ENTSO-E Position Paper

Anticipatory Investments

Working Group Economic Framework

December 2024

15 YEARS OF entsoe ELECTRIFYING EUROPE

ENTSO-E Mission Statement

Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the **association for the cooperation of the European transmission system operators (TSOs)**. The 40 member TSOs, representing 36 countries, are responsible for the **secure and coordinated operation** of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E **brings together the unique expertise of TSOs for the benefit of European citizens** by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the **security of the interconnected power system in all time frames at pan-European level** and the **optimal functioning and development of the European interconnected electricity markets**, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

Our vision

ENTSO-E plays a central role in enabling Europe to become the first **climate-neutral continent by 2050** by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires **sector integration** and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources.

ENTSO-E acts to ensure that this energy system **keeps consumers at its centre** and is operated and developed with **climate objectives** and **social welfare** in mind.

ENTSO-E is committed to using its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

Our values

ENTSO-E acts in **solidarity** as a community of TSOs united by a shared **responsibility.**

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by **optimising social welfare** in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and **innovative responses to prepare for the future** and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with **transparency** and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

Our contributions

ENTSO-E supports the cooperation among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its **legally mandated tasks**, ENTSO-E's key responsibilities include the following:

- Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;
- Assessment of the adequacy of the system in different timeframes;
- Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);
- Coordination of research, development and innovation activities of TSOs;
- Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in the **implementation and monitoring** of the agreed common rules.

ENTSO-E is the common voice of European TSOs and provides expert contributions and a constructive view to energy debates to support policymakers in making informed decisions.

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Summary of key messages

TSO grid investments are in general covered by EU legal frameworks and national regulatory frameworks which have been in place for some time. The concept of anticipatory investments which was introduced by the Electricity Market Design Reform brings some areas of uncertainty and open some questions for TSOs. In this respect ENTSO-E and its members highly welcome the upcoming ECs guidance following the Grid Action Plan on the treatment of anticipatory investments. In this position paper ENTSO-E wants to share its view on such upcoming EC guidance on anticipatory investments with policy and decision makers, regulators, and all stakeholders.

ENTSO-E defines anticipatory investments as follows: "Anticipatory investments are defined as grid investments that reflect expected future energy system needs aligned with long-term climate and energy policy goals for which there is however a higher degree of uncertainty. Anticipatory investments are based on long-term scenarios factoring in best knowledge of likely developments (e. g.: demand, supply, etc.) and can be justified in National Network Development Plans."

Investing in interconnections and other grid infrastructure, based on anticipated, long-term system needs, benefits the entire European industry and society. Anticipatory investments in grid infrastructure enable the energy transition and help achieve European climate targets. They also help strengthen Europe's energy autonomy and security, the Internal Energy Market (IEM) and will support Europe's competitiveness. While infrastructure costs in the short term will rise due to those investments, the socio-economic benefits are expected to outweigh the costs.

A stable regulatory framework is essential to support anticipatory investments, as they have a long planning horizon and necessitate a substantial investment volume. Large-scale grid expansion and modernisation need to be planned over decades, amid uncertainties about future electricity generation and demand patterns. A stable regulatory framework is necessary to support these large-scale anticipatory investments in an uncertain environment.

Regulatory frameworks should support anticipatory investments with sufficient flexibility, appropriate time horizons and without increasing TSOs' risks. The principle of equal treatment should also be respected; anticipatory investments should be treated and remunerated like any other investment, with regulatory provisions managing the risk of underutilisation of assets. Finally, Transmission System Operators should not be exposed to ex-post financial penalties for anticipatory investments.

European Commission should promote anticipatory investments and support their proper implementation through the forthcoming EC guiding principles. The Electricity Market Design Reform included some regulatory elements for anticipatory investments, but only related with tariff methodologies design. In parallel, the Action Plan for Grids asks for the European Commission to provide further guidance on the issue through the proposal of guiding principles. National regulatory frameworks will also need adaptation to incorporate these elements where appropriate. The upcoming EC guidance should help in the appropriate implementation of anticipatory investment.

National Regulatory Authorities (NRAs) must find a balance point between short-term efficiency and mid-to-long-term efficiency and effectiveness. Restrictive approaches and focussing too much on short-term efficiency and costs are likely to have paradoxical effects because ultimately, underinvesting in grid infrastructure could turn out to be costlier to society than running a controlled risk of anticipatory investments.

