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REPORT

NRA Oversight on Electricity Transmission Grid Development and Investment

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NRA oversight on electricity transmission grid development and investment

Regulatory Benchmarking & Legal Commettee Working Group

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Information page

Abstract

This document (C25-RBL-08-03) analyses the role of National Regulatory Authorities (NRAs) in overseeing electricity transmission grid investment in Europe. Based on a survey of NRAs, it finds significant diversity in how they assess, approve, and monitor grid development plans. Key challenges include NRAs' limited resources, a reliance on data from grid operators and insufficient detail on costs in investment plans. The report provides insights aiming to strengthen regulatory oversight, improve transparency, and ensure efficient grid investments critical for the European Union's (EU) energy goals.

Target audience

European Commission, TSOs, Member States, academics and other interested parties.

Keywords

Electricity transmission grid, Investment, Grid development plans, Regulatory oversight.

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Related documents

CEER Documents (this includes joint CEER-ACER documents, but not ACER-only documents)

- **CEER Paper on Incentives in Regulatory Frameworks with a Focus on OPEX/CAPEX Neutrality, 15 May 2025.**
- **ACER-CEER Guidance Paper on Electricity Transmission and Distribution "Smart-Grid" Performance Indicators, 21 June 2024.**
- **ACER-CEER guidance on Electricity Distribution Planning, 28 July 2025.**
- **Report on Regulatory Frameworks for European Energy Networks 2024, 3 February 2025.**

External Documents

- **ACER, Opinion 07/2025 on the electricity NDPs, 16 July 2025.**
- **ACER, Market Monitoring Report 2023, 13 December 2023.**
- **European Commission, ''Directive (EU) 2019/944 on common rules for the internal market for electricity'', 5 June 2019.**

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Executive Summary

Background

Europe's energy transition necessitates a massive expansion and modernization of its electricity transmission grid. NRAs are central to this process, tasked with ensuring grid investments are efficient, cost-effective, and aligned with EU policy goals. Regulatory oversight of transmission grid development varies significantly across Member States. This report analyses the powers, practices, and challenges of NRAs in governing this critical process.

Objectives and contents of the document

The report assesses NRAs' roles in the three core phases of grid development:

- Planning & Approval: Scrutinizing the content and assessment of National Development Plans (NDPs).
- Investment Execution: Examining the powers NRAs have to ensure projects are built.
- Monitoring & Cost Control: Evaluating how NRAs track progress and costs.

It answers key questions regarding NRA competences, the enforcement of cost-control measures, and interactions with public authorities and Transmission System Operators (TSOs).

Brief summary of the conclusions

The analysis reveals a fragmented landscape. While the EU framework provides a foundation, its national transposition and implementation is uneven.

- **NDP Content**: While all NDPs include cost estimates, few provide adequate explanations of cost evolution or tariff impacts. The depth of cost-benefit and risk analyses varies widely. The coverage of some important network investment topics is not mandated.
- **Regulatory Powers**: Half of the NRAs lack the power to unilaterally amend NDPs. Most approved plans are legally binding on the TSO, but oversight is often stronger for planning than for monitoring implementation and costs.
- **Resources & Capacity**: A significant resource gap exists between NRAs. Many regulators lack in-house technical modelling capabilities and rely heavily on TSO-provided data, creating an information asymmetry.
- **Challenges**: The main obstacles are NRA resource constraints, information asymmetry with TSOs and the difficulty of planning in a rapidly evolving energy system while meeting short timelines.

1 Introduction

The European energy sector is undergoing a fundamental transformation, shaped by decarbonization goals, technological innovation and the push for a more interconnected energy market. At the heart of this transition lies the development of the transmission grid, which must evolve to integrate higher shares of renewable energy, manage cross-border electricity flows, and meet changing demand patterns. National Regulatory Authorities (NRAs) are central to this process, tasked with ensuring that grid investments are efficient, cost-effective and aligned with broader EU energy policy objectives. However, regulatory approaches to grid planning and oversight vary significantly across Member States (MS), leading to differences in how investments are assessed, approved and monitored.

This report examines the role of NRAs in overseeing transmission grid development, with a focus on electricity networks, to identify key challenges and opportunities in order to enhance regulatory oversight.

Following the introduction, the report is organized into three main sections:

- Section 2 outlines the current EU legislative framework for grid development, including key provisions under the Electricity Directive and emerging policies on offshore grids.
- Section 3 provides a detailed examination of NRAs' roles in assessing, approving, and monitoring NDPs, with case studies illustrating different regulatory approaches.
- Section 4 presents conclusions and recommendations aimed at enhancing regulatory oversight and fostering greater consistency in grid investment governance across Europe.

The primary objective of this report is to analyse the regulatory frameworks governing electricity transmission grid investments across Europe. Specifically, it assesses the legal and procedural competences of NRAs in reviewing and approving Ten-Year Network Development Plans (TYNDPs), as well as their ability to enforce cost-control measures and ensure timely project execution. The report also explores the interaction between NRAs, public authorities and transmission system operators (TSOs) in infrastructure planning, highlighting areas where coordination could be strengthened.

The analysis looks at three critical phases of grid development: 1) **planning**, where NDPs are drafted and assessed; 2) **approval**, where regulators scrutinize and authorize investments; and 3) **post-implementation monitoring**, where compliance and cost efficiency are tracked.

Essentially, it seeks to provide answers to core questions such as:

- **What legal competences do NRAs have to approve/monitor TSO investment plans?**
- **Can NRAs enforce cost-control measures (e.g., penalties for cost overruns)?**

The findings are based on responses from 19 European NRAs to a structured survey on national grid oversight practices. These responses were supplemented by a review of relevant EU legislation, including ACER reports and positions papers.

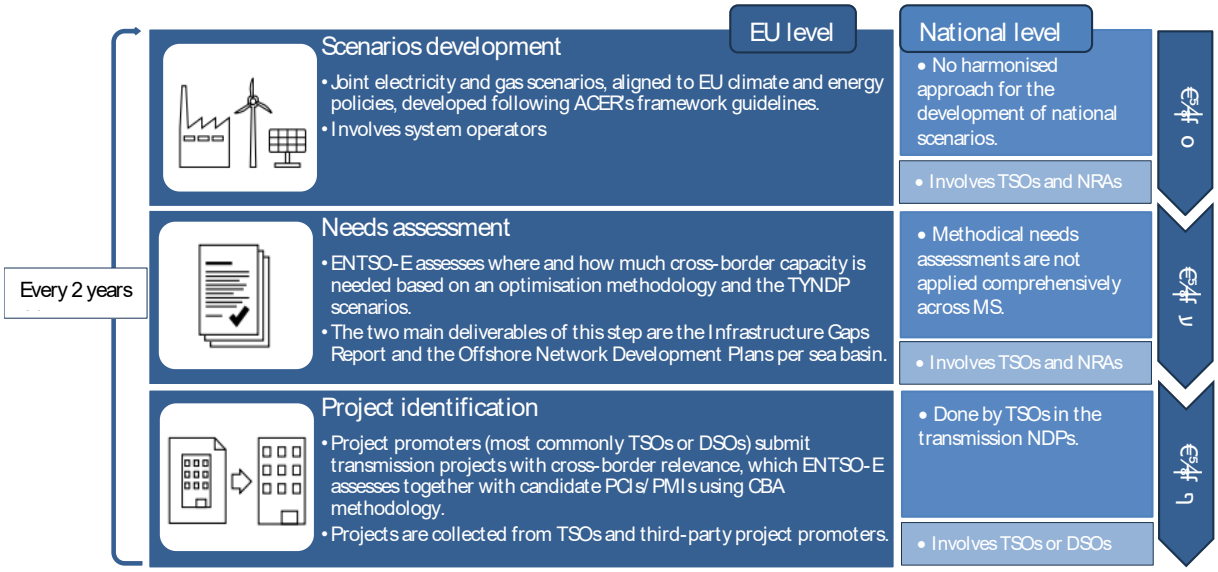
CEER has published several relevant reports on the development of network grids. The aim is primarily set on the regulatory framework that enables and incentivizes efficient electricity network development, focusing on themes such as regulatory incentives, flexibility as well as planning and risk management methodologies. Among these, relevant publications include CEER's benchmarking report on Regulatory Frameworks, a CEER Paper on incentives in regulatory frameworks with a focus on OPEX/CAPEX neutrality as well as an ACER-CEER guidance on Electricity Distribution Planning. These documents help better understand how investments should be planned, justified and funded to ensure they are efficient, timely and in line with EU energy policy goals.

