EUROPEAN
COMMISSION

Brussels, 2.6.2025
C(2025) 3291 final

Commission Notice

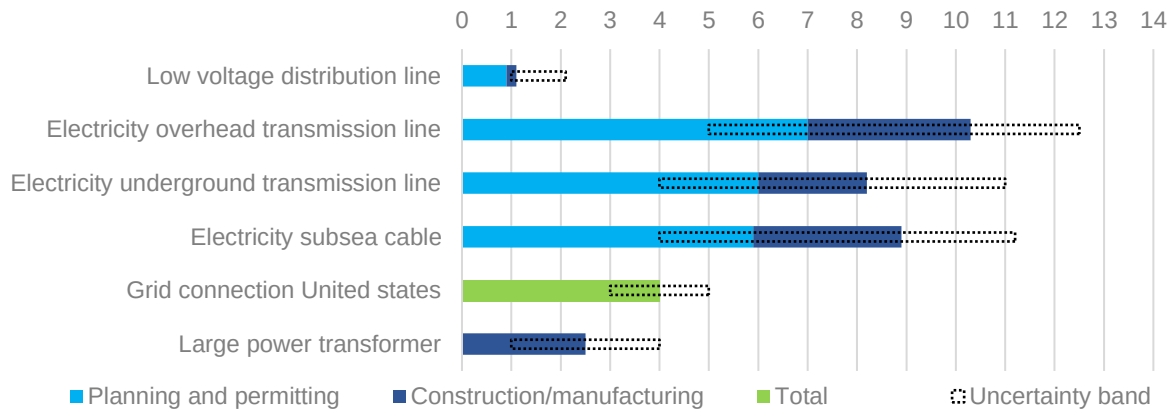
on a guidance on anticipatory investments for developing forward-looking electricity networks

1. INTRODUCTION

Europe's electricity sector is facing an extraordinary and rapid transformation. The deployment of clean capacities, notably variable renewable sources, has been remodelling the electricity mix of the EU to deliver energy that is domestic, secure, competitive, and decarbonised for all consumers. Just in the period of 2022-2024, a record of 168GW of solar and 44 GW of wind capacities were installed in the EU. In 2024, 47 % of electricity generation in the EU came from renewables. Likewise, demand is changing with new uses such as electrification, including electromobility, heating and cooling, hydrogen production and some industrial processes, particularly those operating in low and mid temperatures. These new patterns will likely lead to an increase in electricity consumption in the coming years.

Electricity grids are the necessary link between generation and demand. They provide the network capacity needed to connect households as well as new industry and businesses. Europe's electricity system is based on grids mostly built, in an anticipatory manner, in the 1970s and the 1980s for the traditional types of generation capacities at the time[1]. These grids are both in need of modernisation and refurbishment, but also in urgent need of expansion to capture the current complexities of the energy transition, both at transmission and distribution levels. It is estimated that 40 to 55 % of low-voltage lines will exceed 40 years of age by 2030, while their total length increased only by 0.8 % between 2021 and 2022.[2] Moreover, the transformation of our energy systems moving towards clean energy sources, and the lengthy timeframes traditionally required to develop grid projects lead to significant delays in connecting to the grid. For wind farms, getting access to the network can take as long as 9 years.[3]

Average lead times to build new electricity grid assets in Europe and the US 2010-2021, *source: IEA*



[1] See the history of the European electricity system evolution, The 50 Year Success Story – Evolution of a European Interconnected Grid, https://eepublicdownloads.entsoe.eu/clean-documents/pre2015/publications/ce/110422_UCPTE-UCTE_The50yearSuccessStory.pdf

[2] Eurelectric Grids for Speed report

[3] Based on Wind Europe data.

Delaying grid development also has societal costs due to uneven access to the internal market, driving energy price disparities, as well as in terms of climate externalities. According to the IEA[4], cumulative CO2 emissions from the power sector from 2023 to 2050 would be 58 gigatonnes higher in the Grid Delay Case than in a scenario aligned with national climate targets. This is equivalent to the total global power sector CO2 emissions from 2018-2022.

All of this illustrates that current practices for network development need to change to meet current and future needs in a timely manner.

The present Guidance on Anticipatory Investments supports Member States, national regulatory authorities and distribution and transmission system operators with recommendations for action in the whole process leading to a final investment decision, i.e. network planning, regulatory scrutiny, cost recognition and incentives. The actions listed in this guidance aim at fostering efficient forward-looking investment into network projects and contributing to the affordability of energy costs. Enabling anticipatory investments in a cost-efficient way should cater for a significant increase in annual grid investment levels increasing the efficiency and effectiveness of these investments, while ensuring that electricity bills remain affordable for households, industries and businesses.

2. WHAT IS AN ANTICIPATORY INVESTMENT?

2.1. Definition and examples

'Anticipatory investment' is a term used in EU legislation, despite not being explicitly defined. The TEN-E Regulation[5] refers to anticipatory investments in relation to regulatory incentives, which could address specific higher risks for the development, construction, operation or maintenance of a project of common interest. Anticipatory investments as such are, however, not defined. The same applies to the Electricity Regulation,[6] which, as part of the Electricity Market Design reform, refers to anticipatory investments as a means for grid development to meet the accelerated deployment of renewable generation, including in designated renewables acceleration areas and smart electrified demand.

