

GEODE Recommendations on Electricity Distribution Tariff Structures

Executive Summary

The European electricity system is currently at the forefront of a major transformation. The incorporation of distributed renewable energy production is enhancing the system's environmental sustainability. However, it is also making the electricity supply more unstable.

This instability is further compounded by new technologies such as electric vehicles, solar cells, battery storage, and the increasing use of electricity for heating as a substitute for fossil fuels. Nevertheless, despite these precarious factors, major electrification is one of the most important tools to help solve many of Europe's energy challenges. And it begins now.

The start of the electrification journey will require greater electricity grid capacity. This can be achieved by constructing new cables and stations, or by utilising the existing grid more effectively and flexibly, thus reducing the need for new investments. GEODE believes both are needed to facilitate the green transition in the most cost efficient way.

Consumer electricity distribution tariffs can be an efficient tool for increasing the efficiency of the distribution grid on a long-term basis, as acknowledged by the European Commission in its recently proposed Regulation to improve the Union's Electricity Market Design¹. The price signals that the tariffs provide create financial incentives for consumers to change their electricity consumption and production patterns and further allow them to invest in technology, enabling their participation in demand response services. This in turn reduces the need for grid investments, while at the same time freeing up capacity that can be used for other purposes, such as connecting more renewables or the introduction of EVs or heat pumps.

Cost reflective electricity distribution tariffs can provide great benefits for the electricity system and consumers. They can:

- Reduce the need for grid investments that otherwise would increase distribution costs
- Create incentives for consumer behaviour that reduces peak loads by investing in technology such as batteries, which is enabling active consumers
- Create incentives for smart EV charging
- Make it possible for consumers to reduce their electricity costs

¹ Proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design, European Commission, 14 March 2023, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0148&qid=1679410882233#;~:text=It%20aims%20to%20protect%20consumers,solutions%2C%20with%20better%20regulatory%20oversight>

Smart meters and the ability to communicate prices and consumption data to the consumer is an essential prerequisite of cost reflective electricity distribution tariffs.

Both European and national regulation provide guidelines for DSOs on how to structure cost reflective electricity distribution tariffs. As all electricity grids have different challenges, it is necessary that regulation provides sufficient freedom for DSOs to develop their own tariff structures according to their specific needs and local conditions.



Source: Tekniska Verken i Linköping AB

This paper addresses the structure of cost reflective electricity distribution tariffs for households and SME consumers. Tariff structures for industrial customers differ, as their ability and competence to actively manage their energy usage can be much higher and are not addressed in this paper.

Key principles

In light of the recently proposed European Commission Reform of the Electricity Market Design, it is first important to outline a number of fundamental principles on electricity distribution tariff structures that will help support EU energy policy and goals:

- There is no one-size fits all when it comes to electricity distribution tariffs. Each member state and each electricity grid have different challenges and possibilities
- Electricity distribution tariffs should, to a high degree, be capacity based to best reflect the costs of grid operation, maintenance and investments
- Tariffs should be objective, non-discriminatory and cost reflective
- The price signal from the tariffs must reach the consumer, incentivising them to act in a way that promotes efficient usage of the grid
- Efficient communication and data sharing between DSOs, consumers and other market actors (suppliers, aggregators) is key
- DSO income regulation should provide incentives for DSOs to invest in digital tools to communicate with consumers helping them to understand the price signal provided by the distribution tariff

Electricity distribution tariffs in Europe today

The European electricity consumers' bill for receiving and consuming electricity is typically divided into three components:

- The cost for electricity (energy) provided by a retailer
- The cost for electricity transmission and distribution
- Taxes and other government levies

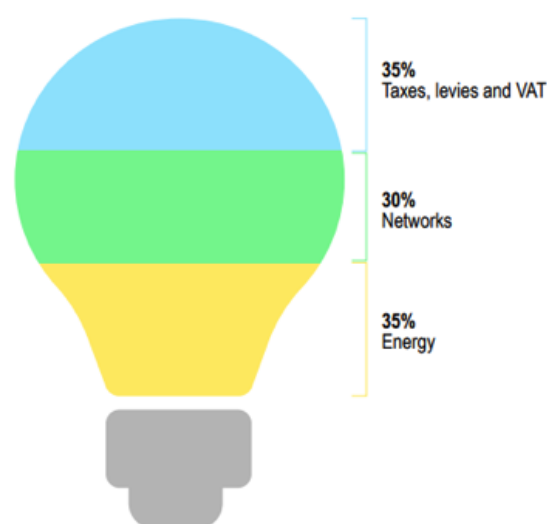
The proportion of these components varies between each EU member state and is dependent of the current price of electricity. Before the 2022 energy crisis, the proportion of distribution network costs in the total electricity bill for household consumers was about one third of their total electricity costs.

Today, in most of European countries, the distribution tariff structure of electricity for household consumers typically comprises of a fixed charge (power capacity) and an energy rate, which may vary between the times of the day and the seasons. The distribution tariff is mainly based on the distributed amount of energy. This structure goes back to a time before deregulation, when consumption and distribution was one service and thereby not cost reflective of each component.

A problem with tariff structures that are mostly based on energy is that they do not reflect the costs for the DSO to distribute power through the grid. DSOs' costs are mainly fixed in the short term and capacity based in the long term. Thus, the distribution grid is dimensioned according to the needed capacity regardless of the energy (kW) being supplied. Cost reflective tariffs should send a price signal to the consumer to reduce peak-loads by levelling out their total consumption during a day or a season. This would further contribute to postponing or reducing the need for grid investments and lead to an increase in overall efficiency in the energy system.

