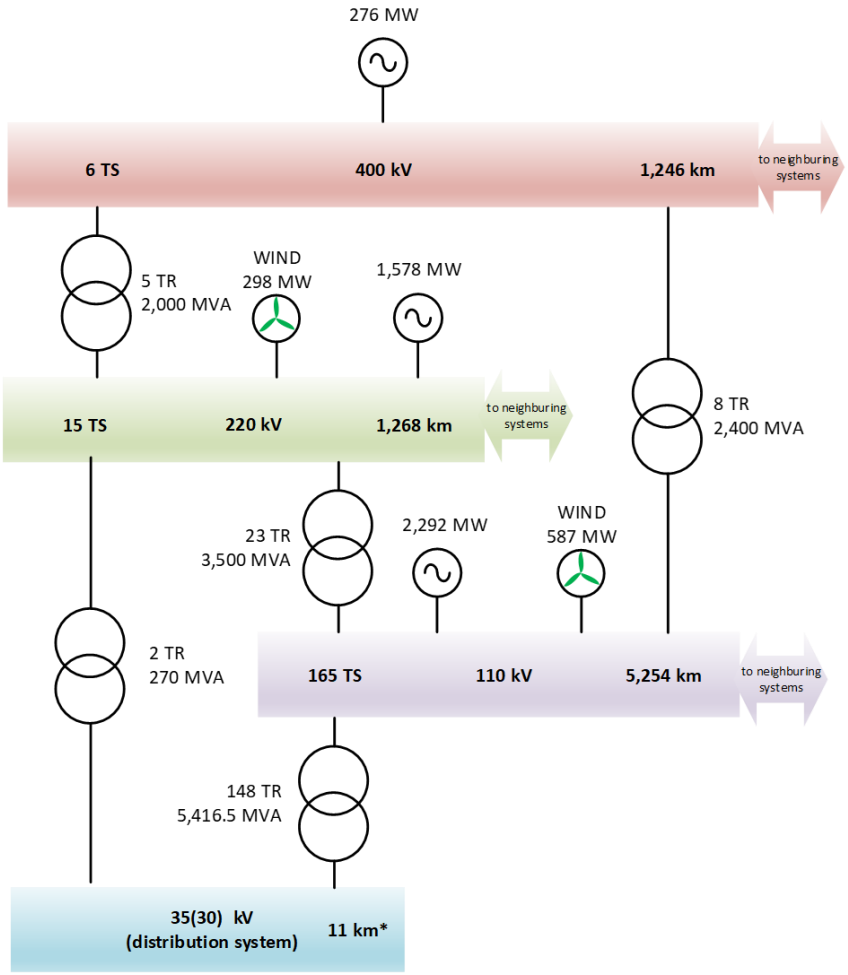
4.2.1 Transmission and distribution system

Electricity transmission and distribution are regulated energy activities performed as public services.

In Croatia, HOPS provides the public service of electricity transmission and is responsible for the operation, management, maintenance, development, and construction of the transmission network and cross-zonal transmission lines, as well as for ensuring the long-term capability of the network to satisfy reasonable requirements for the transmission of electricity.

Figure 4.2.1. shows basic information on the number of transformer substations (TS) and transformer ratings (TR), length of lines, and the power of connected power plants in the transmission system.

[21] *DECISION No 11/2021 OF THE EUROPEAN UNION AGENCY FOR THE COOPERATION OF ENERGY REGULATORS of 13 August 2021 on the market-based allocation process of cross-zonal capacity for the exchange of balancing capacity for the Core CCR*



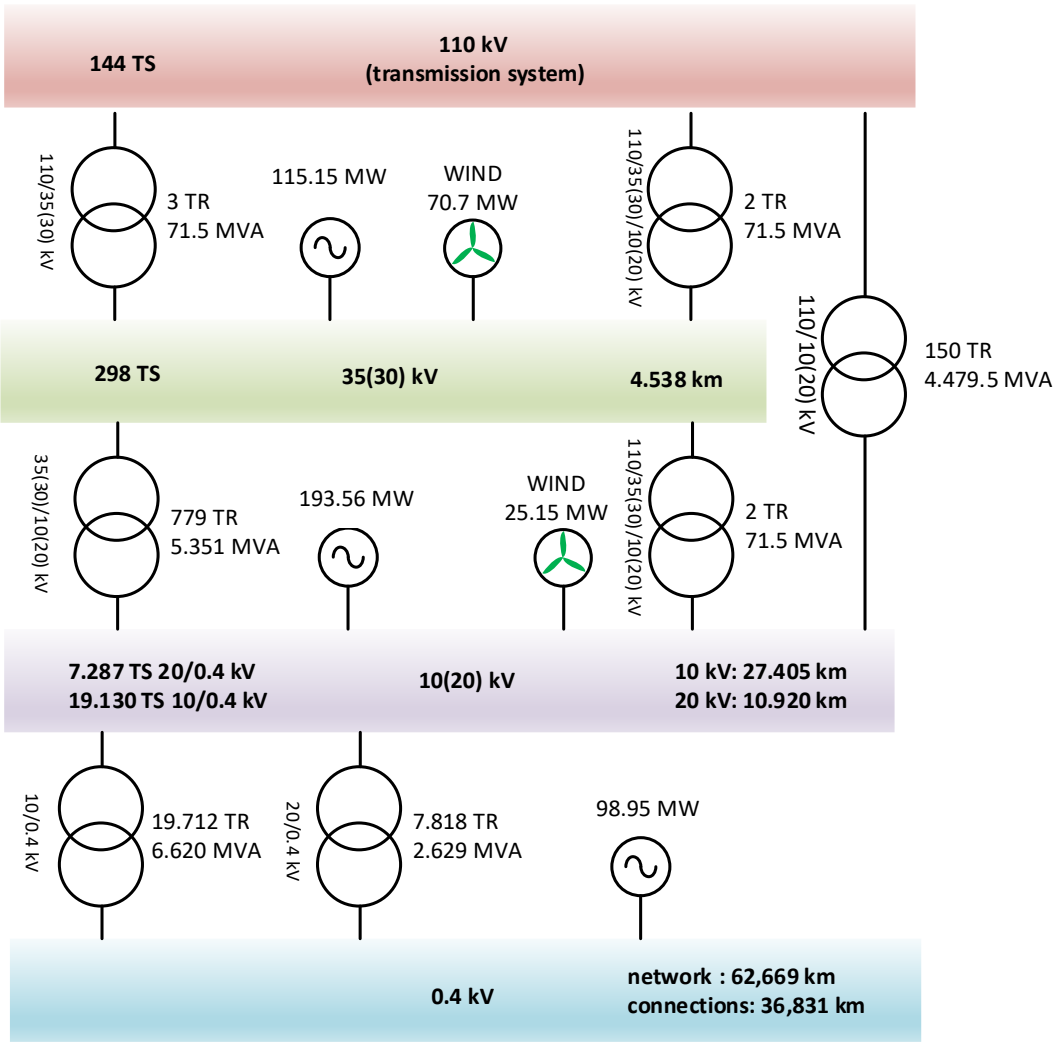
**110kV medium-voltage transmission lines*

Source: HOPS

Figure 4.2.1. Basic information about the transmission system as of 31 December 2021

In Croatia, HEP-ODS renders the public service of distribution of electricity and is responsible for the operation, management, maintenance, development, and construction of the distribution network and for ensuring the long-term ability of the network to satisfy reasonable requirements for the distribution of electricity.

Figure 4.2.2. shows basic information on the number of transformer substations (TS) and transformer ratings (TR), length of lines, and the power of connected power plants in the distribution system.



Source: HEP-ODS

Figure 4.2.2. Basic information on the distribution system as of 31 December 2021

Table 4.2.1. shows indicators for the transmission and distribution system in Croatia from 2017 to 2021.

Table 4.2.1. Indicators for the transmission and distribution system in the Republic of Croatia from 2017 to 2021

Indicator	2017	2018	2019	2020	2021
Maximum daily electricity consumption (GWh/day)	63.1	64.6	61.4	57.3	61.0
Number of transmission systems operators	1	1	1	1	1
Length of transmission network [km]	7,683	7,791	7,758	7,785	7,779
Number of distribution systems operators	1	1	1	1	1
Length of distribution network [km]	140,436	138,789	140,067	140,969	142,363

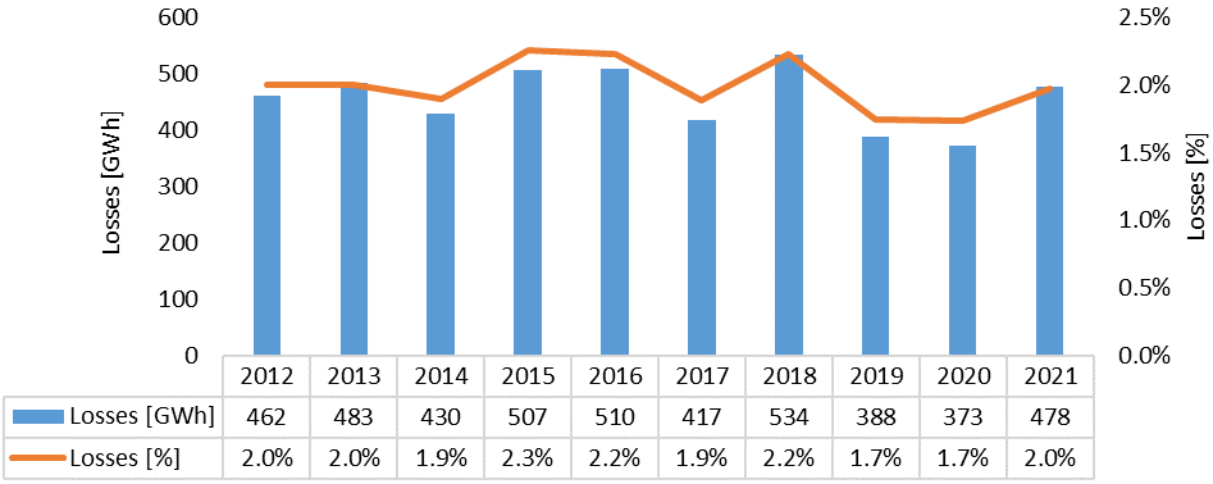
4.2.2 Losses in the transmission and the distribution network

Absolute and relative amount of power losses in 2021

Power losses in the transmission network in 2021 amounted to 478 GWh, or 2.0% of total transmitted electricity (24,199 GWh).

As compared to 2020, the absolute amount of electricity losses in the transmission network was 28.2% higher than in 2021, while the relative amount was 0.3% higher. These amounts are at the level of losses up to and including 2018, while losses in 2019 and 2020 were extremely low.

Figure 4.2.3. shows power losses in the transmission network in the past ten years.



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Losses [GWh]	462	483	430	507	510	417	534	388	373	478
Losses [%]	2.0%	2.0%	1.9%	2.3%	2.2%	1.9%	2.2%	1.7%	1.7%	2.0%

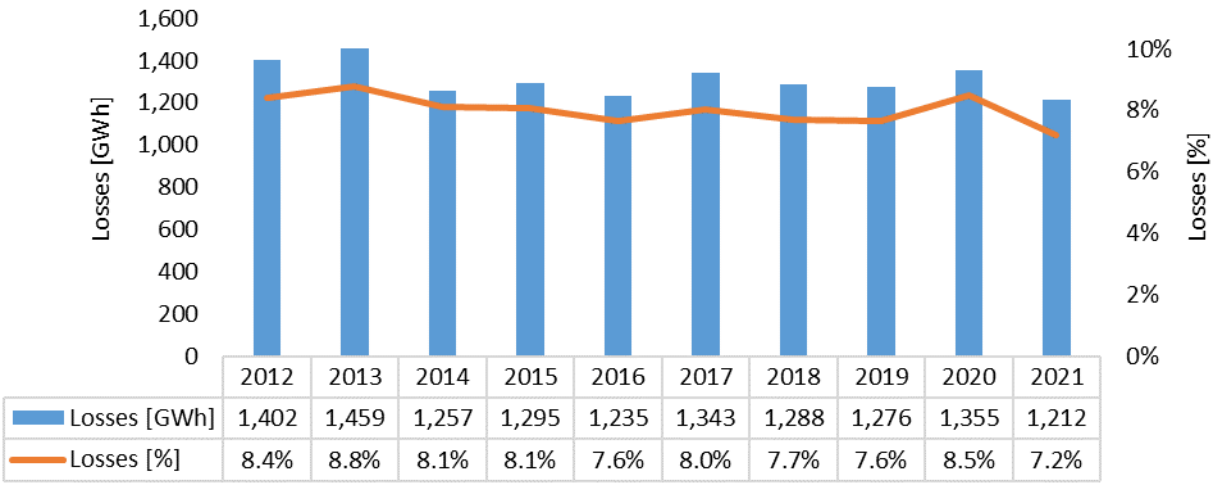
Source: HOPS

Figure 4.2.3. Power losses in the transmission network from 2012 to 2021

Power losses in the distribution network in 2021 amounted to 1,212 GWh, or 7.2% of net electricity taken up, which amounted to 16,877 GWh (net electricity taken up from the transmission network and from electricity producers in the distribution network, minus the net electricity injected into the distribution networks of neighbouring countries).

The absolute and relative amount of losses in the distribution network was the lowest in the past ten years, and significantly lower than in 2020, when losses were unusually high, likely due to difficulties with meter reading due to the Covid-19 pandemic.

Figure 4.2.4. shows the amounts of losses in the distribution network in the past ten years.



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Losses [GWh]	1,402	1,459	1,257	1,295	1,235	1,343	1,288	1,276	1,355	1,212
Losses [%]	8.4%	8.8%	8.1%	8.1%	7.6%	8.0%	7.7%	7.6%	8.5%	7.2%

Source: HEP-ODS

Figure 4.2.4. Power losses in the distribution network from 2012 to 2021

Purchasing dynamics and cost of electricity to cover losses in 2021

Electricity to cover losses in the transmission network in 2021 was purchased on market principles by long-term contract awarded by public tender with given quantities and a lowest-price criterion, as well as through short-term trading on CROPEX.

HOPS acquired a part of the electricity to cover losses in 2021 from basic products (55.7%), 30 MWh/h on a yearly basis and an additional 5 MWh/h for January 2021. HOPS acquired the remainder on the CROPEX intraday market and day-ahead market (34.7%), as well as through imbalance settlement (9.6%) (Table 4.2.2.). Although roughly 56% of energy to cover losses was procured through long-term contracts and

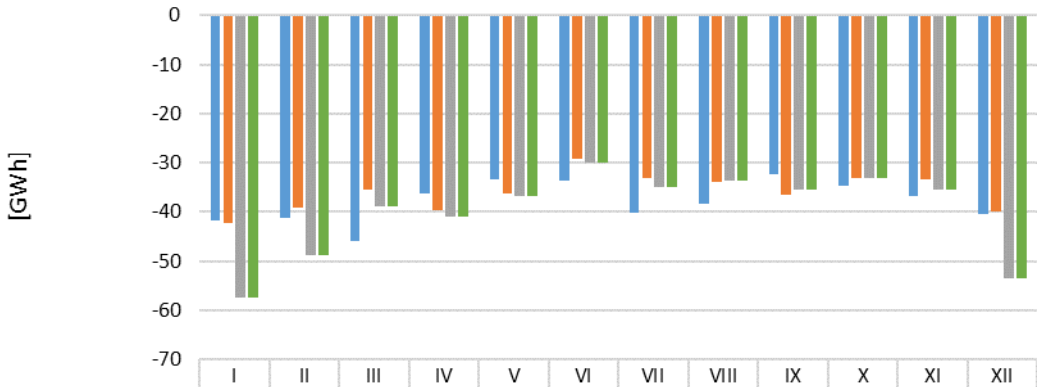
roughly 44% through short-term purchases, due to price increases on the wholesale markets, 65% of the expense relates to short-term purchases.

Table 4.2.2. Costs of the purchase of electricity to cover losses in the transmission network in 2021

Item	Quantity [GWh]	Cost [mil. HRK]	Unit cost [HRK/MWh]	Unit cost* [EUR/MWh]	Share of amount [%]	Share of cost [%]
Long-term agreements	266.5	99.6	373.73	49.70	55.7	34.7
Short-term purchase on CROPEX	166.2	141.3	850.18	113.06	34.7	49.2
Imbalance settlement	45.7	46.2	1,010.94	134.43	9.6	16.1
Incurred losses	478.4	287.1	600.13	79.80	100.0	100.0

** The average exchange rate in 2021 amounted to EUR 1 = HRK 7.52*

Figure 4.2.5. shows the deviation from plans, contractual schedules, and the calculation of imbalances for energy purchasing to cover losses in the transmission network; it is apparent that the largest deviations from the contractual schedule in the first imbalance calculation were in January and December 2021. HERA noted high imbalances in January and February 2021 and requested a statement, after which HOPS reduced the imbalances.



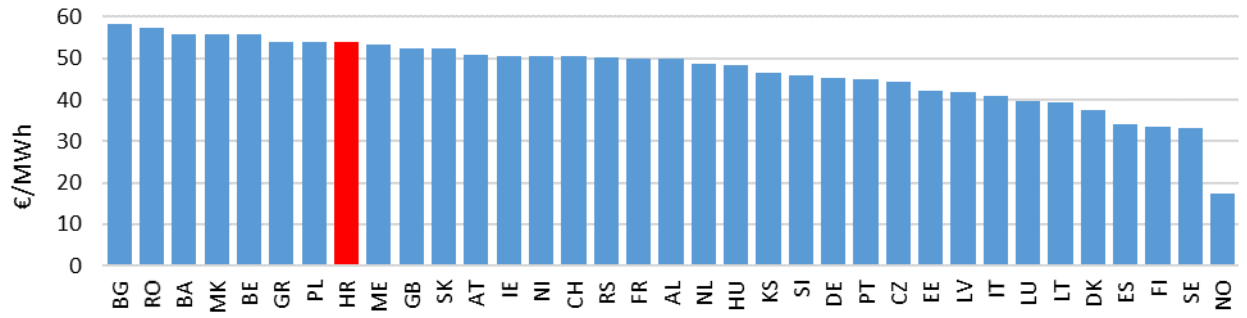
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Procurement plan for 2021	-42	-41	-46	-36	-33	-34	-40	-38	-32	-35	-37	-40
Contractual schedule	-42	-39	-35	-40	-36	-29	-33	-34	-37	-33	-33	-40
Realization - 1st imbalance calculation	-57	-49	-39	-41	-37	-30	-35	-34	-36	-33	-36	-54
Realization - 2nd imbalance calculation	-57	-49	-39	-41	-37	-30	-35	-34	-36	-33	-36	-54

Source: HOPS, HROTE

Figure 4.2.5. Procurement plan, contractual schedule, and realization of electricity losses in the transmission network for 2021

Figure 4.2.6. provides a price comparison for the ITC agreement,[22] in accordance with *Commission Regulation (EU) no. 838/2010 of 23 September 2010 on laying down guidelines relating to the inter-transmission system operator compensation mechanism and a common regulatory approach to transmission charging*, for 2021 between individual countries.

[22] *ITC, ITC Agreement, ITC Mechanism – Inter-Transmission System Operator Compensation (ITC) mechanism*



Source: ENTSO-E

Figure 4.2.6. Unit prices for covering losses for 2021 for the needs of the ITC mechanism

In order to procure energy to cover losses in the distribution network for 2021, a public tender was issued in the form of two long-term products — basic and variable. The basic product had a prearranged quantity and price, while HEP-ODS had the unlimited right to deviate from the framework plan for the variable product. The price of the variable product is calculated as 75% of the winning price in the public tender and 25% of the unit monthly price in the second informative imbalance calculation.[23] These products were procured on a bilateral basis (two long-term contracts) (Table 4.2.3.).

As in 2020, HEP-ODS planned the procurement and bore all positive and negative financial obligations tied to imbalances in 2021.

Table 4.2.3. Costs for the purchase of electricity to cover losses in the distribution network in 2021

Item	Quantity [GWh]	Cost [mil. HRK]	Unit cost [HRK/MWh]	Unit cost* [EUR/MWh]	Share of amount [%]	Share of cost [%]
Agreement – basic product	722.1	291.0	402.99	53.59	59.6	55.8
Agreement – variable product	668.4	366.5	548.32	72.91	55.1	70.2
Imbalance settlement (1 and 2)	-178.6	-135.6	759.24	100.96	-14.7	-26.0
Incurred losses	**1,211.9**	**521.9**	**430.65**	**57.27**	**100.0**	**100.0**

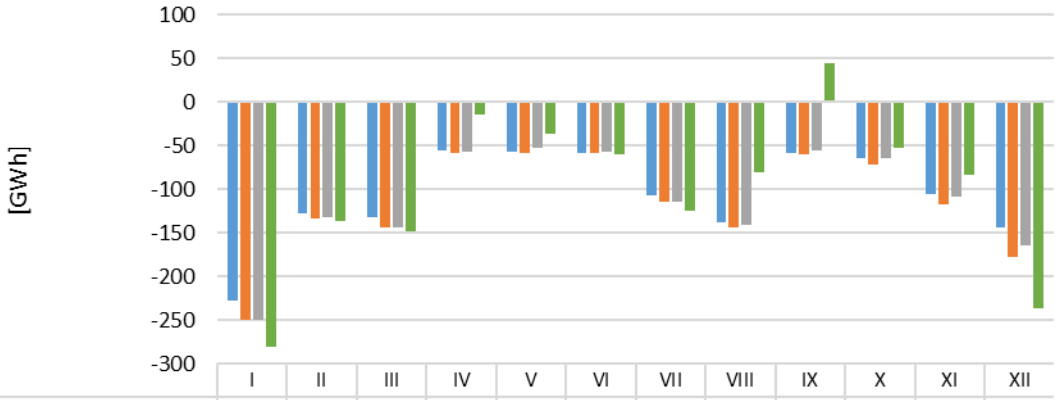
** The average exchange rate in 2021 amounted to EUR 1 = HRK 7.52*

It is evident that, by purchasing energy to cover losses in the first half of 2020 when the price of energy was lower, HEP-ODS mostly avoided the impact of significant price increases in 2021.

HEP-ODS generated significant revenue on the basis of the second imbalance settlement. The highest revenue was generated in September 2021. HERA requested a clarification, in which HEP-ODS stated that it had conducted a meter reading campaign and checked for unauthorised consumption, after which it assigned the difference in the semi-annual reading to consumption in September, which reduced losses. As HEP-ODS had procured energy to cover losses based on the monthly loss ratio according to the *Rules on the application of standard load profiles*, the significant surplus in September was sold in the second imbalance settlement.

Aside from this, a comparison of the market position (procured quantity of electricity) and hourly turnover in the first imbalance settlement in 2021, it is apparent that HEP-ODS systematically purchased too much energy, which it then sold in the first imbalance settlement (Figure 4.2.7.).

[23] *The hourly price on the CROPEX DA market weighted by the load curve of the distribution system (the sum of the product of the hourly load value of the distribution system and the hourly price on CROPEX divided by the sum of the hourly load values of the distribution system).*



	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Procurement plan for 2021	-228	-129	-133	-55	-57	-58	-107	-137	-59	-64	-105	-143
Contractual schedule	-250	-133	-144	-59	-58	-58	-115	-144	-60	-72	-118	-178
Realization - 1st imbalance calculation	-249	-132	-143	-57	-53	-57	-115	-141	-56	-65	-109	-165
Realization - 2nd imbalance calculation	-280	-136	-148	-14	-36	-60	-125	-81	44	-53	-83	-237

Source: HEP-ODS, HROTE

Figure 4.2.7. Procurement plan, contractual schedule, and realisation of electricity losses in the distribution network for 2021

Monitoring of losses

The previously applicable **Electricity Market Act** stipulated HOPS and HEP-ODS' requirement to deliver HERA with a yearly energy procurement plan to cover losses in the distribution network for the following year by 30 September. In December 2021, HERA approved HOPS' yearly plan for 2022, in which HOPS planned quantities of energy procurement to cover losses in the amount of 447.63 GWh at a planned price of HRK 531.70/MWh, which amounted to a planned cost of HRK 238 million.

In December 2021, HERA approved HEP-ODS' yearly plan for energy procurement to cover losses in the amount of 1,310 GWh at a planned price of HRK 495.98/MWh, which amounted to a planned cost of HRK 650 million.

An additional requirement is the delivery of a report on the realisation of the annual energy procurement plan to cover losses in the distribution and transmission network for the previous year up to 31 March of the current year.

The new **Electricity Market Act** prescribes the delivery of the same plans and reports related to the procurement of energy to cover losses with the same deadlines, but requires more detailed content. The annual plan thus stipulates that the system operator should submit to HERA for approval an estimate of the quantity and total cost of electricity procurement to cover losses in the transmission and distribution network for the following year.

As regards the report on the procurement of electricity to cover losses of electricity for the previous calendar year, concluded agreements on the procurement of electricity to cover losses for the previous calendar year must be delivered, including data and information about sales transactions concluded on the electricity exchange or forward market.

Since 2020, HERA has systematically monitored the quantity, price, and purchase cost of electricity to cover losses in the distribution network on the basis of data delivered monthly by HOPS and HEP-ODS.

Observations on losses in the transmission and distribution network for 2021

On the basis of the results achieved in 2020, HOPS continued to increase its share of procured energy to cover losses on short-term markets in 2021. However, in the second half of 2021, electricity prices on wholesale markets unexpectedly increased many times over (a global phenomenon), which led to an increase in realized energy procurement costs to cover losses (HRK 287 million) compared to plan (HRK 184 million).

HOPS had previously concluded bilateral long-term contracts through which it acquired 49% of the total planned amount of losses for 2022 as a basic product (basic energy), while it procured the remainder of the energy in the short-term during Q1 2022.

In 2020, HEP-ODS conducted a public tender for 2021, 2022, and 2023, which resulted in the conclusion of two agreements. One of these agreements defined the base product (base energy) at a fixed price, while the other defined the purchase of a variable quantity of electricity at a price (25%) of which depends on the price on the short-term markets, which moderated the effect of short-term electricity market price increases on the realised cost of purchasing energy to cover losses in 2021.

In late 2021, HERA approved HOPS' yearly plan for 2022 in which HOPS planned quantities of energy procurement to cover losses in the amount of 447.63 GWh at a planned price of HRK 238 million, as well as for HEP-ODS yearly plan in the amount of 1.310 GWh at a cost of HRK 649.79 million. These amounts were taken into account when making decisions on tariffs for electricity transmission or distribution. However, given the situation on wholesale markets in 2022, it is expected that the realized costs of energy procurement to cover losses in the current regulatory year (2022) will be even higher.

The Rules on the application of standard load profiles prescribe the introduction of variable foreseen monthly consumption as of 1 August 2021, which should reduce risk between the first and second imbalance settlement, especially as concerns HEP-ODS' electricity losses. However, HEP-ODS has not yet begun to introduce this. HERA requested a clarification on the introduction of variable monthly consumption, to which HEP-ODS responded by claiming problems in changing their business IT system.

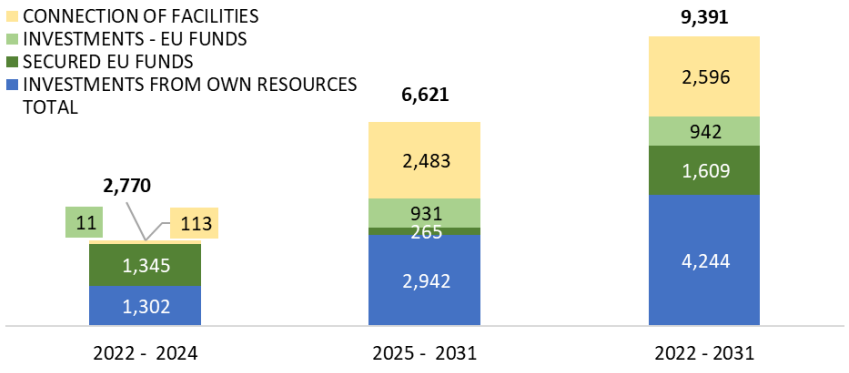
In 2020, HERA initiated a study entitled "Guidelines for the Regulatory Treatment of Electricity Losses in the Electricity Distribution and Transmission Networks in Croatia", which was completed in 2021. The study analysed the existing treatment of the amounts and volume of losses in costs for defining network usage tariffs; at the moment this Report was written, HERA was still in the process of improving the regulatory treatment of losses in defining tariffs.

4.2.3 Development and optimisation of the transmission and distribution network

Ten-year development plan for the transmission network (2022-2031)

In December 2021, HERA approved the *Ten-year development plan for the distribution network from 2022 to 2031, with a detailed elaboration of the initial three- and one-year periods.*

In the ten-year period, HOPS plans to invest roughly HRK 4.2 billion of its own resources, HRK 1.6 billion of already secured EU funds, an additional HRK 942 million from EU funds, and HRK 2.6 billion financed from connection charges or EU funds (Figure 4.2.8.). In total, roughly HRK 9.4 billion of investments are planned, taking into consideration an increase in final consumption as well as the construction and connection of future network users in accordance with the *Croatian Energy Development Strategy* and the *Integrated National Energy and Climate Plan*.



Source: HOPS

Figure 4.2.8. Investment plan for the transmission network in the ten-year period, [million HRK]

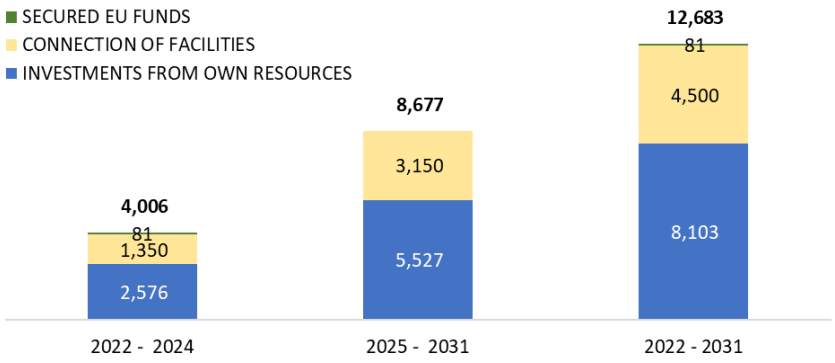
In 2021, a total of HRK 645 million was invested in the transmission network, taking into account all financing sources. Roughly HRK 42 million has already been used in 2021 on the basis of the NRRP, which is aligned with national strategic development documents, as well as with European priorities focused on the digital and green transition, which are founded on the modernisation of the economy and society through increased

investment in innovation and new technologies. These priorities are embedded in the binding framework of the Recovery and Resilience Facility, which stipulates that at least 20% of NRRP funds should be directed towards the digital transformation through investments and reforms, while at least 37% should be directed towards the green transition and the fight against climate change.

Ten-year development plan for the distribution network (2022-2031)

In December 2021, HERA approved the *Ten-year (2022-2031) development plan for the HEP-ODS distribution network with a detailed elaboration of the initial three- and one-year periods.*

Total planned financial investments into distribution network development across a ten-year period amount to roughly HRK 12.7 billion. Investments conditional upon the connection of new users to the network and increasing the connection capacity of existing users amount to roughly HRK 4.5 billion (Figure 4.2.9.).



Source: HEP-ODS

Figure 4.2.9. Investment plan for the distribution network over a ten-year period [million HRK]

Observations on the development plans for transmission and distribution networks

The approval of ten-year development plans is a precondition for the efficient preparation of construction, timely planning and ensuring financing, as well as the harmonisation of timelines and competences in the construction of joint facilities of the transmission and distribution system operators.

During the period under review, interest was expressed in connecting/increasing connection capacity in the transmission network by about 12,000 MW of plants, mostly RES. The majority of these plants would be connected in Dalmatia. The peak power of the electricity system is stagnating; rapidly increasing production on the distribution network will additionally burden the transmission system. Taking this into account, the greatest reason why the transmission network should be strengthened and developed is the connection of new plants along the Croatian hinterland. This primarily refers to the creation of technical requirements in the 110 kV, 220 kV, and 400 kV network in the aforementioned area, i.e. the revitalisation/increase of the transmission power of existing lines or the construction of new ones and the strengthening of the transformation capacity.

In accordance with the aforementioned, investments in the ten-year transmission network development plan are divided into a few basic categories: investments needed for the reliable function of the transmission system from own funds; investments for which funds have already been ensured from EU funds, primarily from the NRRP; investments for which financing will be sought from EU funds, and; investments into network reinforcements needed to connect new network users, mostly production units, which should be financed out of EU funds on the basis of connection charges.

Investments financed out of the NRRP should be completed by the end of 2026. The most important of these are:

- the installation of three 400/220 kV transformers of 400 MVA at TS Konjsko,
- the installation of one 400/110 kV transformers of 400 MVA at TS Velebit,
- an increase in the transmission power of the 220 kV Konjsko–Krš Pađene–Brinje transmission line,
- an increase in the transmission power of the 220 kV Senj–Melina transmission line,
- the installation of two 220/110 kV transformers of 150 MVA at TS Konjsko,
- reconstruction of the 220 kV HE Dubrovnik switchyard,

- construction of the new 2x110 kV Bilice – Trogir transmission line,
- increase in the transmission power of a series of 110 kV transmission lines along the Adriatic coast, and
- the replacement of 110 kV submarine cables with an increase in transmission power on the segments Crikvenica–Krk–Lošinj and Dugi Rat–Brac–Hvar–Korcula.

In 2021, the most important components of the SINCRO.GRID project[24] were installed: Compensation devices with a total power of 550 Mvar at TS Konjsko (250 Mvar SVC device); TS Melina (200 Mvar VSR device); TS Mraclin (100 Mvar VSR device), and; a dynamic line rating system. The SINCRO.GRID project is on the list of EU projects of common interest (PCI project)[25] and has been awarded a 51% grant through CEF.[26]

HOPS and HEP-ODS continued the good practice of harmonising their plans in terms of the construction dynamics and financing of joint facilities (TS 110/x kV). Investments into large 110/x kV facilities jointly owned by HOPS and HEP-ODS are conditioned by different multi-year load increase trends; the most common locations envisioned for new shared facilities are those with strong development in tourism. In 2021, large facilities TS 110/10(20) kV Zamet and TS 110/10(20) kV Zadar – east were completed and commissioned, which are of importance to the energy supply of Rijeka and Zadar, respectively.

In the ten-year plan for the transmission network, all projects specified in TYNDP 2020[27] were considered on an equal basis as other HOPS investments.

The earthquakes that occurred in 2020 caused damage to a large number of distribution facilities in DA Elektra Sisak, DA Elektra Zagreb, and DA Elektra Karlovac; of larger installations, the 110/20 kV Petrinja transformer station suffered significant damage. In 2020 and 2021, HEP-ODS secured a significant share of the funds needed for renovations. The necessary investments to repair damage to the distribution network are estimated at HRK 182 million. For 2021, the usual financial resources were earmarked to repair damage caused by natural disasters in the amount of HRK 15 million; additional funds were earmarked for the urgent repair of earthquake damage in DA Elektra Sisak and DA Elektra Zagreb from other investment programmes in the total amount of over HRK 27 million.

HERA approved a change in the financial framework of HEP-ODS's *Ten-year development plan for the HEP-ODS distribution network (2021-2030)* relating to the one-year period for 2021 in the amount of HRK 75.5 million for the purpose of earthquake damage repair.

For 2022, financial resources were earmarked to repair damage caused in earthquake-stricken areas of Sisak-Moslavina County and DA Elektra Zagreb in the amount of HRK 71 million. Investments in 2023 will depend on the success of the planned investments in 2022.

The ten-year distribution network development plan also takes into account the strategic commitment of Croatia as concerns the reception of renewable energy sources.

The development of the distribution network is being planned to fulfil criteria of safety of supply, allowed voltage deviations, and continuity of supply. Ten-year SAIFI, SAIDI, and CAIDI reliability indicators are trending downward, which indicates an improvement in the quality of electricity supply.

As part of measures for increasing energy efficiency, HEP-ODS also emphasised measures for reducing losses in the distribution electricity grid. HEP-ODS initiated the implementation of the Smart Grid pilot project,[28] co-financed by EU funds. As part of the project, additional investments into the development of advanced networks of HRK 80.5 million have been planned over a ten-year period.

In general, planned investments in the transmission and distribution network were higher than in previous years. Based on the plans submitted, HERA is of the opinion that the planned total income of HOPS and HEP-ODS is sufficient to cover the annual investments in the next three-year period.

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[24] *Project co-financed through CEF. The goal of the project is to improve the voltage quality in the electric power system and use the dynamic transmission capacity of the existing transmission lines by using advanced technical systems and algorithms.*

[25] *PCI - Projects of Common Interest*

[26] *CEF - Connecting Europe Facility - EU financial instrument for infrastructure investments in the fields of transport, energy, and digital services (until 31 March 2021)*

[27] *EU Ten-Year Network Development Plan from 2020*

[28] *A smart grid is an electricity grid that includes various activities and metering methods that include smart meters, smart applications, smart devices, renewable energy sources, energy efficient resources, and high-efficiency devices.*

4.2.4 Tariffs for using the transmission and distribution network and connection charges

Average network charges

Table 4.2.4. shows the average transmission network charges based on the actual consumption of final customers, while Table 4.2.5. shows average distribution network charges.

Table 4.2.4. Average transmission network charges for the period from 2016 to 2021

final customer category	2016 [lp/kWh]	2017 [lp/kWh]	2018 [lp/kWh]	2019 [lp/kWh]	2020 [lp/kWh]	2021 [lp/kWh]
Non-household – high-voltage	8.8	7.7	8.0	7.0	6.6	7.0
Non-household – medium voltage	7.7	7.6	7.6	7.0	6.9	6.8
Non-household – low-voltage	8.9	8.9	9.0	9.1	9.1	9.2
Households	8.9	8.9	8.9	8.9	9.0	9.0
Average for all categories	**8.6**	**8.5**	**8.5**	**8.3**	**8.3**	**8.3**

Table 4.2.5. Average distribution network charges for the period from 2016 to 2021

final customer category	2016 [lp/kWh]	2017 [lp/kWh]	2018 [lp/kWh]	2019 [lp/kWh]	2020 [lp/kWh]	2021 [lp/kWh]
Non-household – high-voltage	-	-	-	-	-	-
Non-household – medium voltage	14.0	14.0	14.0	11.7	11.6	11.5
Non-household – low-voltage	27.5	27.7	28.1	24.7	25.0	24.9
Households	24.5	24.5	24.6	24.6	24.8	24.6
Average for all categories	**22.7**	**22.6**	**22.7**	**21.0**	**21.2**	**21.0**

Depending on consumption category and tariff model, final customers in Croatia are charged tariffs for the use of the transmission and distribution network for the following tariff elements:

- energy at high/low/uniform daily tariff (HRK/kWh),
- settled peak active power (HRK/kWh),
- excess reactive energy (HRK/kVarh), and
- billing metering point charge (HRK/mo).

Figure 4.2.10. shows the share of tariff items in the total network usage charge (transmission and distribution), while Figure 4.2.11. shows average prices per tariff element by consumer category and tariff model.

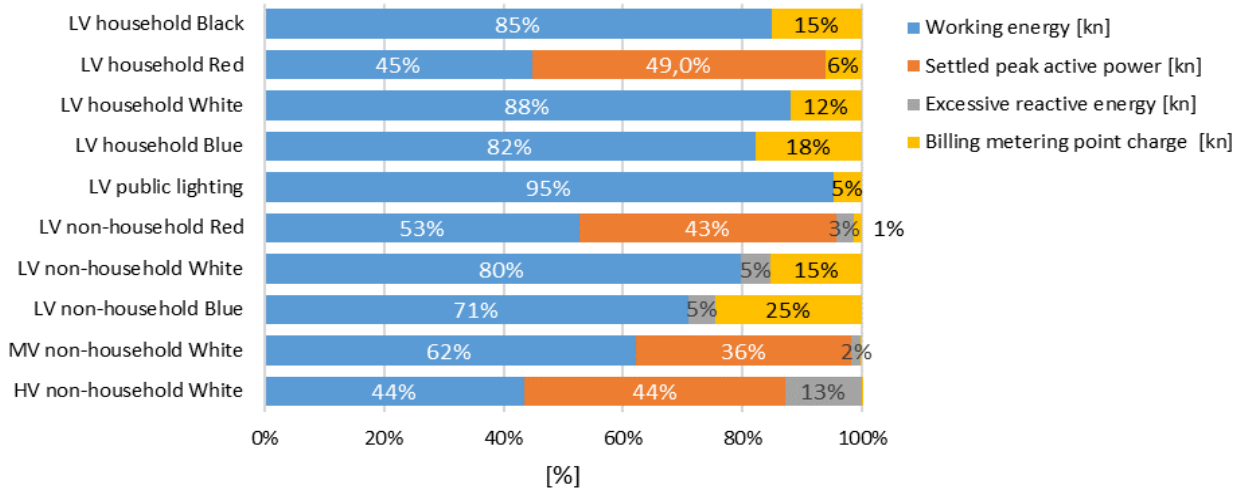


Figure 4.2.10. Share of tariff items in the total network usage charge (transmission and distribution) in 2021

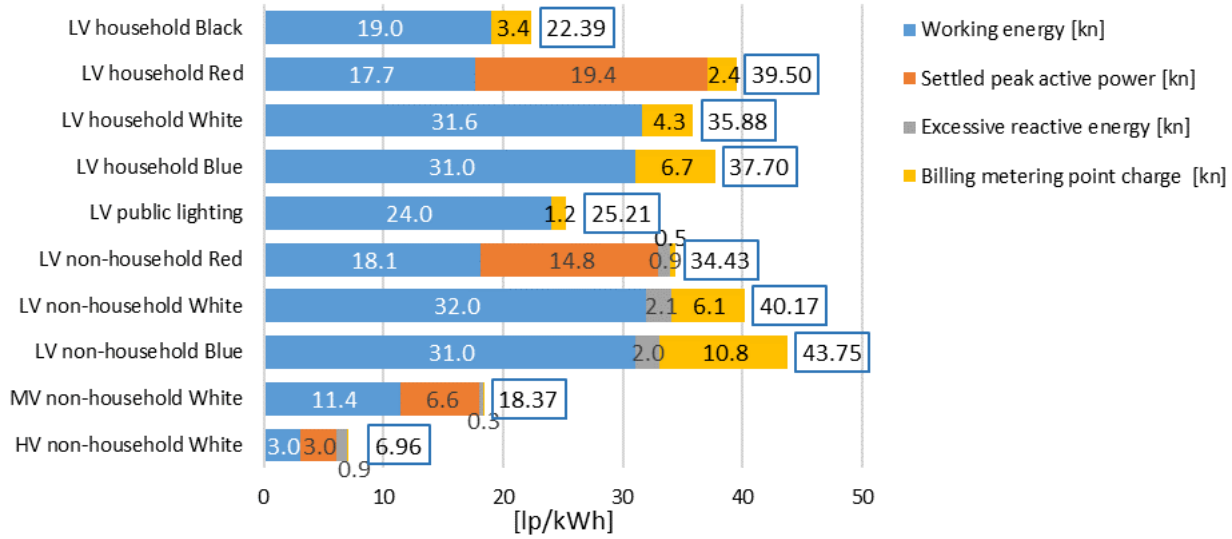
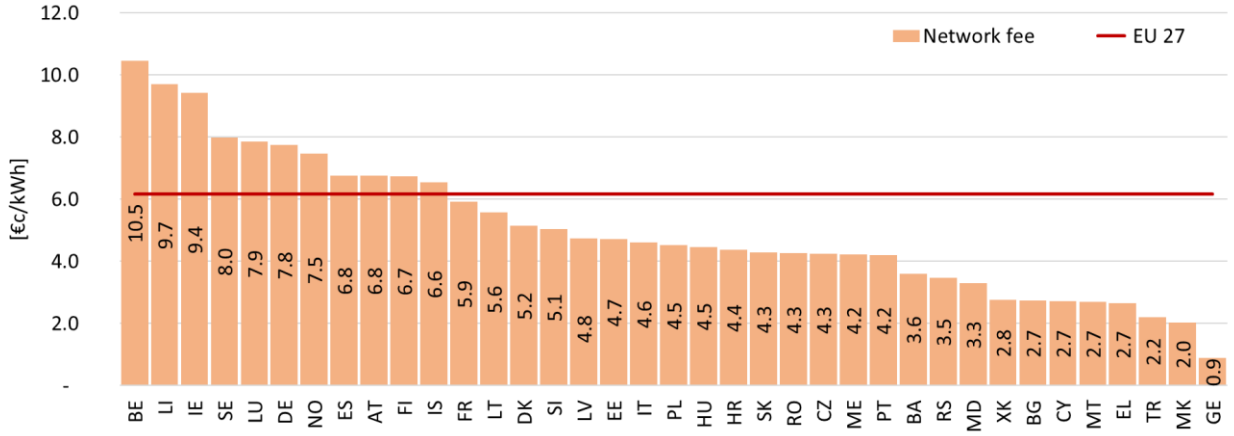


Figure 4.2.11. Average prices by tariff element for consumption categories and tariff models in 2021

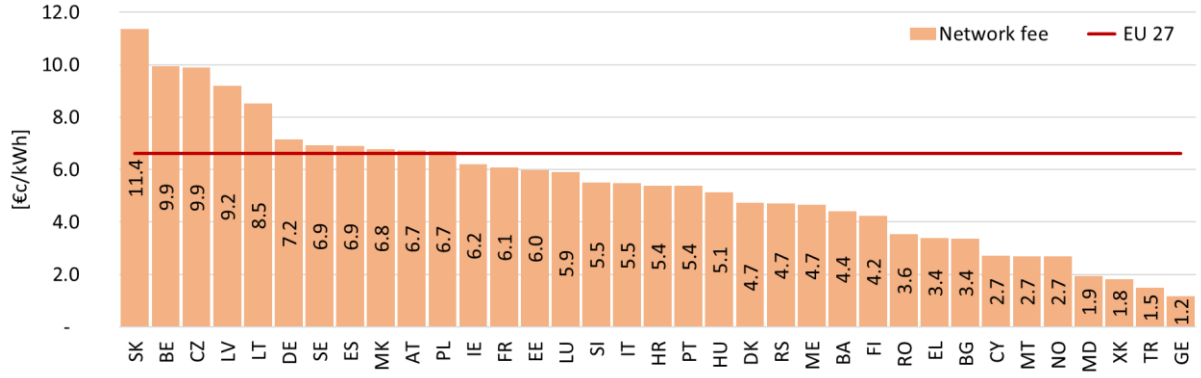
Figures 4.2.12. to 4.2.18. show average network charges in European countries for final customers in EUROSTAT's consumption categories *DC, IA, IB, IC, ID, IE*, and *IF*[29] in 2021.

29 *These consumption categories are in accordance with the differentiation among consumption categories and household/non-household final customer billing metering points, with the corresponding characteristics as noted in Tables 4.4.3. and 4.4.4. of this report.*



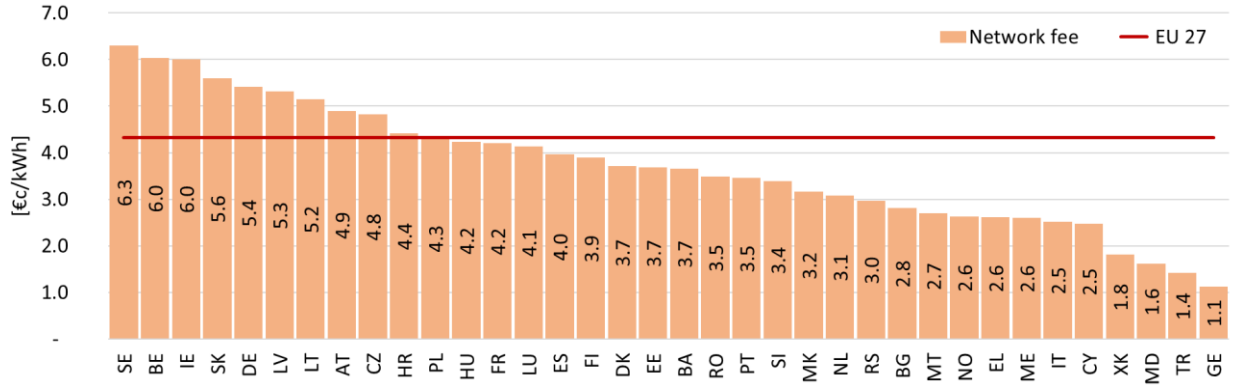
Source: EUROSTAT; data processing: HERA

Figure 4.2.12. Average network charges in European countries for household final customers in the DC consumption category in 2021[30]



Source: EUROSTAT; data processing: HERA

Figure 4.2.13. Average network charges in European countries for non-household final customers in the IA consumption category in 2021



Source: EUROSTAT; data processing: HERA

Figure 4.2.14. Average network charges in European countries for non-household final customers in the IB consumption category in 2021

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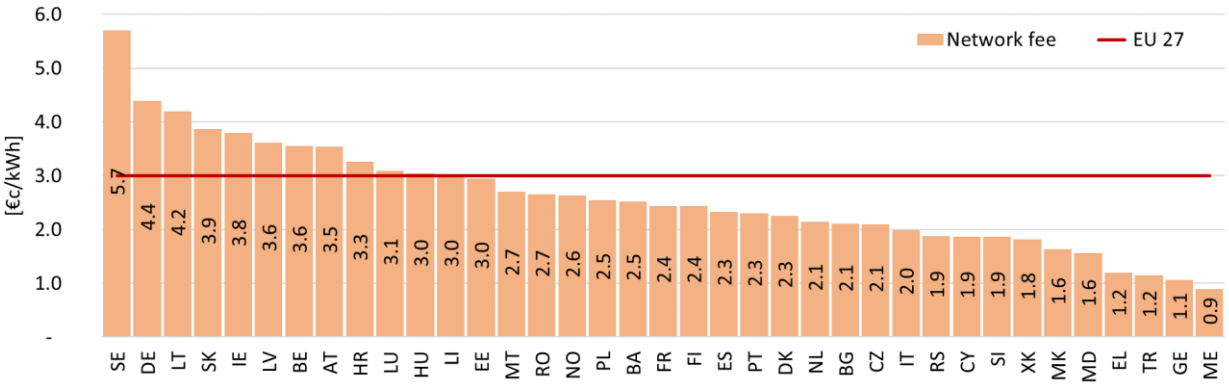
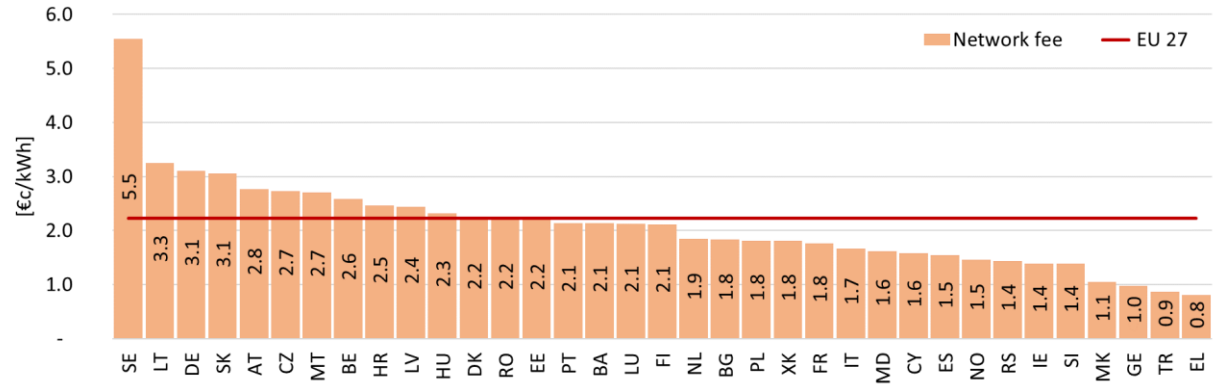
30 *ISO state and country codes: AL - Albania, AT - Austria, BA - Bosnia and Herzegovina, BE - Belgium, BG - Bulgaria, CY - Cyprus, CZ - Czech Republic, DK - Denmark, DE - Germany, EE - Estonia, EL - Greece, ES - Spain, FI - Finland, FR - France, GE - Georgia, HR - Croatia, HU - Hungary, IE - Ireland, IS - Iceland, IT - Italy, LI - Lichtenstein, LT - Lithuania, LU - Luxembourg, LV - Latvia, MD - Moldova, ME - Montenegro, MK - North Macedonia, MT - Malta, NL - Netherlands, NO - Norway, PL - Poland, PT - Portugal, RO - Romania, RS - Serbia, SE - Sweden, SI - Slovenia, SK - Slovakia, TR - Turkey, UA - Ukraine, UK - United Kingdom, XK - Kosovo.*



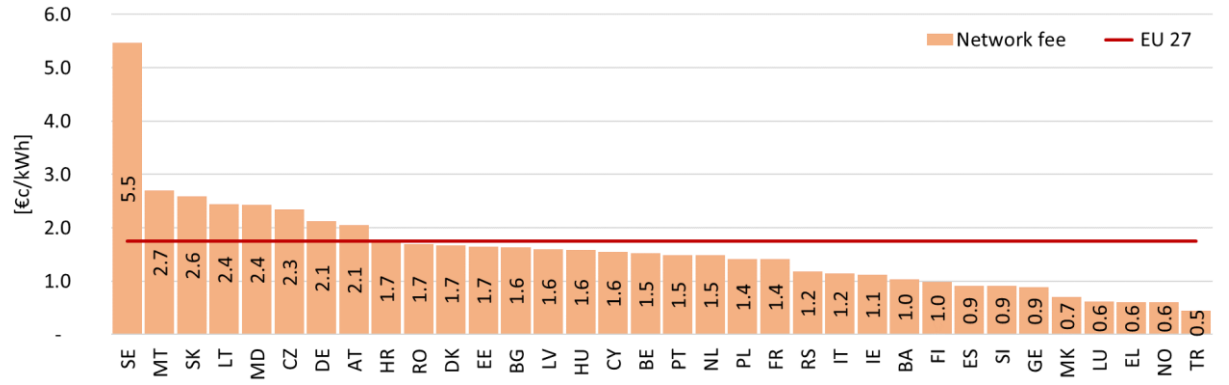
Source: EUROSTAT; data processing: HERA

Figure 4.2.15. Average network charges in European countries for non-household final customers in the IC consumption category in 2021



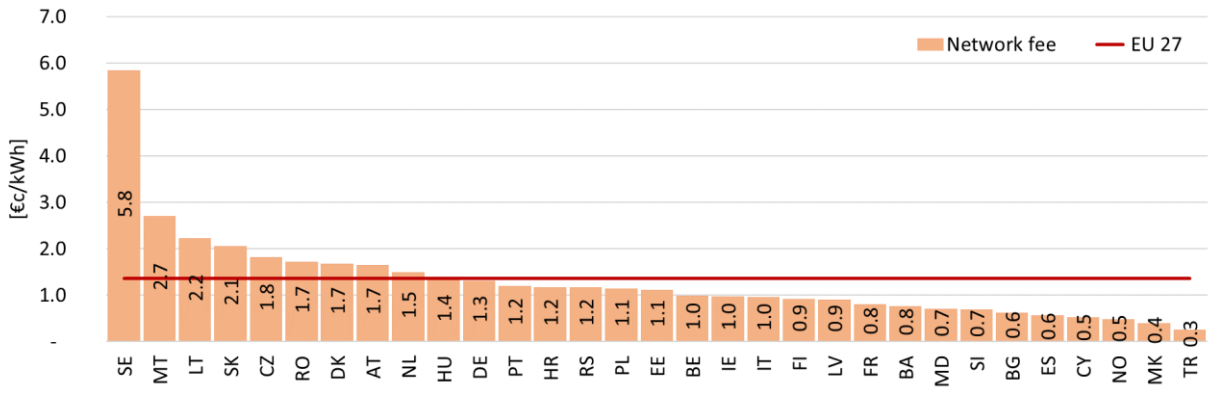
Source: EUROSTAT; data processing: HERA

Figure 4.2.16. Average network charges in European countries for non-household final customers in the ID consumption category in 2021



Source: EUROSTAT; data processing: HERA

Figure 4.2.17. Average network charges in European countries for non-household final customers in the IE consumption category in 2021



Source: EUROSTAT; data processing: HERA

Figure 4.2.18. Average network charges in European countries for final customers in the IF consumption category in 2021

The share of individual consumption categories in system operator revenues from transmission network charges and distribution network charges in 2021 are shown in Figure 4.2.19. Figure 4.2.20. shows the proportions of individual tariff elements in the revenues from transmission network charges and distribution network charges in 2021.

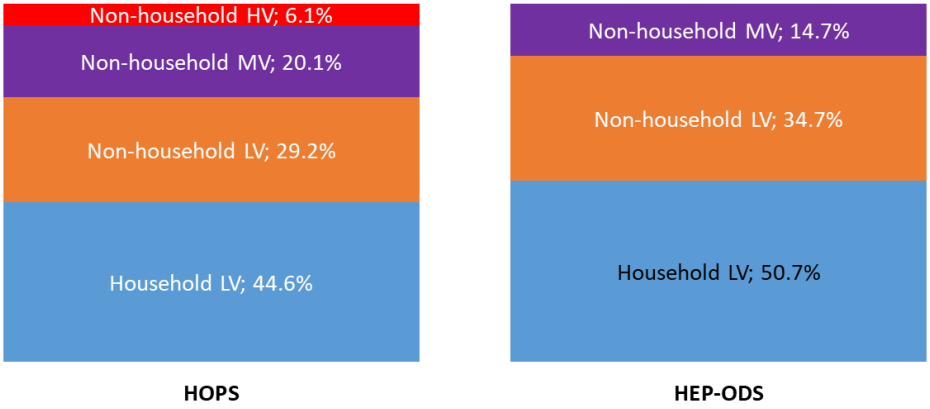


Figure 4.2.19. Share of individual consumption categories in system operator revenues from transmission network charges and distribution network charges in 2021

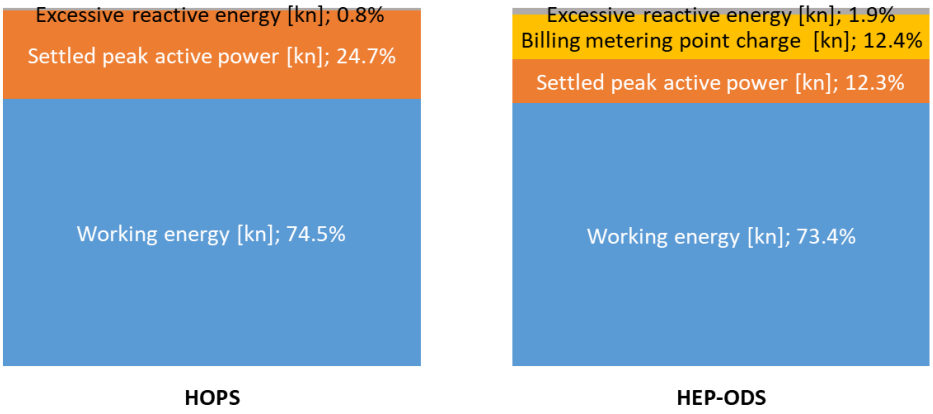


Figure 4.2.20. Proportions of individual tariff elements in revenues from transmission network charges and distribution network charges in 2021

Write-off of receivables for final customers in earthquake-affected areas

On 18 January 2021, the Croatian government adopted the *Decision of the government of the Republic of Croatia regarding the write-off of claims and compensation for claims for energy delivered to final customers in earthquake-affected areas (hereinafter:* Croatian government Decision) for the period from January to

March 2021. On 25 March 2021, it adopted the Decision of the government of the Republic of Croatia for April 2021. On the basis of these decisions, all households in earthquake-stricken municipalities and cities, regardless of the degree of damage they suffered, were freed from paying the cost of electricity. These are the cities of Petrinja, Glina, Sisak, and Hrvatska Kostajnica, and the municipalities of Lekenik, Sunja, Donji Kukuruzari, Majur, Dvor, Topusko, Gvozd, Jasenovac, Hrvatska Dubica, Martinska Ves, Pokupsko, and Kravarsko. In accordance with the aforementioned government decisions, the Shareholders Assembly of Hrvatska elektroprivreda d.d. adopted a Decision on the write-off of receivables for energy delivered to household final customers from earthquake-stricken areas (hereinafter: *Decision on the write-off of receivables*) on 18 January 2021. Table 4.2.6. shows the amount of transmission and distribution network charges written off in 2021 based on the *Decision regarding the write-off of claims*.

Table 4.2.6. Transmission and distribution network charges written off in 2021 based on the Decision regarding the write-off of claims

Consumption category		Tariff model	Tariff element	HEP-ODS revenue [HRK]	HOPS revenue [HRK]
Households	LV	Blue	Energy - single tariff	6,041,891	2,471,683
			billing metering point charge	1,445,824	**250,000,001 - 1,000,000,000**
		White	energy - higher tariff	9,103,463	4,172,420
			energy - lower tariff	2,423,989	1,009,996
			billing metering point charge	1,902,342	**250,000,001 - 1,000,000,000**
		Red	energy - higher tariff	148,245	46,327
			energy - lower tariff	43,375	10,844
			settled peak active power	118,152	71,384
			billing metering point charge	7,360	-
		Black	Energy - single tariff	3	1
			billing metering point charge	6	-
Total:				**21,234,650**	**7,782,654**

Decision on electricity transmission tariffs and Decision on electricity distribution tariffs

On 30 September 2021, HOPS and HEP-ODS submitted to HERA a request to change the tariff items for electricity transmission and distribution. On the basis of the submitted requests and a subsequent analysis, HERA adopted tariff items that were implemented as of 1 April 2022, as shown in Table 4.2.7.

Table 4.2.7. Electricity transmission tariff items and electricity distribution tariff items

Category/tariff model	Tariff element[31]	Unit of measure	"Old" tariff items		"New" tariff items	
			Distribution	Transmission	Distribution	Transmission
HV Non-household – White	EN_{VT}	HRK/kWh	-	0.04	-	0.04
	EN_{NT}	HRK/kWh	-	0.02	-	0.02
	P_V	HRK/kW	-	14.00	-	14.00
	E_J	HRK/kVarh	-	0.16	-	0.16
	NK	HRK/month	-	68.00	-	68.00
MV Non-household - White	EN_{VT}	HRK/kWh	0.10	0.04	0.10	0.04
	EN_{NT}	HRK/kWh	0.05	0.02	0.05	0.02
	P_V	HRK/kW	12.00	14.00	12.00	14.00
	E_J	HRK/kVarh	0.15	-	**0.16**	-
	NK	HRK/month	66.00	-	66.00	-
LV non-household - Blue	EN_{JT}	HRK/kWh	0.22	0.09	0.22	0.09
	E_J	HRK/kVarh	0.15	-	**0.16**	-
	NK	HRK/month	41.30	-	41.30	-
LV Non-household - White	EN_{VT}	HRK/kWh	0.24	0.11	**0.26**	**0.13**
	EN_{NT}	HRK/kWh	0.12	0.05	0.12	0.05
	E_J	HRK/kVarh	0.15	-	**0.16**	-
	NK	HRK/month	41.30	-	41.30	-
LV non-household - Red	EN_{VT}	HRK/kWh	0.16	0.05	**0.17**	0.05
	EN_{NT}	HRK/kWh	0.08	0.02	0.08	0.02
	P_V	HRK/kW	24.00	14.50	**24.50**	14.50
	E_J	HRK/kVarh	0.15	-	**0.16**	-
	NK	HRK/month	41.30	-	41.30	-
LV non-household - Yellow	EN_{JT}	HRK/kWh	0.17	0.06	**0.18**	0.06
	NK	HRK/month	14.70	-	**15.45**	-
LV Household - Blue	EN_{JT}	HRK/kWh	0.22	0.09	0.22	0.09
	NK	HRK/month	10.00	-	**11.60**	-
LV Household - White	EN_{VT}	HRK/kWh	0.24	0.11	**0.26**	**0.13**
	EN_{NT}	HRK/kWh	0.12	0.05	0.12	0.05
	NK	HRK/month	10.00	-	**11.60**	-
LV Household - Red	EN_{VT}	HRK/kWh	0.16	0.05	**0.17**	0.05
	EN_{NT}	HRK/kWh	0.08	0.02	0.08	0.02
	P_V	HRK/kW	24.00	14.50	**24.50**	14.50
	E_J	HRK/kVarh	-	-	-	-
	NK	HRK/month	41.30	-	41.30	-
LV Household - Black	EN_{JT}	HRK/kWh	0.13	0.05	**0.14**	0.05
	NK	HRK/month	5.80	-	**6.10**	-

31 *EN_{ST}: active energy – single tariff, EN_H: active energy – higher tariff, EN_{LT}: active energy – lower tariff, P_V: settled peak active power, E_R: excess reactive energy, NK: BMP charge.*

According to the new tariff items, increases are expected in the average monthly cost of network charges for the household category in the amount of HRK 6.51 (an increase of 8.1%), and for the low-voltage non-household category of HRK 23.12 (an increase of 3.9%) (Table 4.2.8.).

Table 4.2.8. Average increase in network charges after changes to tariff items for electricity transmission and tariff items for electricity distribution

Category/tariff model	Electricity sold in 2021 [MWh]	Average annual relative increase in charges on a yearly basis [%]			Average monthly increase in charges [HRK]		
		Distribution	Transmission	Total:	Distribution	Transmission	Total:
HV Non-household - White	1,298,348	0.0%	0.0%	0.0%	-	-	-
MV Non-household - White	4,355,037	0.2%	0.0%	0.1%	25.90	-	25.90
LV non-household - Blue	184,442	0.4%	0.0%	0.3%	0.48	-	0.48
LV Non-household - White	1,025,406	5.3%	15.0%	7.6%	10.06	9.19	19.26
LV non-household - Red	3,026,648	3.9%	0.0%	2.8%	74.12	-	74.12
LV non-household - Yellow	340,395	5.8%	0.0%	4.4%	13.50	-	13.50
LV Household - Blue	1,468,037	3.3%	0.0%	2.5%	1.60	-	1.60
LV Household - White	5,076,643	8.1%	14.8%	9.9%	5.15	3.55	8.71
LV Household - Red	45,483	3.2%	0.0%	2.3%	15.15	-	15.15
LV Household - Black	6,197	7.2%	0.0%	5.5%	2.10	-	2.10
Total:	**16,826,637**	**4.9%**	**5.8%**	**5.2%**	**5.29**	**2.69**	**7.99**
HV Non-household	1,298,348	0.0%	0.0%	0.0%	-	-	-
MV Non-household	4,355,037	0.2%	0.0%	0.1%	25.90	-	25.90
LV Non-household	4,576,891	4.1%	3.3%	3.9%	17.84	5.28	23.12
LV Household	6,596,361	6.9%	11.3%	8.1%	4.06	2.45	6.51

Network use tariff for energy producers inject into the transmission or distribution network

The new **Electricity Market Act** prescribes that electricity producers who have an electricity production permit are required to pay a network use tariff for the electricity they inject into the transmission or distribution network. *Commission Regulation (EU) No 838/2010 of 23 September 2010 on laying down guidelines relating to the inter-transmission system operator compensation mechanism and a common regulatory approach to transmission charging* defines a limitation by which the average annual transmission charge must be no larger than EUR 0.5/MWh. The procedure for determining producer revenue to be included during the verification of whether this limit has been fulfilled is prescribed in the *Regulation*. Defining network charges, according to Article 18.1. of *Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity* must be implemented such that production connected to the distribution network is not discriminated either positively or negatively as compared to production connected to the transmission network. In accordance with the above, HERA's methodologies for determining electricity transmission and distribution tariffs will introduce tariffs for energy entities who have a permit to produce electricity on the transmission and distribution network. In doing so, HERA will adhere to the stated limit of EUR 0.5/MWh for producers on the transmission network, taking into account that producers on the distribution network must not be discriminated against either positively or negatively with respect to producers on the transmission network.

Transmission and distribution network connection charges

Consumers connecting to the transmission or distribution network or requesting an increase in connection capacity pay a connection charge which is defined in the *Methodology for establishing charges for connection to the electric power network for new network users and for increasing the connection capacity of existing network users* (Official Gazette no. 51/17, 31/18, and 104/20). The connection charge is intended to finance

new connections, create technical requirements in the network, and develop the network. For final customers with a connection capacity of up to 20 kW (inclusive) who are connecting to the low voltage network within a radius of up to 400 metres (inclusive) from an existing transformer substation, the connection charge or the charge for increasing connection capacity amounts to HRK 1,350/kW excluding VAT, except in the city of Zagreb, where the charge amounts to HRK 1,700/kW.

However, for other final customers, if planned connection costs exceed the funds collected from the charges by 20% or more, the consumer pays the actual costs of the connection. Until the adoption of new by-laws in accordance with the new **Electricity Market Act**, a deep approach will be applied to producers; electricity producers will bear the cost of connections to the network, as well as the full costs of network reinforcements required by their connection.

Observations on transmission and distribution charges and connection charges

HEP-ODS' revenues from electricity distribution tariffs in 2021 amounted to HRK 3.264 million, which is 6.9% more than in 2020. The revenue of HOPS from tariff items for electricity transmission in 2021 amounted to HRK 1,400 million, which is 8.5% more than in 2020. It should be noted that electricity sales decreased significantly in 2020 as compared to the pre-pandemic 2019 (a decrease of 5.8%). Economic recovery came in 2021, and so the quantity of energy sold in 2021 amounted to 16.8 TWh, which was 8.3% more than in 2020.

On the basis of the *Decision regarding the write-off of receivables*, HOPS wrote off HRK 7.8 million for household final customers in earthquake-affected areas of Croatia in 2021, while HEP-ODS wrote off HRK 21.2 million for the use of the distribution network. Additionally, in accordance with the *Decision on the write-off of receivables*, these final customers will also be forgiven charges for the relocation of their network connections to temporary accommodation (shipping containers, mobile homes, campers, auxiliary buildings at the same location), including new connections at the same location, and the later return of these connections to renovated or new buildings.

On the basis of a request from HOPS to change tariffs for electricity transmission and a request from HEP-ODS to change electricity distribution tariffs, on 31 September 2021, HERA carried out an analysis and adopted tariffs to be implemented as of 1 April 2022.

Due to the significant decrease in electricity sales in 2020 (the previous regulatory year for setting tariffs), the difference between revenues and costs from tariffs was negative for systems operators in 2020. Also, due to the large increases in electricity prices on the wholesale market and forward contracts markets for 2022, planned expenses for energy purchases to cover losses in 2022 (the coming regulatory year) also increased as compared to planned costs for 2021. This led HERA to adopt a decision on tariffs increasing planned revenues from systems operators tariffs in 2022 on the annual level (HOPS by 5.8%, HEP-ODS by 4.9%). However, in order to ease the position of final customers of electricity, it was decided that the new tariffs would be implemented as of 1 April 2022. Taking this delay into account, the planned increase in system operator revenues is somewhat lower in 2022 (HOPS by 4.3%, and HEP-ODS by 3.7%).

The new **Electricity Market Act** replaces the previous deep approach to network connections with a hybrid approach. The system operator is obligated to create technical requirements in the network in accordance with the ten-year plans for the development of the transmission or distribution network (hereinafter: 10Y plan), which must be in line with Croatia's current spatial development strategy and the spatial plans of counties, cities, and municipalities. Network connections and network reinforcements are also financed out of connection charges. Charges for connecting energy storage facilities to the network must be based on the real cost of technical connection to the network in terms of taking up electricity from the network. As the provisions require system operators to align their 10Y plans with the current spatial development strategy and spatial plans, and the creation of technical requirements in the network is the obligation of systems operators in accordance with 10Y plans, it follows that system operators are obligated to finance the creation of technical requirements in the network out of their own funds in accordance with spatial planning documents. As it is prescribed that network connections and the creation of technical requirements in the network are financed out of transmission or distribution charges and connection charges simultaneously, HERA will adopt a new methodology including a hybrid approach to network connections. In this new methodology, costs for network reinforcements / increasing the connection capacity of the buildings of network users will be determined proportionally to the connection capacity by multiplying the amount of

connection capacity with the unit connection price. This shares the cost of network reinforcements among all network users who pay a network use charge and, proportional to connection capacity, all new network users who connect to the network or increase their connection capacity. The cost of network reinforcements needed for connecting new users can no longer be assigned to a specific connection request / request for increasing connection capacity, as it is charged regardless of whether it is necessary. Although this approach removes location signals, investors will have clearer information on how much it will cost to connect to the network, which was not the case with the previous deep approach to defining charges for new connections or increases in connection capacity. All investors will be in the same position and will jointly share the costs of network reinforcements. The unit connection price will determine the share of network reinforcements that will be financed out of connection charges (grant allocation) and the share divided among network users (financed out of tariffs). Investments from grants do not enter the regulated base price and do not affect tariffs. The financing of a part of the creation of technical requirements in the network out of EU funds must thus also be considered, especially the HRK 1.6 billion foreseen in the NRRP for investment into the transmission network. This kind of financing is also considered grant financing.

The administrative connection process is prescribed through multiple laws and by-laws, the most important of which are the **Construction Act**, the **Spatial Planning Act**, the **Energy Act**, and the **Electricity Market Act**.

In accordance with the new **Electricity Market Act**, the first step in the connection process is now the issuance of an energy approval (EA); previously, the EA was issued after the issuance of planning permission. An EA is needed for all production plants except for simple structures. The conditions for obtaining an EA are: the location where the plant is being built is included in the spatial plan; an opinion has been issued by the system operator as to whether connection is possible on the basis of a connection study; appropriate guarantees have been provided. Previously, the process of creating a report on the optimal technical solution for connecting to the network (hereinafter: EOTRP) on the basis of a conceptual design without the condition of a spatial plan led to network capacity being reserved for projects that could not be realised based upon spatial limitations. This approach led to apparent congestion in the network and limited potential RES projects. The new method of issuing EAs at the beginning of the connection process is expected to result in a smaller number of projects entering the EOTRP phase, and that these projects will be ready for implementation.

4.2.5 Unbundling of activities

Transmission system operator

Electricity transmission is performed as a public service, which must be available at all times to all customers and energy entities at a regulated price and according to the regulated conditions of access and use of service, with a view to the safety, regularity, and quality of service, environmental protection, energy efficiency and climate protection; this service is to be performed according to the principle of transparency and under the supervision of bodies determined by regulations. The transmission system operator shall act in a transparent, objective, and impartial manner towards all electricity market participants and network users.

On 22, February 2016, after obtaining the opinion of the EC, HERA adopted and published on its website its *Decision on the issuance of a certificate* to HOPS according to the model of an independent transmission operator.

According to Article 19 of the previous **Electricity Market Act** or Article 100 of the new **Electricity Market Act**, all commercial and financial relations between the vertically integrated entity and HOPS must be in accordance with market conditions; HOPS is obligated to submit all commercial and financial contracts to HERA for approval prior to their conclusion with the vertically integrated entity. HERA verifies whether the contracts are market-oriented under impartial conditions.

In accordance with the rules on HOPS' functional independence as an independent transmission operator as defined by the **Electricity Market Act**, according to the information available to HERA, neither HEP d.d. (the owner of HOPS) nor other related companies within the vertically integrated entity exerted any undue influence on business decisions taken by HOPS' management structure during 2021. Also, during 2021, HOPS' Management Board took business decisions and represented the company towards all third parties, including companies and other organisations from Croatia and abroad, in accordance with the aforementioned rules of functional independence.

Pursuant to Article 86.12. of the **Electricity Market Act**, a decision taken by HOPS' Assembly on 6 April 2022 and a decision of the Commercial Court in Zagreb dated 11 April 2022 transformed HOPS d.o.o. into a joint stock company under the name Croatian Transmission System Operator d.d. (Cro. *Hrvatski operator prijenosnog sustava d.d.*, HOPS). This change was registered in the Court Register of the Croatian Ministry of Justice and Public Administration.

Unbundling of business premises

As of 31 December 2021, HOPS was the owner of all business premises in its use.

Independence of the IT system

Throughout 2021, HOPS was fully independent in performing activities related to IT system maintenance and upgrading.

In 2021, HOPS implemented the *Rules on HOPS information system security* (adopted in November 2020 by HOPS Management Board), which was adopted in accordance with the *NIS Directive* and the corresponding national legislation and the Croatian Information Systems Security Bureau's best practices. HOPS participates in the activities of ENTSO-E's European Network for Cyber Security, from which it regularly receives information on existing and potential cybersecurity threats to the IT systems of the European transmission system operators.

Throughout 2021, HOPS implemented a project co-financed with EU funds under the CEF Telecom call – Cybersecurity under the name of System for Prevention and Analysis of HOPS's Communication and Network Security Incidents (E-PASIS). This project is to last 27 months (from September 2020 to November 2022). The goal of the project is to strengthen HOPS' cybersecurity capabilities. The project implemented new software to detect and analyse security threats in HOPS' communication network in real time.

As a follow-up to the E-PASIS project, a decision of the EC in April 2021 awarded HOPS co-financing for a new EU project entitled "Advanced platform for business content and file sharing analysis in HOPS Security Operational Centre" (e-CYBIS).

During 2021, HOPS took a snapshot of the status of critical information systems (electricity system management system and associated IT communications infrastructure) in preparation for future ISO 27000 certification for information systems security in accordance with the practices of EU transmission system operators, a significant part of which has already been certified according to this standard.

Telecommunications sector unbundling

In 2021, the unbundling of the telecommunications system continued as in 2020, in accordance with the agreements between HOPS and HEP Telekomunikacije d.o.o defining rights and obligations related to the lease of telecommunications capacities, telecommunications systems maintenance and lease of premises for the storage of telecommunications equipment and fibre-optic telecommunications infrastructure.

Procurement of electricity to cover losses

HOPS purchased the entire volume of electricity necessary to cover losses in 2021 under market principles, without discriminating against market participants.

To procure energy to cover losses in 2021, HOPS carried out four public tenders, which resulted in six contracts for the delivery of electricity to cover losses in the transmission network. Five contracts were concluded for electricity delivery periods throughout 2021, of which two were concluded with HEP d.d. and three with market participants ČEZ a.s., GEN-i d.o.o., and HSE d.o.o. One contract was concluded for electricity delivery on a monthly basis for January 2021 with GEN-i d.o.o.

In order to control liquidity and the price stability of the purchased electricity to cover losses for 2022, HOPS launched an additional tender in December 2021, for which no bids were received.

Procurement of ancillary services and balancing energy

In December 2020, HOPS began procuring mFRR power reserves and/or balancing energy for system security through a public tendering mechanism. All balancing energy providers who have a valid balancing energy supply contract (mFRR) with HOPS had the right to apply. Procurement is carried out in accordance with the

rules published on HOPS website. HOPS signed eight Balancing Energy Supply (mFRR) Agreements that were valid throughout 2021 with the following network users who are not a part of the vertically integrated entity:

- ABS Sisak d.o.o.,
- Cemex Hrvatska d.d.,
- DS Smith Belišće Croatia d.o.o.,
- INA – Rafinerija nafte Rijeka d.d.,
- Messer Croatia Plin d.o.o.,
- Nexe d.d.,
- Petrokemija d.d. and
- PSP – Podzemno skladište plina d.o.o.

Of the total secured mFRR power reserves for system security, the majority (73.9%) is still provided by the dominant provider (HEP Proizvodnja d.o.o. as part of the vertically integrated entity), while the remainder (26.1%) is provided by the aforementioned eight providers of balancing services.

Electric power system balancing

In accordance with the *EBGL Regulation*, HOPS is required to publish balancing reports at least once every two years for the previous two calendar years. The report for 2018/19 has been published on HOPS' website,[32] and contains data on the conditions and provisions for balancing in the Croatian electricity system for the reporting period. HOPS regularly publishes monthly system balancing reports on its website.[33]

HOPS publishes data on electricity system balancing for the Croatian regulatory area on the Central Information Platform for the transparent publication of basic energy and market data, which serves as a source of information for market participants.

Relations with transmission network users and the connection of new users

As concerns HOPS activities towards network users (parts of the vertically integrated entity and third parties outside the vertically integrated entity), HOPS undertook no discriminatory behaviour that might have given the vertically integrated entity a privileged position over any other network user. Also, HOPS did not discriminate against third parties as users of the transmission network.

Electricity supply to HOPS' business premises

As an electricity buyer for end consumption in its business premises, after a public tender carried out for one-year electricity supply, pursuant to the **Public Procurement Act** and with the prior approval of HERA, HOPS concluded an Agreement on final customer supply for a one-year period with HEP-Opskrba. Until the implementation of the new agreement, which will be implemented as of 1 December 2021, HOPS used the guaranteed electricity supply public service provided by HEP Elektra d.o.o. as guaranteed supplier to purchase electricity for final consumption in its business premises.

Cooperation between HOPS and other institutions in Croatia and abroad; participation in the co-founding of business entities

According to the information available to HERA, during 2021, neither HEP d.d. nor other parts of the vertically integrated entity influenced the cooperation, decision-making, or ownership rights of HOPS in companies and organisations of which it is the co-founder or co-owner, or in whose work it participated.

HOPS is the co-founder of HEP-Telekomunikacije d.o.o., in which it has a 13.73% share of ownership. This business entity provides telecommunications services to HOPS and other entities within the vertically integrated entity, under conditions defined by its founding act, agreements with entities in the vertically integrated entity and with HOPS, and conditions from HOPS' certificate according to the model of an independent transmission operator.

[32] *https://www.hops.hr/izvjesce-o-uravnotezenju-ees-a*

[33] *https://www.hops.hr/izvjestaji-uravnotezenje*

Distribution system operator

Pursuant to the **Electricity Market Act***,* HEP-ODS is responsible for ensuring the principles of transparency, objectivity, and impartiality, and is obligated to submit an annual report to HERA on this subject.

On 7 April 2022, HERA received a *Report on the implementation of the distribution system operator's obligations in accordance with the principles of transparency, objectivity, and impartiality for 2021* from HEP-ODS.

During 2021, HEP-ODS performed the activity of electricity distribution in accordance with the principles of transparency, objectivity, and impartiality. The Management Board of HEP-ODS and all employees with special authority took decisions and undertook business tasks independently of the applicants who had submitted them, respecting the principle of impartiality.

Financial and other commercial relationships between HOPS and other companies from the vertically integrated entity

HEP-ODS and HEP d.d. have concluded an *Agreement on mutual relations*, which is an integral part of the methodology for calculating the cost of services offered to HEP-ODS (accounting services, public procurement, IT and communications systems, legal services, human resources management, etc.).

HEP-ODS prepares distribution network development plans with prior approval from its parent company HEP d.d. as regards the financial framework and established debt projections. Parent company HEP d.d. approves the financial framework and structure of financing for one-year business and investment plans in accordance with the **Electricity Market Act**. Consequently, HEP-ODS has real decision-making rights independent of its parent company HEP d.d., given the fixed assets required for the operation, maintenance, and development of the network within the approved financial framework.

During 2021, financial resources for operations, maintenance, development, and construction in the distribution network were available in accordance with the business plans and decisions of parent company HEP d.d.

HEP-ODS compliance programme

In early 2022, HEP-ODS adopted a new *Compliance programme for HEP-Operator distribucijskog sustava d.o.o.* (hereinafter: *Compliance Programme*) in accordance with the provisions of the new **Electricity Market Act**.