In ENTSO-E's view, the development of the EC guiding principles on anticipatory investments should follow five key principles:

1. Long-term forecasts and scenarios should be aligned with climate targets to guide transmission needs in National Network Development Plans.
2. Align National Network Development Plans with European policy goals and IEM in a forward-looking manner that encourages anticipatory investments through sufficiently long-time horizons.
3. Use planning techniques like scenario analyses to assess investments with higher uncertainty.
4. Alignment among stakeholders to identify system needs early, for example, among the Member States, NRAs, TSOs, DSOs, generators, demand, or other infrastructure providers to create synergies with.
5. Provide appropriate regulatory incentives by establishing a regulatory framework that supports investments.

1 Introduction

The International Energy Agency (IEA) report on "Electricity Grids and Secure Energy Transitions[1]" emphasises the necessity for policy and regulation to tackle barriers to anticipatory investments for "grid expansion and modernisation to happen at speed and scale[2]." The European Union and its Member States have among the most ambitious climate goals in the world, which require an unprecedented growth in renewables to serve the increased electricity demand driven by heavy industry, transport, electric vehicles, and data centers.

This significantly updated electricity system will be a key pillar of European industrial competitiveness and energy autonomy in the future. In this context, electricity transmission and distribution grids are the key enabler of the energy transition in Europe, but risk becoming bottlenecks if their build-out does not start well ahead of the anticipated system needs. To support the anticipated system needs, European Electricity Transmission System Operators plan to invest at least € 834 billion until 2050[3].

This requires Transmission System Operators for Electricity (TSOs) to consider system needs with a much longer time horizon than before, thus increasing the inherent uncertainty in investment decisions. This is necessary, as only grid investments in anticipation of future developments of the electricity production and demand and the implementation of the Internal Energy Market accommodate a functional electricity system once these developments will have taken place. Without these anticipatory investments, the required grid expansion and needed interconnections will not enable the rapid expansion of more renewables and new electrification as the average time needed to develop network projects (which is addressed in Figure 1) is several years longer than for generation/demand developments, especially for transmission projects.

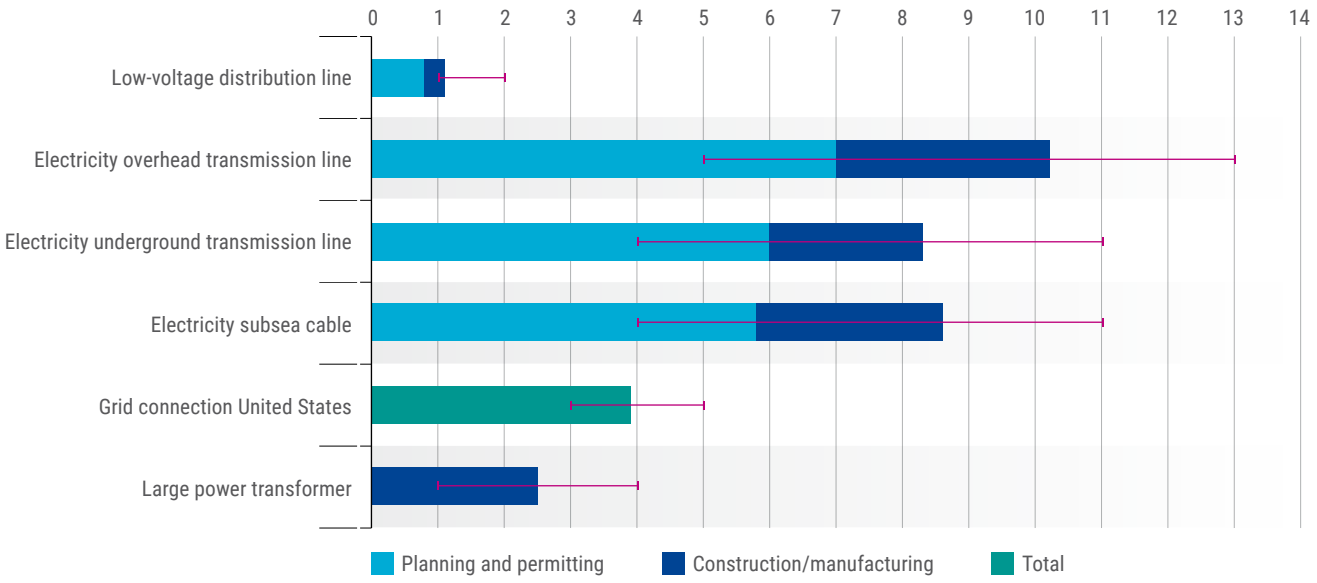

Figure 1: Average lead times to build new electricity grid assets in Europe and the United States, 2010 – 2021[4] Source: IEA