2 Network development and the European legislative framework

The grid development process in the Member States (MS) is shaped by the national network development plans (NDPs). All MS prepare single electricity-specific NDPs (except for Malta) with differing frequencies and methodologies applied.

At EU level, the network development process is clearly defined and follows a three-step procedure: **1) scenario development, 2) needs assessment and 3) project identification**. At national level, those steps are also largely followed although there is no unified procedure for the different aspects.[1]

Figure 1: Different steps of the EU and national network development planning



Source: CEER, 2025

Box 1: Coordination with gas and hydrogen sector – joint planning

Similar to the electricity sector, the development of gas and hydrogen infrastructure is subject to network development plans. The Gas Directive[2] foresees that Member States are required to submit every two years joint or separate TYNDPs for the gas and hydrogen sector. The NDPs should include (quite similar to the electricity sector): main infrastructure needs, investments planned/decided, decommissioned/repurposed infrastructure, time frame etc. This process applies for all gas/hydrogen TSOs regardless of their unbundling model. **The NDPs of the electricity and gas/hydrogen sector need to be closely coordinated as joint scenarios as the basis for the plans are required.**[3]

[1] See ACER Opinion 07/2025 on the electricity NDPs, Link.

[2] Directive (EU) 2024/1788, Article 55.

[3] Directive (EU) 2024/1788, Article 55 (2f).

The legal basis for the development of electricity networks in the EU is shaped by several directives and regulations. **Three central legislative pieces** stand out:

1. The **Internal Market for Electricity Directive** (Directive (EU) 2019/944) sets the main rules for the organisation of the electricity sector. It records the main responsibilities of TSOs and NRAs' powers.
2. The **Internal Market for Electricity Regulation** (Regulation (EU) 2019/943) complements the provisions. It focuses on the operation of electricity markets and cross-border exchanges.
3. The **TEN-E regulation** (Regulation (EU) 2022/869) is a central piece when it comes to trans-European energy infrastructure. It defines criteria and procedures for selecting Projects of Common Interest (PCIs) and Projects of Mutual Interest (PMIs). Moreover, it is relevant as it establishes Offshore Network Development Plans (ONDPs) which are prepared by ENTSO-E with the support of TSOs, NRAs, Member States and the Commission. The ONDPs include offshore transmission corridors, transmission equipment needs and related costs.[4]

Especially the Electricity Directive is a central piece for the network development process as it specifies the responsibilities of TSOs and NRAs in this regard. All TSOs have to ensure "the long-term ability of the system to meet reasonable demands for the transmission of electricity, operating, maintaining and developing under economic conditions secure, reliable and efficient transmission system".[5] However, further specifications on how the network development process is structured depend on the **unbundling model of TSOs**.

The Electricity Directive outlines three models that differ based on their ownership structure and which needs to be certified according to the Directives' provisions: the ownership unbundling (OU) model, the independent system operator (ISO) model or the independent transmission system operator (ITO) model.[6]

Looking at the prevalence of unbundling models among TSOs of the EU countries, the OU model clearly dominates. In only seven MS, the ITO model is (partly) present while the ISO model is only applied in one country (see annex for overview of unbundling regimes). Interestingly, for the gas and hydrogen sector, there is no differentiation when it comes to the network development plans and the unbundling regime.

[4] Regulation (EU) 2022/869, Article 14.2

[5] Directive (EU) 2019/944, Article 40 (1 (a)).

[6] Directive (EU) 2019/944, Article 40 (2).

Table 1: Unbundling models and network development

Unbundling model	Ownership Unbundling (OU)	Independent Transmission Operator (ITO)	Independent System Operator (ISO)
Legal basis	Article 43	Article 51	Article 44
Network development	No specific provisions.	• TSOs to prepare every two years a TYNDP, based on existing and forecast supply and demand and submit it to NRA. • To be done with preceding consultation of relevant stakeholders. • TYNDPs need to indicate main transmission infrastructure to be built or upgraded over the next ten years. • TYNDPs must contain all investments already decided and identify new investments of the next three years, and a time frame for all investment projects. • TYNDPs need to take into account the potential for the use of demand response, energy storage facilities and other resources alternative to system expansion, and expected consumption, trade and other EU/regional investment plans.	• TSOs are responsible for operating, maintaining and developing the transmission system and for ensuring the long-term ability of the system to meet demand through investment planning. • TSOs are responsible for planning, (including authorisation procedure), construction and commissioning of the new infrastructure.
Role of NRA	No specific provisions.	• NRAs are supposed to consult all actual or potential system users on the NDP. • NRAs should examine whether NDPs cover all identified investments needs and	• NRAs shall, for the first TYNDP, approve investment planning and the multi-annual network development plan submitted at least every two years by the TSO.

		whether it is consistent with the Union-wide TYNDP. • NRAs shall consult ACER and may require TSOs to amend TYNDPs. • NRAs should examine the consistency of the TYNDP with the National Energy and Climate Plan (NECP). • NRAs should monitor and evaluate the implementation. In case TSOs do not execute an investment, NRAs have the power to: • require the TSO to execute the investments in question; • organise a tender procedure open to any investors for the investment in question; or • oblige the TSO to accept a capital increase to finance the necessary investments and allow independent investors to participate in the capital. • In this case the NRA ensures that the relevant tariff regulations shall 1) cover the costs of the investments in question and 2) the relevant financial arrangements shall be subject to approval by the NRA.[7]	• NRAs must ensure that grid tariffs collected by the ISOs include remuneration for the network owner(s) so that remuneration for network assets and any new investments are adequately provided for, given they incurred economically and efficiently.[8]

[7] Directive (EU) 2019/944, Article 51 (7-9).

[8] Directive (EU) 2019/944, Article 59 (5 (c-d)).

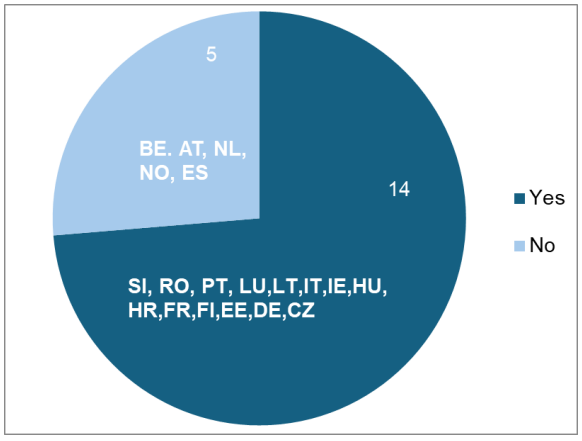
The comparison shows that the responsibilities of TSOs following the ITO model are the most elaborated with article 51 outlining TSOs and NRAs competences in the network development process.

No specific provisions are included for the OU model (see article 43).

The provisions for the ISO model are comparatively less extensive (see article 44). When looking at the status of transposition of article 51, a large majority of Member States (14 out of 19 responses received) report having transposed Article 51 of the Electricity Directive, regardless of the unbundling model of their TSOs.

For these 14 Member States, this approach effectively extends the specific competences outlined in Article 51 (which were designed for the ITO model) to their entire TSO landscape, creating a more harmonized national framework for NDP oversight.

Figure 2: Transposition of article 51 in national law



Source: CEER, 2025

Some countries have transposed Article 51 either partially or not at all due to the prevalence of the OU unbundling model (BE, AT, NL, ES, NO). Depending on the country, provisions of article 51 that have not yet been transposed are related to:

- The binding ten-year horizon of the NDP and the biennial review obligation.
- The obligation for TSOs to publish the NDPSs on their website.
- The obligation for TSO to also consider potential for the use of demand response, energy storage facilities or other resources as alternatives to system expansion.
- The duty for NRAs to consult all actual or potential system users on the NDP and publish the results of the consultation process.
- The duty for NRAs to examine whether the NDPs covers all investments needs identified during the consultation process and whether is it consistent (i) with the EU - TYNDP and consult ACER if any doubt arises, and (ii) the NECP.
- The various measures that NRAs can take in circumstances where the TSO, other than for overriding reasons beyond its control, does not execute an investment which is still relevant based on the most recent NDP.

