GEODE's Key Principles for Anticipatory Investments

Introduction

The European electricity system is currently undergoing a major transition. Centralised large scale electricity production is being complemented with huge volumes of small renewable energy sources that are dispersed throughout the electricity system. At the same time, demand behaviour is changing with new technologies such as storage, fast EV charging and electrification of the heating sector. Industry is demanding more electricity due to the transition away from fossil fuels. New customer types with new patterns of consumption are connecting to the grid, for example data centres and directly connected batteries.

The vast majority of our current electricity grids were built and dimensioned before this transition became evident. 30% of today's EU grid is more than 40 years old demanding huge reinvestments just to maintain the current level of capacity[1]. In order to meet society´s future needs, our current electricity grid needs to be reinforced, and new grids built with more capacity than before. Also, the capacity needs to be available in time to match society's changing and increasing needs.

Traditionally, electricity grids have been dimensioned primarily to meet customers' current needs. Some overcapacity has always been added to manage uncertainty, but never to handle the kind of exponential growth that electricity grids are experiencing today. In many parts of Europe, this has led to a situation where both generation and demand must queue a long time for a connection to allow the DSO time to do the necessary reinforcements. This is a major obstacle for societal development that needs to be urgently addressed.

The concept of anticipatory investments has already been touched upon by GEODE within its paper "Revenue Regulation for Electricity Distribution System Operators"[2]; nevertheless, in this paper, GEODE further examines the concept and role of **anticipatory investments** as a tool for DSOs to stay ahead of customers' needs. The recent revision of electricity market design legislation at EU level has increased the visibility of anticipatory investments as a tool to promote grid development, alongside more traditional investments. GEODE presents eight principles that DSOs and regulators can apply to support anticipatory investments.

[1] Eurelectric. (2024). *Grids for speed: Accelerating Europe's energy transition.* https://powersummit2024.eurelectric.org/wp-content/uploads/2024/07/Grids-for-Speed_Report_FINAL_Clean.pdf

[2] GEODE. (2024, June). *Revenue regulation for electricity distribution system operators: A crucial enabler for the energy transition.* https://www.geode-eu.org/wp-content/uploads/2024/06/20240603_GEODE-Paper-Revenue-regulation.pdf

GEODE's 8 Principles for efficient Anticipatory Investments

1. Distribution Network Development Plans (DNDP) to be used as a guideline
2. No different regulatory treatment for anticipatory investments
3. Include anticipatory investments in the Regulatory Asset Base
4. Secure cash flow for anticipatory investments
5. Meet the mandatory technical requirements first
6. Improve municipal planning
7. Renewables acceleration areas to be used as a guideline
8. Development of best practices for anticipatory investments

Anticipatory investments for electricity DSOs

There are many alternative definitions at the EU level of anticipatory investments. GEODE supports the definition provided by Eurelectric in its paper *"How can DSOs rise to the investment challenge?"*[3]. This also corresponds with Article 18 a of the Amended Electricity Regulation 2024/1747[4].

An anticipatory investment is defined as "one that proactively addresses expected developments, looking beyond immediate needs of generation or demand, assuming with sufficient level of certainty that new generation and demand will materialise, notwithstanding potential low utilisation in the short term."

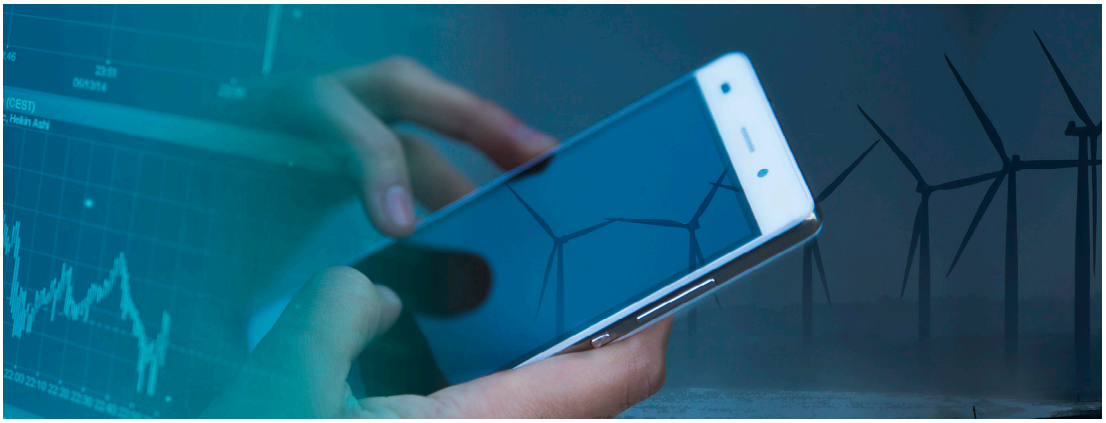
[3] Eurelectric. (2024). *How can DSOs rise to the investments challenge? Implementing anticipatory investments for an efficient distribution grid.* https://www.eurelectric.org/publications/how-can-dsos-rise-to-the-investments-challenge-implementing-anticipatory-investments-for-an-efficient-distribution-grid