1 International Energy Agency, November 2023

2 IEA, November 2023, page 108

3 Adapting TSOs regulatory systems to finance massive grid investments, page 5

4 Average lead times to build new electricity grid assets in Europe and the United States, 2010-2021 – Charts – Data & Statistics – IEA

While NRAs have historically focused on controlling the risk of TSO's investments and their efficiency, underinvesting now carries the risk of a dysfunctional electricity system and an electricity market that can only be operated at high costs. Both overinvestment (i.e., investing too much, too soon) and underinvestment (i.e., investing too little, too late) carry substantial risks. NRAs are typically more focused on the risk of overinvestment, which is reasonable in a static context but much less so in a context of rapid change, necessitated by the need to limit climate change and to accelerate on the path to energy independence and energy price reduction. Investing too early might cause temporary asset underutilisation (e.g., until forecasted supply and demand fully materialise) and tariff increases in the short term. However, significant transmission investments have very long lead times, and typically the bulk of the financial commitment is only during the construction years. This mitigates the risk of overinvestment, because it gives time to correct the course if the scenarios assumptions do not materialise. Furthermore, additional costs for tariff payers should be counterbalanced by earlier connections of new generation and earlier possibility to connect new electricity demands associated with electrification, thus faster time to market for electricity generation from renewable energy sources. These improvements, together with enhanced transmission grid capacity, will also benefit consumers, industrial competitiveness, and the environment.

Where TSOs will be substantially exposed to the risks of anticipatory investments, such investments will not happen. A minimum common base for evaluating the conditions under which these investments is recommended to ensure the harmonised development of the European transmission grid for reaching the policy goals. This would help NRAs to correctly balance the risk of delaying necessary investments (thereby delaying the energy transition) with the risk of premature or incorrect investments, as well as to optimise the investments tariff impact.

The European Commission has recently enhanced the EU legal framework for investments, including provisions for anticipatory investments. The newly adopted Electricity Market Design Reform includes the option for tariff methodologies to cover such investments. Additionally, the Gas Package mandates the development of joint scenarios to be utilised in various planning processes (electricity, gas, hydrogen, etc.), ensuring these scenarios reflect both EU and national policies. Some national regulatory frameworks already allow for anticipatory investments. In line with the Grid Action Plan, the European Commission should provide guidance for Member States and National Regulatory Authorities (NRAs) to adapt national regulatory frameworks where necessary, including provisions for anticipatory investments.

The purpose of this paper is to provide TSO's perspective and recommendations to relevant policy and decision makers, including regulatory authorities, for identifying the conditions under which anticipatory investments should be approved and some conditions on how they should be treated afterwards from the regulatory perspective. These guiding principles require a common definition of anticipatory investments, which constitutes the focus of the second chapter of this paper. In the third chapter, TSOs propose initial suggestions for these guiding principles. The fourth chapter concludes the paper by laying out next steps. TSOs will keep working on more comprehensive and detailed suggestions to supplement this paper.

2 Anticipatory investments – a definition

Following the publication of the EU Action Plan for Grids in November 2023, stakeholders (ACER, CEER, IEA, Eurelectric, etc.) have analysed and published their views on the anticipatory investments issue, approaching it from different points of view. In its 2023 report on risks and incentives[5], **ACER** used the following definition of anticipatory investments: ***"anticipatory investments refer to investments that are risky for society because they may turn out be underused, at least for some years, until developments on the generation side"***.

ENTSO-E finds that this definition could be broadened to allow the inclusion of additional types of investments, the value of which could materialise due to other types of development (changes in the demand, e. g. for electric vehicles or heat pumps and electrolysers, or changes in the environmental policies, such as phasing out of electricity generation from fossil fuels).

