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Webinar on CEER Report on Power Losses in European Electricity Grids

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Background

Since 2017 CEER has undertaken an analysis of losses in European electricity grids

Since then, the CEER Report on Power Losses has made efforts to expand the number of participants with the aim of providing an extended and more reliable database

As a result, the 3rd CEER Power Losses Report raised the total number of participants to 40

History of the report

1st edition, published in 2017

2nd edition, published in 2020

(This) 3rd edition

- Based on a CEER survey from 2023
  - Covers the period from 2013 up to and including 2022.
- Drafting started in 2023.
- The full Report was finally sent to DS WG and was approved on 10 January 2025.
- It was approved by the CEER General Assembly during their meeting on 27 January 2025.
- It was published on 11 February 2025.

Structure of the report

Introduction

Technical and regulatory aspects of losses

- Definition and determination of losses
- Level of losses
- Procurement of losses
- Regulatory treatment of losses

Experiences with treatment of losses

- Case study
- Energy efficiency directive
- Smart meters and power losses

Findings and Recommendations

Fact Sheets and Data Sheets

Introduction

- Power losses are a component of every electrical grid and originate as a consequence of transmission and distribution of electricity, where they constitute a significant amount of energy flows.

- In the simplest of terms, power losses can be described as the difference between the electric energy flowing into and out of a power grid, or in other words, the difference between injections (such as electricity generated) and offtakes (consumption). They can be
  - divided into technical and non-technical components;
  - measured or estimated
    - They are typically measured on higher voltage levels (high and extra high voltage) and
    - calculated/estimated on lower voltage levels (low and medium voltage).

Introduction

- Improvement of energy efficiency and grid reliability, in addition to economic and environmental benefits, are some of the major positive aspects of the reduction of power losses.

- Advanced metering can lead to an overall increase in quality of data used to calculate losses. Smart meters can reduce metering errors and lead to a more accurate measurement of electricity consumption.

- Distributed generation can have either a positive or a negative effect on power losses, depending on the distance between generation and load.

Definition

- All countries except Germany include non-technical losses in the volumes included in this report either
  - as component of losses in distribution or
  - losses in both distribution and transmission.
- Several countries noted that they do not distinguish between technical and non-technical losses. Their overall losses are simply defined as the difference between the injected and delivered energy.
- Non-metered consumption is estimated in most countries (and thus, not seen as losses).
  - A few countries do meter their public lighting

Determination

- The predominant methodology to determine the network losses is based on the difference between total electricity injections and electricity offtakes.
  - Some countries that do not use this approach.

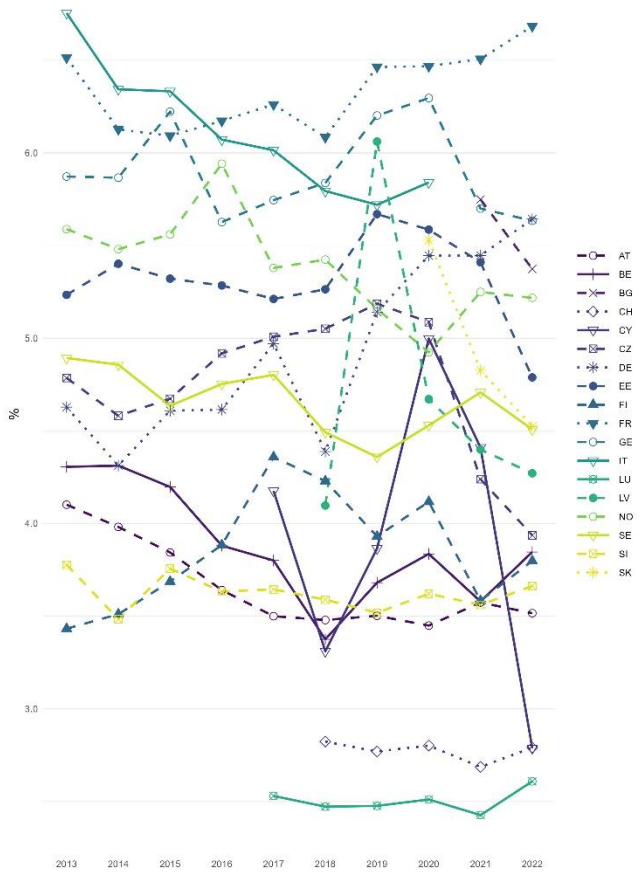
- Generally, the approach adopted to determine losses is the same for both distribution and transmission grids.