[4] Art. 18 a Amended Electricity Regulation (EU) 2024/1747 *"Transmission and distribution tariff methodologies shall provide incentives to transmission and distribution system operators for the most cost-efficient operation and development of their networks including through procurement of services. For that purpose, regulatory authorities shall recognize relevant costs as eligible, including costs related to anticipatory investments, and shall, where appropriate, introduce performance targets in order to provide incentives to transmission and distribution system operators to increase overall system efficiency in their networks, including through energy efficiency, the use of flexibility services and the development of smart grids and intelligent metering system."*

Electricity grid investments can be divided into two categories:

- Reinvestments due to age or condition of the current grid components
- Construction of new grids or capacity increasing investments in order to meet the changing needs of the customers.

Reinvestments due to age or condition are done by the DSO in order to maintain security of supply and to meet legal requirements such as power quality. Reinvestments can usually be combined with simultaneously increasing capacity with only a marginal cost increase. Such practice could be considered an anticipatory investment. Given the current situation with exponential increase in capacity demand, it is crucial that regulation allows and incentivises such practice even if in the short term this means some degree of capacity that is not fully utilised. This will give customers access to needed capacity faster while at the same time reducing costs over time.



New investments or increasing the capacity of the current grid are done according to customer demand. Traditionally, these investments have been done based on current needs rather than anticipated needs. In times of strong growth in demand, anticipatory investments ahead on current needs may be encouraged, as a way of staying ahead of customers' needs. This makes anticipatory investments beneficial for society as a whole, in strategically identified areas where a need for new capacity is seen. However, they must be carefully weighted against the risk of stranded assets and the increase in grid tariffs. Such anticipatory investments are currently not sufficiently encouraged across EU countries.

Anticipatory investments are always based on a forecast of future customer needs. Currently, there might not be any customers in a particular region, but the DSO foresees future customers with enough confidence. Such prognosis could for example be based on local municipal development plans or announced industrial investments. Another example of foreseen needs are designated areas for renewable energy production, where such have been pinpointed by a competent authority.

Anticipatory investments are not a new concept. DSOs have always tried to anticipate future needs of the customer and adapt their investments accordingly. The main difference today is the speed and increase of capacity needs which increases their importance. It is important to treat them as any other type of investment and ensure that they are included in the DSO´s Regulatory Asset Base.

Anticipatory investments – practical examples:

- Choosing a component (cable or transformer) with higher capacity than currently needed in order to handle future foreseen needs. In many cases, additional investments may enable doubling in capacity.
- Strengthening the existing grid with new assets that are not critical for operations today, but likely to be needed for expected growth. Revisiting and reinvesting in assets before they reach their expected lifetime is often not feasible from a strict economic perspective but could be encouraged as an anticipatory investment.
- Preparing the network for foreseen future capacity increases, for example adding extra tubes in ditches or buying an extra-large plot of land when preparing for a substation.
- Utilising "windows-of-opportunity" for more cost-efficient investments, even though the customer's need might not be there yet, and the grid still has an economic and technical life left. Coordination of investments with other municipal projects such as street renovation is one example.

Source: Tekniska Verken

Challenges for efficient anticipatory investments

The incentives for anticipatory investments differ between the EU member states. Usually, investments linked to security of supply are given priority over anticipatory investments. The DSOs planning processes also tend to focus on immediate customer needs. However, the amount of anticipatory investments being realised is usually limited by resources, investment capacity, profitability, and cash flow.