However, there is additional NRA oversight applicable to all three unbundling models (i.e. independently from article 51 provisions):

> **NRAs shall monitor investment plans of TSOs and provide an assessment of the investment plans regarding their consistency with the Union-wide NDP** in their annual report, including potentially recommendations to amend the investment plans.[9]
>
> NRAs shall monitor the implementation of rules relating to the roles and responsibilities of TSOs.[10] As recorded by ACER,[11] an increase of scrutiny powers of NRAs is notable. This pertains the approval or amendment powers, consultation of NDPs, examination of investment needs and consistency with the EU-TYNDP and NECPs.

Most NRAs already exercise powers in those regards but still, there remain countries where the regulatory oversight remains more or less limited.

With regards to the **future legislative framework** for grid development, there are several planned or ongoing initiatives that will have an impact on the European network development process. The European Grids Package of the European Commission will shape the future grid upgrade and expansion to support rapid electrification and speed up permitting in the EU. However, from NRAs' perspective, there are several aspects of the existing framework that function well, amongst other the existing legal framework for transmission NDPs. Nonetheless, it is necessary at national level for the relevant NRA to hold approval powers over the national transmission NDPs for sake of efficiency and coherence.[12]

[9] Directive (EU) 2019/944, Article 59 (1 (k)).

[10] Pursuant to Regulation (EU) 2019/944, Article 59 (1 (u)).

[11] ACER Opinion 07/2025 on the electricity NDPs, Link.

[12] CEER's reply to the public consultation on the European Grids Package can be found online: Link.

3 NRAs powers regarding transmission grid development

The following chapter addresses the main **powers of NRAs** during the grid development process. It is mainly based on the answers from the survey and structured around the different phases of the NDP process (content and assessment, implementation and monitoring) but also focussing on the resources and capacities of NRAs as well as challenges and reform needs faced by NRAs.

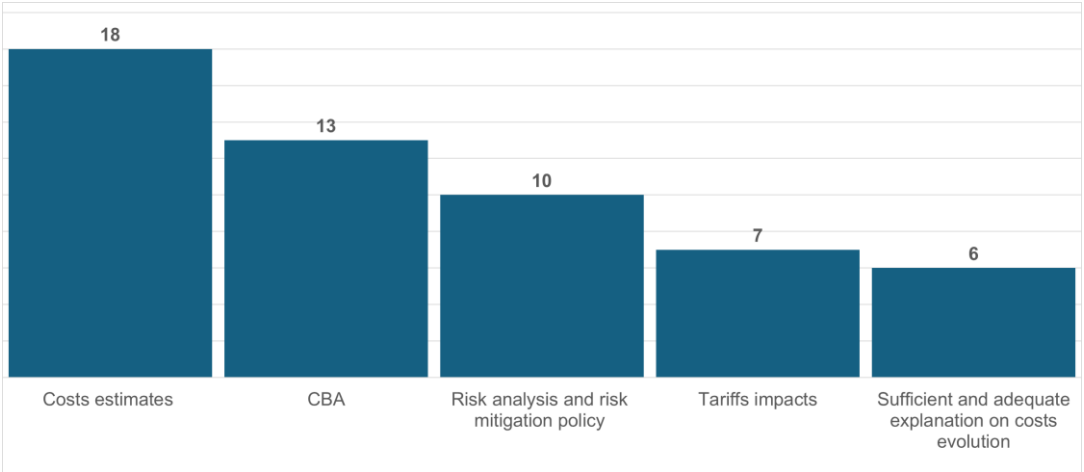
NDPs are mandatory at national level. However, the procedure to obtain the NDPs is not harmonised across Member States. Hence, different NRAs might have different powers when it comes to grid development.

3.1 NDPs Content, Assessment & Approval

The figure below depicts the **content of NDPs in terms of projects costs, benefits, and associated risks** among countries. While NDPs cover different kinds of information, the importance given to each of them varies across countries, reflecting differences in national approaches.

For example, although all respondent NRAs state that their NDPs include **cost estimates**, a much smaller number of them report that these plans provide sufficient and clear explanations of **how cost estimates evolve over the lifetime of investment projects** (6 out of 19), or report on the tariffs impacts for grid users (7 out of 19).

Figure 3: Content of NDPs



Source: CEER, 2025

Cost-benefit analysis

- More than half of the NRAs (13 out of 19) report that the TSO's NDPs include a cost-benefit analysis (CBA).

- In some cases, however, this analysis is limited to large or capital-intensive projects or is only implicit, as in Luxembourg, where the NDP states that such analyses are conducted but not documented in.[13]
- In contrast, in Spain, the CBA is explicitly required under the Spanish Electricity Sector Law.

Risk analysis and mitigation policies

- Are considered as an integral part of the NDP in only slightly more than half of them (10 out of 19).
- In some cases again, this risk analysis remains partial or limited to large projects or cross border projects.

Tariff impacts

- Are addressed in 7 out of 19 cases, though in some instances only for limited periods — for example, just the first three years of the NDP in Hungary.
- In Spain, tariff impacts are evaluated in the CNMC's opinion on economic and financial sustainability of the electricity system and included in each of the project sheets elaborated in the NDP.

Cost estimates

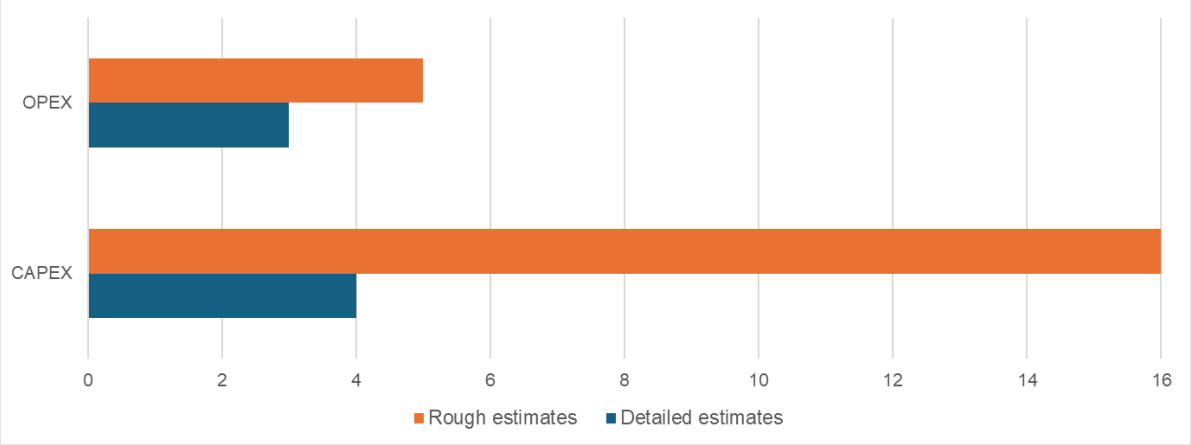
- NDPs include cost estimates in all respondent countries. Again, the responses highlight certain disparities: for example, while ERÚ indicates that this cost information remains limited, AGEN and CNMC specify that it covers all or most investment projects.
- In Spain, the investment costs of all or most projects are also made available to the public.

Breakdown of costs estimates

- Rough estimates of CAPEX are usually provided in the NDPs (16 out of 19), compared to detailed CAPEX or OPEX estimates in general. Detailed CAPEX estimates are provided in only four countries while a very small minority of NRAs report OPEX estimates in NDPs, be it rough (5 out 19) or detailed (3 out 19).
- Only in Spain, NDPs provide both rough and detailed estimates for CAPEX and OPEX. In Luxembourg, the disclosure of CAPEX estimates in the NDP, regardless of the level of detail, depends on the time horizon of the project.