In this sense, European TSOs have reflected and discussed the anticipatory investment issue. ENTSO-E organised an internal survey[6] among its members and a dedicated workshop on the characteristics of anticipatory investments within the framework of their activity.

As general insights:

Although TSOs National Network Development Plans (NDPs) often cover only 10 years, they sometimes use more forward-looking scenarios and include a longer time-horizon. In some Member States (MSs) there is currently no obligation to consider long-term energy policy aspects in developing NDPs and many NRAs are not bound to incorporate net-zero criteria in their NDP review/approval process. For TSOs already considering prospective scenarios, some of the investments included in their NDPs could be implicitly considered as anticipatory.

Therefore, if NDPs consider long-term scenarios, meaning scenarios covering a range of probable developments in line with long-term European and national climate and energy policy goals, NDPs will incorporate anticipatory investments.

About the scenario building:

Anticipation of needs in a more refined form (demand, generation...) is essential to properly build scenarios, for which the availability of information and data with a sufficient level of quality is essential.

TSOs agree with the examples for anticipatory investments brought forward by the EC[7] in its Grid Action Plan for Grids but wish to underline that they should not be considered to be exhaustive or exclusively related to offshore. Additional non-exhaustive examples could be onshore grid reinforcements and interconnections (either related to the offshore grid or to the development of renewables in the onshore grid), climate neutrality and smart grid investments, taking into account that project needs vary according to the geography and system specificities of each TSO (e. g.: landlocked TSOs have different needs compared to TSOs with planned offshore grid developments).

5 https://www.acer.europa.eu/sites/default/files/documents/Publications/ACER_Report_Risks_Incentives.pdf

6 18 TSOs provided answers to the questions.

7 The EU Grid Action plan (2023) mentions the following Examples for anticipatory investments:
· investing in future-proof offshore networks that allow for future expansions of meshed offshore grids;
· for areas with high untapped onshore PV potential such as renewable acceleration areas set in accordance with RED;
· for grid connections to ports for the provision on shore-side electricity supply;
· for building smart grids that support EV infrastructure charging national plans or municipal plans for heat pump rollout

More concretely, the following examples could also be considered as anticipatory investments by TSOs, based on specific regulatory framework in different MSs:

- Investing in **future-proof technical project design choices for offshore projects,** allowing for future expansions and interconnection of platforms (voltage level, converters, j-tubes, preparation for multi-terminal / multi-vendor set-up and potential fall-back solutions etc.)
- **Planning offshore grid for future expansions and additional connections:**
  - Allowing for expansion by connecting additional offshore generation capacities in line with renewable targets and designated renewables acceleration areas (cf. revised RED).
  - Allowing for additional (inter-) connections to or with other offshore projects, platforms, and connection points to other landing points / market zones.
- Investing in **offshore-related onshore reinforcements and expansions** tacking into account exhaustive system integration for further offshore development in later stages:
  - Strengthening and expansion of the onshore transmission and distribution grid infrastructure to enable the integration of increasing offshore generation
  - Anticipation of a more meshed grid and increase of trade via hybrid interconnectors as well as avoidance of congestions and redispatch measures by choosing other landing points.
  - Planned use of cable gates and land required for initial development and future expansions of required facilities.
  - Use maintenance needs as chance for enhancement of transmission capacity rather than replacing lines one to one.
- Investing taking into account the **expected accelerated electrification** of the economy:
  - Grid strengthening and expansion to enable connecting considerable amounts of expected additional electrical demand from the electrification of, amongst others, industry, transport, heating and cooling, and energy conversion (P2G, P2H, etc.) in line with EU and national ambitions.
  - Strengthen grid stability to cope with the expected massive deployment of non-programmable renewable energy sources through investments in grid support measures enabling safe and reliable operation, like (demand and generation) flexibility sources, sector coupling integrators (P2G, P2H, etc), short-term storage, network boosters, in line with EU and national ambitions.
- **Stockpiling** of components with long lead times and / or scarcity and allowing the possibility of stipulating **framework agreements** for critical supplies that provide for minimum quantities purchased.
- **Asset design and dimensioning** to comply with future needs. Focusing on onshore / landlocked substation designs and gears, foundations, and pylons ready to be equipped with additional circuits once needed (as shown in Figure 2) or the erection of spare cable ducts. System resilience due to climate change should also be considered as well as cybersecurity risks.