The stakeholder discussions under the 8th Energy Infrastructure Forum in June 2022[7] made apparent that different understandings exist for the concept of anticipatory investments. Such divergence of views stems from historic practice, where no national regulatory authority (NRAs) currently explicitly identifies any investments by the term "anticipatory"[8]. Nonetheless, in practice it is already applied for some grid investments and in certain regulatory

[4] IEA report on Electricity Grids and Secure Energy Transitions, November 2023, Electricity Grids and Secure Energy Transitions

[5] Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013

[6] Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity, as revised by Regulation (EU) 2024/1747 on improving the Union's electricity market design

[7] https://circabc.europa.eu/ui/group/88886b79-cdea-4633-a933-8b191efb335b/library/ccd71133-eea2-4612-891b-5318a9f6f8a9

8 ACER-CEER position on anticipatory investment, March 2024

systems. Work initiated first by the Forum and taken further within the context of the Action Plan for Grids, have helped narrow down the understanding of the meaning of anticipatory investments. In preparation of this guidance, the Commission gathered input through several dedicated Energy Infrastructure Forum sessions between 2022-2024, two stakeholder workshops on 29 April 2024 and 11 December 2024, and two questionnaires to NRAs[9] and other stakeholders.[10]

The Commission understands anticipatory investments as investments into grid infrastructure assets that proactively address network development needs beyond the ones corresponding to reinforcements relating to currently existing grid connection requests by generation or demand projects. Anticipatory investments are forward-looking network investments **based on identified medium- and long-term network needs,** justified in network development plans, based on scenarios that project plausible trajectories of generation and demand capacities **that support energy, climate and industrial policies**, including the **National Energy and Climate Plans**. Anticipatory investments are not a new investment "class", as they consist of identical network assets as all other types of network investments, such as reactive investments[11].

Anticipatory investing is to some extent common at transmission level, where transmission system operators (TSOs) frequently assess their needs based on scenarios that integrate policy measures, catering for future development of consumption and electricity supply. For instance, offshore hybrid interconnectors are typically anticipatory in their nature, as they are built with the assumption of future growth of nearby generation capacities. Anticipatory investments are still less common at distribution level, where, traditionally, most distribution system operators (DSOs) developed their grids reactively, based on the legal framework in place, making grid reinforcements only once grid connection requests were made or if refurbishments were necessary. The main reason behind reactive grid development is the perceived risk related to the anticipatory investments, especially related to potential underutilisation of the asset leading to higher prices for consumers without perceived benefits. Risk mitigation frameworks are not in place in all Member States yet. The chapter on risk mitigation strategies provides more details on the matter. **Examples** of anticipatory investments, including investment facilitating easier future grid developments, include:

- Onshore grid reinforcements, such as new substations, to be able to accommodate foreseeable changes in supply and demand – for instance by over-dimensioning the capacity of the substation, transformer station or the lines themselves. This could be, for instance, linked to renewables acceleration areas.

- Future-proof design of offshore projects, such as allocating space of an offshore substation and designing it so that it allows for future expansions or designing the whole substation with greater capacity. For example, this could have as purpose enabling the connection of interconnectors under consideration, or the connection of new nearby

[9] ACER and CEER collected the responses into a comprehensive position paper in March 2024.
[10] Some stakeholders developed supporting position papers, including ENTSO-E, EU DSO Entity, Eurelectric and Regulatory Assistance Project.
[11] Investment reacting on the need for network refurbishment or on existing connection requests.

wind farms expected to be auctioned. This anticipation can save significant costs compared to building additional offshore substations.

- Putting down spare cable tubes in ditches to be ready for future capacity increases, since a second round of civil work may entail significant costs and time to attain new permits. Similarly, network assets can be designed to be ready to be equipped with additional circuits if needed. Lines can be built with poles for double-circuit lines while initially equipped with only one circuit.

- Developments to increase long-term system resilience. For instance, this may include network developments to increase climate resilience (ensuring readiness for more adverse climatic years for example through structural reinforcement of lines).

2.2. Why are anticipatory investments needed

Investment of EUR 730 billion for distribution and EUR 472 billion for transmission grid developments are needed until 2040[12] to advance the internal energy market and expand grid capacity, enabling the connection of new, clean, low-marginal-cost generation projects that drive down average wholesale electricity prices. Increasing investment in grids enables the medium-term decrease of the consumer bill by providing the capacity necessary to integrate new low-cost generation and by overall lowering system costs.[13] Critically, access to the network and affordable energy supply is also one of the necessary conditions for Europe's industrial competitiveness. There are three main underlying reasons behind the need to pursue such investments in an anticipatory way:

1. Insufficiently dimensioned grids cause longer lead time for grid connections, postponing electrification as well as deployment of clean energy sources. That is due to the fact that grid development times are longer than those of generation and demand assets. Network projects are complex, frequently extending across multiple regions or across multiple Member States or third countries. Such complexity drives up project development times. Lead times for grid projects can extend to 8-10 years for distribution grid projects and over a decade for transmission.[14] Moreover, due to insufficient domestic manufacturing capacity, prices and waiting times for new transformers and cables have almost doubled in comparison to the situation in 2021-2022, taking 2-3 years to procure cables and up to four years to secure large power transformers.[15] Better catering for anticipatory investments in network planning may significantly lower overall connection waiting times, help the providers of key components to scale up their manufacturing capacities and better plan investments.