The Compliance Programme establishes measures that exclude the possibility of biased behaviour in HEP-ODS' operations, as well as the appropriate monitoring of the implementation of the *Compliance Programme*, and special obligations of HEP-ODS employees and the HEP-ODS *Compliance Programme* Monitoring Committee.

The Director of HEP-ODS and employees with special authority do not participate in the management structures of the vertically integrated entity, which are directly or indirectly responsible for the activities of electricity production, electricity transmission, and electricity supply.

During 2021, the HEP-ODS *Compliance Programme* Monitoring Committee received no written complaints regarding non-compliance with the *Compliance Programme*.

Development of the IT system with users

The introduction of a new business information system (SAP) at HEP d.d. for the needs of HEP d.d. and its subsidiaries in 2021 resulted in certain business processes at HEP-ODS slowing down and an increase in the time needed to address the requirements of users (existing and future network users, measurement data users, etc.), which resulted in the worsening of service quality indicators. This also had adverse effects on the timeliness and completeness of delivery of HEP-ODS data to HERA. This situation resulted in significant backlogs in most distribution areas. These issues with the business information system and backlogs have not yet been resolved.

Procurement of electricity to cover losses

In April 2020, HEP-ODS prepared and carried out procurement for electricity to cover losses in the distribution network from 2021 to 2023 and concluded two agreements with HEP d.d.:

- Agreement for the delivery of basic electricity to cover losses in the distribution network for January 2021 - December 2023, and
- Agreement for the delivery of remaining basic electricity to cover losses in the distribution network for January 2021 - December 2023.

4.2.6 Quality of electricity supply

The quality of electricity supply is defined and monitored in terms of continuity of supply, voltage quality, and service quality.

In the Conditions for the quality of electricity supply, HERA determined electricity supply quality indicators, the method of measuring, collecting, and publishing electricity supply quality indicators, the method, frequency, and scope of reporting and submitting information about the quality of electricity supply to HERA. *The Requirements for the quality of electricity supply* prescribe general, minimum, and guaranteed standards, as well as financial compensation in the event of a failure to meet the guaranteed standards. To this end, operators and suppliers are required to publish request forms for the payment of monetary compensation on their websites.

As of 2020, final customers can receive financial compensation if the guaranteed standard of network connection time and technical services are exceeded; as of 2021, final customers are eligible for financial compensation if the guaranteed standards of individual long-term interruption duration and the total duration of all individual interruptions in the observed year are exceeded, on the basis of an individual request submitted by a final customer.

HOPS, HEP-ODS, and suppliers are obligated to submit an annual report on the quality of electricity supply and quality of service pursuant to the *Requirements for the quality of electricity supply*.

Continuity of supply in 2021

Continuity of supply is measured by the number and duration of supply interruptions. The quality of continuity is inversely proportional to the number of supply interruptions and the duration of such interruptions. A supply interruption is considered planned if it is announced in the manner and within the time frame defined in the *General terms and conditions for network usage and electricity supply*; otherwise, it is considered an unplanned supply interruption.

The Conditions for the quality of electricity supply stipulate general standards of continuity of supply for the transmission network: energy not supplied (ENS) in the amount of 700MWh and an average long-term interruption time (AIT) of 17 minutes. The transmission system operator monitors the number and the duration of supply interruptions in the transmission network and estimates the volume of electricity not supplied during the interruption (Table 4.2.9.)

In 2021, ENS amounted to 333 MWh, while AIT amounted to 7.22 minutes, which means the general supply reliability standard was not breached (ENS 700 MWh, AIT 17 minutes).

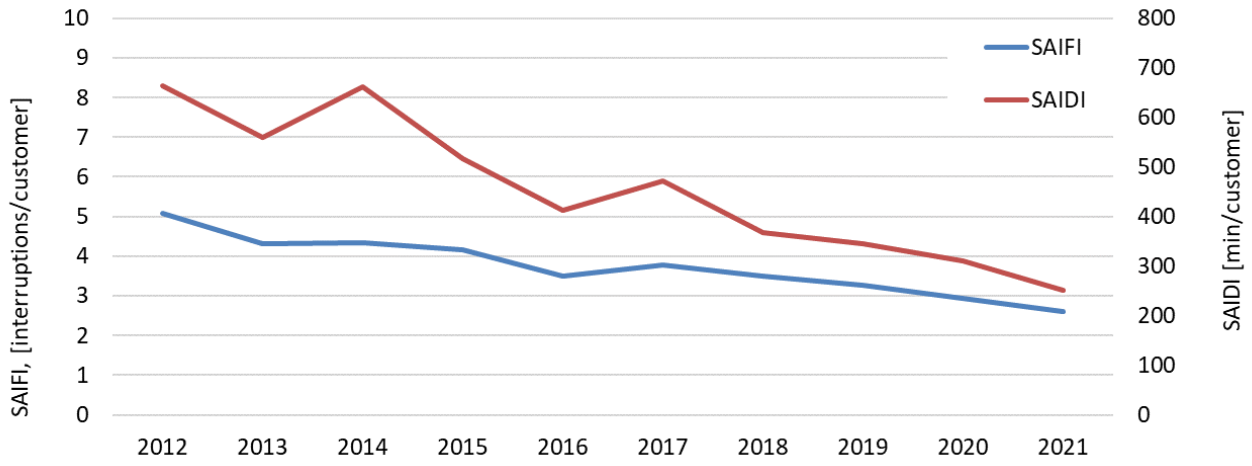
Table 4.2.9. Supply interruptions in the HOPS network from 2011 to 2021

Year	Number of supply interruptions	Duration of supply interruptions [min.]	Estimated volume of electricity not supplied [MWh]
2011	115	3,587	256
2012	200	11,855	1,056
2013	51	2,908	329
2014	40	2,410	485
2015	54	3,522	470
2016	80	4,651	366
2017	147	10,448	949
2018	111	6,124	572
2019	74	5,932	326
2020	85	5,787	874
2021	81	3,098	333

Source: HOPS

Supply continuity indicators, which are systematically monitored in the distribution network, show the annual system average interruption frequency index (SAIFI), and the annual system average interruption duration index (SAIDI).

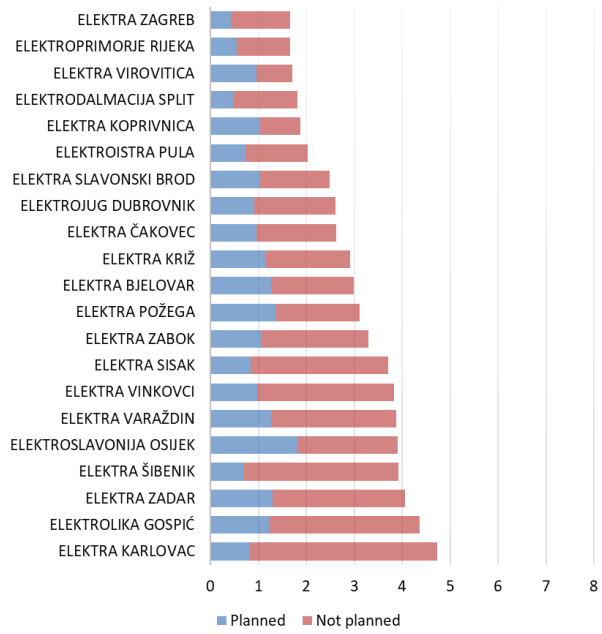
In 2021 SAIFI amounted to 2.61 supply interruptions per consumer in the HEP-ODS network, of which 31% were planned interruptions. SAIDI amounted to 251.3 minutes per consumer, of which 50% related to planned interruptions. SAIFI and SAIDI indicators show a continuing improving trend in supply continuity in the HEP-ODS network (Figure 4.2.21.).



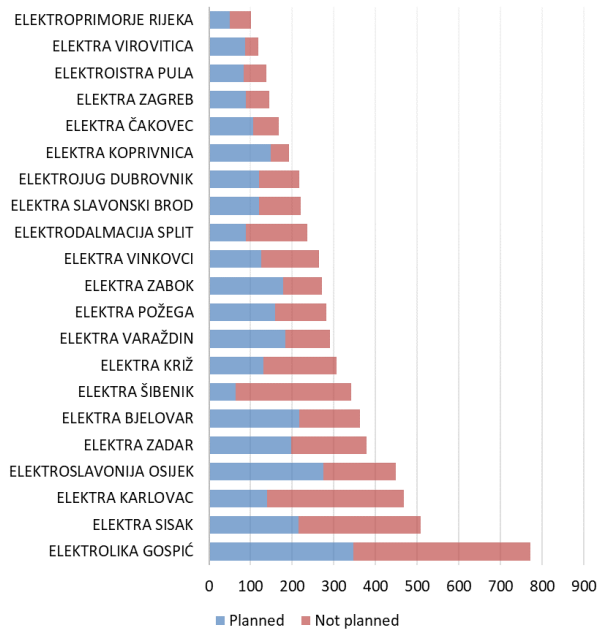
Source: HEP-ODS

Figure 4.2.21. Supply continuity indicators in the HEP-ODS network from 2012 to 2021

Viewed by distribution area, in 2021, the best SAIFI indicator was at Elektroprimorje Rijeka and Elektra Zagreb, while the best SAIDI indicator was at DA Elektroprimorje Rijeka. The worst SAIFI indicator was at DA Elektra Karlovac, due to the consequences of earthquakes and poor weather (Figure 4.2.22.). DA Elektrolika Gospić has a lower SAIDI score because of the harsh weather conditions in the area, as well as its specific network characteristics (long overhead lines). DA Elektra Karlovac, DA Elektra Sisak, and DA Elektrolika Gospić are distribution areas with poor SAIDI and SAIFI indicators. A total of 11 written complaints concerning continuity of supply were filed, of which 8 were resolved in a timely manner.



Annual system average interruption frequency index – SAIFI



Annual system average interruption duration index – SAIDI

Source: HEP-ODS

Figure 4.2.22. Indicators of continuity of supply in the HEP-ODS network per distribution area in 2021

Voltage quality in 2021

According to the *General terms and conditions for network usage and electricity supply*, voltage quality is described as the variation of measured voltage characteristics at a supply terminal from the values listed in the Croatian standard HRN EN 50160.

A network user may submit a written request once a year to HOPS or HEP-ODS, depending on the used network, for a report on voltage quality at the given supply terminal. HOPS or HEP-ODS must perform measurements, prepare and deliver a report on voltage quality at the supply terminal to the network user within 30 days. In 2021, HEP-ODS received a total of 58 written complaints concerning voltage quality in the distribution network. Also, a total of 88 requests to measure voltage quality were filed, of which 21 were founded and resolved in favour of the applicant. In 2021, one request to measure voltage quality was requested by a transmission network user; the measurement affirmed that all parameters in accordance with the HR EN 50160 standard had been met. Voltage quality measurement devices have been installed in nearly all billing metering points in accordance with the HR EN 50160 standard.

Quality of service in 2021

The *Conditions for the quality of electricity supply* specify the guaranteed quality standards for network connection services: time for resolving applications for a report on the optimal technical solution for connecting to the network depending on connection capacity, time for resolving applications for grid connection approvals, and time foreseen for the connection of a building to the network with a simple connection.

The report on the quality of services in 2021 submitted to HERA by HOPS and HEP-ODS shows that operators' general service quality indicators related to network connection for HEP-ODS are below the general service quality standard (Table 4.2.10.). HOPS received three complete requests for the issuance of EOTRP, and one request for a grid connection approval.

Table 4.2.10. General indicators of the quality of service of HOPS and HEP-ODS regarding network connections in 2021

General quality of service indicators	HOPS	HEP-ODS	General standard of service quality
Percentage of applications for EOTRP resolved in a timely manner in the observed year	n/a	37%	95%
Share of requests to issue electricity consent resolved in a timely manner in the observed year	100%	59%	95%
Proportion of timely connections in the case of simple connections of buildings in the observed year	n/a	35%	95%

Source: HOPS and HEP-ODS

All quality-of-service indicators of HEP-ODS regarding network connections fell notably as compared to 2020. In 2020, these indicators were 41%, 62%, and 36%.

Table 4.2.11. shows resolved applications for a report on the optimal technical solution for grid connection (EOTRP) and grid connection approvals (EES). Table 4.2.12. shows simple connections of buildings to the network for the HEP-ODS network in 2021 with the total number of new connections and the number of connections realised within the period prescribed in the *Conditions for the quality of electricity supply*.

Table 4.2.11. Resolved requests to issue EOTRP and EES in the HEP-ODS network in 2021

Type of request	No. of decisions issued	No. of decisions issued in a timely manner
EOTRP	1,800	665
EES	27,831	16,288

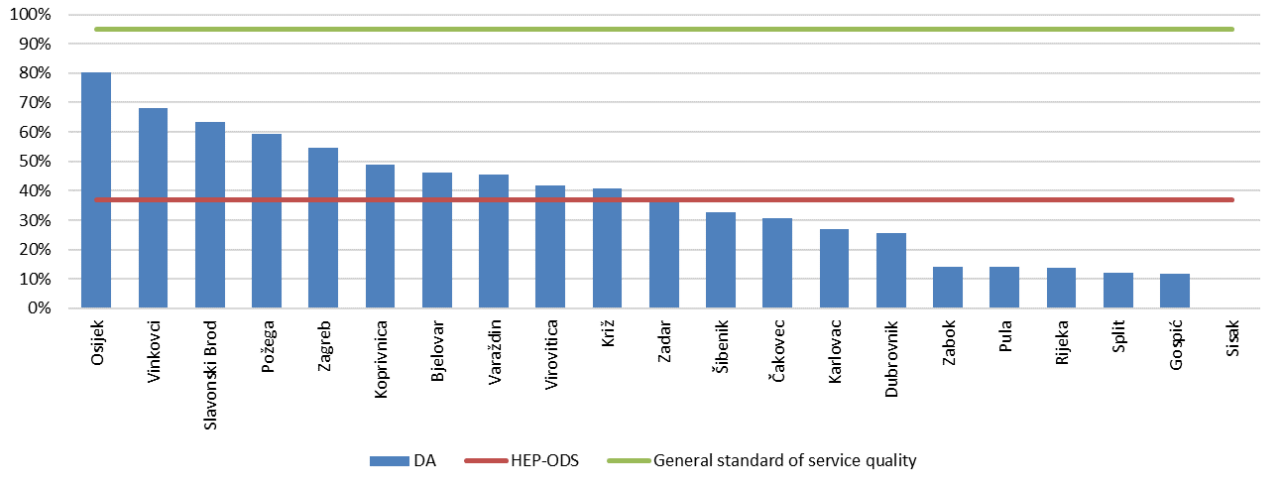
Source: HEP-ODS

Table 4.2.12. Simple connections of buildings in the HEP-ODS network in 2021

Number of connected consumers	Number of timely connections
13,880	4,804

Source: HEP-ODS

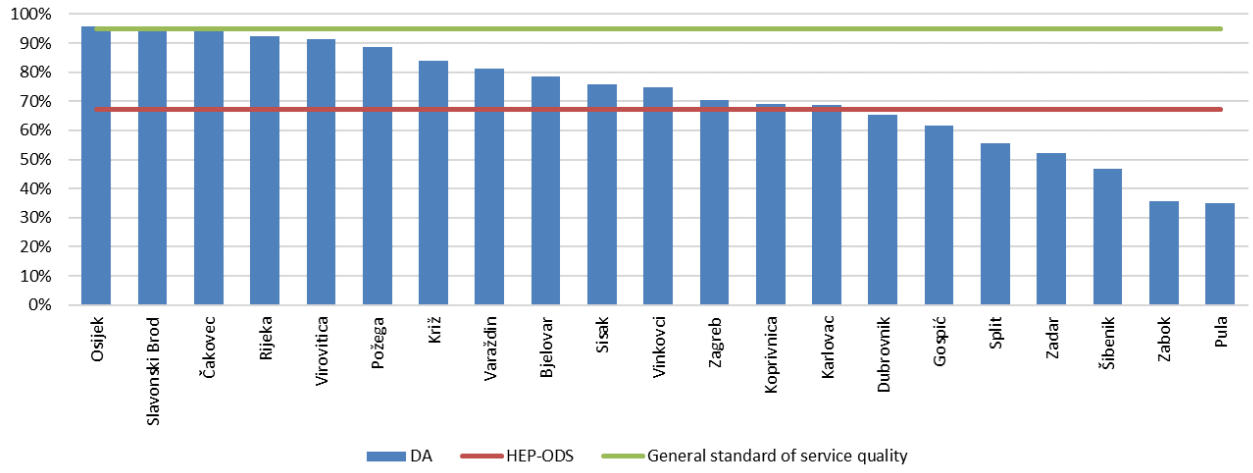
Viewed by distribution area, the share of applications for EOTRP resolved in a timely manner is the lowest in DA Sisak and the highest in DA Osijek; however, none of the distribution areas achieved the required general standard of service quality for resolving applications for EOTRP (Figure 4.2.23.).



Source: HEP-ODS

Figure 4.2.23. Applications for EOTRP resolved in a timely manner in the HEP-ODS network in 2021 by distribution area

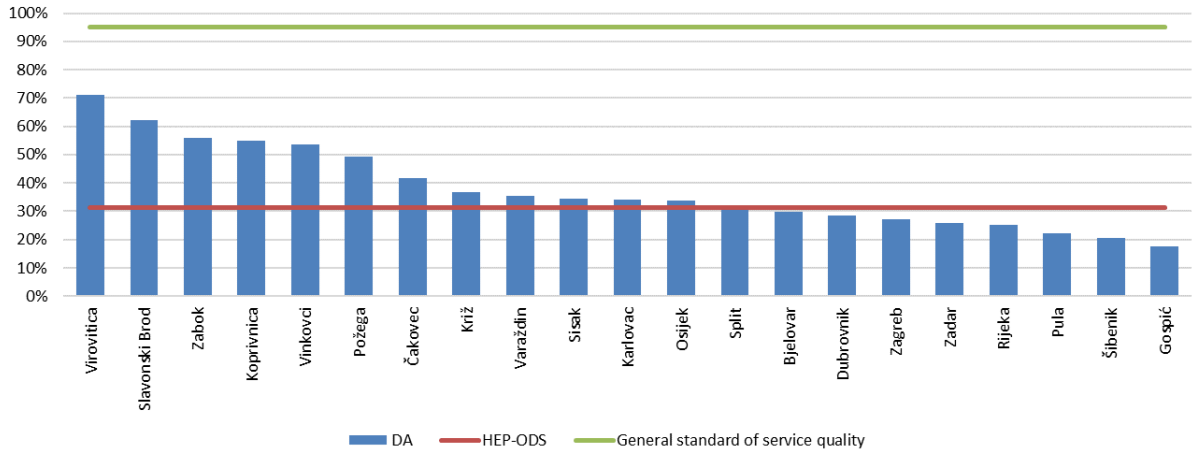
Viewed by distribution area, the proportion of applications for EES resolved in a timely manner is best in DA Osijek and once again worst in DA Pula. DA Slavonski Brod, DA Osijek, and DA Čakovec were once again the only ones to achieve the required general standard of service quality for issuing EES (Figure 4.2.24.).



Source: HEP-ODS

Figure 4.2.24. Share of applications for grid connection approvals resolved in a timely manner in the HEP-ODS network per distribution area in 2021

The proportion of timely connections in the case of simple connections of buildings to the network is once again lowest in DA Virovitica and highest in DA Gospić, however none of the distribution areas achieved the required general standard of service quality for simple connections of buildings to the network (Figure 4.2.25.).



Source: HEP-ODS

Figure 4.2.25. Proportion of timely connections in the case of simple connections of buildings by HEP-ODS per distribution area in 2021

Continental Europe Synchronous Area separation incident, 8 January 2021

On 8 January 2021, an incident separated the Continental Europe Synchronous Area (CE SA) in two. The incident was the subject of an ENTSO-E analysis.

The coordinated action of SA CE transmission system operators fully normalised the situation, and the synchronous area was resynchronized just over an hour after the initial event.

Thanks to the measures and systems in place for high-risk situations, it was possible to reconnect the synchronous area in a short time, without serious disruption to operations for most final customers. Consequently, final customers in Croatia suffered no serious consequences, and there was no effect on electricity supply quality indicators in 2021.

Observations on the quality of electricity supply in 2021

Compared to 2020, the number and the duration of supply interruptions in the transmission network declined significantly in 2021, as did the estimated energy not supplied. The high AIT and ENS values in 2020 were the result of earthquakes in Sisak-Moslavina County and salt sediments in the coastal area and on the islands. AIT and ENS scores were within the stipulated general standard in 2021.

The SAIDI and SAIFI indicators for the distribution network are better than in previous years. HEP-ODS scores for quality of connection services are significantly below the required general standard of service quality. The proportion of simple connections carried out in a timely manner for buildings (most often residential buildings with a gross surface area of up to 400 m^2, i.e. family houses) is especially unsatisfactory; for a few years, it has amounted to over a third of the required general standard of quality and is trending worse.

The poorest SAIFI and SAIDI indicators for HEP-ODS were recorded at DA Elektra Karlovac and DA Elektrolika Gospić as a result of earthquakes and poor weather conditions.

The number of written complaints concerning continuity of supply reduced significantly from 24 to 11. The number of written complaints concerning voltage quality reduced significantly from 83 to 58. The highest number of written complaints regarding voltage quality (15 of 58 submitted complaints) was at DA Elektra Bjelovar, of which four were resolved in a timely manner. Other service quality indicators of HEP-ODS improved as compared to the previous year.

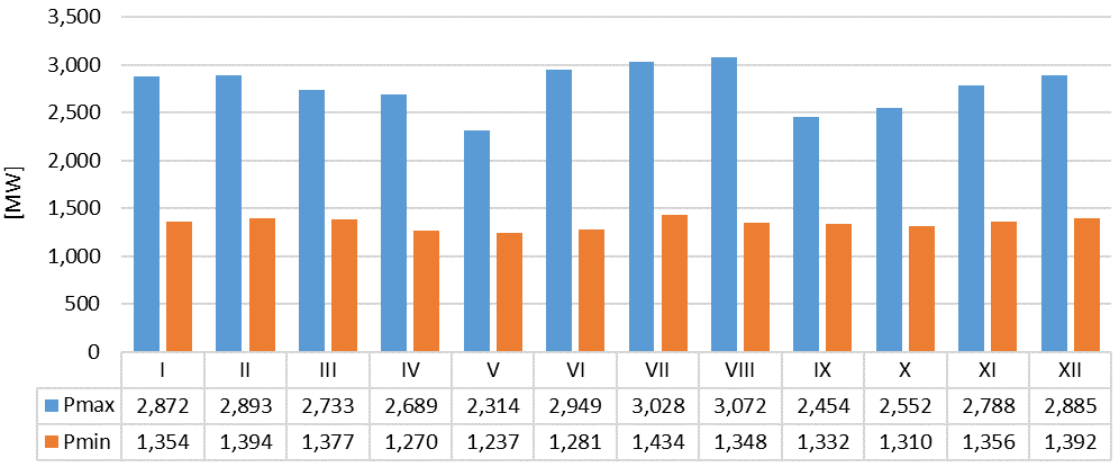
HEP-ODS has upgraded the existing system for monitoring supply interruptions. However, in order to significantly improve SAIDI and SAIFI indicators, and in light of the above, an additional set of measures to improve the reliability of supply must be implemented in certain distribution areas.

4.2.7 Monitoring the balance of production and consumption of electricity

Table 4.2.13. shows important characteristics of the Croatian electricity system, such as the maximum and minimum loads (P_{max} and P_{min}), the times when they occur, and corresponding electricity imports and exports in the past five years. Figure 4.2.26. shows the maximum and minimum loads in the Croatian electricity system in 2021 by month. In the last few years (with the exception of 2018), the maximum load has occurred in the summer months due to relatively mild winters and increased consumption in the summer (air conditioning). This is also apparent in the time of the highest load (14:00).

Table 4.2.13. Maximum and minimum loads of the Croatian transmission system

Year	Maximum load			Minimum load		
	P_{max} [MW]	Date, time	Net exchange [MW] (Imports [MW]; Exports [MW]) with P_{max}	P_{min} [MW]	Date, time	Net exchange [MW] (Imports [MW]; Exports [MW]) with P_{min}
2017	3,079	04/08, 14:00	1,387 (1,657; 270)	1,305	18/09, 04:00	363 (906; 543)
2018	3,168	26/02, 20:00	784 (2,147; 1,363)	1,249	20/05, 06:00	402 (1,008; 606)
2019	3,038	25/07, 14:00	1,545 (1,973; 428)	1,226	22/04, 04:00	545 (1,663; 1,118)
2020	2,872	31/07, 14:00	1,259 (2,007; 748)	1,067	13/04, 05:00	808 (1,167; 359)
2021	3,072	16/08, 14:00	1,462 (1,672; 210)	1,237	02/05, 05:00	197 (897; 700)



	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Pmax	2,872	2,893	2,733	2,689	2,314	2,949	3,028	3,072	2,454	2,552	2,788	2,885
Pmin	1,354	1,394	1,377	1,270	1,237	1,281	1,434	1,348	1,332	1,310	1,356	1,392

Source: HOPS

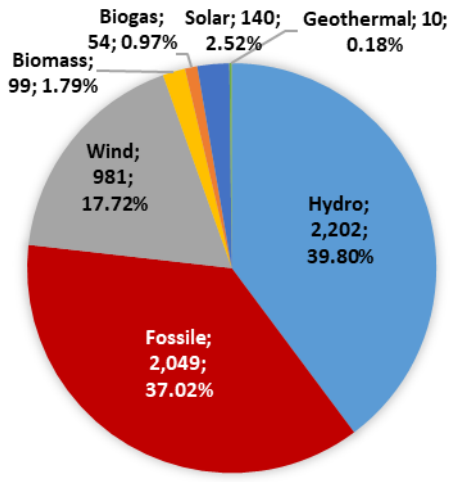
Figure 4.2.26. Maximum and minimum loads of the Croatian transmission system in 2021

In its 2021 Annual Report on Security of Supply in the Distribution System, HEP-ODS also lists the load characteristics of the distribution system. Distribution system load is defined as the sum of power flows simultaneously taken up by the distribution system, i.e. (net) taken up from the transmission network and distributed energy sources (production plants connected to the distribution network). According to this, the maximum load of the Croatian transmission system in 2021 amounted to 2,935 MW; it took place on 16 August at 13:15 (the same day and a similar time as in the transmission system). Of this amount, 94% was taken up from the distribution network and 6% from distributed sources. The minimum load of the transmission system in 2021 amounted to 1,081 MW; it took place on 30 August at 5:15. Of this amount, 84% was taken up from the distribution network and 16% from distributed sources.

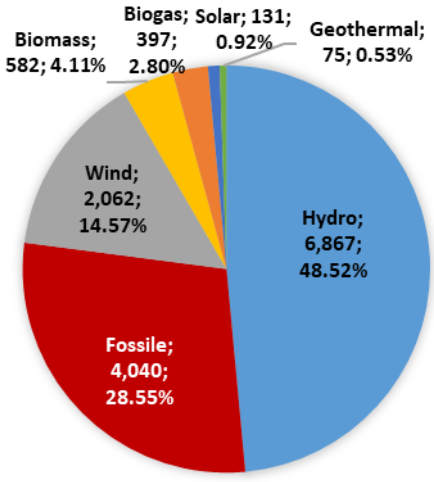
Production capacities in Croatia

The total connection capacity of all power plants in Croatia amounted to 5,534 MW at the end of 2021. In addition, HEP d.d. is a co-owner of the Krško Nuclear Power Plant located in Slovenia, and has at its disposal 50% of its capacity, i.e. 348 MW. The ratio between the total connection capacity of power plants in Croatia and the maximum load of the Croatian electricity system in 2021 amounted to 1.80.

Figure 4.2.27. shows the shares of all primary power sources in the total connected capacity and generated electricity of power plants in Croatia in 2021 (including power plants in test mode). The share of renewable energy sources is evident at over 70%.



Connection capacity in MW

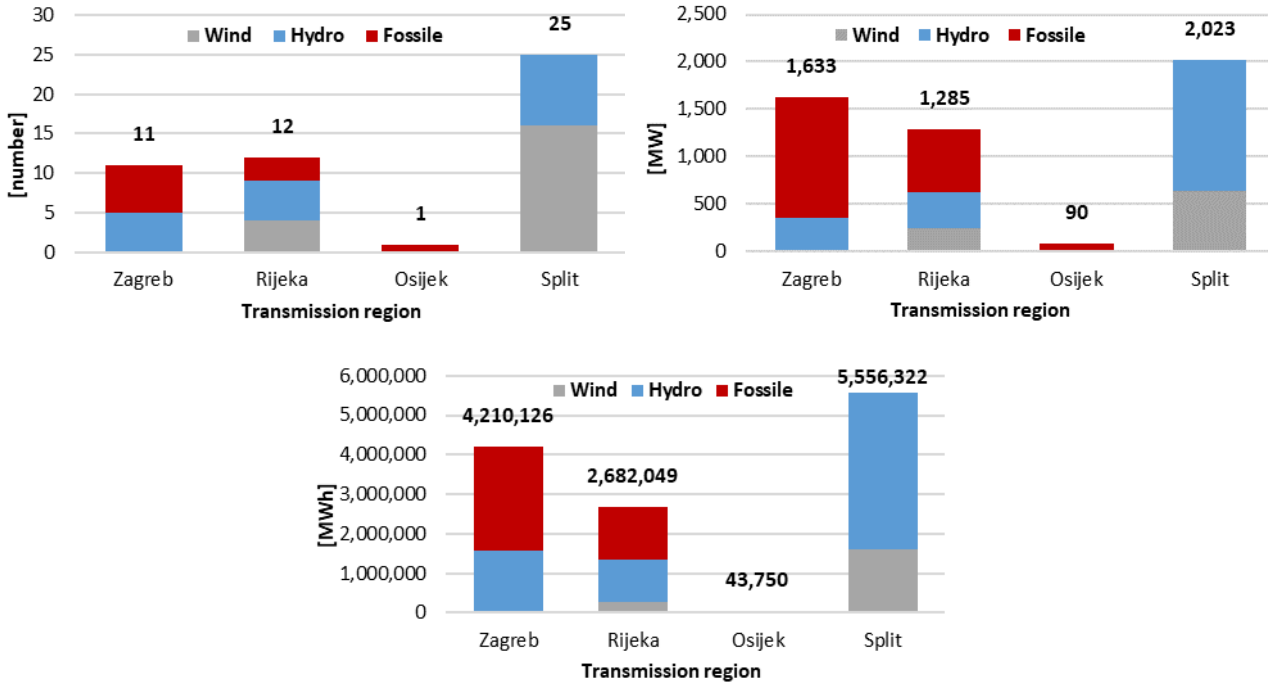


Electricity generated in GWh

Source: HOPS and HEP-ODS

Figure 4.2.27. Share of individual energy sources in the capacity and generated electricity of power plants in Croatia at the end of 2021

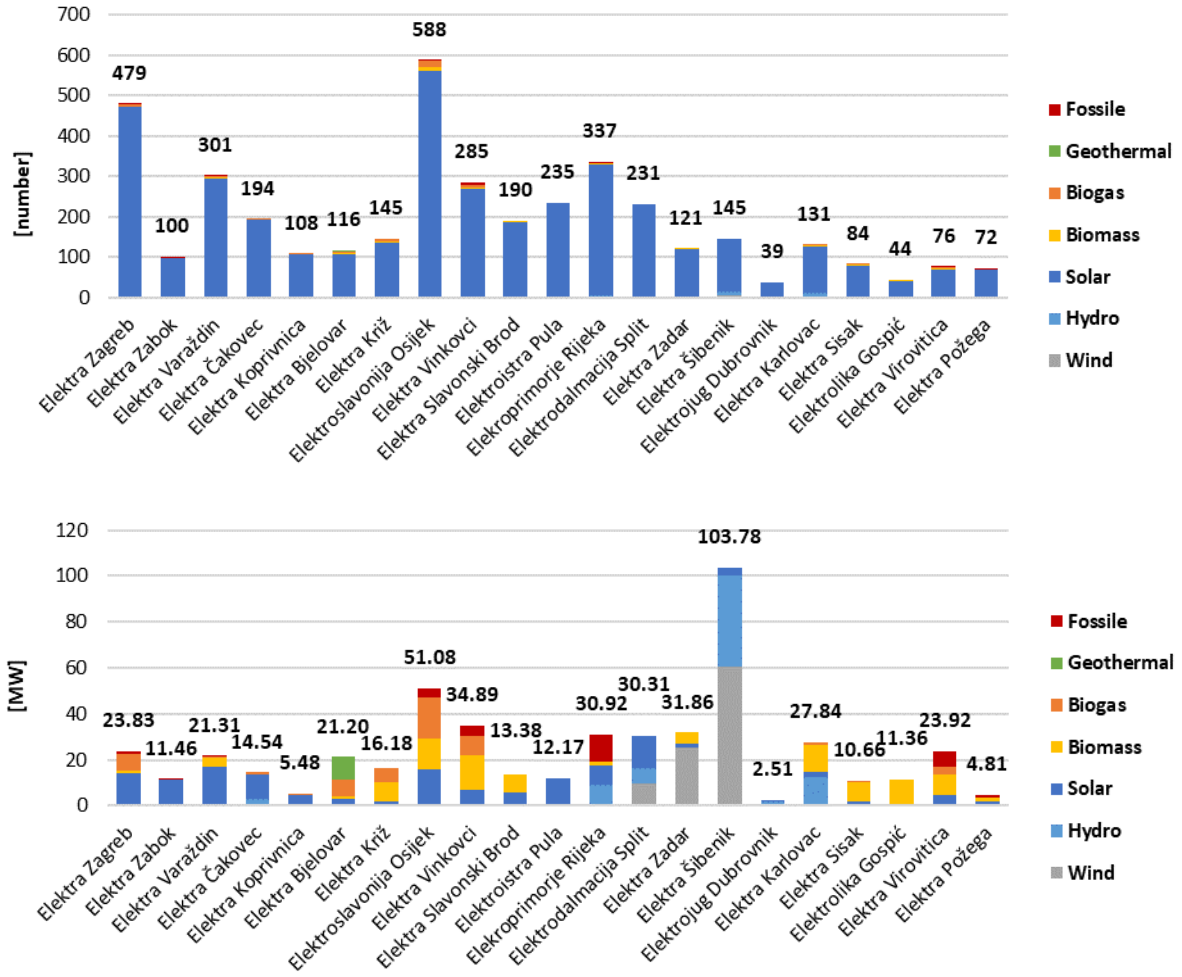
At the end of 2021, 10 thermal power plants with a total connected power of 2,019 MW, 19 hydroelectric power plants with a connected power of 2,127 MW, and 20 wind power plants with a connected power of 885 MW were connected to the transmission network (one more than in 2020). This amounts to a total of 5,031 MW or 91% of the total connection capacity of connected power plants in Croatia, which amounts to 5,534 MW. Figure 4.2.28. shows the layout of power plants by transmission area.



Source: HOPS

Figure 4.2.28. Number, connected power, and production of power plants by HOPS transmission region in 2021

Growth in electricity production from distributed energy sources continued in 2021 with 1,661 GWh of electricity produced, 17% more than in 2020. Roughly 99% of electricity from distributed energy sources was produced using renewable energy sources. The share of delivered electricity from distributed energy sources in the total consumption of the electricity system in (18,495 GWh) in 2021 amounted to 9.0%. Figure 4.2.29. shows the layout of power plants by distribution area.



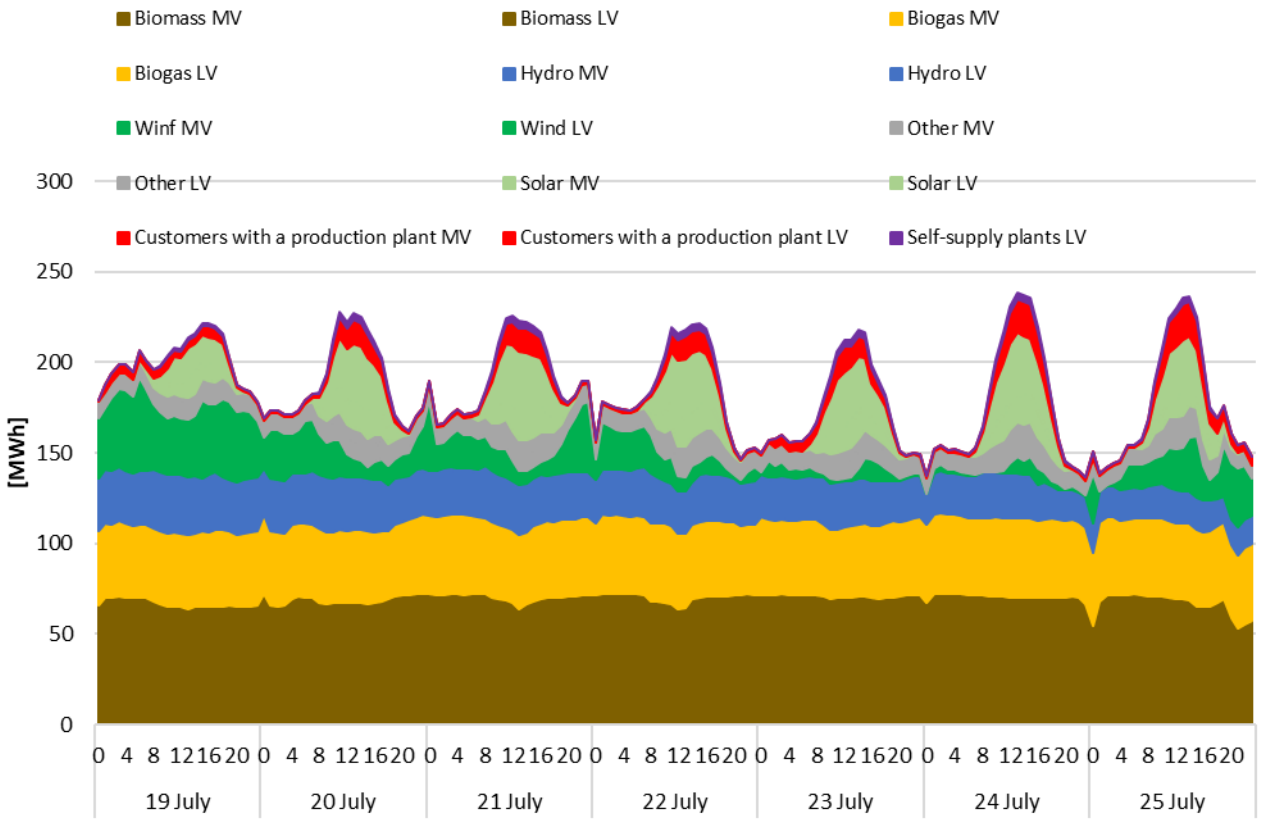
Source: HEP-ODS

Figure 4.2.29. Number and connected power by HEP-ODS distribution area in 2021

At the end of 2021, of the 4,021 billing metering points with the ability to inject into the distribution network, 504 MW of total connection capacity (9% of the total connection capacity of power plants connected in Croatia), 895 (251 more than in 2020) are customers with a production plant, with a total connection capacity of 100 MW injecting into the grid (21 MW more compared to 2020). In 2021, customers with production plants injected 40GWh of electricity (11 GWh more than in 2020).

Additionally, at the end of 2021, 1,570 billing metering points had the status of users of self-supply plants (719 more than in 2020, an increase of nearly two times), with a total connection capacity of roughly 9 MW injecting into the grid (4 MW more than in 2020). In 2021, users of self-supply plants injected over 5 GWh of electricity into the grid (3 GWh more than in 2020, which is a significant increase). There was thus significant growth in this segment as compared to 2020, and especially as compared to 2019 when this category was introduced in legislation (a tenfold increase in all amounts).

Figure 4.2.30. shows an example of hourly supply of electricity from distributed sources into the distribution network in the week from 19-25 July 2021. The maximum total production from distributed energy sources (the sum of all power flows simultaneously taken up from distributed sources into the distribution network) in 2021 was achieved on 12 December at 12:15 and amounted to 285 MW, while the minimum total production was achieved on 17 August at 4:30 and amounted to 105 MW.



Source: HEP-ODS

Figure 4.2.30. Hourly supply of electricity from distributed sources of electricity into the distribution network

Electric power system balancing

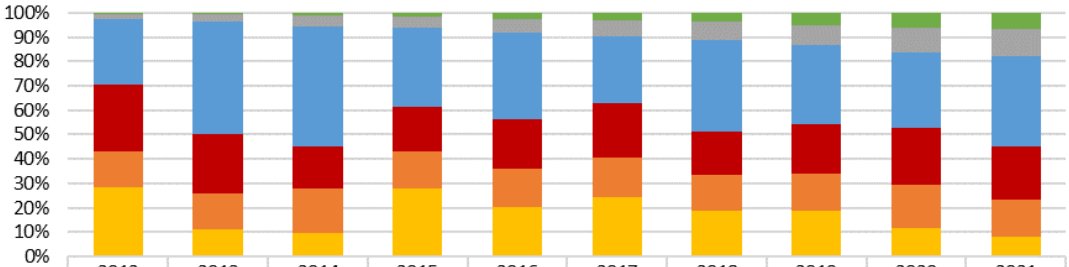
Table 4.2.14. shows Croatia's electricity balance; it is apparent that the largest share of total electricity consumption in Croatia in 2021 (18,495 GWh) was covered by power plants in Croatia (14,153 GWh, 76.5%), while the remainder was covered by physical net imports (4,342 GWh, 23.5%), which were at the same level as 2020. Physical exports from Croatia in 2021 were significantly higher than in 2020, amounting to the largest in the past 10 years.

Table 4.2.14. Electricity balance in Croatia in 2020 and 2021 in GWh

No.	Electricity balance	2020	2021
1	Total production	12,216	14,153
2	Imports into Croatia on the transmission network	10,490	11,504
3	Imports into Croatia on the distribution network	0.6	0.6
4	**Total procurement (1+2+3)**	**22,707**	**25,658**
5	Exports from Croatia to transmission network	5,434	7,159
6	Exports from Croatia to distribution network	4.9	4.1
7	**Physical net imports (2+3-5-6)**	**5,052**	**4,342**
8	**Total electricity consumption (4-5-6)**	**17,268**	**18,495**
9	Production in the distribution network	1,415	1,661
10	Losses in the transmission network	373	478
11	**Transmission consumption (8-9-10)**	**15,484**	**16,359**
12	Delivery to final customers in the transmission network and power plant consumption	826	971
13	Pumping mode of PSH plant	231	169
14	**Net delivery to the distribution network from the transmission network (11-12-13)**	**14,427**	**15,219**

Source: HOPS, HEP-ODS

Figure 4.2.31. shows the share of electricity sources in electricity procured for the requirements of the Croatian electricity system on a yearly basis across the past 10 years. The amount produced by the Krško Nuclear Power Plant for HEP d.d. is presented separately from net imports.

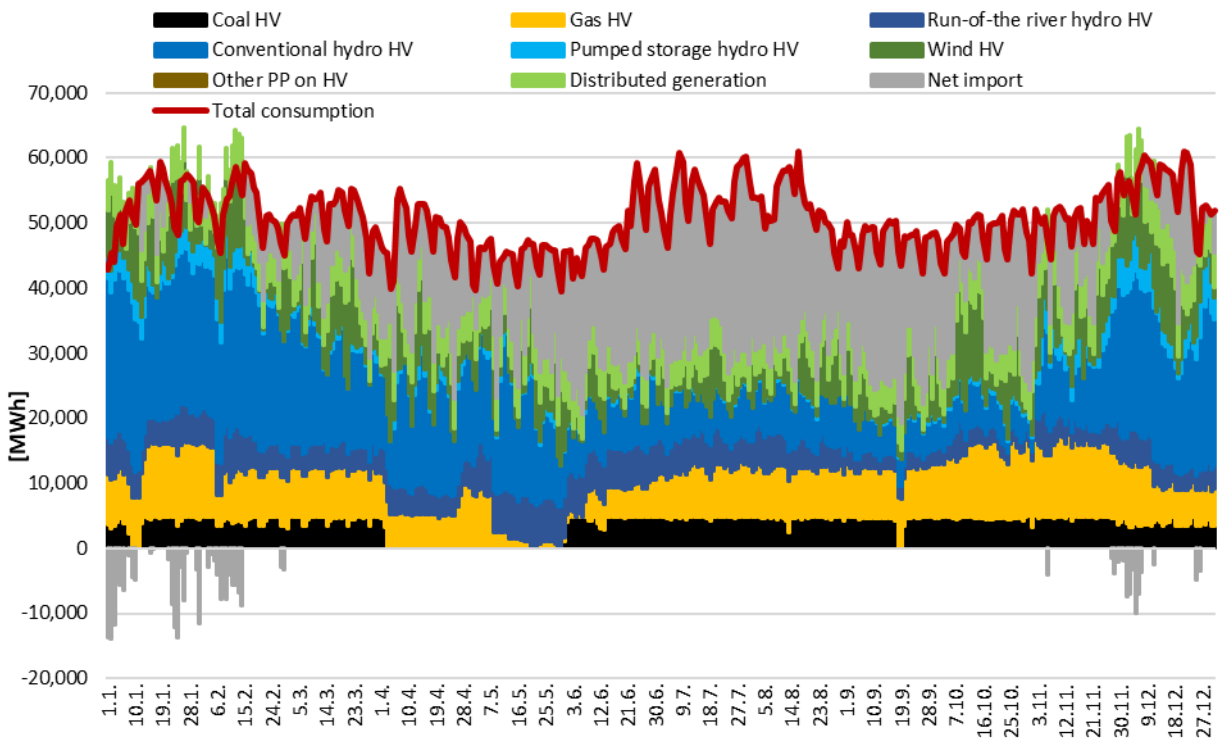


	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Other RES	85	132	194	298	454	535	681	947	1,051	1,184
Wind	329	517	730	794	1,002	1,204	1,335	1,467	1,721	2,062
Hydro	4,772	8,054	8,356	5,715	6,250	5,025	6,959	5,871	5,361	6,867
Fossile	4,791	4,228	2,912	3,192	3,625	4,054	3,216	3,720	4,084	4,040
Krško NPP (NEK)	2,622	2,518	3,030	2,685	2,715	2,984	2,745	2,766	3,020	2,790
Net import w/o NEK	5,002	1,973	1,642	4,948	3,628	4,395	3,415	3,397	2,036	1,551

Source: HOPS, HEP-ODS

Figure 4.2.31. Share of electricity sources in electricity procured and produced [GWh] for the requirements of the Croatian electricity system from 2012 to 2021

In 2021, there was a significant decrease in net import, an increase in hydroelectric power plant production, while fossil fuel source production remained at the same level as in 2020.



Source: HOPS and HEP-ODS

Figure 4.2.32. Daily values of production and consumption of electricity in Croatia's electricity system in 2021

The daily values of production and consumption of electricity in Croatia's electricity system in 2021 in Figure 4.2.32. show similar trends as in 2020; the majority of consumption is met by production from hydroelectric plants and imports, while thermal power plants supply basic production. It is also apparent that the Croatian electricity system physically exported energy due to increased production from renewable energy sources in January, February, and December.

Plant events in the Croatian electricity system

Due to the incident resulting in the separation of the Continental Europe Synchronous Area on 8 January 2021, which was classified as an extensive incident, an expert group was formed in accordance that conducted an analysis of the incident and drew up a report.[34] The main conclusions of the report were that transmission system operators reacted quickly and in a coordinated manner to stabilise the system. Consequently, there was no major impact on the security of supply for final customers. It was also discovered that the reasons for the separation were an unexpectedly large exchange of electricity between Eastern and Western Europe and poor system stability at the moment. As additional increases in cross-border trading are expected in the future, the report concludes that it will be necessary to conduct more precise calculations regarding transmission system security. The report lists 22 suggestions for consideration and further implementation.

Other plant events in the transmission and distribution systems include natural disasters and a fire in the area of Elektra Šibenik in September 2021.

In Q1 2021, HOPS and HEP-ODS carried out activities related to repairing damage from the destructive earthquakes of 22 March 2020 and 29 December 2020.

Notes on monitoring balance production and consumption of electricity

In 2021, 76.5% of total electricity consumption in Croatia was covered by power plants located in Croatia. If we add electricity production from Krško Nuclear Power Plant, which belongs to HEP d.d., 91.6% of the total consumption of electricity in Croatia was covered by 'domestic' production.

34 *Available at: https://eepublicdownloads.azureedge.net/clean-documents/SOC%20documents/SOC%20Reports/entso-e_CESysSep_Final_Report_210715.pdf*

Electricity production from renewable energy sources in 2021 amounted to 10,113 GWh, 54.7% of the total production of electricity.

In Q1 2022, HOPS and HEP-ODS submitted reports to HERA on monitoring the security of supply in the transmission and distribution system for 2021. These reports and the currently available data supplied to HERA by HOPS and HEP-ODS show that systems operators are cooperating to maintain sufficient levels of security of electricity supply in the Croatian electricity system.

There has been a noticeable increase in consumption in the electricity system, the main cause of which is economic recovery after the Covid-19 pandemic.

HOPS notes that the costs of procuring electricity to cover losses in the transmission network and the costs of materials, equipment, and works have increased significantly, but that security of supply has not been impaired.

4.3 Wholesale electricity market

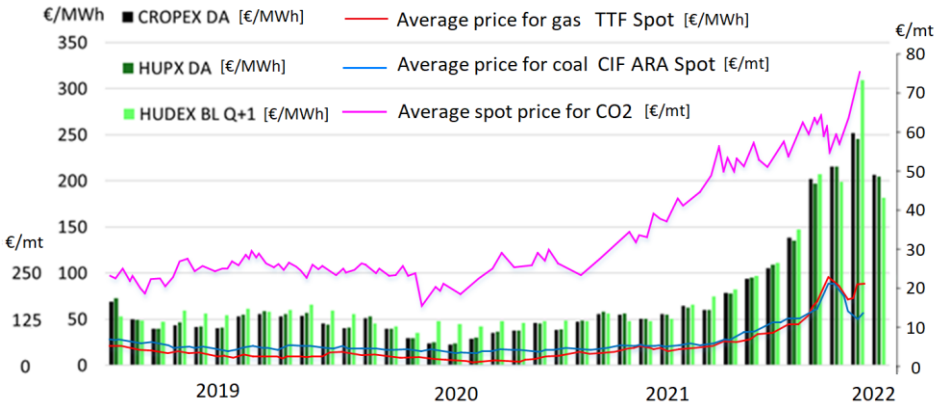
4.3.1 Development of the wholesale electricity market

Price increases on the wholesale market in the second half of 2021

In the second half of 2021, electricity prices in Croatia (and the EU) increased several times over on the wholesale markets. This is apparent from prices on the day-ahead market on the Croatian CROPEX exchange and the Hungarian HUPX exchange.

Average monthly prices on the day-ahead market from January 2019 to January 2022 on CROPEX (*CROPEX DA*) and HUPX (*HUPX DA*) are shown in Figure 4.3.1. The coefficient of determination between prices on CROPEX and on the Slovenian BSP exchange was R^2= 0.9957, and R^2= 0.9405 between CROPEX and the Hungarian HUPX exchange, which indicates a high price correlation.

The rise in electricity prices is related to the manifold increases in wholesale prices of natural gas (*TTF Spot*), coal (*CIF ARA spot*), and carbon dioxide emissions (*Emission allowance spot prices*) (Figure 4.3.1.).



Sources for figure: https://transparency.entsoe.eu/, HUDEX, EC[35]

Figure 4.3.1. Average monthly day-ahead prices on CROPEX, HUPX, average monthly prices for the first following quarter on HUDEX, average price of natural gas on TTF Spot, average prices of coal on CIF ARA spot, and prices of CO_2 emissions

Prices of CO_2 emissions, natural gas, and coal increase the production costs of natural gas and coal thermal power plants. This results in an increase in prices on electricity exchanges. The highest bid accepted on the day-ahead market determines the price of all lower bids (marginal pricing, pay-as-clear). When natural gas or coal power plants must be used to meet demand for electricity, they determine the price on the exchange

[35] *Graphs for "Average of TTF Spot", "Average of Coal CIF ARA spot" and "Emission allowance spot prices" taken from: https://energy.ec.europa.eu/system/files/2022-01/Quarterly%20Report%20on%20European%20Electricity%20markets%20Q3%202021_v1.2_1.pdf, accessed 17/2/2022.*

as the plants with the most expensive offers. This means that the increase in the price of natural gas, coal, and carbon dioxide emissions led to an increase in prices on the electricity exchanges. Increased amounts of electricity delivered by wind power plants and solar power plants in particular months led to decreases in the wholesale price on the day-ahead market. Reduced consumption similarly leads to reduced pricing on the exchanges.

This pricing system on the exchanges (*marginal pricing*, *pay-as-clear*) does not guarantee producers will recover their fixed costs, such as capital expenditures. For example, average weighted prices by technology in the Croatian incentives system in 2020 amounted to HRK 0.76/kWh for wind power plants, HRK 1.31/kWh for biogas power plants, HRK 1.94/kWh for solar power plants, etc. Simultaneously, the price of basic energy on CROPEX was HRK 0.29/kWh, and thus insufficient for these technologies. The price of basic energy on CROPEX in 2021 was HRK 0.87/kWh, and thus more than the average purchase price for wind power in 2020, but insufficient for biogas plants. In 2020, in Portugal, Spain, France, Belgium, Ireland, Germany, Italy, Finland, Sweden, Bulgaria, and Greece, in addition to revenues from the sale of electricity on the market, producers also had additional revenues from the *capacity mechanisms*.[36] These are introduced when prices are insufficient to decide to build a power plant and/or for an existing plant to remain on the grid, while the grid still needs the plant for e.g. security of supply. Wholesale electricity prices in recent years have been insufficient in some European countries to cover the costs of power plants needed to maintain security of supply. The capacity development mechanism, through which producers receive additional revenues in addition to revenues from the delivered energy, is recognised in *Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity*.

There is no Croatian long-term products exchange. However, in recent years, CROPEX has organised several auctions for the purchase and sale of electricity for the quarterly and annual electricity products of the EKO balance group (Table 4.3.1.). The prices achieved correlate with those on HUDEX. The differences range from 0.35% to 6.5% of the relative amount. Differences in the absolute amount range from EUR 0.17/MWh to EUR 5.42/MWh. Prices for long-term products on HUDEX are thus approximately the same as those for long-term products in Croatia, as is the case for the day-ahead CROPEX and HUPX exchanges. Although these are not large amounts of energy, the correlation between long-term prices on CROPEX and HUDEX indicates that the electricity market is functioning well.

Table 4.3.1. Wholesale auctions, quantities, and prices on CROPEX for EKO balance group electricity, and prices on HUDEX for the same product

Date of auction	Product type	Quantity [MWh]	Attained price [€/MWh]	Price on HUDEX for the same product [€/MWh]
25/11/2019	Core product for 2020	60	57.07	56.87 (25/11)
04/08/2020	Core product for Q4 2020	50	45.08	45.74 (4/8)
19/11/2020	Core product for 2021	110	46.84	47.21 (19/11)
23/11/2020	Core product for Q1 2021	20	47.53	48.37 (23/11)
26/04/2021	Core product for 2022	60	62.21	62.38 (26/4)
28/09/2021	Core product for 2022	60	121.32	125.91 (28/9)
29/09/2021	Core product for 2023	60	84.07	89.49 (29.9)
30/09/2021	Core product for 2024	60	73.23	78.02 (30.9)

Sources: CROPEX and HUDEX

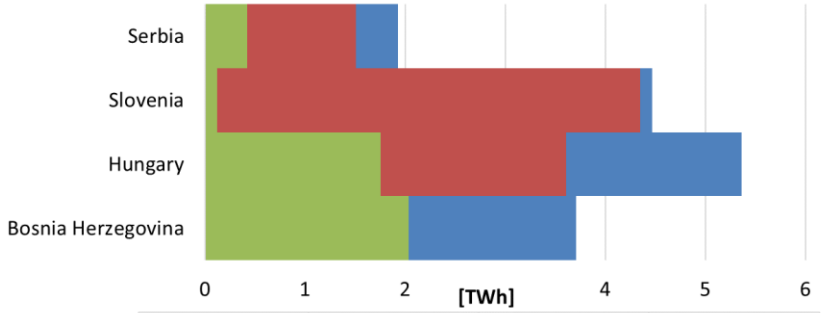
In November 2021, ACER published a report on high energy prices in Europe. It cited an increase in the global price of gas as the main reason for the rise in electricity and gas prices in Europe. The price of liquefied natural gas (LNG) was the primary cause of this increase. ACER claims that the tendency to deviate from the current market model in Europe, such as price caps on exchanges, could endanger security of supply in the long term, and potentially in the short term by sending signals to current and potential stakeholders that might

[36] *https://extranet.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Market%20Monitoring%20Report%202020%20%E2%80%93%20Electricity%20Wholesale%20Market%20Volume.pdf, accessed 12/4/2022, p. 72.*

discourage them from investing in or remaining on the market. Additionally, ACER claims that deviating from the current market model would jeopardise the existing multiple benefits offered by the integration of European electricity markets.[37]

Trade at Croatian borders

Figure 4.3.2. shows the volumes of cross-zonal (cross-border) trading with neighbouring trading zones (countries) in 2021 (imports, exports, and net exchange) at the Croatian borders according to volumes from contractual schedules. Net imports exist at all borders.



	Bosnia Herzegovina	Hungary	Slovenia	Serbia
Net exchange	2.0 TWh	1.8 TWh	0.1 TWh	0.4 TWh
Export	1.7 TWh	3.6 TWh	4.3 TWh	1.5 TWh
Import	3.7 TWh	5.4 TWh	4.5 TWh	1.9 TWh

Source: HROTE

Figure 4.3.2. Cross-zonal trade on the borders between Croatia and neighbouring trading zones in 2021 by volumes from the contractual schedules of energy entities

Imports from Slovenia include electricity from NPP Krško (2.8 TWh) for HEP d.d. Total net (trade) exchange for Croatia, together with electricity from NPP Krško, amounted to 4.3 TWh.

Hrvatska burza električne energije d.o.o. (Croatian electricity exchange)

In 2021, CROPEX's day-ahead (DA) market had 28 registered members. Trading volume on the day-ahead market in 2021 amounted to 5,967 GWh. Since 2018, the day-ahead markets of CROPEX and the Slovenian BSP exchange have been coupled; cross-zonal transmission capacity calculated on the basis of the NTC approach from neighbouring transmission system operators is thus allocated implicitly.

Although shared capacity calculation for the day-ahead market in the Core Region (which includes the Croatian borders with Slovenia and Hungary) was planned for April 2022, this was delayed due to the disagreement of a few stakeholders regarding the reliability of the new approach and the negative impact of the size of available cross-zonal capacities on the intraday markets. The new capacity calculation approach for the day-ahead market will be based on a flow-based approach; its implementation is planned in mid-2022.

The Croatian intraday market (ID) is connected to the Hungarian and Slovenian markets through CROPEX via the Single Intraday Coupling Project, previously known as Cross-Border Intraday (XBID). Connecting intraday markets allows trade orders received on one market to compete with trade orders on other markets within the SIDC project. Market participants can continuously issue trade orders throughout the day (continuous intraday trading).

In 2021, CROPEX's intraday market had 19 registered members, who bought 197.6 GWh and sold 294.3 GWh on CROPEX. Additionally, the Slovenian exchange bought 594.7 GWh from CROPEX on an intraday basis in the same year, while the Hungarian exchange bought 632.1 GWh. Transit amounted to 947.5 GWh.

[37] https://extranet.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER's%20Preliminary%20Assessment%20of%20Europe's%20high%20energy%20prices%20and%20the%20current%20wholesale%20electricity%20market%20design.pdf, accessed 1/4/2022, p. 4, 12, and 14.

On CROPEX's platform, one auction for the delivery of electricity to cover losses in the transmission network for 2022 was held in 2021, while six were held in 2020. In 2021, four auctions for the sale of EKO balance group electricity were organised for HROTE.

Electricity market concentration indicators

HEP d.d. and its subsidiaries dominate in the installed capacity of power plants, produced electricity, and electricity sold on the wholesale market. The total trading volume on the Croatian market in 2021 was 65.3 TWh (including the quantities of CROPEX, HROTE, HOPS, and HEP-ODS); HEP d.d. participated with 41.2 TWh (market share of trading volume).

Energy entities who wish to participate in the Croatian electricity market must obtain the appropriate permit from HERA. As of 31 December 2021, there were 70 valid licences for electricity generation, 11 licences for electricity supply, 34 licences for electricity trade, one license for electricity transmission, one license for electricity distribution, and one license for electricity market organisation. In the electricity sector in 2021, HERA issued ten permits for energy activities, extended the validity of 13 permits, issued one decision rejecting an extension request, and issued two decisions terminating licenses at the request of energy entities. Seven licenses expired.

The EIC label is a prerequisite for participation in the wholesale electricity market. A total of 86 EICs (energy identification codes) were issued in 2021, which is three times more than in 2020. The number of producers and plants using renewable energy sources on the HEP-ODS network also increased notably. These plants are included in market mechanisms through membership in various balance groups. Previously, most were within the framework of the EKO balance group.

The issuance of EIC codes is carried out by ENTSO-E's Central Issuing Office (CIO) and local issuing offices in individual European countries ("local offices"). The Croatian local issuing office (hereinafter: CLIO) is run by the transmission system operator; it implements all activities related to issuing and updating EIC codes. Croatian energy entities need EIC codes to exercise the right to participate in market processes in local and common electricity and gas markets.

Observations on the development of the wholesale market

The rise in electricity prices in the second half of 2021 corresponded to manifold increases in the price of natural gas, coal, and carbon dioxide emissions in Europe. ACER cites a global increase in the price of gas—especially liquefied natural gas (LNG)—as the main cause. Wholesale electricity prices also remained high in the first half of 2022.

During 2021, suppliers in Croatia were obligated to purchase 40% of electricity supply from producers with a guaranteed purchase price. *The Regulation on the share of net electricity delivered by eligible producers that electricity suppliers are obligated to take up from the electricity market operator* reduced the share of the EKO balance group's electricity sold by HROTE at a market price (including on CROPEX) from 60% in 2021 to 40% in 2022. *The Regulation* was adopted on 30 December 2021. The price at which suppliers purchase this energy is HRK 0.42/kWh, in accordance with Article 46.1. of the new **Renewable Energy Sources and High-Efficiency Cogeneration Act**.

Due to the decrease in the share of energy from the EKO balance group freely sold by HROTE on the market, the total volume on CROPEX is expected to decrease, as HROTE is one of the largest day-ahead market participants. Also, HROTE must trade electricity in 2022 to replace the electricity it previously sold at auction in 2021 expecting of a higher share of energy from the members of the EKO balance group sold on the market.

Abolishing the mandatory share of net delivered electricity produced by eligible producers that electricity suppliers are obligated to take up from electricity market operators are obligated to take up would contribute to the development of the wholesale market. In this case, electricity market operators on the market would offer the full amount of net electricity supplied by eligible producers.

During Q1 2021, the price of basic energy for 2022 on the Hungarian HUDEX exchange was around EUR 55/MWh; by the end of the year, it had reached EUR 327/MWh. In the first half of 2021, the average price of basic energy for 2022 was EUR 61.90/MWh; in the second half of 2021, it was EUR 126.80/MWh. As compared to 2020, the average price of electricity on CROPEX'S day-ahead market rose in 2021 from EUR 38.03/MWh to EUR 114.68/MWh. This growth in price on the day-ahead market and long-term markets corresponded with an increase in the price of natural gas, coal, and carbon dioxide emissions.

On 13 January 2021, the day-ahead market for 14 January split, and prices on the CROPEX exchange were published at a delay.[38]

Market participant ENERGIA GAS AND POWER d.o.o. was late in paying its obligations to the system operators and HROTE; finally, on 15 October 2021, the agreement with this supplier on participation in the energy market was terminated. This resulted in the unplanned departure of a supplier from the market.

As transparent disclosure is important in promoting competition, HOPS is required to publish data according to *Commission Regulation (EU) No 543/2013 of 14 June 2013 on the submission and publication of data on electricity markets and amending Annex I to Regulation (EC) No 714/2009 of the European Parliament and of the Council*. Publishing all prescribed data on the central platform for information transparency would enable greater transparency in the wholesale electricity market, and thus improve the operation of the market.

Information on the availability of production units in the electricity system are required by stakeholders when they estimate future prices of electricity. The website http://remit.hep.hr/ publishes data on the availability of production units in Croatia owned by HEP d.d., which increases transparency.

The market in Croatia currently operates on an hourly basis. This means that electricity is purchased and sold for each individual hour, according to which the obligations of market stakeholders are also defined. The deadline for the Croatian electricity market to transition from 60 minutes to 15 minutes is 1 January 2023. Market participants would find it easier to work on a 15-minute basis if they could pair 15-minute products across borders, or at least on the intraday CROPEX market.

CROPEX's contribution to the development of competition is apparent in trading volume, the amount of purchase and sale offers, the number and share of market participants buying and selling, and prices, which were on par with those on neighbouring exchanges.

Table 4.3.2. shows wholesale electricity market indicators from 2016 to 2021.

[38] *Source: https://www.cropex.hr/hr/obavijesti-o-tr%C5%BEi%C5%A1tu/744-day-ahead-further-information-on-the-partial-decoupling.html, accessed 18 February 2021.*

Table 4.3.2. Wholesale electricity market indicators from 2016 to 2021

Indicator	2016	2017	2018	2019	2020	2021
Electricity production [GWh]	11,331	10,818	12,192	12,006	12,216	14,153
Number of active participants in the wholesale market	35	35	41	35	37	47
Total electricity consumption [GWh]	17,674	18,197	18,352	18,169	17,272	18,495
Imports [GWh]	12,397	12,157	12,692	11,400	10,490	11,504
Exports [GWh]	6,054	4,778	6,532	5,237	5,434	7,159
Share of HEP-Proizvodnja d.o.o. in electricity production [%]	73%	79%	83%	80%	77%	75%
Number of active traders on the wholesale market	16	20	24	21	22	23
Trade of electricity on the electricity market [GWh]	258	190	2,460	5,429	7,051	7,391
Total electricity traded [TWh]	47	53	67	58	64	65
Average price of electricity on the market [€/MWh]	n/a	52	52	49	38	115
Structure of production capacities by source in Croatia (GW):						
· Coal	0.34	0.34	0.34	0.34	0.34	0.34
· Natural gas/Fuel oil	1.79	1.79	1.85	1.70	1.70	1.71
· Nuclear	0.00	0.00	0.00	0.00	0.00	0.00
· Hydro	2.15	2.15	2.20	2.20	2.20	2.20
· Wind	0.48	0.47	0.58	0.74	0.79	0.98
· Solar	0.06	0.06	0.07	0.08	0.11	0.14
· Other	0.06	0.08	0.13	0.14	0.16	0.16
Share of electricity production on the market (%)	84%	67%	79%	73%	89%	90%
Total installed plant capacity [GW]	4.87	4.89	5.17	5.21	5.31	5.53

Source: HOPS, HEP-ODS, CROPEX, ENTSO-E

4.3.2 Allocation of cross-zonal capacities and congestion management

Cross-zonal capacity allocation regimes in 2021

The calculation and allocation of cross-zonal transmission capacities are the most efficient congestion management measure. Hops carries out an uncoordinated capacity calculation at all borders, using the *net transfer capacity* (NTC) approach.

The coordinated regional allocation of cross-zonal capacities in all time frames on a market basis has been established at all borders except for intraday capacity allocations at the borders with Serbia and Bosnia and Herzegovina (Table 4.3.3.). Supervision of the allocation of cross-zonal capacity is one of the responsibilities of the regulator as defined by European legislation, in particular by *Regulation (EU) 2019/943*.

Table 4.3.3. Cross-zonal capacity allocation regimes and offices on borders between Croatia and neighbouring bidding zones in 2021

Border	Yearly auction	Monthly auctions	Daily auctions	Intraday allocations
Slovenia	JAO	JAO	CROPEX[39] (SDAC)	CROPEX (XBID)[40]
Hungary	JAO	JAO	JAO	CROPEX (XBID)
Serbia	JAO	JAO	JAO	EMS
Bosnia and Herzegovina	SEE CAO	SEE CAO	SEE CAO	HOPS

Legend:

Coordinated Bilateral

Regional auction offices (JAO for the borders with Slovenia, Hungary, and Serbia, and SEE CAO for the border with Bosnia and Herzegovina) implement annual, monthly, and daily auctions.

During 2021, the day-ahead market was connected only at the border with Slovenia through implicit capacity allocations. HOPS carries out the bilateral allocation of total intraday capacities in both directions at the border with Bosnia and Herzegovina, while the Serbian transmission system operator is in charge of organising intraday allocations at the borders with Serbia. As of November 2019, Croatia's borders with Slovenia and Hungary have been included in the coupling of the intraday markets of EU countries through the XBID project.

Generally, during explicit capacity allocation, auction offices organise auctions in which market participants explicitly compete for (only) the offered capacity. If market participants bid for more capacity than is offered in a particular auction, congestion occurs; neighbouring transmission system operators then share revenues equal to the reference price for unit capacity multiplied by the total allocated capacity.

At the border with Slovenia, where the day-ahead market has been connected, the neighbouring electricity exchanges implicitly allocate the available capacity (cross-zonal transmission capacity and energy are allocated simultaneously) given to them by the transmission system operator. In this case, neighbouring transmission system operators share revenues equal to the difference in hourly prices on the neighbouring day-ahead markets multiplied by the exchange of electricity between neighbouring markets calculated by the EUPHEMIA algorithm.[41]

Capacity unallocated at monthly auction, which is intended for daily auctions, as well as capacity not reported for use, is offered at daily auctions; this capacity is then increased by the long-term capacity that has already been nominated in the opposite direction. The leftover capacity from daily auctions, taking into account transactions in the opposite direction, is allocated on all borders, in the order in which requests were received for intraday capacity allocations.

Currently, transmission system operators do not earn revenues from the allocation of intraday cross-zonal capacity. At the border with Slovenia, in addition to the usual implicit allocation of intraday capacities established by the XBID project, the parallel function of explicit intraday allocation has also been enabled. This allows traders to take advantage of the benefits of both implicit and explicit intraday capacity allocation regimes.

Figure 4.3.3. shows already allocated capacities (AAC) on an annual basis, capacities allocated on a monthly basis ("Allocated"), capacities intended for allocation on a daily basis on the day-ahead market after additional analysis ("Intended for daily"), transmission reliability margin (TRM).

When capacity purchased at the annual auction is resold, this capacity is returned to the auction office, which again offers it at monthly auctions; the AAC value is reduced by the amount of resold capacity. Traders have used this ability to resell capacities most at the border with Slovenia. Time periods of reduced capacity due to planned maintenance of parts of the network were taken into account when calculating the average capacities.

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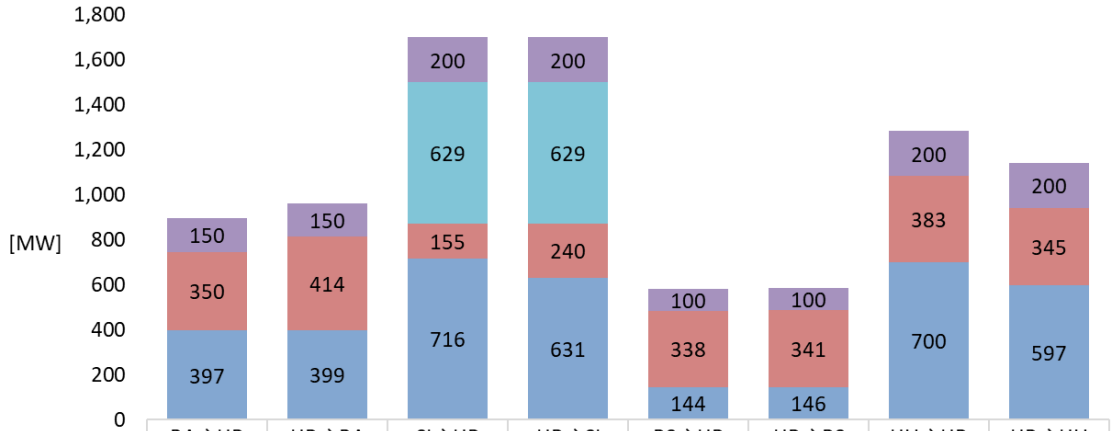
39 *Implicit day-ahead capacity allocation.*

40 *Implicit allocation of intra-day capacity.*

41 *Algorithm for calculating prices on the day-ahead electricity market.*



	BA→HR	HR→BA	SI→HR	HR→SI	RS→HR	HR→RS	HU→HR	HR→HU
TRM	150	150	200	200	100	100	200	200
Intended for day-ahead	0	0	629	629	0	0	0	0
Allocated	350	414	155	240	338	341	383	345
AAC	397	399	716	631	144	146	700	597

Source: HOPS

Figure 4.3.3. Average monthly cross-zonal capacities per border in 2021

The average NTC value of transmission capacities for electricity imports into Croatia for the summer of 2021, based on monthly NTC values for June, July, August, and September, amounted to 3,703 MW. On the other hand, the average NTC value for electricity exported from Croatia in the same period amounted to 3,538 MW.

In the winter period, which includes December 2021, January, February, and March 2022, the average NTC value for electricity imports into Croatia of 3,920 MW was calculated on the basis of monthly NTC values. For the same period, the NTC value for exports from Croatia was calculated at 3,682 MW.

Observations on the allocation of cross-zonal capacities and congestion management

The amount of cross-zonal capacities offered at the Hungarian border in both directions are relatively small in light of the total thermal transmission capacity of cross-zonal transmission lines; in 2021, these capacities reduced even further as compared to the previous year as the Hungarian transmission system operator calculated a lower NTC size, which was then taken as the final value.

At the border with Slovenia, neighbouring transmission system operators left an average of 629 MW of capacity in both directions exclusively for the day-ahead market.

The revenues of transmission system operators from the allocation of cross-zonal capacities should be earmarked to increase or guarantee cross-zonal capacity. In July 2021, HERA published a *Report on the use of HOPS revenues from the allocation of cross-border transmission capacities in 2020* and confirmed that HOPS had used the funds in question in accordance with *Regulation (EU) 2019/943*.

In 2021, HOPS invested around HRK 65 million in earmarked funds into the transmission network, thus taking advantage of all unused funds from the previous years which had been stored in a separate account. Most of the funds were invested into the SINCRO.GRID project, which is intended to increase transmission capacity at the Slovenian border through the optimal management of reactive power flows, as well as through the installation of dynamic line rating (DLR) systems on several 220 kV transmission lines that allow loads above the designed values during favourable weather conditions. In April 2022, HERA published a *Report on the use of HOPS revenues from the allocation of cross-border transmission capacities in 2021*, which confirmed that HOPS had used the funds in question throughout 2021.

Based on data from CROPEX and HOPS, it can be concluded that prices on the day-ahead markets corresponded fully between CROPEX and BSP in most hours during 2021. In such situations, neighbouring transmission system operators earn no congestion revenue the border with Croatia and Slovenia.

On 13 January 2021, due to technical issues, the Croatian trading zone decoupled from the SDAC market at the border with Slovenia (for the delivery of electricity for all hours of 14 January 2021). Market decoupling also took place at the IT-AT, IT-FR, AT-SI, and GR-IT borders.[42] As a result, unusually large hourly price differences emerged between CROPEX and BSP, on the basis of which transmission system operators compensate market participants for long-term capacity not reported for use. That day, HOPS incurred HRK 11.3 million of costs from the compensation of market participants for long-term capacity not reported for use.

In late 2021 and early 2022, HERA approved more rules for the allocation of cross-zonal capacities in order to improve the capacity allocation process. Rules defining the capacity allocation process for all time frames were refined at the border with Serbia. At the border with Bosnia and Herzegovina, only the rules related to intraday capacity allocation were refined; at the border with Hungary, the rules governing capacity auctions for the day-ahead market were refined.

No limitations of previously allocated cross-zonal capacity were recorded for market participants in 2021.

Due to constraints in the transmission network, HOPS redispatched a total of 2.7 GWh of electricity in 2021.

HOPS is currently participating in the non-compulsory multilateral cross-zonal redispatching activity of TSCNET,[43] which can address congestion in the transmission network.

The implementation of coordinated capacity calculation for the Core Region day-ahead market, which includes the Croatian borders with Slovenia and Hungary, is expected in mid-2022. This project will have a positive impact on other regional projects concerning the calculation and allocation of long-term capacities, the calculation of intraday capacities, and the regional coordination of the activation of all types of corrective measures.

According to *Regulation (EU) 2019/943*, transmission system operators are not allowed to limit the interconnection capacity they make available to market participants as a means to resolve congestion within their own bidding zones, or as a means to manage flows that are the result of transactions within bidding zones. A minimum of 70% of capacity must be ensured for cross-zonal trading. The remaining 30% of capacity can be used for confidence limits, circular flows, and internal flows at every critical network element.

In the previous period, HERA approved HOPS' derogations from the minimum 70% of capacity ensured for 2020 and 2021. In December 2021, HERA granted HOPS' request for a derogation from the minimum 70% capacity for cross-zonal trading from the beginning of 2022 to the adoption of an action plan, which is expected in mid-2022. These derogations were approved due to the time necessary to design tools needed to appropriately take energy flows into account within and without the Core Region for capacity calculation, the limited ability to activate redispatching, planned long-term network element downtime, and the time needed to design the action plan.

The existence of structural congestion in the transmission network as regards the minimum require 70% capacity for cross-zonal trading was affirmed in HOPS' Report on structural congestion, which HERA approved in November 2021. The action plan being adopted by the Ministry in cooperation with HERA, on the basis of HOPS' data, should represent a measure by which to solve the identified structural congestion by the end of 2025.

4.3.3 Electric power system balancing and ancillary services

Imbalance settlement for balance responsible parties

The balance groups are balance responsible parties. Imbalances are calculated hourly as the difference between real volume and the market position of the balance group.[44] Hourly volume is the difference between energy injected and taken up by the balance group, while the hourly market position is calculated as the difference between the contracted purchase of energy and contracted energy sold. If the imbalance is

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42 *Two-letter ISO country codes – IT (Italy), AT (Austria), FR (France), GR (Greece).*

43 *Regional Security Coordinator (RSC) Service for the TSOs in Central and South Eastern Europe — one of the regional security coordinators for the synchronous area of continental Europe.*

44 *The difference between sales (including exports) and purchases (including imports) of the balance group's electricity in a single accounting interval, including market position adjustment.*

negative (the balance group procured too little energy), the balance group manager pays the system operator; if the balance is positive (the balance group procured too much energy), the system operator pays the balance group manager.

The price of imbalances per hour is equal for all balance groups; it is determined on the basis of the *Rules on electricity system balancing*.

In 2021, HROTE settled imbalances of the balancing groups in the amount of HRK 161 million. During 2021, four appeals were submitted to HROTE by three suppliers (E.ON Energija d.o.o., GEN-I Hrvatska d.o.o., and Petrol d.d.) for July, August, and September 2021. The objections concerned incorrect imbalances by HEP-ODS (July, August, and September) and HOPS (September). HROTE accepted these complaints, and determined and created the correct imbalances; HROTE then performed a new calculation for the parties and HOPS issued new invoices.

A HERA decision dated 9 June 2020 approved derogations for HOPS from the obligations prescribed in Article 53 of *Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing* until 31 December 2022. This obligation relates to the required transition to the 15-minute calculation interval. Currently, imbalances are calculated on an hourly basis as stated above.

Aside from HEP d.d. and HROTE, in 2021, electricity producers were also included in other balance groups as members.[45]

Figure 4.3.4. shows the average monthly prices of positive and negative imbalances in 2021. The highest average weighted monthly price for negative imbalances C_n was achieved in January (EUR 291/MWh), while the highest average weighted monthly price for positive imbalances C_p was achieved in the same month (EUR 219/MWh).

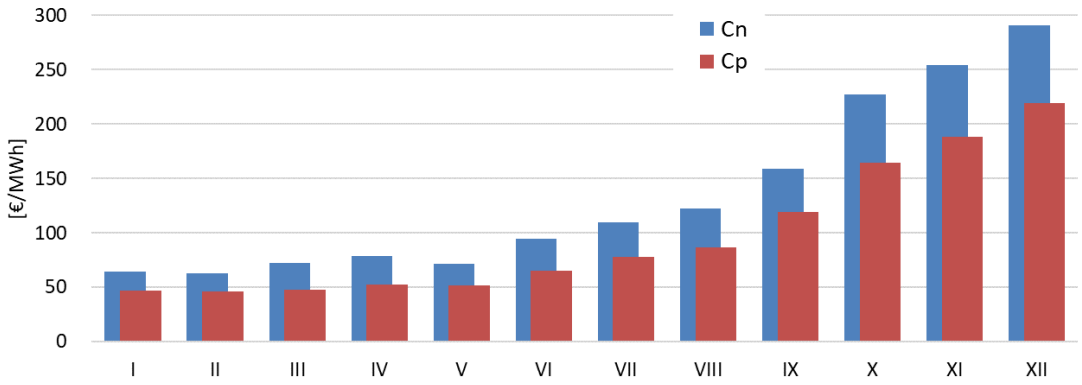


Figure 4.3.4. Average weighted monthly prices of positive and negative imbalances in 2021

Figure 4.3.5. shows a monthly breakdown of imbalance amounts invoiced by HOPS in 2021 (I_{uk} – total amount, I_n – amount of negative imbalances, I_p – amount of positive imbalances). For all months of 2021, the total amount of imbalance settling calculated by HOPS was HRK 161.0 million, of which HRK 53.6 million pertained to imbalances of the EKO balance group, while HRK 46.1 million pertained to imbalances in energy procurement to cover losses in the transmission network.

[45] *Balance group is a term indicating a group consisting of one or more electricity market participants for whose imbalances the balance group manager is responsible.*

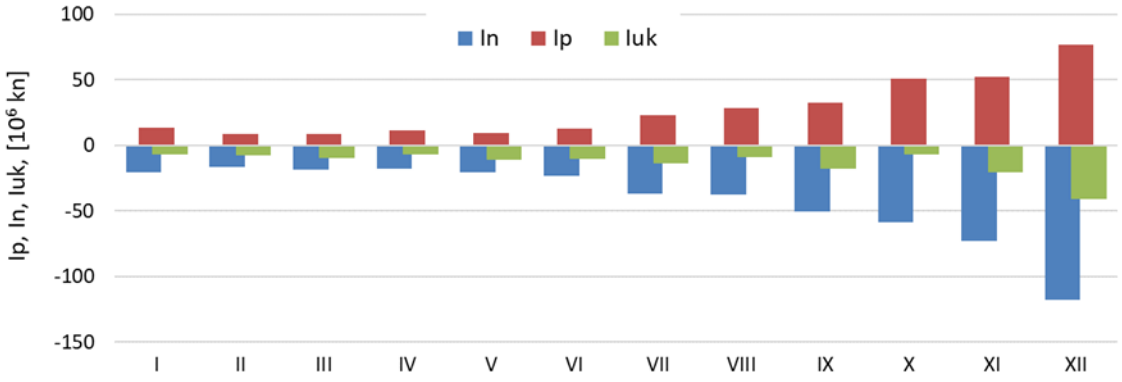


Figure 4.3.5. Imbalance amounts in 2021

On 13 January 2021, the day-ahead market for 14 January split. Prices on the CROPEX exchange were published at a delay. Due to the temporary unavailability of the CROPEX price, Article 32.8. of *Rules on balancing the electricity system* (HOPS 11/2019)[46] was implemented to calculate the unit price of the imbalances. In such cases, this article foresees the use of prices on the Hungarian HUPX and Slovenian BSP electricity exchanges.