Making anticipatory investments means that the existing customer collective needs to pay more for the grid, despite not having immediate use of it. This also means that the customer collective is taking the financial risk of sunk costs if the increased capacity is not ultimately needed.

Source: Tekniska Verken

The foundation for efficient anticipatory investments is the adequate prognosis of future capacity needs in the grid area. This is the basis for the **DSO´s Distribution Network Development Plans (DNDP)** which are updated regularly. A challenge for anticipatory investment is the lack of robust prognoses about regional development. Most European countries have formal local municipal planning systems, but they vary in quality and may not be in sufficient detail when it comes to energy planning. There is also a tendency for local municipal development plans to be overambitious, presenting a desired outcome rather than a realistic prognosis.

As a regulated entity, the DSO´s revenue is dependent on a regulated asset base which constitutes the calculated value of the grid, taking depreciation into account. In some member states, some anticipatory investments are not included in the regulated asset base, such as new lines with no active customers connected, built to facilitate future needs. Although this is not very common, such cases may be more frequent in the future, for example in connection with renewable acceleration areas. Investments should be supported regardless of their timeline, ensuring no distinction between ordinary and anticipatory projects in the Regulatory Asset Base.

Even if included in the regulated asset base, a DSO needs **sufficient cash flow** for making investments. As the revenue regulatory models give the DSOs their income from investments over a long period of time, taking loans are necessary to secure cash flow for investments. Loans mean capital costs that are currently increasing.

In some member states, anticipatory investments are separated from ordinary investments and subject to complicated approval processes from the national regulator. Permission to make anticipatory investments is connected with large administrative costs as well as being time consuming. This reduces the DSO´s incentives to make anticipatory investments.

As already discussed, although anticipatory investments always have been an integrated part of DSO planning, they are more in demand in the light of new trends such as EV charging, PV solar and electrification of heating and industry. These are all developments that demand more electricity capacity fast. Different countries apply different principles for anticipatory investments, and therefore sharing best practices is important.

Reducing uncertainty through improved data and forecasting

Uncertainty increases with long-term forecasting, making it crucial for DSOs to base anticipatory investments on robust data analysis. A **data-driven asset management approach** is essential to optimise existing infrastructure and predict future needs.

KEY ELEMENTS FOR IMPROVED FORECASTING:

- **Granular long-term load forecasting** to anticipate investment needs, tailored to different types of demand (e.g. small consumers vs. large industrial loads).
- **Stakeholder engagement** to refine predictions, especially for large energy users whose locations are harder to determine.
- **Incorporation of broader factors** like policy trends, economic growth, population changes, and renewable energy targets.

A **well-developed regulatory framework and continuous monitoring** would help and improve data accessibility for regulators and stakeholders, limiting uncertainty.

Striking the right balance between risk and reward investment decisions should remain the responsibility of distribution system operators, ensuring flexibility as new information emerges. There should be sufficient rate of return for invested capital considering the risk undertaken.

MANAGING INVESTMENT RISKS:

Uncertainty can lead to **underinvestment** (requiring additional future upgrades) or **overinvestment** (potential stranded assets). Some possible solutions include **government support** (modifying depreciation and providing financial tools), **tariff adjustments** (shifting risk to consumers/NRAs) or/and **asset write-offs** (DSO absorbs the risk).

These mechanisms must be clearly defined at the outset, as they impact the **cost of capital**. After an investment decision is made, **risk conditions should remain predictable** to ensure regulatory stability.

GEODE's 8 Principles for efficient anticipatory investments

1 DISTRIBUTION NETWORK DEVELOPMENT PLANS (DNDP) TO BE USED AS A GUIDELINE

The Electricity Market Directive EU 2019/944 demands DSOs to develop Distribution Network Development Plans for the foreseen development of the local grid[5]. This is to be done in close cooperation with local stakeholders such as municipal authorities. Network development plans are reviewed by the National Regulatory Authority. This process ensures that the network development plans are in line with the best available prognosis for the development of the locality. In the Network Development Plans, anticipatory investments can usually be foreseen and every time the plans are updated, the forecast is also updated and improved, thereby becoming more accurate over time.

Network Development Plans provide a structured, transparent, and collaborative tool for investment planning and are also an important tool for prioritising upcoming needs in time and geography. They can contribute to new planned residential areas, new industrial investments or dedicated go-to areas for renewable energy. The Network Development Plans can therefore serve as a guide for the DSO as to what anticipatory investments are needed. They should be aligned with local, regional and national energy and climate plans (NECPs) and involve regulators and relevant stakeholders such as municipalities and larger customers who should always provide input into the DNDP.