[12] European Commission / Trinomics final report: Investment needs of European energy infrastructure to enable a decarbonised economy, 2025

[13] Eurelectric Grids for Speed report predicts 18 % reduction in total investment needs, hence system costs, if innovative development strategies, inter alia accounting for anticipatory investments, are applied. https://powersummit2024.eurelectric.org/grids-for-speed/

[14] Action Plan for Affordable Energy (*COM(2025) 79 final*)

[15] Building the future transmission grid – Strategies to navigate supply chain challenges; IEA, February 2025

2. For certain applications, dimensioning bigger assets may lead to cost savings per MW of grid capacity build, and potentially also provide for better deals with technology providers. Moreover, in many locations, **underinvesting in grid infrastructure may become costlier to society in the medium term**[16] than making anticipatory investments under controlled scrutiny and risk management processes.

3. Finally, anticipatory investments allow using only one permitting process for imminent as well as future needs, hence accelerating grid development and improving public acceptance.

3. NETWORK DEVELOPMENT PLANNING FOR FORWARD-LOOKING NEEDS

The first area of action is network planning. Network development, at least on a medium and high-voltage level, is based on national development plans and investment plans. Therefore, investment plans of system operators need to be based on forward-looking network development plans (NDPs) that assess, quantify and find the most efficient network solutions for the system needs.

3.1. Requirements and framework for grid planning

There are **three layers of network development planning** when considering geographical scope (EU, transmission, distribution). On an EU-wide level, the ENTSO-E adopts and publishes non-binding **Union-wide ten-year network development plan** (TYNDP) biennially and submits it to ACER for opinion. The TYNDP covers cross-border interconnection within Europe and with third countries, but also internal lines of cross-border relevance. The TEN-E Regulation requires integrated planning of the electricity networks with networks of other energy carriers, including hydrogen. ENTSO-E and ENTSOG[17] are jointly developing the scenarios for the TYNDPs.

From 2024, the TYNDP covers also the **offshore dimension through the offshore network development plans at sea-basin level**, based on offshore non-binding agreements on planned generation capacity which are put forward by Member States every two years. Hybrid interconnectors are usually of an anticipatory nature, as they are typically built on estimates of future offshore renewable generation, considering the TYNDP and national transmission development plans. This is why for the offshore dimension, the EU level network planning is already matching the regular bottom-up approach on planning with top-down reflections based guidance from Member States through their offshore renewables non-binding ambitions at sea-basin level.

[16] For instance, the Scottish TSO estimated that customers would save as much as £750 million over the two and a half years if an equivalent grid capacity at a cost of around £25 million per year was built. In Austria, a report from 2022 explains that for 2040, the system costs of under-capacity of the grid of over €1.5 billion are offset by those of over-capacity of grid, which are less than €133 million. https://oesterreichsenergie.at/fileadmin/user_upload/Oesterreichs_Energie/Publikationsdatenbank/Studien/2022/Frontier_AIT-OE-Wert_der_Stromverteilnetze-Policy_Paper-Langfassung-28012022.pdf
/

[17] They will be joined by the newly established ENNOH as soon as it will have the relevant capabilities.

On a **national level**, transmission and distribution grid operators are obliged to establish respective network development plans ("NDP") at least on a biennial basis.[18] On a **transmission level**, the plan indicates development of main transmission infrastructure over the next ten years and detail investments to be done for the next three years. Network planning has to be well aligned with the national energy and climate plans submitted in accordance with Regulation (EU) 2018/1999, hence reflecting future developments in generation and load and considering development of demand response, flexibility and alternative grid solutions. Moreover, on a transmission level, the NDP should be well aligned with the EU-wide TYNDP.

For the **distribution level**, the plan has to set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required to connect new generation capacity and new loads, including recharging points for electric vehicles. It also has to provide transparency on the medium and long-term flexibility services needed and consider alternatives to grid development (such as flexibility, demand response or innovative grid technologies).[19]

3.2. Improvements in network planning to allow forward-looking investment

Challenges

Based on existing legal requirements, NDPs should cater for future demand and supply development both on a transmission and distribution level which would facilitate the deployment of anticipatory investments. However, the **level of implementation differs a lot within the Union**[20] impeding currently in many instances the inclusion of anticipatory investments in network plans.

While for transmission NDPs, many TSOs already base their planning on scenarios covering energy and climate targets, this is less common for DSOs. This is linked to different situation in respective countries, with several smaller DSOs with often insufficient capacity to model future needs or benefiting from an exemption due to their low customer base.