Figure 4: Cost estimates breakdown

[13] The NDP only sets out guiding principles such as economic efficiency and the NOVA principle - which favours optimisation over reinforcement, and over extension - but does not formally require a documented positive CBA. The NOVA principle, in the context of electricity transmission planning, is a planning and investment prioritization framework that stands for **NO** extension before **O**ptimisation, **V**irtualisation and **A**utomation.



Source: CEER, 2025.

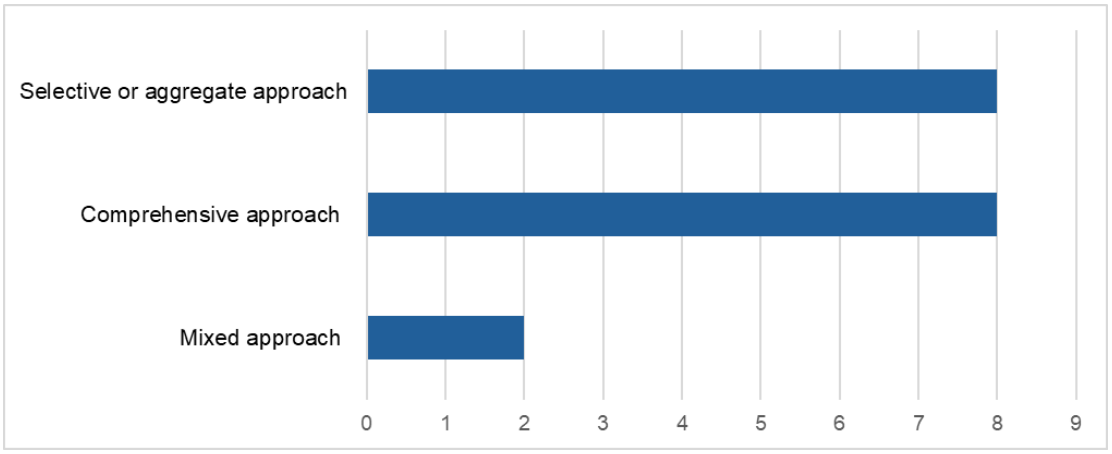
Only a few NRAs (6 out 19) mention that NDPs provide **sufficient and adequate explanation of how estimated costs evolve over time**, during the lifetime of the investment projects. In some cases, this holds only for cost changes exceeding 25% or larger projects and cross-border projects.

Some aspects and concerns have been raised regarding the **cost-related information** included in the NDPs:

- In Belgium, a number of investment projects do not include cost estimates, whether indicative or detailed. Furthermore, when such estimates are provided, they are not broken down over time, resulting in significant limitations in the availability and quality of cost-related information;
- In Germany, TSOs provide (updated) tables of standard cost assumptions, as well as an overview of total investment costs if all proposed projects would be realised, based on those standard costs. However, these figures include only the costs of assets and construction, not of equity and debt;
- In Hungary, the NDP applies actual unit costs based on relevant contracts. These costs are not publicly disclosed (but are known to the NRA) and mainly serve to compare investment options on a financial basis. In addition, cost projections for long-term projects bear significant uncertainties due to tight market conditions;
- In Luxembourg, NDP focuses on planned projects costs, while revenue/tariffs setting relies on actual costs from completed or ongoing projects.

While some countries provide **cost information for all TSO investment projects**, a similar proportion adopt a more selective or aggregate approach, limiting costs data to certain categories or project types. In eight out of 18 cases, NDPs report cost estimates for all TSO projects, indicating a balance between comprehensive and selective or aggregate approaches among national practices. The NDP follows a mixed approach in only two cases, depending on whether the investment project is clearly identified. The figure below shows the distribution of approaches among respondent NRAs.

Figure 5: Approaches to cost information coverage for TSO investment projects



Source: CEER, 2025, n=18.

Regarding **selective or aggregate approaches to cost information coverage** several aspects can be highlighted.

- The German and Belgian NPDs provide costs estimates primarily for interconnection projects. In Belgium, these estimates also extent to the 380 kV transmission grid. Interconnection projects undergo CBA analysis in both Belgium and Spain. Internal projects in Germany, though more numerous, are assessed mainly through technical analysis (impact on load flow and congestion alleviations) and do not receive the same detailed cost treatment, since the main target of the NDP is to provide a reliable and well-functioning grid under the assumed realistic developments.
- In the Czech Republic and the Netherlands, NPDs limit detailed estimates to significant or major projects (i.e. offshore connection).
- In other countries, cost information is also provided for other projects, but for the overall investment trajectory rather than for each individual project. This is the case in Finland, where details concern the NPD as whole and in Spain where the CBA is carried out on a set of investments that provide an aggregate functionality to the system rather than on individual projects, to ensure that the benefits are identified in their entirety.
- In Estonia, data focus on confirmed investments in the 2025-2027 NDP and Croatia provides detailed estimates only for long-lasting projects.
- France combines all approaches (i.e. mixed approach). While the NPD mostly provides detailed cost estimates for major projects (onshore and offshore), the TSO also publishes the cost estimates used to calculate overall investment trajectories. In addition, every year, the TSO submits a comprehensive investment programme to the NRA with the costs of all of its of investment projects.
- In Luxembourg a **mixed approach to cost information coverage** is applied, where well defined projects are monitored individually with full technical and financial documentation. Other projects are grouped and managed under an aggregate envelope approach with relatively detailed information nonetheless.

In case **NRAs assess NDPs before their approval**, a large majority of NRAs (14 out of 19) apply **specific criteria or performance indicators** to evaluate NDPs prior to approval or issuing an opinion.[14]
Criteria quite frequently used are the compliance with climate targets (i.e. from the NECP), cost benefit analysis or social welfare, or tariff impacts. Other criteria used by several NRAs are cost-efficiency, adequacy or compliance criteria (e.g. with the TYNDP or with results of public consultations). In some cases, intensive technical analyses are conducted or indicators such as grid connection capacity increases are being used.

In general, most countries do apply some mix of technical, economic, or policy-based criteria. Still, there is variation in how systematically and intensively these indicators are applied, with some countries relying on rigorous quantitative assessments and others on broader assessment or legal or policy alignment (see box below).

Box 2: Examples of methods used to assess NDPs

E-Control reports that the approval of the NDP requires proof that investments are technically necessary, economically viable, and pursue their objectives with appropriate means. This includes assessing estimated project costs, conducting a risk analysis, and applying the "nova principle"- which prioritizes optimization, then grid reinforcement, and only then grid expansion. Climate targets are not a direct prerequisite for the approval. However, they play an indirect role via other union and national planning instruments that have to be taken into account in the approval process. Also, the nova principle pursues, among other things, environmental goals. In general, the authority must fulfil its duties in line with the Paris climate protection agreement.

BNetzA conducts intensive technical analyses (technical modelling approach) to validate grid reinforcements or expansions. This is done through the following steps:

- Validation of input data (e.g. regionalisation of generation, load and other scenario assumptions)
- Calculating the load flows for every hour of every scenario (8760 x 6) with and without automated outages for the grid topology with and without the project to be assessed. This is done for every project (~190 last iteration). This requires a significant number of calculations, each taking several hours and producing terabytes of data.
- After the calculation, the results are analysed to determine how each project impacted the load flows in the grid with and without outages and whether or not it was able to significantly alleviate congestion and was adequately utilised.
- Interconnectors are analysed via CBA, which means a separate market model has to be calculated and the different effects of the interconnector quantified.

[14] In Belgium, CREG does not approve the NDP but issue an opinion. Also, in Spain, CNMC must issue an opinion on economic implications before NDP approval. In Italy, the NDP is approved by the Ministry of the Environment and Energy Security subject to an opinion by ARERA.

CRE evaluates NDPs through direct exchanges with the TSO (RTE). This includes: grid renewal criteria, possible mutualization of grid connections, reinforcement and interconnections needs. The climate trajectory, particularly how projects align with global warming targets, is also considered in the NDP approval process by CRE. Specific projects and CBA analysis are assessed on a yearly basis in the investment program of RTE.