Level of losses

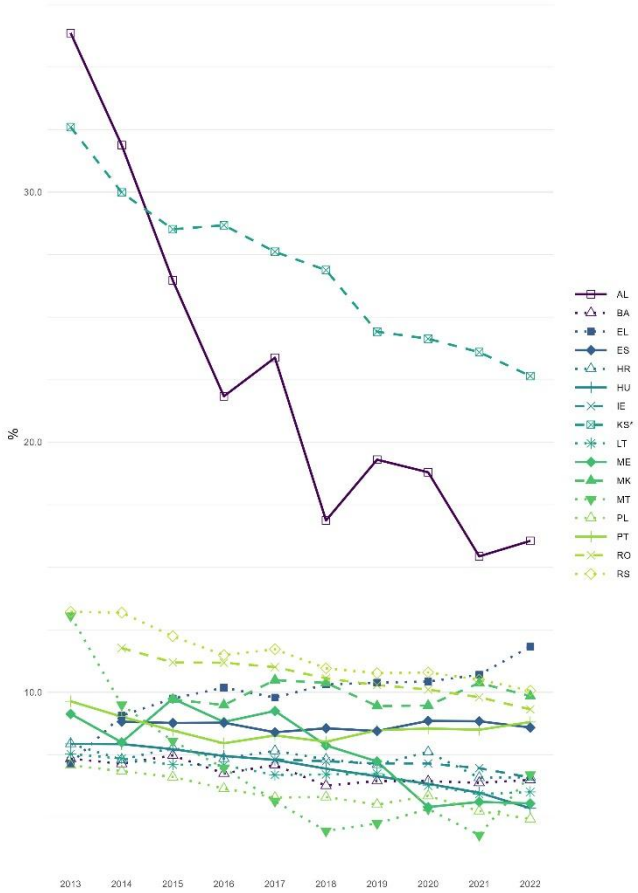
- When comparing data from 40 countries it is important to keep in mind that there are differences in the way losses are defined across Europe
- Throughout the report power losses are presented as percentage of energy injected into the grid.
- All calculations were done by the team writing the report to ensure that the same methodology was used for every country.
- Time series figures are split into two groups for reasons of clarity (with different thresholds for distribution, transmission and total losses)