As not all billing metering points measure electricity consumption on an hourly basis, the *Rules on the application of standard load profiles* are used to determine supplier imbalances in the first (monthly) imbalance settlement. This results in a difference between the net electricity procured by the supplier on the wholesale market (contractual schedules and imbalance settlement) and the electricity the supplier invoices to final customers. This difference is considered in the second (annual) imbalance settlement in accordance with the *Rules on system balancing*, which defines prices as the weighted price on the CROPEX day-ahead market. The load curve of the distribution system is used to calculate the weighted price.

Provision of imbalance settlement

HOPS is obligated to procure balancing energy and exchange imbalances with other regulatory areas (imbalance netting cooperation) to always keep imbalances in the electricity system as close to zero as possible. Balancing energy prices are determined by HEP-Proizvodnja d.o.o in accordance with the *Rules on system balancing*. The balancing energy market in Croatia has not yet been deregulated, as there are no other bidders for aFRR and mFRR balancing reserves besides HEP-Proizvodnja d.o.o. The market for balancing energy from mFRR for system security is partly deregulated.

The Rules on system balancing contain provisions defining the market procurement of balancing energy, which includes an independent aggregator. Network users are required to inform suppliers and/or purchasers and the competent system operator before approaching an independent aggregator.

As of 14 December 2020, HOPS has procured mFRR[47] capacity reserves and balancing energy for security of supply through public tender, which is an improvement on the previous pilot project. As of 31 December 2021, HOPS had concluded nine agreements for 2021. In January 2022, the tenth supplier of balancing energy for mFRR capacity reserves was qualified, and also the first in the role of independent aggregator on the Croatian balancing services market (KOER d.o.o.).

A total of 140 GWh of balancing energy was activated to increase electricity production, while 109 GWh was activated to decrease production. Additionally, within the framework of imbalance exchanges with other regulatory areas, 129 GWh was exchanged for increases and 129 GWh for decreases.

On 23 July 2021, HERA granted a derogation to HOPS until 24 July 2024 in terms of connection to the European mFRR platform (to activate balancing energy from reserves to manually restore frequency) and the

46 *Source: http://www.hops.hr/vijesti/razdvajanje-cropex-dam-od-sdac-1412021, accessed 18 February 2021.*

47 *Manual Frequency Restoration Reserve*

European aFRR platform (for activating balancing energy from reserves to automatically re-establish frequency).

In 2021, HOPS's total costs for imbalance settlement from capacity reserves amounted to HRK 122.4 million. The amounts for other balancing energies are as follows: HRK 4.1 million in revenue for imbalance netting cooperation; HRK 9.4 million in expenses for compensation for unintentional deviations; HRK 10.8 million in expenses for common settlement of unintended exchanges of energy; and HRK 3.6 million in revenue from frequency containment process energy. The total cost of all balancing energy amounted to HRK 135 million.

Ancillary services

HOPS is obligated to maintain the state of the power system such that all network users can exchange electricity flows with the network within the framework of connection capacity. In order to ensure the operational safety of the electricity system, the transmission system operator procures non-frequency auxiliary services, (the availability of plants capable of black start, islanding capability and island operation, and compensation for voltage regulation and reactive power control).

Due to the imbalances of the power system and the requirement to participate in frequency containment at the rated value, HOPS procures frequency auxiliary services in the form of four types of power reserve: frequency containment reserve (FCR); frequency restoration reserve with automatic activation (aFRR); frequency restoration reserve with manual activation (mFRR). Reserves for mFRR are divided into mFRR for balancing and mFRR for security.

In late 2021, HERA approved an ancillary services agreement between HOPS and HEP-Proizvodnja d.o.o. for 2022 based on the *Rules on system balancing*.

Public tenders obtained 26% of the required mFRR capacity reserves for system security. On the other hand, the prices in the ancillary services agreements between HEP-Proizvodnja d.o.o and HOPS were calculated based on the *Methodology for establishing prices for the provision of ancillary services* (HOPS 9/2020). The price mFRR capacity reserves for system security calculated in this way also limited the price in public tenders for mFRR capacity reserves.

The Rules on system balancing contain provisions regulating the market procurement of capacity reserves.

The need for aFRR capacity reserves in 2021 amounted to an average of ±59 MW per hour. The needed capacity reserves for mFRR for system balancing amounted to +120 MW and -100 MW per hour, while reserves for mFRR for system safety amounted to +130 MW per hour. HOPS procured some of the mFRR for system safety from entities outside of HEP d.d., as was previously noted. HOPS also used FCR[48] amounting to ±15 MW per hour, which it obtained from HEP-Proizvodnja d.o.o at no charge.

Ancillary services and balancing energy were paid for based on unit prices and realised quantities. The total costs of providing ancillary services amounted to HRK 295.2 million, of which 82% was related to power reserves for system balancing.

Joint Croatian-Slovenian virtual control centres were established, which represent a unique solution for coordinated voltage regulation. Additionally, in October 2021, a 250 MVAr SVC compensation system for managing reactive power flows was activated at the Konjsko TS 400/220/110 kV transformer station. This completed the implementation of SINCRO.GRID project activities in Croatia.

Observations on electricity system balancing

In the future, HOPS will be required to procure energy via the EU electricity system balancing platforms (IN platform*, aFRR platform, and mFRR platform) in accordance with the* EBGL Regulation.[49] HERA approved a delay in HOPS' accession to the aFRR and mFRR platforms until 24 July 2024.

As the EKO balance group manager, HROTE paid HOPS a total of HRK 53.6 million for imbalances in 2021. Nearly half of this amount (HRK 26 million) was for December 2021 due to HROTE's above-average negative imbalances and unusually high prices on the wholesale markets.

48 *Frequency Containment Reserves*

49 *Imbalance Netting*

A complete lifting of the obligation for suppliers to purchase electricity from HROTE from the incentive system at a regulated price would have a beneficial effect on the balancing system, since the day-ahead production plan would be more consistent with the expected delivery of electricity to the network.

Unlike 2020, when there were no complaints regarding imbalance settlement, there were four complaints regarding imbalance settlement in 2021.

HEP-ODS should improve the publication of data for the needs of balance group planning in order to ensure their imbalances are as close to zero as possible, which would reduce the need for capacity reserves and increase the ability to use renewable energy sources.

4.4 Retail electricity market

4.4.1 Basic features of electricity consumption

Sale of electricity in 2021

Table 4.4.1. shows data on the number of billing metering points[50] (BMP), sale, average sale of electricity by billing metering point, and the share of individual consumption categories in total electricity sales.

Table 4.4.1. Average number of billing metering points and the sale, average sale, and share in the sale of electricity to final customers by consumption category in Croatia in 2021

Consumption category	Average number of BMPs	Sale [MWh]	Sale per BMP [kWh]	Share in total sale [%]	Change in sales 2021/2020 [%]
High voltage-110 kV[51]	154	1,298,348	8,421,715	7.72	14.7
Medium voltage	2,438	4,355,037	1,786,255	25.88	7.8
Total high and medium voltage	**2,592**	**5,653,385**	**2,180,880**	**33.60**	**9.3**
Low voltage – non-household users (blue)	40,012	184,442	4,610	1.10	7.7
Low voltage – non-household users (white)	126,589	1,025,406	8,100	6.09	8.1
Low voltage – non-household users (red)	31,531	3,026,648	95,990	17.99	7.6
Low voltage – public lighting (yellow)	22,255	340,395	15,296	2.02	-5.6
Total low voltage – non-household	**220,387**	**4,576,891**	**20,768**	**27.20**	**6.6**
Low voltage – household (blue)	706,785	1,468,037	2,077	8.72	5.7
Low voltage – household (white)	1,575,615	5,076,643	3,222	30.17	9.4
Low voltage – household (red)	2,228	45,483	20,416	0.27	13.9
Low voltage – household (black)	2,873	6,197	2,157	0.04	12.3
Total low voltage – household	**2,287,501**	**6,596,361**	**2,884**	**39.20**	**8.6**
Total low voltage	**2,507,888**	**11,173,252**	**4,455**	**66.40**	**7.8**
Total	**2,510,480**	**16,826,637**	**6,703**	**100.00**	**8.3**

Source: HEP-ODS and HOPS; data processing: HERA

Table 4.4.2. shows the sales of electricity to end customers in the period from 2012 to 2021. The table specially indicates electricity procured on the wholesale market for the needs of pumping and compensation mode of the pumped storage hydroelectric power plant (PSH).

[50] *The average monthly number of accrued charges for a billing measuring point.*

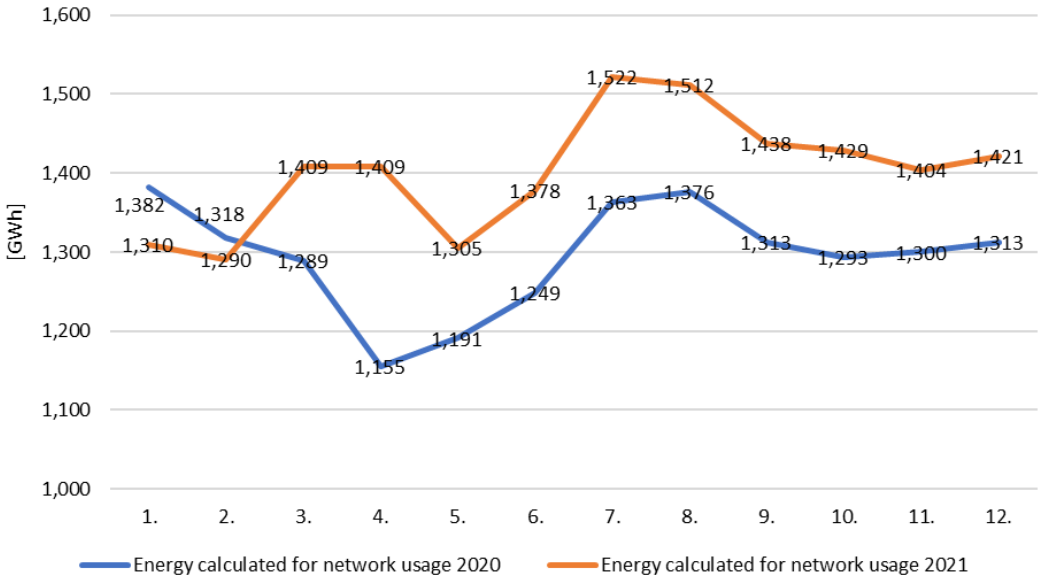
[51] *154 BMPs of non-household and transport (Croatian Railway electric locomotives) final customers are connected to high voltage, as are power plants that are in this case final customers (own consumption). High voltage sales also include PSH Velebit.*

Table 4.4.2. Sale of electricity to final customers from 2012 to 2021

Year		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Final customers	[GWh]	15,353	15,187	14,932	15,485	15,570	16,158	16,407	16,320	15,312	16,679
Change	[%]	-1.6%	-1.1%	-1.7%	3.7%	0.5%	3.8%	1.5%	-0.5%	-6.2%	8.9%
PSH	[GWh]	273	152	171	236	290	284	129	176	231	148
Total:	**[GWh]**	**15,626**	**15,339**	**15,103**	**15,721**	**15,860**	**16,442**	**16,536**	**16,496**	**15,543**	**16,827**

Source: HEP-ODS and HOPS; data processing: HERA

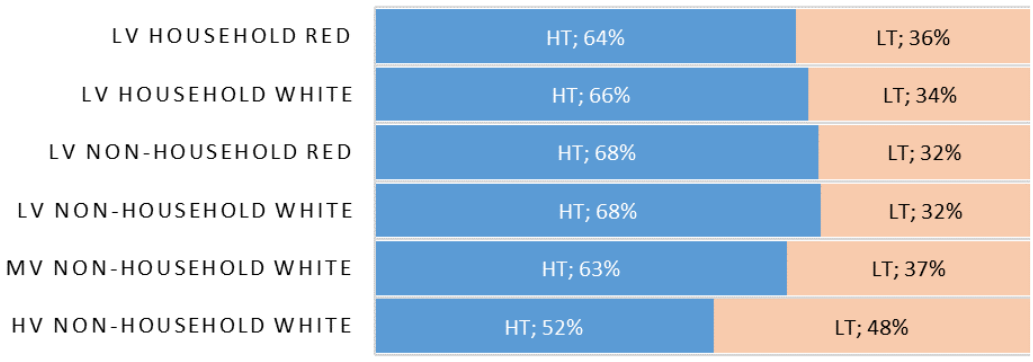
A comparison of the amount of energy calculated for network usage by month in 2021 as compared to 2020 is shown in Figure 4.4.1.



Source: HEP-ODS and HOPS; data processing: HERA

Figure 4.4.1. A comparison of the amount of energy calculated for network usage by month in 2021 as compared to 2020

The consumption ratio in the higher and lower tariffs by category and tariff model in 2021 is shown in Figure 4.4.2.



Source: HEP-ODS and HOPS; data processing: HERA

Figure 4.4.2. Consumption ratio in the higher (HT) and lower tariffs (LT) by category and tariff model in 2021

Distribution by EUROSTAT consumption category

The majority of electricity sold falls into consumption categories *DD* (large households) and *DC* (medium households), while the majority of billing metering points falls into categories *DA* (very small households), *DB* (small households), and *DC* (medium households) (Table 4.4.3.).

Table 4.4.3. Breakdown of consumption and billing metering points for household final customers in Croatia by EUROSTAT consumption category

Consumption category	Minimum consumption [kWh/yr]	Maximum consumption [kWh/yr]	Consumption [%]	Number of BMPs [%]
DA – very small households	1	< 1,000	3.9	31.7
DB – small households	1,000	< 2,500	16.9	26.5
DC – medium households	2,500	< 5,000	35.4	26.6
DD – large households	5,000	< 15,000	39.3	14.6
DE – very large households	≥ 15,000		4.5	0.6

Source: EUROSTAT and HEP-ODS; data processing: HERA

Table 4.4.4. shows electricity consumption categories and indicative peak loads for non-household end consumers according to EUROSTAT, while Table 4.4.5. shows a breakdown of consumption and billing metering points for low, medium, and high voltage non-household end consumers by EUROSTAT consumption category.

Table 4.4.4. Electricity consumption categories and indicative peak loads for non-household final customers according to EUROSTAT

Consumption category	Minimum consumption [MWh/yr]	Minimum consumption [MWh/yr]	Lower value [kW]	Upper value [kW]
IA		< 20	5	20
IB	20	< 500	10	350
IC	500	< 2,000	200	1,500
ID	2,000	< 20,000	800	10,000
IE	20,000	< 70,000	5,000	25,000
IF	70,000	≤ 150,000	15,000	50,000

Source: EUROSTAT

Table 4.4.5. Breakdown of consumption and billing metering points for low, medium, and high voltage non-household final customers in Croatia by EUROSTAT consumption category

Consumption category	Non-household – LV		Non-household – MV		Non-household – HV		Total:	
	Consumption [%]	BMP [%]	Consumption [%]	BMP [%]	Consumption [%]	BMP [%]	Consumption [%]	BMP [%]
IA	8.79	80.60	0.04	0.11	0.00	0.00	8.83	80.7
IB	26.70	17.87	1.99	0.41	0.04	0.01	28.74	18.3
IC	8.31	0.41	8.65	0.34	0.07	0.00	17.03	0.8
ID	1.18	0.02	24.45	0.20	0.30	0.00	25.93	0.2
IE	0.00	0.00	6.46	0.01	3.21	0.00	9.66	0.0
IF	0.00	0.00	0.75	0.00	3.29	0.00	4.04	0.0
> 150,000 MWh	0.00	0.00	0.00	0.00	5.76	0.00	5.76	0.0
All categories	**45.0**	**98.9**	**42.3**	**1.1**	**12.7**	**0.0**	**100.0**	**100.0**

Source: HEP-ODS and HOPS; data processing: HERA

In the low voltage category of non-household final customers, the largest share of electricity sold was in the *IB* consumption category, whereas the share of final customers in the exceptionally small industry category (*IA*) is by far the highest.

In the medium voltage category of non-household final customers, the most electricity was sold in the *ID* consumption category, which also includes the largest number of final customers (in terms of metering points). In the category of high voltage final customers, the most electricity was sold in the *IF* category.

Table 4.4.6. shows a breakdown of consumption for low, medium, and high voltage non-household final customers in Croatia by tariff model and EUROSTAT consumption category. The following is apparent from the table (colour added for emphasis):

- the *IA* consumption category mainly involves the White low-voltage tariff model
- the *IB* consumption category mainly involves the Red low-voltage tariff model,
- the *IC* consumption category mainly involves the Red low-voltage and White medium-voltage tariff models,
- the *ID* consumption category mainly involves the White medium-voltage tariff model,
- the *IE* consumption category mainly involves the White medium-voltage tariff model,
- the *IF* consumption category mainly involves the White high-voltage tariff model,
- the consumption category >150,000 MWh exclusively involves the White high-voltage tariff model.

Table 4.4.6. Breakdown of consumption for low, medium, and high voltage non-household final customers in Croatia by tariff model and EUROSTAT consumption category

Consumption category	HV	MV	LV	LV	LV	LV	Total:
	White	White	Blue	White	Red	Yellow	
IA	0.00002%	0.04083%	1.27547%	5.31906%	0.93826%	1.25926%	**8.83%**
IB	0.04129%	1.99447%	0.51642%	4.61522%	19.06381%	2.50724%	**28.74%**
IC	0.07160%	8.65007%	0.00000%	0.01048%	8.28540%	0.01055%	**17.03%**
ID	0.30344%	24.44644%	0.00000%	0.00000%	1.18421%	0.00000%	**25.93%**
IE	3.20628%	6.45865%	0.00000%	0.00000%	0.00000%	0.00000%	**9.66%**
IF	3.29382%	0.74852%	0.00000%	0.00000%	0.00000%	0.00000%	**4.04%**
> 150,000 MWh	5.75919%	0.00000%	0.00000%	0.00000%	0.00000%	0.00000%	**5.76%**
Total:	**12.68%**	**42.34%**	**1.79%**	**9.94%**	**29.47%**	**3.78%**	**100%**

Source: HEP-ODS and HOPS; data processing: HERA

Observations on the main characteristics of electricity sales in 2021

Electricity sales[52] were 8.3% higher than in 2020; increased sales as compared to 2020 were apparent from March 2021 until the end of the year, as a result of economic recovery.

The increase of sales amounted to 14.7% in the non-household high-voltage category, 8.6% in the household category, and 6.6% in the non-household low-voltage category.

The share of total electricity sold to household final customers was 39.2%, and the share sold to non-household final customers was 60.8%.

The ratio of consumption in the high tariff versus the lower tariff in the household category ('White' model) was 66%:34%.

[52] *The sale of electricity includes electricity procured outside the wholesale market suppliers for the needs of pumping and compensation mode at PSH Velebit.*

4.4.2 Development of the retail electricity market

Electricity supply as universal service

Electricity supply as a public service is electricity supply to final customers who have a right to this manner of supply and choose it either freely or use it automatically. Household final customers who are left without a supplier for any reason will automatically be switched to supply as part of the universal service. If they wish, household final customers supplied by a market supplier can switch to the universal service.

Electricity supply in the public service treats household and non-household final customers differently. Electricity supply is called the *universal service* for household final customers and *guaranteed service* for non-household final customers. In 2021, public supply within the universal service and guaranteed supply were both provided by HEP Elektra d.o.o.

The price of electricity in the universal service is not regulated and is freely determined by HEP ELEKTRA d.o.o., which is in accordance with the recommendations of the European Commission and practice in the majority of EU member states. Prices for household final customers using the universal service has not changed in the past few years.

Guaranteed supply is a service ensuring the right to electricity supply to non-household final customers who have no market supplier under the same conditions throughout Croatia. Guaranteed supply is activated when a non-household final customer is left with no supply agreement with a market supplier of electricity, to ensure that consumers have a continuous supply of electricity. **The Electricity Market Act** prescribes that tariffs in guaranteed supply must be higher than the average amount of tariffs for the supply of similar final consumers supplied on the electricity market.

In the second half of 2021 and beginning of 2022, electricity prices increased several times over on electricity exchanges. The increase in wholesale prices on HUDEX influenced the calculation of the price of guaranteed supply. The price of guaranteed supply was calculated during 2021 according to the *Methodology for setting tariffs for guaranteed electricity supply* (Official Gazette no. 20/19), taking the prices on HUDEX into account. Chapter *4.3.1. Development of the wholesale electricity market* explains the increase in prices on the wholesale electricity market. The increase in retail prices of guaranteed supply and average monthly electricity prices on CROPEX is shown in Figure 4.4.3. It is apparent that the average monthly wholesale prices on the CROPEX day-ahead market was higher than the average weighted price of guaranteed supply as of July 2021.

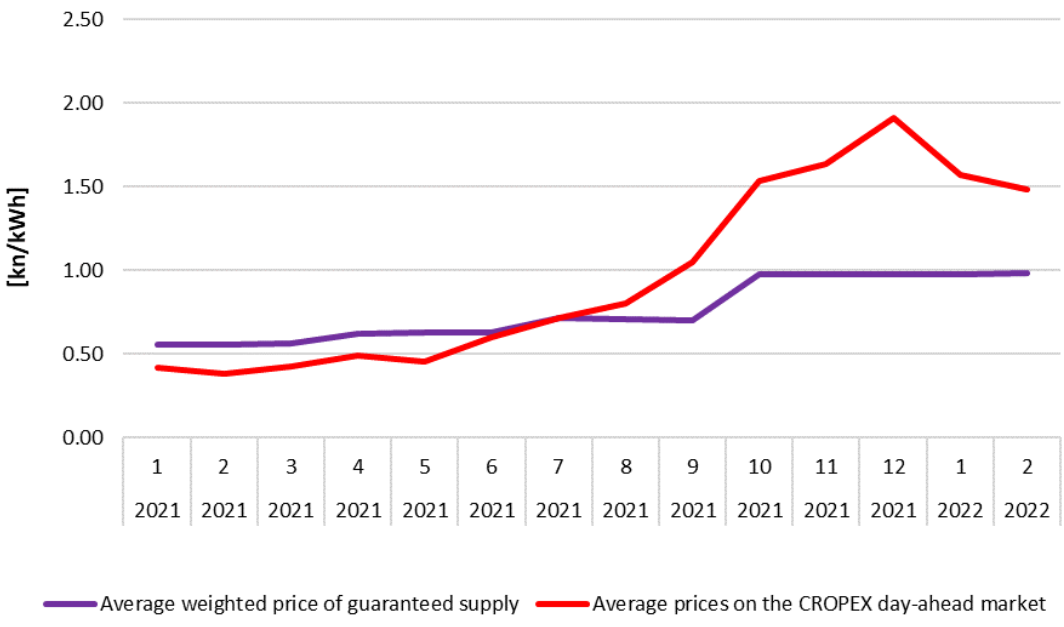


Figure 4.4.3. The average weighted price of guaranteed supply and prices on the CROPEX day-ahead market in 2021 and at the beginning of 2022

Figure 4.4.4. shows the rising trend in the share of guaranteed supply electricity as compared to consumption from the non-household consumption category, as well as the rising trend in the number of billing metering points on the guaranteed supply.

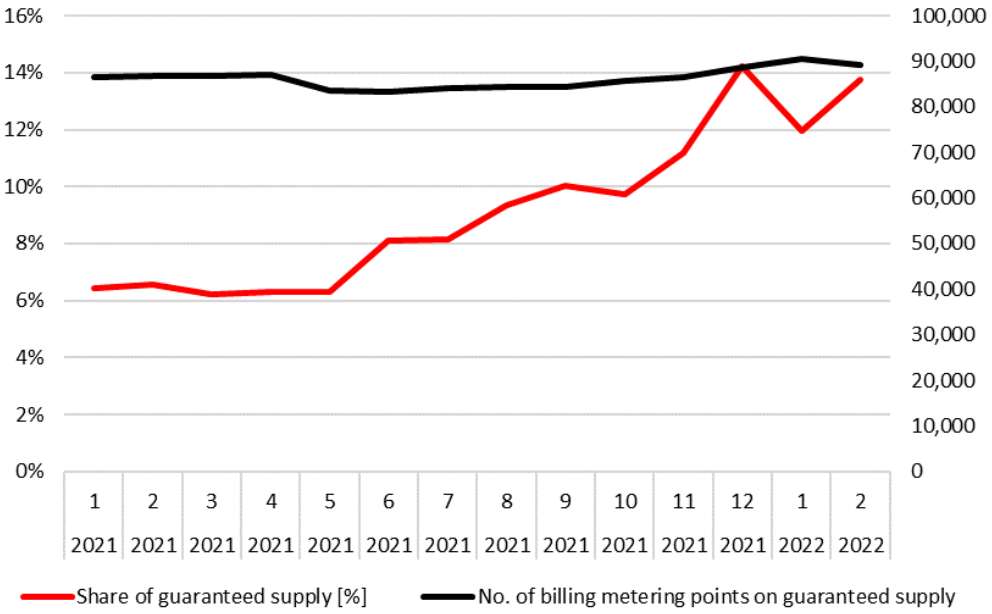


Figure 4.4.4. Share of guaranteed supply in total electricity in the non-household consumption category; number of billing metering points on the guaranteed supply in 2021 and the beginning of 2022

In February 2022, HERA adopted the *Methodology for setting tariffs for guaranteed electricity supply* (Official Gazette no. 20/22); in March 2022, it adopted new tariffs for guaranteed electricity supply. Tariffs for the first two months of guaranteed service from 1 October 2021 to 31 March 2022, and the amount of new tariffs implemented as of 1 April 2022 are shown in Table 4.4.7. Their comparison shows that the new tariffs are roughly 2.1x higher as compared to prices from the preceding two quarters.

In addition to this, HERA introduced a supply charge with a fixed monthly amount for non-household final customers on the guaranteed supply, as the same principle is applied by market suppliers.

Table 4.4.7. Tariffs for the first two months of guaranteed service in the fourth quarter of 2021 and first quarter of 2022, as well as from 1 April 2022 to 30 June 2022

a) From 1 October 2021 to 31 March 2022

Tariff models		Tariff items for active energy [HRK/kWh]		
		EN_{JT}	EN_{VT}	EN_{NT}
High voltage		-	1.0293	0.6055
Medium voltage		-	1.0058	0.5916
Low voltage	Red	-	0.983	0.5782
	White	-	1.1285	0.6638
	Blue	0.9792	-	-
	Yellow	0.7663	-	-

b) From 1 April 2022 to 30 June 2022

Tariff models		Tariff items for active energy [HRK/kWh]			Supply charge [HRK/mo]
		EN_{JT}	EN_{VT}	EN_{NT}	
High voltage		-	2.1891	1.2877	35
Medium voltage		-	2.0698	1.2175	35
Low voltage	Red	-	2.022	1.1894	35
	White	-	2.321	1.3653	35
	Blue	2.0161	-	-	35
	Yellow	1.5778	-	-	0

This increase in tariffs is expected to cause non-household final consumers to leave the guaranteed supply and switch to market suppliers. The retail supply prices of market suppliers should be connected to wholesale prices. Suppliers fail otherwise, and their final customers switch to the guaranteed and universal service; the cost of procuring electricity for these final customers under these conditions also switches to the guaranteed and universal supplier. A case such as this took place in Croatia in October 2021 with supplier ENERGIA GAS

AND POWER d.o.o., whose electricity market participation agreement was terminated due to non-payment. In EU member states in 2021, there were numerous cases of suppliers going bankrupt who had not protected themselves in the long-term from the risk of changes to the price of procuring electricity, as the prices they charged their final customers were insufficient to cover the costs of electricity.

The retail market in 2021

The retail electricity market is completely liberalised and there are no regulated prices, with the exception of guaranteed supply, which was explained above. Of total electricity sold to households in 2021, 88% was within the universal service, while the share of guaranteed supply in the non-household category amounted to 9% (Figure 4.4.5.). The share of HEP d.d.'s suppliers (HEP-Opskrba d.o.o. and HEP ELEKTRA d.o.o.) in supply to all customers in 2021 amounted to 90%.

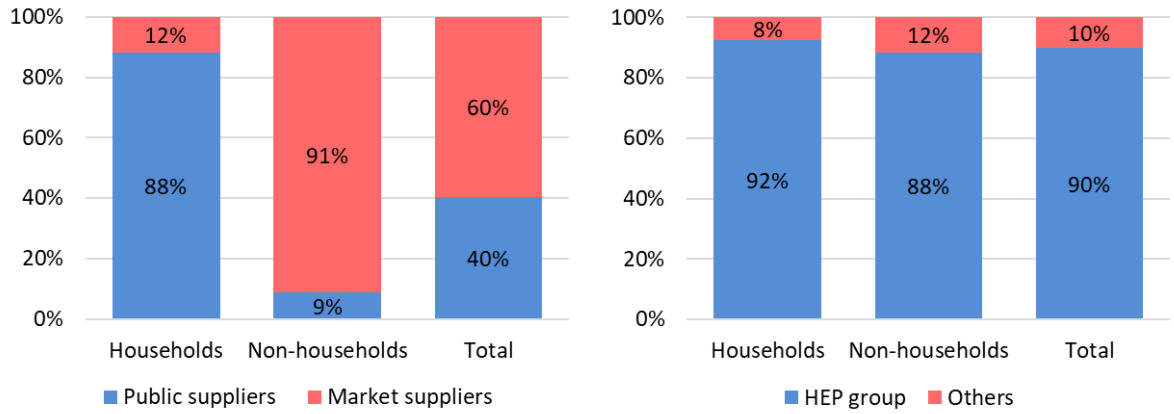


Figure 4.4.5. Proportions of energy sold to household and non-household final customer categories in 2021

Introduction of smart meters

According to the **Energy Act**, HEP-ODS sets out the technical requirements and determines the costs of introducing smart meters and mass roll-out of smart metering systems and communicates these requirements to HERA. HERA then performs a cost-benefit analysis and obtains the opinion of the representatives of consumer protection bodies. The minister responsible for energy in turn sets out a programme of measures for introducing smart meters for final customers. **The Electricity Market Act,** which entered into force in late 2021, similarly defines the framework for the introduction of smart meters. According to this framework, the minister responsible for the energy sector decides to introduce a smart metering system in Croatia on the basis of HERA's economic assessment of all long-term costs and benefits of such a system, wherein the basis for this economic assessment (including the proposed form of smart metering system and the time frame for its introduction) are ensured by the distribution system operator. In December 2021, HERA launched a study that will serve as the basis for the aforementioned economic assessment.

Regardless of the roll-out of smart meters, which would follow the decision to implement smart meters and the plan to introduce them, HEP-ODS installs smart meters at the request of final customers, as well as during particular replacements of meters and as part of smart grid pilot projects. The status of installed types of meters as of the end of 2021 is shown in Table 4.4.8.

Table 4.4.8. Status of total installed smart meters as of the end of 2021

Final customer category	Smart meters in the remote reading system	Smart meters not in the remote reading system	Non-smart meters that are in the remote reading system	Other electricity meters	Total: electricity meters
Medium voltage	2,573	3	-	1	2,577
Low voltage	314,853	99,854	55,057	2,052,810	2,522,574
Non-household LV - Blue	14,108	1,621	992	26,726	43,447
Non-household LV - White	48,871	8,781	7,778	66,683	132,113
Non-household LV - Red	32,107	164	100	219	32,590
Public lighting LV	9,455	405	1,071	11,196	22,127
Households LV	210,312	88,883	45,116	1,947,986	2,292,297

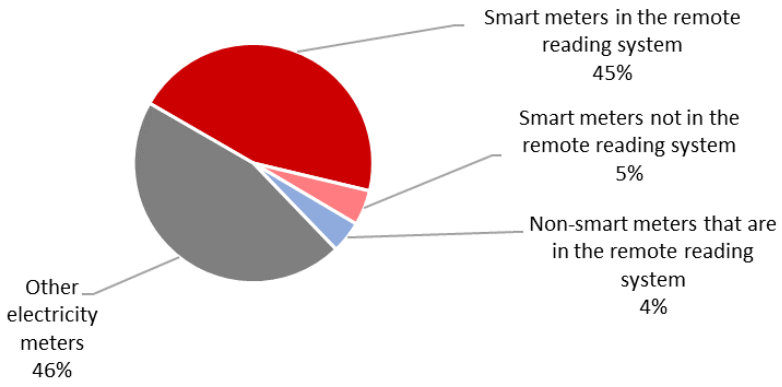


Figure 4.4.6. Share of types of meters at BMPs of non-household low-voltage final customers as of the end of 2021 (all categories)

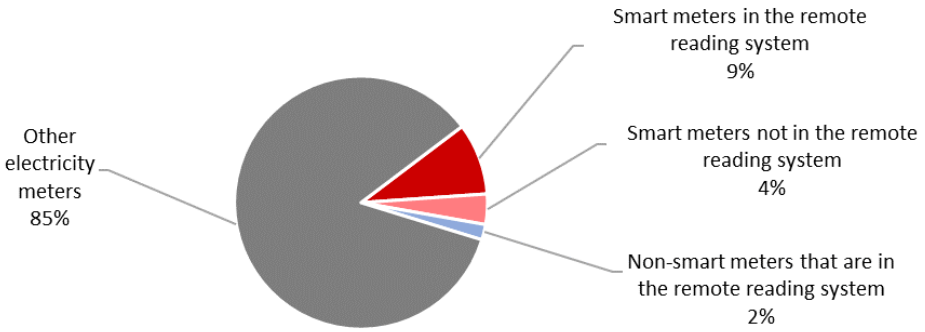


Figure 4.4.7. Share of particular types of meters at BMPs of household final customers as of the end of 2021

The share of installed smart meters in all installed meters at billing metering points (BMP) in the non-household low-voltage consumer category amounts to 50% (Figure 4.4.6.). BMPs in the non-household

category with the 'Red' tariff model are almost completely equipped with smart meters and part of the remote reading system (98.5% of BMPs in this category). Between 36% and 45% of the remaining non-household low-voltage categories (with lower connection capacity) are equipped with smart meters (non-household low-voltage 'Blue' at 36%, 'White' at 44%, and public lighting at 45%). The share of installed smart meters for household BMPs (Figure 4.4.7.) is still low at 13% (of which 70% are in the remote reading system).

In 2021, a total of 105,874 electricity meters were installed, of which 57% were smart meters. In 2021, a total of 9,730 meters were installed for the non-household category, of which 82% were smart meters; for the household category, a total of 95,954 meters were installed, of which 53% were smart meters. However, it must be noted that 40% of the newly installed smart meters for the non-household category are not in the remote reading system. This percentage is higher for the household category at 60%. The number and structure of newly installed meters in 2021 is shown in Table 4.4.9.

Table 4.4.9. Number of meters installed in the distribution system in 2021

Final customer category	Newly installed smart meters in the remote sensing system	Newly installed smart meters not in the remote sensing system	Newly installed electronic smart meters in the remote sensing system	Number of other newly installed meters	Total installed meters
Medium voltage	190	-	-	-	190
Low voltage	25,245	33,702	1,142	45,595	105,684
Non-household LV - Blue	634	465	17	290	1,406
Non-household LV - White	2,045	2,527	143	1,067	5,782
Non-household LV - Red	1,716	86	-	21	1,823
Public lighting LV	404	124	7	184	719
Households LV	20,446	30,500	975	44,033	95,954
Total:	25,435	33,702	1,142	45,595	105,874

Data on meter installation and the state of smart meter installation shows that efforts must be undertaken to introducing smart metering devices in the remote reading system. Although technical problems with particular meters must be resolved or reading systems and meter networks must be installed or updated, some meters are already outdated and malfunction or break down frequently.

As concerns the installation of smart meters, it should be noted that HEP-ODS faces numerous challenges and uncertainties caused by the rapid development of IT and communications technologies. The development of communications technologies and changes in electronic communications markets are so rapid that it is extremely difficult to choose an appropriate technological solution that will still be in use in ten years' time. This development is placing ever greater technical burdens on metering devices and their functionalities, as well as on data processing. Simultaneously, smart functions and the capabilities of these devices offer additional, increased benefits for final customers, distribution system operators, suppliers, and aggregators.

The rapid development of communications technologies imposes the need to choose modular solutions for smart meters with communications modules that can be easily replaced without replacing the entire meter. However, on the basis of its experience, HEP-ODS notes the price of communications modules is often almost equal to that of a new meter. This situation, paired with the rapid technological development of meters themselves, is leading to the complete replacement of meters after the first certification period (the meters are no longer used after the first certification period). When meters are installed *en masse*, their certification periods must be taken into account in order to avoid situations in which recently installed meters must be replaced (a situation in which a meter whose certification period has expired is quickly replaced with a smart meter). Extending the certification period of meters whose replacement has been planned in the near future would certainly reduce the frequency of this phenomenon, however regulations regarding metering devices have not foreseen this option, and further research is needed.

A special problem for HEP-ODS regarding remote reading and communication with meters is contracting and billing for electronic communications services. As a service user, HEP-ODS is not flexible in changing electronic communications operators due to the number of devices and the impossibility of replacing SIM cards (physically replacing SIM cards and configuring more than 160,000 devices throughout the distribution network is impossible in a short time frame). The structure and concentration of the electronic communications market prevents HEP-ODS from finding a better negotiating position with operators, as is reflected in the relatively high costs of remote reading. Mobile service operators and producers of meters and other smart home devices also impose other solutions for metering electricity and managing consumption, most of which are based on the Internet of Things (IoT)*; such solutions and devices are focused on measuring in as close to real time as possible*. This kind of solution, due to the high quantity of metering data, allows good insight into the state of the electricity distribution network, as well as allowing the distribution network to be managed on levels not previously possible with additional functions for final customers and aggregators. However, these solutions bring processing challenges requiring the transmission of large quantities of data, as well as raising the issue of building and managing this additional infrastructure (jurisdiction over and storage of metering data, the creation of a monopoly by mobile service operators, etc.). Due to the manner in which electronic communications are billed and the costs involved, as well as the way metering data is managed and controlled (an increasingly important issue due to the GDPR),[53] HEP-ODS is considering alternatives to the current method of contracting for electronic communications services, including performing the function of a virtual mobile network operator as is possible in other EU member states, as well as using solutions that do not require the physical replacement of a SIM card.

So far, based on pilot projects and studies, HEP-ODS has accumulated considerable experience and knowledge on the basis of which it has identified acceptable communications technologies for the needs of meter procurement in the coming period (G3-PLC technology with narrowband two-way communication on power lines and LTE Cat 1 solutions for mobile broadband networks).

In addition to installing smart meters, it is necessary to develop the remote meter reading system and the metering data management system systematically and continuously. The metering data management system not only unifies remote meter reading, but also enables the use of metering data to better manage the electricity distribution network alongside other information systems used by HEP-ODS. This kind of system would have to be able to communicate remotely with various meters through various communications systems; it would also have to be able to receive, process, and forward increasing amounts of data. It should be noted that the previous method of reading meters by pull request is being replaced with periodic push requests, thus changing the dynamics of reading during billing periods.

A comparison of retail and wholesale electricity prices in Croatia

Retail[54] and wholesale prices in Croatia from 2017 to 2021 are shown in Table 4.4.10. It is evident that the base wholesale price on CROPEX in 2021 increased by roughly three times as compared to 2020.

From 2017 to 2021, the price of the universal service for households remained unchanged. On the other hand, the average annual price for the average non-household final customer grew by about 10% for high and medium voltage, and by about 2% for low voltage.

[53] *Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC ("General Data Protection Regulation").*

[54] *This chapter exclusively discusses the price of electricity a supplier sells to a final customer; it does not include network charges or other prescribed charges.*

Table 4.4.10. Average prices of electricity for final customers on the market and within the universal service (households) compared with the yearly average price on CROPEX in the period from 2017 to 2021 [HRK/kWh]

Type of supply	2017	2018	2019	2020	2021
Market (high and medium voltage)	0.31	0.32	0.39	0.41	0.45
Market (low voltage, non-household)	0.34	0.35	0.42	0.43	0.44
Universal service (households)	0.45	0.45	0.45	0.45	0.45
CROPEX base wholesale price	0.39	0.39	0.37	0.29	0.86

Source: Suppliers on the market (suppliers who are not under the universal service obligation)

The sharp rise in wholesale electricity prices on electricity exchanges does not immediately affect all final customers on the retail market. This is why suppliers procure electricity in the long-term, thus protecting the procurement side from price risk, while simultaneously concluding long-term agreements with final customers, for whom prices do not change during the term of the agreement. For example, it is possible to protect against price risk on HUDEX for coming multi-year periods (https://hudex.hu/en/market-data/power/daily-data#year). After the expiry of such agreements, final customers either end up in the public service or conclude agreements on the basis of new offers received from market suppliers.

During 2021, three suppliers offered contracts with dynamic electricity pricing; during 2021, agreements were concluded for a total of 695 billing metering points with an estimated annual consumption of 32.7 GWh. For such contracts, the wholesale hourly price from the day-ahead electricity exchange is directly reflected each month in the retail price of electricity.

Observations on the development of the retail market in 2021

In 2021, a total of eight suppliers were active on the retail market. Market participant ENERGIA GAS AND POWER d.o.o. was late in paying its obligations to system operators and HROTE, and the electricity market participation agreement with this supplier was terminated. The final customers of this supplier were transferred to the public service in accordance with the *Rules on electricity market organisation* in the event of the unplanned exit of a supplier from the market, thus ensuring uninterrupted supply to these final customers.

The sharp rise in wholesale electricity prices did not significantly affect the average consumer of electricity in 2021. Prices for the average household final customer remained unchanged, while prices for the average non-household final customer increased as compared to 2020 by 2% to 10%.[54]

However, non-household final customers whose long-term price-fixed supply contracts expired while wholesale prices were high were exposed to market offers for electricity at significantly higher prices. Large non-household final customers ended up on guaranteed supply. This is evident from the fact that the relative increase in the share of energy on guaranteed supply is significantly higher than the relative increase in the number of billing metering points. The share of energy on guaranteed supply in total non-household energy grew from an average of 6.4% in the first five months of 2021 to 14% at the end of 2021, while the number of billing metering points on guaranteed supply grew from December 2021 by 2.2% (or 1,952 billing metering points) as compared to January 2021. In Q4 2021, the price of electricity in the guaranteed supply was 2.2 times higher than the average annual price for non-household final customers. This indicates that some non-household final customers opted for prices in the guaranteed supply rather than choosing the prices market suppliers were able to offer.

Therefore, the sudden increase in electricity prices during 2021 did not impact all household and non-household final customers equally. The average household final customer in 2021 was not affected at all by the increase in wholesale prices. On the other hand, the sudden increase in wholesale prices of electricity did not affect all non-household final customers equally. Non-household final customers who had a valid long-term fixed-price electricity agreement during 2021 did not feel the impact of the increase in wholesale electricity prices in their bills. During 2022, some of these final customers were hit with the high prices of electricity offered them after their supply agreements expired.

Due to the significant increase in electricity prices, in March 2022, the Croatian government adopted a package of social measures[55] to protect and help vulnerable household final customers in terms of the availability of electricity and paying for the expenses of electricity. This package consists of:

- *The Regulation amending the Regulation on criteria for attaining the status of a vulnerable energy consumer in networked systems (Official Gazette no. 31/22*),
- *The Regulation on the monthly amount of charges for vulnerable energy consumers, the manner of participating in settling the costs of energy for beneficiaries of compensation and the actions of the Croatian Institute for Social Work (Official Gazette no. 31/22)*,
- *Decision on the implementation of measures to reduce the impact of the increase in energy prices on social service providers in the Republic of Croatia (Official Gazette no. 31/22)*,
- *Decision on the payment of a one-off cash benefit to pension beneficiaries in order to mitigate the consequences of the increase in energy prices (Official Gazette no. 31/22)*, and
- *Decision to adopt Amendments to the Plan for the use of financial assets obtained from the sale of emission units by auction in the Republic of Croatia from 2021 to 2025 (Official Gazette no. 84/19).*

At its 6 May 2022 session, the Croatian government adopted the Decision amending the Decision on the payment of a one-off cash benefit to pension beneficiaries in order to mitigate the consequences of the increase in energy prices (Official Gazette no. 53/22), which expanded the one-off cash benefit to pensioners with somewhat larger pensions (to HRK 4,100 inclusive from HRK 4,000 inclusive).

In order to assist household final customers in choosing their supply model, in accordance with CEER's recommendations, HERA published its Household Electricity Tariff Calculator on its website to allow a comparison of various electricity suppliers on the basis of household final customers' yearly consumption. The new **Electricity Market Act** introduced provisions related to "comparative tools", prescribing that household and non-household final customers with an expected annual consumption below 100,000 kWh must have free access to at least one tool to compare the offers of suppliers, including offers for supply agreements with dynamic electricity pricing. It also prescribes the requirements such tools must satisfy; supervision of the tools' compliance is performed by HROTE.

The three largest suppliers in Croatia in 2021 held 99% of the market share for supplying household final customers. The three largest suppliers in Croatia in 2021 held 93% of the market share for supplying non-household final customers.

The high share of suppliers within the HEP Group in the household (92%) and non-household (88%) categories indicates that market suppliers outside the HEP Group were not able to offer more competitive supply conditions or electricity prices for the average consumer than those offered by HEP-Opskrba d.o.o. and HEP ELEKTRA D.O.O in 2021. This indicates a small margin between wholesale purchase prices and retail prices for the average consumer in Croatia.

In such dynamic conditions, where the price of electricity changes rapidly, one option worth considering would be place a legal limit on the validity of offers to one week or less within the framework of public supply. According to the Electronic Public Procurement Classifieds (https://eojn.nn.hr/Oglasnik/), it is evident that the majority of suppliers outside HEP d.d. did not even apply to public tenders in the second half of 2021; the long validity period of offers is likely the cause of this, as this presents an unacceptable risk to smaller suppliers. This has an adverse effect on market competition in this part of the retail market.

Table 4.4.11. shows wholesale market development indicators in Croatia from 2017 to 2021 for household final consumers, while Table 4.4.12. shows indicators for non-household customers.

[55] *https://vlada.gov.hr/sjednice/107-sjednica-vlade-republike-hrvatske-35029/35029, accessed 15/4/2022.*

Table 4.4.11. Retail market development indicators in Croatia from 2017 to 2021 for household final customers

Indicator	2017	2018	2019	2020	2021
Total electricity consumption [TWh]	6.3	6.09	6.2	6.1	6.5
Average number of billing metering points	2,176,843	2,215,296	2,209,224	2,227,106	2,287,501
Number of registered electricity suppliers	18	16	13	12	11
Number of active electricity suppliers	11	12	9	6	7
Share of the three largest suppliers by BMP [%]	98%	99%	99%	99%	99%
Number of suppliers with market share >5%	2	2	2	2	3
Number of suppliers with share of consumers >5%	3	2	2	2	2
Number of completed supplier switches	57,972	54,348	19,783	14,716	9,439
Legal time limit necessary for supplier switch [days]	21	21	21	21	21
Average time necessary for supplier switch [days]	39	46	42	2.44	1.80
Number of electricity consumers supplied at a regulated price	0	0	0	0	0
HHI for sales	7,982	7,774	7,792	7,749	7,825
HHI for number of BMPs	8,306	8,238	8,221	8,222	8,208
Number of temporary disconnections due to non-payment	17,444	12,896	33,765	22,217	22,365
Average price of electricity (universal supply) [HRK/kWh]	0.45	0.45	0.45	0.45	0.45
Share of the three largest suppliers by energy [%]	97.67	99.07	99.21	99.20	99.23

Table 4.4.12. Retail market development indicators in Croatia from 2017 to 2021 for non-household final customers

Indicator	2017	2018	2019	2020	2021
Total electricity consumption [TWh]	9.71	10.02	10.29	9.47	9.71
Number of final customers	221,519	218,313	219,792	219,785	217,451
Number of registered electricity suppliers	18	16	13	12	11
Number of active electricity suppliers	11	12	9	7	8
Share of the three largest suppliers by energy [%]	87.31	94.72	97.23	93.60	92.6
Number of suppliers with market share >5%	3	2	2	2	2
Number of suppliers with share of consumers >5%	3	3	3	3	3
Number of completed supplier switches	31,066	31,384	20,857	18,760	13,936
Legal time limit necessary for supplier switch [days]	21	21	21	21	21
Average time necessary for supplier switch [days]	5	6	4	0.57	0.16
Number of electricity consumers supplied at a regulated price[56]	79,010	87,797	88,494	86,295	88,549
HHI for sales	5,618	6,627	7,172	6,282	6,432
HHI for number of BMPs	3,456	3,915	4,097	3,994	4,020
Number of temporary disconnections due to non-payment	21,655	4,364	8,313	5,457	4,396

[56] *Under guaranteed electricity supply.*

4.4.3 Electricity prices for final customers

Electricity prices in Croatia in 2021

Table 4.4.13. shows average electricity prices (excluding the network usage charge, other charges, and taxes) for end consumers on the electricity market (non-household consumers) and for end consumers within the universal supply (households) from 2016 to 2021.

Table 4.4.13. Average prices of electricity for final customers on the market (outside the universal service) and within the universal service (households) in the period from 2016 to 2021 [HRK/kWh]

Type of supply	2016	2017	2018	2019	2020	2021
Market (high and medium voltage)	0.33	0.31	0.32	0.39	0.41	0.45
Market (low voltage, non-household)	0.37	0.34	0.35	0.42	0.43	0.44
Universal service (households)	0.45	0.45	0.45	0.45	0.45	0.45

Source: Suppliers on the market

Table 4.4.14. shows the change in the average prices of tariff elements for electricity supply (supply charge – SC, energy single tariff – EST, energy higher tariff – EHT, energy lower tariff – ELT) by half-year in 2021 according to data from suppliers on the market (not including guaranteed supply and universal supply).

Table 4.4.14. Change in the price of electricity supply tariff elements by half-year in 2021 according to data from suppliers on the market (not including guaranteed supply and universal supply)

Category	Model		Tariff element	1	2	Change
Non-household	High voltage		SC	8.7792 HRK/pc	8.7409 HRK/pc	-0.44%
			EHT	0.4559 HRK/kWh	0.5678 HRK/kWh	24.54%
			ELT	0.2921 HRK/kWh	0.4023 HRK/kWh	37.73%
	Medium voltage		SC	9.4271 HRK/pc	9.4828 HRK/pc	0.59%
			EHT	0.4776 HRK/kWh	0.5397 HRK/kWh	13.00%
			ELT	0.3126 HRK/kWh	0.3649 HRK/kWh	16.73%
	Low voltage	Blue	SC	9.9345 HRK/pc	9.9272 HRK/pc	-0.07%
			EST	0.476 HRK/kWh	0.5043 HRK/kWh	5.95%
		White	SC	10.9062 HRK/pc	10.9494 HRK/pc	0.40%
			EHT	0.5017 HRK/kWh	0.5357 HRK/kWh	6.78%
			ELT	0.3359 HRK/kWh	0.3637 HRK/kWh	8.28%
		Red	SC	11.1351 HRK/pc	11.2591 HRK/pc	1.11%
			EHT	0.4805 HRK/kWh	0.5237 HRK/kWh	8.99%
			ELT	0.2944 HRK/kWh	0.3236 HRK/kWh	9.92%
		Yellow	SC	8.7802 HRK/pc	8.7409 HRK/pc	-0.45%
			EST	0.3633 HRK/kWh	0.3968 HRK/kWh	9.22%
Households	Low voltage	Blue	SC	22.3029 HRK/pc	22.6327 HRK/pc	1.48%
			EST	0.4352 HRK/kWh	0.4352 HRK/kWh	0.00%
		White	SC	18.7400 HRK/pc	19.3324 HRK/pc	3.16%
			EHT	0.4563 HRK/kWh	0.4561 HRK/kWh	-0.04%
			ELT	0.2496 HRK/kWh	0.2494 HRK/kWh	-0.08%
		Red	SC	24.7819 HRK/pc	26.0905 HRK/pc	5.28%
			EHT	0.4578 HRK/kWh	0.4578 HRK/kWh	0.00%
			ELT	0.287 HRK/kWh	0.280 HRK/kWh	-2.44%

Source: Suppliers on the market

The average total selling prices for final customers[57] by tariff category and voltage from 2016 to 2021 are shown in Table 4.4.15. Prices are calculated on the basis of average prices determined by applying tariff items for electricity transmission and tariff items for electricity distribution, as well as according to the supplier data.

Table 4.4.15. Average total selling prices of electricity for final customers from 2016 to 2021 [HRK/kWh]

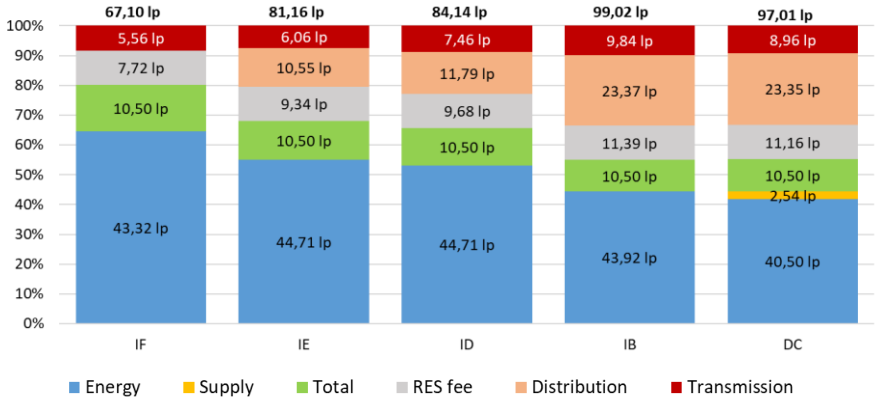
final customer category	2016	2017	2018	2019	2020	2021
Medium voltage consumers	**0.55**	**0.52**	**0.54**	**0.58**	**0.60**	**0.63**
Low-voltage consumers – non-household	0.73	0.68	0.70	0.75	0.77	0.79
Low-voltage consumers – households	0.78	0.78	0.78	0.78	0.79	0.79
Low-voltage consumers	**0.76**	**0.76**	**0.76**	**0.77**	**0.78**	**0.79**

Source: HEP-ODS, suppliers on the market

Table 4.4.16. shows the characteristics of typical end consumers in Croatia by EUROSTAT consumption category, while Figure 4.4.8. shows the structure of the total electricity price for typical end consumers, including all charges and taxes, by EUROSTAT consumption category.

Table 4.4.16. Characteristics of typical electricity final customers in Croatia in 2021

Final customer type	Consumption category	Consumption [MWh/yr]	Settled peak active power [MW]	Consumption ratio HT/LT[58] [%]	Category by tariff system
Very large non-household	*IF*	100,000	15.00	52/48	Non-household HV – White
Large non-household	*IE*	24,000	4.00	63/37	Non-household MV (35 kV) – White
Medium non-household	*ID*	2,000	0.50	63/37	Non-household MV (10 kV) – White
Medium non-household	*IB*	150	0.05	68/32	Non-household LV – Red
Medium households	*DC*	3.5		66/34	Households LV – White



Source: HOPS, HEP-ODS, HEP ELEKTRA, suppliers on the market

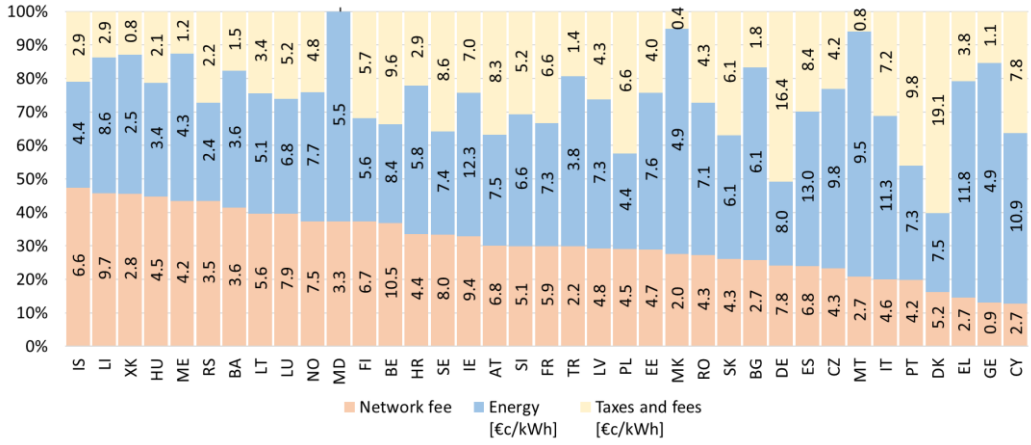
Figure 4.4.8. Structure of the total selling price of one kWh of electricity for average final customers in Croatia according to EUROSTAT consumption categories in 2021

[57] *The total selling price includes transmission and distribution network charges and the price of energy.*

[58] *Ratios taken from "4.4.1 Basic Features of Electricity Consumption".*

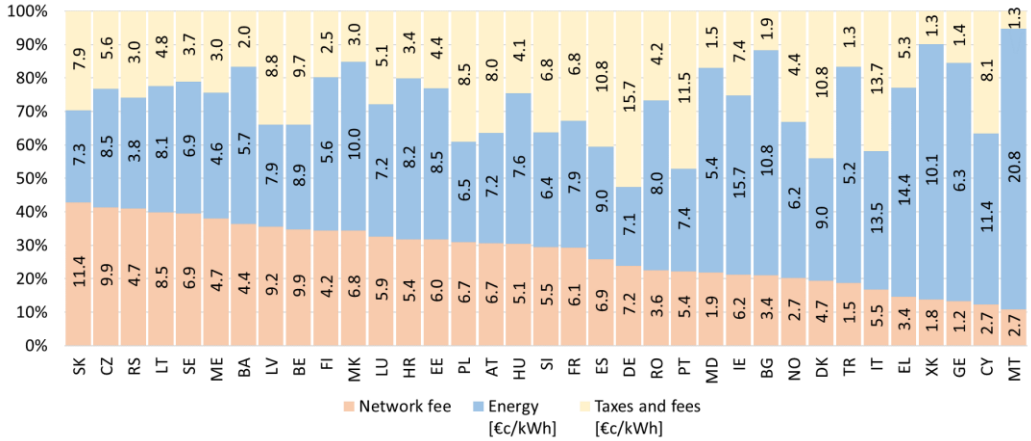
Electricity prices in European countries in 2021

Figures 4.4.9. to 4.4.15. show the structure of the total price of electricity in European countries for final customers in EUROSTAT's consumption categories *DC, IA, IB, IC, ID, IE, and IF*.



Source: EUROSTAT; data processing: HERA

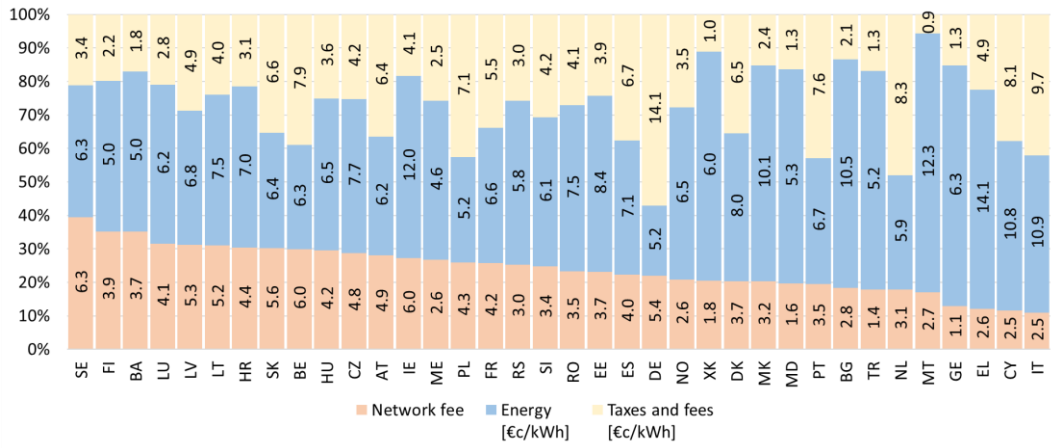
Figure 4.4.9 The structure of total electricity price in European countries for household final customers in the DC consumption category in 2021[59]



Source: EUROSTAT; data processing: HERA

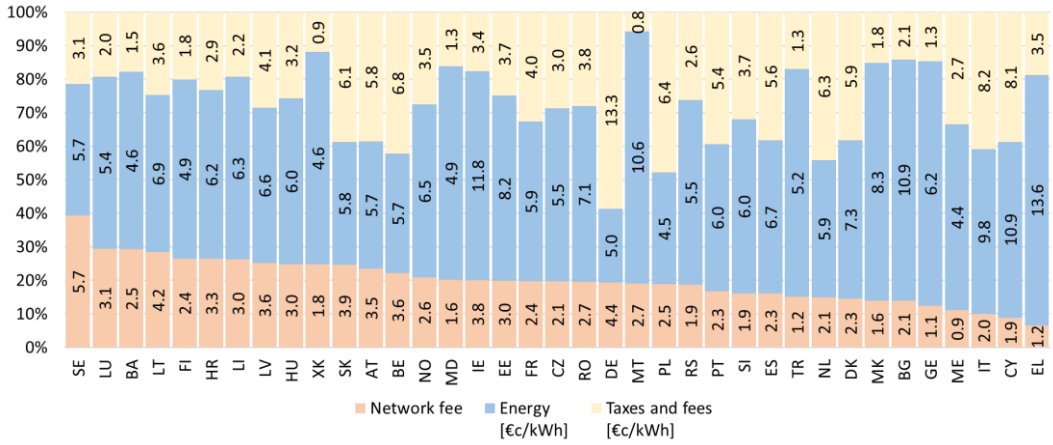
Figure 4.4.10. Structure of total electricity price in European countries for non-household final customers in the IA consumption category in 2021

[59] *ISO state and country codes: AL - Albania, AT - Austria, BA - Bosnia and Herzegovina, BE - Belgium, BG - Bulgaria, CY - Cyprus, CZ - Czech Republic, DK - Denmark, DE - Germany, EE - Estonia, EL - Greece, ES - Spain, FI - Finland, FR - France, GE - Georgia, HR - Croatia, HU - Hungary, IE - Ireland, IS - Iceland, IT - Italy, LI - Lichtenstein, LT - Lithuania, LU - Luxembourg, LV - Latvia, MD - Moldova, ME - Montenegro, MK - North Macedonia, MT - Malta, NL - Netherlands, NO - Norway, PL - Poland, PT - Portugal, RO - Romania, RS - Serbia, SE - Sweden, SI - Slovenia, SK - Slovakia, TR - Turkey, UA - Ukraine, UK - United Kingdom, XK - Kosovo.*



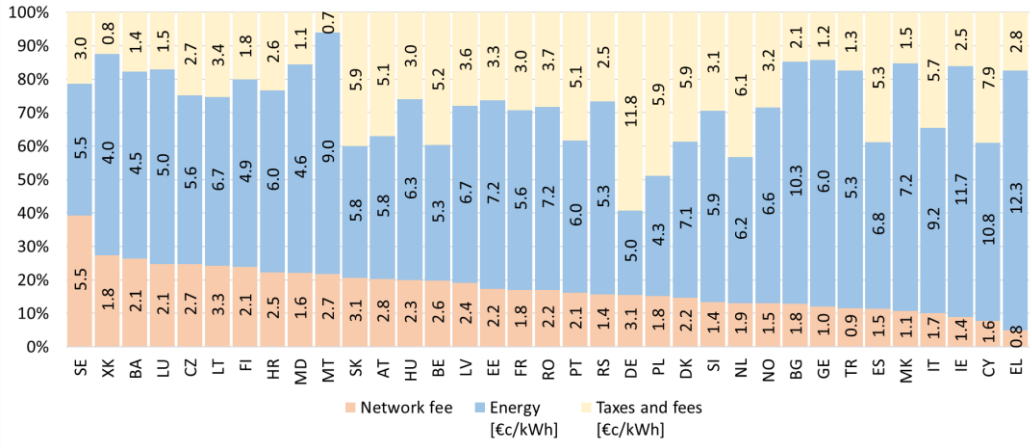
Source: EUROSTAT; data processing: HERA

Figure 4.4.11. Structure of total electricity price in European countries for non-household final customers in the IB consumption category in 2021



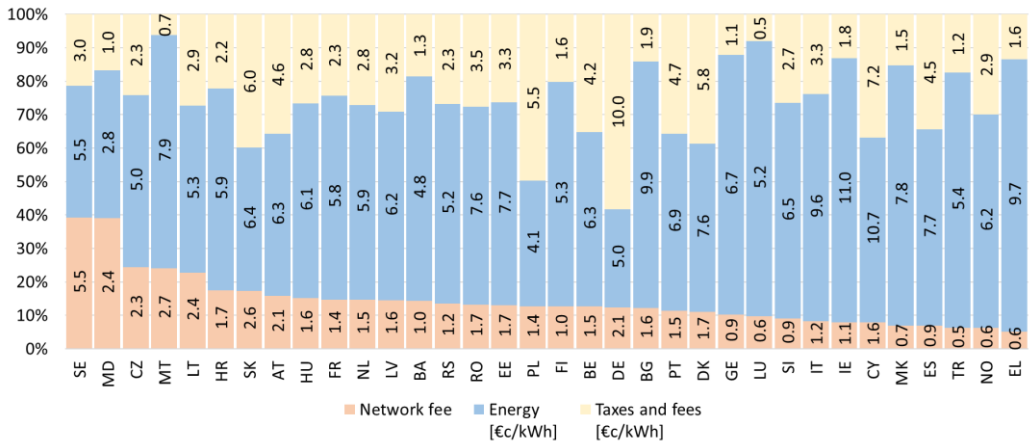
Source: EUROSTAT; data processing: HERA

Figure 4.4.12. Structure of total electricity price in European countries for non-household final customers in the IC consumption category in 2021



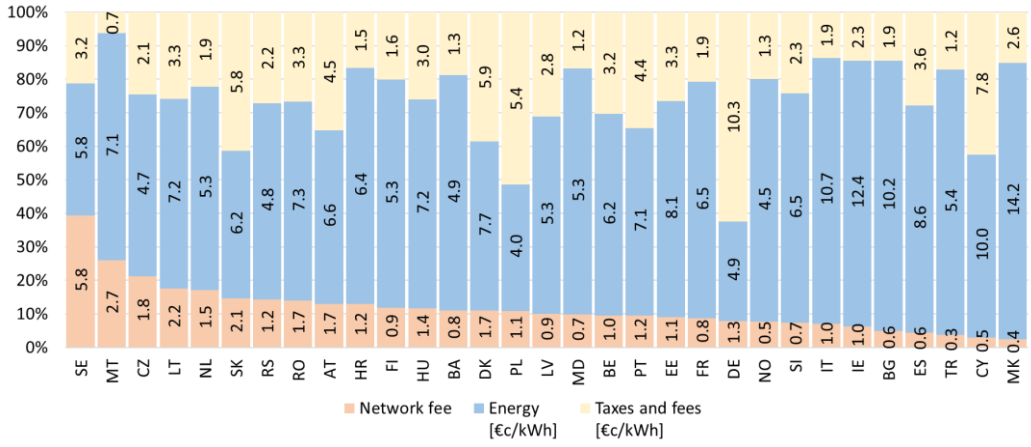
Source: EUROSTAT; data processing: HERA

Figure 4.4.13. Structure of total electricity price in European countries for non-household final customers in the ID consumption category in 2021



Source: EUROSTAT; data processing: HERA

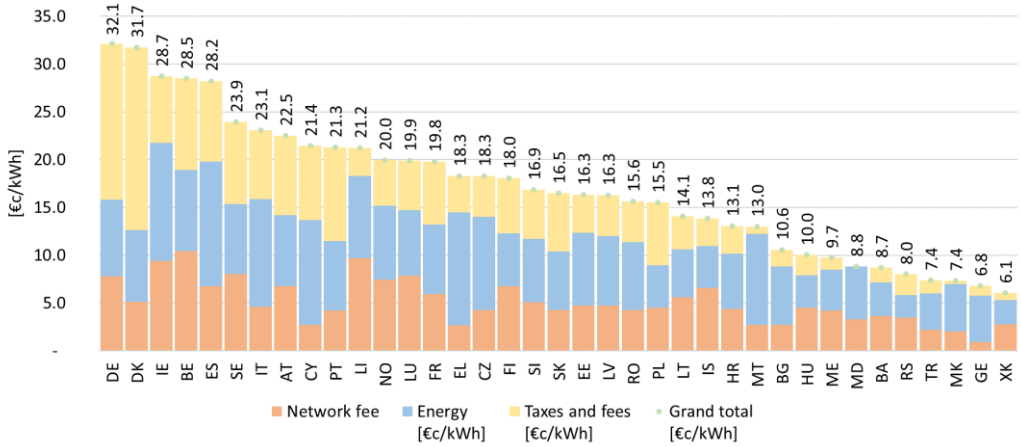
Figure 4.4.14. Structure of total electricity price in European countries for non-household final customers in the IE consumption category (tariff model White MV) in 2021



Source: EUROSTAT; data processing: HERA

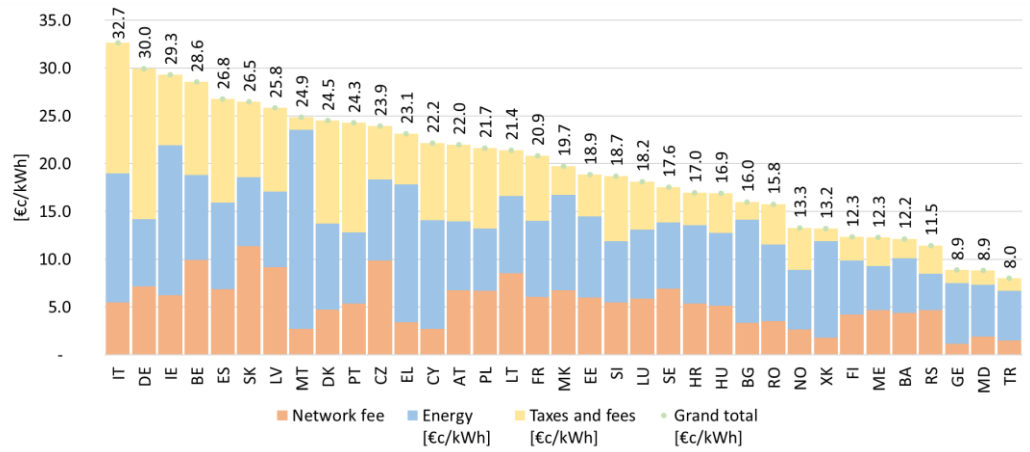
Figure 4.4.15. Structure of total electricity price in European countries for non-household final customers in the IF consumption category in 2021

Figures 4.4.16. to 4.4.22. show the structure of the total price of electricity in European countries for final customers in EUROSTAT's consumption categories *DC, IA, IB, IC, ID, IE,* and *IF*.



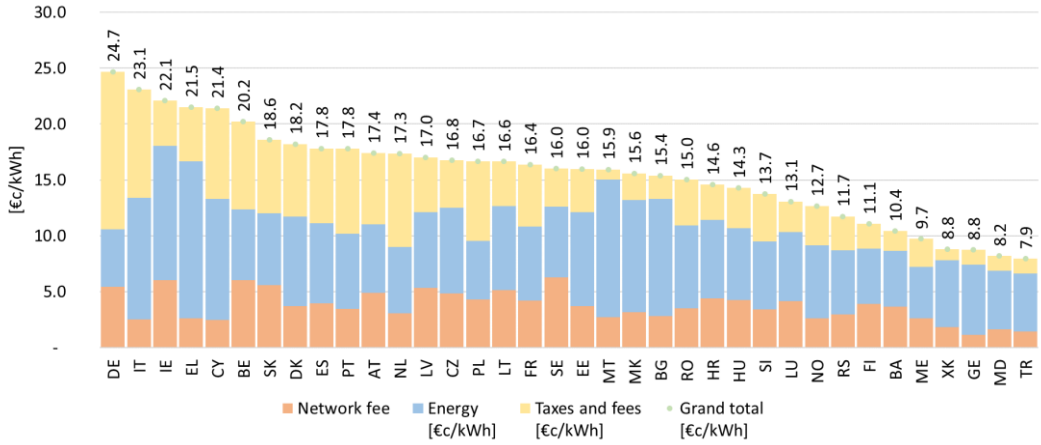
Source: EUROSTAT; data processing: HERA

Figure 4.4.16. Total electricity price in European countries for household final customers in the DC consumption category in 2021



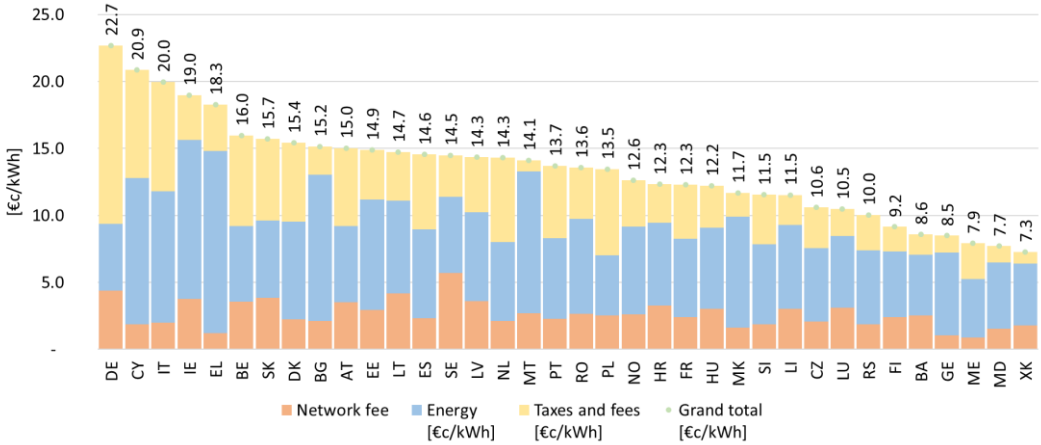
Source: EUROSTAT; data processing: HERA

Figure 4.4.17. Total electricity price in European countries for non-household final customers in the IA consumption category in 2021



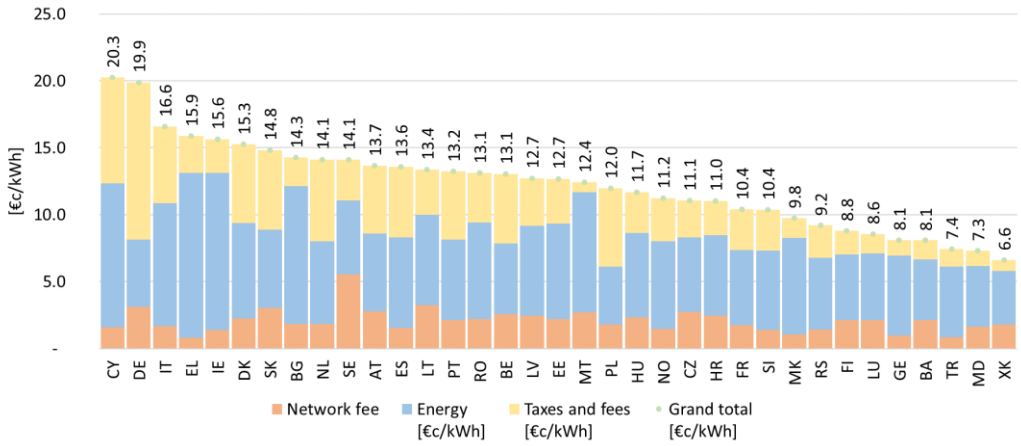
Source: EUROSTAT; data processing: HERA

Figure 4.4.18. Total electricity price in European countries for non-household final customers in the IB consumption category in 2021



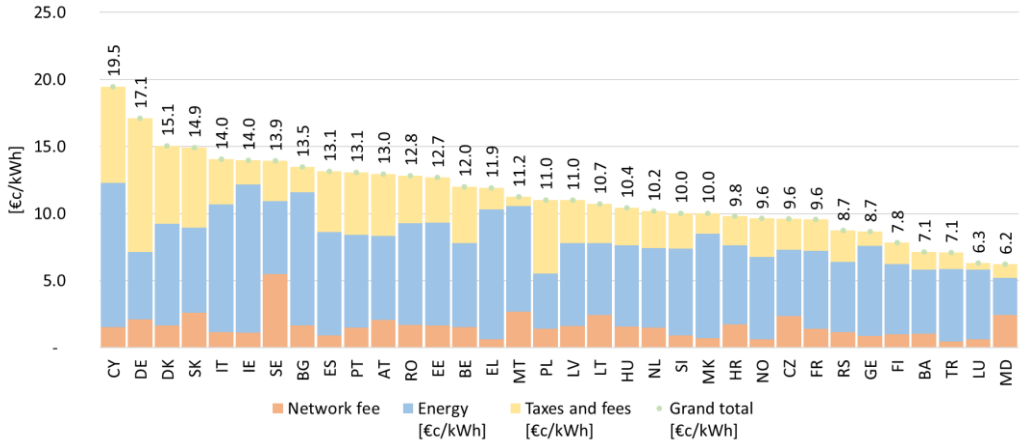
Source: EUROSTAT; data processing: HERA

Figure 4.4.19. Total electricity price in European countries for non-household final customers in the IC consumption category in 2021



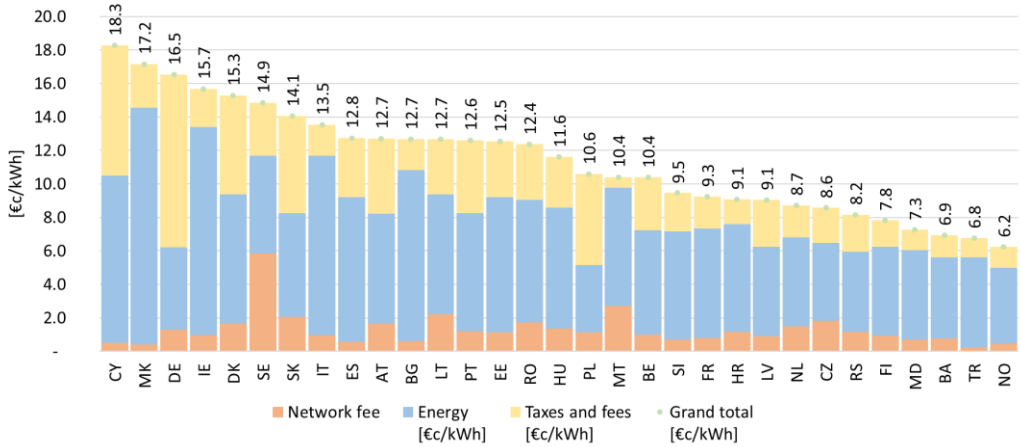
Source: EUROSTAT; data processing: HERA

Figure 4.4.20. Total electricity price in European countries for non-household final customers in the ID consumption category in 2021



Source: EUROSTAT; data processing: HERA

Figure 4.4.21. Total electricity price in European countries for non-household final customers in the IE consumption category in 2021



Source: EUROSTAT; data processing: HERA

Figure 4.4.22. Total electricity price in European countries for non-household final customers in the IF consumption category in 2021

Increased price of electricity as of 1 April 2022

The total sale price of electricity increased for household final customers as of 1 April 2022. The expenses of the average household end consumer in the universal service (around 90% of all household final customers) increased by HRK 15 per month on average for the "Blue" tariff model, or HRK 28 for the "White" tariff model, HRK 133 for the "Red" tariff model, and HRK 8 for the "Black" tariff model (Table 4.4.17.).

Table 4.4.17. Average increase in monthly electricity costs for household final customers in the universal supply

Tariff model	Average number of BMPs in 2021	Average annual consumption in 2021 [kWh]	Ratio of higher tariff item to lower tariff item	Total price [HRK/kWh]	Old monthly bill [HRK]	New monthly bill [HRK]	Difference [HRK]	Difference [%]
LV Household - Blue	706,785	2,077	-	1.191	191	206	15	8.1%
LV Household - White	1,575,615	3,222	66:34	1.082	262	291	28	10.8%
LV Household - Red	2,228	20,416	64:36	1.091	1,723	1,856	133	7.7%
LV Household - Black	2,873	2,157	-	0.621	103	112	8	7.9%

Source: HOPS, HEP-ODS, HEP ELEKTRA, suppliers on the market; data processing: HERA

Observations on electricity prices for final customers in 2021

Average electricity prices on the Croatian retail electricity market were generally higher in 2021 as compared to 2020.

The average price of electricity for households remained at the same level as in 2020.

The average sale prices of electricity for non-household end consumers increased significantly in the second half of 2021.

The total sale price of electricity increased for household final customers as of 1 April 2022.

4.4.4 Protection of network users and other subjects

Final customer submissions in the electricity sector in 2021

Table 4.4.18. shows the classification of consumer submissions resolved by HERA in the electricity sector in 2021, while Table 4.4.19. shows statistics on appeals and complaints resolved in the electricity sector.

Table 4.4.18. Classification of final customer submissions in the electricity sector resolved by HERA in 2021

Description	Number	Share [%]
Appeal	55	8%
Complaint	396	60%
Inquiry	154	23%
Other submissions	54	8%
Total:	659	100%

Source: HERA

Table 4.4.19. Statistics on appeals and complaints regarding electricity resolved by HERA in the electricity sector in 2021

Description	Number	Share
Records of grid users / buyers of electricity	30	6%
Loss of consumer status / network usage rights	34	5%
Quality of electricity supply	24	4%
Unauthorised consumption	4	1%
Other	16	20%
Right to use property not owned by energy entities	2	2%
Supplier switching	6	1%
Connection	162	28%
Temporary grid disconnection	37	7%
Change in contract/unit price of electricity	7	1%
Billing	121	22%
Termination of supply contract and conduct of sales representatives	8	2%
Total:	**451**	**100%**

Source: HERA

Most of the inquiries, complaints, and appeals resolved by HERA in 2021 related to connections (most of which during the issuance of EES and EOTRP, which can also be seen as an objection to the quality of service of the system operator) and to billing (primarily amount and metering data), temporary disconnection of electricity supply, and loss of customer status or the right to use the network. Regarding the situation with energy prices on the European market, by the end of 2021, seven complaints and appeals were resolved regarding the change of contractual provisions and unit prices of electricity.

The transmission and distribution system operator, as well as electricity suppliers are required to submit a quality of service report to HERA for 2021 in accordance with the *Conditions for the quality of electricity supply*; they are also required to publish quality of service indicators for final customers for the previous year on their website once yearly, thus enabling the systematic and transparent monitoring of the work of operators and suppliers in this important segment.

Based on the quality of service reports submitted by suppliers to HERA in 2021 by 15 April 2022,[60] statistics were prepared regarding complaints received regarding the work of suppliers (Table 4.4.20.).