DNDPs should be approached from an holistic, high and strategic enough level, not by single project/investment, as otherwise, it will create complexity and administrative burden. The focus should be on the big picture, ensuring the whole of the planned investments are beneficial for society.

[5] European Union. (2019). *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.* Official Journal of the European Union. Article 32 (3). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0944

2 NO DIFFERENT REGULATORY TREATMENT FOR ANTICIPATORY INVESTMENTS

It is difficult to separate anticipatory investments from regular investments such as reinforcements to handle customers' immediate needs. Having separate treatment for anticipatory investments in revenue regulation demands vast administration while adding little value to the electricity system. Therefore, anticipatory investments should be treated as ordinary investments in the regulatory asset base for DSOs and not be subject to long and complex approval processes.

3 INCLUDE ANTICIPATORY INVESTMENTS IN THE REGULATORY ASSET BASE

Anticipatory investments done in line with the principles presented in this paper must be allowed to be included in the DSO´s regulated asset base. This means that the current customer collective will pay for investments that may not yet be in use but are seen to be needed in the future (for example in the DNDP). However, the benefits for the customer in the long run such as avoiding waiting time for new connections and the ability to directly apply new technology such as EV charging, electric heat pumps and solar PV are very likely to surpass those costs.

4 SECURE CASH FLOW FOR ANTICIPATORY INVESTMENTS

Increased investments need a sufficient cash flow for the DSO. The current regulatory models usually give the DSO their income for an investment over a longer period of time, often several decades. In order to promote anticipatory investments, it is necessary to secure a sufficient cash flow that enables the DSO to finance anticipatory investments over time. The Weighted Average Cost of Capital (WACC) set in revenue regulation must give a reasonable rate of return on investments and be competitive in comparison to other similar investments. It must also give sufficient compensation for relevant investment risks.

5 MEETING THE MANDATORY TECHNICAL REQUIREMENTS FIRST

Although anticipatory investments are important for the long-term development of the electricity system, investments driven by legal demands must always have priority as they address society's immediate needs. However, ideally anticipatory investments should be done in conjunction with other investments, for example the reinforcement of local grids.

6 IMPROVED MUNICIPAL PLANNING

Municipal planning is key for anticipatory investments. However, municipal plans may vary in ambition, detail, and quality. Setting good standards for municipal planning without prejudice to local interests would enable the DSOs to make anticipatory investments based on a higher degree of certainty.

7 RENEWABLES ACCELERATION AREAS TO BE USED AS A GUIDELINE

An important reform presented in the revised EU Renewable Energy Directive (EU) 2023/2413 is the establishment of so-called "Renewable Acceleration Areas[6]. These areas are to have a simplified permitting process for renewable energy production due to their geographical features, demography, and grid access. DSOs should be incentivised to prepare for such areas by providing sufficient grid connections for the fast connection of new energy production as soon as the renewable energy production projects are realised. Such anticipatory investments must be included in the regulated asset base, despite the fact there is a risk that the connections will not be utilised for some time.

8 DEVELOPMENT OF BEST PRACTICES FOR ANTICIPATORY INVESTMENTS

This can be done via cooperation between DSO associations, local municipalities, and representatives of different customer groups. Such best practice could, for example, be about how to dimension grids in new residential areas for EV charging and solar PV.

[6] European Parliament and Council Directive (EU) 2023/2413 of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652. *Official Journal of the European Union*, L 2023/2413, 31 October 2023, pp. 1–77. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202302413.

Conclusion

Anticipatory investments are key to unlocking the full potential of the energy transition. Access to grid capacity in time is crucial for industrial competitiveness, the development of a modern energy society and to unlock the benefits of new smart technologies and low carbon solutions. Although anticipatory investments mean some level of risk of capacity that is not fully utilised, the risks can be significantly reduced by applying the proposed principles outlined in this paper. In the light of the ongoing electrification of many sectors in society, lack of grid capacity is always more costly for society than a slight temporary overcapacity.

Avoiding grid bottlenecks through anticipatory investments can prevent delays in decarbonisation, support green technology deployment, and maximise economies of scale.

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