Figure 2: Double-circuit pylons with a single circuit installed as an example for a line which can be easily equipped with an additional circuit

- **Safeguarding properties** for e.g. substations and RES zones. TSOs experience that properties become a scarce resource in general in anticipation of future expansion.
- Planning for a **sustainable grid** by:
  - Investing in advanced technology anticipating more strict sustainability requirements, like, for example, alternatives to SF6 equipment, procurement of green steel and green losses, transformers operating with eco-friendly-based oil, etc..A nature inclusive design of the assets.
  - Considering other uses of the sea basin.
  - Gas-exit, Coal-exit
  - SF6 and PFAS

Given the abovementioned considerations, TSOs propose the following definition for anticipatory investments:

"Anticipatory investments are grid investments that reflect expected future energy system needs aligned with long-term climate and energy policy goals for which there is however a higher degree of uncertainty. Anticipatory investments are based on long-term scenarios factoring in best knowledge of likely developments (e.g.: demand, supply, etc.) and can be justified in National Network Development Plans".

3 Developing EC guiding principles on anticipatory investments to enable the implementation of anticipatory investments in national regulatory frameworks

Given the definition presented in the previous chapter, TSOs have developed an initial suggestion towards principles that give guidance on how anticipatory investments should be treated and under which conditions they should be approved. There are currently differences in how national policies and NDPs incorporate anticipatory investments.

Most MSs mandate a 10-year national development plan, but some TSOs extend their analysis more into the future (up to 25 years in some cases). In Germany, for example, scenarios look ahead up to 21 years into the future and the current NDP is in line with the government's target to reach climate neutrality by 2045. In France, the latest published national development plan was released in 2019 for 2035, and a new development plan is expected for 2024, with a time horizon until 2040. On the other hand, the NDP in Spain only provides a 6-year scope.

Length of NDPs	Number of TSOs
< than 10 years	1
10 years	10
> than 10 years	7

TSOs believe that a European framework providing base principles to be transposed into national policy and legislation may help providing legal certainty for TSOs and NRAs, especially for those MSs where the legitimacy of anticipatory investments and their recognition is still somehow uncertain.

In this sense, TSOs welcome ACER & CEER's 2024 ***"Position on anticipatory investments"*** [8] and the proactively suggested tools to reduce, as far as possible, uncertainties about future developments of grid usage. TSOs believe that these tools, as renewable hubs identified by the system operators based on expected projects, or the request to producers to declare their expected projects through a specific website and request to network operators to start the works based on these evaluations as soon as possible, should aim to reduce the uncertainty and improve the ability to evaluate an investment while at the same time being practical to implement. TSOs also welcome Eurelectric's 2024 position paper on ***"How can DSOs rise to the investments challenge? implementing anticipatory investments on distribution grid level"*** [9].

Building on the results of the conducted ENTSO-E survey and good practices in Member States, while taking into consideration the recommendations of additional stakeholders, TSOs suggest the following initial, and non-exhaustive guiding principles for the development of the EC guiding principles on anticipatory investments:

8 ACER-CEER Paper on anticipatory investments – CEER

9 https://www.eurelectric.org/wp-content/uploads/2024/06/how-can-dsos-rise-to-the-investments-challenge-implementing-anticipatory-investments.pdf

Principle 1 – Align long-term forecasts and scenarios used in Grid Development Plans with long-term climate targets.

Long-term national forecasts and scenarios aligned with long-term climate targets should be established at Member State level. The long-term forecast should set the overall direction for the development of the energy system (not only transmission) in order to establish a common ground for all parties in the energy system.

Principle 2 – Network Development Plans should serve as a vehicle within which anticipatory investments can be assessed and approved.

NDPs should be aligned with European and National policy goals and climate targets and should therefore be forward-looking with time frames in line with European policy goals but considering national circumstances.

There is a consensus among TSOs that regulatory frameworks and network developments plans should reflect the expected long-term system needs consistently with European and/or national adopted policies and encourage informed and controlled risk taking for investments that are deemed anticipatory. Currently, while TYNDP scenario building considers prospective scenarios, the degree to which national NDPs do so varies widely across member countries, with broad differences in time horizons, firmness requirements for connection requests, etc.