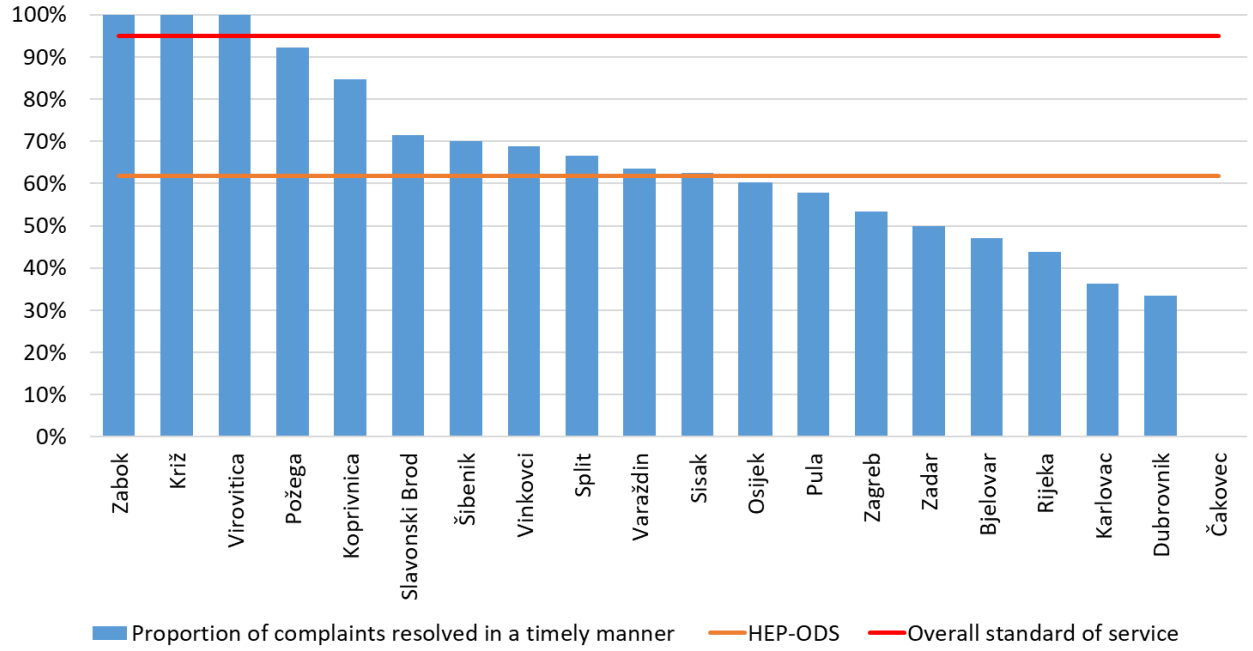
[60] *Reports were submitted in a timely fashion by Opskrba d.o.o., GEN-i Hrvatska d.o.o., HEP-Elektra d.o.o., HEP-Opskrba d.o.o., MET Croatia Energy Trade d.o.o., and PETROL d.o.o.; E.ON Energija d.o.o. submitted a report past the deadline, while Energia Gas and Power d.o.o. did not submit a quality of supply report.*

Table 4.4.20. Data on complaints regarding the work of electricity suppliers in 2020 and 2021

Subject of complaint	Number of complaints	
	2020	2021
Unfair commercial practice	22	6
Contracts and sales	1,898	2,332
Initial connection	0	1
Disconnection due to late payment or non-payment (suspension of electricity supply)	877	907
Calculation, collection, and debt claim proceedings	5,378	7,928
Tariff items	19	7
Compensation for damages	1	1
Supplier switching	7	0
Customer support	574	1
Other		437
Total:	**8,776**	**11,620**

Source: Electricity suppliers

In 2021, HEP-ODS received a total of 283 complaints. A total of 252 complaints were resolved, 152 of which were resolved in a timely manner. Figure 4.4.23. shows the share of complaints resolved in a timely manner in the total share of resolved complaints by distribution area in 2021, without network access complaints. HERA has stipulated that the aforementioned share must be greater than or equal to 95%. Only distribution areas where complaints were resolved are shown.



Source: HEP-ODS

Figure 4.4.23. Proportion of complaints resolved in a timely manner as compared to the overall standard of service by HEP-ODS distribution area and in the HEP-ODS system as a whole in 2021, not including network access complaints

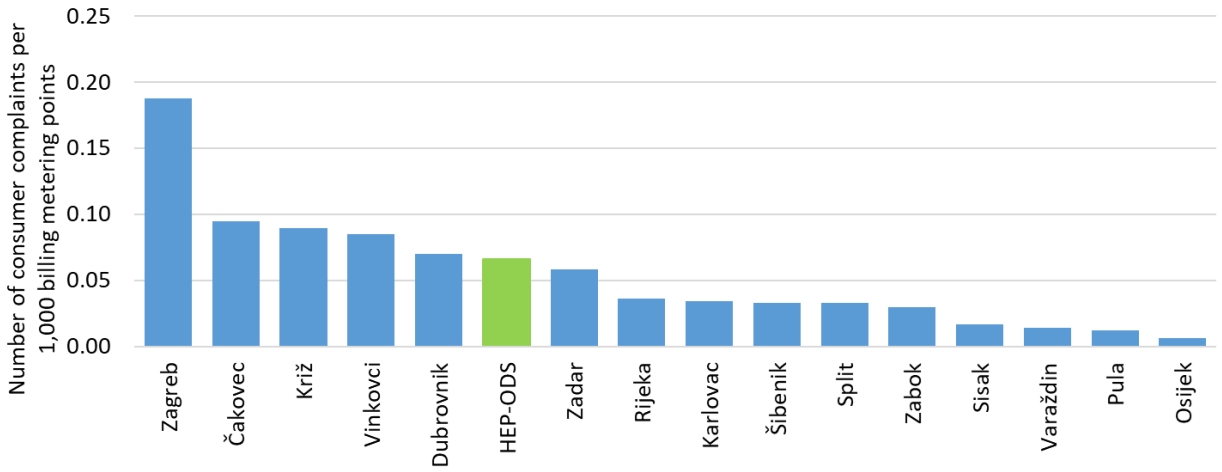
The figures above show that there has been an improvement, but that there are still differences among distribution areas in how the overall standard of service is fulfilled as regards the timely resolution of complaints; this results in HEP-ODS failing to fulfil the overall standard as a whole.

The work of the HEP-ODS Consumer Complaints Committee in 2021

The HEP-ODS Consumer Complaints Committee for consumers in HEP ODS' distribution areas was founded in accordance with the **Consumer Protection Act** (Official Gazette no. 41/14, 110/15, 14/19, and 19/22). Members of the committee are representatives of distribution areas and consumer associations.

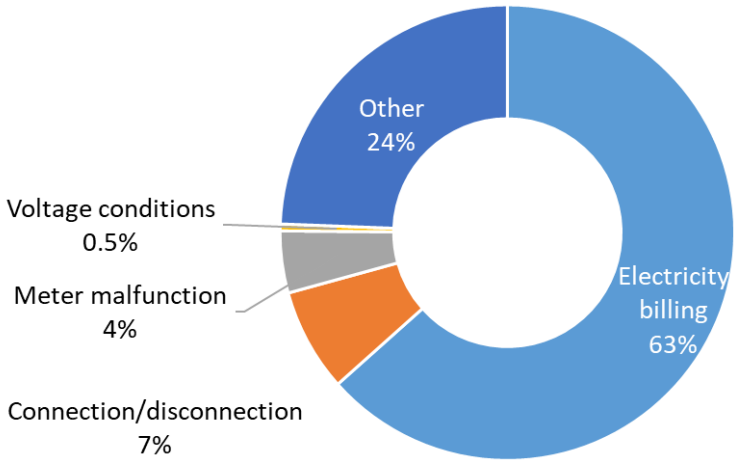
The Consumer Complaints Committee resolves complaints related to electricity billing, meter malfunction, connection/disconnection, voltage conditions, etc. HEP-ODS has ensured that inquiries, complaints, and appeals can be received and processed via e-mail.

Figure 4.4.24. shows the number of complaints per 1,000 billing metering points per distribution area, while Figure 4.4.25. shows the structure of consumer complaints resolved by HEP-ODS's distribution area consumer complaints committees in 2021. Only distribution areas where complaints were received are shown.



Source: HEP-ODS

Figure 4.4.24. Number of consumer complaints per 1,000 billing metering points by HEP-ODS distribution area in 2021

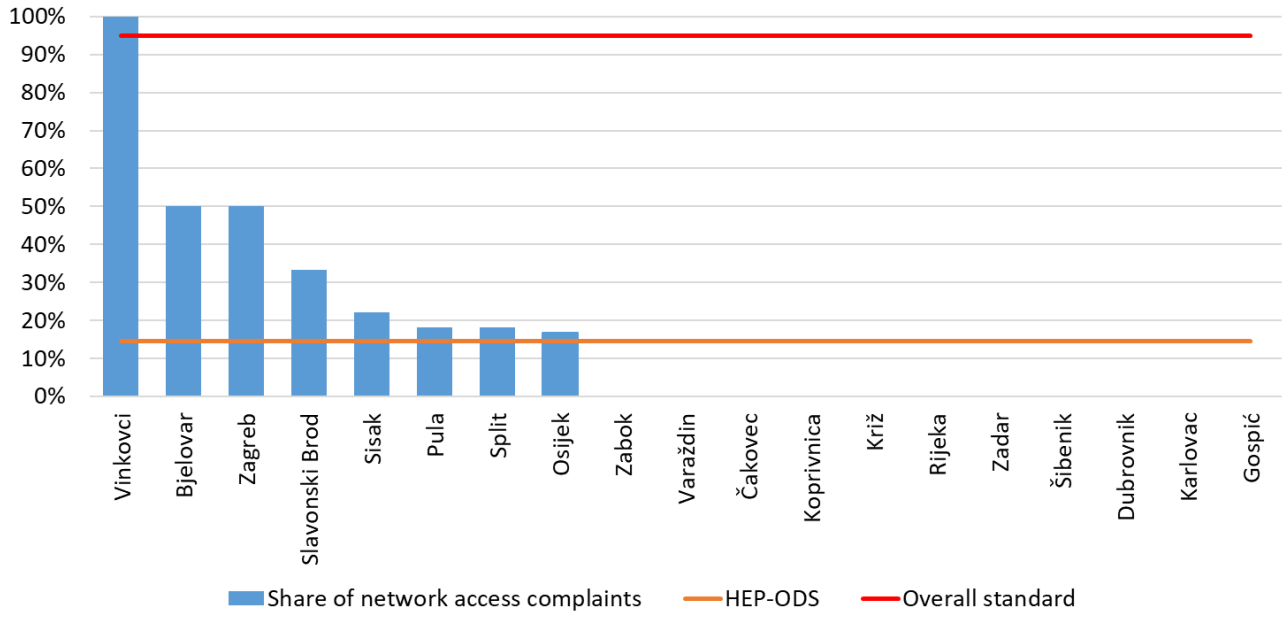


Source: HEP-ODS

Figure 4.4.25. Structure of complaints processed by HEP-ODS distribution area consumer complaints committees in 2021

Complaints from network users regarding network access are resolved by the centralised Appeals Processing Committee of HEP-ODS. This greatly standardises access to appeal resolution and the application of by-laws and regulations in all HEP-ODS distribution areas. In 2021, 124 complaints were received regarding network access, 18 of which HEP-ODS resolved in a timely manner. The largest number of complaints (44) were resolved in DA Pula. Figure 4.4.26. shows the share of network access complaints resolved in a timely manner

in the total share of resolved complaints by HEP-ODS distribution area in 2021. Only distribution areas where complaints were resolved in 2021 are shown.



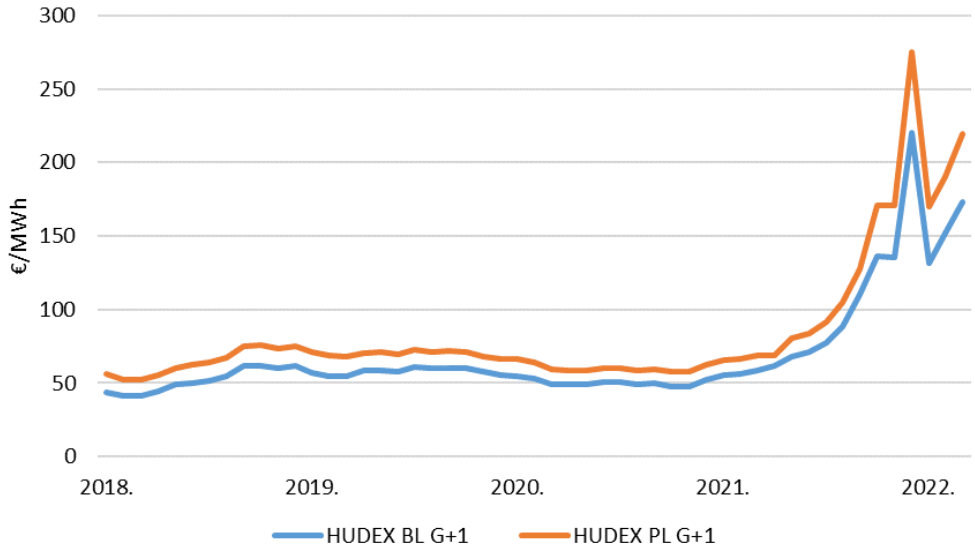
Source: HEP-ODS

Figure 4.4.26. Share of network access complaints resolved in a timely manner in the total share of resolved complaints by HEP-ODS distribution area in 2021

The figures above show that the general indicator of timely resolution of network access complaints is below the prescribed general standard of service, both for HEP-ODS as a whole and for all distribution areas except DA Vinkovci.

Measures to mitigate energy price increases in the European Union and Croatia in 2021 and 2022

At the end of 2021, there was a significant increase in the price of electricity on the European market. This resulted in manifold increases in prices on electricity exchanges and wholesale markets. Figure 4.4.27. shows trends in wholesale electricity prices on the Hungarian HUDEX exchange by month for year G+1.



Source: HUDEX

Figure 4.4.27. Trends in prices on the Hungarian HUDEX exchange by month for year G+1 (from 2018 to March 2022 inclusive)

High gas and electricity prices affected most member states, albeit to varying degrees and at different times. The relationship between wholesale and retail prices differs among member states, depending on regulation and the structure of final retail prices. The wholesale element (price of energy) usually comprises only 1/3 of the final price; other costs include transmission and distribution costs, taxes, and other duties.

EU member states' measures against the growth in energy prices and to mitigate the negative impact of high growth in energy prices in 2021 were primarily directed at the retail markets. Twenty member states implemented or plan to implement measures, often focused on mitigating impact on the most vulnerable groups, small businesses, and energy-intensive industries. This includes price caps and temporary tax breaks for vulnerable energy consumers or vouchers and subsidies for consumers and businesses. The majority of measures are aimed at protecting vulnerable consumers either directly or indirectly, and can be divided into:

1. support measures to vulnerable households through vouchers or other forms of direct support, and limiting disconnections,
2. protective measures such as reductions in tax, duties, and other levies related to energy bills, and
3. other measures.

The EC also issued "*Guidance on Application of Article 5 of the Electricity Directive*[61] *during current situation*",[62] which reminds member states of the possibility of deviating from market pricing principles. *Directive (EU) 2019/944* contains provisions under which member states may provide for public interventions into electricity supply prices to be carried out by national legislation, namely:

- Article 5.3., which allows member states to regulate retail energy supply prices to poor or vulnerable household customers, subject to special conditions in Article 5.4., in order to ensure they can afford to satisfy their basic energy needs, and
- Article 5.6., which allows intervention in determining retail prices for households and micro-enterprises during a given period in order to ease the transition to real market competition between suppliers. This derogation is subject to more specific conditions in Article 5.7., which differ from those applicable to regulated retail prices for energy for poor or vulnerable customers. Recital 23 of the *Directive*, which states the objective of Article 5, shows that it can be used to mitigate the consequences of especially high prices.

Thus, the EC supports (under certain conditions) measures including temporary interventions into retail prices in order to protect vulnerable customers and household customers during periods with exceptionally high prices, ensuring the continuation of a transition to a fully deregulated market and preventing serious disruption to the level of market competition attained so far for the aforementioned reasons. Which measures are most appropriate depends on the specific situation in each member state and the specific challenges they face.

On 16 February 2022, the Croatian government adopted a package of measures to mitigate the rise in energy prices worth HRK 4.8 billion. These measures included changes in the compensation system for socially disadvantaged customers and one-off benefits for pensioners. The scope of electricity and gas voucher users was significantly expanded, and the monthly voucher amount was increased from HRK 200 to HRK 400 for a period of one year. A special one-off allowance (energy allowance) was provided for over 721,000 pensioners with a monthly pension of up to HRK 4,000 in the amount of HRK 400 to 1,200, depending on the amount of their pension.

Additionally, at its 6 May 2022 session, the Croatian government adopted the *Decision amending the Decision on the payment of a one-off cash benefit to pension beneficiaries in order to mitigate the consequences of the increase in energy prices* (Official Gazette no. 53/22), which expanded the one-off cash benefit to pensioners with somewhat larger pensions (to HRK 4,100 inclusive from HRK 4,000 inclusive).

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61 *Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 concerning common rules for the internal market in electricity and amending Directive 2012/27/EU.*

62 *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS REPowerEU: Joint European Action for more affordable, secure and sustainable energy, COM(2022) 108 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A108%3AFIN and annexes.*

Observations on consumer protection in 2021

Most customer appeals and complaints resolved by HERA pertained to billing for electricity and grid connections. The majority of complaints resolved by the HEP-ODS Complaints Committee regarded billing and grid connections. The number of complaints about billing increased twofold, as did the percentage of adopted requests. The number of complaints regarding faulty meters decreased marginally. Complaints related to connections/disconnections decreased significantly as compared to the previous year. The number of complaints about voltage conditions also decreased. Viewed as a whole, the absolute number of complaints decreased; the number of complaints per 1,000 customers reduced significantly in nearly all distribution areas, as well as in HEP-ODS as a whole. However, indicators of the time needed to resolve complaints and appeals are unsatisfactory; HEP-ODS must invest additional efforts in this area.

As in previous years, suppliers received the largest number of complaints regarding billing calculation, collection, debt claim proceedings, as well as contracts and sales. The total number of complaints rose by one third. E.ON Energy is the supplier with the highest number of complaints recorded. Of the 11,620 complaints received, 8,589 (74%) were received by this supplier. As this supplier supplies roughly 5.7% of customer billing metering points and supplies roughly 2.7% of electricity in total, the disproportion between market share and the number of complaints received is significant, and efforts will be needed to eliminate the reasons for the complaints and reduce their number.

Timeliness and quality in terms of data delivery and publication on the website as per the *Conditions for the quality of electricity supply* in 2021 regarding achievements in 2020 were partly satisfactory.

In addition to the package of energy laws and by-laws, household final customers are also protected by the **Consumer Protection Act.**

Table 4.4.21. shows indicators of the position of household final customers in Croatia from 2017 to 2021.

Table 4.4.21. Indicators of the position of household final customers in Croatia from 2017 to 2021

Indicator	2017	2018	2019	2020	2021
Number of household final customers	2,223,119	2,220,180	2,240,916	2,263,628	2,266,847
Number of final customers supplied under the universal service	2,003,916	2,008,848	2,026,349	2,047,012	2,046,906
Number of working days in practice between debt notifications and temporary disconnection due to non-payment [days]	17.41	14.06	11.72	9.90	14.22
Number of temporary disconnections for household consumers due to non-payment	17,444	12,896	33,765	22,217	22,365
Number of BMPs with smart meters	-	66,612	149,436	270,818	299,195
Number of households with photovoltaic systems installed for self-supply	-	-	146	855	1,580

Source: HEP-ODS

4.5 Electricity production from renewable energy sources and high-efficiency cogeneration

4.5.1 Eligible electricity producers and the incentives system

Eligible electricity producers

Eligible producer status enables producers of electricity with plants using renewable energy sources and high-efficiency cogeneration (hereinafter: RES&HEC) priority in injecting[63] electricity into the grid and participation in the guarantees of origin system; this status is a requirement for participation in the incentives system for the production of RES&HEC energy as defined by the **Renewable Energy Sources and High-**

[63] *Determined in Article 34.2. of the Renewable Energy Sources and High-Efficiency Cogeneration Act.*

Efficiency Cogeneration Act. The status is acquired by the decision of HERA; for plants built as simple structures, this status is automatically acquired by exercising the right to permanent connection to the grid.

For wind power plants, hydroelectric power plants, and solar power plants, in 2021, HERA issued six decisions granting eligible producer status, two decisions transferring rights and obligations, and three prior approvals for planned changes. For thermal power plants, it also issued: five decisions awarding eligible producer status (two for biomass power plants, two for biogas power plants, and one for a landfill gas power plant); one decision denying the issuance of eligible producer status, two decisions amending decisions on eligible producer status, two decisions transferring rights and obligations from a decision on eligible producer status, one decision terminating a decision on eligible producer status, one decision extending a prior decision, one decision amending a prior decision on eligible producer status, two decisions halting the procedure of amending a prior decision on eligible producer status, six prior approvals for planned changes, and one decision rejecting a request for prior approval for planned changes to the conditions of use of a power plant.

Table 4.5.1. shows the number of decisions granting eligible electricity producer status issued by HERA in 2021, while Table 4.5.2. shows decisions granting eligible electricity producer status issued by HERA from 2007 to 2021.[64]

Table 4.5.1. Decisions granting eligible electricity producer status issued by HERA in 2021

Type of plant / primary energy source	No. of decisions issued	Plant capacity [MW]
Solar power plants	2	0.94
Hydroelectric power plants	2	49.8
Wind power plants	2	67.6
Biomass power plants	2	9.9
Geothermal power plants		
Biogas power plants	2	2
Cogeneration		
Other plants using renewable sources	1	1.2
Total:	11	131.44

Source: HERA

[64] *The data refers to decisions issued by HERA, and therefore the number and the total capacity of plants do not necessarily match the number of facilities in the incentives system (e.g. eligible producers who are not in the incentives system, integrated solar power plants which are not required to apply for a decision by HERA, etc.).*

Table 4.5.2. Decisions granting eligible electricity producer status issued by HERA from 2007 to 2021

Type of plant / primary energy source	Number of plants	Total capacity [MW]
Solar power plants	232	25.33
Hydroelectric power plants	41	2,145.31
Wind power plants	33	817.40
Biomass power plants	41	96.07
Geothermal power plants	1	10.00
Biogas power plants	44	50.65
Cogeneration	6	112.94
Other plants using renewable sources (landfill gas, gas from wastewater treatment plants, etc.)	2	3.70
Total:	400	3,261.41

Source: HERA

Incentives for the production of electricity from renewable energy sources and cogeneration

The system of electricity production from RES&HEC described in this chapter refers to a system of state incentives defined by the **Renewable Energy Sources and High-Efficiency Cogeneration Act** and previous tariff systems for the production of energy from RES&HEC. Although it may appear that electricity production is incentivised because incentives are paid on the basis of the electricity supplied (operational aid), it is essentially a system that encourages the construction of new power plants.

From 2007 to 2015, investors were able to obtain incentives on the basis of tariff systems for RES&HEC energy production via a feed-in system, in which HROTE paid eligible producers for electricity delivered at an incentivised price. However, the entry into force of the previous **Renewable Energy Sources and High-Efficiency Cogeneration Act** on 1 January 2016 introduced a new form of incentive based on public tenders. This framework was elaborated in greater detail in the *Regulation on promoting electricity production from renewable energy sources and high-efficiency cogeneration* (Official Gazette no. 116/18 and 60/20), on the basis of which the first agreements distributing state incentives were signed in 2021. Under this framework, which was improved in the new **Renewable Energy Sources and High-Efficiency Cogeneration Act** adopted in late 2021, investors apply to HROTE's public tenders with projects listing the *reference value* of electricity—the purchase price necessary for return on investment. HROTE's public tender defines quotas (the total capacity of plants for which a corresponding agreement can be signed) by individual group of plant (groups of plants differ by type of renewable energy source and capacity); for each group, the maximum reference price that can be offered is defined. **The Renewable Energy Sources and High-Efficiency Cogeneration Act** foresees incentives via long-term market premium agreements and fixed-price electricity purchase agreements. Market premium agreements allow producers to receive a premium in addition to revenues from the sale of electricity and the sale of related guarantees of origin of electricity on the market. The premiums HROTE pays out should make up the difference between the revenue needed for return on investment and expected revenues from the sale of electricity on the market (which is assumed to be lower). Incentivising through guaranteed purchase prices is similar to the previous feed-in system of incentives, as HROTE buys the delivered electricity at an incentivised price. However, as opposed to the earlier system in which purchase prices were defined in advance in tariff systems for electricity production from RES&HEC, individual incentive agreements with a guaranteed price list the purchase price the investor stated in the public tender (their reference price at the public tender).

The Regulation on quotas for promoting electricity production from renewable energy sources and high-efficiency cogeneration stipulates the total connection capacity (total quota) of all groups of plants for which the electricity market operator can issue a tender for the allocation of market premiums/guaranteed purchase price (Table 4.5.3.). The total quota for all such plants amounts to 2,265 MW.

Table 4.5.3. Total quota by groups of plant type for the incentivised production of electricity from renewable energy sources and high-efficiency cogeneration

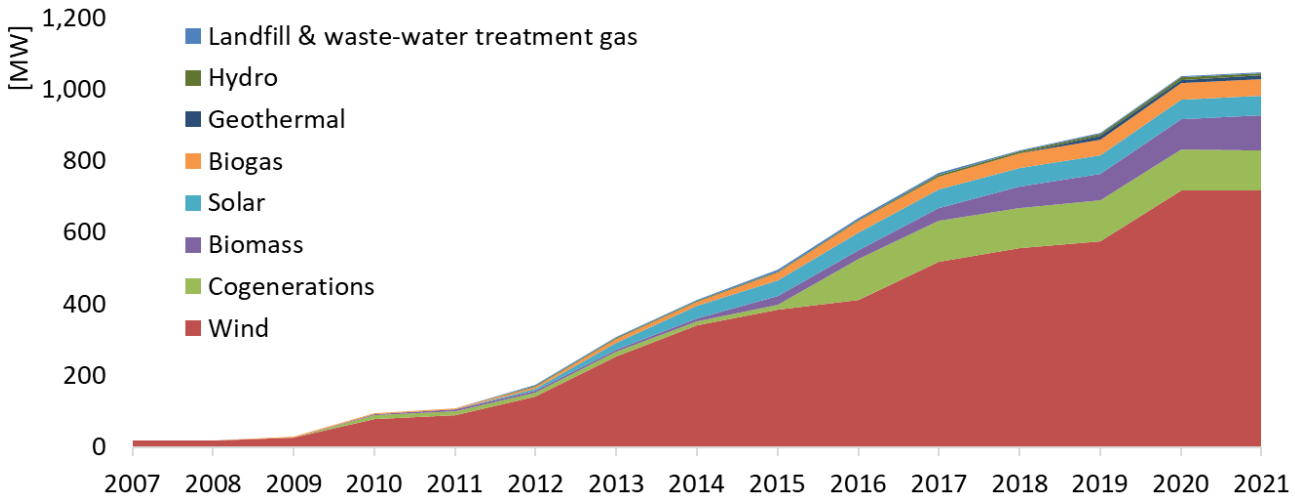
Groups of plants	Classification of plants depending on the primary energy source and installed capacity	Quota [MW]
a.2	Solar power plants with installed capacity from 50 kW to 500 kW inclusive	210
a.3	Solar power plants with installed capacity from 500 kW to 10 MW inclusive	240
a.4	Solar power plants with installed capacity greater than 10 MW	625
b.1	Hydroelectric power plants with installed capacity up to 50 kW inclusive	4
b.2	Hydroelectric power plants with installed capacity from 50 kW to 500 kW inclusive	10
b.3	Hydroelectric power plants with installed capacity from 500 kW to 10 MW inclusive	10
c.4	Wind power plants with installed capacity greater than 3 MW	1,050
d.2	Biomass power plants with installed capacity from 50 kW to 500 kW inclusive	6
d.3	Biomass power plants with installed capacity from 500 kW to 2 MW inclusive	20
d.4	Biomass power plants with installed capacity from 2 MW to 5 MW inclusive	15
e.2	Geothermal power plants with installed capacity greater than 500 kW	20
f.2	Biogas power plants with installed capacity from 50 kW to 500 kW inclusive	15
f.3	Biogas power plants with installed capacity from 500 kW to 2 MW inclusive	30
	Innovative technologies in accordance with the classification of plants from energy approvals which have received development support from the European Union	10

Source: Official Gazette

On the basis of this *Regulation*, in November 2020, HROTE issued the first public tender for the allocation of market premiums or guaranteed purchase price for incentivised electricity production from renewable energy sources. On the basis of this tender, 68 agreements were concluded with a guaranteed purchase price for power plants with a total capacity of 16.73 MW and 9 agreements with a market premium for power plants with a total capacity of 13.54 MW—for plants with a total connection capacity of 30.27 MW. Of these agreements, the payment of the guaranteed purchase price has begun for six built plants with a total connection capacity of 2.8 MW.

In 2021, there were no new tenders for the allocation of quotas. On 30 March 2022, HROTE issued a public call for bids for incentivised electricity production from renewable energy sources through the market premium system. The total quota for new projects in this call amounted to 630 MW, which is roughly 60% of the current portfolio run by HROTE in the incentives system. The call is open for solar power plants larger than 500 kW, hydroelectric power plants from 500 kW to 10 MW inclusive, wind power plants larger than 3 MW, biomass power plants from 500 kW to 5 MW inclusive, biogas power plants from 500 kW to 2MW inclusive, and geothermal power plants larger than 500 kW.

Figure 4.5.1. shows the gradual entry of plants into the incentives system since its introduction in 2007, while Table 4.5.4. shows basic indicators related to the incentives system.



Source: HROTE

Figure 4.5.1. Installed capacity of plants in the incentives system from 2007 to 2021 by type of plant

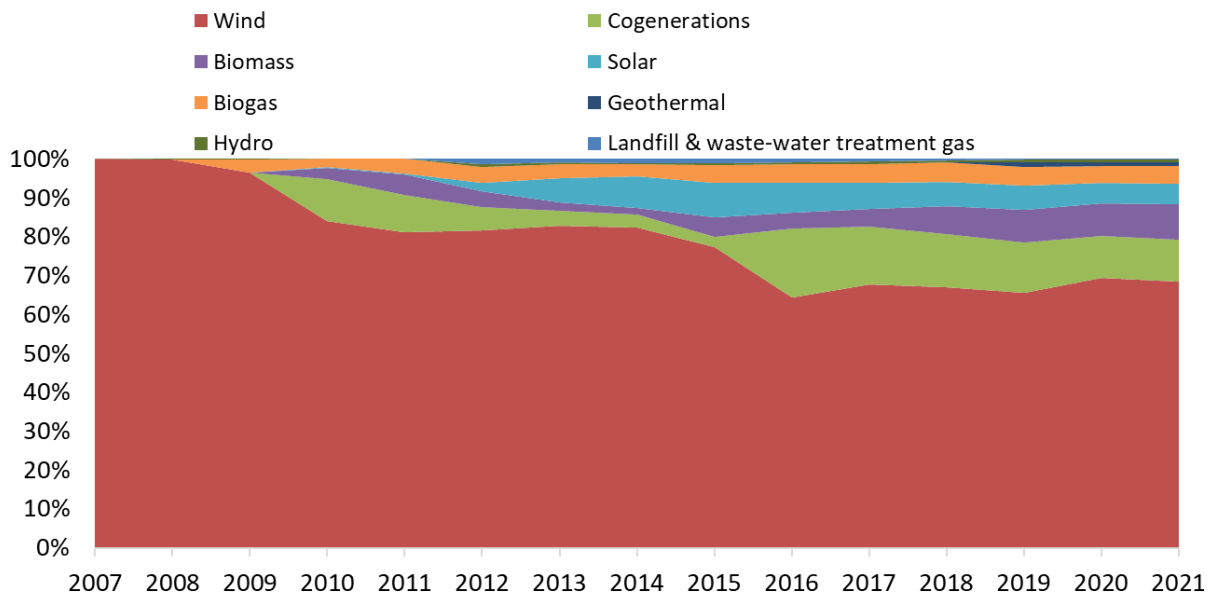
Table 4.5.4. Generation and paid incentives to eligible producers in 2021 by type of plant

Type of plant / primary energy source	Number of plants	Installed capacity [MW]	Share of installed capacity	Electricity production [MWh]	Share of production	Incentives paid (without VAT) [mil. HRK]	Share of disbursements
Solar power plants	1,234	55.9	5.3%	74,660	2.1%	141.60	4.2%
Hydroelectric power plants	15	6.4	0.6%	28,908	0.8%	28.65	0.9%
Wind power plants	26	717.8	68.4%	1,819,514	52.1%	1,444.15	43.3%
Biomass power plants	41	96.1	9.2%	592,365	17.0%	835.49	25.1%
Geothermal power plants	1	10.0	1.0%	74,650	2.1%	118.02	3.5%
Biogas power plants	42	46.9	4.5%	363,016	10.4%	478.80	14.4%
Power plants fuelled by landfill gas and gas from waste-water treatment plants	1	2.5	0.2%	17	0.0%	0.01	0.0%
Cogeneration	6	113.3	10.8%	540,855	15.5%	287.52	8.6%
Total:	**1,366**	**1,048.8**	**-**	**3,493,986**	**-**	**3,334.24**	**-**

Source: HROTE

In 2021, a total of 12 agreements to buy electricity produced using renewable energy sources and cogeneration (incentives system) were activated at a total capacity of 15.4 MW (seven solar power plants, two biomass power plants, two biogas power plants, and one hydroelectric power plant), one agreement with a 2.5 MW wind power plant was terminated (at the request of the eligible producer), and one agreement for a 9.6 MW wind power plant expired. Only six biomass plants with a total installed capacity of 10.5 MW are waiting to be started permanently, for which purchase agreements have been concluded pursuant to the Tariff System from 2012 and 2013. After the launch of these plants, only electricity purchase agreements with a guaranteed price and market premium agreements remain inactivated.

Shares of installed capacity in the incentives system by plant type and by year are shown in Figure 4.5.2.



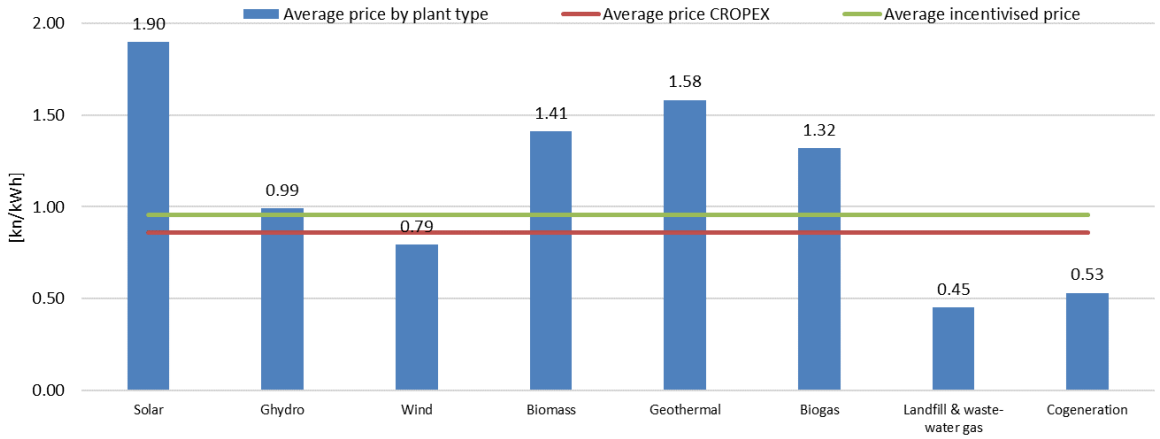
Source: HROTE

Figure 4.5.2. Installed capacity of plants in the incentives system from 2007 to 2021 by plant type

The total installed capacity of all eligible producers in the incentives system in 2021 amounted to roughly 1,048.8 MW. Wind power plants retained the largest share in this capacity at 68.4%.

All installed production capacities for renewable energy sources and cogeneration in the incentives system in 2021 produced around 3.5 TWh (including test mode), which represents an increase of 6.3% as compared to the previous year. Wind power plants comprise the largest share of this production, with total production of around 1.8 TWh (52%), followed by biomass with around 0.6 TWh (17%) and high-efficiency cogeneration with 0.54 TWh (15.5%). Biogas is in fourth place with 0.36 TWh (10.4%).

Figure 4.5.3. shows average prices for delivered electricity by plant type in the incentives system and in total for all types as compared to the annual average price of electricity on the day-ahead market on CROPEX in 2021 (HRK 0.86/kWh). The average incentivised price amounted to HRK 0.95, while the highest incentivised price (HRK 1.90/kWh) was paid for electricity from solar power plants; the lowest incentivised price was for electricity from landfill gas power plants (HRK 0.45/kWh). The average incentivised price paid for electricity from wind power plants amounted to HRK 0.79/kWh.



Source: HROTE, HNB, CROPEX

Figure 4.5.3. Weighted average buy-off price of electricity in the incentives system by plant type in 2021.

In 2021, HROTE bought off electricity from eligible producers in the incentives system using funds collected on the following bases:

- in the Republic of Croatia, the fee for incentivising RES&HEC is HRK 0.105/kWh for all customers; for electricity buyers who must obtain greenhouse gas emissions permit in accordance with the law governing air protection, the fee for incentivising RES&HEC is HRK 0.021/kWh. Certain energy-intensive customer categories of customers are entitled to a reduced fee for incentivising RES&HEC according to the electrical intensity classes;
- all suppliers must buy off 40% of electricity generated in the incentives system at the regulated price of HRK 0.42/kWh in an amount proportional to their share in total electricity delivered to consumers. Electricity generated in eligible producer plants is allocated to suppliers in two ways:
  - by allocating realised quantities of electricity from the previous period via buy-off schedules (with a time shift of three months) for all other suppliers, and (exceptionally);
  - by allocating planned day-ahead values for HEP ELEKTRA d.o.o. and HEP-Opskrba d.o.o.
- revenues from the sale of 60% of electricity produced from renewable energy sources and cogeneration on CROPEX by the EKO balance group;
- revenues from the sale of guarantees of origin of electricity produced by eligible producers in the incentive system sold on CROPEX through the EKO balance group; and
- revenues from the membership of eligible producers with capacity greater than 50 kW that are in the incentives system in the EKO balance group.

The new **Renewable Energy Sources and High-Efficiency Cogeneration Act** expands the collection of funds for incentives to:

- funds raised from CO_2 emissions trading,
- charges for imported electricity produced from fossil fuel power plants in third countries,
- charges for the issuance of energy approvals, and
- funds collected through statistical transfers between Croatia and EU member states.

Table 4.5.5. shows HROTE's revenues and expenditures related to the incentives system and the operation of the EKO balance group in 2021.

Table 4.5.5. Revenues and expenditures related to the incentives system [mil. HRK]

Income/expenses	2018	2019	2020	2021
Incentives system income	2,645.00	2,789.92	2,691.63	3,591.42
Income from final customers of electricity (from RES&HEC fees)	1,602.34	1,598.65	1,487.08	1,577.95
Income from the sale of electricity from the incentives system to suppliers	1,042.66	847.38	552.27	586.99
Income from the sale of electricity on the market	-	315.31	612.64	1,379.82
Income from the sale of guarantees of origin	-	3.08	10.86	14.07
Income from charges paid by members of the EKO balance group	-	25.50	28.59	32.50
Income from interest earned			0.19	0.09
Incentives system expenses	2,187.42	2,723.47	3,063.38	3,397.49
Cost of electricity bought from eligible producers	2,176.32	2,667.11	3,038.82	3,334.24
Costs of financing HROTE's activities in the RES&HEC incentives system and the EKO balance group	11.10	11.00	12.60	9.69
Balancing energy costs	-	45.36	11.96	53.56
Difference in income and expenditures on an annual basis	**457.58**	**66.45**	**-371.75**	**193.93**

Source: HROTE

In accordance with the *Regulation on the share of net electricity delivered by eligible producers that electricity suppliers are obligated to take up from the electricity market operator*, in 2021, electricity suppliers were obligated to take up from HROTE 40% of net delivered electricity from eligible producers. In late 2021, the Croatian government adopted a new regulation increasing this share to 60% as of 1 January 2022.

Due to the Covid-19 pandemic, in order to reduce the risk of businesses losing market competitiveness due to the expense of paying for RES&HEC charges, in 2020, the Croatian government adopted the *Regulation on criteria for paying a reduced charge for renewable energy sources and high-efficiency cogeneration allowing particular customers to pay reduced charges* (Official Gazette no. 57/2020) (energy-intensive industry). The reduced charge is in accordance with electrical intensity categories.[65] A percentage in charge reduction is defined for each category. Of a total of 69 requests to reduce charges, 65 businesses received the right to a reduction, of whom 13 were in the 40% category, 28 were in the 60% category, and the remaining 24 were in the 80% category.

Observations on eligible producers and the incentive system

Considering the significant increase in energy prices in late 2021, the average weighted price of electricity in 2021 paid to eligible producers in the incentives system was 11% higher than the yearly average price of electricity on the CROPEX day-ahead market. During this same time period, the price of electricity on CROPEX tripled.

During the first half of the year, HROTE's revenues used for payments into the incentives system were insufficient to cover all financial obligations in the incentives system, however, reserves from the previous period were sufficient to maintain liquidity. The growth in electricity prices in the second half of the year enabled significantly better cash flows in the second half of the year, which ended with a positive balance.

Plants in the incentives system using renewable energy sources and high-efficiency cogeneration have continued to show growth in energy production.

Considering the market premium agreements and electricity purchase agreements at a guaranteed price already concluded, as well as HROTE's March 2022 public tender, the construction of new plants and the continued increase in production of electricity from renewable energy sources and high-efficiency cogeneration is expected, which will result in an increase in the funds needed to pay incentives.

In March 2020, the *Regulation on quotas for promoting electricity production from renewable energy sources and high-efficiency cogeneration* (Official Gazette no. 57/20) and the *Regulation on amendments to the Regulation on promoting electricity production from renewable energy sources and high-efficiency cogeneration (Official Gazette no. 60/20) were passed. The Regulation on quotas* stipulates a large quota (2,265 MW) for the new incentives system (market premiums and purchase at guaranteed price). The explanatory memorandum to the draft *Regulation* states that the quotas have been defined with the **Strategy** and the NECP in mind, however these quotas are higher than the targets for 2030 listed in the two documents.

In accordance with these regulations, in November 2020, HROTE issued the first public tender for the allocation of market premiums or guaranteed purchase price for incentivised electricity production from renewable energy sources. The total quota for the public tender was 88 MW, and agreements were concluded for roughly 30 MW. A total of 72 MW was up for bid in this public tender, which amounts to 29% of the total quota for guaranteed purchase (245 MW); a total of 16 MW was up for bid for market premium agreements, which is less than 1% of the total quota for market premiums (2,020 MW). In late March 2022, HROTE issued a public call for bids for incentivised electricity production from renewable energy sources exclusively through the market premium system for a total of 630 MW. It is apparent that the first tender placed an emphasis on incentives through guaranteed purchase price, while the second placed an emphasis on incentives through market premiums.

4.5.2 Construction and usage of plants that use renewable energy sources and cogeneration

Register of renewable energy sources and cogeneration, and eligible producers

The Register of Renewable Energy Sources and Cogeneration, and Eligible Producers (hereinafter: RES&C Register) is a unified register of renewable energy and high-efficiency cogeneration projects, plants using

[65] *R1: electrical intensity from 5% to 10% inclusive - right to a reduction in charges by 40% or HRK 0.063/kWh, R2: electrical intensity from 10% to 20% inclusive - right to a reduction in charges by 60% or HRK 0.042/kWh, R3: electrical intensity greater than 20% - right to a reduction in charges by 80% or HRK 0.021/kWh.*

renewable energy sources, high-efficiency cogeneration plants, and eligible producers operating in Croatia. It is established and maintained by the Ministry in order to monitor and supervise the implementation of projects involving renewable energy sources and high-efficiency cogeneration and to provide administrative support to project operators, as well as public and legal entities.

The Register is published on the Ministry's website at https://oie-aplikacije.mzoe.hr/Pregledi/ (Figure 4.5.4.) along with an interactive map of Croatia containing the locations of all plants entered into the Register, accessible at https://oie-aplikacije.mzoe.hr/InteraktivnaKarta/ (Figure 4.5.5.).

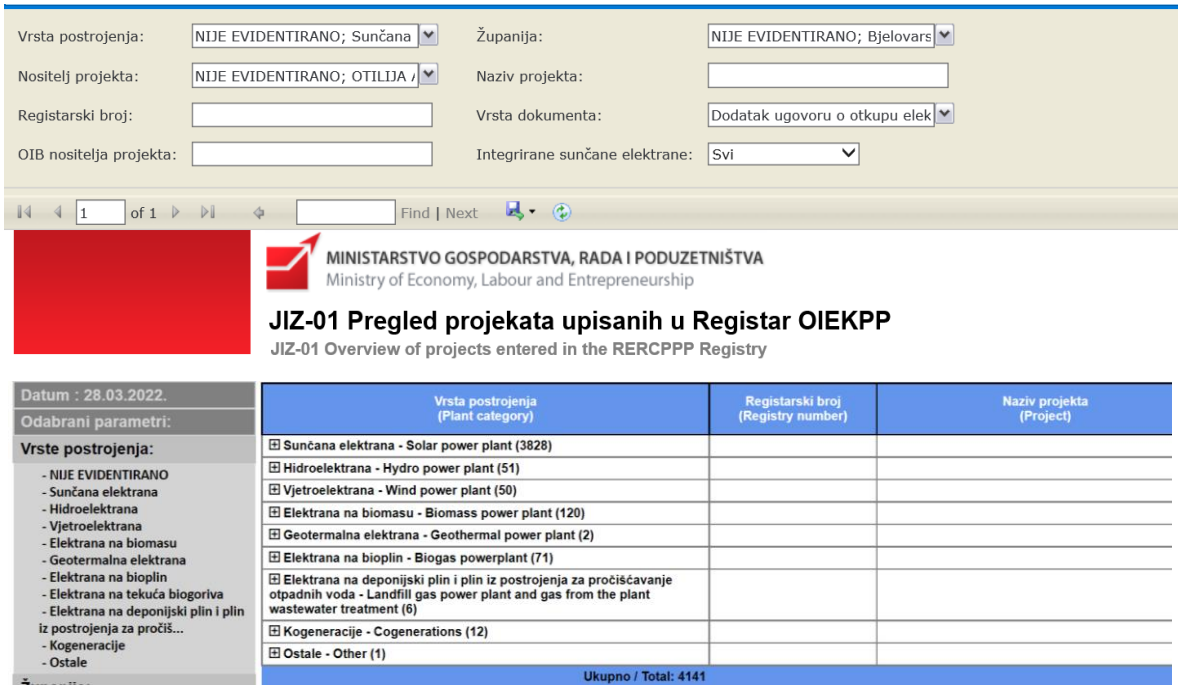


Figure 4.5.4. Review of data from the Register, https://oie-aplikacije.mzoe.hr/Pregledi/

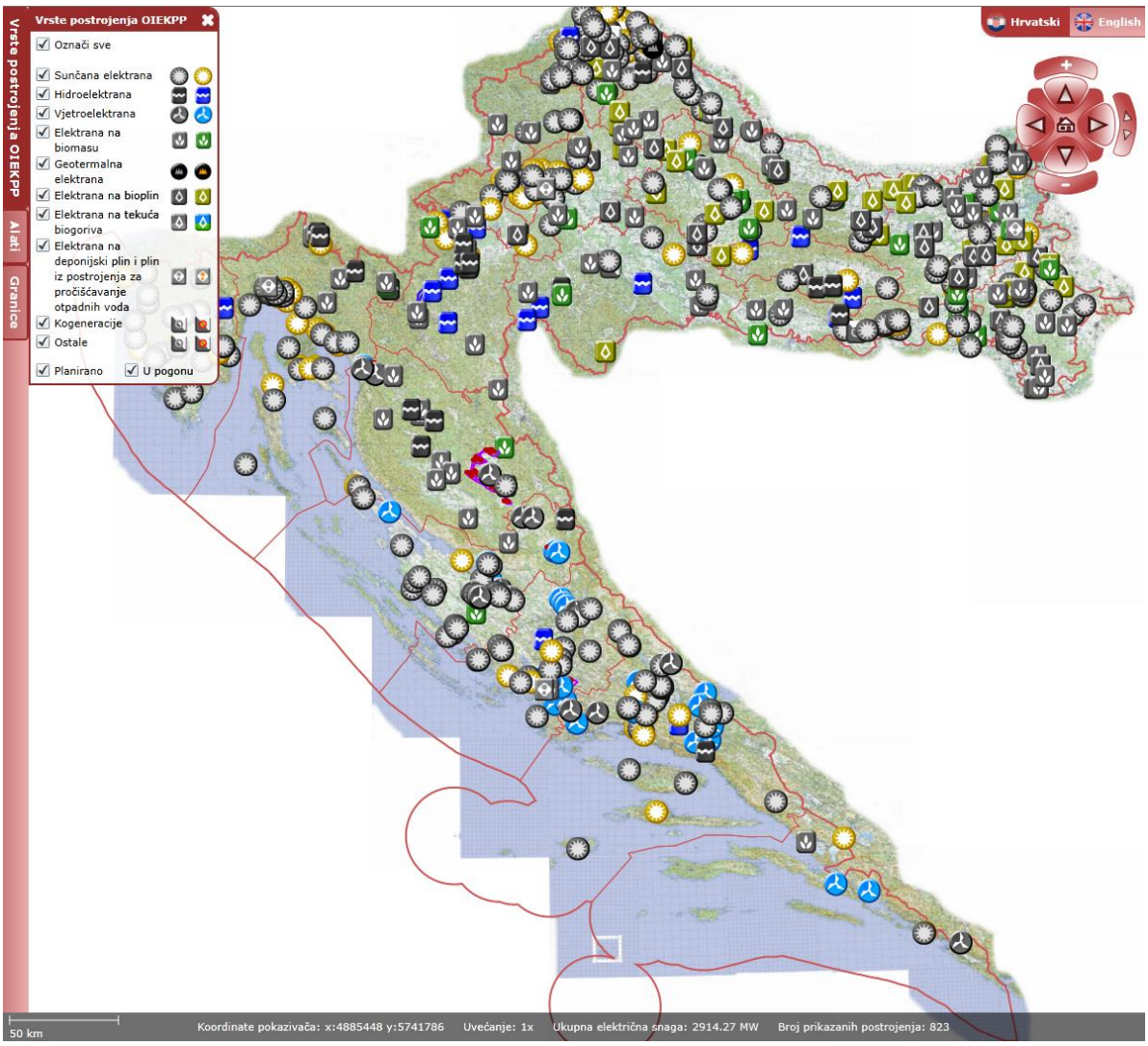


Figure 4.5.5. Interactive map of Croatia with marked locations of all plants within the Register, https://oie-aplikacije.mzoe.hr/InteraktivnaKarta/[66]

In accordance with the *Ordinance on the Register of renewable energy sources and cogeneration and on eligible producers*, information, data, certificates, and documents regarding eligible producers are entered into the Register by HERA.

An overview of projects from the publicly available sections of the Register of Renewable Energy Sources and Cogeneration and on Eligible Producers (Ministry data) and constructed plants from RES&HEC in the incentives systems and guarantees of origin system (HROTE data) is shown in Table 4.5.6.

66 *The site requires Microsoft Silverlight, which is incompatible with most new browsers.*

Table 4.5.6. Overview of projects entered into the RES&C Register and constructed RES&HEC plants

Type of plant / primary energy source	Total registered in the RES&C Register		Constructed and in the incentives system by tariff system[67]		Constructed and in the guaranteed purchase price system or premium system		Constructed and in the guarantee of origin system	
	Number of plants	Installed capacity [MW]	Number of plants	Installed capacity [MW]	Number of plants	Installed capacity [MW]	Number of plants	Installed capacity [MW]
Solar power plants	3,828	799.9	1,228	53.1	6	2.8		
Hydroelectric power plants	51	1,711.2		6.4			6	2,043.7
Wind power plants	50	2,082.3	26	716.8			4	84.8
Biomass power plants	120	218.8	41	96.1				
Geothermal power plants	2	20.0	1	10.0				
Biogas power plants	71	78.1	42	10.0				
Power plants fuelled by landfill gas and gas from waste-water treatment plants	6	8.7	1	2.5			2	4.2
Cogeneration	12	1,069.0	5	113.3				
Other	1	1.0						
Total:	**4,141**	**5,989.1**	**1,344**	**1,008.1**	**6**	**2.8**	**12**	**2,132.7**

Sources: Ministry, HROTE

Activities of the EKO balance group

The establishment of the EKO balance group is regulated by the **Renewable Energy Sources and High-Efficiency Cogeneration Act** and the *Rules on electricity market organisation*; it consists of eligible producers of electricity and other entities performing electricity production activities who have the right to an incentivised price in accordance with electricity buy-off agreements.

The EKO balance group began operating in the beginning of 2019.*The Regulation on the share of net electricity delivered by eligible producers that electricity suppliers are obligated to take up from the electricity market operator* (Official Gazette no. 119/19) prescribes that electricity suppliers were obligated to take up from HROTE 40% of net delivered electricity from eligible producers in the incentives system in 2020. The remaining electricity produced by the EKO balance group is sold by HROTE on the electricity market in accordance with the *Rules on the sale of electricity* (HROTE, 12/2018), which established the combined short-term and long-term sale of electrical energy through three possible models: sale at auction, sale on the electricity exchange, and sale through framework agreements. Energy was sold on the day-ahead market, on the intraday market, and at auction.

The *Regulation on the share of net electricity delivered by eligible producers that electricity suppliers are obligated to take up from the electricity market operator* (Official Gazette no. 147/21) prescribes that electricity suppliers were obligated to take up from HROTE 60% of net delivered electricity from eligible producers in the incentives system in 2022.

In case the production of the EKO balance group deviates from planned production, HROTE is obligated to reimburse HOPS for the balancing energy costs incurred by the EKO balance group from the funds collected within the incentives system for the production of electricity from renewable energy sources and cogeneration and from monthly charges paid by members of the EKO balance group.

[67] *Tariff system for the production of electricity from renewable energy sources and cogeneration (Official Gazette no. 33/07), Tariff system for the production of electricity from renewable energy sources and cogeneration (Official Gazette no. 63/12, 121/12, and 144/12), and Tariff system for the production of electricity from renewable energy sources and cogeneration (Official Gazette no. 133/13, 151/13, 20/14, 107/14, and 100/15).*

Self-supply installation users

Self-supply installation users are household final customers of electricity who have an electricity self-supply system on their property that uses either renewable energy sources or high-efficiency cogeneration. Energy surpluses can be taken up by a supplier or market participant under a relevant contract, provided that the total volume of electricity injected into to the network in a calendar year is less than or equal to the electricity taken up from the network.

Suppliers are obligated to conclude a supply contract with self-supply installation users at the users' request; this agreement must contain provisions on the buy-off of surplus electricity produced by the production facility. **The Renewable Energy sources and High-Efficiency Cogeneration Act** stipulates that, when calculating electricity consumption, network charges, and charges for renewable energy sources and high efficiency cogeneration of users of self-supply plants, the difference in the amount of electricity taken up and injected in the accounting period (one month) under a particular tariff is taken into account.

While there were 146 users of self-supply plants at the end of 2019, by the end of 2020, there were 851 such users; by the end of 2021, this number had increased to 1,580 users with a total installed capacity of 9,368 kW. During 2021, 223 self-supply customers lost this status. All final customers with self-supply use solar power for production.

Observations on the construction and use of plants using renewable energy sources and cogeneration

According to HOPS' data, interest has been expressed in connecting new renewable energy sources and cogeneration power plant projects with a total connection power of 12 GW to the transmission network (mainly solar and wind plants). Of the planned plant capacity, 87% is located in the Adriatic Croatia national strategic region, while 70% of the connected capacity is planned in three counties: Zadar County, Šibenik-Knin County, and Split-Dalmatia County. In accordance with the new **Electricity Market Act**, the issuance of an energy approval is the first step in the grid connection process, which is why it is expected that fewer projects will enter the phase of EOTRP development (those that more ready for implementation).

Challenges and issues project managers encounter while developing renewable energy and cogeneration power plant projects are not unique to Croatia; the majority of EU member states are also in an energy transition and are still developing or modifying the legislative and regulatory framework for this segment of energy production.

Users of self-supply plants and final customers with self-supply influence HOPS and HEP-ODS revenues. Observing tariffs in 2020, the results of a study entitled *An assessment of the influence of self-supply installation users on the amount of distribution and transmission network charges* showed that each installed kW of photovoltaic systems in households reduce HEP-ODS revenues by HRK 279 to 331 per year, and those of HOPS by HRK 125 to 148 per year. Given the changes in tariffs that occurred in 2021, this decrease in revenue is now even greater.

4.5.3 Guarantee of electricity origin system

Development of the guarantee of origin system

The guarantee of origin system enables suppliers of electricity to offer final customers supply contracts or tariff models with a guaranteed share of one or more electricity sources used for electricity generation. In addition, final customers can rely on this system when choosing a tariff model, as it ensures the sale of electricity of a guaranteed structure.

The *Methodology for determining the origin of electricity* requires electricity suppliers to submit a relevant annual report to final customers describing the structure of the electricity supplied during the previous year, between 1 and 31 July of the current year. Those suppliers who sent reports to their final customers provided only a minor portion of the required data (basic data and basic structure of electricity sold).

According to the *Methodology*, electricity suppliers base their reports to final customers on HROTE reports:

- annual report on the structure of total remaining electricity for the previous year, and
- annual report on the generation of electricity under the incentives system for the previous year.

HROTE published these reports for 2021 on its website, together with the required *Annual report on the origin of electricity in the Republic of Croatia for 2021*, which provides an overview of the structure of the

electricity produced and sold in Croatia, information on suppliers' reports regarding the origin of electricity, the use of guarantees of origin of electricity, and other related data.

A guarantee of origin, among other things, contains data on the quantity of electricity (the basic unit is 1 MWh), the date of the beginning and end of electricity generation for which the guarantee of origin is issued, the type of primary energy source, and data on the production plant, including the location of the plant and the identity of the authority that issued the guarantee of origin.

Eligible producers in Croatia that are not in the electricity generation incentives system may request the issuance of a guarantee of origin. Electricity producers may sell guarantees of origin independently from the produced electricity, on a separate market of guarantees of origin, as these are used only to prove the structure of electricity.

The origin of electricity, i.e. the structure of electricity sold to the final customer, is proven according to the *Methodology* and through the use of guarantees of origin, and excludes the use of other certificates, certificates of generation of electricity, or contracts tracing the origin of electricity.

Register of Guarantees of Origin

As the authority competent for issuing guarantees of origin in Croatia, HROTE operates a Register of Guarantees of Origin (hereinafter: the Register) – a computer system that stores guarantees of origin, used to issue, transfer, and cancel guarantees of origin as electronic documents.

The register enables the transfer of guarantees of origin from one user account to another, which is the basis for trade in guarantees of origin. HROTE is a full member of the *Association of Issuing Bodies* (AIB), an international association of competent authorities for guarantees of origin, and the Croatian register is connected to other registers in EU Member States via AIB's hub.

HROTE issues guarantees of origin in accordance with the *Regulation on the establishment of a system of guarantees of origin of electricity* (Official Gazette no. 84/13, 20/14, 108/15, 55/19) and the *Rules for using the Register of Guarantees of Origin* (HROTE, 7/19).

The register has been fully implemented since 2 February 2015. By the end of 2021, six electricity suppliers, seven electricity producers, and one electricity trader were registered in the Register. Table 4.5.7. provides an overview of registrations.

Table 4.5.7. Registrations in the Register of Guarantees of Origin

Type of registration	New registrations in 2021	Total registrations
User accounts of electricity producers	2	7
User accounts of other Register users	-2	9
Total user accounts	0	16
Total registered plants	7	27

Source: HROTE

In 2021, six registered suppliers traded in guarantees of origin, while guarantees of origin were issued for 27 plants. An overview of activities in the Register of Guarantees of Origin is provided in Table 4.5.8.

Table 4.5.8. Activities in the Register of Guarantees of Origin in 2020 and 2021

Activity	No. of guarantees (1 guarantee = 1 MWh)		Increase 2021/2020
	2020	2021	
Number of issued guarantees of origin for electricity generated in Croatia	4,855,963	6,700,127	38.0%
Number of imported guarantees of origin	139,949	197,533	41.1%
Number of exported guarantees of origin	2,163,776	2,161,901	-0.1%
Number of cancelled guarantees of origin	2,876,586	2,677,695	-6.9%
Number of expired guarantees of origin	0	0	-

Source: HROTE

In 2021, HROTE generated income of HRK 2,556,673 in charges for operating the Register. The cost of operating the Register and other activities in the guarantee of origin system amounted to HRK 1,290,270. The balance of the Register amounts to HRK 1,266,402.89.

Auctions of guarantees of origin of electricity

During 2021, HROTE issued guarantees of origin for electricity for a part of the electricity produced by eligible producers in the incentives system, which was sold on the electricity market through the EKO balance group; these guarantees of origin were then sold on the market through guarantee of origin auctions on CROPEX's IT auction trading platform. After the end of auctions and the successful sale of guarantees of origin, the funds collected were transferred to HROTE for payment into the incentives system; on the other hand, the guarantees of origin sold at auction were transferred from HROTE's account in the Croatian Register of Guarantees of Origin to the user accounts of auction participants who had won the guarantees of origin at auction. Before holding each public auction, HROTE published the minimum price of guarantees for individual groups of plants at the link *https://www.hrote.hr/drazbe-jamstva-podrijetla*.

In 2021, 2,110,133 guarantees of origin tied to 60% of electricity produced in the incentives system sold by HROTE on the market were sold at auction. The funds collected from the sale of guarantees of origin and paid to HROTE for transfer into the incentives system amounted to HRK 14,029,661.

Observations on the guarantees of origin system

In 2021, higher activity was observed in the Register compared to previous periods. Seven new plants were registered (Orlice wind power plant, Korlat wind power plant, Phase 14.3 - Expansion of the gas facility with additional generator 4, HE Đale, HE Jaruga, ABM HE Kraljevac, and HR Kraljevac) with a total installed capacity of 167.8 MW. As compared to 2020, the issuance of guarantees of origin increased by 38% in 2021.

4.6 Energy efficiency in the electricity sector

Directive 2012/27/EU, *Directive 2018/2002/EU*, and the **Energy Efficiency Act** generally define HERA's obligations regarding energy efficiency. These obligations primarily pertain to the consideration of energy efficiency in decision and tariff methodologies related to the transmission and distribution of electricity, as well as enabling and promoting demand response. As these are principled obligations, HERA primarily fulfils these obligations by adopting by-laws that direct HOPS and HEP-ODS and network users to behave in accordance with the principles of energy efficiency.

When determining costs in the process of adopting tariff items for electricity transmission and distribution, the quantity of energy losses in the grid is taken into account; when approving ten-year development plans, investments and measures to reduce technical losses in the transmission and distribution networks are taken into account.

It must be noted that technical losses cannot be eliminated completely due to the limitations of the laws of physics; as losses become smaller, the investments required to reduce them further increase. The implementation of measures must also take into account plant safety, technical regulations, and the development of the grid.

In accordance with the **Energy Efficiency Act**, in 2016, HERA published *An Assessment of the Potential for Increasing Energy Efficiency of the Electricity Infrastructure* on the basis of a previous study examining specific measures and investments in the ten-year development plans of the transmission and distribution system from 2016 to 2025 as concerns technical losses. Once the conditions are met for the introduction of advanced technologies, such as load management technologies (e.g. installation of appropriate meters), HERA will revise the assessed potential for increases in energy efficiency of the electricity infrastructure and the target dates for their deployment.

The approved *Ten-year development plan for the transmission network from 2022 to 2031, with a detailed elaboration of the initial three- and one-year periods* contains the following measures to improve energy efficiency: replacing conductors with overhead lines (use of HTLS conductors); replacing submarine 110 kV cables (replacing existing oil-filled submarine cables at the end of their working cycle with new, ecologically friendly cables with higher transmission capacity); strengthening the network (building new lines); installing compensation devices; replacing old grid and energy transformers with new, lower loss transformers; cabling overhead 110 kV lines; and optimising power flows and the operation of transformers.

The approved *Ten-year development plan (2022-2031) for the distribution network with a detailed elaboration of the initial three- and one-year periods* foresees the following measures to improve energy efficiency: rebuilding parts of the grid with small conductor diameter and long sections of line (increasing conductor cross-sections in the initial parts of MV and LV outlets); changes in network topology (dividing MV and LV outlets into two or more outlets, transferring some LV outlets to neighbouring LV outlets that are closer and/or less loaded, or to MV/LV TS); switching parts of the network from 10kV to 20 kV (investing in the reconstruction of MV lines and MV/LV transformer stations as part of switching the MV network to 20 kV alongside the gradual introduction of direct 110/10(20) kV transformers and the removal of 35/10(20) kV transformers); replacing old transformers with lower loss transformers; and further implementation of reactive energy compensation.

These ten-year development plans are aligned with the *Integrated National Energy and Climate Plan for the Republic of Croatia for 2021-2030* (hereinafter: NECP); it should be noted that the NECP contains the measure "ENU-15: Energy Efficiency of the Electricity Transmission System" and the measure "ENU-16: Reduction of losses in the electricity distribution network and introduction of smart networks".

Furthermore, the *Methodology for setting tariffs for electricity transmission* and the *Methodology for setting tariffs for electricity distribution* were also adopted with the goal of encouraging energy efficiency among network users. Together with the General terms and conditions of network usage and electricity supply, these methodologies define tariff elements used to calculate transmission and distribution network charges. Specifically, tariff elements are active energy (by single, higher and lower daily tariff), settled peak active power, and excess reactive energy.

The higher and lower daily tariffs enable final customers to save money by using electricity during the lower tariff hours. As a result, the change in time of use leads to savings, both in the transmission and distribution of electricity and in the production of electricity. Final customers on the low-voltage network with a dual-tariff model ('White' tariff model) can request to switch to a single-tariff model ('Blue' tariff model). The opposite change is also possible; however, if a single-tariff meter is installed at the billing metering points, a new meter must be installed.

Final customers with a connection capacity over 22 kW are charged for settled peak active power as a tariff element. Settled peak active power (the highest amount of active power during a billing period during the higher daily tariff period) as a tariff element directly encourages final customers to monitor and alter the time and ways in which they use their devices (especially those requiring more power), thus motivating final customers to adopt electricity usage habits that result in lower losses in the electricity system and also optimise the operations of power plants.

Reactive energy occurs during the use of alternating current; it is the consequence of the electromagnetic nature of the electricity system, devices, and other components of the electricity system that work in the unified alternating current system. As it causes losses in the network, the *General terms and conditions of network usage and electricity supply* prescribe that billing metering points that measure reactive energy are charged for excess reactive energy. This encourages final customers to withdraw as little reactive energy as possible by purchasing and using devices that use less reactive energy and, where technically feasible and

justified in terms of cost, to produce the required amounts of reactive energy to power these devices on their own premises.

The 'Black' tariff model is unique in terms of energy efficiency. This is tariff model to manage electricity consumption via MTU signals, which is still in limited use in the Elektroistra Pula and Elektrojug Dubrovnik distribution areas. This model includes the delivery of electricity to household customers for whom HEP-ODS determines the time at which electricity can be used by remote control (customers do not have access to electricity 24 hours a day).

The aforementioned tariff elements are used to determine network usage charges; they are also traditionally used to bill for electricity suppliers sell to final customers. Suppliers can offer their own supply models, which use different elements and billing methods. If a particular billing metering point is equipped with a smart meter with a load profile (measuring for each 15-minute or hour interval within a billing period of a calendar month), then innovative billing methods can be implemented. In other words, electricity suppliers can offer final customers with smart meters supply models oriented towards specific groups of final customers and their consumption habits.

Smart meters are the prerequisite for dynamic pricing and the implementation of supply agreements that incorporate dynamic pricing for electricity reflecting changes in price on the short-term markets in intervals shorter than a billing period of one month, the shortest being the market settlement interval.

The basic idea of electricity supply agreements with dynamic pricing is that final customers can accommodate their consumption to price signals on the short-term markets. This kind of agreement transfers the risk of changes in price from suppliers to final customers.

Although electricity supply agreements with dynamic pricing were possible before the adoption of the new **Electricity Market Act**, the **Act** prescribes that suppliers who supply more than 200,000 billing metering points of final customers are required to offer an electricity supply agreement with dynamic pricing for non-regulated elements upon customer request. During 2021, three suppliers offered agreements with dynamic electricity pricing.

Electricity billing in Croatia is based on real electricity consumption from metering data taken at the billing metering points of final customers of electricity (network users). If a billing metering point cannot be accessed or read, electricity consumption is estimated, and the estimated value on the bill is specially marked. In multi-apartment buildings, each independent unit has its own billing metering point, while shared consumption is metered at a separate billing metering point.

Within the separate bill for network usage, the distribution system operator delivers information on the current network usage charges and real electricity consumption. As separate bills for network usage are issued for final customers on medium and high voltage (these customers are also charged for peak load and excess reactive power in addition to electricity consumption), data by which to compare current electricity consumption and consumption in the same period in the previous year (measured in 15-minute intervals in numerical and graphical form) are available via the internet portal of the distribution system operators (*mjerenje.hep.hr* or *mojamreza.hep.hr*). The *mjerenje.hep.hr* web portal allows access to the following metering data on consumption and production of electricity: active energy curve, register readings, and calculated delivered electricity into the distribution network. These portals can be accessed by all final customers with household category billing metering points with connection capacity above 20 kW withdrawing from the network, all non-household final customers with an interval meter, and all electricity producers on the distribution network.

Household category customers can also access data on readings and electricity consumption in past periods via the distribution system operator internet portal (the *mojamreza.hep.hr* app), which also allows them to deliver meter readings.

The system operator is obligated to install a smart meter at the request of final customers or at the request of the supplier with the consent of the final customer.

With the aim of contributing to the achievement of national indicative energy efficiency targets, the **Energy Efficiency Act** set mandatory cumulative energy saving targets in energy end-use for the first energy savings cumulation period, which lasted from 1 January 2014 to 31 December 2020, as well as for the second energy savings cumulation period, which will last from 1 January 2021 to 31 December 2030.

The obligatory cumulative targets are met through a combination of the energy efficiency obligation system prescribed by the **Act** and alternative policy measures defined in the NECP.

The energy efficiency obligation system obligates energy suppliers to save in one of the following ways:

- investing in measures to improve energy efficiency in final consumption sectors through measures to improve energy efficiency defined in the *Ordinance on the system for monitoring, measuring and verification of energy savings* (Official Gazette no. 33/20, 98/21, 30/22), without excluding investments into equipment to produce electricity and for electricity self-supply, small and micro-cogeneration facilities, smart meters for final consumers, and all other investments into measures to improve energy efficiency through which obligated parties prove new energy savings, or
- investments into energy efficiency improvement measures in the energy conversion and distribution sectors, including district heating and cooling infrastructure, or
- the purchase or transfer of energy savings from third parties, or
- paying an amount into the Environmental Protection and Energy Efficiency Fund that corresponds with the unit charge for unrealised savings multiplied by the amount of energy savings to which the obligated party is obligated.

In fulfilling the energy savings obligation, obligated parties are encouraged to increase energy efficiency as a priority in households at risk of energy poverty in the following manner:

- calculated savings resulting from measures for improving energy efficiency implemented in households in areas with developmental issues in accordance with acts regulating regional development are increased by 10%,
- calculated savings resulting from measures to improve energy efficiency implemented in households that are beneficiaries of compensation as at-risk energy customers are increased by 20%,
- calculated savings resulting from measures to improve energy efficiency implemented in households that are beneficiaries of compensation as at-risk energy customers in areas with developmental issues are increased by 30%.

The legal framework for the energy efficiency obligation system is defined in detail the **Energy Efficiency Act**, which foresaw the gradual implementation of the energy efficiency obligation system as of 2019. In 2019, the obligated parties were energy suppliers and their subsidiaries who delivered more than 300 GWh of electricity in 2017 (the obligation in a given year is affirmed on the basis of delivered electricity in the year before last). This limit reduced to 100 GWh in 2020; the final limit for the implementation of the obligation was reduced to 50 GWh in 2021 for implementation in 2021 and beyond.

The Act on Amendments to the Energy Efficiency Act (Official Gazette no. 41/21) introduced new provisions related to the energy savings obligation system, primarily for the new (second) cumulation period from 2021 to 2030. Likewise, the entry into force of the **Act** repealed the *Ordinance on the energy efficiency obligation system* (Official Gazette no. 41/19). The provisions of the *Ordinance on the energy efficiency obligation system* for the needs of implementation in the first cumulation period were included in the **Energy Efficiency Act** and in the *Ordinance on the system for monitoring, measuring, and verifying energy savings (Official Gazette no. 98/21).*

The Ministry takes an ex officio decision defining the energy savings requirement in kWh for a particular year, and obligated parties are required to deliver reports on realised savings to the Ministry and enter data on implemented measures into SMIV. For the unfulfilled part of the obligation from the previous year, the Ministry will also determine the amount that the party is obligated to pay in a lump sum into the Environmental Protection and Energy Efficiency Fund.

It should be noted that the obligation applies to the energy supplier and subsidiaries who are energy suppliers according to the definition of the term in the **Energy Efficiency Act**. Subsidiaries are obligated parties if they fulfil the criteria for the energy savings obligation as a whole. Table 4.6.1. shows savings obligations prescribed for active electricity suppliers;[68] it must be noted that the obligations are not directly proportional to the sale of electricity, as the obligation is determined on the basis of the sale of all forms of energy, and each supplier can achieve certain reductions in the obligation determined by the **Energy Efficiency Act** of up to 25% of its sales.

[68] *In 2021, a total of seven of 12 suppliers with an electricity supply license were active.*

Table 4.6.1. Savings obligations prescribed for active electricity suppliers for 2021 and implemented own measures

Active electricity suppliers	Obligation [kWh]	Savings from own measures [kWh]
HEP ELEKTRA d.o.o.	50,191,214	95,837,086
HEP-Opskrba d.o.o.	58,251,462	10,357,229
PETROL d.o.o.	31,446,275	21,182,038
GEN-I Hrvatska d.o.o.	2,205,743	-
MET Croatia Energy Trade d.o.o.	4,162,000	2,925,600
E.ON Energija d.o.o.	7,041,972	5,157,057
ENNA Opskrba d.o.o.	The business had no savings obligation in 2021.	

According to the statements received by HERA from active electricity suppliers, nearly all active electricity suppliers who were obligated parties in 2021 fulfilled their requirements and reported them to the Ministry, except for E.ON Energija d.o.o. E.ON Energija d.o.o. and related businesses E.ON Plin d.o.o., MOSLAVINA PLIN d.o.o., MONTCOGIM PLINARA d.o.o., KOPRIVNICA OPSKRBA d.o.o., and PLIN PROJEKT d.o.o. submitted a request to the Ministry for a different time distribution within which to realise the cumulative goal.

PETROL d.o.o., GEN-I Hrvatska d.o.o., and MET Croatia Energy Trade d.o.o. purchased savings on the market to fulfil their obligations.

HEP d.d. and its subsidiaries are related parties in terms of the energy efficiency obligation system, in which HEP d.d. was the holder of the unified report on realised savings. In 2021, the Ministry set savings obligations for HEP d.d.'s subsidiaries in the total amount of 133 GWh, of which amount 58 GWh related to HEP-Opskrba d.o.o and 50 GWh to HEP ELEKTRA d.o.o.; the remainder related to two suppliers under HEP d.d. (HEP-Plin d.o.o. and HEP-Toplinarstvo d.o.o.). HEP d.d. and its subsidiaries achieved 161,229,717 kWh of energy savings in 2021, which is more than the defined obligation. HEP d.d. requested that the Ministry transfer the surplus in realised savings in the amount of 27,928,303 kWh to the obligation in 2022.

HEP ELEKTRA d.o.o. achieved savings significantly greater than its individual obligation. The total of 95,837,087 kWh of savings of HEP ELEKTRA d.o.o. in 2021 were realised on the basis of reduced revenues due to paying a solidary charge in place of its customers and reduced revenues on the basis of write-offs in earthquake-stricken areas (93,523,683 kWh), on the basis of the "Moj račun" [En. *My Bill*] web application (2,309,930 kWh), and on the basis of educational and informative measures (3,474 kWh). On the other hand, HEP-Opskrba d.o.o. realised savings significantly below its obligations, but the redistribution of savings among related parties allowed it to fulfil its obligations. The total of 10,357,229 kWh of savings of HEP-Opskrba d.o.o. in 2021 were realised on the basis of reduced revenues due to paying a solidary charge in place of its customers and reduced revenues on the basis of write-offs in earthquake-stricken areas (6,233,160 kWh), on the basis of the "Moj račun" [En. *My Bill*] web application (1,024,901 kWh), and on the basis of educational and informative measures (2,932,524 kWh) and other measures (166,645 kWh).

It should be noted that HEP ELEKTRA D.O.O. and HEP-Opskrba d.o.o. realised significant amounts of savings on the basis of paying solidary charges in place of its customers and reduced income on the basis of write-offs in earthquake-affected areas in accordance with Article 19 of the *Ordinance on the system for monitoring, measuring, and verifying energy savings*.

From the perspective of wholesale electricity market development, bearing in mind that electricity suppliers can invest directly in energy efficiency measures with final customers (including measures that require significant investment), the **Energy Efficiency Act** prescribes that obligated parties, when fulfilling their energy efficiency obligation, must not create barriers to their customers related to switching to other energy suppliers. HERA has not yet received any complaints regarding this issue.

According to the **Energy Efficiency Act**, measures to improve energy efficiency achieved in the transmission and distribution of electricity are considered alternative policy measures by which to achieve part of the mandatory cumulative energy savings goal. Also, HOPS and HEP-ODS are required to enter such energy efficiency improvement measures into SMIV.

NECP and the *Ten-year development plan for the transmission network 2022-2031, with a detailed elaboration of the initial three- and one-year periods* and the *Ten-year development plan for the HEP-ODS*

distribution network 2022-2031, with a detailed elaboration for the initial three- and one-year periods contain measures that HOPS and HEP-ODS will implement in coming periods as alternative measures.

In 2021, HOPS drafted the following documents for the needs of entering data into SMIV:

- Methodology for calculating energy savings in the transmission network from typical energy efficiency measures,
- Report on energy savings realised by replacing conductors on the 220 kV Zakučac-Konjsko transmission line,
- Report on energy savings realised by replacing transformers at TS 400/110/30 kV Tumbri,
- Report on energy savings realised by replacing conductors on the 110 kV Bilice-TS Velika Glava transmission line, and
- Report on energy savings realised by installing a VVC process system to minimise active energy losses in the transmission network.

HEP-ODS began activities to identify alternative measures, as well as to create and define the energy savings calculation process (reducing electricity losses). According to HEP-ODS, the introduction of alternative measures into special web forms on SMIV is being considered in agreement with the Ministry. HEP-ODS has announced that it will enter alternative energy efficiency measures into SMIV during 2022.

Additionally, in 2021, HEP-ODS implemented 59 individual measures regarding to buildings and means of transport (used by HEP-ODS), which it entered into SMIV. Of the total of 59 measures, 47 are related to buildings and 12 are related to means of transport.

Independent of savings implemented within the energy savings system and alternative measures, as described above, energy entities can implement energy efficiency measures to reach other goals. Table 4.2.6. shows data on energy savings and carbon dioxide (CO_2) emissions savings that particular energy entities realised by individual type of measure and in total in 2021. The table shows data only for those energy entities with permits for energy activities defined in the **Electricity Market Act** who implemented and entered measures in to SMIV, which is managed by the Ministry's National Coordinating Body for Energy Efficiency (NCB). Of the energy entities shown, there is only one of the 69 with a permit to produce electricity (at the end of 2021), only one electricity trader of the total of 31 with a permit, and three electricity suppliers of the total of 12 with a permit. The total savings of these entities amounts to 144.83 GWh and 9,234 tonnes of CO_2 emissions.

Table 4.6.2. Data on realised energy savings and carbon dioxide (CO_2) emissions savings of particular energy entities, by type of energy savings measure

Energy entity / Measure	HEP-Opskrba d.o.o.	HEP-ELEKTRA d.o.o.	MET Croatia Energy Trade d.o.o.	E.ON Energija d.o.o.	PETROL*	HEP-Proizvodnja d.o.o.	HEP d.d.	HOPS	HEP-ODS
Energy savings [kWh]									
Measures in industry (I99)	-	-	-	-	10,204,996	-	6,699,409	-	-
Installation or replacement of public lighting (M12)	-	-	-	-	1,267,490	-		-	-
Introduction of smart metering systems to monitor consumption (M24)	-	-	-	645,451	-	-	669,108	-	-
Installation of heat elevators (M13)	-	-	-	-	-	-	-	-	1,227,011
Installation or replacement of heating systems and hot water preparation (M4)	-	-	-	-	-	-	-	-	385,576
Replacement of existing vehicles and purchase of new vehicles (T1)	-	-	-	-	-	-	-	-	487,217
Measures undefined in the methodology (M99)	6,244.679	93,523,683	-	-	-	6,846	4,702,341	-	-
Measures in other sectors (O99)	3,945,906	2,309,930	-	-	-	-	-	4,566,654	-
Other measures	166,644	3,474	2,925,600	4,511,606	-	-	196,215	-	135,451
Total:	**10,357,229**	**95,837,087**	**2,925,600**	**5,157,057**	**11,472,486**	**6,846**	**12,267,073**	**4,566,654**	**2,235,255**
CO_2 emissions savings [t]									
Total: (all measures):	**613**	**763**	**802**	**949**	**202**	**1**	**4,528**	**726**	**650**

** Some measures realised by Petrol were divided between measures in the electricity sector and measures in the gas and oil sector.*

Source: Ministry (SMIV), suppliers, HERA

Table 4.6.3. and Table 4.6.4. show data on energy savings and carbon dioxide emissions savings that particular energy entities from Table 4.6.2. realised by sector (building, transport, industry) that are large consumers of energy. According to these tables, the most savings were realized in the building sector (116 GWh or 80.4%). Although this is to be expected as the building sector has the greatest savings potential, the majority (nearly 100 GWh of savings) was defined on the basis of reduced revenues due to the payment of solidary charges in place of customers and reduced revenues on the basis of write-offs in earthquake-affected areas. This is why the amount of savings in CO_2 emissions is significantly lower; the structure of CO_2 emissions savings corresponds to measures actually implemented.