Endowed only with an advisory (not an approval) role, **CREG** relies exclusively on CBA results as the main quantitative indicator.[15] Similarly, **HERA** applies CBAs for major capital projects and tariff impact assessments, primarily during the first three years of the NDP. In Luxembourg, the CBA technique is also used (in combination with cost-efficiency, adequacy) but potential for improvement during implementation is identified. In addition, compliance with EU policies criteria (including TYNDP and NECP) is checked.

CRU and ARERA follow a very formal approach when approving the NDP, applying compliance criteria based on legal obligations set out in national and European regulations. In particular, the evaluation considers whether the NDP addresses all investment needs identified during the consultation process and whether it is consistent with the TYNDP at Union level as well as with the National Energy and Climate Plan (Italy).

VERT/NERC lists cost-efficiency, tariff impacts, and compliance with climate targets as core assessment criteria, reflecting a broader concern for both economic viability and environmental alignment. The same holds for Portugal, where ERSE evaluates expected tariffs impacts and, in a qualitative manner, indicators like adequacy, compliance with climate targets, grid connection capacity increase, social welfare, among others.

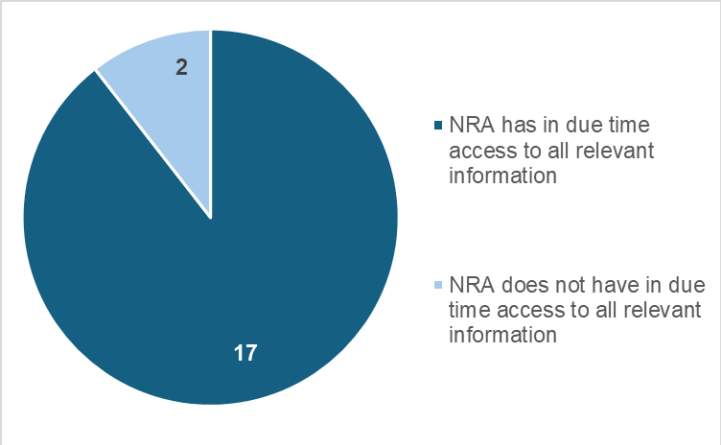
ANRE applies a simpler set of criteria, focusing on adequacy and tariff impacts, while AGEN assesses NDPs based on CBA results, tariff impacts, and alignment with climate targets.

ACM's focus is on assessing whether the TSO has reasonably developed the NDP, justified the necessity of investments and avoided both over- and under-investment. Interestingly, costs are not directly assessed when assessing NDP, but legal compliance (e.g. climate targets) are. It is worth noting that the ACM is currently updating its regulatory approach. Starting in 2027, the ACM also plans to evaluate the efficiency of the TSO/DSO's processes and procedures based on the NDP.

In case NRAs have a scrutiny role on the NDP, most NRAs (17 out of 19) have **access to all relevant information in due time before issuing an opinion or approving the NDP**. Three NRAs refer explicitly to the legal obligation of the TSO to provide any information deemed necessary by the NRA for assessing the NDP. Two NRAs state that they do not have access in due time to all relevant information to assess the NDP.

Figure 6: NRA's access to relevant information in due time

[15] However, it is the ambition to include the impact on the regulated asset base and indicators of the plan's adequacy with system needs in future editions of the plan.



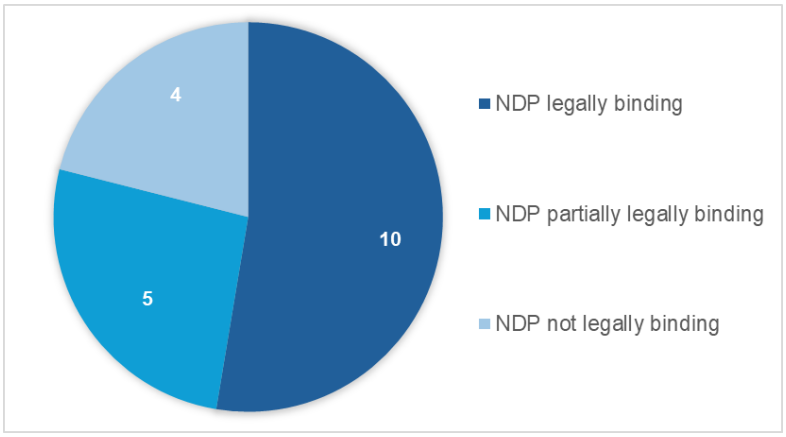
Source: CEER, 2025, n=19.

On the question whether NRAs can **unilaterally amend the NDP**, the survey answers show an even split between positive and negative answers. Just over half of the NRAs (10 out of 19) do not have the power to amend unilaterally the NDP. However, some NRAs responded that they can encourage TSOs to modify or amend the NDP. For the NRAs which have the power to amend the NDP, their power is conditioned by the limits set out in the national legislation. These limits can be grouped in two categories:

- Power to oblige the TSO to modify or amend the NDP.
- Power to amend in certain cases the NDP without intervention of the TSO.

The **approval of the NDP is mostly (either totally or partially) legally binding on the network operator**. Only in four countries, the approved NDP is not legally binding for the transmission system operator.

Figure 7: Legally bindingness of approved NDP



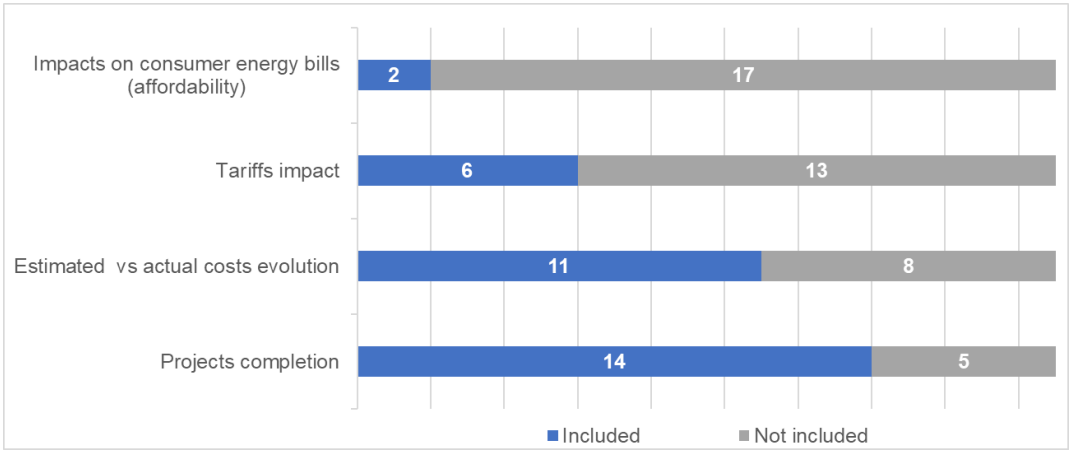
Source: CEER, 2025, n=19.

NRAs mostly (15 out of 18) do not give a **cost-conditional approval or favourable opinion** on NDP-projects. Two NRAs provide as a general rule a cost-conditional approval or opinion on NDP-projects. One NRA provides a cost conditional approval only for some projects.

3.2 NDPs Implementation & Monitoring

The **monitoring of the approved NDPs** lies within the responsibilities of most of the NRAs consulted. However, the scope of the monitoring varies. While for most NRAs (14 out of 19) the monitoring of projects' completion is an integral part, the monitoring of the evolution of estimated versus actual costs is done by 11 out of 19 NRAs, and the impact on tariffs only by six NRAs. The potential impact on consumers' energy bills is only done by two NRAs. Two NRAs mentioned that they are not doing an exhaustive monitoring of NDPs' implementation. However, it was mentioned that when needed some investments might be subject to a similar type of monitoring or that other programmes (outside of the NDP process) are subject to monitoring (the capital expenditure program of the price control framework of the NRA. Other aspects of monitoring can include the priority of projects with underlying reasons or the monitoring of timing and its impact on connection request and other infrastructure projects.