In this respect, the experience of several TSOs is truly relevant, as their NDPs aim at climate neutral electricity systems in 2045.

This policy-based approach, which implies developing NDPs, and investment plans based on policy scenarios, could be further explored by TSOs.

Also, setting the time horizon to be covered by the scenarios in relation to both European and national long term energy policy objectives and mandating NRAs to consider the needs arising from policy objectives within the analysis of investment plan could be also explored. Recognising the cost of the investments resulting from this planning exercise would ensure that anticipatory investments are embedded in the national planning processes.

Generally speaking, more TSOs need to be more forward-looking in their NDPs. The time horizon itself should be established at the national level.

Principle 3 – Adequate planning techniques[10] to assess investments with higher uncertainty should be considered.

Quality of information

Quality of information is key to reduce uncertainties with regard to investment outcomes in the NDPs. In some MSs an analysis is carried out during the planning process through a so-called "Probability of success methodology" to evaluate the probability of success of the construction of PV and windfarm power plants based on geographic location, resource distribution, production efficiency and ease of permitting.

The goal is to estimate the most favourable locations for the deployment of the requested generation until the generation targets established by the scenarios set out in the National energy and climate plans (NECP) are reached. This practice of using a probability of success methodology could be extended to projects in general, adapting the criteria according to the projects analysed (e.g. demand, power to gas…).

Acceleration areas

Another example of good practice in Europe is the focus on acceleration of the green transition. The concept can look at different aspect, i.e. regulatory and practical hurdles, which delay the establishment of industrial consumption or production of electricity with a high potential for decarbonisation. Actions can include:

- Reduce administrative burden;
- Streamline and shorten processes for network expansion throughout the entire process from need detection to commissioning;
- Uncover typical project risks and 'best practices' that strengthen collaboration and shorten implementation time;
- Increase consumption flexibility, co-location and other measures for grid relief and temporary solutions;
- Prioritisation of infrastructure, i.e. connection of specific consumers or producers;
- Oversizing the grid in high potential areas.

The EC consultation for "Guidance aiming at supporting Member States in designating dedicated areas for grid and storage infrastructure"[11] points in the same direction, aiming to support Member States in appropriately designating areas for grid and storage infrastructure necessary to integrate renewable energy into the electricity system in an effective and efficient manner leading to true acceleration of permitting for energy infrastructure.

Removing barriers

In addition to the use of adequate planning techniques, it is also relevant to avoid aspects of regulation that may act as a barrier to investments. Barriers can be investment limits that go beyond the appropriate economic control of the system, and which do not allow investments resulting from the planning exercise to be implemented. In some Member States are investment caps applied which, although introduced for the financial control of the sector, need to be reviewed, customised, or even removed so that they do not hinder necessary investments.

Principle 4 – Alignment among stakeholders should be improved to identify system needs early on.

The achievement of the established policy goals is a task that must involve and requires the commitment of all parties. From the Member States and regulatory authorities to the agents of the entire value chain of the energy sector (TSOs, DSOs, generators, demand, storage, as well as all the new figures that may emerge in the future…). In particular, quality of information from all stakeholders involved is key to reduce investment outcomes uncertainties in the NDPs. There are diverse ways to improve it, but in general the involvement of all parties, such as project promoters (generation, demand, storage…), NRA's, local authorities, etc. could be key.

In relation to anticipatory investments, it is essential that the authorities analysing the plans are sensitive to reality and circumstances when assessing risks (e.g. considering the risk of the grid becoming a bottleneck for the transition and considering the need to reach policy goals).

On the other hand, TSOs also have a key role to play in this task, and they must take it responsibly and find the balance to contribute to the system in an efficient way and maximise the benefit for society, tackling in a proper manner the concerns coming from regulatory authorities and minimizing inefficient investments.

The proposal for improvement of the planning process by integrating in it the anticipatory investments is a good example of the TSO's commitment to this objective.

10 scenario analysis, real options or similar

11 Informal targeted stakeholder consultation for Guidance on the establishment of areas for grid and storage infrastructure necessary to integrate renewable energy into the electricity system in line with Article 15(e) of the Renewable Energy Directive

4 Regulatory treatment

Principle 5 – As stated in the Grid Action Plan, providing appropriate regulatory incentives starts by establishing a regulatory framework that supports investments.