Table 4.6.3. Data on energy savings and carbon dioxide emissions savings realised by energy savings obligated parties in 2021 by sector of consumption

Energy savings obligated party in the electricity sector	Energy savings [kWh]	Energy savings by sector [kWh]			
		building industry	transport	industry	other
HEP – Opskrba d.o.o.	10,357,229	6,397,144	14,179	-	3,945,906
HEP-ELEKTRA d.o.o.	95,837,087	93,527,157	-	-	2,309,930
PETROL d.o.o.	11,472,486	1,267,490	-	10,204,996	-
MET Croatia Energy Trade d.o.o.	2,925,600	2,925,600	-	-	-
E.ON Energija d.o.o.	5,157,057	5,157,057	-	-	-
HOPS	4,566,654	-	-	-	4,566,654
HEP-ODS	2,235,255	1,748,038	487,217	-	-
HEP-P-Proizvodnja d.o.o	6,846	6,846	-	-	-
HEP d.d.	12,267,073	5,425,720	-	6,841,353	-
Total:	**144,825,287**	**116,455,052**	**501,396**	**17,046,349**	**10,822,490**

Source: Ministry (SMIV), suppliers

Table 4.6.4. Data on realised carbon dioxide CO_2 emissions savings (t) by energy savings obligated parties in 2021 by sector of electricity consumption

Energy savings obligated party in the electricity sector	CO_2 emissions savings [t]	CO_2 emissions savings by sector [t]			
		building industry	transport	industry	other
HEP – Opskrba d.o.o.	613	50	4	-	559
HEP-ELEKTRA d.o.o.	763	1	-	-	762
PETROL d.o.o.	202	202	-	-	-
MET Croatia Energy Trade d.o.o.	802	802	-	-	-
E.ON Energija d.o.o.	949	949	-	-	-
HOPS	726	-	-	-	726
HEP-ODS	650	520	130	-	-
HEP-P-Proizvodnja d.o.o	1	1	-	-	-
HEP d.d.	4,528	1,933	-	2,595	-
Total:	**9,234**	**4,458**	**134**	**2,595**	**2,047**

Source: Ministry (SMIV), suppliers

5 NATURAL GAS

5.1 Legal framework for natural gas

The legal framework of the gas sector and gas market in the Republic of Croatia includes the **Energy Act**, **Act on the Regulation of Energy Activities, Gas Market Act**, **Act on the Liquefied Natural Gas Terminal**, and by-laws adopted pursuant to these laws.

In 2021 and early 2022, with a view to the continuous improvement of the gas market in Croatia, HERA adopted the following:

- *Amendments to the Methodology for setting tariffs for gas transmission,*
- *Amendments to the General terms and conditions of gas supply,*
- *Amendments to the Gas Distribution System Network Code*,
- *Amendments to the Methodology for setting the price of non-standard services for gas transmission, distribution, storage, the unloading and send out of liquefied natural gas, and public service gas supply, and*
- *Amendments to the Methodology for setting tariffs for public service gas supply and guaranteed supply.*

Amendments to the Methodology for setting tariffs for gas transmission (Official Gazette no. 79/20 and 36/21)

In April 2021, HERA adopted *Amendments to the Methodology for setting tariffs for gas transmission* (hereafter: *Amendments to the Methodology*). Transmission system operator PLINACRO d.o.o. began calculating transmission system usage charges according to the formula from the previously valid *Methodology for setting tariffs for gas transmission* in February 2021; however, calculating this charge using the reserve price for the contracted intraday constant standard capacity product resulted in users who had contracted a nominally higher amount of hourly capacity for a shorter number of hours paying a lower fee than users who had contracted a lower amount of hourly capacity for a longer number of hours in a day, and for a summarily equal amount to the contracted capacity of the transmission system in a day.

In order for transmission system users to bear an equal charge for using the transport system for the same daily contracted capacity, regardless of the dynamics and number of hours contracted within the gas day, the *Amendments to the Methodology* prescribes a change in the formula used to calculate reserve prices for contracted intraday constant standard capacity product. *The Amendments to the Methodology* ensure cost objectivity in the use of the transport system; they also encourage the optimum balanced usage of intraday capacities in order to prevent hourly contractual congestion, which would result in the need to introduce multiple levels of multiplier for intraday standard capacity products.

Amendments to the General terms and conditions of gas supply (Official Gazette no. 50/18, 88/19, 39/20, and 100/21)

The Amendments to the General terms and conditions of gas supply adopted by HERA in 2021 mostly relate to improving provisions in the section dealing with providing information to gas market stakeholders through the Register of Billing Metering Points, standard quality of gas, and conditions and billing for gas delivered on the basis of gross calorific value (GCV).

In order to increase the availability of information to gas market stakeholders, the balance group manager's right of access to the monthly report on the total gas consumption of final customers who are indirect members of the balance group, expressed by gas supplier, and organised by group of billing metering point depending on the metering period. New data are also prescribed to be entered into the RBMP, which will serve to improve the provision of information to gas market stakeholders, for whom potential future upgrades to the RBMP will also represent data necessary to calculate gas billing charges.

As of 1 October 2021, methane number has been introduced as a gas quality standard parameter; the minimum and maximum gross calorific values, the maximum and minimum Wobbe number, and the minimum relative density were also adjusted.

The provisions of the Amendments to the General terms and conditions of gas supply related to calculation and billing for delivered gas on the basis of GCV require delivered gas billing calculations to be performed using the upper GCV instead of the lower GCV as of 1 October 2022.

Amendments to the Gas Distribution System Network Code (Official Gazette no. 50/18, 88/19, 36/20, and 100/21)

The Amendments to the Gas Distribution System Network Code (Official Gazette no. 100/21), which HERA adopted in September 2021, mostly relate to improvements to provisions on supplying information to gas market stakeholders through the RBMP, billing for gas based on delivered gas on the basis of GCV, equipping BMPs with specific types of consumption with daily metering equipment, procuring gas to cover gas losses in the distribution system, and gas consumption charges without a valid gas supply agreement.

It is prescribed that metering data is also to be submitted to the gas market operator (via the RBMP) as of 1 November 2021. As concerns billing calculation by GCV, the volume correction factor of gas is prescribed when converting gas volume under standard conditions (absolute gas pressure of 1.01325 bar and gas temperature of 15°C) to the volume of gas under normal conditions (absolute gas pressure of 1.01325 bar and gas temperature of 0°C) as of 1 October 2022.

Furthermore, the gas market operator is obligated to mark BMPs with specific types of consumption in the RBMP by 1 February each year; the distribution system operator is required to equip such BMPs with daily metering equipment by 31 December of the same year at the latest. As an exception, the gas market operator is obligated to mark BMPs with specific types of consumption in the RBMP within 7 days of the *Amendments to the Gas Distribution System Network Code* entering into force (23 September 2021); the distribution system operator is required to equip such BMPs with daily metering equipment by 30 September 2022.

As concerns gas procurement and covering gas losses in the distribution system, the *Amendments to the Gas Distribution System Network Code*, require the distribution system operator (or closed distribution system operator) to purchase gas to cover gas losses in the distribution system on the market on the basis of gas supply agreements concluded with gas suppliers selected via a gas procurement public tender. After the termination or expiry of a gas supply agreement, in cases where final customers have not enabled the suspension of gas delivery, it prescribes that the distribution system operator has the right to charge such final customers for gas consumption without a gas supply agreement.

Amendments to the Methodology for setting the price of non-standard services for gas transmission, distribution, storage, the unloading and send out of liquefied natural gas, and public service gas supply (Official Gazette no. 48/18, 25/19, 134/21, and 9/22)

Amendments to the Methodology for setting the price of non-standard services for gas transmission, distribution, storage, the unloading and send out of liquefied natural gas, and public service gas supply (Official Gazette no. 134/21) (hereinafter: Amendments to the Methodology), adopted by HERA in December 2021, harmonises the list of non-standard services of LNG terminal operator with the Rules for LNG terminal use (Official Gazette no. 87/21). The LNG terminal began operating on 1 January 2021; after the initial period of the terminal's commercial operation, it became necessary to harmonize the previous Rules for LNG terminal use (Official Gazette 60/18, 39/20, and 136/20) with the new circumstances. On 30 July 2021, the LNG terminal operator thus adopted the Rules for LNG terminal use, which (inter alia) defined new non-standard services, primarily related to LNG reload from the floating LNG storage and regasification unit into the LNG carrier or LNG transport truck, as well as the implementation of extraordinary inventory requested by users and the changing of LNG transport ship arrival times. Likewise, in accordance with the new Rules for LNG terminal use, certain non-standard services have been deleted as redundant. The Amendments to the Methodology thus harmonise the list of non-standard services with the new Rules for LNG terminal use by prescribing new non-standard services, as well as the number of "working hours" required to execute the prescribed non-standard services.

Aside from the aforementioned, the Amendments to the Methodology introduce a description of calculation or explanation of non-standard services as a component part of all appendices in the Methodology, which had previously been presented on adopted and published price lists of non-standard services of all service providers and implemented as such.

With regard to the adoption of a decision establishing a price list for non-standard services for non-standard service providers, HERA set prices for non-standard services for distribution system operators, public service suppliers, and gas storage system operators in accordance with Article 6 of the Methodology in 2021 (year T-1) for the years of the 2022-2026 regulatory period. Likewise, in light of defining new non-standard services for the LNG terminal operator, the Amendments to the Methodology prescribe the adoption of a new decision affirming the price of non-standard services for the LNG terminal operator for the remaining years of the first regulatory period (2022-2025).

Furthermore, considering that HERA adopted the new Methodology for setting tariffs for gas transmission in July 2020, which prescribes that the third regulatory period for the transmission system operator begins as of 1 January 2021 and ends 31 December 2025, the Amendments to the Methodology prescribes that HERA adopt a decision affirming the price list of non-standard services for the transmission system operator for the remaining years of the third regulatory period (2022-2025), as the price list for non-standard services of the transmission system operator in force in 2021 is that from the 2017-2021 regulatory period.

Amendments to the Methodology for setting tariffs for public service gas supply and guaranteed supply (Official Gazette no. 108/20 and 20/22)

Given the current situation on the European wholesale gas market and manifold price increases, which has resulted in an increase in the sale price of gas for non-household final customers beyond the guaranteed supply price range foreseen in the *Methodology for setting tariffs for gas supply as a public service and guaranteed supply* (Official Gazette no. 108/20) in Q4 2021, in February of 2022, HERA adopted the *Amendments to the Methodology for setting tariffs for gas supply as a public service and guaranteed supply* (Official Gazette No. 20/22) (hereinafter: *Amendments to the Methodology*). *The Amendments to the Methodology* prescribe a new way of determining the final price of guaranteed supply for non-household final customers by reflecting current market trends on a three-month basis. As a result of the *Amendments to the Methodology*, which changed the conditions under which guaranteed supply is provided, a public tender to determine a new guaranteed supplier of gas was undertaken.

Amendments to the Rules on gas storage system use (Official Gazette no. 50/18, and 26/20, and 58/21)

The gas storage system operator Podzemno skladište plina d.o.o., with HERA's approval, adopted the *Amendments to the Storage code* (Official Gazette no. 58/21) in May 2021 (hereinafter: *Amendments to the Code*). *The Amendments to the Code* prescribe changes to the allocation of storage capacities for the period after 1 April 2022 through an auction process, which is carried out on the basis of bids, which are accepted according to the following rules: the basic element for SBU allocation is an auction premium, which represents a percentage increase in the amount of the SBU tariff rounded off to two decimal places. In the SBU allocation process, each storage year is viewed as a separate auction; bidders can submit one or more bids. The bid with the highest auction premium takes priority in the allocation of SBUs (regardless of the number of SBUs requested); at the end of the auction, the resulting auction premium is calculated, which represents the premium from the lowest ranked bid to which an SBU was allocated, and which is implemented for a particular storage year for all bidders to whom an SBU has been allocated.

The Amendments to the Code, due to the change in the SBU allocation model, additionally defines a changed time frame for the publishing of available capacities for a given storage year; the gas storage system operator must publish a call for the bids on their website from 1 April to 20 May of the current storage year. The deadline for the submission of bids for capacity reservations has also been changed on the annual and multiannual level; bids must be submitted to the address of the gas transmission system operator 20 days at most from the day the call for bids is published. The bid deposit amount is defined such that the basis is no longer a percentage of the value of the gas storage service; instead, absolute amounts are defined on the basis on the sum of SBUs requested for all storage years for which bids are submitted. *The Amendments to the Code* also modify the deadline for notifications on the number of SBUs allocated and the resulting auction premium for each storage year; the gas storage system operator, after allocating the SBUs, must inform the bidders 15 days at the most from the deadline for bid delivery, while the agreement and corresponding confirmation of the contracted service must be delivered by the gas storage system operator within 10 days of the delivery of the notification on the number of allocated SBUs.

Rules for LNG terminal use (Official Gazette no. 87/21)

The LNG terminal operator, LNG HRVATSKA d.o.o., adopted the *Rules for LNG Terminal Use* (hereinafter: the Rules) in July of 2021 with HERA's approval. *The Rules* prescribe the process of contracting the service of unloading and send out of LNG, with the goal of simplifying the contracting process on the one hand and protecting the interest of the LNG terminal operator on the other. The procedure of submitting bids for capacity allocation in the yearly LNG unloading and send out service contracting procedure has been changed; bids are submitted together with a guarantee for capacity allocation in the form of a cash deposit or an unconditional bank guarantee. The process of contracting LNG terminal services has also been elaborated in detail, from the submission of bids for capacity allocation to the conclusion of LNG terminal use agreements or agreements on the shared use of the LNG terminal and the return of the guarantee for capacity allocation. The new chapter in the *Rules*—" *LNG reload from the Floating LNG Storage and Regasification Unit into the LNG carrier or LNG transport truck*"—prescribes the method of using non-standard LNG terminal services, as well as defining the mutual rights and obligations of the users of these services and the LNG terminal operator in greater detail.

The *Rules* also stipulate that natural gas distribution policy (Annex II of the *Rules*), which affirm the principles by which the amount of natural gas available at the LNG terminal is calculated, must be separated from the *Rules* in a separate document the LNG terminal operator, LNG HRVATSKA d.o.o., will publish on its website.

Amendments to the Network code for the gas transmission system (Official Gazette no. 50/18, 31/19, 89/19, 36/20, and 106/21)

In September 2021, the transmission system operator, PLINACRO d.o.o., adopted the *Amendments to the Network code for the transmission system* (Official Gazette 106/21) with HERA's approval; these supplement and amend provisions related to gas quality monitoring in the transmission system, capacity contracting, measurement rules, and reports on measured gas quantities such that the lower net calorific value of gas (NCV) is replaced with GCV.

The *Amendments to the Network code for the transmission system* erased provisions regarding the non-standard service of reduced interruption interruptible capacity at the HR-HU interconnection, which is no longer implemented; instead, GCV is prescribed as of 1 October 2022.

The decarbonisation package and the European Commission's measures for affordable, secure, and sustainable energy

On 15 December 2021 the European Commission adopted proposals for legislative acts to decarbonise the European gas market, thus facilitating the deployment of renewable and low-carbon gases into the gas system, promoting the use of hydrogen, and reducing methane emissions while ensuring energy security for all EU citizens. The proposal for the package of acts contains:

1) *COM 2021/0425: Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on common rules for the internal markets in renewable and natural gases and in hydrogen*
2) *COM 2021/0424: Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the internal markets for renewable and natural gases and for hydrogen (recast)*, and
3) *COM 2021/0423: Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on methane emissions reduction in the energy sector*.

In order to reduce greenhouse gas emissions by at least 55% by 2030 as compared to values in 1990, and for Europe to become the first climate-neutral continent by 2050, energy consumption in the European Union must be decarbonised. This package is intended to contribute to achieving this objective.

The measures of this package should create the conditions for the transition from the use of fossil natural gas to the use of renewable and low-carbon gases, specifically biomethane and hydrogen. Some of the main objectives are to establish a hydrogen market, create an investment-friendly environment, and enable the development of dedicated infrastructure. It proposes that market rules should be applied in two phases, before and after 2030; the topics covered in particular in the proposals are:

- access to hydrogen infrastructure,
- unbundling of hydrogen production and transport activities, and
- setting tariffs.

In order to promote the development of dedicated hydrogen infrastructure, cross-border coordination, and the construction of a network of interconnectors, it is proposed to establish a new governance structure in the form of the European Network of Network Operators for Hydrogen (ENNOH).

The proposals foresee that national grid development plans should be based on a common scenario for electricity, gas, and hydrogen. Such development plans should be consistent with national energy and climate plans, as well as with the ten-year network development plan at the EU level. Gas system operators' development plans must also include information on infrastructure that can be decommissioned or repurposed; separate reporting on the development of the hydrogen network is introduced to ensure that the construction of hydrogen systems is based on realistic demand forecasts.

To facilitate access to the existing gas system for renewable and low-carbon gases, the new rules eliminate tariffs for cross-border interconnections and reduce tariffs at gas injection points. The new rules also establish a low-carbon gas certification system to complete the work started with the certification of gases from renewable sources under *Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources* (hereinafter: *Directive on Energy from Renewable Sources*). To prevent Europe from remaining dependent on fossil natural gas, and to open more space for clean gases in the European gas market, the EC proposes that long-term contracts for the unabated use of fossil natural gas not be extended beyond 2049.

Another priority in the decarbonisation package is to strengthen the position of customers and customer protection Similar to the electricity market, final customers in the gas market will be able to switch suppliers more easily using price comparison tools to obtain accurate, fair, and transparent information on gas billing; they should also have better access to their gas consumption data using smart technologies. In the future, final customers should be able to choose renewable and low-carbon gases instead of fossil fuels.

These proposals are an important step in decarbonising Europe, alongside the legislative package presented on 14 July 2021 under the name "Fit for 55%" and the revision of *Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency*, which was also presented in mid-December; they will certainly contribute to reducing greenhouse gas emissions by at least 55% by 2030 and achieving climate neutrality by 2050.

In March 2022, the EC adopted an initiative called *REPowerEU*: joint European action for more affordable, secure, and sustainable energy. With this initiative, the European Commission proposed a draft plan under which Europe would become independent of Russian fossil fuels well before 2030.

The document in question contains a number of measures as a response to rising energy prices in the European Union, as well as to restore gas supplies for the coming winter. *REPowerEU* will seek to diversify gas supply and accelerate the deployment of renewable gases in heat and electricity production. These measures are projected to reduce the European Union's demand for Russian gas by two-thirds before the end of 2022.

The energy price instrument package adopted by the EC in October 2021 has helped member states mitigate the impact of high prices on vulnerable customers and remains an important framework for national measures. With the *REPowerEU* initiative, the EC has presented additional guidelines offering the possibility of regulating prices under exceptional circumstances; it also sets out how
member states can redistribute revenue from high energy sector profits and emissions trading to consumers. EU State Aid rules also offer Member States options to provide short-term support to companies affected by high energy prices, and help reduce their exposure to energy price volatility in the medium to long term.

Following this March 2022 initiative, on 23 March 2022, the EC launched a legislative procedure to adopt a *Regulation amending Regulation (EU) 2017/1938 concerning measures to safeguard the security of gas supply COM(2022) 135*.

The proposed *Regulation* covers the following topics:

- filling level of gas storage facilities,
- discount of 100% at entry points from and exit points to storage facilities, and
- certifying gas storage system operators.

Regarding the filling level of storage facilities, the EC proposes obligating member states to maintain minimum filling levels in order to ensure security of gas supply in the European Union before the onset of winter. Member states in whose territory a gas storage facility is located must ensure a filling rate of at least 80% by 1 November 2022; this percentage for 2023 and all subsequent years is to be 90%.

The EC believes that gas injections should start as early as April 2022 in order to minimise supply risk in the coming gas year. In order to reduce the risk of bottlenecks during injection, the EC recommends introducing certain incentives for market participants in the form of financial support or compensation mechanisms. Member states will be left to decide for themselves how and who they will incentivise to fill storage facilities. As it is the obligation and responsibility of the member states to maintain filling levels, they can also impose certain penalties for non-compliance with the obligation to fill storage facilities.

Measures adopted by EU member states must be limited exclusively to attaining the goal of filling gas storage facilities; they must be clearly defined, transparent, proportional, non-discriminatory, and verifiable. The measures chosen are not to unduly distort competition and the effective functioning of the internal gas market, nor are they to endanger the gas supply security of other member states or of the Union as a whole.

The EC assumes that gas prices will be high in the summer of 2022, and therefore the storage of gas will not be economically viable for market participants. The EU thus proposes a 100% discount on tariffs at entry points to and exits from gas storage facilities in order to incentivise participants to use the storage facilities as much as possible.

The EU emphasises that storage facilities are considered critical infrastructure, and thus prescribes the certification of those gas storage system operators who manage storage facilities with a capacity higher than 3.5 TWh and who were at less than 30% off their maximum capacity on 31 March 2021 and 31 March 2022.

The Regulation should enter into force early enough to be implemented in the second half of 2022, as the first control point for filling levels mentioned is 1 August 2022.

5.2 Regulated activities in the natural gas sector

5.2.1 Gas transmission

Gas transmission is a regulated energy activity performed as a public service. The state-owned energy entity PLINACRO d.o.o. is Croatia's transmission system operator. On 23 July 2021, HERA issued PLINACRO d.o.o. a *Decision on the issuance of a certificate to the transmission system operator*, as a transmission system operator unbundled in terms of ownership.

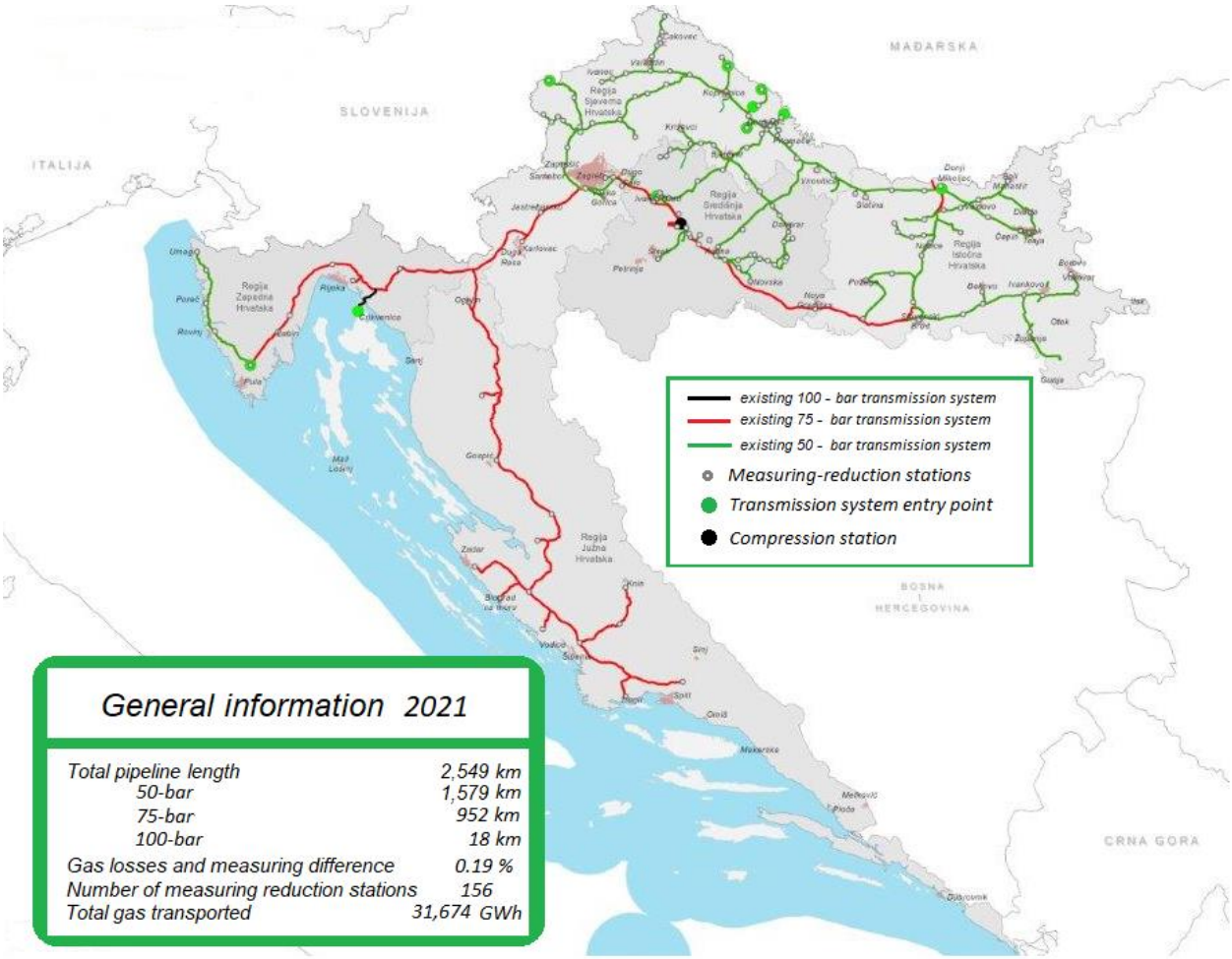
The certification PLINACRO d.o.o. is a process based on the principles of the European Union single internal electricity and gas market, through which HERA, as the national energy regulator, confirms the conformity of the transmission system operator with the provisions of the **Gas Market Act**, which govern the unbundling, independence, and organisational structure of the gas transmission system operator. The **Gas Market Act** lays down three possible models according to which the operator can be certified:

- as a transmission system operator unbundled in terms of ownership,
- as an independent system operator, or
- as an independent transmission operator.

In June 2015, PLINACRO d.o.o. applied for certification as a gas transmission system operator to HERA as an operator unbundled in terms of ownership. Before 2021, the application was supplemented several times, as certain requirements were not fulfilled – the unbundling of public authorities that simultaneously control PLINACRO d.o.o. and some entities engaged in the production, trade, and supply of electricity, as well as natural gas production. The complete documentation and final (supplemented) application for certification as a transmission system operator unbundled in terms of ownership in accordance with the **Gas Market Act** was delivered to HERA on 15 February 2021. In response to the supplemented application, HERA's cooperation with energy entity PLINACRO d.o.o. continued; on 22 March 2021, it took a *Decision* affirming the *Draft decision on the certification granted to PLINACRO d.o.o.* as a transmission system operator unbundled in terms of ownership, which was also submitted to the European Commission for an opinion. On 25 May 2021, HERA received *COMMISSION OPINION C(2021) 3856* (hereafter: *Commission Opinion*).

Taking the *Commission Opinion* into consideration, on 23 July 2021, HERA adopted the *Decision on the certification granted to PLINACRO d.o.o.* as a transmission system operator unbundled in terms of ownership.

The transmission system managed by PLINACRO d.o.o. consists of trunk and regional gas pipelines through which natural gas from domestic production (the northern part of continental Croatia and the Northern Adriatic), the LNG terminal on the island of KRK, and from imports via the interconnections with Slovenia (Zabok–Rogatec) and Hungary (Donji Miholjac–Dravaszerdahely) is transported to exit metering-reducing stations (hereinafter: MRS), where the gas is delivered to gas distribution systems and to final (non-household) customers directly connected to the transmission system. The Croatian gas transmission system is shown in Figure 5.2.1.



Source: Plinacro d.o.o.

Figure 5.2.1. The Croatian gas transmission system

The total length of the gas transmission system in the Republic of Croatia at the end of 2021 was 2,549 km (1,579 km of gas pipelines with a working pressure of 50 bar, 952 km of gas pipelines with a working pressure of 75 bar, and 18 km of gas pipelines with a working pressure of 100 bar).

Gas is received into the transmission system from nine connection points at entry measuring stations, five of which are used to receive gas from production fields in Croatia, two of which are measuring stations at interconnections with the Slovenian and Hungarian transmission systems, one is used to inject and withdraw gas from the underground gas storage facility, and one is used to receive gas from the LNG terminal.

Gas from the transmission system is delivered to 170 connection points (156 exit pressure reducing metering stations), 39 of which are used to deliver gas to final customers connected to the transmission system, 128 of which are used to deliver gas to distribution systems operated by 33 distribution system operators, one of

which is used for injecting and withdrawing from the underground gas storage facility, and two of which are exits at interconnections.

In 2021, the transmission system operator PLINACRO d.o.o. continued its development activities in preparing numerous projects, both through the phases of environmental impact studies and in creating draft and final projects and obtaining planning permission and building permits.

The following investments were also realised in 2021:

- reconstruction of the Ivanić Grad - Kutina gas pipeline,
- at the southern interconnection with Bosnia and Herzegovina, activities were undertaken to obtain the necessary permits for the Zagvozd - Imotski and Imotski - Posušje gas pipelines,
- planning permission was obtained for works at interconnection pipelines with Serbia for the Slobodnica - Sotin and Sotin - Bačko Novo Selo pipelines,
- activities were undertaken regarding environmental impact studies for the construction of the Lepoglava - Krapina (Đurmanec), Osijek - Vukovar, Vukovar - Negoslavci gas pipelines,
- a draft project and planning permission for the construction of the Slatina - Velimirovac gas pipeline,
- the MRS Hampovica, MRS Čađavica, and MRS Daruvar metering-reducing stations were completed; a utility license was obtained for the MRS Banova Jaruga and MRS Molve selo projects; a draft project was created for the purpose of obtaining planning permission for the MRS Bobuši and MRS Žabno projects,
- applications were submitted for building permits for the MRS Slavonski Brod and MRS Gaj projects,
- construction was completed on the Slobodnica - Bosnia and Herzegovina gas pipeline connection at the Slobodnica gas node, and
- activities were undertaken to obtain the necessary permits for the reconstruction of gas nodes MRS/MRN Ivanja Reka, MRN Kutina, GN Dobrovac, and MRN/MRS Ivanić Grad.

In 2021, requests for capacity reservations in the gas transmission system were received from 14 balance group managers, which include 44 direct balance group members; gas transmission services were used by 73 transmission system users in 2021 according to the number of entries into and exits from the transmission system used:

- 9 users using entries at interconnections,
- 1 user using an entry from an upstream pipeline network,
- 3 users using an entry from the LNG terminal,
- 42 users using exits to the distribution systems,
- 12 users using exits to final customers, and
- 6 users using exits at interconnections.

In 2021, applications for yearly, quarterly, monthly, daily, and intraday capacity reservations were received via the capacity management system (SUKAP) and via auctions on online platforms for capacity lease and trade (PRISMA at the interconnection with Slovenia and RBP at the interconnection with Hungary).

During 2021, transmission system users used all available capacity products; short-term capacity products were used heavily at entries into the transmission system in the first half of the year, primarily at interconnections, in order to satisfy increased demand for gas due to low temperatures. Aside from this, in the first half of 2021, monthly capacity products were also heavily used as a result of the launch of the LNG terminal (as of 1 January 2021). In the 2021/2022 gas year, annual capacity reservations at entries into the transmission system were around 26% higher than in the previous gas year. In 2021, transmission system users expressed significant interest in capacity reservations at the Omišalj metering station, which resulted in a decrease in reservations at the Rogatec and Dravaszerdahely metering stations as compared to 2020. During February 2021, monthly capacity reservations were increased at the entry to the Dravaszerdahely interconnection as a result of disruptions in the market price of LNG, which led to the redirection of LNG ships to the Asian market, where they could attain significantly higher prices; this resulted in the temporary unavailability of capacities at the Omišalj metering station. Capacity reservations at the exits to the distribution systems were at the same level, which means short-term capacity products were in standard use during the heating season to cover peak demand. Capacity reservations at the exits towards final customers connected to the transmission system in 2021 were lower than in 2020, as the largest final customer was undergoing a refit (Petrokemija d.d.), which reduced its capacity significantly during two peak months. There

was increased interest in gas exports from Croatia, primarily due to the new gas supply route from the LNG terminal and gas price increases on EU markets.

According to data submitted to HERA by energy entity PLINACRO d.o.o., the total quantity of gas transported in Croatia in 2021 amounted to 31,674 kWh, which represents a 2.5% decrease as compared to the total transported quantity in 2020.Total losses and imbalances in gas metering in 2021 amounted to 0.19%. The largest quantity of gas for end consumption[69] transported in a single day was 128.87 kWh/day, which represents a 6% decrease as compared to 2020. The maximum utilised capacity at all entries into the transmission system in 2021 was 9.07 GWh/h, which is 12.3% more than in 2020. The highest maximum used capacity at an individual entry into the transmission system took place at the LNG terminal entry in the amount of 2.94 GWh/h, which was 6.1% higher than the maximum used capacity in 2020, which was measured at Dravaszerdahely metering station. As compared to 2020, the maximum used capacity at the entry to the Rogatec interconnection reduced significantly by 78.2% as a result of the significant increase of gas prices on the EU markets, as well as the launch of the LNG terminal. Capacity usage continued to fall at the entry from domestic production, by 27.4% as compared to the same entry in 2020.

The quantities of transported gas by transmission system entry groups per month in 2021 are shown in Figure 5.2.2.

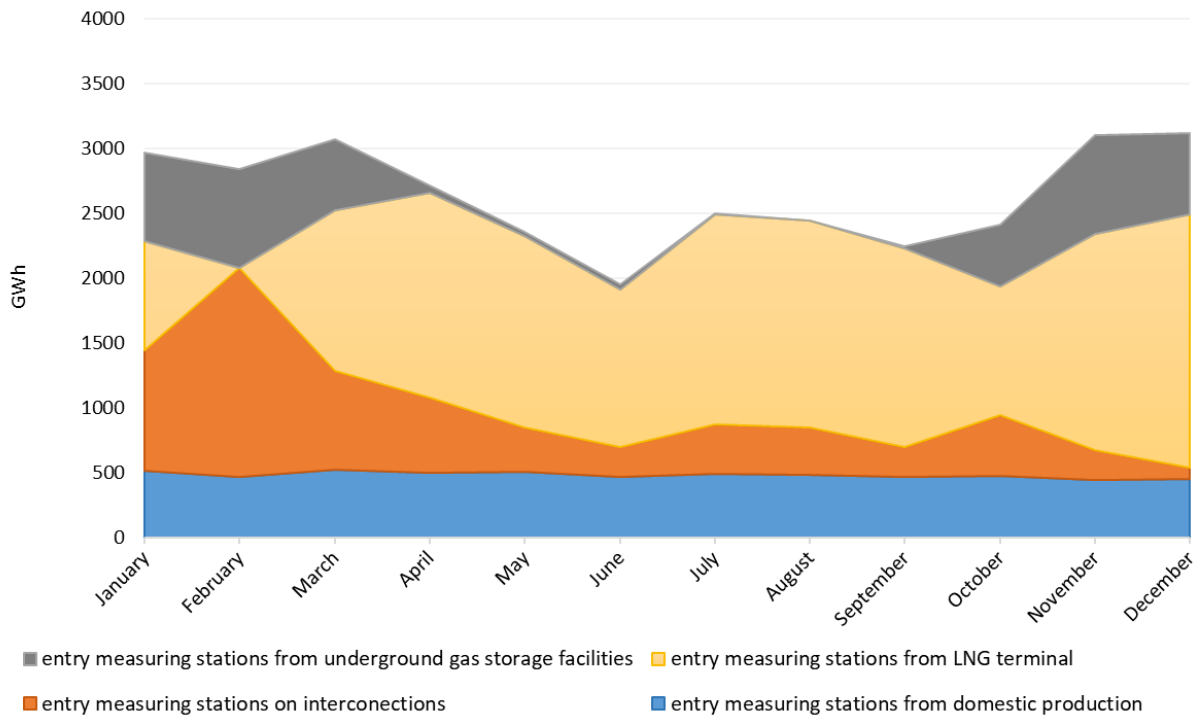


Figure 5.2.2. Quantities of transported gas by transmission system entry groups by month in 2021

The maximum used capacity at all transmission system exits in 2021 amounted to 8.66 GWh/h, which represents a 20.8% increase as compared to 2020; the highest maximum used capacity was recorded at exits to distribution systems in the amount of 3.24 GWh/h, which represents a 4.8% increase as compared to 2020.

The quantities of transported gas for transmission system groups od exits by month in 2021 are shown in Figure 5.2.3.

[69] *Exits to distribution systems and exits to final customers directly connected to the transmission system.*

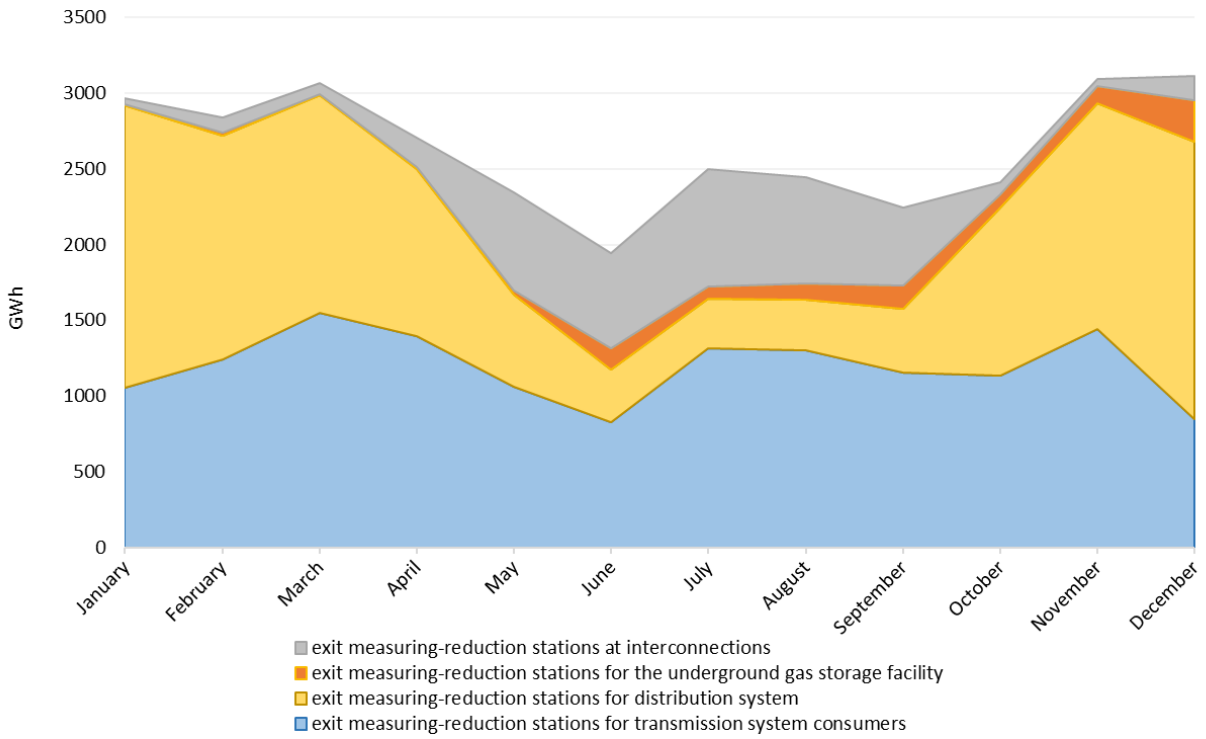


Figure 5.2.3. Quantities of transported gas by transmission system exit groups by month in 2021

The total annual quantities of transported gas by final customer groups are shown in Figure 5.2.4.

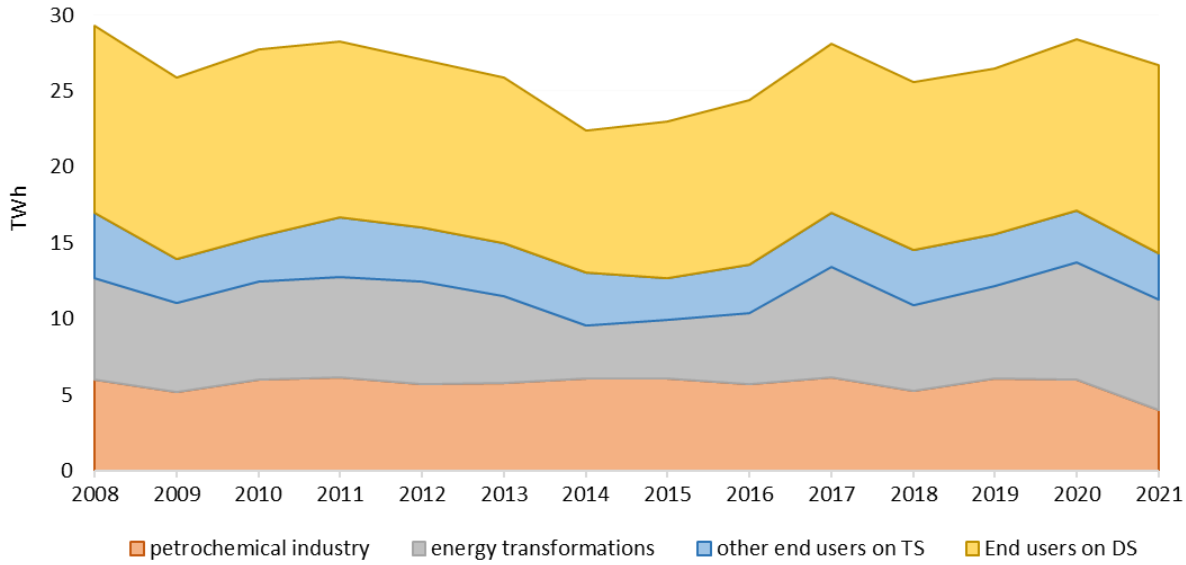


Figure 5.2.4. Total annual quantities of transported gas by final customer groups from 2008-2021

As of January 2019, in addition to the current firm physical capacity for gas transmission from Slovenia to Croatia, firm physical capacity for gas transmission from Croatia to Slovenia has been enabled at the Zabok-Rogatec interconnection. The maximum utilised capacity in 2021 was 0.28 GWh/h.

At Donji Miholjac – Dravaszerdahely interconnection, in addition to the permanent physical capacity for gas transmission from Hungary to Croatia, the construction of the KS1 compressor station in Velika Ludina (commissioned in January 2020), the non-standard service of using reduced interruptibility interruptible capacity to transport gas from Croatia to Hungary was replaced by permanent physical capacity from Croatia into Hungary. The maximum utilised capacity in 2021 was 0.56 GWh/h.

An overview of indicators for gas transmission by year from 2017 to 2021 is presented in Table 5.2.1.

Table 5.2.1. Overview of indicators for gas transmission by year from 2017 to 2021

Indicator	2017	2018	2019	2020	2021
Number of transmission system operators	1	1	1	1	1
Total length of gas pipelines in the transmission system (km)	2,693	2,693	2,531	2,549	2,549
The largest quantity of transmitted gas for end consumption (TWh/day)	0.158	0.157	0.133	0.137	0.129
Quantity of transmitted gas for exit groups into the transmission system (TWh)	32.348	29.541	30.807	32.481	31.712
Quantities of transmitted gas for entry groups from the transmission system (TWh)	32.340	29.541	30.809	32.481	31.674

Transmission system balancing

Transmission system balancing was managed in accordance with the *Gas Market Code* and the provisions of the *Network code for the gas transmission system*. Activities have continued regarding the implementation of *Commission Regulation (EU) 312/2014 of 26 March 2014 establishing a network code on harmonised transmission tariff structures for gas balancing* (hereinafter: *Regulation 312/2014*), which prescribes gas balancing rules.

Transmission system balancing in 2021 was undertaken in accordance with the valid rules, according to which the transmission system operator intervened via the gas market operator's trading platform by activating standardised short-term products in periods when balancing group managers did not balance their portfolios. Balancing actions can be undertaken by using available products on the trading platform as negative or positive balancing energy, by publishing calls for bids for products if there are no suitable products on the trading platform that can also be used as negative or positive balancing energy, and by using balancing energy for the balancing service (contracted annually by the transmission system operator on the basis of a public tender they independently carry out).

The number of transmission system operator interventions was lower in 2021 than the previous year (104 interventions compared to 113 in 2020). The balancing service was not available as there was no need to use the balancing service, as short-term products offered through the trading platform were always sufficient.

A total of 156 million kWh of positive balancing energy and 221 million kWh of negative balancing energy were activated in 2021. As compared to the total amount of gas taken up into the transmission system, 0.70% of negative balancing energy and 0.49% of positive balancing energy was activated in 2021.

Gas transmission regulation methods

In addition to the **Gas Market Act** and other energy regulations, gas transmission is also regulated by the *Methodology for setting tariffs for gas transmission* and is based on the incentive regulation method, which defines the maximum allowed levels of transmission system operator revenues in an individual revenue period. The distribution of allowed revenues and the determination of tariff amounts is based on the entry-exit model, without considering the length of the transmission route, i.e., the distance between entry and exit points in the transmission system (postage stamp principle). According to the *Methodology*, allowed operating costs are determined by applying incentive mechanisms of efficiency coefficients and allocating actual savings, while allowed capital costs are determined based on the allowed depreciation of regulated assets and the allowed rate of return on regulated assets. The projection of value of regulated assets for a regulatory period of five years is determined with the *ex-ante* approach of approving investment plans, as well as with the *ex-post* revision of realised investments. The *Methodology* also prescribes the ability to determine justified values of long-term material and non-material assets on the basis of economic efficiency analyses of operator assets, as well as expense and efficiency analyses of transmission system operators in the region surrounding Croatia.

Upon the expiry of a regulatory period, allowed revenues are revised, including operating and capital costs, and the realised revenues are compared based on tariffs with the revised allowed revenues; possible imbalances are included in the calculation of allowed revenues for the following regulatory period.

A regulatory period for gas transmission is defined as a multi-annual, five-year period for which allowed revenues and tariffs are determined independently for each regulatory year. The third regulatory period is currently underway, which began on 1 January 2021 and will last until 31 December 2025, and for which tariffs are determined using the *Methodology* in accordance with *Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonised transmission tariff structures for gas* (hereinafter: *NC TAR Regulation*).

Gas transmission price and connection charge

In accordance with the *Amendments to the Methodology for setting tariffs for gas transmission*, HERA adopts tariff amounts for gas transmission, which are equal for all transmission system users.

In 2021, the first year of the third regulatory period for gas transmission, tariffs were defined in the *Decision on tariffs for gas transmission*, which HERA adopted in accordance with the *Methodology for setting tariffs for gas transport* in December 2020. The total average price of gas transmission in 2021, influenced by the heavy usage of more expensive short-term capacity products, amounted to HRK 0.0174/kWh, which represents an increase of HRK 0.0052/kWh, or 42.6% as compared to the realised average cost of HRK 0.0122/kWh in 2020.

Tariffs for transmission system use for the third regulatory period are based on a calculation of planned permitted operator revenue, which also contains the difference established during the regular revenue audit for the previous (second) 2017-2020 regulatory period, which is to a certain extent influenced by new gas transmission infrastructure that allows gas to be dispatched from the LNG terminal into the Croatian gas transmission system and onward towards the rest of the European Union.

On the basis of the established planned permitted revenue and with the implementation of the elements of the aforementioned *Methodology*, the amount of tariffs for all transmission system entries are equal, except the transmission system entries from the gas storage facility and the LNG terminal, which are discounted as compared to other tariffs. The amounts of tariffs for transmission system exits (exits in Croatia and exits at interconnections) are also equal. Likewise, the charge for transported quantity of gas is no longer applied as of the third regulatory period.

Figure 5.2.5. shows tariff amounts for gas transmission for the third regulatory period (2021-2025), net of VAT.

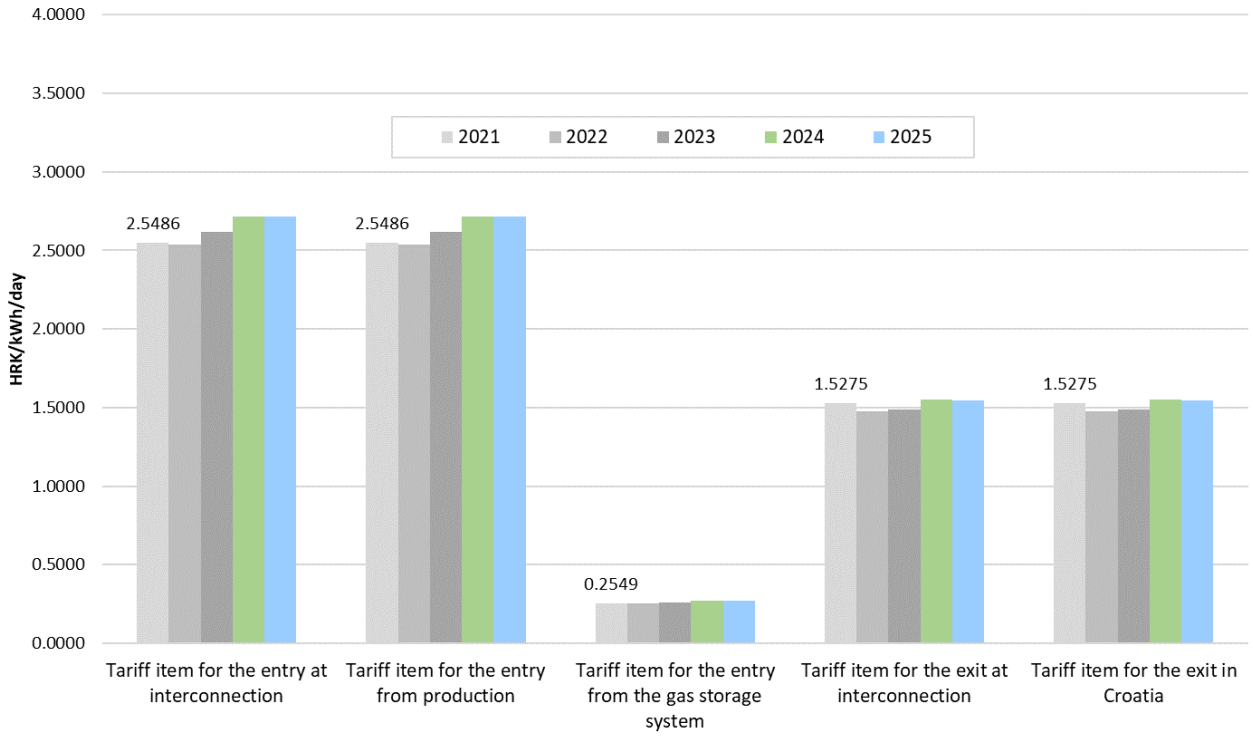


Figure 5.2.5. Tariff amounts for gas transmission for the first and second regulatory period (2021-2025), net of VAT

In addition to gas transmission service, the transmission system operator also provides connection services to the transmission system or increases in connection capacity in accordance with the *Methodology for establishing charges for connection to the gas distribution or transmission network and for increasing connection capacity*. Among other things, this *Methodology* defines: categories of connections to the gas transmission system; categories of operations according to complexity; methods, elements, and criteria for calculating charges for gas transmission system connection and increases in connection capacity; request procedure for determining or changing the amount of charges for connection, as well as the adoption, publishing, and implementation of connection charges. *The Methodology* defines categories of connections and the corresponding coefficients, as well as the number of working hours required in a particular category of operations according to complexity for connecting particular categories of use to the transmission system.

Connection fees consist of the cost of the extraordinary creation of technical requirements in the transmission system and the cost of implementing connections to the transmission system. The cost of the extraordinary creation of technical requirements, which is equal to the cost of building new parts of the transmission system, consist of the cost of project documentation, enacting the permits required by valid legislation, resolving property ownership issues, purchasing the required materials and equipment, and implementing engineering, electrical, construction, geodetic, and other required works. The connection charge is charged directly to the investors at whose request the service is initiated, and the amount of the charge depends on the complexity of the task.

The connection charge is determined by HERA for a regulatory period of five years; in 2021, it was calculated by the transmission system operator based on HERA's *Decision on charges for connection to the gas distribution or transmission and for increasing connection capacity for the 2017-2021 regulatory period* (Official Gazette no. 122/16) of 16 December 2016. In December 2021, on the basis of *the Methodology for calculating the charge for connection to the gas distribution or transmission system and for the connection capacity increase*, HERA adopted a new *Decision on charges for connection to the gas distribution or transmission and for increasing connection capacity* (Official Gazette no. 48/18), which defined the charge for connection to the transport system during preparatory and final works for the years of the third regulatory period (2022-2025).

Additionally, on the basis of the *Methodology for setting the price of non-standard services for gas transmission, distribution, storage, the unloading and send out of liquefied natural gas, and public service gas supply*, in December 2021, HERA adopted the *Decision on the cost of non-standard services of the transmission system operator* (Official Gazette no. 141/21) for the period from 2022-2025 according to the average price of a working hour in the amount of HRK 190.00/h, net of VAT.

5.2.2 Management of the liquefied natural gas terminal

Management of the liquefied natural gas terminal is a regulated energy activity performed as a public service. The LNG terminal operator in Croatia is energy entity LNG Hrvatska d.o.o.

The LNG terminal operator has concluded a lease agreement for LNG terminal capacities for the regulatory period from 2021-2040 with five terminal users; the full capacity of the LNG terminal has been leased for the first three gas years. The LNG terminal operator publishes and updates free long-term capacities for lease in the annual LNG unloading and send out procedure on its website, as well as free short-term capacities that can be leased in the process of contracting short-term LNG regasification capacities, which are published after the annual procedure for contracting LNG unloading and send out services, in accordance with the *Rules for LNG terminal use.* In 2021, short-term lease of LNG regasification capacities was not contracted.

The terminal consists of a floating storage and regasification unit and an onshore terminal. The technical capacity of the LNG terminal on the island of Krk is 2.6 billion m^3 per year.[70] In addition to the floating storage and regasification unit (FSRU), LNG carriers with a capacity of 3,500 m^3 to 265,000 m^3 can also dock at the terminal. The "*LNG Croatia*" FSRU ship consists of LNG storage containers and equipment for the loading, unloading, and regasification of LNG. The "*LNG Croatia*" FSRU ship is equipped with four LNG storage tanks with a total storage capacity of 140,206 m^3, three LNG regasification units with a maximum total regasification rate of 451,840 m^3/h, and a power plant that produces electricity for the terminal's operations.

[70] *As of 11 April 2022, the technical capacity of the LNG terminal has been increased to 2.9 billion m^3 per year*.

The onshore part of the LNG terminal consists of the jetty head, breasting dolphins for FSRU berthing, mooring dolphins for FSRU and LNG carrier berthing, quick release hooks, an access bridge, high-pressure offloading arms with connecting pipeline, a pig launching station, firefighting system, terminal control building, and associated facilities. Figure 5.2.6. shows the "LNG Croatia" FSRU ship on the island of Krk.

Source: LNG Hrvatska d.o.o.

Figure 5.2.6. FSRU ship "LNG Croatia" on the island of Krk

The LNG terminal began operations on 1 January 2021. Developments and improvements to the terminal in 2021 included investments into the increased efficiency and reliability of technological processes, as well as the increased security of the terminal itself, including e.g. the construction of access paths and roads, the placement of a protective fence around the terminal, works on the coastline, anti-corrosion protection for pipe fittings and the dolphin catwalks, adjustments to the cathodic protection system, the implementation of methane number in TMS and IAS IT systems, etc. In 2021, in order to increase the security and reliability of the terminal, LNG terminal operator LNG Hrvatska d.o.o. began a project to develop an optical gas pipeline monitoring system for the terminal.

Also, during 2021, several projects were initiated that will enable the LNG terminal operator to provide new services and increase added value. The same applies to adaptation works on the FSRU ship to enable a new LNG reloading service from the FSRU ship to LNG carriers, as well as works on the terminal to develop a new LNG reloading service from the FSRU ship into LNG transport trucks. The construction of an electricity connection facility continued in 2021.

In 2021, a total of 19 ships from 7 different countries arrived at the LNG terminal: USA, Nigeria, Belgium, Qatar, France, Egypt, and Trinidad and Tobago. The total purchased amount of LNG amounted to 16,264,872 MWh. The total quantity of natural gas sent out from the LNG terminal into the gas transmission system in 2021 amounted to 15,703,324 MWh, while the total amount of LNG stored at the terminal as of 31 December 2021 amounted to 389,413 MWh. Figure 5.2.7. shows the share of purchased quantities of LNG in 2021 by LNG terminal user, while Figure 5.2.8. shows the total quantity of LNG by country of origin.

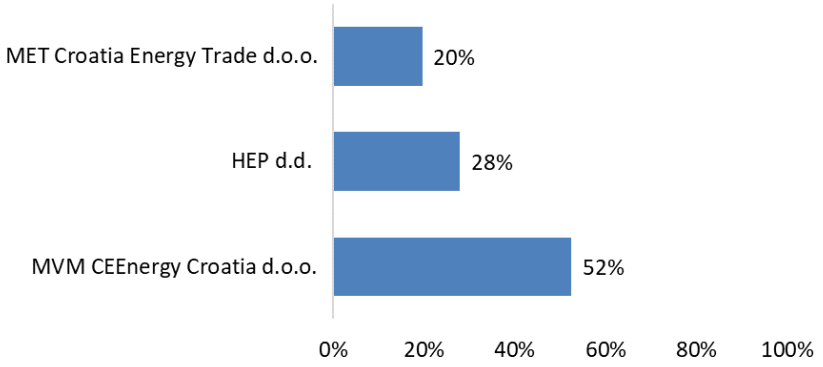


Figure 5.2.7. Share of purchased quantities of LNG in 2021 by LNG terminal user

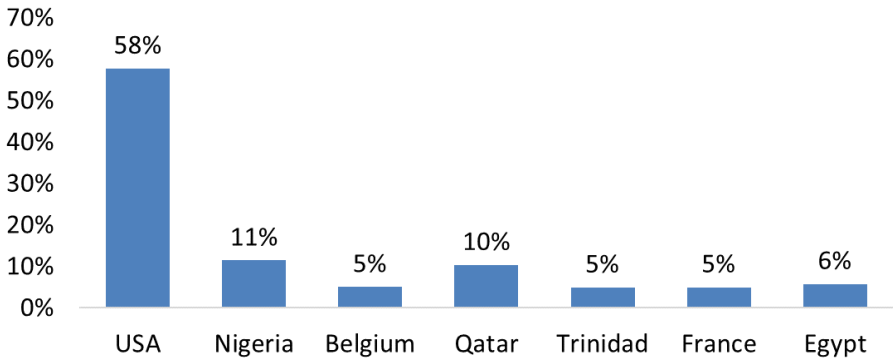


Figure 5.2.8. Total quantity of LNG by country of origin

The maximum utilized LNG receipt capacity on the FSRU ship in 2021 was 1,127,513 MWh/day, while the maximum used LNG regasification capacity at the terminal was 71,080 MWh/day.

Figure 5.2.9. shows the shares of total contracted LNG terminal capacities for 2021-2040 per LNG terminal user, with the balance as of the end of 2021.

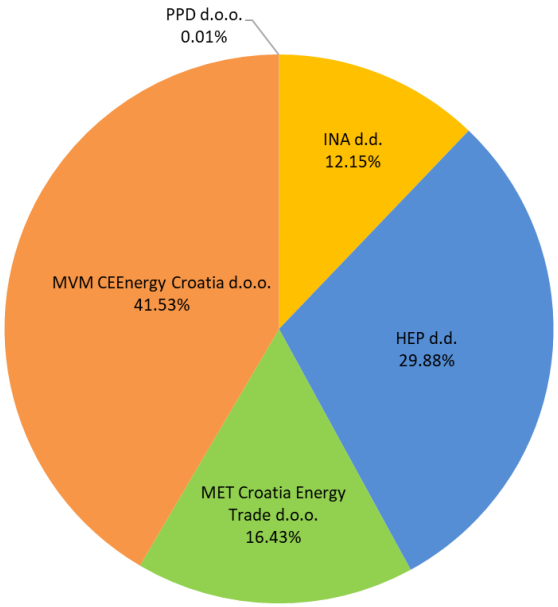


Figure 5.2.9. Distribution of shares of total contracted LNG terminal capacities for 2021-2040 per LNG terminal user (balance as of the end of 2021)

An overview of indicators for LNG terminal management for 2021 is shown in Table 5.2.2.

Table 5.2.2. Overview of indicators for liquefied natural gas terminal management for 2021

Indicator	2017	2018	2019	2020	2021
Total receipt of LNG per year (MWh)	-	-	-	127,260	16,264,872
Total sent out natural gas from the terminal into the transmission system (MWh)	-	-	-	74,188	15,703,324
Total LNG stored at the terminal on 31/12 (MWh)	-	-	-	17,331	389,413
LNG reception capacity on the FSRU ship (MWh/day)	-	-	-	48,000	1,156,424
Storage capacity (MWh/day)	-	-	-	840,000	844,466
LNG regasification capacity at the terminal (MWh/day)	-	-	-	10,800	107,056
Natural gas send out capacity into the transmission system (MWh/day)	-	-	-	72,000	72,000

Management of the liquefied natural gas terminal

In addition to the **Gas Market Act**, the **Liquefied Natural Gas Terminal Act**, and other energy regulations, the management of the LNG terminal is also regulated by the *Methodology for determining the amount of tariffs for the unloading and send out of liquefied natural gas*, which is based on the incentive regulation method, which defines the maximum allowed levels of LNG terminal operator revenues in an individual revenue period.

The *Methodology* also foresees the implementation of a regulatory account, which was established for LNG Hrvatska d.o.o for the period from 2021-2040 as a model of incentivised energy activity regulation when, due to significant planned investments in the development of the LNG terminal, a lengthy ROI period is foreseen for the operator, given that the amount of tariff items for the unloading and send out of LNG without the implementation of a regulatory account may result in a non-competitive price that hinders the development of the project. The regulatory account is based on the incentive regulation method, i.e. on the maximum allowable price method, and is approved such that the operator generates cumulatively equal permitted revenues as it would without the implementation of a regulatory account, but at a different time dynamic.

The *Methodology* also includes the economic efficiency of existing operator assets, as well as foreseeing the possibility of determining the fair value of long-term material and non-material assets on the basis of an economic efficiency analysis of operator assets, as well as comparative expense and efficiency analyses of transmission system operators in Croatia and the surrounding the region.

The regulatory period for which the regulatory account is established may not be shorter than two regulatory periods, i.e. shorter than 10 years. The operating conditions of the LNG terminal are determined by the *Rules for LNG terminal use*.

Price of the unloading and send out of liquefied natural gas

In December 2020, based on the Methodology for determining the amount of tariffs for the unloading and send out of liquefied natural gas (Official Gazette no. 48/18 and 79/20), HERA adopted the Decision on the amount of tariffs for the unloading and send out of liquefied natural gas (Official Gazette no. 144/20) for the years of the first regulatory period (2021-2025) and the Decision establishing a regulatory account for LNG terminal management for energy entity LNG Hrvatska d.o.o., Zagreb, for the period from 2021-2040 in order to define tariffs for LNG terminal operator LNG Hrvatska d.o.o. that are competitive as compared to the service prices of other LNG terminal operators in Croatia's surrounding area, and which reduce significant variability in tariffs due to the influence of changes in capacity lease levels at the LNG terminal realised for a period of 20 years.

On the basis of these decisions, the amounts of tariffs for the unloading and send out of LNG were defined for LNG terminal operator LNG Hrvatska d.o.o., which are equal for all years of the first regulatory period (2021-2025) and amount to EUR 1.17/MWh.

Also, on the basis of the Methodology for setting the price of non-standard services for gas transmission, distribution, storage, the unloading and send out of liquefied natural gas, and public service gas supply, in December 2021, HERA adopted the Decision on the cost of non-standard services of the liquefied natural gas

terminal operator (Official Gazette no. 141/21) for the period from 2022-2025 according to the average price of a working hour in the amount of HRK 270.00/h, net of VAT.

5.2.3 Gas storage

Gas storage is a regulated energy activity performed as a public service. The Croatian gas storage system operator is energy entity Podzemno skladište plina d.o.o., which uses UGSF Okoli for natural gas storage.

UGSF Okoli consists of underground gas reservoirs (geological formations), operating and control wells, and the overground part of the plant with well platforms, connection pipelines, regulation station, gas drying station, measuring station, compression station and ancillary facilities. As a rule, natural gas is injected into the underground reservoir from 1 April to 31 September and withdrawn from 1 October to 31 March. The maximum capacity of the injection cycle is 180,000 m^3/h, and the maximum capacity of the withdrawal cycle is 240,000 m^3/h.

The technical capacity of the gas storage system[71] in working volume in 2021 amounted to 4,700,000 MWh or 94 SBU; the technical withdrawal capacity amounted to 2,116 MWh/h (50,784 MWh/day); the technical injection capacity amounted to 1,587 MWh/h (38,088 MWh/day).

In 2021, a total of 3,331,125 MWh of natural gas was injected into UGSF Okoli, while 3,417,057 MWh of natural gas was withdrawn. There were several operating cycles in UGSF Okoli in 2021: three periods of gas withdrawal, two stand-by periods, and two periods of gas injection. The day marking the end of the natural gas withdrawal cycle and the beginning of the injection cycle, as determined according to the minimum gas quantity in the storage facility for the calendar year, was 3 April 2021, when the operating volume was 936,393 MWh. The beginning of the final gas withdrawal cycle was 27 October 2021, when the working volume balance amounted to 4,265,882 MWh, which was the highest working volume balance of UGSF Okoli in 2021.

The largest gas withdrawal capacity achieved in 2021 was 2,103 MWh/h, while the largest gas injection capacity achieved was 1,587 MWh/h.

Natural gas stocks at UGSF Okoli (GWh) on the first day of the month from 2017-2021 are shown in Figure 5.2.10.

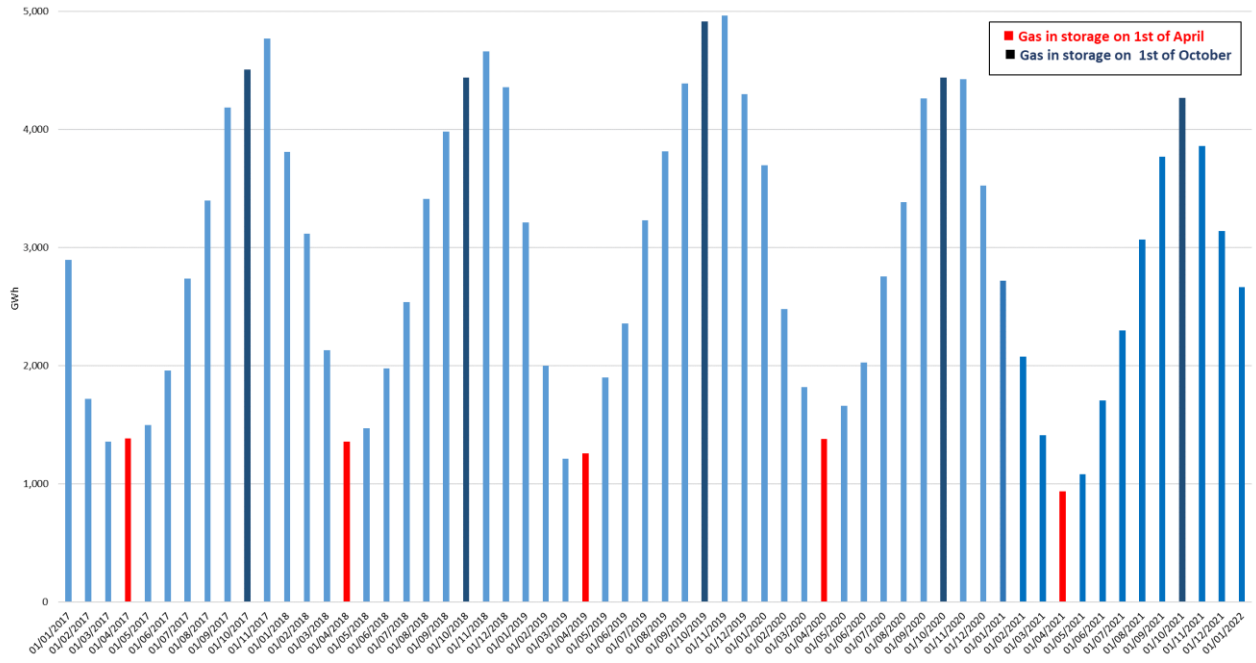


Figure 5.2.10. Natural gas stocks at UGSF Okoli (GWh) on the first day of the month from 2017-2021

An overview of indicators for gas storage by year from 2017 to 2021 is presented in Table 5.2.3.

71 *Technical capacity is the total capacity of the gas storage system that the gas storage system operator can offer to system users, taking into account the integrity and technical capabilities of the gas storage system.*

Table 5.2.3. An overview of indicators for gas storage by year from 2017 to 2021

Indicator	2017	2018	2019	2020	2021
Working volume capacity of the gas storage system (GWh)	5,050	5,050	5,050	4,700	4,700
Technical working volume capacity of the gas storage system (SBU)	101	101	101	94	94
Maximum used working volume capacity of the gas storage system (SBU)	96	95	100	90	85
Gas withdrawal capacity of the gas storage system (MWh/h)	2,274	2,274	2,274	2,116	2,116
Gas injection capacity of the gas storage system (MWh/h)	1,705	1,705	1,705	1,587	1,587

The following investments were started and completed in 2021:

- the continuation of activities on the construction of the new underground gas storage facility at the "*Grubišno Polje*" production field, in relation to which the following significant activities can be singled out:
  - a permit for the storage of natural gas at the "*Grubišno Polje*" production field was obtained from the Ministry, and a natural gas storage agreement was signed with the Ministry,
  - a building permit was obtained for the reconstruction and refit of the Virovitica-Kutina main gas pipeline from the Ministry of Physical Planning, Construction and State Assets,
  - the main equipment to build and equip future structures and facilities at UGSF Grubišno Polje production field were purchased, and agreements were concluded for construction and supervision for the first construction phase of UGSF Grubišno Polje,
- the project to connect UGSF Okoli to the public network by fibre optic line was completed in order to ensure constant, reliable telecommunications connections for the needs of the control room, the installation of servers at UGSF Okoli, dispatch software, and communication with PLINACRO d.o.o. fibre optic cable was laid from UGSF Okoli to MRS Ludina; two fibre optic cables were leased between MRS Ludina to Ivanić Grad, where there is a redundant exit to the HT public network,
- a project to improve the technical protection system at UGSF Okoli was also completed, in the aim of improving protection of the most critical points of the existing system.

The market role and the significance of gas storage is directly related to other gas market components, particularly in the context of market liberalisation. In this sense, the operations of the gas storage system operator were marked by several phases – up to 31 March 2014, when the storage system was used by only one user; from 1 April 2014 to 31 March 2017, when the storage system was used by a number of users for the first time (four gas suppliers and the transmission system operator); and from 1 April 2017 up to and throughout 2021, when the gas storage service was used by 10 users (nine gas suppliers and the transmission system operator).

It should be noted here that the gas storage system operator was obligated[72] to allocate, as a priority, a part of the gas storage system capacities, i.e. the standard storage capacity packages (SBUs), to the supplier in the wholesale market from 1 April 2018 to 31 March 2020. Thus, from 1 April 2014 to 31 March 2017, the wholesale market supplier was allocated 70% of the total available capacity; this share was reduced to 60% of the total available capacity as of 1 April 2017, throughout all of 2018 and 2019, until 31 March 2020.

From 1 April 2020 to 31 March 2021, the gas storage system operator distributed the available number of SBUs to suppliers in the public service using a proportional principle based on historical data on delivered gas quantities in accordance with the **Gas Market Act**.

As of 1 April 2021, the gas storage system operator places the available number of SBUs and the period for which they are being offered on the market, without priority allocation for the public service.

[72] *Decision of the Republic of Croatia on determining priorities in implementing the procedure for gas storage system capacity allocation for suppliers participating in the wholesale gas market (Official Gazette no. 29/14), Article 31.2. of the Act on Amendments to the Gas Market Act (Official Gazette no. 16/17), and Article 114 of the Gas Market Act (Official Gazette no. 18/18).*

In June of 2021, in accordance with the *Amendments to the Storage Code*, the gas storage system operator Podzemno skladište plina d.o.o. allocated 32 available SBUs, which were placed on the market for the contracting period from 1 April 2022 to 31 March 2027. SBUs were allocated through an auction, which was a new model of allocation enabling the more efficient allocation of SBUs; the available number of SBUs was allocated to 5 users who submitted requests for allocation on the basis of the highest auction premium offered. As of 1 April 2022, the capacity of the gas storage system operator contracted by users amounts to 86 SBUs.

The allocation of capacities (SBUs) in the gas storage system by user, showing the three largest users of the gas storage system in the aforementioned periods, is shown in Figure 5.2.11.

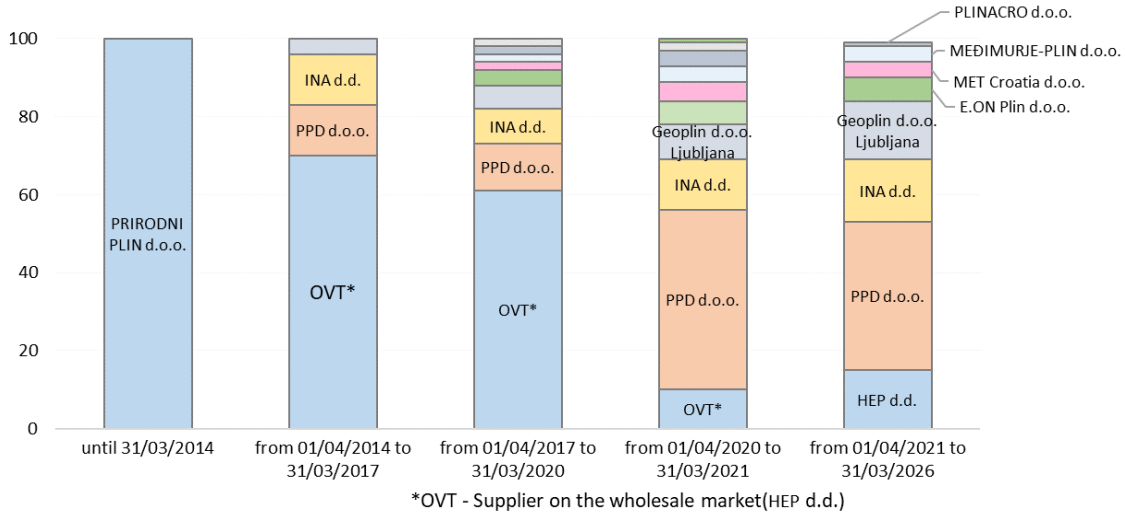


Figure 5.2.11. Allocation of UGSF Okoli gas storage capacities (standard bundled units)

To adapt to market demands and the new balancing rules, the gas storage system operator enabled gas storage system users a number of renominations for the use of storage capacities in a gas day, the reversal of nominations, and changing of storage operating cycles.

Gas storage regulation methods

Aside from the **Gas Market Act** and other energy-related legislation, gas storage is also regulated by the *Methodology for setting tariffs for gas storage* (Official Gazette no. 48/18). This *Methodology* is based on incentive regulation, which involves determining the maximum allowed revenue for the gas storage system operator. According to the *Methodology*, the operator's allowed operating costs are determined by applying incentive mechanisms of efficiency coefficients and allocating actual savings. Allowed capital costs are determined based on the allowed depreciation of regulated assets and the allowed rate of return on regulated assets. The *Methodology* also foresees the implementation of a regulatory account as a separate model of incentivised energy activity regulation; its implementation enables an appropriate return on reasonable investments made by the operator, who plans significant investments into the development of the LNG terminal system under particular circumstances and across a long time period. The *Methodology* also includes the economic efficiency of existing operator assets, as well as foreseeing the possibility of determining the fair value of long-term material and non-material assets on the basis of an economic efficiency analysis of operator assets, as well as comparative expense and efficiency analyses of transmission system operators in Croatia and the surrounding the region.

A regulatory period is defined as a multi-annual period of five years for which allowed revenues and tariff amounts are determined independently for each regulatory year. The operating conditions of the gas storage system are prescribed by the *Storage code*, which has been upgraded and supplemented in order to comply with the provisions of the **Gas Market Act** in May 2021 in terms of prescribing the general rules for the allocation of SBUs and the rules for the allocation of SBUs in the auction process for the period after 1 April 2022.

Gas storage price

Gas storage tariffs in 2021 were established in the *Decision on gas storage tariff amounts* (Official Gazette no. 122/16), which HERA adopted in accordance with the *Methodology for setting tariffs for gas storage*. According to the *Decision*, which defines tariffs for gas storage for the second regulatory period from 2017-2021, tariffs for contracted SBUs on the annual level for 2021 were 1.1% lower than in 2020.

In March 2022, HERA issued the *Decision on tariffs for gas storage*, which sets out tariffs for gas storage in the third regulatory period of 1 March 2022 - 31 December 2026. The tariff for contracted SBUs on an annual basis for 2022 was 3.9% lower than in 2021. The established tariffs for gas storage in the third regulatory period are based on the calculation of the anticipated allowed revenues of the gas storage system operator, which include the difference identified after the regular revision of revenues for 2016 and the years of the second regulatory period in 2017, 2018, 2019, and 2020, which is also founded on planned investment projects for the third regulatory period.

The largest investment project the gas storage system operator is planning for the period from 2022-2026 is the first phase of construction of the new Grubišno Polje peak storage facility, which involves research work and initial investments into purchasing and installing equipment for the project, which HERA has accepted as part of the approval for the investment plan for the third regulatory period. By decision of the Ministry and pursuant to the **Act on Strategic Investment Projects of the Republic of Croatia** (Official Gazette no. 18/18 and 23/20), the project "*Construction of an underground gas storage facility at the Grubišno Polje hydrocarbon production field*" has also been included in the list of strategic projects as of 23 February 2018.

The total calculated amount of the charge based on the tariff item for the contracted annual SBU accounted for 98.72% of the total gas storage charges in 2021 charged to users by the gas storage system operator, while 1.23% referred to individual interruptible daily services and 0.05% to non-standard services.

In December 2021, on the basis of the *Methodology for setting the price of non-standard services for gas transmission, distribution, storage, the unloading and send out of liquefied natural gas, and public service gas supply*, HERA adopted the *Decision on the cost of non-standard services of the gas storage facility operator* (Official Gazette no. 141/21) for the period from 2022-2026 according to the average price of a working hour in the amount of HRK 190.00/h, net of VAT.

5.2.4 Gas distribution

Gas distribution is a regulated energy activity performed as a public service. In 2021, gas distribution in Croatia was performed by 33 energy entities (distribution system operators). In late 2021, HEP-PLIN d.o.o., Osijek informed HERA of its intent to purchase DARKOM DISTRIBUCIJA PLINA d.o.o., Daruvar, and GRADSKA PLINARA KRAPINA d.o.o., Krapina; the merger of these entities with HEP-PLIN d.o.o. was completed in early 2022. This resulted in a decrease in the number of distribution system operators; in the first half of 2022, gas distribution was performed by 31 operators.

According to data collected by HERA from 33 distribution system operators, the total quantity of gas[73] distributed in Croatia in 2021 amounted to 12,366 kWh, which was a 9.3% decrease in comparison to the total distributed quantity in 2020. Of the total quantity of distributed gas, the largest quantities were distributed to the TM2 (4,728 GWh), TM5 (1,442 GWh), and TM3 (1,286 GWh) tariff model users.

The total number of billing metering points for final customers connected to the distribution system amounted to 694,269 in 2021, which was an increase of 1.4% as compared to the total number of billing metering points in 2020. Of the total number of billing metering points in 2021, 688,486 were under TM1-TM4 tariff models (with annual consumption up to 100,000 kWh), while 5,783 were under TM5-TM12 tariff models (with annual consumption exceeding 100,000 kWh).

The total length of all gas distribution systems in Croatia was 19,891km at the end of 2021, which represents a 0.5% increase compared to 2020 according to data collected from distribution system operators. Of the total length of distribution systems at the end of 2021, low-pressure gas pipelines accounted for 16.0%, medium-pressure gas pipelines accounted for 77.4%, and high-pressure gas pipelines accounted for 6.6%. In terms of material type, 15.9% of the total distribution system at the end of 2021 was made of steel pipes,

[73] *Natural gas and non-standard gas.*

82.9% was made of polyethylene pipes, and 1.2% was made of other materials. The total number of odorization stations in all distribution systems at the end of 2021 was 130. A comparison of the length of distribution systems, total technical capacity of entries into distribution systems, and gas losses by distribution system operators in Croatia in 2021 is shown in Figure 5.2.12.; the geographical layout of the distribution system operators' distribution areas in 2021 is shown in Figure 5.2.13.

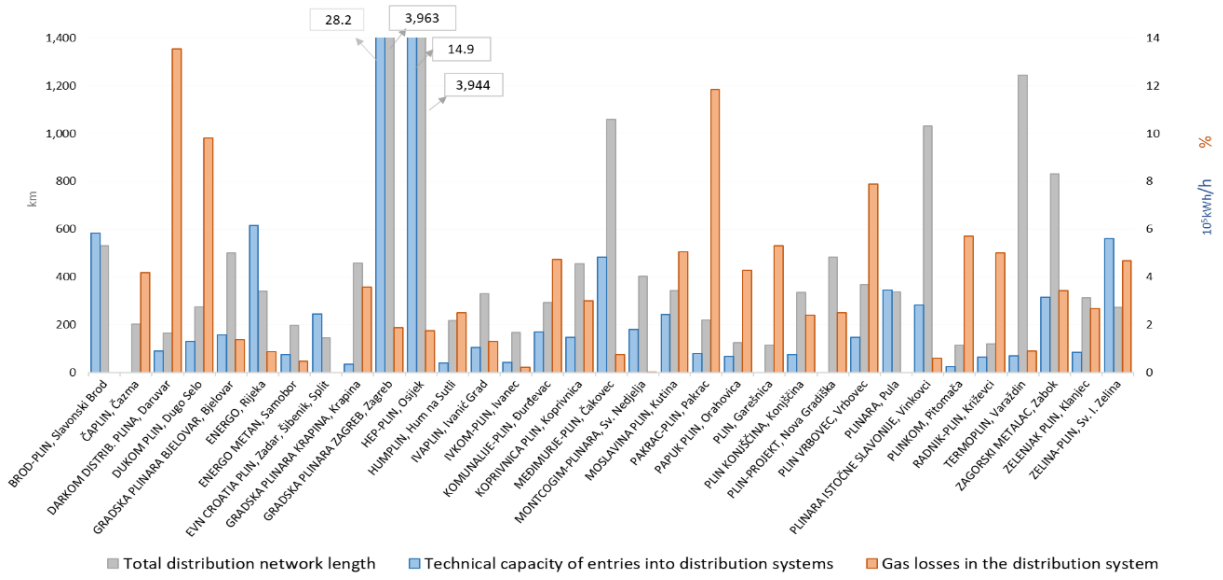


Figure 5.2.12. Comparison of the length of distribution systems, the total technical capacity of entries into distribution systems, and gas losses by distribution system operator in the Republic of Croatia in 2021

Figure 5.2.13. Locations of the distribution system operators' distribution areas and basic information on gas distribution activities in Croatia in 2021

An overview of indicators for gas distribution by year from 2017 to 2021 is presented in Table 5.2.4.

Table 5.2.4. Overview of indicators for gas distribution by year from 2017 to 2021

Indicator	2017	2018	2019	2020	2021
Number of distribution system operators	35	35	35	33	33
Total length of distribution network (km)	19,091	19,448	19,673	19,787	19,891
Total distributed gas (GWh)	11,173	11,071	10,914	11,309	12,366

Gas distribution regulation methods

Aside from the **Gas Market Act** and other energy-related legislation, gas energy distribution is also regulated by the *Methodology for setting tariffs for gas distribution* (Official Gazette no. 48/18). This *Methodology* is based on determining the maximum allowed revenue for the distribution system operator in a given regulatory period. Tariff items for gas distribution for all billing metering points on the same tariff model within a distribution system managed by a single operator are equal, regardless of the length of the distribution route (postage stamp principle). According to the *Methodology*, allowed operating costs are

determined by applying incentive mechanisms of efficiency coefficients and allocating actual savings, while allowed capital costs are determined based on the allowed depreciation of regulated assets and the allowed rate of return on regulated assets. The projection of value of regulated assets for a regulatory period of five years is determined with the *ex-ante* approach of approving investment plans, as well as with the *ex-post* revision of realised investments.