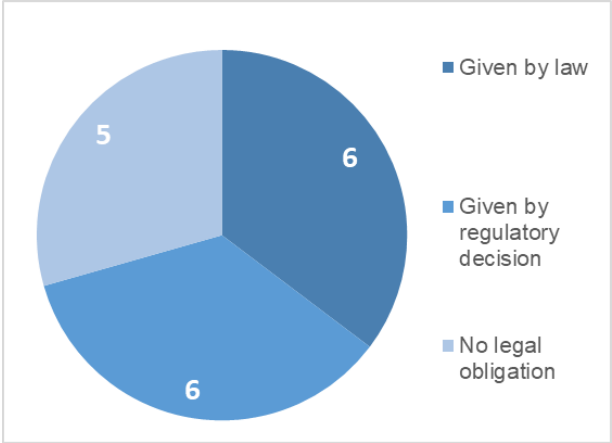
Figure 8: Scope of NDP monitoring



Source: CEER, 2025, n=19.

For most countries, the **TSOs are obliged to submit a progress report** on the NDP implementation (12 out of 17 NRAs). This is done either via law (six NRAs) or via regulatory decisions (six NRAs). In five cases, TSOs are not obliged to submit a progress report (see figure below). The frequency of the reporting varies between quarterly, twice a year, annually or every two years. In general, those reports are publicly available.

Figure 9: Legal obligation by TSOs to submit progress report



Source: CEER, 2025, n=17.

The **main component of the progress reports** is usually an update of the status of projects (planning, approval, construction etc.). This can for instance include a concrete project timeline and planning progress (approval procedures, public tendering etc.). Information on the evolution of costs is less represented. Information on costs can include an update on deviations from original costs and adequate explanations, tables on aggregated investment costs, or the financial (and quantitative) realisation of the NDP for each group of electricity facilities and assets.

In case **deviations from approved NDP arise with regard to planned investments**, NRAs have some competences and powers. Most prominently, in case TSOs do not execute an investment, Article 51 of Directive 2019/944 grants NRAs the power to[16]:

- Require TSOs to execute the investments in question;
- Organise a tender procedure open to any investors for the investment in question; or
- Oblige the TSO to accept a capital increase to finance the necessary investments and allow independent investors to participate in the capital.
- In this case the NRA ensures that the relevant tariff regulations shall 1) cover the costs of the investments in question and 2) the relevant financial arrangements shall be subject to approval by the NRA.

All NRAs having fully transposed Article 51 in national law have those tools at their disposal. However, those tools are related to the situation where an investment is not executed. There are some other tools NRAs have in case the investment deviates from the NDP. For instance, BNetzA could tighten reporting obligations for TSOs (on their investment behaviour) and similarly HERA could require more detailed explanations by TSOs on the reasons. VERT has the option to not approve such investments although they were included in the NDP. ILR pointed out that the main tool is the revenue/tariff setting methodology with its build-in incentives to foster efficient execution as there is no possibility for a penalty or enforcement if the TSO decides to revise a project (given that the reasons are shared with the NRA). However, for most NRAs the tools are applicable only to the situation where a TSO does not execute an investment (as stipulated in Article 51).

[16] Given that Article 51 is transposed into national law, independently from the unbundling models of TSOs.

The majority of the consulted NRAs reported that **TSOs are not legally obliged to publish updates on investment costs** (11 out of 17 NRAs). There are some exemptions. For instance, E-Control reported that TSOs are not legally obliged to publish general updates on investment costs but cost increase of more than 10% must be reported to the NRA. ECA stated that although the TSO does not have to publish updates, it has to submit reports on investment costs and updates to the regulator for monitoring purposes. HERA added that although there is no legal obligation to publish updates, the NDP is issued every year in Croatia, so the costs are updated.

If TSOs are obliged to publish investment costs updates, this can take various forms:

- CRE and CRU reported that TSOs must submit an annual investment plan.
- ACM pointed to tariff setting related updates.
- ACM receives annual updates for the tariff decision (not linked to NDP)
- ARERA: the Italian TSO presents the CAPEX figures for each investment
- BNetzA: the TSOs are obliged to publish the CAPEX from the CAPEX mark up (a surcharge on the cost of capital, which makes it possible to refinance new investments in the grid by increasing the revenue cap during the regulatory period annually on a planned-cost basis).

Cost remuneration and incentives

Regarding the question under which circumstances **investment costs can be passed on to consumers**, in general, if costs of approved investments are rated as efficient, economically justified and necessary they can be passed on to consumers through tariffs. In principle, if the NRA reviews and approves an investment based on certain criteria (economic efficiency, reasonable, etc.), the costs can be remunerated via tariffs. Other regulatory conditions have not been reported by the responding NRAs. NRAs highlighted the following general regulatory conditions that must be met (list non exhaustive):

- E-Control: Only investments that are appropriate in terms of reason and amount are taken into account in the tariffs.
- BNetzA: Beginning of remuneration via tariffs without time-lag to investments as TSOs can adjust their allowed revenues for CAPEX from new grid investments annually on a planned-cost-basis.
- ILR: The framework foresees a pass through of actual cost +/- bonus-malus, as long as the costs are deemed efficient and compliant with legal missions of TSO. So revenue is revised for actual investment cost and volumes, difference between actuals and forecasts are analysed and allocated between operators and tariffs following merit & causality.

In case **significant cost increases** arise, NRAs follow similar procedures. First, some NRAs highlighted that the additional costs might be subject to a re-assessment or scrutiny. Most NRAs responded that, if the costs increases are justified, they can be remunerated via tariffs. There are different approaches to it:

- BNetzA: Remuneration via CAPEX Mark Up procedure;[17]

[17] See more detailed explanations (here for DSOs but process is similar for TSOs):

- CRU: Application of CAPEX Adjustment Mechanism (access additional expenditure within a price control period where it has been identified that there is likely to be significant overspend);
- AGEN: Deviations are cleared at the end of the regulatory period and the difference is carried forward to the next regulatory period;
- ACM: If costs are necessary and efficient they will be included in tariffs. ACM has the possibility to spread costs over time;
- ERSE: TOTEX revenue cap regulation is complemented by a profit and loss sharing mechanism limiting the losses of TSOs given its effective costs (namely investment costs) are higher than the amounts recovered through the allowed revenues.
- CRE and CREG reported on two mechanisms how to exclude significant costs increases from tariffs. CRE has the power to exclude capital expenditure from the RAB of the TSO if deemed inefficient. Moreover, the target budget mechanism allows CRE to give a financial penalty to the TSO if costs are exceeded for a budget (this mechanism might also give a bonus depending on the performance). CREG has the possibility to decide that part of those cost increases cannot be passed on to consumers (and as a result will be supported by the shareholders).

Regarding **incentives to encourage TSOs to carry out effective and efficient investments** the answers of the NRAs vary. Five NRAs responded that currently there are no (sufficient) incentives present. However, three of those NRAs stated that incentives are being developed for the next regulatory period. Existing incentives from other NRAs range from financial incentives for efficient project implementation, decreasing rates of return for investments during construction, to OPEX incentives by a return on cost savings for TSOs and consumers, or a penalty for failure to achieve the plan below a percentage established by NRA regulation. ERSE reported on the incentive for the Portuguese TSO to improve the network's technical performance and achieve that network planning is executed in a way that ensures the defined power quality standards and the defined interconnection goals. There are several incentive tools that are being developed by the NRAs:

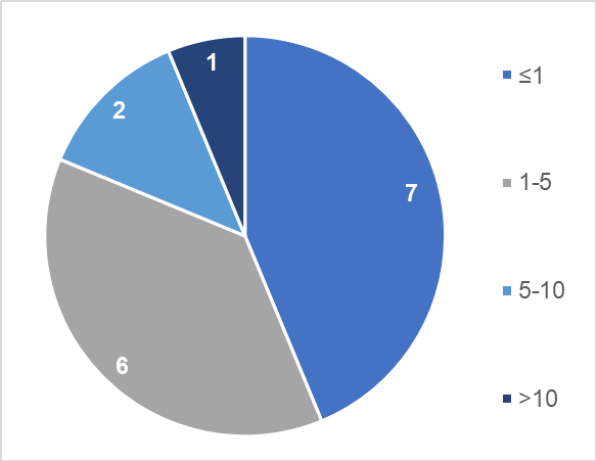
- ERÚ: Efficiency incentive: there will be a tool with certified methodology for investment assessment for ex-ante and ex-post scrutiny.
- ACM: Efficiency assessment beforehand from 2027 on (so far afterwards as benchmarking).
- BNetzA: Possible options for an efficiency assessment of TSOs are partial benchmarking, activity-based costing and output-based setting of costs.