Anticipatory investments should be treated and remunerated as any other TSO investment except for greater protection of TSOs from possible penalties in case of under-utilisation of investments, provided that the investment decisions have been taken on a sound basis. TSOs should not be the sole bearer of the risk in case policy goals and/or any assumption made to develop the investment plan change after the investment was carried out. Conventional ex-post efficiency measures are a good example of a negative regulatory measure which strongly disincentivises TSOs in undertaking anticipatory investments. Where efficiency measures are already applied, underutilised assets should not be subject to any benchmarking or other efficiency exercise.

Additionally, where needed TSOs should be incentivised to incorporate longer time-horizons in network planning, and any additional cost arising from this additional/more complex activity should be recognised by the regulation.

NRAs must find a balance point between short-term efficiency and mid-to-long-term efficiency and effectiveness. Restrictive approaches and focussing too much on short term efficiency and costs are likely to have paradoxical effects because ultimately, underinvesting in grid infrastructure could turn out to be costlier to society than taking a controlled risk of anticipatory investments[12].

- **First,** there might be cases where assets are only temporarily underutilised because of delays in other sectors. Such unused capacities might lead to apparent inefficiencies in benchmarking exercises that focus on one point in time. However, if seen as spare capacities, they also have economic value as such. Not only would they offer additional security and reliability of the grid but would also allow quicker reaction to and accelerated integration of unforeseen future developments.
- **Second,** overinvestment implies higher capital expenditures, but underinvestment leads not only to higher cost of operational expenditures (e.g. due to higher redispatch) but also more frequent curtailment or delays in the connections of renewable energy sources. As some of the RES projects would resultingly become economically not viable, under-dimensioned grids would ultimately endanger both the green energy transition and the path to energy independence, as instead of cheap renewable sources, energy would have to be generated from fossils sources that often must be imported from unstable countries.
- **Third,** grid underinvestment jeopardises a country's attractiveness as a business location both directly – by increasing the costs of electricity, increasing the risk of unplanned outages, decreasing reliability and flexibility- and indirectly, by slowing down and/or obstructing investments in renewable energy sources.
- **Finally,** grid investments have profound positive macro-economic and socio-economic implications, which could not be achieved if risk were transferred on TSOs. This is particularly important in the currently challenging European economic environment, characterised by weak economic growth rates, low investment activity and low productivity growth, as well as high insecurity in the aftermath of the corona pandemics and the war in Ukraine. TSOs grid infrastructure investment plans can thus act as an anchor of stability and provide a significant contribution to societal growth and welfare.

12 According to the TYNDP 2022, for example, by 2040 TYNDP investments come with:
· 42 TWh/year of curtailed energy saved;
· A reduction in the dependence on gas for power generation by 75 TWh/year;
· A decrease in generation cost by 9 billion €/year;
· 31 Mton of CO_2 emissions avoided per year.

5 Conclusions and next steps

The average time needed to develop network projects is several years longer for transmission projects, compared to generation / demand developments. Consequently, there is a need to anticipate certain network developments to serve the purpose for which it is needed.

Furthermore, if the policy goals are to be met, transmission grid investments should increase to accommodate all the renewable generation needed to reach those goals and all the demand to make it economically feasible. Network should be ready on time and any delay on its commissioning would be more detrimental than their under-use over several years.

European Commission's Action Plan for Grids points in the direction of providing appropriate regulatory incentives by establishing a supportive regulatory framework that brings investment certainty. With this paper, ENTSO-E expects to contribute to European Commission on its guidance identifying conditions under which the approval of anticipatory investments should normally be expected.

The vision of the TSOs is that anticipatory investments should be treated and remunerated like any other investment and NDPs could be the framework to assess and analyse them. In addition, some adequate techniques could be explored to assess investments with higher uncertainty. Long-term policy goals should be contemplated in scenarios, the quality of information should be improved, barriers to investments should be removed and synergies among infrastructure providers could be fostered. ENTSO-E is committed to contribute to the necessary developments to ensure that this new regulatory concept is implemented in a satisfactory manner for all actors involve.

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