Lack of appropriate coordination processes in scenario-building **increases the risk of network bottlenecks and delays**. For example, if a DSO conducts network plans and introduces anticipatory investments that account for the rapid uptake of renewables and electromobility, heat pumps, or industrial electrification in a region, but the TSO does not sufficiently consider such developments in its own scenarios, available grid capacity for new connections is likely to become exhausted once a new substation is required at transmission

[18] Pursuant to requirements of Articles 51 and 32 of the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast) ("Electricity Directive").

[19] There is an ongoing work between the TSOs, DSOs, ACER and the Commission following-up on most recent revision of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast) ("Electricity Regulation") in 2024, mandating the regulatory authorities or dedicated authorities to conduct biennial assessment of flexibility needs. Relevant methodology, explaining inter alia the link to network development planning should be adopted still in Q3 2025.

[20] Based on the Commission own research.

level in that region. With transmission projects being typically more complex and lengthier to build than distribution ones, this can create significant delays in new network connections.

Commission recommendations

a) National Regulatory Authorities and/or Member States authorities should ensure that **network development plans are based on scenarios of future development and should clearly explain the link between future expected generation and consumption and suggested grid development**. Also, scenarios should be aligned at least per respective planning level. Member States where the concept of anticipatory investments is used, usually develop NDPs based on scenario-planning, which is considered to be a good practice.[21]

b) Scenarios used for network development planning define the parameters that impact the assessments on future network needs. **Scenarios should** be developed following public consultation and coordination with the Member States / NRAs to **ensure alignment with the national long-term energy and climate policy goals (in line with NECPs)** and **inclusive and transparent consideration of stakeholders' input**. In particular, the planning should enable achievement of EU and national targets, such as for renewable energy, heating and cooling (link to local heating and cooling plans), electromobility recharging infrastructure, industrial decarbonisation including via electrification or hydrogen. Scenarios should be cross-sectorial also on a national level, to allow risk assessments to be performed with coordinated planning considered. NDPs should use multiple scenarios and sensitivity analyses to factor in uncertainties over future demand and supply. **Importantly, Member States should make sure to timely develop stable national medium and long-term energy and climate policy goals, strategies and plans, that facilitate network development scenarios building.**

c) **Grid operators should ensure that NDPs are the first and foremost instrument where anticipatory investments should be included, assessed and eventually approved by the regulatory system**. NDPs should clearly explain how the network will be developed, providing visibility for investors as well as supply chains. The level of detail can vary across voltage levels, but also in view of the customer base in the case of DSOs[22]. For instance, on a DSO low-voltage level, network elements are likely to be very project-specific, with needs and characteristics tailored to each network user needs.

d) **When planning newly built investments, grid operators should consider solutions, which would allow for potential future capacity increases, preparing assets for future expansion**. This could significantly accelerate overall grid development from a transparency, visibility and permitting perspective. Concrete applications may concern allocating more space for substations, installing bigger pylons or transformers or poles

[21] ACER/CEER recommendations on anticipatory investment and ACER report on Investment Evaluation, Risk Assessment and Regulatory Incentives for Energy Network Projects

[22] In line with Article 32 of the Electricity Directive, DSOs smaller than 100,000 customers do not have to prepare NDPs.

(allowing for future additional circuits on the line), putting down spare cable tubes in ditches.

e) Member States and/or NRAs could consider **introducing an adequate forward-looking period for the detailed network planning or, if the case may be, for the investment plans of the system operators, to factor in and be able to approve anticipatory investments.** This could help avoiding supply chain bottlenecks and contribute to the objective to keep the manufacturing value chain in Europe, also in line with NZIA.

f) **Further efforts are also needed to coordinate among the respective layers of network planning, to ensure assets are planned in a cost-efficient way.** This can be done by Member States or NRAs on a national level and, as much as possible on a regional level, for instance by requiring alignment in terms of timing of the NDPs or **coordination of inputs (scenarios) used** across the planning levels. Currently, all plans are required at least on a biennial basis, however there are no requirements on their sequence or inter-linkages, leading to inefficiencies. The European Commission is analysing possible further action under the upcoming Grids Package. Network planning is also addressed in the draft network code on demand response, as submitted by ACER to the European Commission in March 2025. ACER also plans to issue a guidance on distribution network development plans by mid-2025.

3.3. Scrutiny regime for NDPs

Challenges

It is often the case that anticipatory investments are not planned and not included in NDPs from the beginning under the presumption that they would be later dismissed in the scrutiny process. In addition, in many cases, even if proposed in NDPs or investment plans, the assessment practice of NRAs of anticipatory investments could represent a stumbling block if such assessment is based, for example, on scenarios which take different assumptions or check different timelines than those used for the network plans, mainly, as regards decarbonisation objectives or the integration of renewable energy. This could also be the case when the level and conditions of regulatory scrutiny are not set transparently upfront.