https://www.bundesnetzagentur.de/EN/RulingChambers/Chamber8/RC8_05_Revenue%20caps_revenue%20regulation/55_Adjustment%20of%20capital%20expenditure/Adjustment%20of%20capital%20expenditure.html

3.3 NRAs resources and capacities

NRAs showcase significant disparities in **staffing dedicated to assessing NDPs**. BNetzA and ERSE report the highest engagement, with 5–10 and over 10 full-time equivalents (FTEs) respectively, including specialized modelling teams. In contrast, other NRAs like ECA, HERA, and AGEN operate with less than one FTE, indicating potential resource constraints. E-Control notes that while four staff members contribute to NDP processes, none work on them full-time. ILR clarifies that half of its small multidisciplinary team (9 FTEs total) is intermittently engaged during peak periods, suggesting fluctuating capacity. The figure below shows the overall distribution of FTE that are engaged in the NDP process at NRAs.

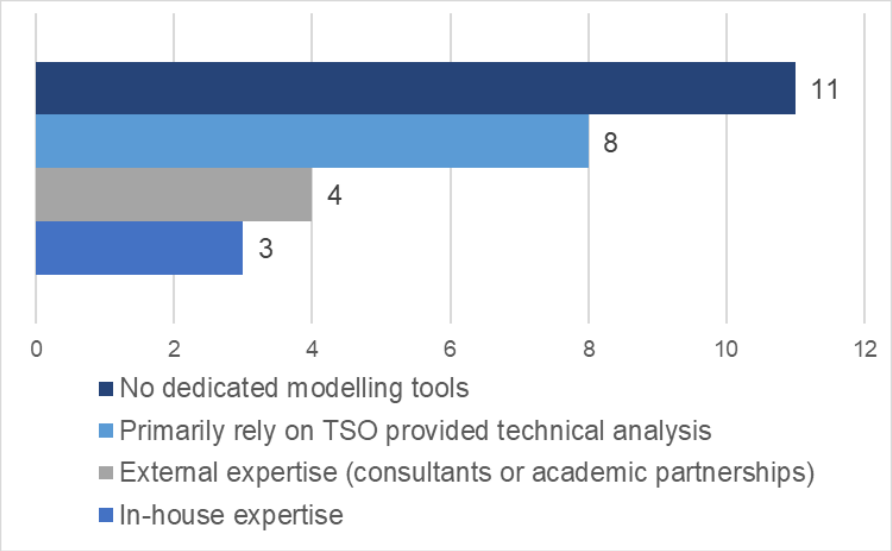
Figure 10: FTE per NRA in the NDP process



Source: CEER, 2025, n=16.

When it comes to **technical modelling capabilities to assess NDPs**, most NRAs rely heavily on TSOs for technical analysis, with some NRA's explicitly stating dependence on TSO-provided data. This constitutes a certain reliance, particularly where NRAs lack in-house tools. BNetzA stands out for developing advanced in-house modelling, including automated load-flow calculations and scenario analysis. ERSE reports in-house expertise for tariff impact analysis but admits gaps in network modelling, while ILR cites benchmarking challenges due to inconsistent data. The figure below illustrates the available technical modelling capabilities of NRAs and which main sources they use.

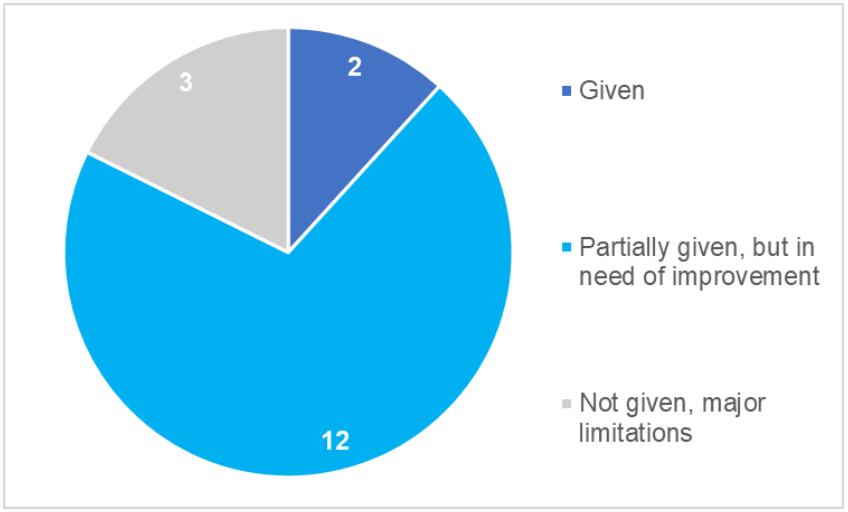
Figure 11: Technical modelling capabilities of NRAs



Source: CEER, 2025, n=16.

Looking at the **satisfaction with the analytical capacity**, only CRE, CRU, and RME express full satisfaction with their capacity. The majority flag partial shortcomings, often tied to insufficient tools or expertise (see figure below). BNetzA acknowledges room for improvement despite robust capabilities, while ILR highlights data granularity as a bottleneck. Clear deficiencies are reported by EV, HERA, and AGEN, with HERA and AGEN citing "major limitations" due to staff shortages.

Figure 12: NRAs' satisfaction with their analytical capacities



Source: CEER, 2025, n=17.

Regarding **institutional collaboration on network development issues**, the coordination with ministries, ACER, and ENTSOs is common, but depth varies. For instance, CREG and BNetzA engage regularly with TSOs and policymakers, while ERSE collaborates occasionally on cross-border issues. MEKH and AGEN report no collaboration.

4 Conclusion

This report has examined the regulatory oversight of transmission grid development across Europe, focusing on the roles, competences, and challenges faced by NRAs. The findings reveal significant disparities in how NRAs assess, approve, and monitor NDPs, with implications for the efficiency and transparency of grid investments.

At EU level, the network development process is clearly defined and follows a three-step procedure: **1) scenario development, 2) needs assessment and 3) project identification**. At national level, those steps are also largely followed, although there is no unified procedure for the different aspects. Furthermore, the NDPs of the electricity and gas/hydrogen sector need to be closely coordinated as joint scenarios and the basis for the plans are required.

The **Electricity Directive** is a central part of the network development process as it specifies the responsibilities of TSOs and NRAs. The Directive outlines three regulation models that differ based on the TSO ownership structure. The Directive only details the NDP process for the ITO model (Article 51). Although article 51 only foresees the NDP process for the ITO model, many MS have implemented this article. Its provisions related to the NDP process apply to **all TSOs regardless of their unbundling regime even if the** transposition of Article 51 of the Electricity Directive remains uneven. Furthermore, while most MS have implemented its provisions, gaps persist in areas such as biennial reviews, public consultations, and enforcement mechanisms for non-executed investments.

NDPs are mandatory at national level, however, the procedure to develop the NDPs is not harmonised across MS and different NRAs might have different powers when it comes to grid development.

On the **content of NDPs,** these cover different kinds of information and the importance given to each of them varies across countries, reflecting differences in national approaches. All NRAs state that their NDPs include cost estimates but only a few consider that these plans provide sufficient and clear explanations of how cost estimates evolve over the lifetime of investment projects or reports on the tariffs impacts for grid users.

Most of the NDPs contain an **understandable breakdown of costs estimates,** meaning a rough estimate of CAPEX compared to detailed CAPEX or OPEX estimates in general. Detailed CAPEX estimates are provided in only four countries. In some countries NDPs provide both rough and detailed estimates for CAPEX and OPEX, whereas in other countries , the disclosure of CAPEX estimates in the NDP, regardless of the level of detail, depends on the time horizon of the project. Tariff impacts are addressed in only a few cases and for limited periods, or are evaluated in the NRAs opinion on economic and financial sustainability of the electricity system. Some countries provide cost information for all TSO investment projects whereas others adopt a more selective or aggregate approach, limiting cost data to certain categories or project types.