Level of losses

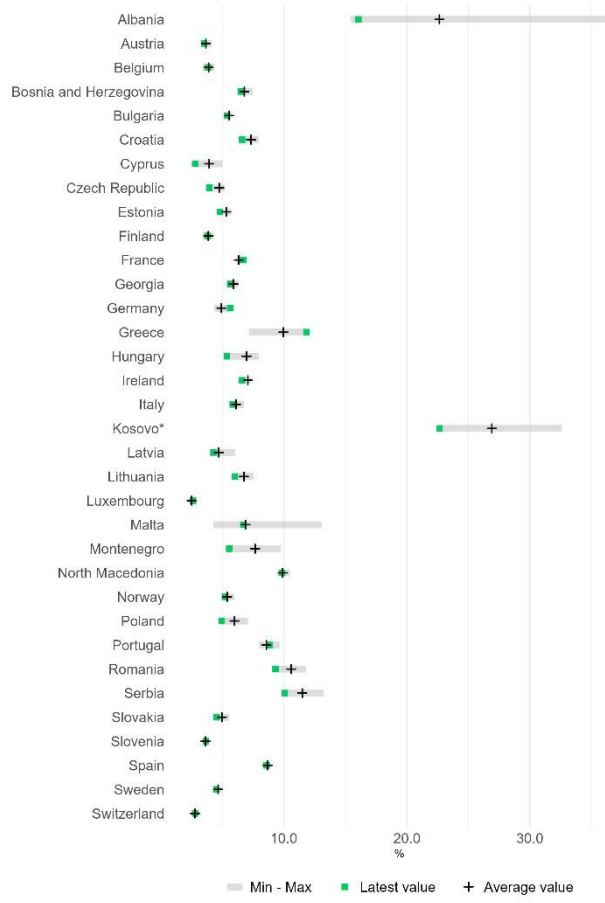
Total lossen as % of injected energy



Time series (below 7%)



Time series (above 7%)



Box Plot

Losses in distribution vary between 1.95% and 22.63% in the latest year data was available for (2022)

- Values show substantial differences among the participants.
- The countries with the highest distribution losses (in percent) have managed cut down their distribution losses by more than 50% (Albania) and by nearly a third (Kosovo*) between 2013 and 2022.
- While many respondents show a decreasing trend in distribution losses, there have also been increases over time in a few countries (Belgium, Greece, Georgia).

Losses in transmission vary between 0.99% and under 3.96% in the latest year data was available for (2022)

- While increases in transmission losses (in percent) have been observed in the last few years in some countries, the rise is only on the order of a few tenths of a percent at the most.

- The percentage of losses depends not only on the absolute value of losses, but on the volume of injected energy as well. With decreased volumes, the percentage of losses will increase, even if losses remain unchanged in absolute terms.

Procurement

- Electricity Market Directive obliges system operators to procure the energy used to cover power losses according to
  - transparent,
  - non-discriminatory and
  - market-based procedures

- Consequently, in most European countries system operators are responsible for procurement of losses in their respective grids
  - There are only a few exceptions to this, where either a supplier (5 countries) or a Balance Responsible Party (one country, only for transmission) acquires the energy necessary to cover power losses

Regulation

- Multiple ways to choose a regulatory approach to power losses, with incentive-based regulation as typical application for European DSOs
- 27 responding countries have implemented at least some type of incentive in distribution
  - Increasing number (it was 20 countries in the 2nd edition of this report).
- Incentives in transmission are not implemented in as many countries as incentives in distribution are
  - probably due to the mostly technical character of losses in transmission making them more difficult to reduce

Findings

- Reduction of power losses is an important contributor to improvement of energy efficiency and decrease of operational expenses of power grids.
- Non-technical losses have different definitions and different components that they include.
- Incentives to reduce power losses in distribution have been implemented in 27 countries, while 18 countries have implemented incentives in transmission.

Findings

- According to Energy Efficiency Directive, system operators are required to quantify the overall volume of network losses and optimise networks and improve network efficiency.
- To bring about a distinct reduction in non-technical losses, a significant level of Smart Meter penetration is essential. Also, there is an indication that the use of SM will lead to a reduction of energy consumption.
- In most European countries, system operators are responsible for procurement of losses in their respective grids, with only a few exceptions to this.

Recommendations

- Harmonize definitions of power losses in order to simplify comparison and enable proper benchmarking among countries.
  - Consensus on a clear differentiation between technical and non-technical losses would simplify the benchmarking of power losses.

- System operators should be given clear incentives to reduce power losses instead of just being allowed to pass the cost to consumers.
  - Where appropriate, operate higher voltages in distribution grids in order to reduce technical losses.
  - Additional mandatory requirements such as replacement of older existing transformers with new high efficiency transformers could also be implemented.

Recommendations

- Increased smart meter penetration can simplify and expedite matching supply to actual demand as the need to use load profiles to estimate demand would be reduced
- Smart meters can help lower the non-technical losses, especially regarding causes such as faulty meter reading or illegal consumption.
- Country-specific characteristics must be taken into consideration as CEER Members and Observers may require individual solutions rather than a single regulatory framework expected to be applied in all of Europe.

Thank you

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