The *Methodology* also prescribes the ability to determine justified values of long-term material and non-material assets on the basis of economic efficiency analyses, as well as the implementation of comparative expense and efficiency analyses of the operations of distribution system operators in Croatia and the surrounding region. Upon the expiry of a regulatory period, allowed revenues are revised, including operating and capital expenditures, and the realised revenues are compared based on tariffs with the revised allowed revenues. Possible imbalances are included in the calculation of allowed revenues for the following regulatory period.

The *Methodology* also foresees the implementation of a regulatory account as a model of gas distribution regulation; its implementation enables operators planning significant investments into new distribution systems or the development of an existing system to be recompensated in later years of the regulatory account for lower revenues from initial years.

A regulatory period for gas transmission is defined as a multi-annual, five-year period for which allowed revenues and tariffs are determined independently for each regulatory year. The second regulatory period, which began on 1 January 2017, lasted until 31 December 2021; the third regulatory period for gas distribution has begun, which will last from 1 January 2022 to 31 December 2026.

The *Methodology* classifies billing metering points into 12 tariff models according to annual gas consumption; the operator classifies them in accordance with the operator's data on realized annual gas consumption at each billing metering point in the previous calendar year or, in the case of new billing metering points, according to estimated annual gas consumption based on the operator's data on the connection capacity of each billing metering point.

The gas distribution price consists of tariff item Ts1 for the distributed quantity of gas, which is established independently for each distribution system operator, and tariff item Ts2, representing a fixed monthly charge that is equal for all operators for a particular tariff model.

Gas distribution price and connection charge

Gas distribution tariffs in 2021 were established in the *Decision on gas distribution tariff amounts* (Official Gazette no. 127/17) and the *Decision on gas distribution tariff amounts for energy entity HEP-PLIN d.o.o., Cara Hadrijana 7, Osijek* (Official Gazette no. 94/20).

The total average weighted price of gas distribution in the period from 1 January to 31 December 2021 for the 33 distribution system operators in Croatia was HRK 0.0508/kWh, which represents an increase of 1.4% compared to the total average weighted price of gas distribution in 2020, which amounted to HRK 0.0501/kWh after confirmation of the realised distributed amounts of gas.

Figure 5.2.14. shows the average gas distribution tariffs, net of VAT, for 2020-2021 per distribution system operator in Croatia.

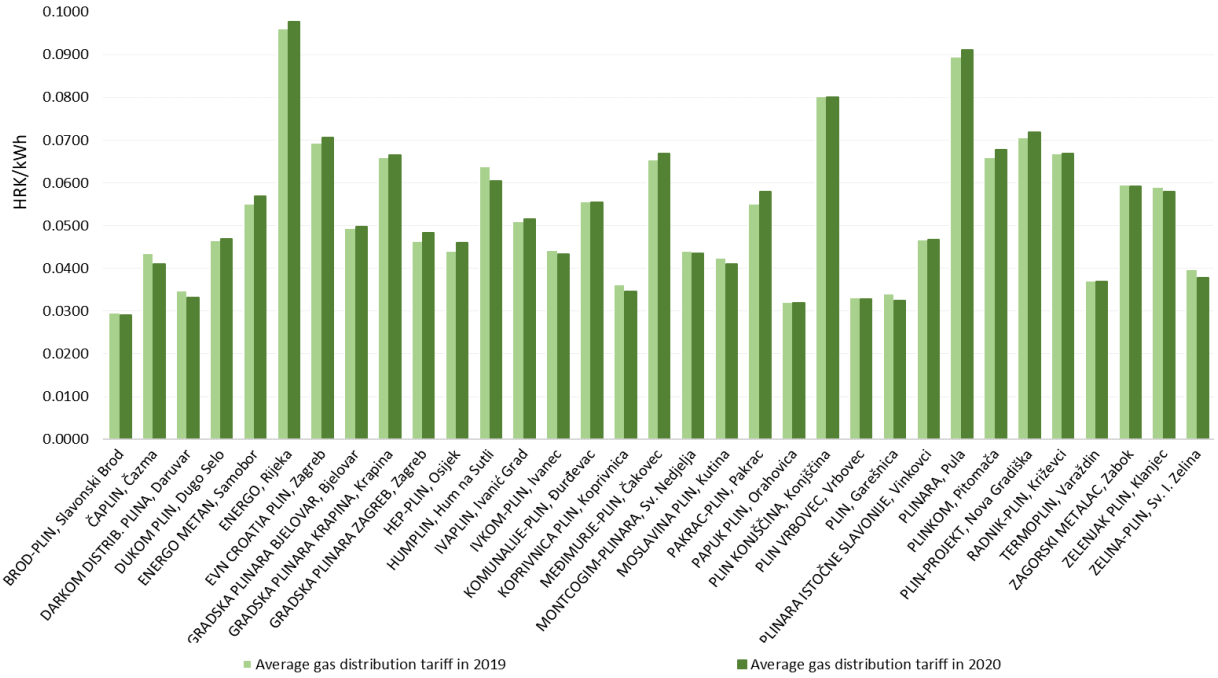


Figure 5.2.14. Average gas distribution tariffs, net of VAT, in 2021 as compared to 2020 per distribution system operator in Croatia

In December 2021, in accordance with the provisions of the *Methodology for setting tariffs for gas storage* (Official Gazette No. 48/18), HERA adopted a *Decision on gas distribution tariffs* (Official Gazette no. 141/21 and 32/22), which defined the amounts of tariffs for gas distribution for the third regulatory period, which began on 1 January 2022 and will end on 31 December 2026, for 33 distribution system operators. The established tariffs for gas distribution in the third regulatory period are based on the calculation of the anticipated allowed revenues of a given gas distribution system operator, which include the difference identified after the regular revision of allowed revenues for the years of the second regulatory period in 2017, 2018, 2019, and 2020.

The adopted *Decision* resulted in a decrease of roughly 7.9% in the average tariff for gas distribution for 2022 as compared to 2021, such that the gas distribution tariff decreased in 23 distribution areas, while it increased in 8 distribution areas.

Figure 5.2.15. shows trends in average gas distribution tariffs by year of the first and second regulatory period, as well as trends in the planned average tariffs for the third regulatory period from 2022-2026 for all distribution system operators in Croatia.

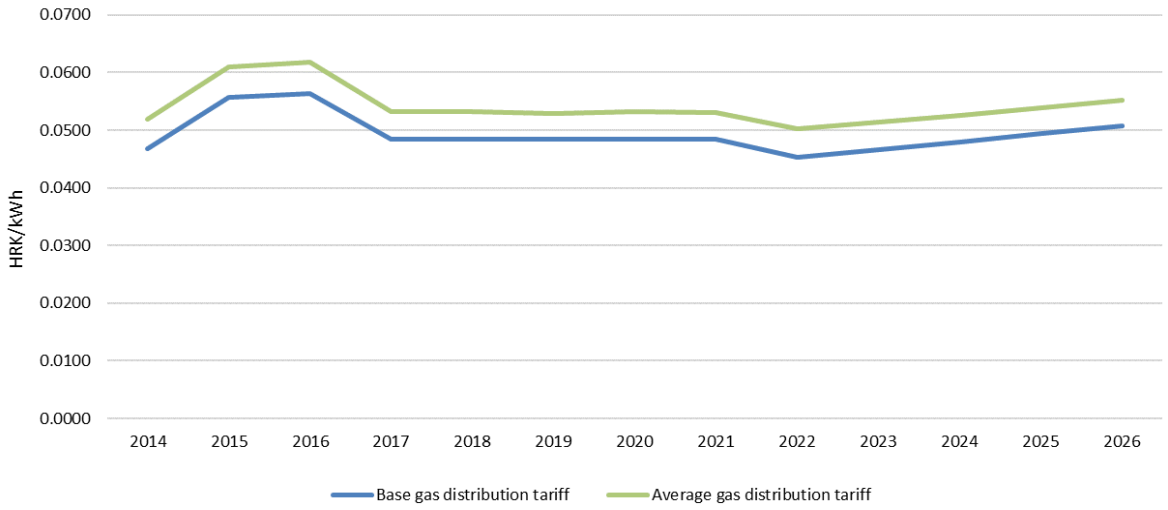


Figure 5.2.15. Trends in average gas distribution tariffs by year of the first and second regulatory period; trends in the planned average tariffs for the third regulatory period from 2022-2026 for all distribution system operators in Croatia

The charge for connection to the gas distribution system is based on the *Methodology for calculating the charge for connection to the gas distribution or transmission system and for the connection capacity increase* (Official Gazette no. 48/18). This *Methodology* defines: categories of connections to the gas transmission system; categories of operations according to complexity; methods, elements, and criteria for calculating charges for gas transmission system connection and increases in connection capacity; the procedure for requests to determine or change the amount of charges for connection, as well as changes in connection charges and charges for the adoption, publishing, and implementation of connection fees. *The Methodology* defines categories of connections to the distribution system and the corresponding coefficients, as well as the number of working hours required in a particular category of operations according to complexity for connecting particular categories of use to the distribution system.

Connection charges consist of the cost of the extraordinary creation of technical requirements in the distribution system and the cost of implementing connections; it is charged directly to investors who have requested the service, and the amount of the charge depends on the complexity of the work involved. The charge for these services in 2021 was calculated by the distribution system operator based on HERA's *Decision on charges for connection to the gas distribution or transmission system and for increasing connection capacity for the 2017-2021 regulatory period* (Official Gazette no. 122/16) of 16 December 2016. In December 2021, on the basis of the *Methodology for calculating the charge for connection to the gas distribution or transmission system and for connection capacity increase*, HERA adopted a new *Decision on charges for connection to the gas distribution or transmission system and for increasing connection capacity* (Official Gazette no. 48/18), which defined the charge for connection to the distribution system during preparatory and final works for the years of the third regulatory period (2022-2026).

Also, in December 2021, on the basis of the *Methodology for setting the price of non-standard services for gas transmission, distribution, storage, the unloading and send out of liquefied natural gas, and public service gas supply* (Official Gazette no. 48/18, 25/19, and 134/21), HERA adopted the *Decision on the cost of non-standard services of the distribution system operator* (Official Gazette no. 141/21) for the period from 2022-2026 according to the average price of a working hour in the amount of HRK 110.00/h, net of VAT.

5.2.5 Management of liquefied natural gas and/or compressed natural gas supply points

In 2021, HERA began collecting data on sold quantities of liquefied natural gas and compressed natural gas (hereinafter: CNG) to final customers at LNG and/or CNG supply points.

In 2021, LNG or CNG supply point management was undertaken by 4 energy entities, of whom 3 sold CNG and one sold LNG. LNG and CNG are considered alternative fuels, and, as such, represent a measure from the

common alternative fuel infrastructure deployment framework, which intends to reduce oil dependence to the greatest degree possible and mitigate the negative impact of transport on the environment, as set forth in the **Act on Alternative Fuel Infrastructure Deployment** (Official Gazette no. 120/2016), which transposes the provisions of *Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure* into Croatian legislation.

At a session held on 24 November 2021, the Croatian government adopted the **Draft Proposal for the Act on Amendments to the Act on Alternative Fuel Infrastructure Deployment**. This **Draft Proposal** proposes to amend the existing legal framework for the development of infrastructure and the use of alternative fuels in transport, with the aim of achieving a sustainable market and transport system with minimal negative effects on the environment and society.

CNG is an alternative to LNG in the transport of natural gas and the development of the retail market for natural gas; it is playing an increasingly important role in the supply of alternative transport fuel, the main difference being the aggregate state of the gas. CNG is a gas in its aggregate state, while LNG is a liquid when transported.

CNG is brought to the CNG supply point via the gas distribution system to which the supply point is connected, and is compressed at the CNG supply point, while LNG is first delivered by ship to the LNG terminal, from where it is delivered to the LNG supply point by LNG truck. CNG has long been used as an internal combustion fuel for transport and represents a more ecological alternative to liquid fossil fuels.

The establishment and opening of new LNG and CNG supply points contributes to the greater use of alternative fuels in heavy transit (trucks), public transit (buses), and personal vehicles, which has a positive economic impact (cheaper fuel); as an alternative fuel with low carbon content, it also has a significant positive impact on the environment as compared to liquid petroleum-based fuels.

Final customers use CNG supply points for their personal vehicles, buses, and trucks. The total sold quantity of CNG amounted to 1,399,329 kg, or 19,514 MWh, or 99.9% of the total sold amount of natural gas at LNG or CNG supply points.

The average purchase price of gas delivered at the CNG supply point ranged from HRK 0.18/kWh to HRK 0.27/kWh, while the average sale price of gas delivered at the CNG supply point ranged from HRK 0.37/kWh to HRK 0.59/kWh.

Final customers used the LNG supply point to supply trucks. At this supply point, the total sold quantity of LNG amounted to just 827 kg, or 12.6 MWh, or 0.1% of the total sold quantity of natural gas at LNG or CNG supply points. The average purchase price of LNG amounted to HRK 0.44/kWh, while the average sale price of gas delivered at the LNG supply point amounted to HRK 0.87/kWh.

5.2.6 Energy entities in the gas sector and energy activities

The activities of transmission system operators, distribution system operators, gas storage system operator, and LNG system operator, including operators that are part of a vertically integrated energy entity, must be organised into independent legal entities independently of other activities in the gas sector pursuant to the provisions of the **Gas Market Act** on the unbundling of energy activities.

In 2021 the energy activity of gas transmission was performed by energy entity PLINACRO d.o.o., while the energy activity of gas storage was performed by energy entity Podzemno skladište plina d.o.o.

In 2021, gas was distributed by 33 energy entities, while gas was actively supplied by 42 out of 49 licensed energy entities. In late 2021, HEP-PLIN d.o.o., Osijek informed HERA of its intent to purchase DARKOM DISTRIBUCIJA PLINA d.o.o., Daruvar, and GRADSKA PLINARA KRAPINA d.o.o., Krapina; the merger of these entities with HEP-PLIN d.o.o. was completed in early 2022. This resulted in a decrease in the number of distribution system operators; gas distribution is currently performed by 31 energy entities. Of the 31 distribution system operators, 10 were organised as independent legal entities engaged only in gas distribution, whereas 21 energy entities were organised as vertically integrated legal entities with fewer than 100,000 consumers and were active both in gas distribution and gas supply. The structure of energy entities in the gas sector as of 31 March 2022 with respect to their energy activities and unbundling requirements pursuant to the **Gas Market Act** is shown in Figure 5.2.16.

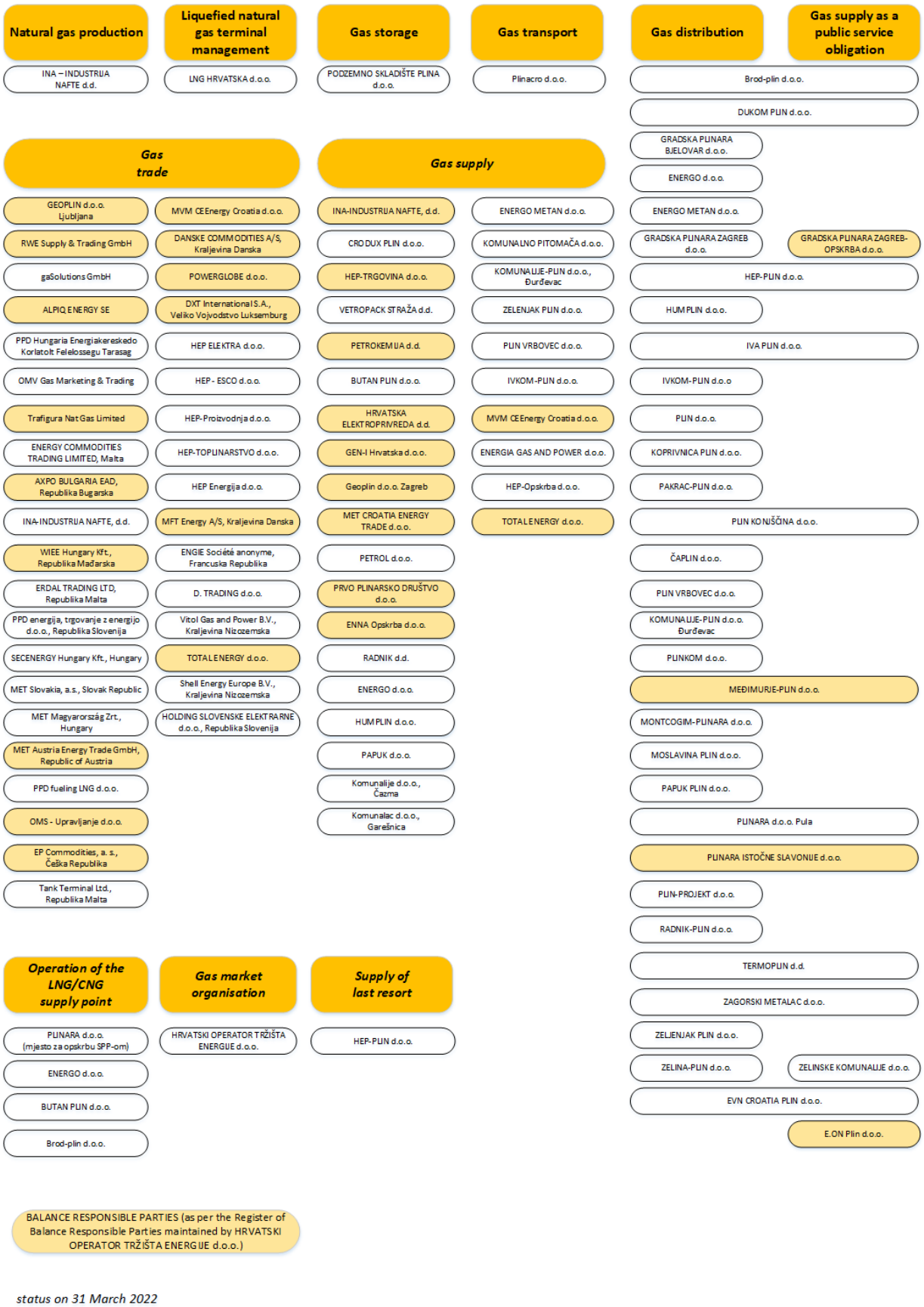


Figure 5.2.16. Structure of energy entities by their role in the Croatian gas market

5.3 Competition and function of the natural gas market

Natural gas balance

In 2021 the total natural gas quantity that entered the transmission system amounted to 31,712 GWh, which was 2.4% less than in 2020. 5,775 GWh, or 18.2%, of total transported natural gas came from domestic production, which is 13.5% less than in 2020; 6,225 GWh, or 19.6%, of the total transported quantity of natural gas entered the transmission system from interconnections, which is 70.1% less than in 2020; 4,009 GWh, or 12.6%, of the total transported quantity of natural gas entered the transmission system from UGSF Okoli, which is 19.6% less than in 2020. In 2021, the total quantity of natural gas sent out from the LNG terminal into the transport system was 15,703 GWh, or 49.5% of the total quantity of gas transported (Figure 5.3.1.).

The total gas quantity that exited the transmission system in 2021 amounted to 31,674 GWh, which is 2.5% less than in 2020. Of this amount, 14,319 GWh of natural gas (45.2% of the total quantity) was delivered to final customers connected directly to the transmission system, which is 16.3% less than in 2020; 12,366 GWh of natural gas was delivered to customers on the distribution system, or 39.0% of the total quantity, which is 9.3% more than in 2020. The quantity of natural gas delivered at exits at interconnections amounted to 1,030 GWh, or 3.3% of the total quantity; at UGSF OKOLI, 3,959 GWh of natural gas were delivered, or 12.5% of the total quantity, which is 2.4% less than in 2020.

According to the data obtained from gas suppliers in Croatia, a total of 12,137 GWh of natural gas were delivered to final customers from the distribution systems in 2021, of which 6,557 GWh (54.0%) was delivered to households, and 5,580 GWh (46.0%) was delivered to non-household consumers.

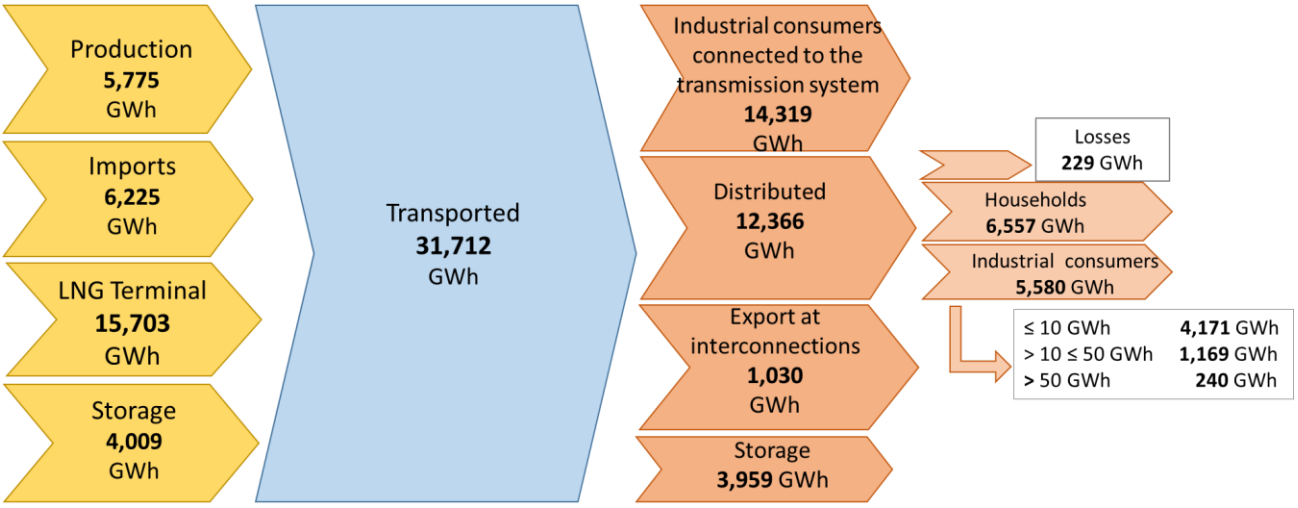


Figure 5.3.1. Natural gas balance in Croatia in 2021

In 2021, requests for transmission system capacity booking were submitted by 44 transmission system users, i.e. direct members of balance groups associated into 14 balance groups. According to the shares of individual balance groups in the quantity of gas transported by transmission system exit groups, balance group manager HEP-Trgovina d.o.o. offtook 26.7% of gas from the transmission system, balance group manager PRVO PLINARSKO DRUŠTVO d.o.o. offtook 25.4% of gas, balance group manager INA d.d. offtook 17.9%, and balance group manager GEOPLIN d.o.o. offtook 6.2% of gas, while the remaining ten balance groups offtook 23.8% of gas. The shares of individual balance groups in total natural gas quantities allocated by the transmission system in 2021 are shown in Figure 5.3.2.

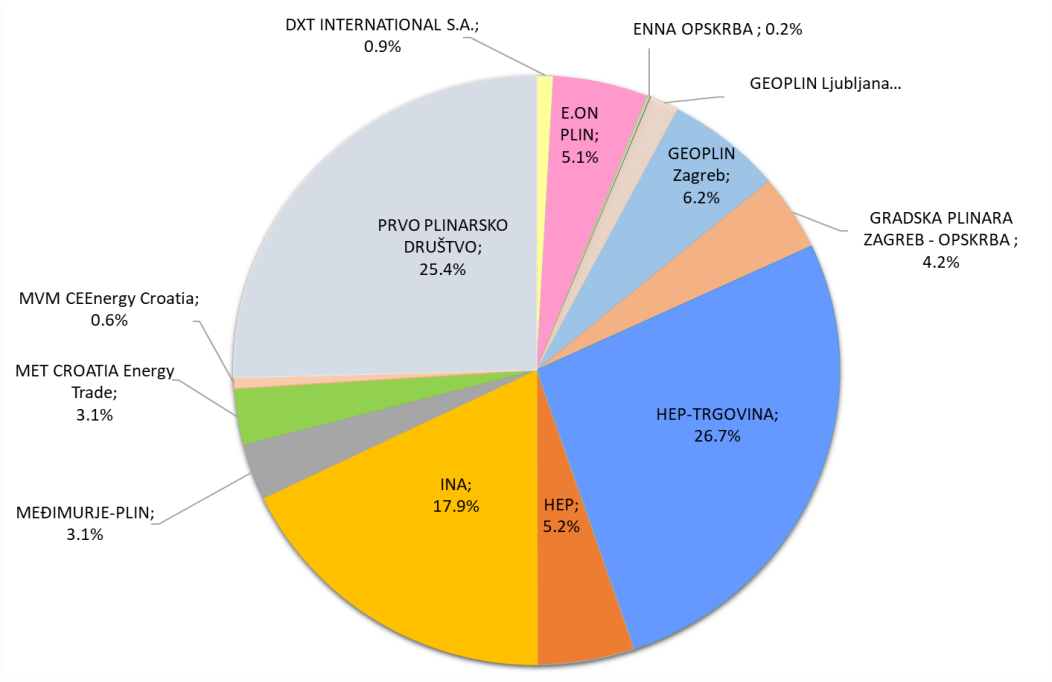


Figure 5.3.2. The share of balance groups in total natural gas quantities allocated at exits from the transmission system in 2021

5.3.1 Wholesale natural gas market

Wholesale market development indicators

The wholesale gas market in Croatia is organised according to the balance group model, representing an interest group of participants on the gas market, organised on a commercial basis, primarily for the purpose of balancing and optimising balancing costs, for which the balance responsible party is responsible.

Performance indicators of the wholesale market are reflected in the diversity of gas supply sources, concentration of gas suppliers and the market's potential to meet its demand for gas without its largest supplier. Therefore, the Herfindahl-Hirschman Index (HHI), the number of gas supply sources, and the *Residual Supply Index* (RSI) are the most important measures applicable to the Croatian market. These three closely related and interdependent measures indicate whether there is healthy market competition.

HHI measures the level of market concentration and is the most commonly used indicator for determining the concentration of market power. A higher HHI indicates greater concentration and measures how much market share is held by a few of the largest traders. HHI is calculated by adding the squared market share of each company in a particular country's market. HHI ranges between 0 and 10,000; a high HHI closer to 10,000 indicates a monopoly, i.e. that one market participant has a predominant influence. A market with an HHI score below 2,000 is considered a competitive market in which none of the participants has a dominant influence.

According to HERA's data for 2021, the HHI score for the Croatian wholesale gas market (excluding sales for supply under the public service obligation) was 2,160, compared to 2,699 for 2020, which is an indicator a moderate concentration of suppliers on the wholesale gas market. The HHI trend for the Croatian wholesale gas market in the period from 2011 to 2021 is shown in Figure 5.3.3.

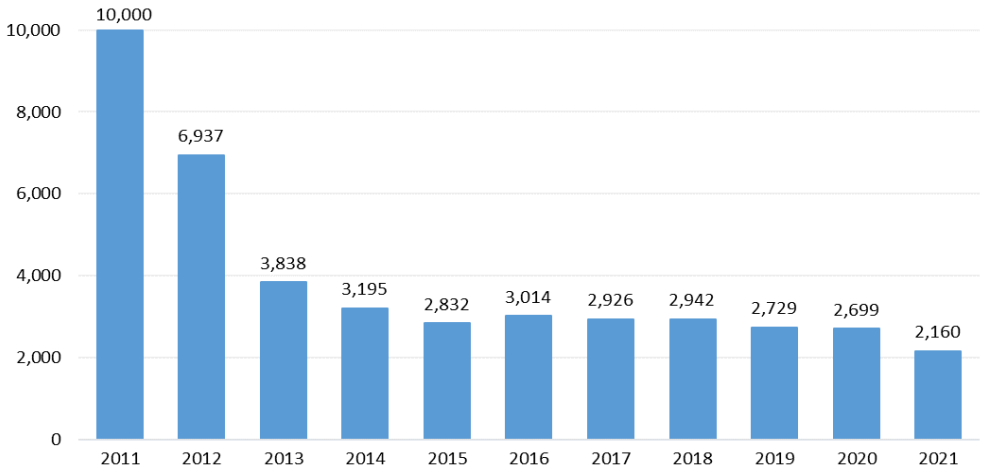


Figure 5.3.3. HHI trend for the Croatian wholesale gas market from 2011-2021

The number or diversity of gas supply sources is another wholesale market development indicator. According to data collected by HERA for 2021, gas in Croatia was mostly procured from three sources: from domestic production, from imports at interconnections and from imports of gas at the LNG terminal, which is certainly an indicator of diversity of supply.

As an indicator measuring the development of the wholesale market, RSI determines the relationship between the sum of supply capacities of all but the largest supplier, and total market demand. RSI measures the market's dependence on the largest supplier by analysing the availability of alternative suppliers, to avoid the full reliance of the market on its largest supplier to meet market demands. An RSI equal to or greater than 110% indicates that the market can survive without its largest supplier. RSI in Croatia in 2021 was above 110%, which is an indicator that the market is not dependent on its largest gas supplier.

An overview of wholesale gas market indicators per year for the period from 2017 to 2021 is shown in Table 5.3.1. The table shows that, with an increase in the number of sources of gas supply, natural gas trading activity on the wholesale market also increased; by activating two-way flows at interconnections, the amount of exported natural gas from Croatia also increased.

Table 5.3.1. Overview of wholesale gas market indicators per year for the period from 2017 to 2021

Indicator	2017	2018	2019	2020	2021
Total volume produced in Croatia (GWh)	11,193	9,664	8,194	6,675	5,775
Gas imported at interconnections (GWh)	17,955	15,535	19,442	20,821	6,225
Quantity of gas from the LNG terminal (GWh)	-	-	-	-	15,703
Quantity of gas from gas storage facility (GWh)	3,191	4,342	3,172	4,985	4,009
Gas available for sale on the Croatian market (GWh)	32,348	29,541	30,807	32,481	31,712
Total quantity of gas sold on the wholesale market (GWh)	20,687	26,117	26,787	26,885	43,643
out of which: on the Croatian market (GWh)	20,459	25,963	26,275	26,629	42,413
exported from Croatia (GWh)	228	154	512	256	1,230
Number of gas supply sources	3	3	3	3	4
Number of active suppliers (balance responsible parties) on the wholesale market	11	13	13	11	14
Shares of the largest balance responsible parties on the wholesale market:					
HEP (HEP-Trgovina d.o.o. and HEP d.d.)	52%	59%	49%	38%	32%
INA d.d.	19%	15%	20%	20%	18%
PRVO PLINARSKO DRUŠTVO d.o.o.	17%	12%	14%	22%	25%
Others (less than 7%)	12%	14%	17%	20%	25%

A significant component of Croatia's wholesale gas market is gas trade carried out at the virtual trading point (VTP). The VTP is a gas trading place between the entry and exit points of the transmission system, including the gas storage system, where balance responsible parties may trade in gas. Transactions are agreed bilaterally and confirmed and carried out via a system provided by gas market operator HROTE d.o.o. There were 11 active balance responsible parties at the VTP in 2021, which traded a total of 35,152 GWh of gas (61.8% more than in 2020), as shown in Figure 5.3.4.

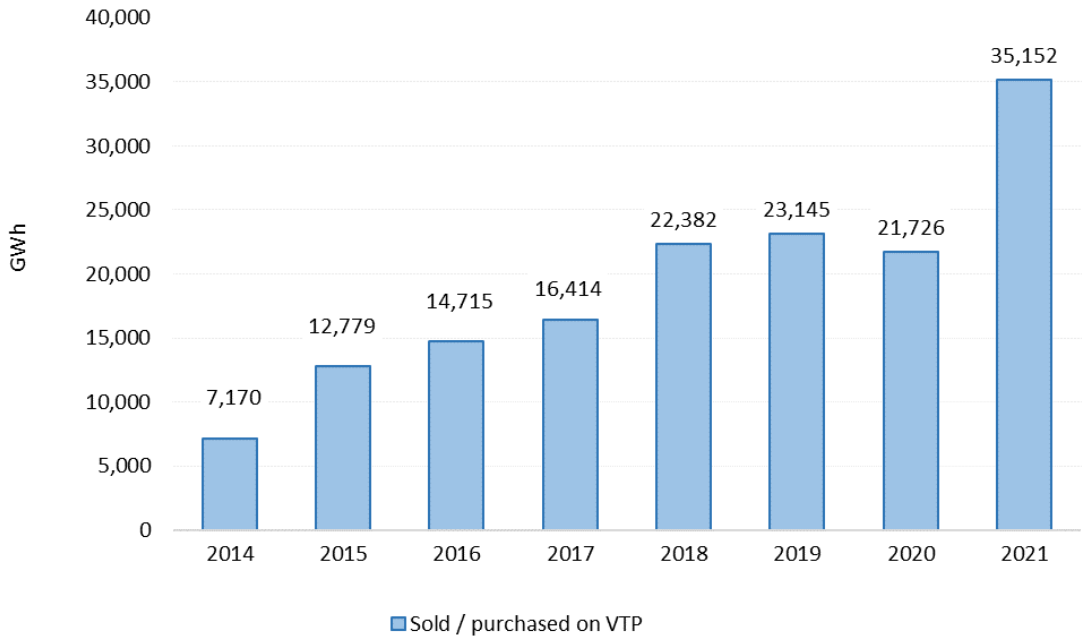


Figure 5.3.4. Gas quantities traded at the virtual trading point (VTP) from 2014 – 2021

The significant increase in VTT trading in 2021 is the result of the launch of the LNG terminal as of 1 January 2021 and related transactions between wholesale gas market participants.

In addition to trading at the VTP, transactions on the wholesale market in Croatia are also carried out on the trading platform. With the implementation of *Commission Regulation (EU) No 312/2014*, a trading platform was established on which all balance responsible parties and the transmission system operator can trade short-term standardised products. Title products and locational products can be traded daily, and products can be offered and used within on a within day or day ahead basis. A product is the amount of gas available for trading by the participants on the trading platform.

This trading platform enables transparent, non-discriminatory, anonymous trading; it is also managed by HROTE d.o.o. Since the establishment of the trading platform, i.e. the full implementation of *Regulation 312/2014*, the costs of balancing energy have been significantly reduced thanks to a more efficient model and a more balanced transmission system and the achievement of a more favourable unit price through transparent market competition.

Gas prices on the wholesale market

In order to monitor gas prices on the wholesale market, in 2021, HERA continued to collect data from gas suppliers and traders in the Republic of Croatia on a quarterly basis through a gas supply and trade questionnaire. The purpose of the questionnaire was to gather data on gas purchase and sale, such as the quantity and prices of gas purchased and sold (delivered) to final customers.

The average gas purchase price net of VAT on the market in 2021 (purchase under bilateral agreements, at a virtual trading point, on the trading platform, and from imports) was HRK 0.2909/kWh, which represents an increase of 139.2% as compared to 2020, when it amounted to HRK 0.1216/kWh. In 2021 the highest average purchase price of gas on the wholesale market was recorded in Q4, when it amounted to HRK 0.5876/kWh; the lowest average purchase price of gas was recorded in the Q1 at HRK 0.1490/kWh.

The average gas sale price net of VAT on the market in 2021 (sale under bilateral agreements, at a VTT, on the trading platform, and from exports) was HRK 0.2813/kWh, which represents an increase of 109.0% as compared to 2020, when it amounted to HRK 0.1346/kWh.

In 2021, a total of 14 suppliers and traders sold gas on the wholesale market. At the level of individual gas suppliers and traders, the highest average sale price of gas on the wholesale market in 2021, including exports from Croatia, amounted to HRK 0.5745/kWh, while the lowest amounted to HRK 0.1302/kWh.

Suppliers in the public service obligation in Q1 2021 were allowed to buy gas for household final customers in the public gas supply service from wholesale market suppliers under regulated conditions, which did not exclude the possibility of also buying gas from gas suppliers or traders on the gas market. Taking into account the provisions of the **Gas Market Act,** after 31 March 2021, the role of the wholesale market supplier was abolished; the reference price of gas, which was the highest price at which a wholesale market supplier was allowed to sell gas to suppliers in the public service obligation, was no longer prescribed. As of 1 April 2021, the wholesale component of the gas price for household final customers using the public service—i.e. the cost of gas procurement—fully reflected the price of gas on the reference gas market, and was based on the realised price of seasonal futures (winter and summer) for gas delivery in the regulatory year on the European Title Transfer Facility (TTF).

Assessment of the functioning of the wholesale gas market

An analysis of the most important measures of healthy function on the wholesale market – HHI, RSI, and the number of gas supply sources – shows that the wholesale gas market in Croatia still mostly meets the parameters defined in ACER's *European Gas target model - Review and update*, while bearing in mind that the Croatian market is relatively small.

It is evident that the launch of the LNG terminal affected the increase in gas supply quantities, which was also reflected in a slightly lower HHI index (2,160) as compared to 2020, which is an indicator of moderate competition from wholesale market participants. The HHI index refers to the share of balance groups in the total traded quantities of natural gas; the lower index is the result of the reduced dominance of the three largest market participants (Prvo plinarsko društvo d.o.o., INA-Industrija nafte d.d., and Geoplin d.o.o. Ljubljana), as well as the increased activities of new participants (MVM CEEnergy Croatia d.o.o.). Sources of gas supply are diversified, mostly coming from domestic production (INA d.d.), some from imports at

interconnections, and a large quantity from the LNG terminal (57% of the total procured quantity). The RSI index is still above 110%, showing that the market is not dependent on only one source, that security of supply is not at risk and does not rely on a single source for gas supply.

The LNG terminal is certainly conducive to increased market competitiveness and security of supply in Croatia; the terminal began operations as of 1 January 2021, which means an additional supply route and increased diversification in gas source supply.

5.3.2 Retail natural gas market

Quantities of gas delivered to final customers

Transactions associated with the delivery of gas to consumers, for the purpose of consumption by final customers, are made on the retail gas market. Gas supply is regulated by a contract between a final customer and a gas supplier, and gas is delivered at billing metering points.

According to the data collected by HERA from gas suppliers, the gas supply structure in 2021: was as follows:

- 6,557 GWh were delivered to household final customers[74] connected to the distribution system, which comprises 24.8% of the total gas quantity delivered,
- 5,580 GWh were delivered to non-household final customers connected to the distribution system, which comprises 21.1% of the total gas quantity delivered, and
- 14,319 GWh were delivered to non-household final customers directly connected to the transmission system, which comprises 54.1% of the total gas quantity delivered.

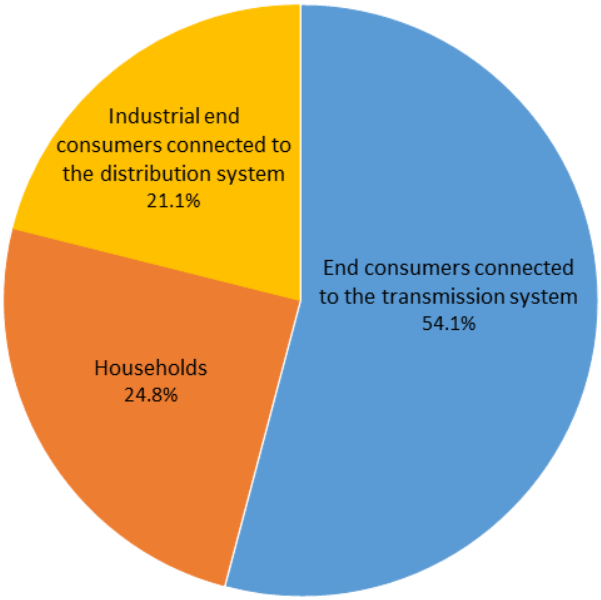


Figure 5.3.5. Structure of natural gas delivery from the transmission system in 2021

In 2021, the total gas quantity that gas suppliers delivered to final customers connected to the distribution system amounted to 12,137 GWh. Of this amount, a total of 6,557 GWh of gas was delivered to household final customers, which represents an increase of 10.4% as compared to 2020. A total of 5,580 GWh of gas was delivered to non-household final customers connected to the distribution system, which represents an increase of 11.2% as compared to 2020. A total of 14,319 GWh of gas was delivered to final customers connected to the transmission system, which represents a decrease of 16.3% as compared to 2020.

[74] *The household category includes household final customers using the public supply service and household final customers purchasing gas under market conditions.*

The total number of final customers connected to the distribution system at the end of 2021 was 694,269, of which 643,823 were household final customers and 50,446 were non-household final customers. A total of 17 non-household final customers were connected to the gas transmission system.

An overview of retail gas market indicators per year for the period from 2017 to 2021 is shown in Table 5.3.2.

Table 5.3.2. Overview of retail gas market indicators per year for the period from 2017 to 2021

Indicator	2017	2018	2019	2020	2021
Total amount of gas sold on the retail market (GWh)	28,129	25,609	26,498	28,426	26,685
Of which: in the TS (GWh)	16,955	14,538	15,583	17,117	14,319
in the DS (GWh)	11,173	11,071	10,914	11,309	12,366
Remaining gas in storage on 31 Dec (GWh)	4,211	3,932	4,310	4,055	3,959
Out of total gas volume of gas sold in the DS: to households (GWh)	6,017	5,865	5,781	5,941	6,557
to non-households (GWh)	4,822	5,035	4,933	5,019	5,580
Losses in the DS (GWh)	334	171	200	349	229
Total number of final customers on the retail market (non-household and household)	662,864	671,737	679,997	684,955	694,286
Out of which: on the DS	662,845	671,716	679,976	684,936	694,269
on the TS	19	21	21	19	17
Total number of registered suppliers during the year	46	45	45	51	49
Out of which active suppliers	45	45	44	41	42
Total number of registered traders during the year	7	10	12	25	34
Out of which active traders	-	-	1	1	2
Specified time frame for supplier switching procedure (in days)	15	15	15	15	15
Average duration of supplier switching procedure (in days)	10	8	4	4	4
Supplier switching rate (per BMP)	2%	1%	1%	5%	11%
Supplier switching rate according to distributed gas quantities (kWh)	6%	6%	7%	11%	13%
Number of completed supplier switches (per BMP)	13,619	7,088	7,728	31,409	76,775
Number of terminated supplier switches (per BMP)	8,345	6,746	5,704	3,199	4,416

Retail gas market development indicators

The HHI score for the retail market for non-household final customers in 2021 was 2,056, which is somewhat lower than in 2020. In terms of competitiveness, this is still a good level of participation of all suppliers in the total gas trade on the retail market. The HHI trend for the Croatian retail gas market in the non-household segment in the period from 2011 to 2021 is shown in Figure 5.3.6.

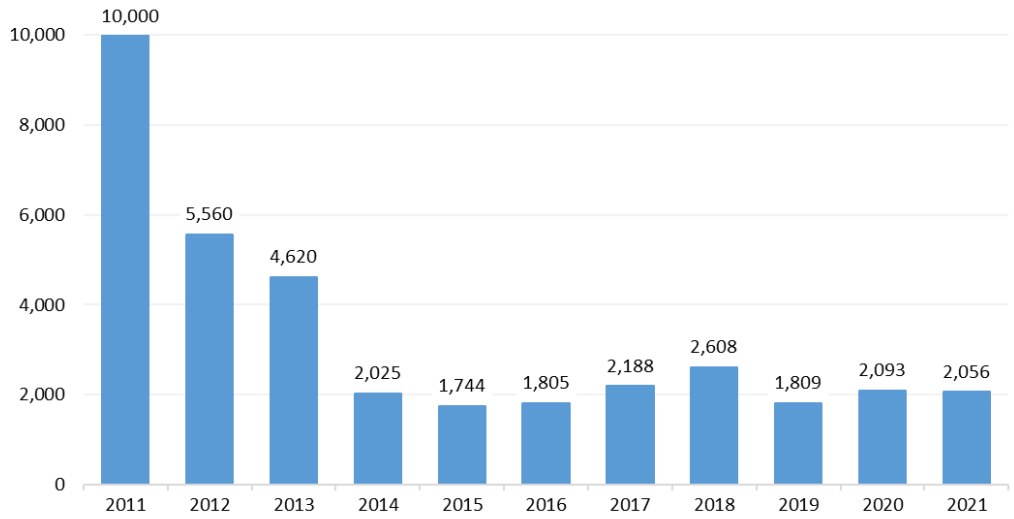


Figure 5.3.6. HHI index trend on the Croatian retail gas market for non-household final customers in the period from 2011-2021

In addition to the concentration of market power, another important indicator of retail market development and effective retail market competition includes the existence of conditions for fast and simple gas supplier switching. In this sense, HERA implements the following measures:

- issues rules for supplier switching (*General terms and conditions of gas supply*) and opinions or binding interpretations of these rules,
- continuously improves the IT system for the implementation of supplier switches, in cooperation with the gas market operator, which organises and maintains the system,
- upon the receipt of complaints, supervises the actions of energy entities during supplier switches and issues decisions on handling complaints (binding decisions, non-binding proposals for action, opinions), and
- offers information to final customers regarding gas supply contracts, as well as their rights.

Supplier switching and final customer awareness of the possibility of switching is one of the most important indicators of retail market development, especially in the household category. The indicator can be observed through internal change, as well as through external supplier switching. Internal change refers to the modification of existing contracts with the current supplier, while external change refers to a change in supplier upon the request of final customers.

According to data on supplier switching collected by HROTE, 76,775 supplier switches were completed in 2021, which is 144.4% more than in 2020.

As compared to 2020, 2021 saw a significant increase in the number of supplier switches for household final customers; a total of 72,729 supplier switches were carried out for this category of customer, which amounts to 95% of all supplier switches. Supplier switches were at their highest intensity during April-May and November-December 2021, mostly regarding internal supplier switches, wherein gas suppliers who are also gas suppliers in the public service obligation contracted gas supply according to market conditions with their household final customers. A public tender to select the gas supplier for the public service obligation for 1 April 2021 to 30 September 2024 also had an impact on the increased number of switches. Namely, in distribution areas where new public service obligation gas suppliers were selected, some customers in the public service ceased to use it, i.e. switched to gas supply according to market conditions from regulated conditions, or vice versa.

The proportion of gas distributed to consumers who switched gas suppliers in 2021 was 13.3% (1,616 GWh) of the total distributed quantity of gas (12,137 GWh), while the number of successful supplier switches (76,775) accounts for 11.1% of the total number of billing metering points (694,269) (Figure 5.3.7.).

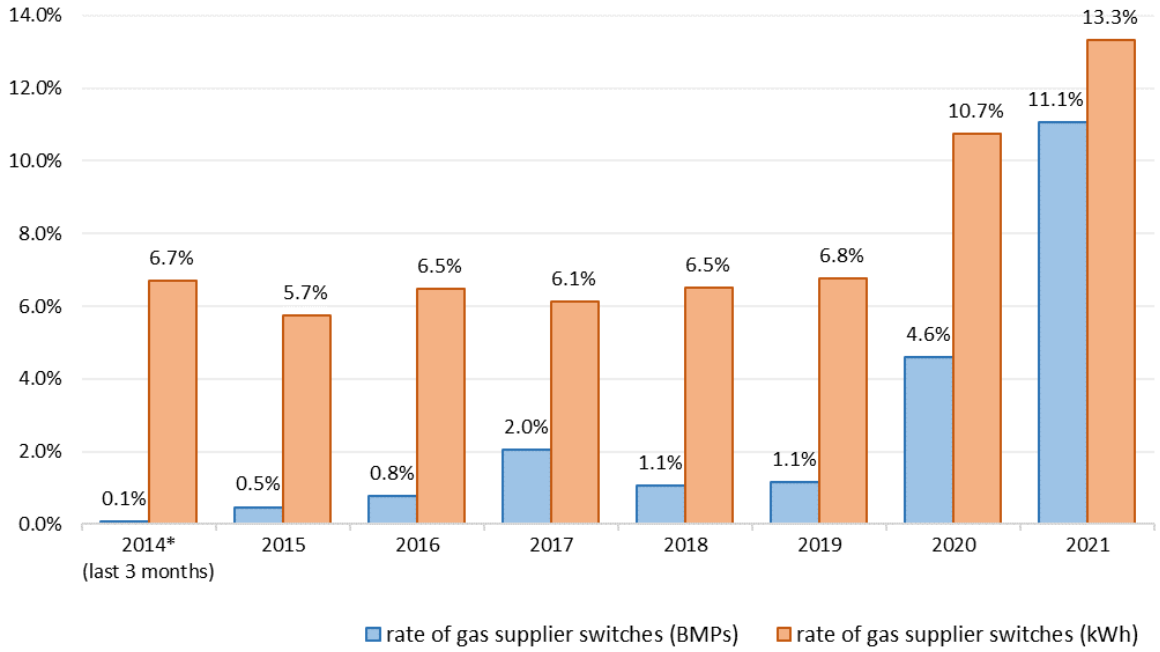


Figure 5.3.7. Rates of gas supplier switches per billing metering points (BMPs) and distributed gas quantities (kWh) since the beginning of retail market liberalisation in Croatia

During 2021, a number of supplier switches were cancelled (4,416 procedures), amounting to 5.8% of the number of supplier switches carried out in 2021; this is also less than in 2020, when this percentage amounted to 10.2%. A number of complaints regarding the actions of market participants were also recorded, an overview of which is presented in chapter *"5.3.6. consumer protection"* of this report. The reasons for terminating the supplier switching process relate to due outstanding consumer debt towards existing suppliers and consumers' withdrawal from the supplier switching procedure. An overview of completed and terminated gas supplier switches since the start of retail market liberalisation in Croatia is shown in Figure 5.3.8.

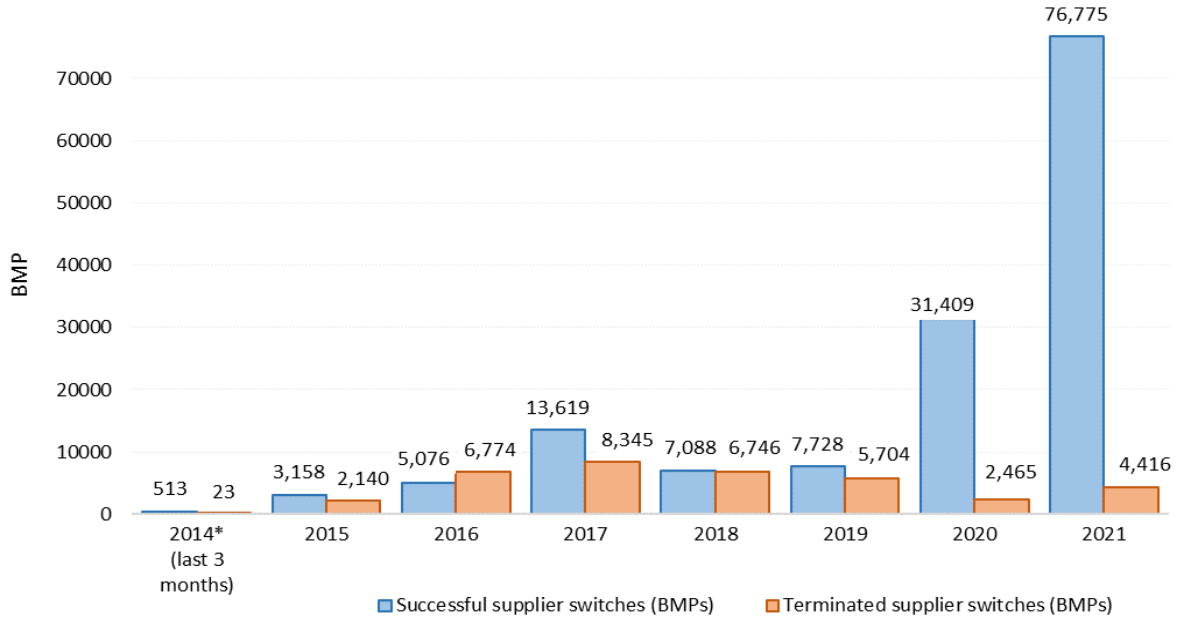


Figure 5.3.8. Number of completed and terminated gas supplier switches since the start of retail market liberalisation in Croatia

In consultation with HERA, HROTE has put in place security mechanisms to eliminate observed deficiencies and improve the functioning of the software within the gas market operator's information system. As of 1

October 2018, HROTE established and operates the Register of Billing Metering Points (hereinafter: RBMP), which it maintains based on the *General terms and conditions of gas supply*. RBMP is a unique electronic database of final customer billing metering points for all distribution system operators, transmission system operators and closed distribution system organisers in Croatia, with the purpose of monitoring and improving business processes on the gas market, better and faster implementation of the supplier switching procedure and allocations of gas energy received at the distribution system entry point.

Another precondition for effective competition is the availability of information for market participants. It is particularly important to make information on gas consumption available to final customers, and in this sense HERA establishes relevant rules (*General terms and conditions of gas supply*):

- on mandatory content of invoices for delivered gas, and
- on gas suppliers' obligation to periodically inform consumers of past gas consumption in the previous year and of estimated gas consumption in the current year (by 1 March each year).

HERA also informs consumers of their rights and obligations:

- by regularly publishing information on HERA's official website,
- by monitoring information published on energy entities' websites,
- by responding to consumer inquiries, and
- via the tariff calculator (iPlin) for consumers supplied under the public service obligation regime.

To this end, HERA undertook a number of measures and activities, the most important of which were informing gas market participants of their rights and obligations, in particular as regards the contracting of gas supply to final customers, with more detailed information published on the HERA website and available at the following links:

https://www.hera.hr/hr/html/odgovori_plin.html

https://www.hera.hr/hr/docs/2022/Obavijest_2022-03-11_02.pdf.

In addition, the development of an informative application is planned that would objectively and clearly present a comparison of tariff models and gas prices, and standardised gas offers by individual gas suppliers. Based on the provisions of the General terms and conditions of gas supply and with the aim of promoting competition, HERA is obligated to establish an appropriate gas price comparison tool to make it easier for final customers to select a gas supplier, compare gas prices and gas supply conditions, and to make gas supplier contact information more accessible.

From July 2021 to January 2022 HERA undertook an analysis of offers, standardised contracts, and conditions offered by gas suppliers who supply household final customers. By January 2022, the gas suppliers encompassed by the above analysis had harmonized their standard contracts and contractual conditions, of which they were also obligated to inform their final customers.

5.3.3 Natural gas prices

Gas prices on the retail gas market

The regulated retail gas price, which is applied to household final customers using the public service, is established pursuant to *the Methodology for setting tariffs for public service gas supply and guaranteed supply*.

Tariffs for public service gas supply and guaranteed supply for all public service gas suppliers in Croatia were established during 2021 according to relevant decisions on tariffs for gas supply as a public service.

In 2021, the average gas sale price for household final customers[75] using the public gas supply service in Croatia was HRK 0.2709/kWh, which represents an increase in the average price of 0.3% as compared to 2020.

According to the *Methodology for setting tariffs for public service gas supply and guaranteed supply* (Official Gazette no. 34/18 and 14/20), according to which the *Decision on tariffs for gas supply as a public service for the period from 1 March to 31 December 2020 and for the period from 1 January to 31 March 2021* (Official Gazette no. 16/20) was adopted, the price of gas for final customers on the public service from 1 January to

[75] *The weighted average by delivered gas quantities for household final customers using the public service, for each particular public service gas supplier.*

31 March 2021 consisted of the reference price of gas, the cost of gas distribution, and the cost of gas supply. The reference price of gas was the highest price at which the wholesale market supplier could sell gas to public service suppliers for household final customers, and was determined as the sum of the purchase price and the premium as the fixed part of the reference price of gas. However, according to the new *Methodology for setting tariffs for public service gas supply and guaranteed supply* (Official Gazette no. 108/20 and 20/22), according to which the *Decision on tariffs for gas supply as a public service for the period from 1 April to 31 December 2021* (Official Gazette no. 28/21 and 33/21) was adopted, the price of gas for final customers on the public service from 1 April to 31 December 2021 consisted of the cost of gas procurement, the cost of gas distribution, and the cost of gas supply. The cost of gas procurement reflects the price of gas on the reference gas market, and is a wholesale component in the structure of the final price of gas supply. The cost of gas distribution is intended to cover the cost of distribution network usage charges. The cost of gas supply is intended to cover the cost of the supplier's operations in the public service obligation, including the cost of using gas infrastructure (transmission system and gas storage system and/or LNG terminal), the cost of balancing energy, and other costs in accordance with the *Gas market code*, as well as other operational costs and the supplier's margin in the public service obligation. The cost of gas supply is determined on the basis of a public tender to select a public service obligation gas supplier for each distribution area for a period of time defined in the public tender.

The share of the reference price of gas in 2021 averaged 53.3% of the total regulated final price of gas, net of VAT. The share of the cost of gas distribution in the average final gas price in 2021 (net of VAT) was 23.4%, while the cost of gas supply (which includes the cost of transmission, storage, other related costs, and the supply margin) amounted to 23.3%. Figure 5.3.9. shows the structure of the final gas price for households in the public supply service in Croatia in 2021.

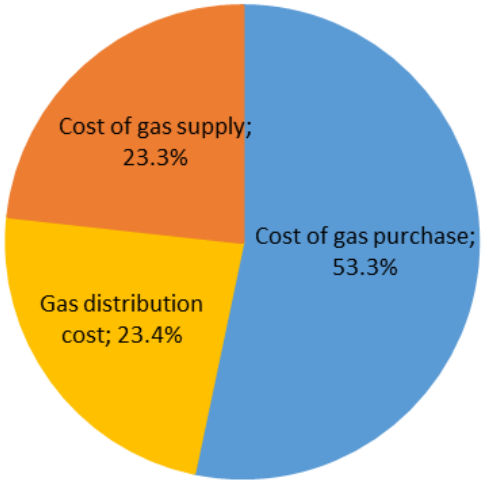


Figure 5.3.9. Structure of gas prices for households in the public service supply in Croatia in 2021

Figure 5.3.10. shows the structure of the final gas price for households VAT inclusive by consumer category D1 - D3 according to EU *Directive 2012/27/EU* and EU Regulation 2016/1952, i.e. according to EUROSTAT's methodology, encompassing households in the public supply service and households with market contracts.

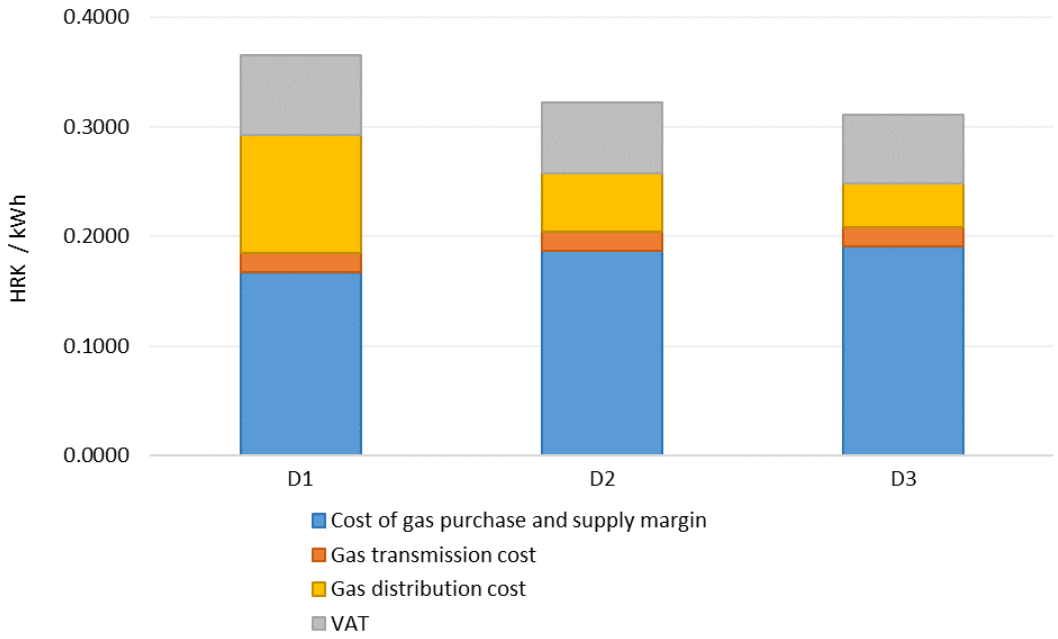


Figure 5.3.10. Structure of the final gas price for households in Croatia in 2021 – consumer categories D1 – D3 (according to EUROSTAT categorisation)

In 2021, the average gas sale price in Croatia for household final customers connected to the distribution system[76] was HRK 0.3130/kWh (net of VAT), or 15.8% more than in 2020. The lowest price in Q3 was HRK 0.2542/kWh, and the highest was in Q4 at HRK 0.4178/kWh.

In 2021, the average gas sale price in Croatia for non-household final customers connected to the transmission system[77] was HRK 0.2847/kWh (net of VAT), or 114.5% more than in 2020; this same price was at its lowest in Q1 (HRK 0.1711/kWh) and Q4 (HRK 0.4534/kWh), respectively.

Table 5.3.3. shows average gas sale prices (net of VAT) in Croatia in 2021 for final customers on the market (non-household) by HERA's categorisation, separately for final customers connected to the transmission system and final customers connected to the distribution system, as well as the total average sale prices of gas for all final customers on the market in Croatia.

[76] *The weighted average by delivered gas quantity for final customers on the market connected to the distribution system, for each gas supplier.*

[77] *The weighted average by delivered gas quantity for final customers on the market connected to the transmission system, for each gas supplier.*

Table 5.3.3. Average gas sale price for non-household final customers on the market in Croatia in 2021, net of VAT

Category (by annual consumption in kWh)		final customers connected to the transmission system (HRK/kWh)	final customers connected to the distribution system (HRK/kWh)	TOTAL (HRK/kWh)
I1-1	≤ 100,000	*	0.3693	0.3692
I1-2	100,001 - 250,000	*	0.3612	0.3612
I2	250,001 - 2,500,000	*	0.2984	0.2971
I3-1	2,500,001 - 10,000,000	*	0.2975	0.2965
I3-2	10,000,001 - 25,000,000	*	0.2417	0.2420
I4-1	25,000,001 - 50,000,000	0.2595	0.2898	0.2825
I4-2	50,000,001 - 250,000,000	0.3860	0.2997	0.3518
I5	250,000,001 - 1,000,000,000	*	-	0.3311
I6	> 1,000,000,001	0.2787	-	0.2787
	Total:	**0.2847**	**0.3130**	**0.2934**

** HERA does not publish the average price for this category for reasons of confidentiality, as there were less than three final customers in this category in 2021*

HERA also analyses the structure of the final gas price for non-household consumers. In 2021, the cost of goods, which includes the cost of gas purchase and the supply margin, accounted for 82.5% of the total average gas price for all final customer categories on the market (net of VAT). The cost of gas transmission and the cost of gas distribution accounted for 4.8% and 12.7%, respectively. Figure 5.3.11. shows the structure of the final gas price in 2021 for non-household final customers on the market in Croatia according to EUROSTAT consumer category.

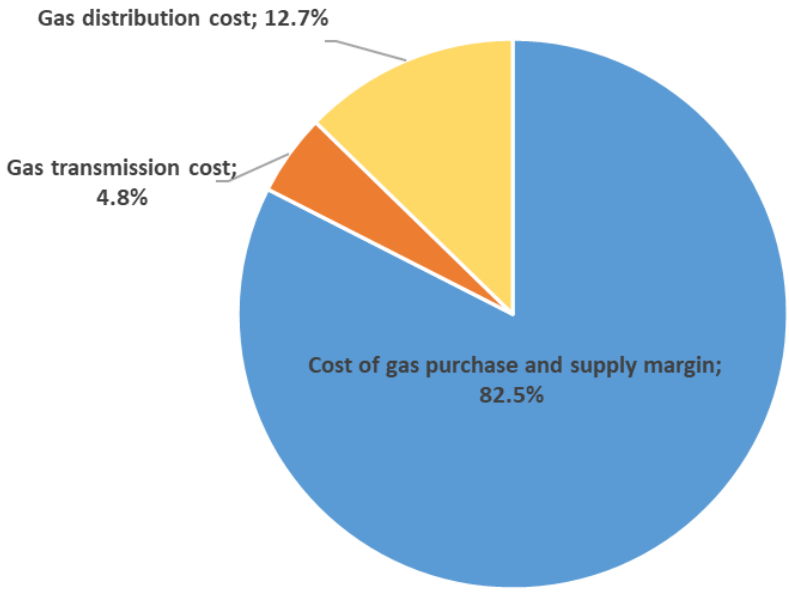


Figure 5.3.11. Structure of retail gas prices for non-household final customers in Croatia in 2021

Figure 5.3.12. shows the structure of the final gas price for non-household final customers in Croatia in 2021, according to EUROSTAT consumer categories I1 – I6, according to EU *Directive 2012/27/EU* and EU *Regulation 2016/1952* (EUROSTAT methodologies).

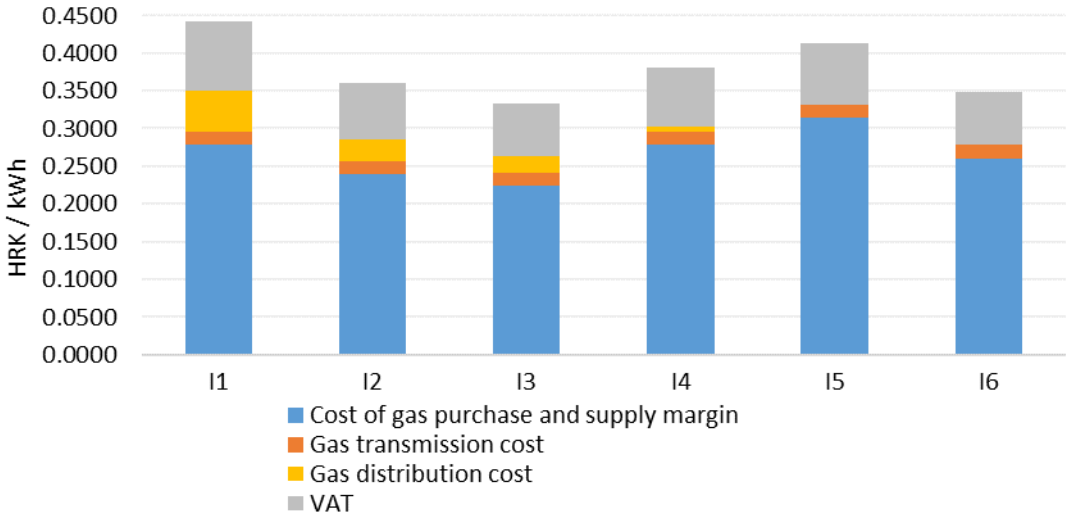


Figure 5.3.12. Structure of the final gas price for non-household final customers in Croatia in 2021 – EUROSTAT, consumer categories I1 – I6

Quarterly trends in average retail gas prices in 2021 for non-household final customers on the market are shown in Figure 5.3.13. The average retail price of gas in Croatia (net of VAT) for non-household final customers in 2021 amounted to HRK 0.2934/kWh, which is an increase of 79.9% compared to the average retail price in 2020.

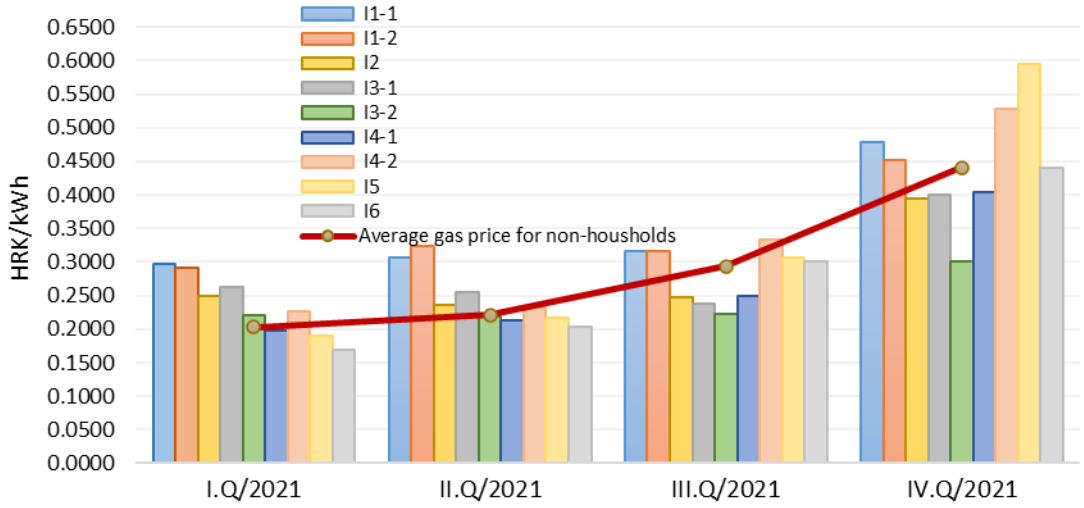


Figure 5.3.13. Average retail gas prices (net of VAT) for categories of non-household final customers on the market in Croatia by quarter in 2021

Figure 5.3.14. shows average retail market gas prices in Croatia for non-household final customers in Croatia according to gas consumption by quarter from 2017 to 2021.

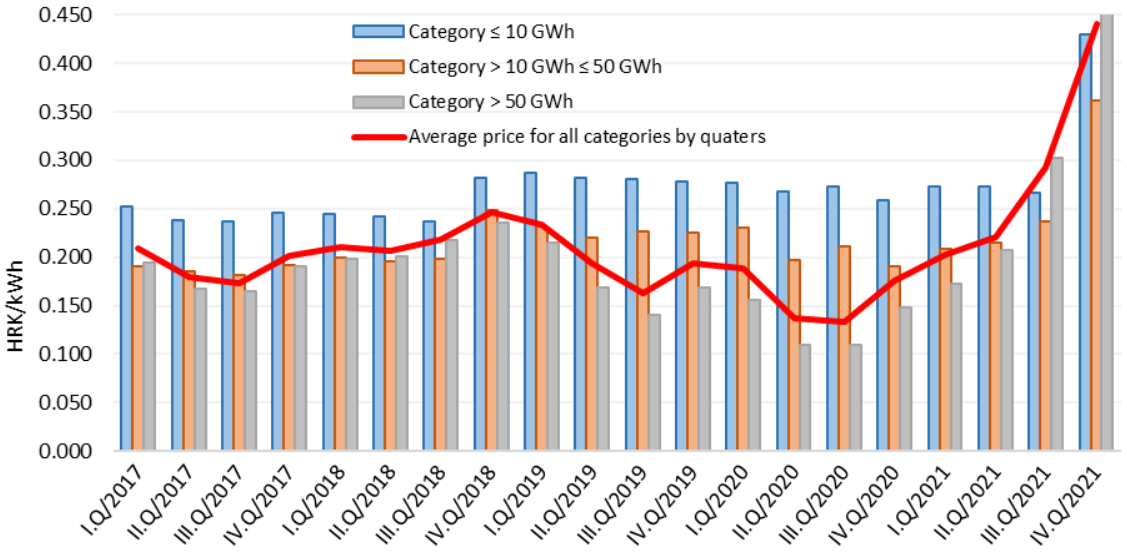


Figure 5.3.14. Average retail gas prices (net of VAT) for categories of non-household final customers on the market in Croatia by quarter from 2017-2021

A comparison of retail and wholesale market prices of gas for non-household final customers in 2021 shows that the average retail price of gas was 4.3% higher than the average wholesale price.

A comparison of the average sale price of gas for households on the public service obligation and households with market agreements, as well as a comparison of the average sale price of gas on the retail market for non-household final customers with the average sale price of gas on the wholesale market (net of VAT) from 2018 to 2021 is shown in Figure 5.3.15.

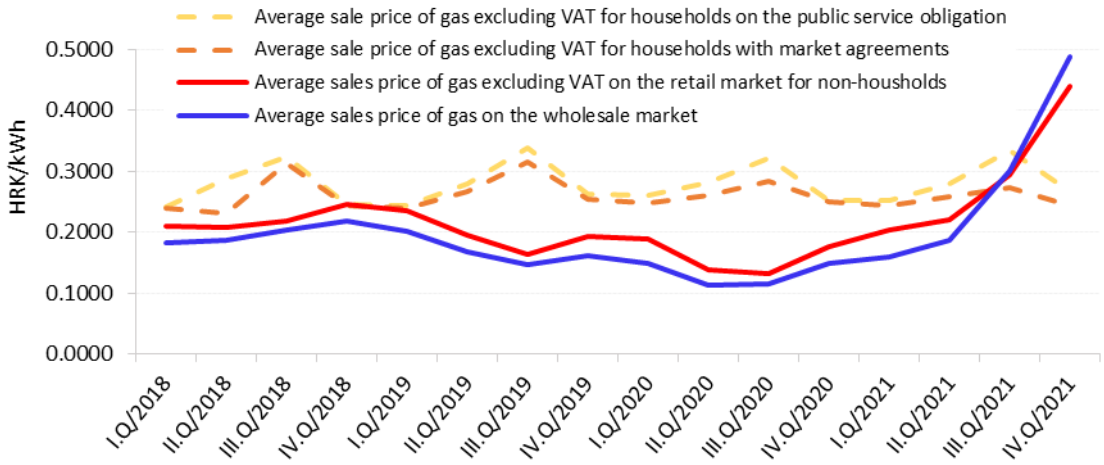


Figure 5.3.15. Trends in average retail gas prices for final customer categories as compared to the average wholesale price of gas on the market from 2018-2021

Natural gas prices for final customers in European countries – households

According to EUROSTAT, the prices of natural gas (excluding taxes) for household final customers in the European Union increased on average by 5.6% in 2021 as compared to 2020. The price of natural gas (excluding taxes) for households in Croatia was still 35.5% below the European average in 2021.

In 2021, the average sale price of natural gas including taxes for households in the D2[78] category was highest in Sweden (42.90 EUR/GJ), Denmark (29.75 EUR/GJ) and the Netherlands (28.58 EUR/GJ); it was lowest in

[78] *The D2 consumption category includes households whose annual natural gas consumption ranges from 20 to 200 GJ, which approximately corresponds to natural gas consumption of 5,001 to 50,000 kWh (i.e. households in TM2 and TM3 tariff classes).*

Hungary (8.49 EUR/GJ), Lithuania (9.56 EUR/GJ), and Latvia (10.14 EUR/GJ). The price of natural gas for households in category D2 (including taxes) in Croatia was 45.6% below the European average in 2021.

The share of taxes in the total price of natural gas for this consumer category varied greatly; it was highest in the Netherlands (60.5%), Denmark (49.9%), and Italy (32.6%), and lowest in Greece (6.9%), Bulgaria (12.1%), and the Czech Republic (15%). In Croatia, the share of taxes in the total gas price for this category of consumers amounted to 20%.

Figure 5.3.16. shows average natural gas prices for households in the D2 consumer category in 2021, both including and excluding taxes.

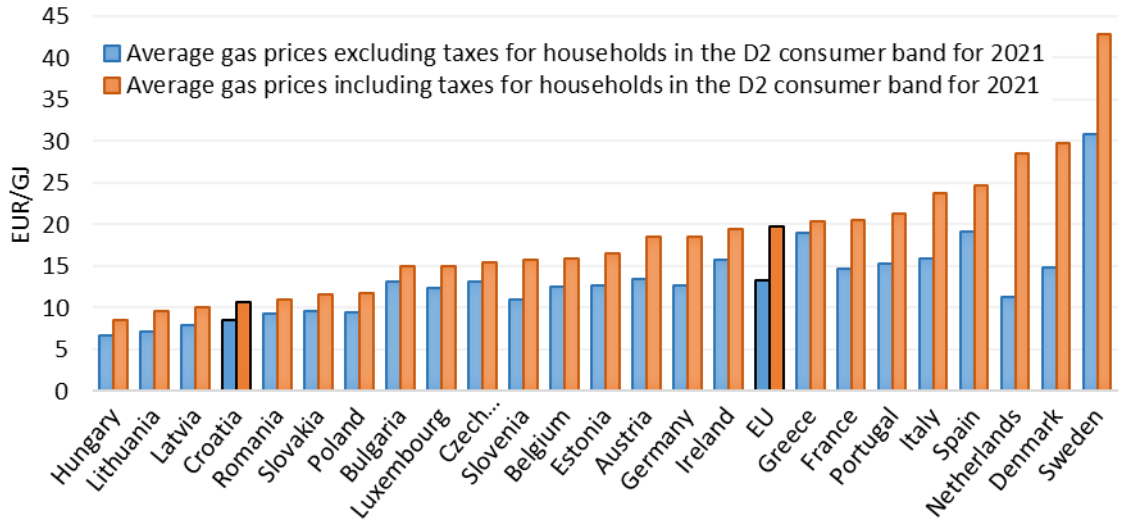


Figure 5.3.16. Average natural gas prices for households in the D2 consumer category in 2021 (including and excluding taxes)

If the price of natural gas for households in the D2 consumer category is expressed using the international PPS/GJ unit in order to eliminate differences in the prices of goods/services across countries, in 2021, the price was highest in Sweden (33.23 PPS/GJ) and lowest in Luxembourg (11.61 PPS/GJ).[79] Taking into account the purchasing power standard expressed in PPS, the final price of gas including taxes for households in the D2 consumer category in Croatia in 2021 was 16.7 PPS/GJ, which is 15.7% lower than the European average. Figure 5.3.17. shows a comparison of European natural gas retail prices, including taxes for households in the D2 consumer category for 2020 and 2021, expressed in PPS/GJ.

79 *PPS (purchasing power standard) is a unit that equalises the purchasing power of different countries.*

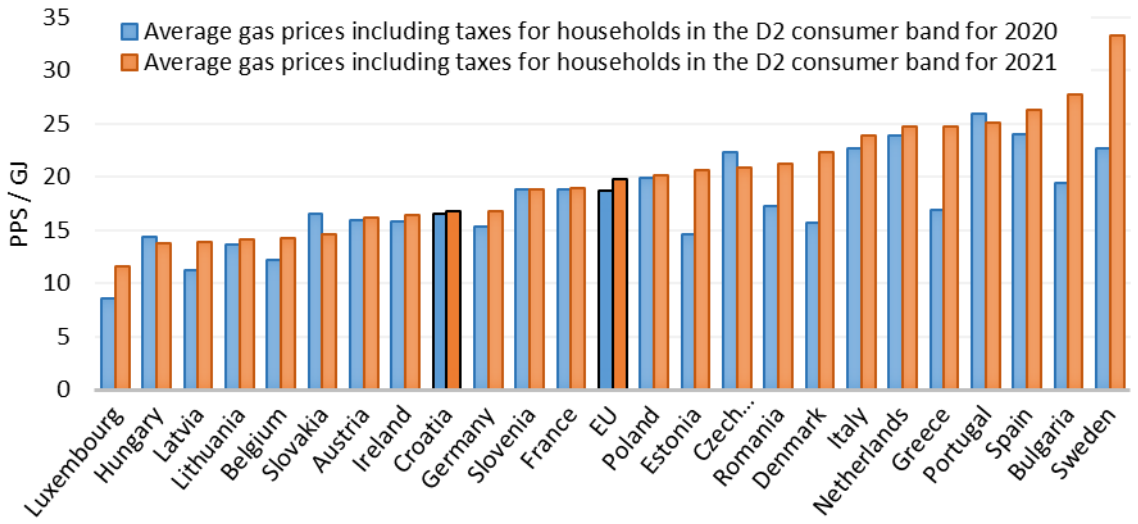


Figure 5.3.17. Natural gas prices for households in the D2 consumer category in relation to the price of goods/services in European countries (including taxes) for 2020 and 2021

Natural gas prices for final customers in European countries – non-household

According to EUROSTAT, the prices of natural gas (excluding taxes) for non-household final customers in the I3 consumer category in the European Union increased in 2021 by 24% as compared to 2021.[80] Figure 5.3.18. shows average natural gas prices for non-household consumers in the I3 consumer category in EU countries for 2021, with and without taxes.

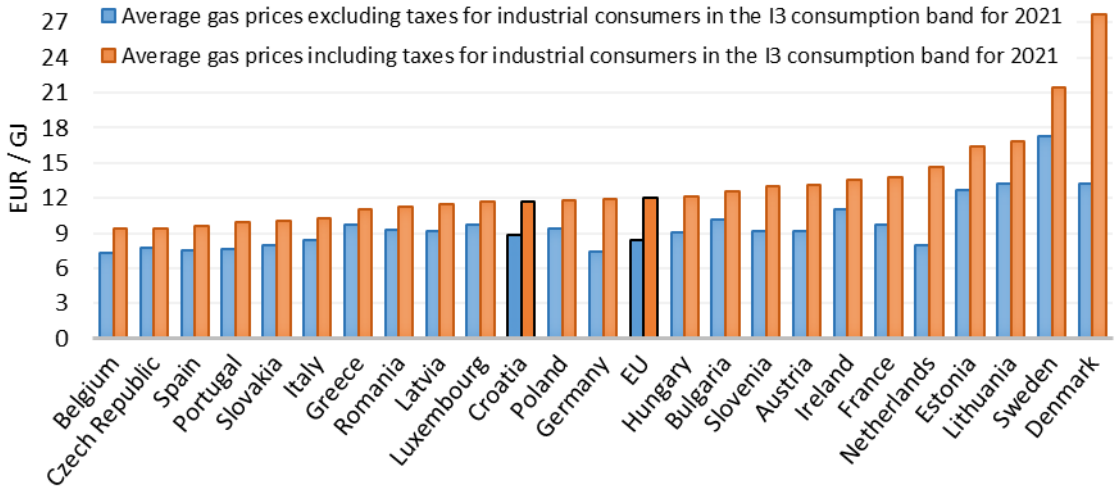


Figure 5.3.18. Average natural gas prices for non-household consumers in the I3 consumer band for 2021 (including and excluding taxes)

In 2021, the average sale price of natural gas including taxes for non-household consumers in the I3 consumer category was highest in Denmark (27.66 EUR/GJ), Sweden (21.42 EUR/GJ), and Lithuania (16.88 EUR/GJ); it was lowest in Belgium (9.38 EUR/GJ), the Czech Republic (9.42 EUR/GJ), and Spain (9.66 EUR/GJ). In Croatia, the average natural gas sale price including taxes for non-household consumers in the I3 consumer band in 2021 was 11.73 EUR/GJ, which is 1.9% less than the EU average.

The share of taxes in total natural gas prices for this customer category varied greatly; it was highest in Denmark (52.2%), the Netherlands (45.7%), and Germany (37.8%), and lowest in Greece (12.4%),

80 *The I3 consumption category includes non-household final customers whose annual natural gas consumption ranges from 10,000 to 100,000 GJ, which approximately corresponds to natural gas consumption of 280,000 to 2,800,000 kWh.*

Luxembourg (17.0%), and Romania (17.7%). In Croatia, the share of taxes in the total gas price for this category of consumers amounted to 24.4% in 2021.

If the price of natural gas for non-household consumers in the I3 category is expressed in PPS/GJ, in 2021, the price of gas was highest in Lithuania (24.81 PPS/GJ) and lowest in Belgium (8.38 PPS/GJ). Taking into account the purchasing power standard expressed in PPS, the final price of gas including taxes for non-household consumers in the I3 consumer category in Croatia in 2021 was 18.26 PPS/GJ, which is 47.5% higher than the European average. Figure 5.3.19. shows a comparison of European natural gas retail prices including taxes for non-household consumers in the I3 consumer category for 2020 and 2021, expressed in PPS/GJ.