Different practices exist to support scrutiny efforts. For example, in Latvia, the national regulatory authority evaluates consistency of the transmission NDPs with the Union-wide TYNDP and in particular the prevention of congestions in cross-border interconnectors. In Portugal, the NRA issues an Opinion to the draft NDPs, to be considered by the system operators in the final version. In Austria, the NRA supports scrutiny efforts with quality and cost assessments by auditors before the inclusion of an investment into the regulatory asset base. In many Member States, the NRAs assess the NDPs overall, while focusing their scrutiny attention on high-investment projects and investment programmes, requiring cost-benefit analyses for these.[23]

Best practices on network development planning to enable anticipatory investments:

[23] Position on anticipatory investments; ACER and CEER, March 2024

Austria	Federal ministry of climate, energy and mobility prepares integrated network development plan, including both electricity and gases, based on common scenarios of future development capturing both 2030 and 2040 horizon. The NDP of the TSO must consider this plan in order for the planned network infrastructure to reflect future needs.
Belgium	Offshore renewables development catered for in NDPs, which are based on scenarios considering national and EU energy and climate targets.
Denmark	2050 targets fully considered in network planning with assumptions for the scenarios to be used across the board by the system operators and the NRA being set by the Danish Energy Agency.
France	Obligation for grid users to notify future plans to the grid operator to take them into account in planning. France has put in place a regulatory framework (S3REnR)[24] for network development planning that comprehensively integrates renewable production development by coordinating renewable developer projects, network planning and mutualising costs. This is based on the **declaration by renewable developers of expected projects** on a dedicated website. Likewise, France has set up "**decarbonisation zones**", industrial hubs where an important future electricity demand is expected to replace natural gas consumption.
Germany	Joint scenarios for TSO and DSO level, accounted in future grid development. Network development plans are forward looking, high- and medium voltage DSOs prepare and publish together NDP for the period of upcoming 10 years, annually. They coordinate in 6 planning regions. Scenarios capture period until 2045.
Portugal	NDPs must reflect NECPs, network planning must meet climate needs. For distribution NDP (dNDP), there are three electricity demand scenarios for 2024-2031, with central scenario (1.1% annual growth) as reference. dNDP consider flexibility and other alternative grid options. New substations leave room for scalability and future network users. New one circuit lines are built with poles which are also fitting double circuit.

Commission recommendations

a) **NRAs should ensure proper regulatory scrutiny on NDPs to facilitate the assessment and inclusion of anticipatory investments by ensuring they are based on appropriate scenarios and there is a clear link between NDPs and the approval of investments or the further investment plans.** If investments are not directly approved in a follow-up of

[2424] Schéma Régional de Raccordement au Réseau des Énergies Renouvelables

the NDP, for the sake of transparency, at least the methodology for investment approval should be included in the NDP.

b) Where needed, the NRAs should adapt their existing practices as regards the requirements on amendment of the NDPs, for instance when it comes to reflection of future needs, to allow the NDPs to become **true investment planning tools** that anticipate and cater for the system benefits and requirements for the future.

4. ALLOWING ANTICIPATORY INVESTMENT WHILE KEEPING ELECTRICITY BILLS AFFORDABLE

Challenges

More renewables, the electrification of the economy, and new demand sources like data centres and electrolysers, **require increasing electricity grid investment levels compared to the past**.[25] Beyond higher overall annual investment needs, anticipatory investments may require frontloading part of those investment needs to the present. This poses a challenge on making the necessary investment to connect new network users and transport electricity to where needed while maintaining affordable bills for consumers.

At the same time, due to such scale, **system operators require raising significant new equity and debt** to finance their investment plans. They need a competitive remuneration based on reasonable return and predictability about future earnings to facilitate their efficient access to the financial markets to obtain the investment funds.

Action is needed in the areas of network tariff setting, network connection charges and regulatory scrutiny and incentives definition.

4.1. Network tariffs

Network tariffs are the prices that network users pay for the service of having electricity transported from the point of production to where the electricity is used. **A main purpose of network tariffs is to allow for the cost recovery** necessary for network investment into assets in transmission and distribution grids and smart meters, and to support the costs for running system services. The Electricity Regulation (Article 18), provides that network charges must be cost-reflective, provide appropriate short- and long-term incentives including anticipatory investments, and foster the integration of renewables, flexibility, optimisation solutions for existing grids, and contribute to the NECP objectives.