In some cases, NRAs **assess NDPs before their approval**. A large majority of NRAs apply specific criteria or performance indicators to check the economic sustainability of the system prior to approval or issuing an opinion on the NDPs. In general, most countries do apply some mix of technical, economic, or policy-based criteria. Variations still remain when it comes to how systematically and intensively these indicators are applied, with some countries relying on rigorous quantitative assessments and others on broader assessments or legal/policy alignment.

In case where NRAs have a **scrutiny role on the NDPs**, most NRAs have access to all relevant information in due time before issuing an opinion or approving the NDPs. Half of the NRAs do not have the power to amend unilaterally the NDPs. For the NRAs which have the power to amend the NDPs, their power is conditioned by the limits set out in the national legislation.

The **approval** of the NDPs is mostly (either totally or partially) legally binding on the transmission network operator. Most NRAs do not provide a cost-conditional approval or favourable opinion on NDP-projects.

The **monitoring** of the approved NDPs lies within the responsibilities of most NRAs, however, the scope of the monitoring varies. While for most NRAs the monitoring of projects' completion is an integral part of their work, the monitoring of the evolution of estimated versus actual costs is done by two-thirds of NRAs and the impact on tariffs only by six NRAs; whereas the potential impact on consumers' energy bills is only done by two NRAs.

With regards to **reporting** and for most countries, the TSOs are obliged to submit a progress report on the NDP implementation to the NRAs. The report is usually an update of the status of projects (planning, approval, construction etc.). This can for instance include a concrete project timeline and planning progress (approval procedures, public tendering etc.). Information on costs can include an update on deviations from original costs and adequate explanations, tables on aggregated investment costs, or the financial (and quantitative) realisation of the NDP for each group of electricity facilities and assets. In cases where deviations from the approved NDPs arise with regard to planned investments, NRAs have some competences and powers under Article 51 of the Electricity directive (see above).

It shall be noted that for the majority of countries, TSOs are not legally obliged to publish updates on investment costs. For those who are obliged, this can vary e.g. submit an annual investment plan; receive annual updates for the tariff decision; presents the CAPEX figures for each investment; publish the CAPEX from the CAPEX mark up (a surcharge on the cost of capital, which makes it possible to refinance new investments in the grid by increasing the revenue cap during the regulatory period). In case of significant cost increase, some NRAs highlight that the additional costs might be subject to a re-assessment or scrutiny, and if the costs increases are justified, they can be remunerated via tariffs.

When it comes to **resources**, NRAs exhibit wide variations in staffing and technical capacity. Regulators with larger resources deploy dedicated teams and advanced modelling tools, whereas other NRAs struggle with limited resources and reliance on TSO-provided data. The primary challenges include resource constraints and the need for **greater independence from TSOs in technical analysis**. Oversight effectiveness is often hampered by information asymmetries, particularly regarding cost transparency and risk assessments. Only a minority of NRAs require detailed explanations of cost evolution or tariff impacts.

Finally, regarding institutional collaboration, the coordination with ministries, ACER, and ENTSOs is common, but depth varies. Some do engage regularly with TSOs and policymakers, while others collaborate occasionally on cross-border issues.

NDP challenges and views on improving the network development process

The main challenges faced by NRAs in the context of NDPs concern a variety of issues. Based on the responses from NRAs, the main obstacles lie in the following fields:

- Resources constraints
- Information asymmetry
- Rapidly changing and complex electricity system to which NDPs must respond
- The high frequency of NDP publication (every two years)
- Coordination of voltage relief measures during construction and commissioning phases
- The requirement to assess the whole business operation of the TSOs, on the only basis of NDPs and the difficulty to speed up investments processes within this framework
- Underestimation of costs (CAPEX and OPEX) combined with the absence of cost-conditional approval of the NDP
- The limited scope of NDPs: issues such as renewal, digitization, stress management, and adaptation to climate change are also important investment topics.

Resource constraints are clearly the main challenge for NRAs in the context of NDPs, particularly compared to the resources available to TSOs.. Such constraints may relate to the staffing levels dedicated to the task or the availability of modelling tools or methodological best practices. The high frequency of NDP publication (every two years) amplifies this issue.

The second major challenge lies with **information asymmetry**, which includes the consistency, transparency, and timely availability of data needed by NRAs to effectively carry out their tasks. This issue is especially relevant in relation to cost data and the technical alternatives or options linked to investment projects. Regarding suggestions to improve the regulatory oversight of NDPs (procedural or other, at national or EU level), NRAs presented views and suggestions on several aspects:

- **Strengthen NRAs' scrutiny power over NDPs:** Amongst others, some NRAs suggest strengthening NRAs' scrutiny power over NDPs through measures including stronger involvement of the NRA prior to the approval of NDPs by the NRA, as well as the strengthening of enforcement powers to NRAs. While no additional legislative measures are deemed necessary in the short term, enhanced European cooperation - for instance through CEER - is recommended, particularly by sharing best practices. Only one NRA indicated that requiring NRA approval of the NDP would necessitate a

much more detailed, project-level plan, along with improved analytical tools and additional resources for the NRA. At this stage, such additional regulation is not considered necessary.

- **Strengthen TSOs' transparency obligations:** NRAs suggested to strengthen TSOs' transparency obligations from the earliest stages of the TYNDP process and related procedures such as the PCI/PMI list.
- **Joint development of NDPs:** One NRA expressed the wish for a stronger promotion of a joint development of NDPs by TSOs and DSOs.

Annex 1 – Overview of unbundling regimes

Country	NRA	Unbundling regime(s) of TSOs preparing NDPs[18]
Austria	E-Control	One ITO, two OU
Belgium	CREG	OU
Bulgaria	EWRC	ITO
Croatia	HERA	ITO
Cyprus	CERA	n/a
Czech Republic	ERÚ	OU
Denmark	DUR	OU
Estonia	ECA	OU
Finland	EA	OU
France	CRE	ITO
Germany	BNetzA	Two ITO, two OU
Greece	RAAEY	OU
Hungary	MEKH	ITO
Ireland	CRU	OU/ISO
Italy	ARERA	OU
Latvia	PUC	OU
Lithuania	NERC	OU
Luxembourg	ILR	Derogation
Malta	REWS	(no NDP/TSO)
Netherlands	ACM	OU
Poland	URE	OU
Portugal	ERSE	OU
Romania	URSO	OU
Slovakia	AGEN	OU
Spain	CNMC	OU
Sweden	EI	OU

[18] Information based on ACER Opinion 07/2025 on the electricity NDPs

Annex 2 – List of abbreviations

Term	Definition
CBA	Cost-benefit analysis
CEER	Council of European Energy Regulators
FTE	Full-time equivalent
ISO	Independent system operator
ITO	Independent transmission system operator
MS	Member States
NDP	Network Development Plan
NECP	National Energy and Climate Plan
NRAs	National Regulatory Authorities
ONDPs	Offshore Network Development Plans
OU	Ownership unbundling
PCIs	Projects of Common Interest
PMIs	Projects of Mutual Interest
TSO	Transmission System Operator
TYNDP	Ten-Year Network Development Plan

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The Council of European Energy Regulators (CEER) is the voice of Europe's national energy regulators. CEER's members and observers comprise 39 national energy regulatory authorities (NRAs) from across Europe.

CEER is legally established as a not-for-profit association under Belgian law, with a small Secretariat based in Brussels to assist the organisation.

CEER supports its NRA members/observers in their responsibilities, sharing experience and developing regulatory capacity and best practices. It does so by facilitating expert working group meetings, hosting workshops and events, supporting the development and publication of regulatory papers, and through an in-house Training Academy. Through CEER, European NRAs cooperate and develop common position papers, advice and forward-thinking recommendations to improve the electricity and gas markets for the benefit of consumers and businesses.

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Specifically, CEER deals with a range of energy regulatory issues including wholesale and retail markets; consumer issues; distribution networks; smart grids; flexibility; sustainability; and international cooperation.

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