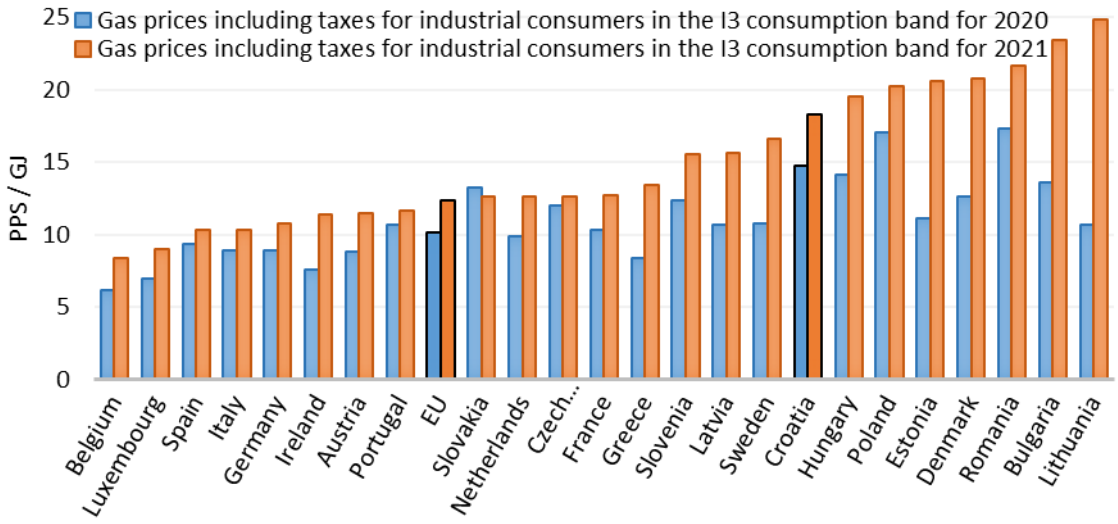


Figure 5.3.19. European natural gas prices (including taxes) for non-household consumers in the I3 consumer band for 2020 and 2021, expressed in PPS/GJ

Assessment of retail gas market function

The main indicators of the functioning of the retail market are supplier switching rate, HHI, and the impact of regulation on the market as a whole.

In 2021, there was a significant increase in the number of supplier switches as compared to the previous year; simultaneously, there was an increased number of supplier switches that were cancelled, which was the result of a reduced number of suppliers in the public service obligation and of some suppliers switching to market-based operations in particular distribution areas.

The market concentration indicator (HHI) for non-household consumers was still near the target level (2,000) at 2,056, which is an indicator of positive trends on the retail market in 2021. The appearance of new market participants reduced the share of the three largest market participants, which amounted to 65.4% in 2021; in 2020, this share amounted to 70%.

HHI trends in the past five years clearly show that the level of retail gas market concentration is still mostly the result of fluctuations in the distribution of market share among the three largest market participants, which is clearly apparent in Figure 5.3.20., which shows the share of individual retail gas market participants in Croatia from 2017 to 2021.

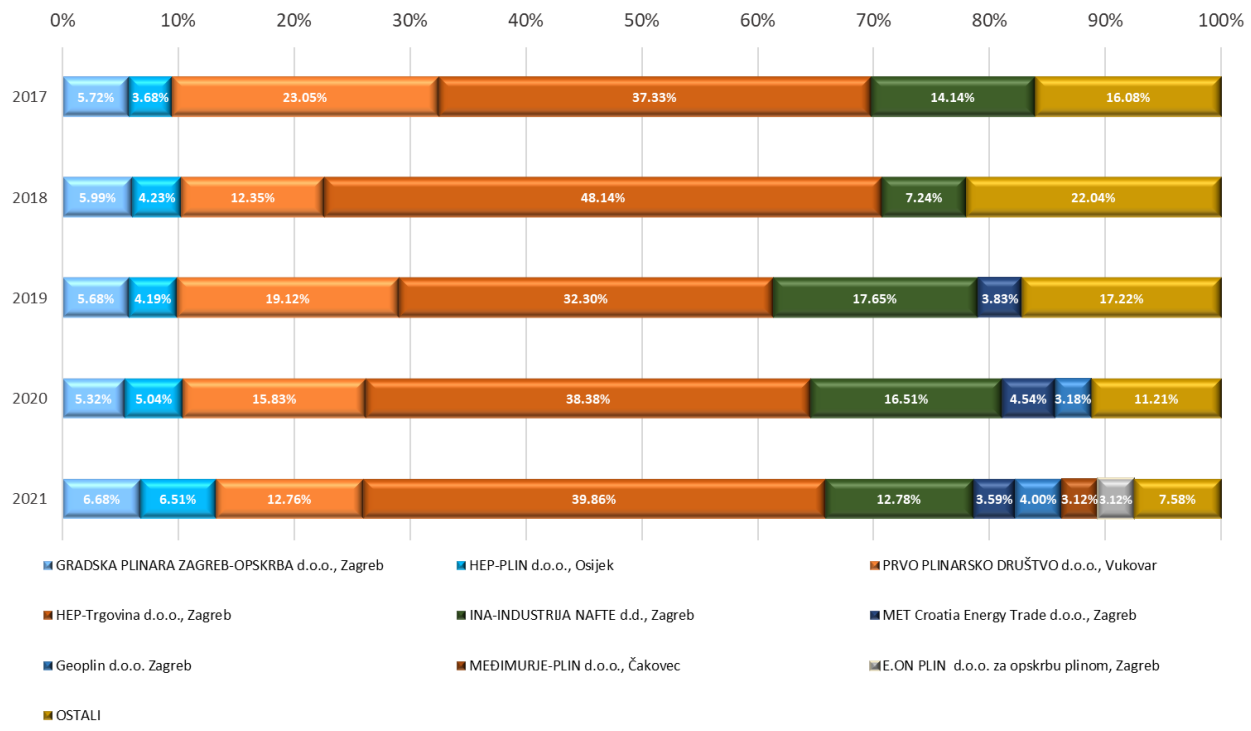


Figure 5.3.20. Share of individual retail gas market participants in Croatia from 2017 to 2021

The majority of households in Croatia still purchase gas under regulated conditions (79% as of 31 December 2021), considering the regulation model of the final price of gas, which protects household final customers on the gas supply public service from fluctuations on the gas market, ensuring a predictable, guaranteed final price of gas throughout the regulatory year, as well as considering the other regulated conditions of gas supply.

The establishment of a gas price comparison tool will also contribute to the further development of the retail gas market; this tool will be of key importance to final customers as it will allow them compare verified offers at the market level of all gas suppliers in one place, thus facilitating their choice of a gas supplier. HERA plans to launch this gas price comparison tool in 2022.

An overview of retail gas market indicators for household final customers per year for the period from 2017 to 2021 is shown in Table 5.3.4.

Table 5.3.4. An overview of retail gas market indicators for household final customers per year for the period from 2017 to 2021

Retail natural gas market - HOUSEHOLDS					
Indicator	**2017**	**2018**	**2019**	**2020**	**2021**
Total quantity of gas sold - households (GWh)	6,017	5,865	5,781	5,941	6,557
Of which sold: under the public service (GWh)	5,808	5,471	5,388	5,380	5,407
under market conditions (GWh)	209	394	393	561	1,150
Number of suppliers for households	35	36	37	33	33
Of which: suppliers in the public service	34	34	34	31	32
suppliers under market conditions	2	9	10	10	20
Number of final customers - households	615,576	621,748	629,693	634,791	643,823
Of which: in the public service	579,086	582,596	588,799	565,592	510,805
buy gas under market conditions	36,490	39,152	40,894	69,199	133,018
Number of suppliers with market share > 5%	3	3	3	3	5
Number of suppliers with share of consumers > 5%	3	3	3	3	4
Share of the three largest suppliers (by number of BMP)	61%	60%	60%	64%	72%
HHI (according to quantity of gas sold)	2,155	2,138	2,050	2,073	2,220
HHI (by number of BMP)	2,193	2,159	2,137	2,282	2,661

An overview of retail gas market indicators for household final customers per year for the period from 2017 to 2021 is shown in Table 5.3.5.

Table 5.3.5. An overview of retail gas market indicators for household final customers per year for the period from 2017 to 2021

Retail natural gas market - NON-HOUSEHOLDS					
Indicator	**2017**	**2018**	**2019**	**2020**	**2021**
Total quantity of gas sold - non-household (GWh)	21,777	19,573	20,517	22,136	19,899
Of which: in the TS (GWh)	16,955	14,538	15,583	17,117	14,319
in the DS (GWh)	4,822	5,035	4,933	5,019	5,580
Number of final customers - non-households	47,288	49,989	50,304	50,164	50,463
Of which: in the TS	19	21	21	19	17
in the DS	47,269	49,968	50,283	50,145	50,446
Number of suppliers for non-households	45	45	44	41	49
Of which: active suppliers in the DS	44	43	43	40	39
active suppliers in the TS	8	9	9	7	9
Number of suppliers with market share > 5%	4	4	4	5	5
Number of suppliers with share of consumers > 5%	3	4	4	4	5
Share of the three largest suppliers (by quantity of gas sold)	75%	68%	69%	71%	65%

5.3.4 Public service obligation in the gas sector

Performance of energy activities as a public service is regulated by the **Energy Act**. The public service is defined as a service available at all times to final customers and energy entities at a regulated price and/or under regulated conditions for access to and use of the energy service, which has to be available, sufficient,

and sustainable, taking into account the safety, regularity, and quality of service, environmental protection, efficiency of energy utilisation, and climate protection, and which is performed according to the principles of transparency and impartiality and supervised by competent authorities.

Regulated energy services in the gas sector performed as public services are:

- gas transmission, gas distribution, gas storage, LNG terminal management,
- wholesale market supplier activity (until 31 March 2021),
- public service gas supply, guaranteed supply, and
- gas market organisation.

The public supply service represents a protective measure for household final customers by regulating gas supply conditions. In addition to the **Gas Market Act**, the regulatory consumer protection mechanisms used by the public service are also prescribed by the *General terms and conditions of gas supply*. Suppliers in the public service obligation are required to charge for delivered gas according to valid tariff amounts for the public gas supply service as adopted by HERA in accordance with the *Methodology for setting tariffs for public service gas supply and guaranteed supply (*also adopted by HERA), as well as ensure the quality of gas and quality of service in accordance with the *General terms and conditions* of gas supply.

HERA conducted a public tender from October to December 2020 to select the gas supplier in the public service obligation for household final customers for the period from 1 April 2021 to 30 September 2024 for all distribution areas in Croatia. On the basis of public tenders to select suppliers in the public service obligation for household final customers, HERA's decisions of 11 December 2020 selected suppliers in the public service obligation for 33 distribution areas in Croatia for the period from 1 April 2021 to 30 September 2024. As a result of this tender, gas supply in the public service obligation in Croatia is undertaken as of 1 April 2021 by 14 gas suppliers instead of the previous 32. A list of all designated gas suppliers by distribution area can be found at the following link:

https://www.hera.hr/hr/docs/SPN/Popis_OUOJU_DP_2022-03-11.pdf

It should be emphasised that household final customers have the right to decide whether to buy gas under regulated conditions in the public service or freely on the market from the same or any other gas supplier without prejudicing their right to switch back to the public service.

The Gas Market Act prescribes consumer protection measures for all final customers via the right to guaranteed supply. The role of a guaranteed supplier is to provide public gas supply service to final customers left without a supplier under specific conditions, over a limited period and under regulated circumstances. The period during which this service is to be provided and the relevant conditions of guaranteed supply are stipulated in the *Methodology for setting tariffs for public service gas supply and guaranteed supply. Having applied the criteria from the tender documentation for the period from 1 October 2018 to 30 September 2021, HERA appointed the energy entity GRADSKA PLINARA ZAGREB - OPSKRBA d.o.o. as the guaranteed supplier in Croatia.*

From 9 to 30 June 2021, in accordance with the **Gas Market Act**, HERA held a public tender to select the guaranteed supplier; energy entity Termoplin d.d. was designated the guaranteed gas supplier in Croatia for the period from 1 October 2021 to 30 September 2024.

Given the current situation on the European wholesale gas market and manifold price increases, which has resulted in an increase in the sale price of gas for non-household final customers beyond the guaranteed supply price range foreseen in *the Methodology for setting tariffs for gas supply as a public service and guaranteed supply* (Official Gazette no. 180/20) in Q4 2021, HERA adopted the *Amendments to the Methodology for setting tariffs for gas supply as a public service and guaranteed supply* (Official Gazette No. 20/22), which prescribes a new way of determining the final price of guaranteed supply for non-household final customers by reflecting current market trends on a three-month basis. The *Amendments to the Methodology for setting tariffs for public service gas supply and guaranteed supply* prescribes that the cost of gas procurement and the cost of gas supply for guaranteed supply is calculated according to a new formula, and according to the prices of "*TTF Price Assessment Quarter +1*" futures contracts for gas delivery in the coming quarter for which the final price of guaranteed supply is being set, published in a given day during the first two months of the current quarter; the cost of gas supply for guaranteed supply is defined as the average amount of the cost of gas supply for all distribution areas defined on the basis of a public tender to select the supplier in the public service obligation. As an exception, the cost of gas supply for

guaranteed supply for March 2022 was determined according to the price of "*TTF Price Assessment, March '22*" futures contracts published between 1 February to 15 February 2022. HERA also adopted a *Decision on tariff items for guaranteed gas supply for non-household final customers for March 2022* (Official Gazette no. 21/22).

As a result of the *Amendments to the Methodology for setting tariffs for gas supply as a public service and guaranteed supply*, which changed the conditions under which guaranteed supply is provided, a public tender to determine a new guaranteed supplier of gas was undertaken. On the basis of a public tender conducted from 18 February to 25 February 2022, in March 2022, HERA adopted a decision designating HEP-PLIN d.o.o. the guaranteed supplier of gas in Croatia from 10 March 2022 to 30 September 2024.

5.3.5 Quality of gas supply

The **Gas Market Act** sets out the obligations of gas producers, the transmission system operator, distribution system operator, closed storage system operator, gas storage system operator, LNG terminal system operator, and LNG and/or CNG supply point operator (hereinafter: system operators), as well as the obligations of gas suppliers, with regard to the disclosure and maintenance of agreed gas supply quality parameters. The quality of gas supply comprises quality of service, reliability of delivery, and quality of gas.

The framework for ensuring the quality of gas provided by system operators and gas suppliers is set out in the *General terms and conditions of gas supply*. In this regard, the quality of service encompasses the commercial requirements of gas supply quality, which, when respected by the system operator or gas supplier, ensure a satisfactory level of services provided to system users or final customers. The reliability of delivery implies the continuity of gas delivery from the transmission or distribution system in a period of time, and is expressed in the number of delivery interruptions and their duration. Gas quality implies that the parameters of gas delivered into the gas system are in line with standard gas quality as described in the General terms and conditions of gas supply. Gas producers, suppliers, and traders are obligated to ensure the standard quality of the gas that they deliver into the transmission or distribution systems.

Further, the transmission system operator and the gas supplier are also obligated to establish a system of data collection concerning the quality of gas supply and to publish digitised annual reports on the quality of gas supply. In this way, data on the fulfilment of general and guaranteed standards of quality of supply is monitored and collected. The general standards of supply quality serve to measure the general level of gas supply quality of individual system operators or gas suppliers, whereas guaranteed standards of supply quality determine the minimum level of gas supply quality they are obligated to provide to individual system users, final customers, or the gas market operator. As of 1 April 2020, system operators or gas suppliers are required to offer a minimum level of gas supply service, including to the gas market operator. At the request of the gas market operator, if the guaranteed standard of quality of supply is not met, the distribution system operator, closed distribution system organiser, or gas supplier is required to pay a charge in accordance with the General terms and conditions of gas supply.

System operators and gas suppliers are obligated to provide HERA with data on realised quality of supply indicators for guaranteed standards of quality of supply no later than 30 days after the end of the relevant quarter to which a particular indicator of quality of gas supply relates. Likewise, gas system operators and suppliers are obligated to provide HERA with annual reports on the quality of gas supply for the previous year by 1 March of the current year and to publish them on their websites.

With respect to system operators, HERA collects data on the quality of gas supply in order to monitor:

- general standards of supply quality: reliability of delivery (monitoring delivery interruptions, system leak tests, gas odourisation, emergency responses), quality of service (connection to the distribution system), and gas quality (gas quality control), and
- guaranteed standards of supply quality: reliability of delivery (planned delivery interruptions) and quality of service (connection to the distribution system, intervention by an authorised person, submission of readings to the supplier, supplier's order to suspend gas delivery, resumption of gas supply on the order of the supplier, entry and updating of data in the Register of Billing Metering Points).

With respect to gas suppliers, HERA collects data on the quality of gas supply in order to monitor:

- general standards of supply quality: quality of service (resolution of complaints and inquiries from final customers, correction of gas supply invoices), and
- guaranteed standards of supply quality: quality of service (correction of gas supply invoices, resumption of gas supply after settlement of obligations, entry and updating of data in the Register of Billing Metering Points).

Incentives and reimbursements for services rendered beyond the guaranteed standard are planned for the upcoming periods; by that time, values and criteria for the adjustment of general standards of gas supply quality must be established, including reimbursement amounts for particular guaranteed standards of gas supply quality.

In 2021, the transmission system operator recorded 12 planned delivery interruptions and 2 unplanned activities related to maintaining and building transmission system facilities that affected the capacity of the gas transmission system. Capacity limitation lasted a total of 124 hours. These activities affected the capacity limitation at interconnections to UGSF Okoli, INA's PS Gola production facility, as well as gas delivery to 14 distribution systems and one final consumer.

In 2021, distribution system operators recorded an average of 17 planned gas delivery interruptions with an average duration of 49 hours, as well as 36 unplanned delivery interruptions with an average duration of 69 hours.

5.3.6 Consumer protection

In 2021 HERA received a total of 255 submissions from natural and legal persons within its area of competence in the gas sector, as shown in Table 5.3.6.

Table 5.3.6. Customer submissions by type in 2021

Type of case	Number	Share, %
Complaints	120	47.1
Inquiries	105	41.2
Other consumer submissions	30	11.8
Total:	**255**	**100**

Of the 255 complaints and other consumer submissions, 99 were submitted by citizens (natural persons). Table 5.3.7. shows the most common reasons for complaints from natural persons.

Table 5.3.7. Complaints received from natural persons in 2021

Complaints from natural persons	Number	Share, %
Calculation of gas consumption	38	38.4
Price of gas	4	4.0
Unauthorised gas consumption	9	9.1
Supplier switches	5	5.1
Quality of gas	1	1.0
Delivery interruption	14	14.1
Other	28	28.3
Total:	**99**	**100**

The final customer protection framework in the gas sector is laid down in *Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC*, *Directive (EU) 2019/692 of the European Parliament and of the Council of 17 April 2019 amending Directive 2009/73/EC concerning common rules for the internal market in natural gas*, and the measures listed in Annex I. "*Consumer protection measures*". Provisions of the

Directive and Annex 1 have been transposed into the Croatian legal system through the following acts and by-laws:

- **Energy Act** (in force as of 21 September 2018)
- **Gas Market Act** (in force as of 6 March 2020)
- **Act on the Regulation of energy activities** (in force as of 21 November 2018),
- **Consumer Protection Act** (in force as of 21 October 2015), and
- *General terms and conditions of gas supply* (in force as of 17 September 2021).

The measure protecting gas consumers and gas system users against actions of gas system operators and suppliers, pursuant to Article 88 **of the Gas Market Act**, stipulates that a final customer dissatisfied with an action or failure to take action on the part of the transmission system operator, distribution system operator, gas storage operator, LNG terminal operator, gas market operator, or supplier, may initiate an administrative dispute. The procedure before the administrative court will be heard urgently.

In addition, the measure protecting gas consumers against actions of the gas supplier, pursuant to Article 24 of the *General terms and conditions of gas supply*, stipulates that final customers dissatisfied with an act or failure to act on the part of the supplier may file a written complaint with the supplier.

Complaints may be filed in particular against the following:

- failure to comply with the obligation to inform final customers of modifications to the contract terms and the right to terminate the gas supply contract,
- failure to comply with the obligation to provide timely information to household final customers about the termination of the concluded gas supply contract,
- the content of an invoice issued for delivered gas,
- non-fulfilment of the provisions of a public service obligation gas supply contract,
- failure to re-establish gas delivery within the defined time frames, upon payment of overdue amounts from the warning letter, due to which gas delivery was suspended, and
- supplier switching not carried out pursuant to the *General terms and conditions of gas supply*.

On the basis of the complaint, HERA may take the following measures:

- issue a binding decision on how to handle the complaint,
- provide instructions on how to handle the complaint, or
- issue an opinion on a complaint.

In order to protect final customers, throughout 2021, HERA continuously reminded and asked all gas suppliers to ensure that their final customers are protected from unfair and misleading sales methods, that the provisions of gas supply agreements are fair to final customers, and that they clearly, easily, and unambiguously describe the rights and obligations of both the supplier and the customer. When a large number of supplier switches was noted with a particular gas supplier, HERA requested a statement on the manner in which the suppliers ensured final customers were informed of the terms and conditions of gas supply prior to concluding the agreement, as well as the full documentation provided to final customers by gas suppliers when offering market-based agreements.

5.4 Security of natural gas supply

The basic framework on the security of natural gas supply in Croatia is laid down in Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010 (hereinafter: Regulation (EU) 2017/1938), which entered into force on 1 November 2017. The objective of Regulation (EU) 2017/1938 is to boost solidarity and trust between the Member States and put in place measures needed to achieve these aims.

In addition, pursuant to the provisions of the **Gas Market Act**, market participants are responsible for the security of gas supply within the scope of their activities. The competent authority in charge of implementing measures under Regulation (EU) 2017/1938 is the ministry competent for energy. Together with regional self-government units, it is responsible for implementing measures ensuring the security of supply.

In order to establish a preventive action plan containing measures needed to mitigate identified risks in accordance with the risk assessment undertaken pursuant to Article 9 of Regulation (EU) 994/2010 and of the European Parliament and of the Council of 20 October 2010 concerning measures to safeguard security

of gas supply and repealing Council Directive 2004/67/EC (hereinafter: Regulation (EU) 994/2010) and to establish an emergency plan containing measures to be taken to eliminate or mitigate the impact of gas supply disruptions pursuant to Article 10 of Regulation (EU) 994/2010, the Croatian government adopted the Emergency plan concerning measures to safeguard the security of gas supply in Croatia (Official Gazette no. 78/14) in July 2014. In order to establish criteria for acquiring the status of a protected consumer and measures to safeguard reliable supply of protected consumers, in June 2015,

the Croatian Government adopted the Regulation on the criteria for acquiring the status of a protected consumer in gas supply crisis situations (Official Gazette no. 65/15).

The preventive action plans and the emergency plans drawn up pursuant to Regulation (EU) 994/2010 will remain in force until new preventive action plans and emergency plans drawn up pursuant to Regulation (EU) 2017/1938 are first adopted.

5.5 Energy efficiency in the natural gas sector

Energy efficiency in gas infrastructure

Gas infrastructure is unique in that it is a large and expensive infrastructure that has been developed over decades; its construction, maintenance, and improvement require significant financial resources. For these reasons, increasing the energy efficiency of gas infrastructure is a complex economic and environmental issue.

The energy efficiency of gas infrastructure predominantly relates to losses of natural gas from the system and to the system's own energy consumption (gas and electricity consumption). Gas losses occur in almost all components of the gas system (transmission, distribution, compressor stations, metering and regulating stations [MRS], storage system); these are divided into ventilation losses (during reconstruction and maintenance), fugitive emissions (leakage), and losses due to incidents (accidents). The issue of system gas losses has recently become especially important, not only due to direct energy losses but also due to the exceptional environmental issues caused by methane (CH_4 emissions. Methane, one of the basic components of natural gas, is of particular importance because the greenhouse gas potential of methane is twice that of the same mass of carbon dioxide (CO_2).[81]

Energy efficiency in Croatia is regulated by the **Energy Efficiency Act**. With the adoption of this Act, EU acquis in the field of energy efficiency has been fully transposed into Croatian legislation.

In the context of assessing potentials and proposing measures to increase the energy efficiency of gas infrastructure, Article 16.1 of the **Energy Efficiency Act**, in accordance with the transposed EU acquis, provides that HERA will take energy efficiency into account when making decisions in areas under its jurisdiction. This applies in particular to decisions on tariff methodology, wherein cost-effective measures to increase energy efficiency must be considered in order to offer incentives that will increase the efficiency of gas infrastructure and abolish those that are harmful to the infrastructure's efficiency.

In its *Methodology for setting tariffs for gas distribution*, HERA defined operating costs as all justified business expenses related to gas distribution, including the cost of procuring gas to cover allowed losses of up to 3% of the total amount of gas at entrances to the distribution system. Furthermore, in the *Methodology for setting tariffs for Gas transmission*, HERA defined operating costs as all justified business expenses related to gas transmission; this does not include amortisation costs, while it does include the cost of procuring gas necessary to maintain operational accumulation, plant consumption, and to cover allowed operating losses and differences in measurements. Allowed operating losses and differences in measurement amount to a maximum of 0.3% of the total amount of gas at entrances to the transmission system confirmed on the basis of measurement data on the use of transmission system capacities. These provisions encourage the energy efficiency of transmission system operators and distribution system operators by requiring them to develop, maintain, and operate a system that takes energy savings into account, endeavouring to reduce gas losses to prescribed levels.

81 *Climate Change: the IPCC Scientific Assessment* https://www.ipcc.ch/site/assets/uploads/2018/03/ipcc_far_wg_I_full_report.pdf

In accordance with Article 5 of the **Energy Efficiency Act**, energy efficiency improvement policies are determined by energy efficiency plans.

In order to implement these tasks, in 2017, HERA commissioned a study entitled *An Assessment of the Potential for Increasing the Energy Efficiency of the Gas Infrastructure.* The aim of the study was to determine the potential for increasing the energy efficiency of gas infrastructure. Gas infrastructure losses are based on the *net-balancing* methodology. The goal is to increase the energy efficiency of gas infrastructure; this study analyses financially acceptable measures that can be implemented to reduce losses in gas infrastructure. These measures are contained in ten-year Croatian gas transmission system development plans, distribution systems development plans, and development plans and reports regarding realised investments in the gas storage system with a detailed elaboration of realised planned investments into system improvements on an annual and multi-annual basis.

The deadlines for the introduction of these measures are defined in ten-year development plans for the gas transmission system, development plans and reports on realised investments in the gas storage system, and distribution system development plans, with a detailed elaboration of the initial three- and one-year periods, which HERA approves with a view to cost-efficient improvements to gas infrastructure.

Applicable and cost-effective measures to increase the energy efficiency of gas infrastructure stem from the need to reduce gas losses. Measures for the transmission system are connection to the low-pressure system (during the reconstruction and maintenance of the existing system), improvements to the pneumatic valve system, the evaluation and possible replacement of overpressure valves, and the replacement of gas preheating boilers at MRSs.

The analysis of distribution system development plans shows that the potential for increased energy efficiency is fairly high in the distribution system, especially as concerns the replacement of existing steel piping with PE piping and the evaluation and possible replacement of overpressure values.

As concerns the gas storage system, activities directed towards increasing energy efficiency involve improvements to the energy efficiency of compressors, dehydration and hydration units, and preheating systems at reducing stations.

The energy obligation system in the gas sector – public service obligation suppliers

In accordance with Article 13.2. of the **Energy Efficiency Act**, obligated parties in the obligations system in 2021 are: energy suppliers and all their related persons who are energy suppliers who delivered a total of more than 50 GWh of energy to final customers or distribution stations in the year before last; all parties who sell biofuels on the market, or distributers who sell diesel fuel or motor fuel for motor vehicles who are considered an excise duty payer under the special act governing excise duties.

The competent Ministry adopts an ex officio decision determining the required savings in kWh of an obligated party for the current calendar year, on the basis of data on energy supplied by the obligated party to final customers or to distribution stations that sold energy in the year before last; the obligated party is required to submit the data to the Ministry by 30 June of the current year for the year before last.

The Ministry's decision determines the initial base obligation of bond parties in the amount of 1.5% of their annual energy sales to final customers in the year before last. The Ministry subtracts the following from the base obligation:

- the share of the target achieved through alternative measures in the observed year, beginning in 2017,
- the share of biofuels that entities (which are also obligated parties) that sell diesel fuel or petrol for motor vehicles were required to include in their fuel in accordance with a special regulation governing the use of biofuels for transport,
- share of energy supplied by the energy supplier to consumers who are producers, distributors, or suppliers of thermal energy, and
- share of energy supplied by the energy supplier to an industry that is bound by legislation regulating greenhouse gas emissions trading.

The **Energy Efficiency Act** also stipulates that, if the obligated parties fail to realise savings not exceeding 10% of their total obligation in the previous year, the Ministry will increase the
obligation by these unrealised savings from the preceding year. However, for the unfulfilled part of the obligation, the Ministry will ex officio determine the amount that the obligated party must pay to the Environmental Protection and Energy Efficiency Fund (hereinafter: the Fund) as a single payment in the name

of unrealised savings with a payment deadline of 30 days from the date of delivery of the decision to the party. The payment for the unrealised share of the energy savings obligation from the preceding year is determined by multiplying the unrealised part of the obligation from the preceding year in kWh with a unit fee, expressed in HRK/kWh. The unit fee for the first and second cumulation periods of energy savings is HRK 1.2/kWh, but is adjusted every year, starting from 1 January 2022, in relation to the determined adjusted unit fee from the preceding year, by multiplying it with the Consumer Price Index published by the Croatian Bureau of Statistics for the previous calendar year.

The **Amendments to the Energy Efficiency Act** specify the cumulation periods of energy savings as follows:

1 the first cumulation period of energy savings lasts from 1 January 2014 to 31 December 2020;
2 the second cumulation period of energy savings lasts from 1 January 2021 to 31 December 2030;
3 the third and each subsequent cumulation period of energy savings is the subsequent ten-year period.

It is important to note that, under the current provisions of the **Act**, energy savings realised in one cumulation period cannot be carried over to another cumulation period.

Introduction of smart meters

Pursuant to the provisions of the **Energy Act**, the distribution system operator determines the technical requirements and the costs of deploying advanced metering devices and submits them to HERA, which performs a cost-benefit analysis and obtains the opinion of the representatives of consumer protection bodies to enable the minister responsible for energy to set out a programme of measures to introduce advanced meters for final customers.

During 2021, 8 distribution system operators of a total of 19 distribution system operators who provided statements to HERA on the measures taken to increase energy efficiency carried out pilot projects to introduce smart metering devices and systems to network them. Distribution system operators have not provided detailed information on the funds invested and the savings achieved, as the pilot projects are still under way and the real impact cannot yet be determined precisely.

It must be noted that the minimum functionality of smart metering devices has not yet been established in Croatia, and that the study HERA plans to implement will include an analysis of the necessary and acceptable functionality of the devices, as well as a proposal of the minimum functional requirements for advanced metering devices.

An overview of the abilities and specific minimum functional requirements for smart meters and the technologies that enable such functionality will be the subject of public consultation with distribution system operators conducted by HERA with the aim of identifying functionalities and technologies that are acceptable to distribution system operators in Croatia. A final cost-benefit analysis must be carried out with regard to acceptable functionality and the optimal technology by which to enable such functionality.

Energy efficiency and the energy savings obligation system of energy entities in the gas sector

In order to monitor the activities of energy entities related to gas distribution and gas transport as concerns fulfilling energy savings obligations, HERA issued a questionnaire to collect data on measures taken by energy entities in accordance with the provisions of the **Energy Efficiency Act**, as well as on the impact of the energy savings obligations system on their operations in 2021.

Of the questionnaires collected, a total of 19 energy entities who distribute gas, one energy entity who transports gas, and two energy entities who supply gas responded as energy savings obligated parties.

The transmission system operator implemented savings measures by replacing gas preheating boilers with new, more efficient condensing boilers with a lower power at MRS Zagreb South. This investment and the replacement of the boilers enabled the proper function of the gas preheating system, which resulted in a reduction in gas consumption required for preheating and a reduction in harmful gas emissions.

Aside from introducing smart meters and networking systems, as concerns the operations of distribution system operators, measures were taken to inform customers about the efficient use of gas through leaflets and brochures, as well as the participation of individual distribution system operators in projects co-financing the procurement of more efficient gas heating systems, such as the replacement of atmospheric boilers with more efficient condensing boilers with digital temperature regulation. Some distribution system operators reconstructed gas pipelines, replacing worn-out steel gas pipelines with new gas pipelines made of high-

density polyethylene (PEHD), thus improving the security of distribution systems. The impact of these measures will be more accurately measurable after the two-year usage period.

As concerns the operations of gas suppliers, measures were taken to implement the automatic delivery of information to final customers in the public sector through an energy management information system (ISGE), as well as through providing notifications on gas invoices, alongside the annual delivery of data, or through informative leaflets as a part of energy efficiency measures campaigns.

The annual savings obligation on the basis of delivery of data to final customers is determined by the Ministry; energy suppliers are required to inform the Ministry of their fulfilment of this obligation for the previous year by 15 February of the current year. Active gas suppliers became obligated to implement the energy savings system in 2020; they fulfilled their obligations in 2021 by purchasing savings and investing in energy efficiency improvements in final consumption. The savings obligation is based on the quantity of energy delivered to the obligated parties' final customers on the basis of the regulation prescribing the manner in which emissions allowances are traded, in the amount of the initial reduction, which is limited to 25% of the annual sale of energy to final customers.

In 2021, the total energy savings realised by active gas suppliers exceeded the savings obligation established int he Ministry's decision; savings were transferred either to another legal entity, or suppliers requested the savings be transferred to 2022.

Data in the Energy Savings Monitoring, Measurement, and Verification System (hereinafter: SMIV) operated by the Ministry established that 10 energy operators in the gas sector (gas suppliers) were in in the energy savings obligation system in 2021. Energy savings were implemented through the measures listed in Table 5.5.1.

Table 5.5.1. Overview of implemented energy savings measures in the gas sector with associated codes

Measure code	Name of energy savings measure
M18	Informing customers about improving energy efficiency through leaflets
M24	Introduction of smart metering systems to monitor the consumption of electricity and thermal energy, gas-derived energy, and water consumption
M1	Integral renovation of existing buildings
M4	Installation or replacement of heating systems and hot water preparation
M2	Renovation of thermal insulation
M25	Installation of heating system control equipment
T1	Replacement of existing vehicles and purchase of new vehicles
T2	Eco-driving

Energy savings were achieved in the building (1,287,309.66 kWh) and transport (44,846,738.41 kWh) sectors. Total energy savings in the gas sector in 2021 amounted to 46,134,048 kWh. Table 5.5.2. shows the amount of energy savings by obligated party in the gas sector, the measures by which savings were achieved, and savings in the sectors of energy consumption (use in transport and construction).

Table 5.5.2. Overview of the amount of energy savings by obligated party in the gas sector in 2021, measures by which savings were achieved, and savings by sector (transport and construction).

Name of savings obligated party	Energy savings measure code	Total energy savings (kWh):	Sector and amount of energy savings	
			Transmission (kWh)	Building industry (kWh)
BROD-PLIN d.o.o.	M18	2,573,999.19	_	599,137.00
	M24		_	1,974,862.19
ENERGO METAN d.o.o.	M18	2,733,853.00	_	191,053.00
	M24		_	2,542,800.00
GRADSKA PLINARA ZAGREB – OPSKRBA d.o.o.	M25	1,392,753.06	_	21,587.94
	T1		1,094,457.00	_
	T2		192,852.66	_
	M24		_	83,855.46
HEP-PLIN d.o.o.	M18	14,903,063.01	_	2,843,196.00
	M24		_	12,059,867.01
MEĐIMURJE-PLIN d.o.o.	M18	15,790,481.95	_	15,506,200.00
	M24		_	284,281.95
PLIN KONJŠČINA d.o.o.	M18	347,584.96	_	323,330.00
	M24		_	24,254.96
PLINARA d.o.o.	M24	806,507.61	_	89,591.44
	M1		_	684,008.08
	M4		_	32,908.09
PLINARA ISTOČNE SLAVONIJE d.o.o.	M18	962,129.14	_	589,961.00
	M2		_	230,157.50
	M24		_	142,010.64
TERMOPLIN d.d.	M18	6,127,676.15	_	1,240,000.00
	M24		_	4,887,676.15
ZAGORSKI METALAC d.o.o.	M18	496,000.00	_	496,000.00
Total energy savings (kWh):		**46,134,048.07**	**1,287,309.66**	**44,846,738.41**

Source: Ministry (SMIV)

6 OIL AND PETROLEUM PRODUCTS

6.1 Legal framework for oil and petroleum products

The oil and petroleum product market and energy activities in the oil and petroleum product sector are governed by:

- the **Energy Act**,
- the **Act on the Regulation of Energy Activities**,
- the **Oil and Petroleum Products Market Act (Official Gazette no. 19/14, 73/17, and 96/19),** and
- and regulations subordinate to these acts.

Petroleum products placed on the market must meet the conditions laid down in the regulations on the quality of liquid fuels. The quality of liquid petroleum fuels is verified by an accredited legal entity.

Regulations adopted by the Ministry regulating the quality control of liquid petroleum fuels are:

- the **Air Protection Act (Official Gazette no. 130/11, 47/14, and 127/19)**,
- the *Regulation on liquid petroleum fuel quality, monitoring and reporting methods, and calculation methods for greenhouse gas emissions in the life cycle of supplied fuel and energy (Official Gazette no. 57/17)*, and
- the *Programme for monitoring liquid petroleum fuel quality for 2021*.

6.2 Transmission of oil through pipelines

In Croatia, oil transmission through pipelines is performed by Jadranski naftovod d.d. (hereinafter: JANAF d.d.). Pursuant to the **Oil and Petroleum Products Market Act**, JANAF d.d. is obligated to provide legal and natural persons with access to the transmission system in an impartial and transparent manner.

Oil is imported by tanker ships via the offshore terminal in Omišalj on the island of Krk, and then further transported through JANAF's oil pipeline system to oil refineries in Rijeka and Sisak, as well as for the needs of refineries in Bosnia and Herzegovina, Serbia, Slovenia, and Hungary, as shown in Figure 6.2.1. In addition, the system can also be used for oil imports by land.

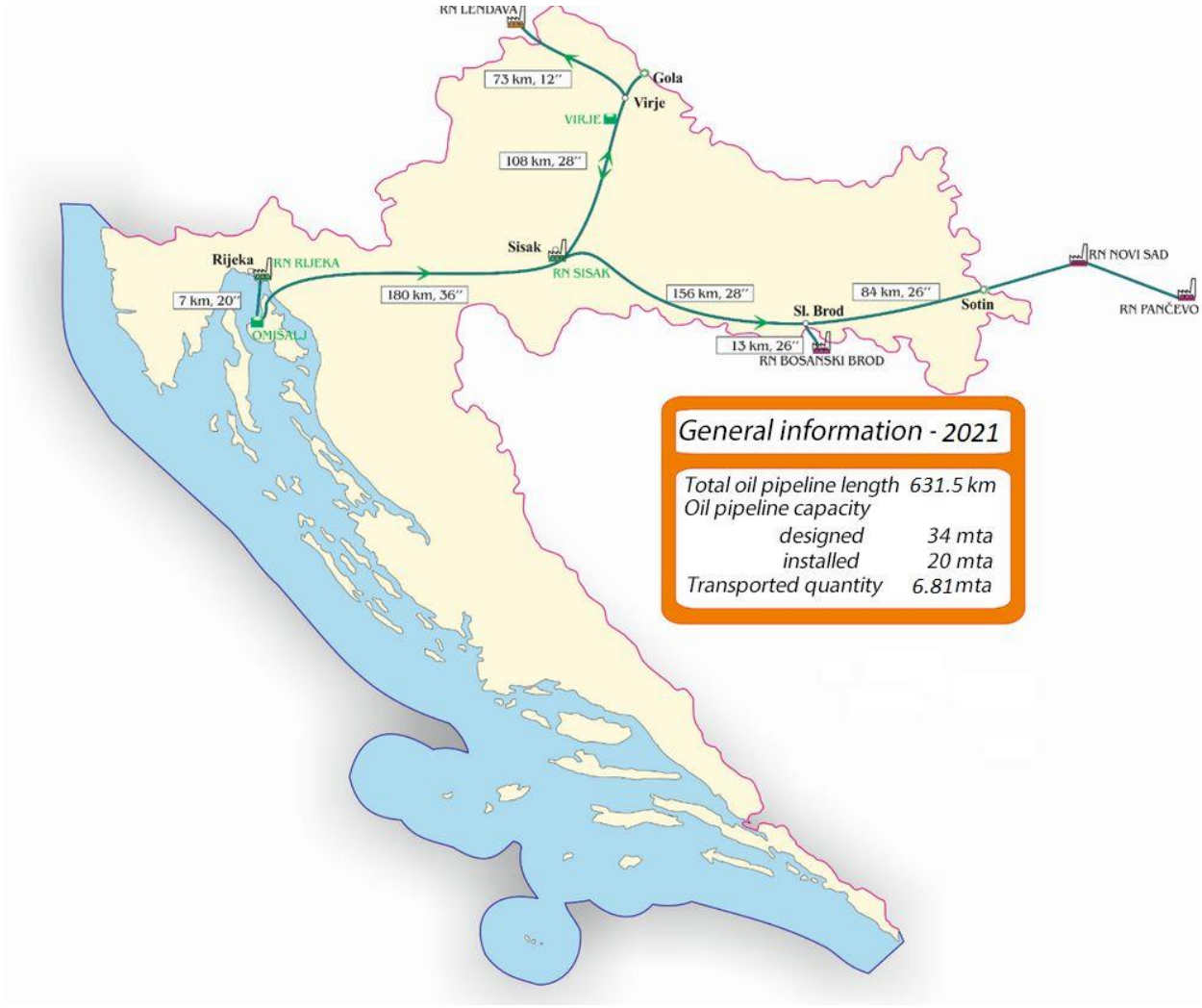


Figure 6.2.1. The JANAF d.d. oil pipeline system

In 2021, a total of 6.81 million tonnes of crude oil were transported through the oil pipeline system, which is an increase of 0.1% as compared to the previous year. Oil quantities transported from 2005 to 2021 and planned quantities for 2022 are shown in Figure 6.2.2.

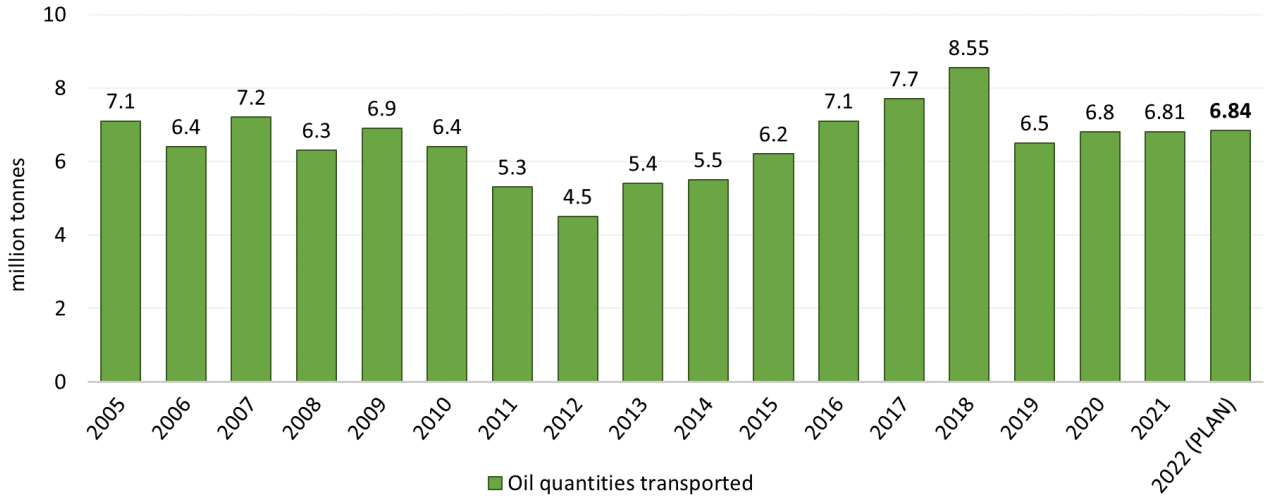


Figure 6.2.2. JANAF's oil pipeline system – transported quantities in [millions of tonnes]

6.3 Production of crude oil and petroleum products

Production of crude oil

Even though it is not considered an energy activity, the production of crude oil is a significant factor for energy security in every country, including Croatia. In Croatia, crude oil is produced by INA d.d. at hydrocarbon production fields in the continental part of Croatia.

HERA does not collect data on the total domestic production of crude oil, but it does have data on the raw material structure is refined, processed, and used in the production of petroleum products.

During 2021, the Rijeka Oil Refinery refined only 63,000 tonnes of crude oil, 32,000 tonnes of domestically produced condensates, 713,000 tonnes of other raw materials (domestic and imported), and 1.76 million tonnes of imported crude oil from Azerbaijan, Nigeria, Libya, and Kazakhstan. The aforementioned quantity of imported crude oil in 2021 was 6.8% less than the quantity of imported crude oil in 2020. Total demand for raw materials for the production of petroleum products in Croatia in 2021 amounted to 2.57 million tonnes.

Figure 6.3.1. shows trends in imported quantities of crude oil and quantities of crude oil from domestic production processed in Croatia from 2006 to 2021.

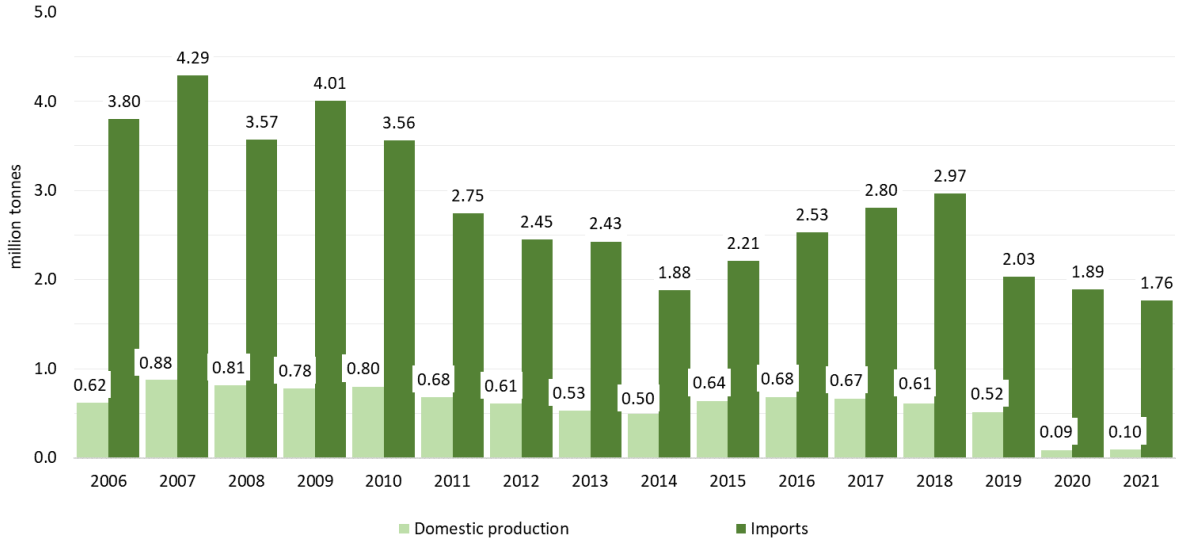


Figure 6.3.1. Imported quantities of crude oil and quantities of crude oil from domestic production processed in Croatia between 2006 and 2021,[mil. t]

Production of petroleum products

Petroleum Products are produced by energy entity INA d.d. at the oil refinery in Rijeka and at the Etan ethane facility in Ivanić Grad. Available petroleum products from imports and domestic production are used in industry, transport, households, services, agriculture, in construction as fuel, and in energy transformation, as well as for non-energy purposes.

Raw materials used in the production of petroleum products include imported crude oil and crude oil and condensates produced in Croatian oil and gas fields. The shares of raw materials used for refinery processing in 2021 are shown in Figure 6.3.2.

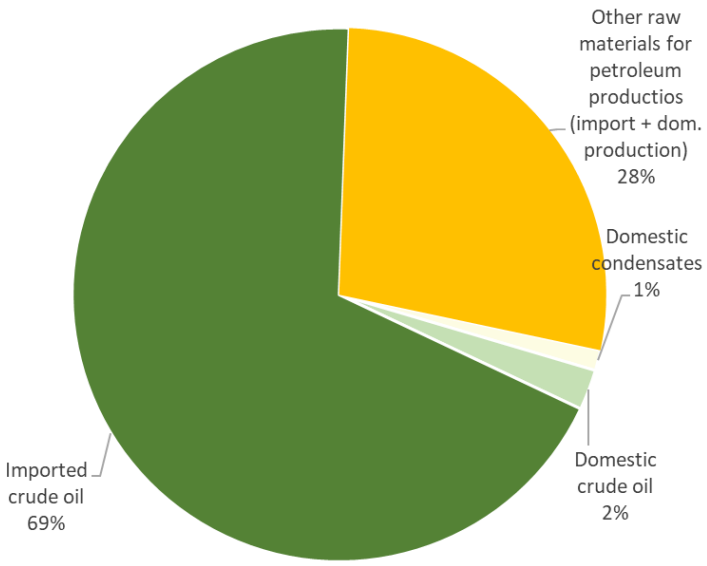


Figure 6.3.2. Shares of raw materials used for refinery processing in 2021

Domestic production of petroleum products amounted to 2.4 million tonnes in 2021, which is 0.1 million tonnes (4%) less than in 2020. This represents a continued negative trend and an increasing dependence on petroleum product imports as a result of reduced domestic refinery processing capacity. In addition to the aforementioned decline in the production of petroleum products, the closure of the Sisak refinery affected refinery capacity for the production of petroleum products, which was thus reduced from 8.3 million tonnes/yr to 4.5 million tonnes/yr. The total quantities of petroleum products produced from 2006 to 2021 are shown in Figure 6.3.3.

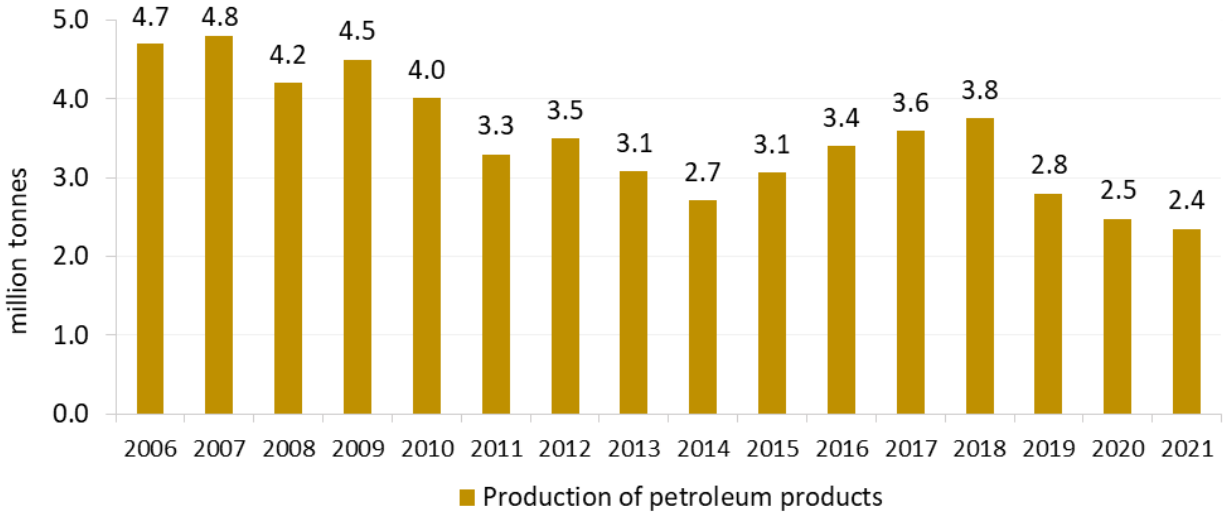


Figure 6.3.3. Quantities of petroleum products produced from 2006 to 2021 [in millions of tonnes]

The total production of liquefied petroleum gas in 2021 amounted to 118,000 tonnes, which is a decrease of 68,000 tonnes (36.6%) as compared to 2020. Figure 6.3.4. shows the quantities of liquefied petroleum gas (LPG) produced from 2006 to 2021.

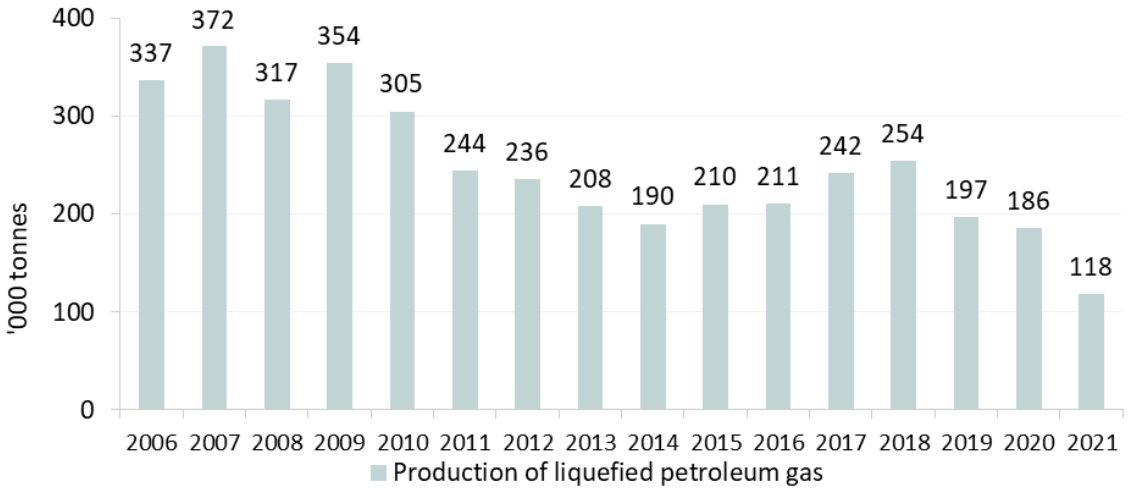


Figure 6.3.4. Quantities of LPG produced from 2006 to 2021 [in thousands of tonnes]

6.4 Competition and function of the petroleum products market

According to the **Oil and Petroleum Products Market Act**, energy activities in the oil and petroleum product market include:

- the production of petroleum products,
- the transmission of oil through pipelines,
- the transmission of petroleum products through product pipelines,
- the transport of crude oil, petroleum products, and biofuels by road,
- the transport of crude oil, petroleum products, and biofuels by rail,
- the transport of crude oil, petroleum products, and biofuels by boat,
- wholesale trade in petroleum products,
- retail trade in petroleum products,
- the storage of oil and petroleum products,
- the storage of liquefied petroleum gas,
- wholesale trade in liquefied petroleum gas, and
- retail trade in liquefied petroleum gas.

6.4.1 Storage of oil and petroleum products

In 2021, oil and petroleum products were stored by 24 energy entities, while liquefied petroleum gas was stored by four energy entities. According to data furnished by the energy entities,[82] total available storage capacities in 2021 amounted to 3.2 million m^3 as compared to the total capacity in 2020 of 2.79 million m^3 (excluding storage capacities within INA's refineries). The geographical locations of the most important oil and petroleum products storage facilities in Croatia, according to the type of goods stored, are shown in Figure 6.4.1.

[82] *This data on total available storage capacities is incomplete given that the requested data required for the preparation of this Annual Report was not submitted by the following energy entities: ZAGREBAČKI PROMETNI ZAVOD d.o.o., Ljubljanska avenija 1, 10000 Zagreb, Croatia; FUEL trading d.o.o. za usluge, Amruševa ulica 5, 10000 Zagreb, Croatia; and NAFTA CENTAR d.o.o. za trgovinu i usluge, Mirka Kleščića 7, 10430 Samobor, Croatia.*

Figure 6.4.1. Geographical locations of oil and petroleum product storage facilities according to the type of goods stored, and total storage capacities in 2021

6.4.2 Wholesale trade in petroleum products

Petroleum products trading covers the following energy activities:

- wholesale trade in petroleum products,
- retail trade in petroleum products,
- wholesale trade in liquefied petroleum gas, and
- retail trade in liquefied petroleum gas.

Wholesale trade in petroleum products and LPG are subject to licensing by HERA.

In 2021, wholesale trade in petroleum products was carried out by 51 energy entities, while wholesale trade in liquefied petroleum gas (LPG) was carried out by 15 energy entities.

Total sales of petroleum products in 2021 amounted to 2.45 million tonnes, which represents an increase of 1.08 tonnes or 78.9% as compared to 2020, when it amounted to 1.37 million tonnes. The aforementioned growth in the quantities of petroleum products sold is the direct consequence of economic and social

recovery and an increase in citizens' activities and mobility through the easing and later lifting of measures against the Covid-19 pandemic.

In addition to petroleum products from domestic production, imported petroleum products account for a significant share on the Croatian market. According to data supplied to HERA by the energy entities, a total of 1.6 million tonnes of petroleum products[83] were imported in 2021, which represents an increase in imports of 0.06 million tonnes (3.8%) as compared to 2020. Figure 6.3.6. shows the imported quantities of petroleum products from 2006-2021.

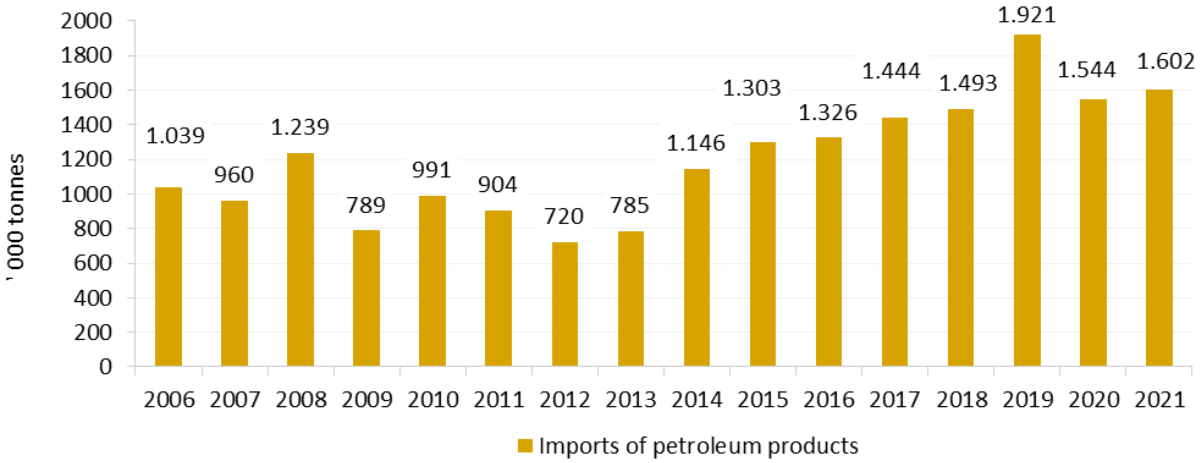


Figure 6.4.2. Imports of petroleum products from 2006 to 2021 [in thousands of tonnes]

Wholesale market prices of petroleum products

Since the **Oil and Petroleum Products Market Act** entered into force in 2014, the prices of petroleum products on the Croatian market are no longer regulated, but are market based.

In order to monitor prices of petroleum products on the wholesale market, in 2021, HERA began collecting data on average prices of petroleum products (net of VAT) by administering questionnaires to the wholesale traders of petroleum products registered in Croatia. The purpose of the questionnaire was to gather information on the quantities and prices of petroleum products purchased and sold on the wholesale market.

An overview of the average purchase and average sale prices of petroleum products (net of VAT) by individual type of petroleum product is shown in Table 6.4.1.

Table 6.4.1. Overview of the average purchase and average sale prices of petroleum products (net of VAT) by individual type of petroleum product in 2021

Petroleum product	Average purchase price (HRK/tonne)	Average sale price (HRK/tonne)
Motor fuel	7,043.8	7,864.1
Diesel fuels	7,290.4	7,460.1
Fuel oil	3,714.8	3,910.8
Liquefied petroleum gas	4,662.0	5,952.2

The average gas purchase price (net of VAT) of motor fuel on the wholesale market in 2021 (purchase under bilateral agreements and from imports) was HRK 7,043.8/t, as compared to HRK 6,713.0/t in 2020, which amounts to an increase in price of 4.9%.

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83 *The above data on total quantities of imported petroleum products is incomplete because the requested data required for the preparation of this Annual Report was not submitted by the following energy entities: NAFTA CENTAR d.o.o. za trgovinu i usluge, Mirka Kleščića 7, 10430 Samobor, Croatia; FUEL trading d.o.o. za usluge, Amruševa ulica 5, 10000 Zagreb, Croatia; PRIVAJ d.o.o. Putaljski put 58, 21212 Kaštel Sućurac, Croatia; EKO-FLOR PLUS d.o.o., Mokrice 180C, 49243 Oroslavje, Croatia; FLASH ENERGY d.o.o., Trg hrvatske bratske zajednice 2, 21000 Split, Croatia; NIKICA PETROL d.o.o., Berislavićeva 5, 35000 Slavonski Brod, Croatia; VELOX VENUM d.o.o., E. Vidovića 13, 10360 Sesvete, Croatia; BRALA d.o.o., Ulica braće Dežmalj 26, 23242 Posedarje, Croatia; TROMILJA BENZIN d.o.o. za trgovinu i usluge, Tromilja 1/a, 22221 Lozovac, Croatia.*

The average gas purchase price (net of VAT) of diesel fuel on the wholesale market in 2021 (purchase under bilateral agreements and from imports) was HRK 7,290.4/t, as compared to HRK 6,419.2/t in 2020, which amounts to an increase in price of 13.6%.

The average gas purchase price (net of VAT) of fuel oil on the wholesale market in 2021 (purchase under bilateral agreements and from imports) was HRK 3,714.8/t, as compared to HRK 3,126.0/t in 2020, which amounts to an increase in price of 18.8%.

The average gas purchase price (net of VAT) of liquefied petroleum gas on the wholesale market in 2021 (purchase under bilateral agreements and from imports) was HRK 4,662.0/t, as compared to HRK 4,368.9/t in 2020, which amounts to an increase in price of 6.7%.

In 2021, wholesale trade in petroleum products was carried out by 66 energy entities (including wholesale traders in liquefied petroleum gas).

Energy efficiency and the energy savings obligation system of energy entities in the oil and petroleum products sector

In order to monitor the activities of energy entities related to wholesale trade in petroleum products as concerns fulfilling energy savings obligations, in 2021, HERA issued a questionnaire to collect data on measures taken by energy savings obligated parties towards their final customers, as well as on measures undertaken to reach their goals in increasing energy efficiency and the savings realised. In order to gain more detailed insight into the achieved energy savings, HERA plans to improve this questionnaire in the coming years.

Of the questionnaires collected, a total of 7 energy entities who trade in petroleum products responded as energy savings obligated parties, and the measures they had undertaken were as follows:

- 28 - replacement of existing vehicles and purchase of new, more efficient vehicles, and
- 30 - the addition of additives into petrol and diesel fuels to reach energy efficiency goals.

In the previous year, energy savings achieved by applying energy savings measures towards final customers in the final consumption sector (transport) and the energy transformation sector amounted to 237.1 GWh.

Data in SMIV established that 15 energy entities in the petroleum products sector were in in the energy savings obligation system in 2021 (wholesale traders of petroleum products, wholesale traders of LPG). Energy savings were implemented through the following measures:

- T1 - replacement of existing vehicles and purchase of new vehicles,
- T9 - adding additives to diesel fuel (HRN EN 590), and
- T10 - adding additives to petrol fuels (HRN EN 228).

Energy entities in the petroleum products sector achieved energy savings in the transport sector; total energy savings in 2021 amounted to 139.1 GWh. An overview of implemented energy savings measures in the petroleum products sector related to the transport sector in 2021 is shown in Table 6.4.2.

Table 6.4.2. Overview of implemented energy savings measures in the petroleum products sector related to the transport sector

Name of savings obligated party	Energy savings measure code	Savings in the transport sector (kWh)
ADRIA OIL d.o.o.	T9	13,047,539.14
	T10	1,833,678.35
AGS HRVATSKA d.o.o.	T9	2,434,847.77
	T10	76,085.40
BENZINSKA PUMPA BREBRIĆ d.o.o.	T9	12,290.28
	T10	1,260.91
Coral Croatia d.o.o.	T9	8,557,773.82
	T10	2,089,239.41
CRODUX DERIVATI DVA d.o.o.	T9	11,545,601.83
	T10	8,930,179.12
ETRADEX proizvodnja i trgovina d.o.o.	T9	99,049.68
	T10	3,012,301.69
GAS OIL d.o.o.	T9	124,225.94
	T10	39,439.39
INA-INDUSTRIJA NAFTE, d.d.	T9	8,852,196.39
	T10	20,787,657.69
KTC d.d.	T9	110,935.69
LUKOIL Croatia d.o.o.	T9	11,679,624.27
	T10	4,015,013.01
OKTAN ŽAŽINE d.o.o.	T9	81,819.76
PETROL d.o.o.	T9	10,984,378.89
	T10	8,930,168.78
RIJEKA TRANS d.o.o.	T9	1,279,348.77
	T10	95,593.70
TIFON d.o.o.	T9	15,785,766.09
	T10	4,136,604.09
	T1	243,122.47
TRI BARTOLA d.o.o.	T9	217,409.66
	T10	68,991.34
	Total (kWh):	**139,072,143**

Source: Ministry (SMIV)

Assessment of the functioning of the wholesale petroleum products market

The petroleum products wholesale market in Croatia was fully liberalized in 2014 after the entry into force of the **Oil and Petroleum Products Market Act**. It is organised on a commercial basis as in other EU Member States.

Indicators of the level of functioning of the wholesale market manifest primarily in the concentration of traders of petroleum products on the market. The HHI index is the most important measure applicable to the Croatian market.

According to data collected by HERA, the HHI score was 5,566 in 2021, and 4,350 in 2020. This indicates that the Croatian petroleum products market continues to be moderately concentrated with relatively low competitiveness, and that it is still dominated by a small number of large traders.

The HHI trend in Croatia's wholesale petroleum products market in the period from 2017 to 2021 is shown in Figure 6.4.3. The HHI trend from 2017 to 2019 shows constant growth; however, since the market was completely liberalised during this period, as during 2021, this growth can be attributed to inconsistent data collection.

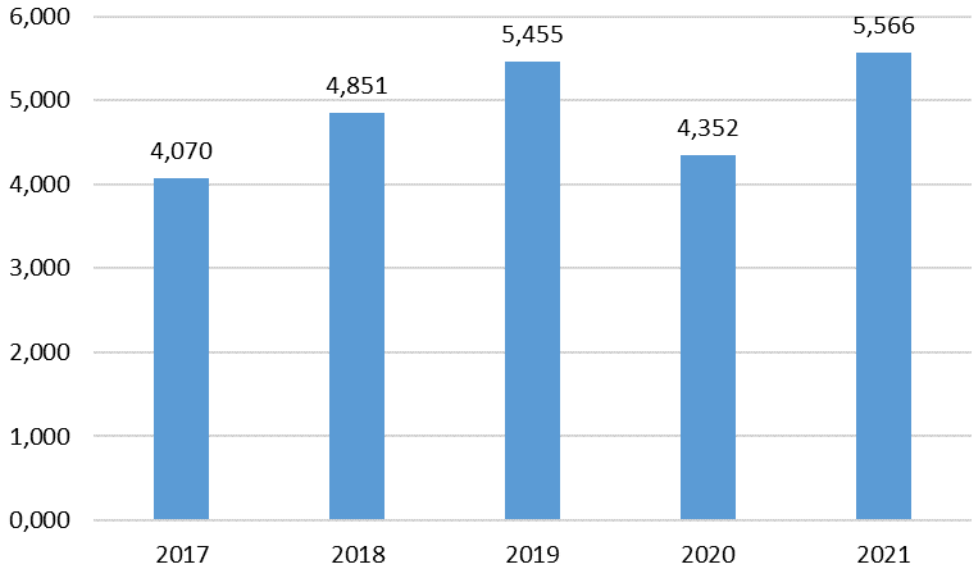


Figure 6.4.3. HHI trends in Croatia's wholesale petroleum products market in the period from 2017 to 2021

The diversity of sources of petroleum products is also an indicator of the level of development of the wholesale market. According to data collected by HERA for the Croatian market in 2021, petroleum products were mostly purchased from two sources – from domestic production (refinery in Rijeka) and from imports (Italy, Hungary, Slovakia, and Switzerland), which is certainly an indicator of healthy competition and security of supply.

An analysis of HHI and the number of supply sources (as the most important measures of the healthy functioning of a wholesale market) shows that the Croatian wholesale market for petroleum products is relatively small and that it is mainly dependent on the operations of INA, the largest trader in petroleum products.

It is apparent that competition cannot come to its full expression, as indicated by the HHI index score, which is somewhat lower than in 2020, although still high (5,566), which relates to the share of the five largest petroleum products traders, who dominate the market (INA d.d., CRODUX DERIVATI DVA d.o.o., PETROL d.o.o., CORAL CROATIA d.o.o., and AGS HRVATSKA d.o.o.). Sources of procurement of petroleum products are diversified; the majority of petroleum products are produced in the only remaining oil refinery in Rijeka, which is owned by INA d.d., or procured through imports of petroleum products from surrounding countries, which indicates that the market is not dependent on only one source, i.e. the security of supply is not at risk and does not rely on only one source of procurement of petroleum products.

The growth in the price of petroleum products and the entry of multinational oil company Shell plc into the Croatian market through the purchase of APIOS d.o.o. by CORAL CROATIA d.o.o. were the two main events that marked 2021.

6.5 Security of supply of oil and petroleum products

The requirements for the secure supply of oil and petroleum products on the Croatian market are laid down in the **Oil and Petroleum Products Market Act**, transposing *Council Directive 2009/119/EC of 14 September 2009 imposing an obligation on member states to maintain minimum stocks of crude oil and/or petroleum*

products into the Croatian legal system; this directive requires member states to maintain minimum stocks of crude oil and/or petroleum products. In accordance with the **Act on Amendments to the Act on the establishment of the Croatian Hydrocarbon Agency (Official Gazette no. 84/21)** and the **Act on Amendments to the Oil and Petroleum Products Market Act (Official Gazette no. 96/19)**, the Croatian Compulsory Oil and Petroleum Product Stocks Agency (HANDA) was merged with the Croatian Hydrocarbon Agency (CHA) on 1 September 2017. CHA is therefore the central authority in Croatia for compulsory oil and petroleum product stocks, and it is a single authority authorised to form, maintain, and sell compulsory stocks.

In this context, the competent ministry establishes the necessary conditions and monitors the secure, regular, and quality supply of the oil and petroleum products market in Croatia, and is responsible for coordination and cooperation with the European Commission and the International Energy Agency, while expert assistance to the ministry is provided by the CHA.

A representative of HERA takes part in an expert committee for monitoring the regular market supply of oil and petroleum products. The committee puts into action the *Emergency Plan in Case of Unexpected Supply Disruption in the Oil and Petroleum Products Market* (Official Gazette no. 111/12). *The emergency plan* lays down the procedures and criteria for identifying unexpected disruptions, as well as competencies and responsibilities in the event of a disruption in supply and procedures for the normalisation of supply in the oil and petroleum products market. These involve measures to reduce the consumption of petroleum products, as well as conditions for the consumption and renewal of compulsory oil and petroleum product stocks. The expert committee for monitoring the regular market supply of oil and petroleum products did not meet in 2021.

CHA is obligated to determine compulsory oil and petroleum product stocks equal to 90-day average consumption. Pursuant to the provisions of the **Oil and Petroleum Products Market Act**, CHA issues a decision determining the quantity and shares of compulsory stocks for each year. CHA issued no decision regarding the quantity and shares of compulsory oil and petroleum product stocks for 2021.

7 BIOFUELS

7.1 Legal framework for biofuels

The biofuel market and energy activities related to biofuels are governed by:

- **the Energy Act**,
- **the Act on the Regulation of Energy Activities**,
- **The Act on Act on Biofuels for Transport (Official Gazette no. 65/09, 145/10, 26/11, 144/12, 14/14, 94/18, and 52/21)**, and
- and regulations subordinate to these acts.

The **Act on Biofuels for Transport** governs the production, trade, and storage of biofuels, the use of biofuels for transport, and the adoption of programmes, plans, and measures promoting the production and use of biofuels for transport.

7.2 Development of the biofuels market

The segment of biofuels comprises the following energy activities:

- the production of biofuels,
- the storage of biofuels
- wholesale trade in biofuels, and
- retail trade in biofuels.

These energy activities are subject to a licence issued by HERA, except in the case of biofuel produced exclusively for own needs or if less than 1 TJ is produced annually, retail trade in biofuels and storage of biofuel exclusively for own needs.

Permits were held by three energy entities to perform these energy activities in 2021; they produced a total of 390 tonnes of biodiesel, which represents an increase in production of 128.1% as compared to 2020. The production of biofuels in 2021 represents only a small percentage of peak production from 2012, when it amounted to 39,476 tonnes. The quantities of biofuel produced from 2009 to 2021 are shown in Figure 7.2.1.

Energy entities have a total of 1,800 m^3 of storage capacity. In 2021, the total biofuel production capacity remained unchanged as compared to 2020 at 184 tonnes per day, with waste edible oil being the only raw material used to produce biofuel.

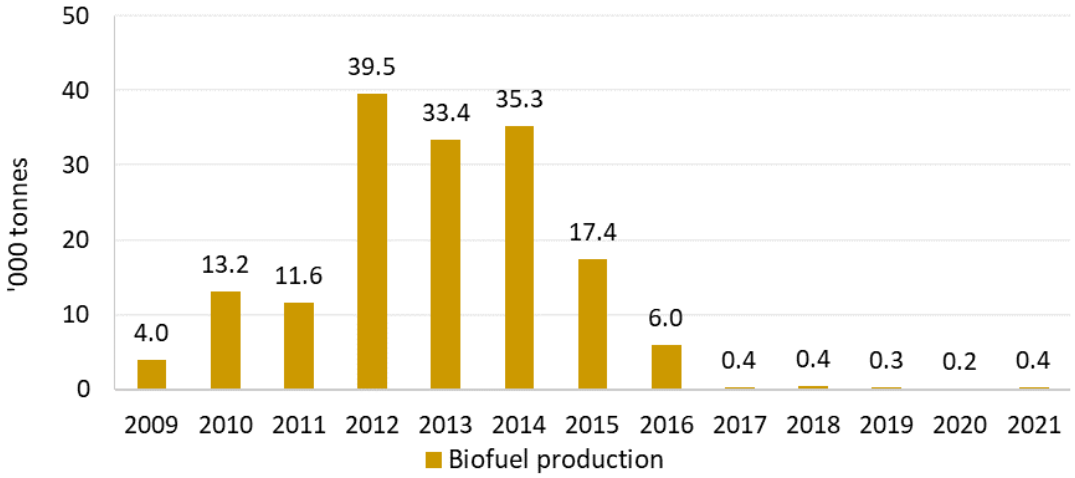


Figure 7.2.1. Quantities of biofuels produced from 2009 to 2021 in [thousands of tonnes]

Biofuels as a supplement or substitute for diesel or petrol for transport purposes

The **Oil and Petroleum Products Market Act** recognises the utilisation of biofuels as a supplement to petroleum products provided that they meet the legal requirements regarding the quality of biofuels.

The *Regulation on the Quality of Biofuels* (Official Gazette no. 141/05 and 33/11) sets threshold values for the quality of biofuels intended for use as a supplement or substitute for diesel or petrol for transport purposes.

The **Act on Biofuels for Transport** provides for incentives for the production and consumption of biofuels in Croatia, particularly in terms of promoting the utilisation of biofuels and other renewable fuels for transport, thus aligning Croatian legislation with European Union acquis.

8 THERMAL ENERGY

8.1 Legal framework for thermal energy

Basic information on the legal framework for thermal energy

The legal framework for the thermal energy sector and thermal energy production, distribution, and supply activities in Croatia consists of: the **Energy Act**, the **Act on the Regulation of Energy Activities**, the **Thermal Energy Market Act**, and by-laws adopted pursuant to these acts.

The key by-laws governing specific activities in detail adopted by HERA are: *the General Requirements for Thermal Energy Supply* (Official Gazette no. 35/14), the *General Requirements for Thermal Energy Delivery* (Official Gazette no. 35/14 and 129/15), and the *Network Codes for Thermal Energy Distribution* (Official Gazette no. 35/14).

The Ordinance on the Method of Allocating and Calculating the Costs of Supplied Thermal Energy (Official Gazette no. 99/14, 27/15, and 124/15) is the by-law subject to the highest number of inquiries and complaints.

The manner and conditions of performing energy activities in the heating sector (thermal energy production, distribution, and supply) depend on the type of heating system used to supply final customers of thermal energy. The **Thermal Energy Market Act** differentiates between central, closed, and independent district heating systems. Central district heating systems are large heating systems encompassing multiple buildings/structures; they consist of production facilities (boilers and cogeneration facilities), as well as a hot water and/or steam distribution network longer than 2000 metres, to which more than 500 independent users are attached. In a central district heating system, only one energy entity distributes thermal energy on the basis of a concession. A closed heating system (CHS) is smaller than a district heating system and covers multiple industrial and/or commercial and residential buildings/structures with less than 500 independent consumer unit connections, connected by external installations consisting of a hot water, warm water, and/or steam network distribution pipeline shorter than 2000 m. Closed heating systems do not perform the energy activity of thermal energy distribution. Independent heating systems are systems for one building/structure with its own boiler and multiple independent users.

In addition to the energy activities related to heating, the activity of the buyer of thermal energy is also regulated by the **Thermal Energy Market Act**; however, this activity is considered an energy activity. Thermal energy buyers are legal or natural persons who undertake the activity of purchasing thermal energy in an independent, closed, or central district heating system on behalf of the owner and/or co-owners of a given building/structure. The activity of purchasing thermal energy encompasses professional management, handling, maintenance of internal installations, delivery of thermal energy for thermal energy billing, and issuing invoices to final customers in the building/structure in an independent, closed, or central district heating system on the basis of a thermal energy consumption agreement signed with an authorised representative of the co-owners. Thermal energy buyers purchase energy for the production of thermal energy in an independent district heating system, or they purchase thermal energy from a thermal energy supplier in a closed or central district heating system.

In accordance with the **Thermal Energy Market Act**, in independent and closed heating systems, the prices of thermal energy delivered to the buyers of thermal energy or final customers are contracted freely.

HERA adopts tariffs for regulated activities (production and distribution of thermal energy) which must be applied by the energy entity performing these activities as a public service in a district heating system. Charges for thermal energy supply and the fee for performing thermal energy buyer activities are contracted freely. In cases where the final customer uses thermal energy mostly for commercial purposes, the prices of all energy activities in central district heating systems are determined by agreement.

Tariffs for the production and distribution of thermal energy in central district heating systems are determined according to the *Methodology for setting tariffs for thermal energy production* (Official Gazette no. 56/14) and the *Methodology for setting tariffs for thermal energy distribution* (Official Gazette no. 56/14). Furthermore, HERA has also adopted the *Methodology for Calculating the Charge for Connection to the Thermal Distribution Network and for Increase in the Connection Capacity* (Official Gazette no. 42/16).

With regard to the construction of thermal energy production facilities, the *Ordinance on the criteria for issuing energy approvals for production facilities* (Official Gazette No. 5/20) was adopted pursuant to the **Electricity Market Act**. This *Ordinance* regulates the issuing of energy approvals for all production facilities generating electricity and/or thermal energy, i.e. it regulates the issuing of energy approvals for power plants, cogeneration installations, and boiler stations.

The *Ordinance on the criteria for issuing energy approvals for production facilities* establishes the requirement for a cost-benefit analysis (*inter alia*) for production facilities as a precondition for an energy approval. **The Thermal Energy Market Act** stipulates that a cost-benefit analysis is required for:

- new electricity and thermal energy production facilities with a total thermal capacity of more than 20 MW in order to estimate the costs and benefits of ensuring the facility operates as a high-efficiency cogeneration facility,
- significant renovations of existing production facilities for electricity and thermal energy with a total thermal capacity of more than 20 MW in order to estimate ethe costs and benefits of its transformation into a high-efficiency cogeneration facility,
- new non-household facilities or those undergoing significant renovations with a total thermal capacity of more than 20 MW that produce waste heat at a useful temperature, in order to estimate the costs and benefits of using waste heat in order to satisfy economically justifiable demand through the use of cogeneration and the connection of such facilities to closed and central district heating systems, and
- new closed and central district heating systems, or if existing closed and central district heating systems plan new production facilities for thermal energy with a total thermal capacity of over 20 MW, or if an existing facility is being significantly renovated, in order to estimate the costs and benefits of using waste heat from neighbouring non-household facilities.

Exemptions from obligatory cost-benefit analyses are identified in Article 15.13. and 15.14. of the **Thermal Energy Market Act** and in the *Decision on the procedure for verifying criteria for exemptions from obligatory cost-benefit analyses for electricity and thermal energy production facilities used for peak loads and for facilities that produce reserve energy* (Official Gazette no. 153/13), which was adopted by HERA in 2013.

The cost-benefit analysis for individual facilities required to obtain an energy approval is carried out according to the *Ordinance on the preparation of cost-benefit analyses* (Official Gazette No. 110/19). This *Ordinance* specifies the details of the economic cost-benefit analysis within the framework of assessing national potentials for heating and cooling on the state level, pursuant to the provisions of the *Energy Efficiency Directive 2012/27/EU*, the Directive amending the Energy Efficiency Directive 2018/2002/EU, and *Commission Delegated Regulation (EU) 2019/826* amending Annexes VIII and IX to Directive 2012/27/EU of the European Parliament and of the Council on the contents of comprehensive assessments of the potential for efficient heating and cooling.

Changes to the legal framework in 2021

The Renewable Energy Sources and High-Efficiency Cogeneration Act (Official Gazette no. 138/21) introduced mandatory increases in the share of renewable energy sources in the heating and cooling sector of roughly 1.1% as a yearly average calculated for the period from 2021 to 2025 and from 2026 to 2030, beginning from the share of renewable energy in the heating and cooling sector in 2020. In the context of the stronger inclusion of renewable energy in heating and cooling, measures are expected to be implemented involving the installation of high-efficiency heating and cooling systems using renewable sources in buildings, or the use of renewable energy or waste heat and cold energy in industrial heating and cooling processes.

With the goal of decarbonising the energy system, the **Act** includes provisions on the sustainability of the production and use of energy and energy resources, the role of renewable energy sources in reducing energy dependence, as well as incentivising citizens to participate in the energy transition in terms of independent energy production for their own needs or joining energy communities.

The setting of a binding renewable energy target of a minimum of 32% renewables by 2030 for the European Union represents a continued incentive for the development of renewable energy technologies for the heating and cooling sectors.

In its *Legislative Activities Plan for 2021*, the Croatian government envisaged a draft **Act on Amendments to the Thermal Energy Market Act**. However, as this act has not yet been adopted, this activity has been transferred to the *Legislative Activities Plan for 2022*.