Commission recommendations

a) **Network tariffs should reflect cost structures in the short term** (such as network losses and congestion costs) **and in the long term**, including planned infrastructure

[25] Eurelectric Grids for speed report mentioned yearly investments in distribution networks of approximately EUR 36 billion in 2023, whereas Commission Investment report expects more than EUR 44 billion yearly only by 2034 (upcoming MFF), with increasing tendency by 2040.

development investment costs. In the majority of jurisdictions, the NRA has the legally granted power to set or approve the tariff methodology.

b) Cost allocation among consumer groups, as set by the NRA, needs careful attention as the energy system evolves. However, as a general principle, all network users should be charged for the network services provided to them. Due regulatory scrutiny should secure that costs covered by consumers via network tariffs are reflecting future needs of the network.

c) In line with the Action Plan for Affordable Energy, where relevant in targeted cases, Member States could make use of their public budget to lower network charges to cover the additional costs resulting from major network investments necessary to accelerate decarbonisation and market integration, in compliance with the legal framework, State aid rules and competition law. **Member States could also consider the option to use congestion income to finance anticipatory investments**[26] to alleviate the overall burden on the tariff system. State loans on infrastructure development paid back on the actual asset utilisation rate could be another option (see Swedish example in Section 4.3). Moreover, State guarantees could contribute to better financing anticipatory investment in cases where the required new investment is too high in comparison to the existing regulatory asset base or the debt ratio of the companies.

As mandated by the Action Plan for Affordable Energy, the Commission will put forward guidance on network tariffs including the related use of public budget by Q2 2025, and a Clean Energy Investment Strategy still in 2025.

4.2. Connection charges

The main goal of grid connection charges is recovering the cost of the assets, new or upgraded, necessary for the connection of network users. Their design therefore plays a fundamental role in the cost recovery of anticipatory investments. As for network tariffs, beyond cost recovery, connection charges **can also be designed to incentivise system-friendly behaviour by network users**.

Commission recommendations

a) **Connection charges set by the NRAs can help recover costs for the connection of network users' projects in a smarter way.** Smart designs for connection charges and their levels can be used to incentivise connection requests where more appropriate for the system, such as providing lower (**shallow**) **connection fees in areas where anticipatory network investments were conducted**, and higher (deep) connection fees where, despite not having been planned for, network users decide to develop projects in congested areas. This can encourage network users to take part in the (anticipatory) planning process and to propose projects in system-friendly locations.

[27] In line with the Article 19 of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity.

b) **Moreover, connection charges in anticipatory investment areas should consider that, while the network assets may be initially underutilised, a significant number of new connections may be expected in the future**. Over-burdening the early consumers in such areas with high connection fees could undermine their business case for a location in such area, and unfairly displace the costs on them if they do connect.

c) Where anticipatory investments are very significant, **deferral strategies can mitigate immediate cost impacts on consumers**. Use of **standardised reservation fees** (e.g. per MW) that constitute a share of the total (deep) anticipatory cost divided by the expected amount of future users' demand, can be effective tools to ensure success in getting potential network users to deploy their projects into areas as planned in NDPs. For example, Ireland facilitates the establishment of Renewable Hubs supported by a **per- Mega Volt Amper (MVA) connection charging methodology**.[27] To avoid high connection costs for early comers, some national regimes establish **refunding systems** or cost-sharing methods between network users.[28]

d) At the same time, **risks of initial under-utilisation of the asset could be better prevented if Member States, at the same time, introduce very clear rules on connection requests, setting maximum periods for connection with clear obligations for both grid operators and grid users**. As stipulated in the Industrial Action Plan for the European automotive sector, the European Commission will put forward broader recommendations on treatment of connection requests by the end of 2025.

4.3. Regulatory scrutiny of network investments and incentives

Challenges

Regulatory scrutiny of network development is essential to ensure that investments are cost-effective and justified, and electricity bills remain affordable. As mentioned before in section 3.3., **regulatory scrutiny of anticipatory investments should mainly be carried out in the planning phase,** when evaluating respective network or investment plans of grid operators (included in the NDP or separately). Importantly**, it should start already with NDPs, as these should provide the analytical basis for investment decisions.**

Commission recommendations

a) **NRAs should introduce clear up front rules for the cost-approval of anticipatory investments. Based on the network planning, NRAs should evaluate potential welfare losses from a "too early" vs. "too late" implementation of projects to be taken into account in the investment approval process.** This should ensure equal treatment of anticipatory investments with other investments while catering for their specific character in terms of risk-distribution. The scrutiny process should be carefully balanced. In practical terms this means, for instance, avoiding too strict practices such

[27] Renewable Hubs Pilot – Decision Paper; CRU, November 2023
[28] Electricity transmission and distribution tariff methodologies in Europe; ACER, January 2023

as the obligation for projects to prove their value under too many or too diverse scenarios. For instance, rules may specify a limited number of concrete scenario(s) in which the need for investment was identified, as is the case today with the TYNDP and the PCI/PMI selection process under the TEN-E Regulation, which are based on three scenarios out of which, one main scenario is prioritised in the assessment.

b) **In addition, once projects proposed in the NDPs or investment plans are positively assessed and justified (approved) costs have been incurred, their consideration should be administratively unchallenged *ex post.*** For assets constructed, inclusion in the Regulatory Asset Base should not be challenged by the NRA in case of unpredicted changes in the actual utilisation of the network assets against modelled expectations. **Regulatory regimes should ensure stability and certainty in conducted investments, while incentives should be introduced** to encourage system operators to do their possible best to mitigate uncertainty (such as enhancing further the stakeholder engagement in scenario-building). *Ex post* **penalties** to system operators for actual network asset utilisation that differs from the expectation at the time when the anticipatory investment was assessed may pose a significant disincentive to future investments. Once an anticipatory investment decision is approved by the regulatory authority, it should be considered as meeting robust planning and decision-making requirements.