In early 2021, the **Act on Amendments to the Energy Efficiency Act entered into force.** Although the amendments introduced by the **Act** are primarily related to the transposition of several EU directives, changes in the energy savings obligation system are of significance to energy entities in the thermal energy sector.

The energy efficiency obligation system requires suppliers to implement energy efficiency measures in final consumption as prescribed by the *Directive 2012/27/EU* and *Directive 2018/2002/EU*. **The Energy Efficiency Act** foresees the gradual implementation of the energy efficiency obligation system, according to which obligated parties in 2019 were energy suppliers and related persons who supplied a total of more than 300 GWh of energy in 2017; this limit was reduced to 100 GWh in 2020, and was finally lowered to the limit of 50 GWh in 2021. Entities in the heating sector subject to the obligation in 2021 were: HEP-Toplinarstvo d.o.o., Zagreb; Energo d.o.o., Rijeka; and Brod-plin d.o.o., Slavonski Brod.

The Act on Amendments to the Energy Efficiency Act introduced new provisions related to the energy savings obligation system, primarily for the new cumulation period (in which the implementation of measures is monitored) from 1 January 2021 to 31 December 2030. Likewise, the entry into force of the Act repealed the *Ordinance on the energy efficiency obligation system* (Official Gazette no. 41/19). The provisions of the *Ordinance on the energy efficiency obligation system* were included in the **Energy Efficiency Act** and in the *Ordinance on the system for monitoring, measuring, and verifying energy savings*.

8.2 Thermal energy sector: organisation, activities, and indicators

8.2.1 Thermal system characteristics

Energy entities for thermal energy generation, distribution, and supply in Croatia provide the services of space heating and preparation of sanitary hot water for 159,000 final customers, 95% of whom fall under the household category.

Thermal energy used for space heating and the preparation of sanitary hot water is produced in co-generation thermal power plants, as well as in local heating plants, i.e. separate boiler rooms. In 2021, energy entities supplied more than 2.23 TWh of thermal energy to households and non-household consumers (Figure 8.2.1.). The total length of the distribution network and external installations is more than 443 kilometres.

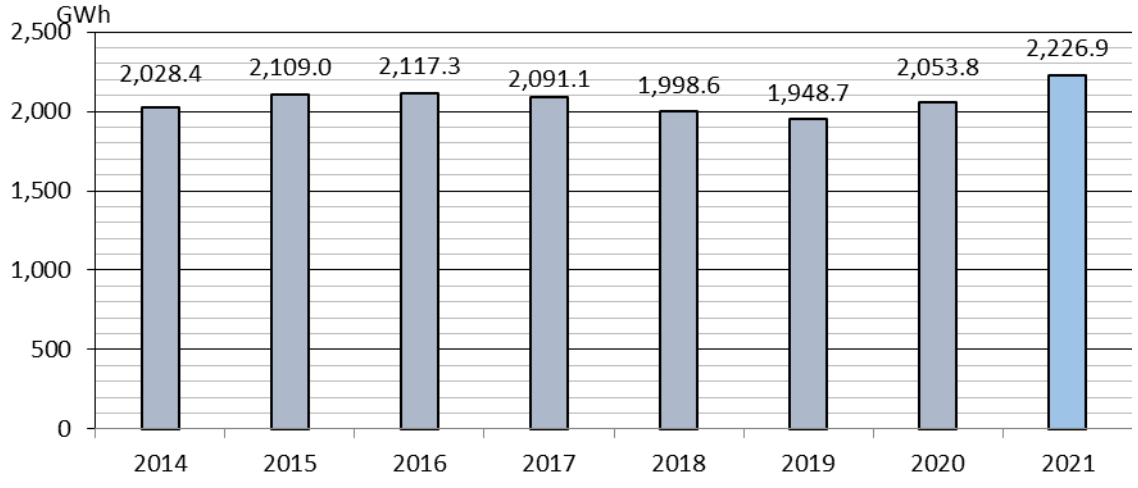


Figure 8.2.1. Supplied thermal energy in Croatia from 2015 to 2021

Table 8.2.1. contains data about energy entities supplying thermal energy to households, non-household, and commercial consumers; Figures 8.2.2., 8.2.3., and 8.2.4. show the thermal energy they supplied, the number of final customers, the installed capacity of the thermal energy production facilities, and contracted capacity in 2021. However, Table 8.2.1. does not include data pertaining to energy entities supplying thermal energy exclusively to non-household and commercial consumers, nor data for energy entities who were not involved in this activity in 2021.

Average losses in thermal energy production and distribution for thermal systems, i.e. the energy entities from Table 8.2.1. amounted to 18.6% in 2021.

Average losses in the distribution networks in 2021 amounted to 15.8%, while average losses in 2020 amounted to 18.2%.

Table 8.2.1. Data concerning energy entities in the thermal energy sector in 2021

Energy entity	Number of final customers	Network length	Total installed capacity	Thermal energy produced	Thermal energy supplied	Surface area	Fuel*
		km	MWt	GWh/y	GWh/y	m^2	
HEP-Proizvodnja d.o.o.			1,541.00	2,337.53			NG, FO
Zagreb			1,201.00	1,925.19			NG, FO
Osijek			230.00	244.01			NG, FO
Sisak			110.00	168.33			NG
HEP-Toplinarstvo d.o.o.	130,533	388.52	268.78	101.82	2,034.22	10,064,329	NG, FOEL, LFO
Zagreb	105,035	284.85	19.12	10.03	1,580.70	8,160,117	NG, FOEL
Osijek	11,847	57.19	140.50	4.43	223.56	1,103,006	NG, FOEL, LFO
Sisak	4,000	29.95	0.00	0.00	150.46	278,513	NG
Velika Gorica	5,902	10.81	65.65	56.40	51.03	335,615	NG, FOEL, LFO
Samobor	1,383	3.35	18.11	13.85	12.80	78,839	NG, FOEL
Zaprešić	2,366	2.37	25.40	17.11	15.66	108,240	NG, FOEL
Energo d.o.o., Rijeka	9,551	15.66	100.10	66.85	63.04	614,688	NG, FOEL, FO
Gradska toplana d.o.o., Karlovac	7,832	21.20	88.63	66.57	55.96	503,235	NG
Brod-plin d.o.o., Slavonski Brod	3,711	5.48	33.91	33.16	31.82	189,483	NG
Tehnostan d.o.o., Vukovar	3,655	7.22	37.99	23.54	19.88	204,794	NG, FO
Vartop d.o.o., Varaždin	998	1.57	24.97	0.00	5.82	50,961	NG
GTG Vinkovci d.o.o., Vinkovci	1,676	1.60	17.83	9.50	9.22	88,179	NG, FO
Poslovni park Virovitica d.o.o., Virovitica	444	0.90	4.08	3.64	3.64	28,311	NG
Komunalac d.o.o., Požega	417	0.61	4.00	2.48	2.23	19,838	NG
SKG d.o.o., Ogulin	90	0.58	4.40	1.15	1.03	6,483	LFO
Total:	**158,907**	**443.34**	**2,125.68**	**2,646.25**	**2,226.85**	**11,770,301**	

** NG – natural gas, FO – fuel oil, FOEL – fuel oil extra light, LFO – light fuel oil*

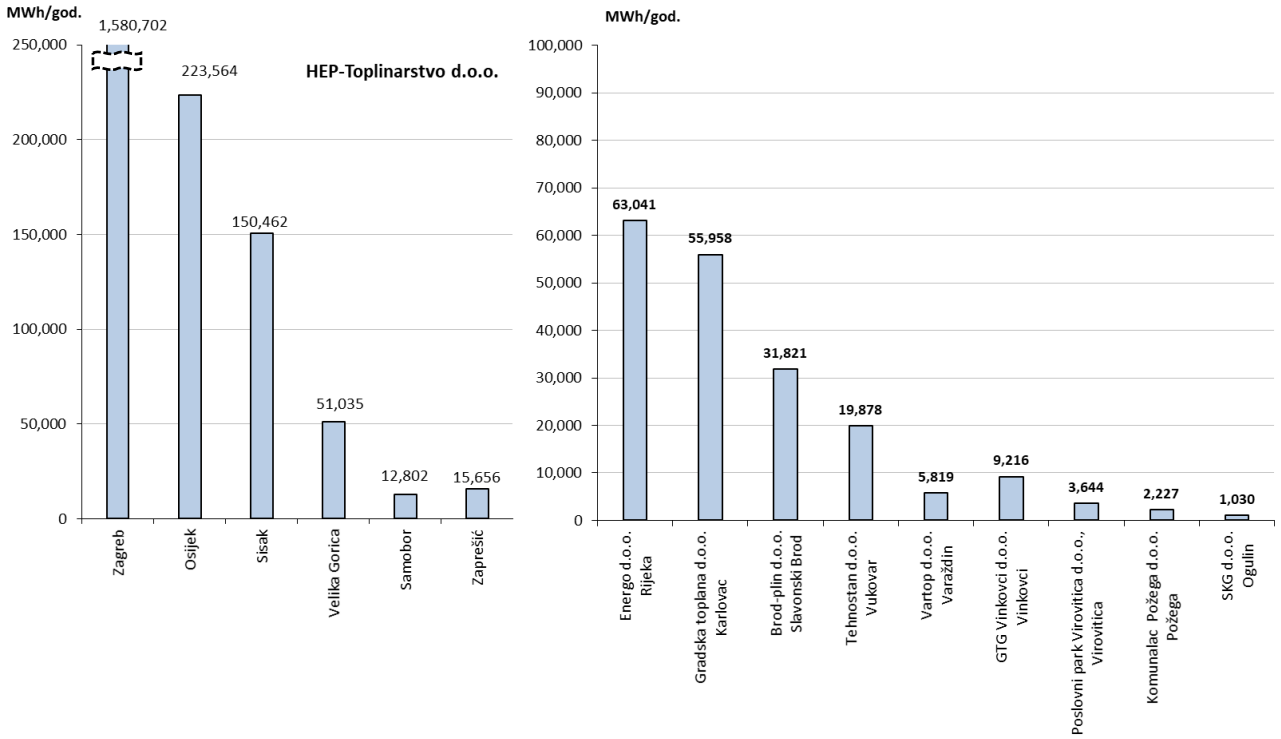


Figure 8.2.2. Supplied thermal energy in 2021

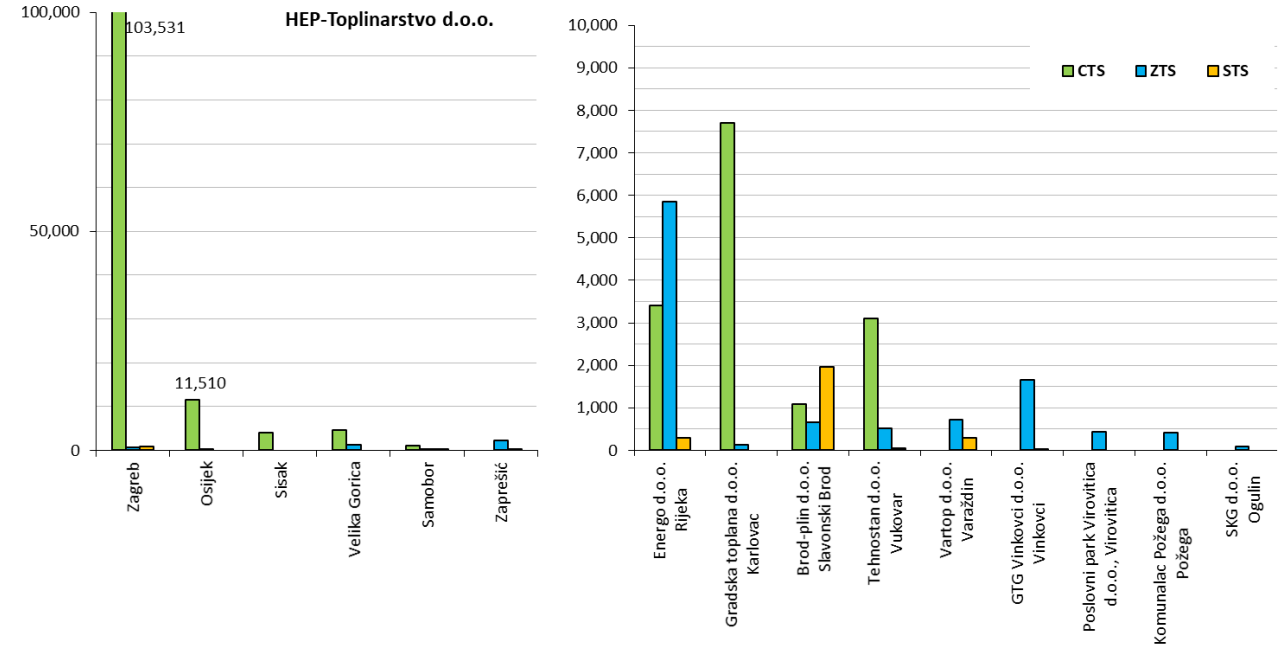


Figure 8.2.3. Number of final customers in 2021

The majority of energy entities in the thermal energy sector have a considerable installed capacity reserve in relation to the connection capacity. Although HEP-Toplinarstvo d.o.o. is the largest district heating energy entity, it generates only a small portion of supplied thermal energy in its own plants; it purchases and assumes the remainder of the thermal energy from HEP-Proizvodnja d.o.o., a thermal energy producer. In 2021, HEP-Proizvodnja d.o.o. delivered 2,337.53 GWh of thermal energy to HEP-Toplinarstvo d.o.o.

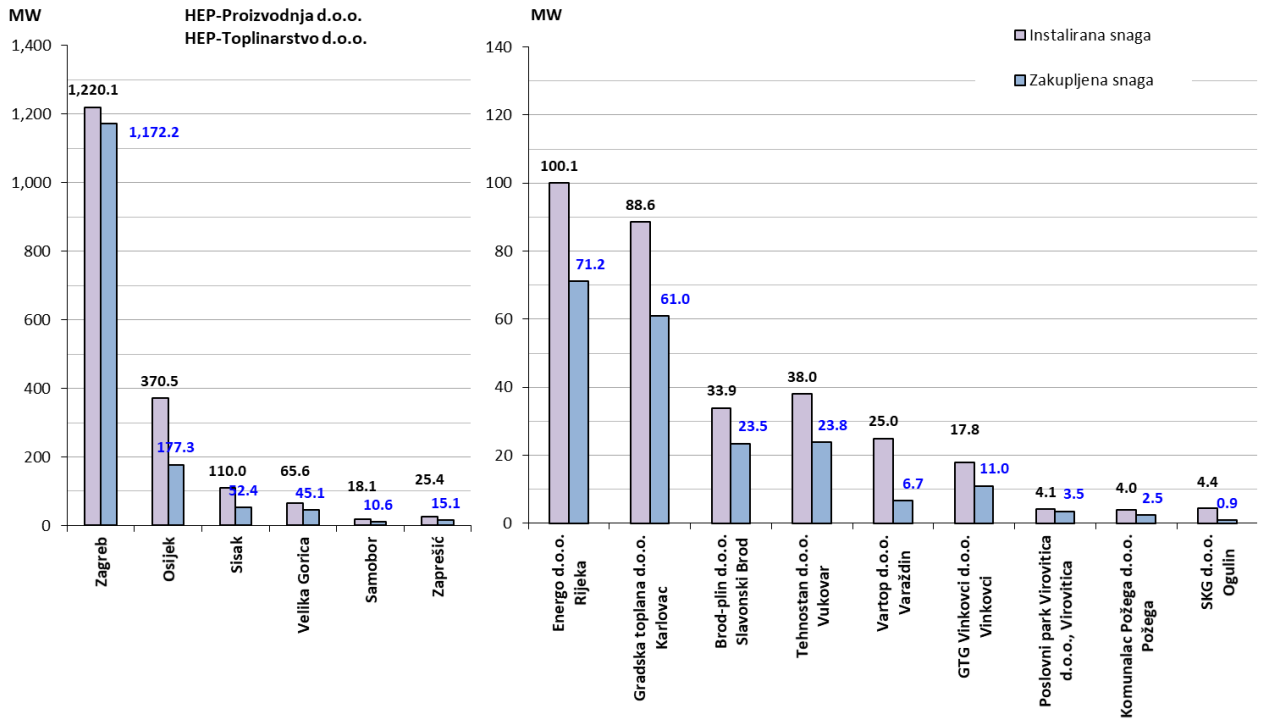


Figure 8.2.4. Installed capacity of thermal energy production facilities and contracted capacity in 2021

The majority of energy entities engaged in thermal energy production, distribution, and supply are mostly owned by units of local government or the state, while a smaller portion of energy entities are partially privately owned. In addition to thermal energy, the activities of these energy entities most frequently include gas distribution, public utilities, and building management.

Of all the district heating systems listed in Table 8.2.1., centralised district heating systems in Zagreb, Osijek, Sisak, Samobor, Velika Gorica, Rijeka, Karlovac, Slavonski Brod, and Vukovar account for almost 88% of final customer connections, 91% of heated surface area, and 93% of supplied thermal energy, as shown in Figure 8.2.5.

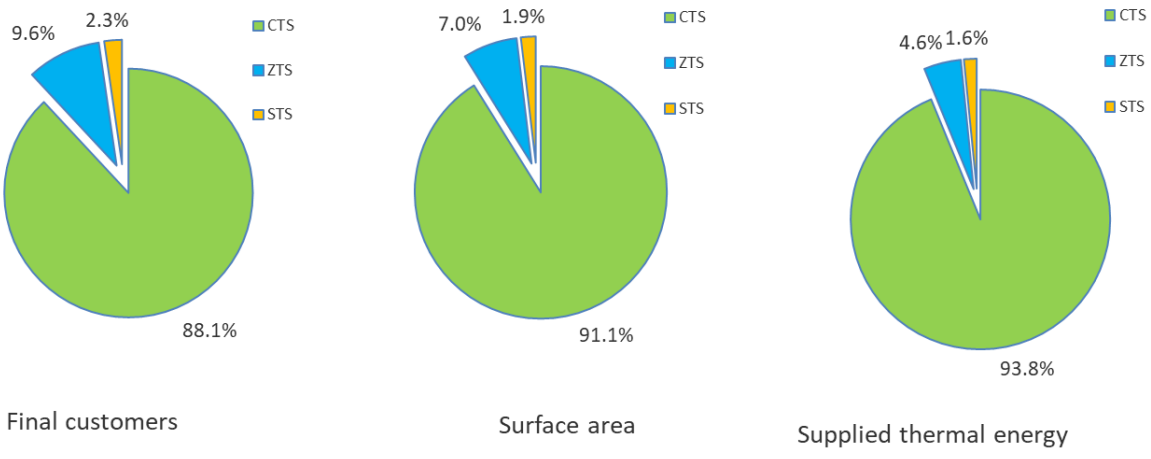


Figure 8.2.5. Share of final customers, surface area, and supplied thermal energy per district heating system

Given the insufficient use of renewable energy sources for heating and cooling in households, progress is needed towards the greater use of new technologies using green energy, which can also meet the need for interior heating and/or hot water, as well as cooling.

An additional challenge lies in the high share of renewables in heating and cooling, which must be introduced in the coming decade in accordance with Directive 2018/2001/EU such that each member state endeavours

to increase the share of renewables in this sector by roughly 1.3% as a yearly average calculated for the period from 2021 to 2025 and from 2026 to 2030, as compared to the share of renewable energy in the heating and cooling sector in 2020.

8.2.2 Energy activities in the thermal energy sector

In 2021, five licences for the performance of energy activities were issued in the thermal energy sector:

- two licences for thermal energy production (BE-TO BRINJE d.o.o., Zagreb, RENETEH OGULIN d.o.o., Ogulin), and
- three licences for thermal energy supply (RENETEH OGULIN d.o.o., Ogulin, BIOEL d.o.o., Maslenjača, ENERGANA BENKOVAC d.o.o.).

In 2021, four licences for the performance of energy activities were extended:

- one license for thermal energy distribution (GTG VINKOVCI d.o.o., Vinkovci), and
- three licences for thermal energy supply (RESALTA d.o.o., Zagreb, ELEMENT ENERGETIKA d.o.o., Zagreb, BIO ENERGANA BJELOVAR d.o.o., Bjelovar).

As of 31 December 2021, the number of licences in the thermal energy sector was as follows:

- 38 licenses for thermal energy production,
- 6 licenses for thermal energy distribution, and
- 33 licenses for thermal energy supply.

New licenses for thermal energy production and thermal energy supply are mainly related to the construction of new cogeneration facilities in the incentives system for the production of electricity from renewable energy sources and cogeneration, for which HERA has issued decisions on eligible electricity producer status. In 2021, HERA issued five decisions granting eligible electricity producer status to new solid biomass plants and three decisions for biogas plants.

Pursuant to the **Thermal Energy Market Act**, HERA manages a register of thermal energy buyers, which is accessible on its website. Two new businesses were recorded in the Register of Thermal Energy Buyers in 2021, while one business was deleted from the register. As of 31 December 2021, 47 businesses were recorded in the register (legal and natural persons). In addition to this register, HERA also keeps records on thermal energy buyers containing data relevant for monitoring thermal energy consumption; these records are also used to resolve claims and complaints related to thermal energy supply in buildings and structures.

In addition, in line with the regulations governing the renewable energy and cogeneration incentives system, minimum total annual facility efficiency is a condition for incentivised prices for electricity delivered from facilities using biomass or biogas. For high-efficiency cogeneration facilities using fossil fuels, primary energy savings are a condition for the right to incentivised prices for delivered electricity. In 2021, HERA issued 54 decisions affirming the total annual efficiency of such facilities, as well as seven decisions affirming primary energy savings.

8.2.3 Tariffs for thermal energy

Pursuant to the provisions of the **Thermal Energy Market Act**, and based on the *Methodology for setting tariffs for thermal energy production* and the *Methodology for setting tariffs for thermal energy distribution*, HERA defines tariff amounts for thermal energy production and distribution exclusively for district heating systems.

Energy entities involved in thermal energy production and thermal energy distribution in district heating systems requested a change in tariffs for thermal energy production in 2021 in accordance with the *Methodology for setting tariffs for thermal energy production*. Requests to change tariffs for thermal energy production due to natural gas price increases were submitted by Tehnostan d.o.o. for the Borovo Naselje and Olajnica district heating systems. HERA received the requests from Tehnostan d.o.o. on 30 December 2021; its *Decision on tariffs for thermal energy production for the Borovo Naselje and Olajnica district heating systems for energy entity Tehnostan d.o.o., Dr. Franje Tuđmana 23, Vukovar* (Official Gazette no. 27/2022) entered into force on 1 April 2022, approving the amount of tariffs for thermal energy production. Following this request, tariffs for the Borovo Naselje district heating system increased for the household category

(31.42%) and for the industrial and commercial category (32.35%). Following this request, tariffs for the Olajnica district heating system increased for the household category (30.93%) and for the industrial and commercial category (31.61%). However, the *Methodology for setting tariffs for thermal energy production* provides for a simplified procedure for changing tariffs in case of changes in the price of fuel used for thermal energy production of more than ±5% as compared to the price of the fuel for which the energy tariffs have been approved. In 2021, HERA received five such requests for changes in tariffs for energy: three requests from Gradska toplana d.o.o. and two requests from Brod-plin d.o.o. As a result of two requests from Gradska toplana d.o.o., in early 2021, tariffs for 2021 were reduced for the household tariff group (decrease of 10.46%) and for the industrial and commercial tariff group (decrease of 25.81%). Due to an increase in the price of natural gas, HERA received one request from Gradska toplana d.o.o. to increase the tariff for the industrial and commercial tariff group and two requests from Brod-plin d.o.o. to increase tariffs for the household tariff group and the industrial and commercial tariff group. These requests from Gradska toplana d.o.o. and Brod-plin d.o.o. were received in late 2021. As a result of the request from Gradska toplana d.o.o., energy tariffs were increased for the industrial and commercial tariff group (increase of 28.49%) as of 1 March 2022. Likewise, as a result of the request from Brod-plin d.o.o., energy tariffs were increased for the household tariff group (increase of 26.77%) and the industrial and commercial tariff group (increase of 31.86%) as of 1 April 2022.

Table 8.2.2. shows tariff amounts for thermal energy production and thermal energy distribution for district heating systems as of 31 December 2021. These amounts represent the regulated portion of the thermal energy price, whereas the charges for thermal energy supply and charges for thermal energy buyer activities are contracted freely pursuant to the provisions of the **Thermal Energy Market Act**. Therefore, the final price of thermal energy in district heating systems, in addition to the regulated portion, consists of charges for thermal energy supply and for performing thermal energy buyer activities, which make up the market component of thermal energy prices and which are contracted freely.

A chart showing the average shares of individual components in the total price of thermal energy for household final customers for district heating systems in Croatia is provided in Figure 8.2.6. Shares of different thermal energy price components were calculated based on the data on supplied thermal energy, connection capacity, surface area, and number of final customers for each district heating system in 2021, tariffs for the production and distribution of thermal energy, charges for thermal energy supply, and charges for thermal energy buyers.

Table 8.2.2. Amounts of tariff items for thermal energy generation and thermal energy distribution for district heating systems as of 31 December 2021 (net of VAT)

Energy entity	District heating system	Tariff groups (Tg)*	Tariff models (TM)**	Tariff amounts - 31 December 2021					
				Production		Distribution		Prod. + dist.	
				Energy [HRK/kWh] *[HRK/t]*	Capacity [HRK/kW] *[k/t/h]*	Energy [HRK/kWh] *[HRK/t]*	Capacity [HRK/kW] *[k/t/h]*	Energy [HRK/kWh] *[HRK/t]*	Capacity [HRK/kW] *[k/t/h]*
Energo d.o.o., Rijeka	GORNJA VEŽICA	Tg1	TM1	0.2961	9.50	0.0500	4.00	0.3461	13.50
		Tg2	TM2	0.2961	9.50	0.0500	4.00	0.3461	13.50
	VOJAK	Tg1	TM1	0.2912	11.00	0.0500	5.50	0.3412	16.50
		Tg2	TM2	0.2912	11.00	0.0500	5.50	0.3412	16.50
Gradska toplana d.o.o, Karlovac	TINA UJEVIĆA	Tg1	TM1	0.2345	11.60	0.0400	4.40	0.2745	16.00
		Tg2	TM2	0.2722	12.60	0.0400	4.40	0.3122	17.00
BROD-PLIN d.o.o., Slavonski Brod	SLAVONIA	Tg1	TM1	0.2332	11.60	0.0500	5.20	0.2832	16.80
		Tg2	TM2	0.2650	11.60	0.0500	5.20	0.3150	16.80
Tehnostan d.o.o., Vukovar	BOROVO NASELJE	Tg1	TM1	0.2686	9.50	0.0470	5.00	0.3156	14.50
		Tg2	TM2	0.3045	9.50	0.0470	5.00	0.3515	14.50
	OLAJNICA	Tg1	TM1	0.2696	9.50	0.0470	5.00	0.3166	14.50
		Tg2	TM2	0.3062	9.50	0.0470	5.00	0.3532	14.50
HEP-Toplinarstvo d.o.o., Zagreb	SAMOBOR	Tg1	TM1	0.2605	7.24	0.0395	3.73	0.3000	10.97
		Tg2	TM2	0.2952	7.69	0.0448	3.97	0.3400	11.66
	VELIKA GORICA	Tg1	TM1	0.2760	7.88	0.0240	3.27	0.3000	11.15
		Tg2	TM2	0.3128	8.97	0.0272	3.73	0.3400	12.70
	DUBRAVA	Tg1	TM1	0.1569	3.96	0.0131	2.64	0.1700	6.60
		Tg2	TM2	0.3137	7.36	0.0263	4.90	0.3400	12.26
HEP-Proizvodnja d.o.o., Zagreb HEP-Toplinarstvo d.o.o., Zagreb	ZAGREB	Tg1	TM1	0.1525	2.30	0.0175	3.45	0.1700	5.75
		Tg2	TM2	0.3050	5.86	0.0350	6.17	0.3400	12.03
			TM3	*232.5521*	*3,980.57*	*55.7079*	*4,194.64*	*288.2600*	*8,175.21*
	OSIJEK	Tg1	TM1	0.1492	4.32	0.0108	4.11	0.1600	8.43
		Tg2	TM2	0.2891	7.01	0.0209	6.20	0.3100	13.21
			TM3	*207.2821*	*3,222.26*	*58.2879*	*4,953.16*	*265.5700*	*8,175.42*
	SISAK	Tg1	TM1	0.1089	3.44	0.0711	4.11	0.1800	7.55
		Tg2	TM2	0.2058	5.65	0.1342	6.61	0.3400	12.26
			TM3	*174.4590*	*5,233.29*	*113.8010*	*8,905.09*	*288.2600*	*14,138.38*

* Tariff groups are Tg1 - Households and Tg2 - Industry and commercial consumers

** Tariff models are: TM1 - Hot/warm water (in HRK/kWh), TM2 - Hot/warm water (in HRK/kWh), and TM3 - Technological steam (in HRK/t)

*** Tariff items for the production of thermal energy have been determined for HEP-Proizvodnja d.o.o., Zagreb, which delivers thermal energy from its cogeneration plants for the needs of the final customers of HEP-Toplinarstvo d.o.o.

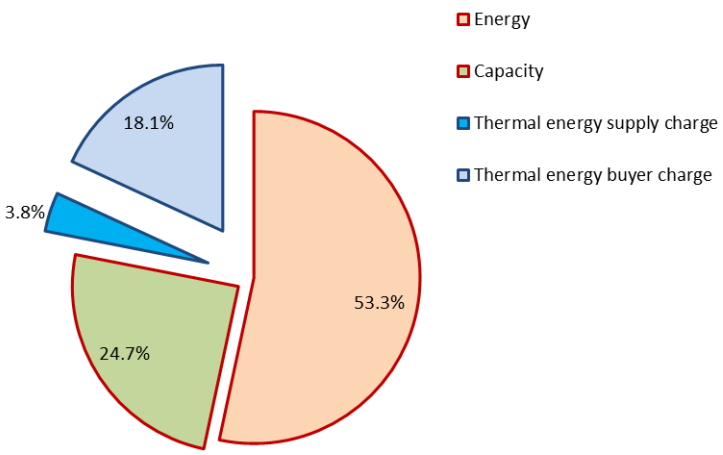
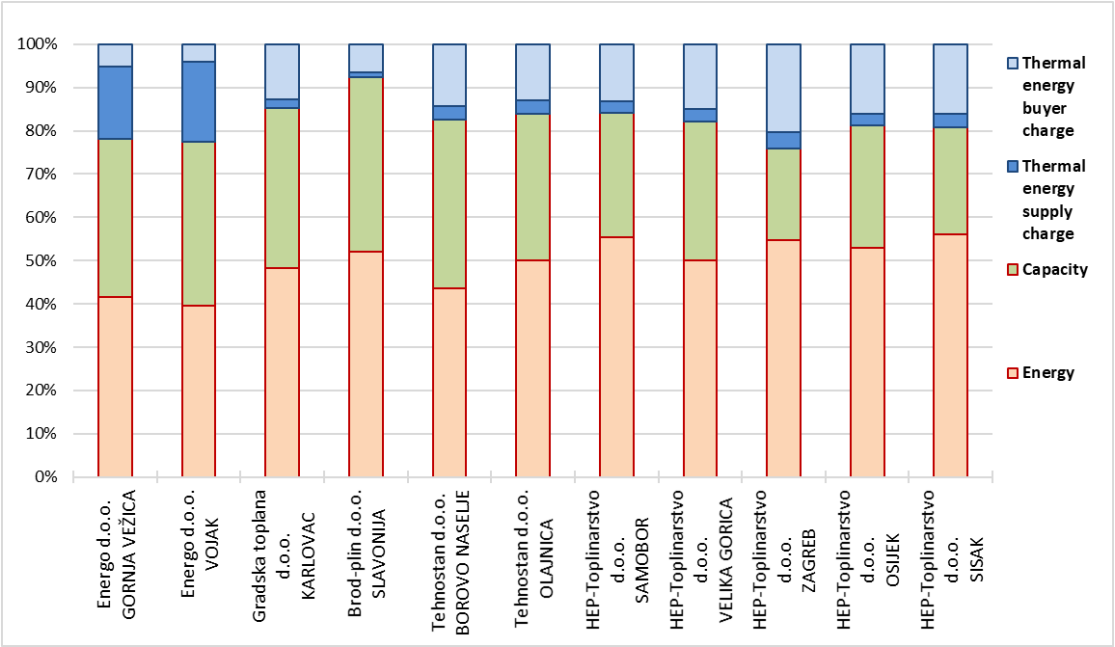


Figure 8.2.6. Average shares of individual components in the total price of thermal energy for household final customers of district heating systems

Figure 8.2.6. shows that the average regulated portion of the thermal energy price for all district heating systems amounts to around 77.8% (capacity plus energy).

Figure 8.2.7. provides a more detailed breakdown of the total price of thermal energy and its different components for household final customers across district heating systems in Croatia in 2021.



Thermal energy buyer charge	**5.3%**	**4.2%**	**12.7%**	**6.5%**	**14.4%**	**13.1%**	**13.1%**	**14.9%**	**20.3%**	**16.1%**	**16.2%**	**Market portion**
Thermal energy supply charge	**16.6%**	**18.5%**	**2.2%**	**1.2%**	**3.1%**	**3.1%**	**2.9%**	**3.0%**	**3.8%**	**2.8%**	**3.0%**	
Capacity	**36.6%**	**37.8%**	**36.9%**	**40.3%**	**39.0%**	**33.9%**	**28.7%**	**32.1%**	**21.1%**	**28.2%**	**24.9%**	**Regulated portion**
Energy	**41.5%**	**39.6%**	**48.2%**	**52.0%**	**43.5%**	**50.0%**	**55.3%**	**50.0%**	**54.8%**	**52.9%**	**56.0%**	

Figure 8.2.7. Shares of particular components in the total price of thermal energy for final customers in the household category for individual district heating systems in 2021

In accordance with the **Thermal Energy Market Act**, in independent and closed heating systems, the prices of thermal energy delivered to buyers of thermal energy or final customers are contracted freely. Given that HERA does not define any of the components of thermal energy prices for closed and independent heating systems, Table 8.2.2. does not show prices for those systems, and Figure 8.2.7. does not show the price structure in such systems.

8.2.4 Consumer protection

In 2021, HERA received 71 submissions (two appeals, 24 complaints, 39 inquiries, and six other submissions) concerning the thermal energy sector. Submissions were submitted by thermal energy final customers, authorised representatives of co-owners, energy entities, thermal energy buyers, institutions, and other parties.

Table 8.2.3. shows a breakdown of submissions related to heating by basic category and reasons for submission per category, with corresponding shares. Compared to 2020, which was marked by complaints regarding billing for thermal energy and requests for opinions and interpretations of the **Thermal Energy Market Act** and by-laws from final customers and other legal and natural persons, the number of complaints received in 2021 (similar to 2020) regarding payment for fixed costs of thermal energy remained the same; however, there was a decline in the number of complaints regarding thermal energy buyers and companies that installed and read heat cost allocators. Instead, complaints and appeals primarily related to specific cases regarding the actions of energy entities and thermal energy buyers. The total number of submissions related to district heating was 9.8% lower than in the previous year.

Table 8.2.3. Submissions (appeals, complaints, inquiries) regarding district heating received in 2021

Description	Number	Share in category [%]	Share of all submissions [%]
Appeals	**2**		**2.82%**
Complaints	**24**		**33.80%**
Complaints related to billing, calculation, and allocation	15	62.50%	
Complaints related to activities of thermal energy buyers	5	20.83%	
Complaints related to meter/heat cost allocator reading	1	4.17%	
Complaints related to suspension and disconnection	3	12.50%	
Inquiries	**39**		**54.93%**
Inquiries related to billing, calculation, and allocation	6	15.38%	
Inquiries related to activities of thermal energy buyers	6	15.38%	
Inquiries related to meter/heat cost allocator reading	2	5.13%	
Inquiries related to suspension and disconnection	8	20.51%	
Inquiries related to energy licences, energy activities, etc.	5	12.82%	
Inquiries related to eligible producers	12	31.00%	
Other	**6**		**8.45%**
Opinions and instructions from HERA	**6**		

Much like in 2020, the majority of submissions concerned thermal energy billing and the allocation and calculation of costs of supplied thermal energy, as well as to the obligations of thermal energy buyers, authorised representatives of co-owners of independent heating units within a building/structure, and persons in charge of reading devices for the local distribution of supplied thermal energy (heat cost allocators). The majority of complaints were essentially outside the remit, jurisdiction, and responsibilities of HERA as specified by the acts and related by-laws governing the energy sector, and pertained to issues such as civil obligations, ownership and co-ownership, etc.

In terms of jurisdiction, it should be noted that an energy inspection unit for heating and gas was established at the State Inspectorate, tasked with, inter alia, monitoring the implementation of regulations governing:

- conditions for the energy activities of production, distribution, supply of thermal energy, and thermal energy buyer activities,
- the obligations of energy subjects and thermal energy buyers during the performance of electricity-related activities and the use of thermal energy in meeting requirements for the security, reliability, consistency, and quality of thermal energy supply, as well as professional management, handling and maintenance of internal installations and all equipment located at the internal installation, and
- measures to protect final customers of thermal energy, as well as the powers and responsibilities of co-owners and final customers of thermal energy.

However, consumer protection is made significantly more difficult by the complex organization of activities as laid down in the **Thermal Energy Market Act**. The protection of final customers' rights differs depending on whether the final customer is part of an independent heating system, closed heating system, or district heating system, as the requirements and manner in which activities are performed in these systems differ. Given that the framework for the performance of energy activities of thermal energy production, thermal energy distribution and supply, and the activity of buyers of thermal energy differ depending on the type of heating system, final customers of thermal energy are often unsure whom to address to resolve issues or protect their rights. Moreover, such differences often prevent a direct comparison of prices and requirements for the performance of said activities, especially bearing in mind that the prices and tariffs for thermal energy production and distribution are regulated only in district heating systems (constituting only a part of the final price of thermal energy, as demonstrated in section 8.2.3.).

In blocks of flats, an additional issue related to consumer protection is the complexity of relationships between the owners (final customers of thermal energy), representatives of owners, building management agencies, persons reading heat cost allocators and meters, thermal energy buyers, and energy entities, with some roles in most buildings being exercised by the same person. Most commonly, the thermal energy supplier is also a thermal energy buyer. However, there are also other situations, e.g. where a thermal energy buyer is also the person reading heat cost allocators; it is also possible for the thermal energy buyer to be both a supplier and a building manager.

Moreover, the situation in blocks of flats is characterised by a specific relationship between the thermal energy buyer and final customer of thermal energy, which is regulated by a "thermal energy consumption agreement" based on a decision of the majority of owners, but which is binding for all owners (i.e. final customers of thermal energy). There are also buildings in which thermal energy suppliers supply thermal energy without having concluded an agreement on thermal energy consumption, as well as buildings in which gas suppliers supply gas for the needs of common boiler stations and allocate supplied gas to the owners of these buildings and boiler stations. The reading of heat cost allocators and separate meters is also of importance to final customers, however this is not mentioned in the **Thermal Energy Market Act**, and is thus not one of the required activities of thermal energy buyers. Reading meters/heat cost allocators is only touched upon in the *Ordinance on the method of allocating and calculating costs of supplied thermal energy*, according to which reading is to be performed by the authorised representative of owners, or a natural or legal person authorised by said representative. In practice, meter/heat cost allocator reading (frequently combined with the installation of heat cost allocators) is contracted with business entities in different various; reading is sometimes contracted with individual final customers, and sometimes collectively for all owners (with the form of the agreement differing from building to building or from manager to manager).

As a result, the various ways in which the supply and calculation of thermal energy is organised in blocks of flats, together with management or decision-making issues, greatly interfere with the protection of final customers' rights. It is thus necessary to improve legislation and practice in the heating sector in order to simplify the management and maintenance of heating systems in buildings and thermal energy billing, bearing in mind the considerable similarities between the activity of the thermal energy buyer and the role of the building manager.

8.3 Energy efficiency in district heating systems

8.3.1 Energy efficiency in tariff systems

As explained in the previous chapters, HERA sets tariffs for thermal energy production and thermal energy distribution, which are then applied by thermal energy producers and thermal energy distributors in district heating systems. However, the final price of thermal energy in district heating systems is only partly regulated, as charges for thermal energy supply and for performing thermal energy buyer activities are contracted freely.

Tariffs for the production and distribution of thermal energy in central district heating systems are determined according to the *Methodology for setting tariffs for thermal energy production* and the *Methodology for setting tariffs for thermal energy distribution*; all individual decisions on the amount of tariffs for thermal energy production and thermal energy distribution for individual central district heating systems are available on HERA's website. As tariff items are adopted for an individual central district heating system and not for an individual energy entity, tariffs reflect the costs of an individual central district heating system. Each central district heating system has its own expenses, which are ultimately related to the technical characteristics of production and distribution, including losses in the transformation and distribution of thermal energy.

The aforementioned methodologies for individual tariff groups or tariff models are determined by only two items – tariffs for energy and tariffs for power. According to the *Methodology for setting tariffs for thermal energy production*, revenue from the energy tariff should cover variable energy costs, while revenue from the capacity tariff should cover fixed costs. The capacity tariff is applied to the amount of purchased or connected power, and as such defines the fixed part of the end price of thermal energy.

According to the *Methodology for setting tariffs for thermal energy distribution*, HERA recognises realised losses in the hot water/warm water distribution network of up to 10% of the total thermal energy taken up at the entrance to the distribution network. Realised losses in the steam distribution network are also recognised, however up to a maximum of 18%. In exceptional cases, HERA may approve larger losses in the distribution network, taking into account the specific business conditions and characteristics of the distribution network, whereby the thermal energy distributor is required to provide an operative plan to reduce losses in the distribution network within a specific, feasible time frame. According to the above *Methodology*, thermal energy losses in the distribution network for the regulatory year are calculated as the difference between the measured thermal energy taken up in the base year at the points of demarcation between thermal energy producers and distributors or at the entrance to the distribution network and delivered thermal energy in the base year at the points of demarcation between the distributor and supplier of thermal energy, i.e. at the exit from the distribution network.

According to the *Methodology for setting tariffs for thermal energy production*, thermal energy producers in a central district heating system are required to prove thermal energy production losses for each type of fuel used to produce thermal energy; in affirming variable expenses, HERA will confirm the amount and justifiability of these losses. On the basis of an analysis of variable costs and calculated losses in thermal energy production, HERA can rule a part of the amount of variable costs as justifiable, taking into account the specificity of business conditions and the characteristics of production facilities.

8.3.2 Increasing the energy efficiency of district heating systems

European and national strategic objectives highlight the requirement to increase energy efficiency in all sectors as one of the most important levers of sustainable development. Increased energy efficiency in thermal systems in Croatia is planned through projects to renovate the hot water network and thermal systems, which are to be implemented from 2020 to 2023. As part of the Competitiveness and Cohesion 2014-2020 operational programme, funds were approved for projects to reduce thermal losses and increase the reliability of thermal energy supply to more than 120,000 households; implementation of these projects began in Zagreb, Osijek, Rijeka, and Karlovac.

HEP-Toplinarstvo d.o.o. is implementing the *"Revitalization of the hot water network in the city of Zagreb"* project, which will renovate 68.5 km of worn hot water pipelines out of the total network of 227.3 km in the city of Zagreb. This HRK 700 million project, of which HRK 471.5 million comes from the European Regional Development Fund, will contribute to a reduction in energy consumption and greenhouse gas emissions, as well as security of supply in Zagreb's district heating system.

HEP-Toplinarstvo d.o.o Osijek Plant is implementing the "Replacement of the connecting hot water pipeline from the Osijek Thermal Power and District Heating Plant to the Osijek District Heating Plant", which will replace a worn 4.4 km, 550 mm diameter hot water pipeline with a new, more modern one with a diameter of 800 mm. This HRK 78.91 million project, of which HRK 46 million comes from the European Regional Development Fund, will contribute to a reduction in energy consumption and greenhouse gas emissions, as well as security of supply and increased efficiency in Osijek's district heating system.

ENERGO d.o.o. is implementing the "Renovation of Rijeka's district heating systems" project, which will renovate the existing distribution network through new connecting heat pipelines and the connection and reconstruction of 7 district heating systems (63% of current production). The project foresees the installation of a cogeneration plant and the full transition to fuel oil from natural gas, the installation of solar panels, tanks, a full automation system, and increased efficiency to optimise production and decrease losses in distribution. In addition to renovating 7.9 km of the existing hot water distribution network, a new 2.5 km connecting network will be built, joining three district heating systems in the eastern part of the city with three in the western part into unified systems. This HRK 112.27 million project, of which HRK 83.9 million comes from the European Regional Development Fund, will contribute to a reduction in energy consumption and greenhouse gas emissions, as well as increased security of supply and increased efficiency in Osijek's district heating system through the use of renewable energy sources.

GRADSKA TOPLANA d.o.o. Karlovac is implementing the "Revitalising the hot water network in the city of Karlovac" project, which will replace 15.7 km of the hot water network, revitalise equipment in hot water substations, modernise the pumps at the distribution facility and the chemical water preparation system, and install a central control system to manage and monitor the network. This HRK 133.87 million project, of which HRK 103.59 million comes from the European Regional Development Fund, will contribute to a reduction in energy consumption and greenhouse gas emissions, as well as increased security of supply and increased efficiency in Karlovac's district heating system, as well as preparations for the use of renewable energy sources.

8.3.3 High-efficiency cogeneration

According to the **Renewable Energy Sources and High-Efficiency Cogeneration Act**, legal or natural persons who simultaneously produce electricity and thermal energy in a highly energy-efficient manner in a single production facility may attain eligible electricity producer status. The criteria for acquiring eligible electricity producer status are specified in the provisions of the **Renewable Energy Sources and High-Efficiency Cogeneration Act** and the *Ordinance on acquiring eligible electricity producer status*, until the adoption of the regulation from Article 41 of the **Renewable Energy Sources and High-Efficiency Cogeneration Act**, which should replace the aforementioned *Ordinance*.

Producers with eligible electricity producer status for natural gas cogeneration facilities must realise a minimum *primary energy savings* indicator. The procedure and parameters for defining primary energy savings have been harmonised with the following EU regulations related to high-efficiency cogeneration:

- *Directive 2012/27/EU and Directive (EU) 2018/2002,*
- *Commission Delegated Regulation (EU) 2015/2402 of 12 October 2015 reviewing harmonised efficiency reference values for separate production of electricity and heat in application of Directive 2012/27/EU of the European Parliament and of the Council and repealing Commission Implementing Decision 2011/877/EU, and*
- *2008/952/EC: Commission Decision of 19 November 2008 establishing detailed guidelines for the implementation and application of Annex II to Directive 2004/8/EC of the European Parliament and of the Council (notified under document number C(2008) 7294).*

On the basis of the *Ordinance on acquiring eligible electricity producer status*, HERA has issued decisions on eligible electricity producer status for six natural gas cogeneration plants (shown in Table 8.2.4.).

Table 8.2.4. Decisions awarding eligible electricity producer status to high-efficiency cogeneration plants

Eligible producer	Name of plant	Capacity - electric [MW]	Capacity - thermal [MW]	Date of decision
TERMOPLIN d.d.	TERMOPLIN cogeneration facility	0.033	Not indicated in decision	26 July 2010
Hrvatska industrija šećera d.d. (transferred from SLADORANA d.d.)	Sladorana d.d. cogeneration facility	10.000	Not indicated in decision	29 July 2010
Energo d.o.o., Rijeka	Energy facility next to Kantrida indoor swimming pool	0.460	0.720	28 March 2011
OSATINA GRUPA d.o.o., Semeljci	Greenhouse for hydroponic tomato production with ancillary facilities	0.650	1.208	29 May 2013
OSATINA GRUPA d.o.o., Semeljci	Tomašanci cogeneration plant 1MW + 1MW	1.800	2.416	12 July 2014
HEP-Proizvodnja d.o.o., Zagreb	Combined cogeneration Block L, 100 MWe/80 MWt at TETO Zagreb	100.000	80.000	26 July 2016

In accordance with the *Ordinance on attaining eligible electricity producer status*, HERA conducts yearly supervision of primary energy savings and issues decisions affirming the amount of primary energy savings for individual cogeneration facilities.

HERA has issued decisions determining primary energy savings for all six cogeneration installations for 2020. Five plants achieved a volume of primary energy savings higher than the required minimum. HERA adopted a decision for the TERMOPLIN cogeneration facility of eligible electricity producer TERMOPLIN d.d. affirming that primary energy savings in the plant cannot be defined as the plant was not operational. Also, at the request of eligible electricity producer TERMOPLIN d.d., HERA revoked the eligible electricity producer status for this plant. All decisions are published on HERA's website.

At the end of 2021, there were five cogeneration plants in the electricity production incentives system with electricity buy-off agreements concluded with HROTE.

In accordance with the *Memorandum of understanding on mutual data exchange* concluded between HERA and the Croatian Bureau of Statistics on 12 June 2017, HERA delivered aggregate data on primary energy savings for the six aforementioned cogeneration facilities to the Bureau of Statistics. The Bureau of Statistics uses this aggregate data to complete EUROSTAT questionnaires in accordance with *Directive 2012/27/EU*.

According to the **Renewable Energy Sources and High-Efficiency Cogeneration Act**, when electricity delivered from plants into the electricity grid must be limited, the transmission system operator or the distribution system operator are required to ensure that plants with eligible producer status have priority over other plants for the delivery of electricity into the grid, unless such priority delivery significantly undermines the reliability and stability of the grid. In other words, cogeneration plants with eligible electricity producer status have priority in delivery. Similar provisions exist in the **Thermal Energy Market Act** and the **Electricity Market Act**.

Aside from this, HERA determines the total yearly energy efficiency for biomass and biogas cogeneration facilities that have concluded electricity buy-off agreements on the basis of the *Tariff system for the production of electricity from renewable energy sources and cogeneration* (Official Gazette no. 133/13, 151/13, 20/14, 107/14, and 100/15) and the *Tariff system for the production of electricity from renewable energy sources and cogeneration* (Official Gazette no. 63/12, 121/12 and 144/12). Total yearly energy efficiency is defined on the yearly level as efficiency in converting primary fuel energy into electricity and useful heat.

8.3.4 Energy efficiency commitment system

The legal framework for the energy efficiency obligation system is defined in the **Energy Efficiency Act**; its implementation began in 2019.

Given the gradual implementation of the energy efficiency obligation scheme, in 2021, obligated parties were energy suppliers and their affiliated persons who had supplied a total of more than 50 GWh of energy in 2019. Entities in the heating sector subject to the obligation in 2021 were HEP-Toplinarstvo d.o.o., Zagreb; Energo d.o.o., Rijeka; and Brod-plin d.o.o., Slavonski Brod. It should be noted that Brod-plin d.o.o. and Energo d.o.o. were obligated parties in 2021 because they simultaneously acted as suppliers of thermal energy and gas, with their total gas and thermal energy delivered to final customers in 2019 (as the criterion for the obligation in 2021) being higher than the predefined threshold.

The district heating sector in Croatia has great development opportunities to increase energy efficiency, reliability, and security of supply through new, modern technologies. This mainly refers to the use of thermal energy from renewable sources, high-efficiency cogeneration, heat pumps, the replacement of old, inefficient pipeline networks with new, pre-isolated pipelines, systems automatisation, and amendments to the legislative and regulatory framework.

Table 8.2.5. shows data on energy savings and carbon dioxide (CO_2) emissions savings that savings obligated parties (energy entities with a license to perform the corresponding energy activity) in the thermal energy sector realised by individual type of measure in 2021. This data is taken from SMIV, which is managed by the Ministry.

Table 8.2.5. Realised energy and CO_2 emissions savings of energy savings obligated parties in 2021 in the thermal energy sector, by individual measure

Holder of savings	Description of measure	Energy savings, [kWh]	CO_2 emissions savings (t)
HEP-Toplinarstvo d.o.o. za proizvodnju i distribuciju toplinske energije	Reconstruction of thermal substations in Dubrava neighbourhood, Thermal network plant	3,408,029.09	933.80
	Reconstruction of thermal substations, Maintenance Sector	37,774.32	10.35
	Remote reading of thermal energy meters_PLIVA Hrvatska d.o.o.	1,300,472.20	357.63
	Remote reading of thermal energy meters_University Hospital Centre Zagreb	699,243.00	387.10
	Remote reading of thermal energy meters_Zagrebačka pivovara d.o.o.	474,377.40	130.45
	Remote reading of thermal energy meters_Sisters of Charity Hospital	352,791.00	97.02
	Remote reading of thermal energy meters_Croatian Military Academy, Ministry of Defence	273,292.20	75.16
	Remote reading of thermal energy meters_INA Maziva d.o.o.	216,032.40	59.41
	Remote reading of thermal energy meters_ZET D.O.O.	215,408.80	59.24
	Installation of an energy management system_HEP-TOPLINARSTVO d.o.o.	1,203,774.14	259.58
	Reconstruction of the main hot water pipeline and the adjacent distribution grid- SPIN, OSIJEK - 1	7,512.58	17.27
	Reconstruction of the main hot water pipeline and the adjacent distribution grid- SPIN, OSIJEK - 2	7,756.98	18.41
	Reconstruction of the main hot water pipeline and the adjacent distribution grid- SPIN, OSIJEK - 3	13,665.60	57.15
	Reconstruction of the hot water connection, School of Commerce, Osijek	14,711.60	66.23
	Reconstruction of the hot water junction for Vijenac Ivana Mažuranića, Osijek	21,155.40	136.95
	Reconstruction of the hot water connection for the County building and 1st Gymnasium Osijek	27,045.27	223.82
	Reconstruction of the hot water network in Tvrđa, Osijek, 1	22,811.04	159.23
	Reconstruction of the hot water network in Tvrđa, Osijek, 2	16,903.30	87.43
	Reconstruction of the hot water network in Tvrđa, Osijek, 3	12,693.24	49.30
	Reconstruction of thermal substations, Special heating plant	355,173.38	118.27
	Reconstruction of thermal substations, Sisak Plant	348,936.34	107.47
	Reconstruction of thermal substations, Maintenance Sector	110,478.54	36.02
	Entry of savings based on reduced income due to natural disaster - earthquake	5,125,016.42	0.00
ENERGO d.o.o. za proizvodnju i distribuciju toplinske energije i plina	Installation of new substations at 13 different locations in Rijeka on heating systems	528,212.20	144.73
	Energy savings achieved through the replacement/reconstruction of the hot water pipeline in Srdoči, Rijeka	90,724.00	24.86
	Total:	**14,883,990.44**	**3,616.88**

Source: Ministry (SMIV)

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10 ABBREVIATIONS AND GLOSSARY

AAC	*Already Allocated Capacity*
ACER	*Agency for the Cooperation of Energy Regulators*
aFRR	*Automatic Frequency Restoration Reserve*
Aggregator	A natural or legal person who combines multiple consumer loads or generated electricity for sale, purchase, or auction in any electricity market
AIB	*Association of Issuing Bodies*
AIT	*Average Interruption Time*
CHA	Croatian Hydrocarbon Agency
BSP	Slovenian Power Exchange
CEER	*Council of European Energy Regulators*
CEF	Connecting Europe Facility (a key EU financing instrument that promotes growth, employment, and competition through targeted investments into infrastructure on the European level)
CEP	Clean Energy Package – The "Clean energy for all Europeans" package
CEREMP	Centralised European Register of Energy Market Participants
CHP	Cogeneration through combined heat and power
Core region	Region in the EU for the calculation of transmission capacities determined by borders and not by bidding zones, and which includes the following cross-zonal borders (borders marked with ISO codes of countries and countries): FR-BE, BE-NL, FR-DE/LU, NL-DE/LU, BE-DE/LU, DE/LU-PL, DE/LU-CZ, AT-CZ, AT-HU, AT-SI, CZ-SK, CZ-PL, HU-SK, PL-SK, HR-SI, HR-HU, RO-HU, HU-SI, DE/LU-AT
Core FB MC	Core Flow-based Market Coupling
CROPEX	Hrvatska burza električne energije d.o.o. (Croatian electricity exchange)
DHS	District heating system
DA	Distribution area
EES	Grid connection approval
EC	European Commission
EKO Balance Group	A balance group operated by HROTE consisting of eligible producers of electricity and other entities performing electricity production activities who have concluded an agreement for electricity buy-off from renewable sources and high-efficiency Cogeneration with HROTE (renewable energy and cogeneration incentive system).
ENS	Energy Not Supplied
ENTSO-E	European Network of Transmission System Operators for Electricity
ENTSOG	European Network of Transmission System Operators for Gas
EOTRP	Report on the optimal technical solution for connecting to the network
E-PASIS	System for Prevention and Analysis of HOPS's communication networks' security incidents
EU	European Union
EUPHEMIA	Algorithm for calculating prices on the electricity market.
EUROSTAT	Statistical office of the European Union
Ex-ante	a phrase meaning "before the event". Here, it relates to the approval of development and investment plans and the setting of tariffs and charges for future periods
Ex-post	a phrase meaning "after the event". Here, it relates to the analysis and/or revision of results, realised plans and investments, and the justification of applied tariffs and charges after the conclusion of a particular period
FB	Flow-based
FCA	Forward Capacity Allocation
FCR	Frequency Containment Reserves
FEED-IN	System or incentive mechanism with a guaranteed purchase price
Fund	Environmental Protection and Energy Efficiency Fund
FRR	Frequency Restoration Reserve
FSRU	Floating storage and regasification unit

HANDA	Hrvatska agencija za obvezne zalihe nafte i naftnih derivata (Croatian Agency for Required Stocks of Crude Oil and Petroleum Products)
HE	Hydroelectric power plant
HEP d.d.	Hrvatska elektroprivreda – joint stock company
HEP-ODS	HEP-Operator distribucijskog sustava d.o.o. (distribution system operator)
HERA	Croatian Energy Regulatory Agency
HHI	Herfindahl-Hirschman index
HOPS	Hrvatski operator prijenosnog sustava d.o.o. (Croatian transmission system operator)
HROTE	Hrvatski operator tržišta energije d.o.o. (Croatian energy market operator)
HTLS	High-temperature Low-sag
HUDEX	Hungarian Derivative Energy Exchange
HUPX	Hungarian electricity exchange
IN	Imbalance Netting
INA d.d.	Industrija nafte d.d.
IoT	Internet of Things - a multifunctional integrated platform for managing "smart" devices, network infrastructure that connects devices via the internet so that they can communicate and interact, allowing new ways of controlling and monitoring them and offering smart services
iPLIN	The application available on HERA's website – calculator for household gas consumers using gas supply as a public service
ISGE	Energy Management Information System
ISO codes	ISO country codes: AL – Albania, AT – Austria, BA – Bosnia and Herzegovina, BE – Belgium, BG – Bulgaria, CY – Cyprus, CZ – Czechia, DK – Denmark, DE – Germany, EE – Estonia, GR – Greece, ES – Spain, FI – Finland, FR – France, GE – Georgia, HR – Croatia, HU – Hungary, IE – Ireland, IS – Iceland, IT – Italy, LI – Liechtenstein, LT – Lithuania, LU – Luxembourg, LV – Latvia, MD – Moldova, ME – Montenegro, MK – North Macedonia, MT – Malta, NL – Netherlands, NO – Norway, PL – Poland, PT – Portugal, RO – Romania, RS – Serbia, SE – Sweden, SI – Slovenia, SK – Slovakia, TR – Turkey, UA – Ukraine, UK – United Kingdom, XK – Kosovo
ITC	and/or ITC Agreement – Inter-TSO Compensation for transit
JANAF	Jadranski naftovod d.d.
JAO	Joint Allocation Office
JKC	Central HEP-ODS Contact Centre
LCOE	Levelized Cost of Electricity
MC	Market Coupling
mFRR	Manual Frequency Restoration Reserve
MRS	Measuring reduction station
NCV	Net calorific value of gas under normal conditions – heat freed during the combustion of natural gas in air, at a combustion temperature of 15°C and a natural gas temperature of 15°C
NECP	Croatian integrated National Energy and Climate Plan for 2021-2030
NEMO	Nominated Electricity Market Operator
NIS Directive	Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union
LV	Low voltage level / low voltage network
NOP	National policy framework for establishing infrastructure and developing the alternative transport fuels market
NRRP	National Recovery and Resilience Plan
n/a	Not applicable
LT	Lower daily tariff
NTC	Net Transfer Capacity
RSE	Renewable sources of energy
RSE&C	Renewable energy sources and cogeneration

RES&HEC	Renewable energy sources and high-efficiency cogeneration
BMP	Billing metering point
WGMS	Wholesale gas market supplier
PCI	Projects of Common Interest
PPS	Purchasing Power Standards
PRISMA	Regional Booking Platform – for capacity booking at interconnections of gas transmission systems
UGSF Okoli	Okoli - Podzemno skladište plina d.o.o.
RBP	Regional Booking Platform – for capacity booking at interconnections of gas transmission systems
RES&C Register	Register of renewable energy sources and cogeneration, and eligible producers
RH	Republic of Croatia
PSH	Pumped storage hydroelectric power plant
RBMP	Register of Billing Metering Points
RSC	Regional Security Coordinator
RSI	Residual Supply Index
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
Council	Regulatory Affairs and Consumer Protection Council
SBU	Standard bundled unit
SEE	South East Europe
SEE CAO	South East Europe Coordinated Auction Office
SHB	Regulatory block consisting of Slovenia, Croatia, and Bosnia and Herzegovina
SINCRO.GRID	Project financed by CEF. The goal of the project is to improve the voltage quality in the electric power system and use the dynamic transmission capacity of the existing transmission lines by using advanced technical systems and algorithms.
Smart grid	Smart grid
SMIV	System for measuring and verifying energy savings
MV	Medium voltage level / medium voltage network
Strategy	Energy Development Strategy of the Republic of Croatia until 2030 with a view to 2050 (Official Gazette, no. 25/20)
IHS	Independent heating system
STUM	Creating technical requirements in the network
SUKAP	Yearly, quarterly, monthly, daily and intraday capacity management system
TM	Tariff model
TRM	Transmission Reliability Margin
TS	Transformer station
TSC; TSCNET	TSC - Transmission System Operator Security Cooperation (An initiative of 13 transmission system operators from 10 continental European countries, one of which is HOPS; its goal is to increase system security by developing multilateral procedures to eliminate congestion in the transmission system); TSCNET Services - Transmission System Operator Security Cooperations - Regional Security Coordinator Service for the TSOs in Central and South Eastern Europe
TYNDP 2020	Ten-Year Network Development Plan
PES	Primary Energy Savings
LPG	Liquefied petroleum gas
LNG	Liquefied Natural Gas
CACM Regulation	Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management
DCC Regulation	Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a network code on demand connection
EBGL Regulation	Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing
ERNC Regulation	Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration

FCA Regulation	Commission Regulation (EU) 2016/1719 establishing a guideline on forward capacity allocation
HVDC Regulation	Commission Regulation (EU) 2016/1447 of 26 August 2016 establishing a network code on requirements for high voltage direct current system and direct current-connected power park module grid connections
NC TAR Regulation	Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonised transmission tariff structures for gas
REMIT Regulation	Regulation (EU) No 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency
RFG Regulation	Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators
SOGL Regulation	Commission Regulation (EU) 2017/1485 establishing a guideline on electricity transmission system operation
HV	High voltage level / high voltage network
HT	High daily tariff item
VTP	Virtual Trading Point – a virtual place within the gas system (gas transmission systems and storage systems) where balance responsible parties can mutually trade gas
XBID	Cross Border Intraday
CHS	Closed heating system

11 APPENDIX – LICENSES FOR THE PERFORMANCE OF ENERGY ACTIVITIES

List of licences issued from 01/01/2021 to 31/12/2021	No. of issued licences
Electricity production	**5**
BE-TO BRINJE d.o.o., I. Oranički odvojak 4, 10000 Zagreb, Croatia	
Geo Power Energy Development d.o.o., Radnička 34a, 10000 Zagreb, Croatia	
ENERGETSKI PARK KORLAT d.o.o., Ulica grada Vukovara 37, 10000 Zagreb, Croatia	
NIZA d.o.o., Kolodvorska 42, 31224 Niza, Croatia	
BERKO d.o.o., Marije Jurić-Zagorke 3, 40000 Čakovec, Croatia	
Electricity supply	**1**
ENNA Opskrba d.o.o., Gospodarska zona 13, 32000 Vukovar, Croatia	
Electricity trade	**4**
Nano Energies Trade s.r.o., Národni 135/14, Nové Město, 110 00 Praha 1, Czech Republic	
D. TRADING d.o.o. za trgovinu, Drenovačka 3, 10000 Zagreb, Croatia	
Vitol Gas and Power B.V., K.P. van der Mandelelaan 130, 3062MB Rotterdam, Netherlands	
Yesilyurt Energy Trading d.o.o., Josipa Stadlera 76, 10000 Zagreb, Croatia	
Gas trade	**9**
HEP ELEKTRA d.o.o., Ulica grada Vukovara 37, 10000 Zagreb, Croatia	
HEP - ESCO d.o.o., Ulica grada Vukovara 37, 10000 Zagreb, Croatia	
HEP-Proizvodnja d.o.o., Ulica grada Vukovara 37, 10000 Zagreb, Croatia	
HEP-TOPLINARSTVO d.o.o., Miševečka 15/a, 10000 Zagreb, Croatia	
HEP Energija d.o.o., Tivolska cesta 48, 1000 Ljubljana, Slovenia	
MFT Energy A/S, Margrethepladsen 4, 3. sal, DK-8000 Aarhus C, Denmark	
ENGIE Société anonyme, 1 Place Samuel de Champlain, 92400 Courbevoie, France	
D. TRADING d.o.o., Drenovačka 3, 10000 Zagreb, Croatia	
Vitol Gas and Power B.V., K.P. van der Mandelelaan 130, 3062MB Rotterdam, Netherlands	
Gas supply	**4**
MVM CEEnergy Croatia d.o.o., Radnička cesta 177, 10000 Zagreb, Croatia	
ENERGIA GAS AND POWER d.o.o., Ulica Alexandera von Humboldta 4B, 10000 Zagreb, Croatia	
HEP-Opskrba d.o.o., Ulica grada Vukovara 37, 10000 Zagreb, Croatia	
ENNA Opskrba d.o.o., Gospodarska zona 13, 32000 Vukovar, Croatia	
Management of liquefied natural gas and/or compressed natural gas supply points	**2**
BUTAN PLIN d.o.o., Ulica rijeke Dragonje 23, 52466 Novigrad, Croatia	
Brod-plin d.o.o., Trg pobjede 5, 35000 Slavonski Brod, Croatia	
Thermal energy production	**2**
RENETEH OGULIN d.o.o., Otok Oštarski 4e, 47300 Ogulin, Croatia	
BE-TO BRINJE d.o.o., I. Oranički odvojak 4, 10000 Zagreb, Croatia	
Thermal energy supply	**3**
RENETEH OGULIN d.o.o., Otok Oštarski 4e, 47300 Ogulin, Croatia	

List of licences issued from 01/01/2021 to 31/12/2021	No. of issued licences
BIOEL d.o.o., Velika Maslenjača 46, 43531 Maslenjača, Croatia	
ENERGANA BENKOVAC d.o.o., Poslovno industrijska zona Šopot 28, 23420 Benkovac, Croatia	
Production of biofuels	**1**
Energija logistika d.o.o., Žrtava Domovinskog rata 23, 44400 Glina, Croatia	
Storage of biofuels	**2**
DELTA TERMINALI d.o.o., Kaptol 19, 10000 Zagreb, Croatia	
Adriatic Tank Terminals d.o.o., Cesta B1 5, 20340 Ploče, Croatia	
Wholesale trade in petroleum products	**6**
GRUPACIJA FLAVIA, d.o.o. za trgovinu, Borisa Papandopula 14, 21000 Split, Croatia	
EKO-FLOR PLUS d.o.o., Mokrice 180C, 49243 Oroslavje, Croatia	
ISTRAŽIVAČ BENZ d.o.o., Križnog puta 151A, 32221 Nuštar, Croatia	
FLASH ENERGY d.o.o., Trg hrvatske bratske zajednice 2, 21000 Split, Croatia	
Santini d.o.o., Starčević Ante 79, 32100 Vinkovci, Croatia	
NIKICA PETROL d.o.o., Berislavićeva 5, 35000 Slavonski Brod, Croatia	
Storage of oil and petroleum products	**2**
DELTA TERMINALI d.o.o., Kaptol 19, 10000 Zagreb, Croatia	
Terminal Slavonski Brod d.o.o., Dr. Mile Budaka 1, 35000 Slavonski Brod, Croatia	
Total:	**41**

List of licences extended from 01/01/2021 to 31/12/2021	No. of licences extended
Electricity production	**8**
ZAGREBAČKE OTPADNE VODE - upravljanje i pogon d.o.o. za usluge, Čulinečka cesta 287, 10000 Zagreb, Croatia	
VJETROELEKTRANA ORLICE d.o.o. za proizvodnju energije, Dr. Ante Starčevića 45, 20000 Dubrovnik, Croatia	
STRIZIVOJNA HRAST d.o.o. proizvodnja i trgovina drvom, B. Radića 82, 31410 Strizivojna, Croatia	
VJETROELEKTRANA RUDINE d.o.o. za proizvodnju električne energije, Bijenička cesta 21, 10000 Zagreb, Croatia	
Farma muznih krava Orlovnjak d.o.o., Orlovnjak Tovilište 1, 31216 Antunovac, Croatia	
BIOPLINARA ORGANICA KALNIK 1 d.o.o., Gregurovec 23, 48265 Gregurovec, Croatia	
SLK PROJEKT d.o.o. za proizvodnju, distribuciju i trgovinu električnom energijom, Domagojeva 14, 10000 Zagreb, Croatia	
MOSLAVINA PROIZVODI d.o.o. za proizvodnju, trgovinu i usluge, Sišćani 31, Sišćani, 43240 Čazma, Croatia	
Electricity supply	**1**
HEP ELEKTRA d.o.o. za opskrbu električnom energijom, Ulica grada Vukovara 37, 10000 Zagreb, Croatia	
Electricity trade	**4**
HEP-Trgovina d.o.o. za trgovanje električnom energijom, Ulica grada Vukovara 37, 10000 Zagreb, Croatia	
GEN-I Hrvatska d.o.o. trgovina i prodaja električne energije, Radnička cesta 54, 10000 Zagreb, Croatia	
AXPO BULGARIA EAD, 5 Lachezar Stanchev str., Building B, fl. 5, 1756 Sofia, Bulgaria	

List of licences extended from 01/01/2021 to 31/12/2021	No. of licences extended
HRVATSKI OPERATOR TRŽIŠTA ENERGIJE d.o.o., Ulica grada Vukovara 284, 10000 Zagreb, Croatia	
Natural gas production	**1**
INA-INDUSTRIJA NAFTE, d.d., Avenija V. Holjevca 10, 10000 Zagreb, Croatia	
Gas distribution	**9**
ENERGO METAN d.o.o. za distribuciju plina i opskrbu plinom, Ulica Vlade Gotovca 2, 10430 Samobor, Croatia	
MONTCOGIM - PLINARA d.o.o. za izgradnju distribucijskih mreža, distribuciju plina i održavanje, Trg Ante Starčevića 3A, 10431 Sveta Nedelja, Croatia	
ZAGORSKI METALAC d.o.o. za distribuciju plina i opskrbu plinom, Ulica Josipa Broza Tita 2/F, 49210 Zabok, Croatia	
PLIN-PROJEKT d.o.o. za izgradnju plinovoda i distribuciju plina, Alojzija Stepinca 36, 35400 Nova Gradiška, Croatia	
PLINARA d.o.o. za opskrbu plinom, Industrijska 17, 52100 Pula, Croatia	
Brod-plin d.o.o., Trg pobjede 5, 35000 Slavonski Brod, Croatia	
PLINKOM d.o.o. za distribuciju plina, Vinogradska 41, 33405 Pitomača, Croatia	
DUKOM PLIN d.o.o. za distribuciju plina, Slavka Kolara 4, 10370 Dugo Selo, Croatia	
EVN Croatia Plin d.o.o. za distribuciju plina, Zagrebačka avenija 104, 10000 Zagreb, Croatia	
Gas trade	**3**
ENERGY COMMODITIES TRADING LIMITED, 53, Office 2, Sir Adrian Dingli Street, Sliema SLM 1902, Malta	
AXPO BULGARIA EAD, 5 Lachezar Stanchev, zgrada B, kat 8, 1756 Sofia, Bulgaria	
INA-INDUSTRIJA NAFTE, d.d., Avenija V. Holjevca 10, 10000 Zagreb, Croatia	
Gas supply	**4**
PETROKEMIJA d.d. tvornica gnojiva, Aleja Vukovar 4, 44320 Kutina, Croatia	
HEP-Trgovina d.o.o. za trgovanje električnom energijom, Ulica grada Vukovara 37, 10000 Zagreb, Croatia	
HEP dd., Ulica grada Vukovara 37, 10000 Zagreb, Croatia	
MET Croatia Energy Trade d.o.o. za trgovinu i usluge, Radnička cesta 80, 10000 Zagreb, Croatia	
Thermal energy supply	**3**
ELEMENT ENERGETIKA, d.o.o. za usluge i trgovinu, Šetalište Nikole Fallera 14, 10000 Zagreb, Croatia	
BIO ENERGANA BJELOVAR d.o.o. za proizvodnju električne i toplinske energije, distribuciju usluge i trgovinu, Ulica hrvatskog proljeća 3, 43000 Bjelovar, Croatia	
RESALTA d.o.o. za savjetovanje i usluge, Zagrebačka avenija 104, 10000 Zagreb, Croatia	
Thermal energy distribution	**1**
GTG VINKOVCI d.o.o., Kralja Zvonimira 1, 32100 Vinkovci, Croatia	
Storage of biofuels	**1**
BIOTRON d.o.o. za proizvodnju biogoriva, Karlovačka cesta 124, 47280 Ozalj, Croatia	
Wholesale trade in petroleum products	**18**
LUKOIL Croatia d.o.o. za trgovinu naftom i naftnim derivatima, Capraška ulica 6, 10000 Zagreb, Croatia	
Coral Croatia d.o.o., Budmanijeva 5, 10000 Zagreb, Croatia	
AGS HRVATSKA d.o.o. za trgovinu i usluge, Zagrebačka avenija 100 A, 10000 Zagreb, Croatia	
RIJEKA TRANS d.o.o. za trgovinu i poslovanje nekretninama, Kukuljanovo 337, 51227 Kukuljanovo, Croatia	

List of licences extended from 01/01/2021 to 31/12/2021	No. of licences extended
ETRADEX proizvodnja i trgovina d.o.o., Benazići 99, 52332 Pićan, Croatia	
Air BP Croatia d.o.o. za trgovinu naftom i naftnim derivatima, Savska cesta 32, 10000 Zagreb, Croatia	
BRALA d.o.o. za trgovinu i usluge, Ulica braće Dežmalj 26, 23242 Posedarje, Croatia	
Agencija za ugljikovodike, Miramarska 24, 10000 Zagreb, Croatia	
PRVO PLINARSKO DRUŠTVO d.o.o. za uvoz, opskrbu i trgovinu plinom, Gospodarska zona 13, 32000 Vukovar, Croatia	
ŽMINJ PETROL d.o.o., Matka Laginje 2/P, 52341 Žminj, Croatia	
ASPETROL d.o.o., Matuljska cesta 29 a, 51410 Opatija, Croatia	
ATTENDO CENTAR d.o.o., Rugvička 151/a, 10370 Dugo Selo, Croatia	
BP-PETROL d.o.o., Rudolfa Matza 1, 10360 Sesvete, Croatia	
GRŽINČIĆ usluge transporta i trgovine d.o.o., Podstrmac 6, 51217 Klana, Croatia	
KTC d.d., N. Tesle 18, 48260 Križevci, Croatia	
ALDO COMMERCE d.o.o., Molindrio 11a, 52440 Poreč, Croatia	
PRIVAJ d.o.o., Putaljski put 58, 21212 Kaštel Sućurac, Croatia	
GRUPACIJA FLAVIA, d.o.o. za trgovinu, Borisa Papandopula 14, 21000 Split, Croatia	
Storage of oil and petroleum products	**4**
Adriatic Tank Terminals d.o.o., Cesta B1 5, 20340 Ploče, Croatia	
INA-INDUSTRIJA NAFTE, d.d., Avenija V. Holjevca 10, 10000 Zagreb, Croatia	
BIOTRON d.o.o. za proizvodnju biogoriva, Karlovačka cesta 124, 47280 Ozalj, Croatia	
AGS HRVATSKA d.o.o. za trgovinu i usluge, Zagrebačka avenija 100 A, 10000 Zagreb, Croatia	
Storage of liquefied petroleum gas,	**2**
ZAMAX PLIN d.o.o. za opskrbu plinom, IV. Trnjanski nasip 18, 10000 Zagreb, Croatia	
G.S. PLIN d.o.o. za punjenje i distribuciju plina, Bast 10 A, 21320 Baška Voda, Croatia	
Wholesale trade in liquefied petroleum gas	**3**
PETROL d.o.o. za trgovinu i prijevoz nafte i naftnih derivata, Savska Opatovina 36, 10000 Zagreb, Croatia	
ADRIA OIL d.o.o. za prodaju naftnih derivata, Spinčići 38, 51215 Kastav, Croatia	
ZAMAX PLIN d.o.o. za opskrbu plinom, IV. Trnjanski nasip 18, 10000 Zagreb, Croatia	
Total:	**62**

List of licences expired from 01/01/2020 to 31/12/2020	Number / reason for expiry of license
Electricity production	**3**
Sladorana tvornica šećera d.o.o. za proizvodnju, trgovinu i usluge, Ulica grada Vukovara 269 g, 10000 Zagreb, Croatia	Expired
SENSE ESCO BELIŠĆE d.o.o. za usluge, Zagorska 31, 10000 Zagreb, Croatia	Expired
MEBU d.o.o. za proizvodnju, trgovinu i usluge u stečaju, Ivana pl. Zajca 17, 40000 Čakovec, Croatia	Expired
Electricity supply	**2**
Hrvatski Telekom d.d., Roberta Frangeša Mihanovića 9, 10000 Zagreb, Croatia	Expired
ENERGIA GAS AND POWER d.o.o. za trgovinu i usluge, Ulica Alexandera von Humboldta 4 B, 10000 Zagreb, Croatia	Expired

List of licences expired from 01/01/2020 to 31/12/2020	Number / reason for expiry of license
Electricity trade	**4**
Yesilyurt Energy Trading d.o.o. za trgovinu električnom energijom, Josipa Stadlera 76, 10000 Zagreb, Croatia	Expired
Pow-en a.s., Prievozská 4B, 82109 Bratislava, Slovakia	Expired
EZPADA d.o.o. za trgovinu i usluge, Ulica grada Vukovara 284, 10000 Zagreb, Croatia	Termination requested
ELECTRADE S.P.A., Via Nonis 68/A, 36063 Marostica (VI), Italy	Termination requested
Gas supply	**2**
KOPRIVNICA OPSKRBA - opskrba plinom društvo s ograničenom odgovornošću, Mosna ulica 15, 48000 Koprivnica, Croatia	Expired
Montcogim-Plinara d.o.o. za izgradnju distribucijskih mreža, distribuciju plina i održavanje, Trg Ante Starčevića 3A, 10 431 Sveta Nedelja, Croatia	Termination requested
Production of biofuels	**1**
MEBU d.o.o. za proizvodnju, trgovinu i usluge u stečaju, Ivana pl. Zajca 17, 40000 Čakovec, Croatia	Expired
Storage of biofuels	**1**
TANKERKOMERC dioničko društvo za trgovinu, turizam i usluge, Obala Kneza Trpimira 2, 23000 Zadar, Croatia	Termination requested
Storage of oil and petroleum products	**1**
TANKERKOMERC dioničko društvo za trgovinu, turizam i usluge, Obala Kneza Trpimira 2x, 23000 Zadar, Croatia	Termination requested
Wholesale trade in petroleum products	**9**
RIJEKATANK ekologija i zaštita okoliša, društvo s ograničenom odgovornošću, Bartola Kašića 5/2, 51000 Rijeka, Croatia	Expired
VELOX VENUM društvo s ograničenom odgovornošću za trgovinu i usluge, E. Vidovića 13, 10360 Sesvete, Croatia	Expired
INVEST AGRO d.o.o., Varaždinska 70x, 33520 Novi Senkovac, Croatia	Expired
SIRO-NEK d.o.o. za trgovinu i usluge, Zagrebačka avenija 104, 10000 Zagreb, Croatia	Expired
SEDLIĆ društvo s ograničenom odgovornošću za proizvodnju i trgovinu, Berek 54, 43232 Berek, Croatia	Expired
CRODUX PLIN d.o.o. za trgovinu i usluge, Savska Opatovina 36, 10000 Zagreb, Croatia	Expired
FUEL trading d.o.o. za usluge, Amruševa ulica 5, 10000 Zagreb, Croatia	Expired
PIA j.d.o.o. za trgovinu i usluge, Požeška cesta 1A, 35000 Slavonski Brod, Croatia	Expired
ENERGOSPEKTAR d.o.o. za trgovinu, usluge i proizvodnju, Matije Divkovića 71, 10000 Zagreb, Croatia	Expired
Total:	**23**

Permits for energy activities issued in accordance with the Energy Act (Official Gazette no. 68/01, 177/04, 76/07, 152/08, 127/10):	No. of licences
Transmission of oil through pipelines and other unspecified forms of transmission from Article 15.1.22. of the Energy Act	**0**
Transmission of petroleum products through product pipelines and other unspecified forms of transmission from Article 15.1.22 of the Energy Act	**0**
Transport of crude oil, petroleum products, and biofuels by road	**0**
Trade, brokerage, and representation on the energy market	**0**
Wholesale and retail trade in liquefied petroleum gas	**0**
Total:	**0**

Status of licences for the performance of energy activities as of 31/12/2021 / Energy activity	Number of valid licenses - status as of 31/12/2021
Electricity production	70
Electricity transmission	1
Electricity distribution	1
Electricity market organisation	1
Electricity supply	11
Aggregation	0
Electricity trade	34
Energy storage	0
Organisation of a Citizen Energy Community	0
Closed Distribution System Operator	0
Natural gas production	1
Gas transmission	1
Gas storage	1
Management of the liquefied natural gas terminal	1
Gas distribution	33
Gas market organisation.	1
Gas trade	34
Gas supply	48
Management of liquefied natural gas and/or compressed natural gas supply points	4
Thermal energy production	38
Thermal energy supply	33
Thermal energy distribution	6
Production of biofuels	3
Wholesale trade in biofuels	7
Storage of biofuels	5
Production of petroleum products	1
Transmission of oil through pipelines	1
Transmission of petroleum products through product pipelines	0
Wholesale trade in petroleum products	46
Storage of oil and petroleum products	21
Storage of liquefied petroleum gas,	4
Wholesale trade in liquefied petroleum gas	14
Total:	421

The status of licences for the performance of energy activities as of 31/12/2021 was: **421 licences**. Information on licences granted to perform energy activities is available in the licence register hosted by HERA:
https://www.hera.hr/hr/html/registar_dozvola.html.