c) Beyond specific scrutiny actions for projects or programmes, **efficiency benchmarking** can also be used by NRAs to encourage cost-effectiveness. It is important that, when doing so, such practices account for anticipatory investments and, thus, not be based solely on historical information or short-term effectiveness. Otherwise, the relative performance of system operators that conduct anticipatory investments would show negative performance and, thus, mis-incentives.

d) **Depreciation, set by the NRAs, is a major part of the allowed revenue used to set tariffs**. Adjusting depreciation profiles can reduce the short-term impact on tariffs of anticipatory investment costs. Typically, network assets are depreciated linearly over their useful life. Since anticipatory investments may lead to initially underutilised assets, passing the full depreciation cost onto consumers immediately can lead to tariff spikes. **Where deemed necessary and justified, depreciation could potentially be backloaded to shift more cost recovery into future years with higher consumer base and asset utilisation, improving the investment case without burdening current consumers disproportionally.** Regulatory authorities may also postpone the start of the depreciation until a certain level of asset utilisation or demand is reached, smoothing cost recovery over time and aligning better with actual system use and consumer benefit. Nonetheless, **such approaches need to be balanced against the investment case for operators due to the increased investment return period**, particularly from a financing and cash flow perspective, with higher investments occurring upfront while revenues coming later. This can increase credit risk and lead to higher cost of capital or reluctancy to finance anticipatory investments.

e) Finally, **investment caps applied by the NRAs, as well as delays in cost recognition may also hinder anticipatory investments and should be removed if they exist**. If cost recognition is linked to a concrete utilisation rate of the asset, it may significantly

disincentivise anticipatory investments. Similarly, if big investment projects are included in the regulatory asset base only once fully commissioned, it may lead to disincentives to even consider them, if the risk related to underlying financing is too high. Regarding investment caps per year, this is directly contradictory with the greater investment need and may not take into account that investing ahead may be more efficient than waiting for the demand to materialize, as mentioned previously.

Examples of some of the practices enabling anticipatory investments:

Austria	System operators are entitled for return already before project's commissioning. Mark-up on revenue caps allows for additional revenue stream.
Belgium	System operators are entitled for return already before project's commissioning, gradual inclusion in the Regulatory Asset Base (RAB).
Denmark	Anticipatory investment pursued based on the sensitivity analysis in the NDP and socio-economic CBA. Risk premium in regulated income to cover the losses in the rare cases the asset ends up underutilized / stranded.
Germany	DSOs perform anticipatory network expansion as well, on a case-by-case basis. Special depreciation can be used to depreciate stranded assets, if such situation occurs. Residual risks are compensated by the market risk premium within the imputed rate of return on equity. Mark-up on revenue caps allows for additional revenue stream.
Ireland	Building in advance renewable hubs identified by the system operators based on expected projects, available generation capacity, available upstream grid capacity and/or other factors. For these pilot hubs, there is an expectation of anticipatory investment being carried out (e.g. upgrading transformers at substations).
Portugal	TOTEX model, new investment included in RAB ex ante is based on the NDP.
Sweden	Grid reinforcement loans[29]: the State takes the financial risk for the part of the grid reinforcement that is not utilized in the initial stage. The loan is repaid proportionate to utilization.

4.4. Perceived risks and risk mitigation strategies

Challenges

Given their nature, anticipatory investments can carry different degrees of risks. Stranded assets are possible where a grid project is commissioned and, contrary to the analysis when the investment was made, it becomes unutilised because the expected generation or demand does not materialise. A **stranded asset** can be a severe risk, since consumers will pay, through the

[29] The European Commission approved the respective State aid decision SA.38918.

network tariffs part of their electricity bills, for an investment cost that brings them no benefits. This risk is nonetheless limited where the network need is demonstrated by different scenarios, justifying that grid connections are highly likely to be requested, even if by network users different than originally foreseen. Such **limited risk** will frequently be the case **in renewables acceleration areas**, **grid and storage infrastructure areas** necessary to integrate renewable energy into the electricity system,[30] **areas for publicly accessible electric vehicle recharging infrastructure** along the TEN-T network,[31] **emerging low-carbon industrial hubs** (including hydrogen facilities) and areas where concentrated electrification nexuses are being promoted, such as ports and urban centres where electromobility and electrified heating and cooling is extensively promoted.

Finally, other risks can be less severe, but more common. It is possible that the network users expected in the scenarios make connection requests, but this takes longer than originally expected. This leads to a risk that some of the network assets are **initially underutilised**.

Commission recommendations

a) **Risk assessment is essential and should be undertaken in the phase of the scenario definition and analysis**. NRAs and/or Member State authorities should establish clear rules for such assessment and grid operators should apply them consequently. Risks in network development should be assessed in view of the costs and benefits perceived by consumers and against alternative counterfactual scenarios where the network is not expanded sufficiently in advance and, as such, societal opportunity costs will mount. Investments should be supported by inclusion in pre-specified scenarios.

b) **Risks could also be alleviated by a 2-step evaluation of major network development projects**. Such approach consists of, firstly, regulatory approval of costs on pre-construction activities (i.e. design and permitting), and, secondly, construction, once further confirmed by another round of NDP or other developments, including the outcomes of RES tendering procedures. Besides prevention of sunk costs, this allows for quicker project development with limited costs.

c) **Member States may play a role in de-risking part of the investment while the network asset is underutilised**. Besides adapted return regimes and adapted connection charges as mentioned previously, the use of available public funding for financing investment could alleviate the overall burden to be carried by network tariffs, in compliance with the current legislation as well as State aid rules and competition law, as mentioned in the Action plan for Affordable Energy. The Commission will provide a guidance document as announced under the Action Plan for Affordable Energy and described under section 4.1 above. State loans on infrastructure development paid back on the actual asset utilisation rate could be another option, delaying the repay, with the risk being carried by the State entity providing the loan.

[30] Designated by Member States in accordance with the Renewable Energy Directive (EU) 2023/2413.
[31] Deployed in accordance with the TEN-T Regulation (EU) 2024/1679 for a trans-European transport network.

d) Lastly, ENTSO-E and EU DSO Entity should s**upport de-risking by sharing best practices and proposing a methodology on how to conduct probability assessments** to evaluate uncertainty levels regarding the development of new projects.

5. CONCLUSIONS

For anticipatory investments to fully reach their potential, existing practices from network planning via investment and cost-approval to connection charges setting need to adapt. To this aim, the Commission provides with this guidance a number of recommendations to transmission and distribution system operators, national regulatory authorities, and Member States (see annex to the Guidance).

The European Commission will continue supporting the development of grids infrastructure on European, national and regional level, in a cost-efficient manner to meet energy and climate goals. The European Grids Package, as announced in the Action Plan on Affordable Energy, will strive to further improve transmission and distribution network planning, speed-up permitting, improve cost-sharing, boost innovation and support supply chains. The European Commission will also continue to assist Member States and stakeholders to find best possible ways to financing grid infrastructure, including anticipatory investments.

Annex: Summary of the Commission Recommendations on Anticipatory Investments

Actors	***Area of action***	***Recommendation***
Member States	Planning	Make sure to develop in a timely manner stable national medium and long-term energy and climate policy goals, strategies and plans, well aligned / linked with NECPs if they are separate from them, to facilitate network development scenarios by enabling scenario assumptions that are accepted and applied across-the board.
TSOs / DSOs	Planning	Ensure network development plans are based on scenarios of future development, consider coordination of scenarios on a national level and with the TYNDP (ensure data from TYNDP are taken into account, develop dNDPs and tNDPs in a coordinated and coherent way). Ensure stakeholder involvement already at scenario development phase.
NRAs / Member State authorities	Planning	Introduce adequate forward-looking periods for the detailed network planning or, if the case may be, for the investment plans of the system operators, to factor in and be able to approve anticipatory investments.
TSOs / DSOs	Planning	Planned investment to consider future capacity extensions (and other elements such as climate resilience).
NRAs	Regulatory Scrutiny in planning phase	Ensure regulatory scrutiny on NDPs facilitates the assessment and inclusion of anticipatory investments by ensuring they are based on appropriate scenarios and there is a clear link between NDPs and the approval of investments or the further investment plans. If investments are not directly approved in a follow-up of the NDP, for the sake of transparency, at least the methodology for investment approval should be included in the NDP.
NRAs / Member State authorities	Keeping costs in check and incentives	Introduction of definition and upfront cost-approval and rate of return rules for anticipatory investments, including as regards risk management schemes, to allow for investor certainty as regards anticipatory investments.

		Ensure equal treatment of anticipatory investments with other grid investments, catering for their specific character (risk-distribution).
NRAs / Member State authorities	Keeping costs in check and incentives	Consider two-step cost approval process for accelerating grid projects while minimising risk and costs, consisting of 1. design and permitting, 2. construction (based on deeper analysis, results of RES auctions or similar).
NRAs / Member State authorities	Keeping costs in check and incentives	Design connection charges with a view to facilitating the connection of future users of the grid and an optimal grid use. Consider designing shallow vs. deep connection charges accounting for anticipatory investments.
Member State authorities / NRAs	Keeping costs in check and incentives	Introduce clear rules on connection requests, setting maximum periods for connection and related penalties, to avoid underutilisation of the related asset.
NRAs	Keeping costs in check and incentives	Ensure that once assets are approved, their remuneration is not retroactively questioned for instance based on initially low utilisation rate of the given asset. Remove ex-post efficiency benchmarking.
NRAs / Member State authorities	Keeping costs in check and incentives	Consider strategies to limit impact on tariffs and through State guarantees or the use of public budget to lower network charges to cover the additional costs resulting from measures to accelerate decarbonisation and market integration, including for anticipatory investments, in compliance with the current regulatory framework, as well as State aid rules and competition law.