Energy efficiency measures are important, but they tend to lower the overall consumption while not reducing peak loads. The latter is crucial. Electrification of heating and transport will increase peak loads if introduced without smart incentives. Photovoltaics will also increase peak loads if the consumption and production does not match.

Average electricity breakdown



Source: ACER/CEER: Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2020

European legislative framework

There are already different provisions concerning DSO tariffs in European legislation stating the following principles:

- Distribution tariffs shall be cost reflective taking into account the use of the distribution network by system users including active consumers. (Art. 18, 7 Electricity Regulation 2019/943)
- Distribution tariffs may contain network connection capacity elements and may be differentiated based on system users' consumption or generation profiles. (Art. 18, 7 Electricity Regulation 2019/943)
- Network regulation and tariffs shall not prevent network operators making available system services for demand response measures, demand management and distributed generation on organized electricity markets. (Annex XI Electricity Directive 2019/944)
- Network tariffs shall be cost reflective of cost-savings in networks achieved from demand-side and demand-response measures and distributed generation, including savings from lowering the costs of delivery or of network investment and a more optimal operation of the network. (Annex XI Electricity Directive)
- Member states shall ensure the removal of those incentives in distribution tariffs that are detrimental to overall efficiency (including energy efficiency) of the generation, transmission, distribution, and supply of electricity or those that might hamper participation of demand response, in balancing markets and ancillary services. (Art. 15 Energy Efficiency Directive 2012/27/EU2 amended by Directive 2018/2002)

In this position paper, GEODE presents several principles, in addition to the mentioned ones, to increase the efficiency of electricity distribution tariffs as means of supporting EU energy policy and goals.



Source: Tekniska Verken i Linköping AB

Energy based tariffs give the wrong price signals to prosumers

Prosumers – individuals who produce and consume their own energy – lower the amount of electricity bought from the grid, but this does not necessarily lower the consumption at peak times. If prosumers still need the same capacity during peak hours, their own electricity production will not contribute to lower the grid capacity costs. Also, if the production unit is relatively large and the production is high during times when the consumption is very low, the peak power can even increase, thereby increasing overall network costs.

An energy-based grid tariff gives a discount to prosumers at the expense of other consumers. If a more cost reflective tariff is given, the price signal to prosumers would promote self-produced electricity when it is available or invest in a combination of photovoltaics and batteries. Such a combination would enable prosumers to store their energy production and consume it at a time more beneficial to the grid, helping to reduce peaks.

Technology development affecting electricity tariff structures

Most European countries deregulated their electricity markets in the early 2000s. At the time, the technological possibilities for smart application of electricity distribution tariffs were very limited. Consumption meters were mechanical with no connection to the internet. The electricity meters mostly measured cumulative consumption and were read manually once every year. Electrical functions such as light and heating were regulated manually and battery storage for flexibility purposes was yet to be developed.

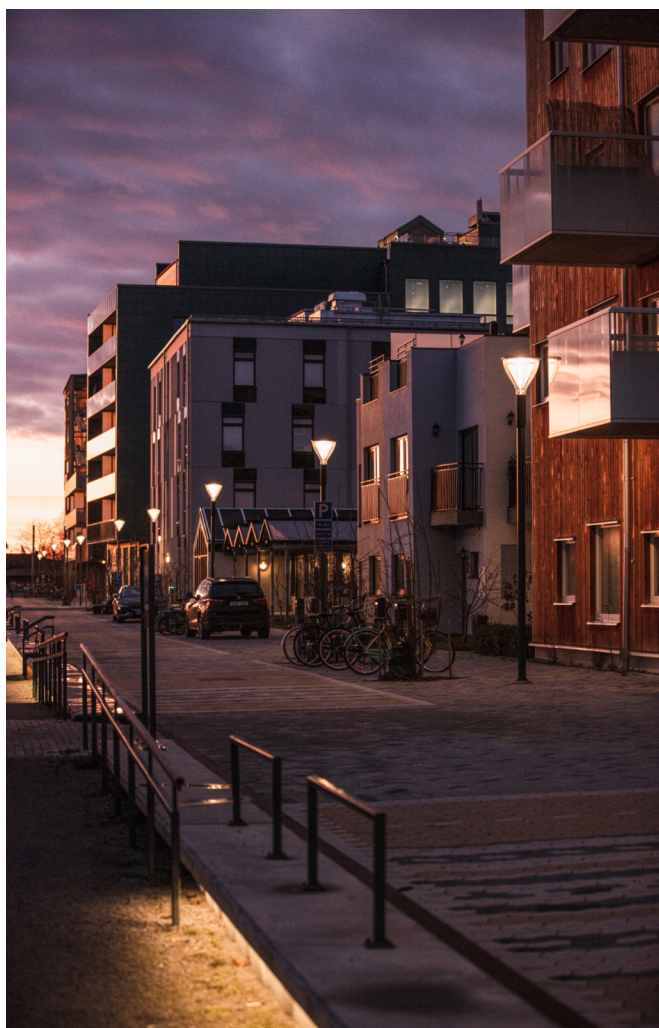
Today, most electricity meters in Europe are smart and digital with a variety of functions such as load control, remote readability and the ability to measure power usage at least by each imbalance settlement period. The smart electricity meter is an essential tool for the implementation of smart electricity distribution tariffs.

Many household appliances are connected to the Internet and can be controlled with smartphone apps. Heating systems, local batteries and EVs can be programmed to respond to grid tariffs. The old stereotypes associated with demand response such as doing laundry at night are no longer valid. This technological development creates new possibilities for smartly designed electricity distribution tariffs that will allow the development of products and services to reduce demand and/or shift loads in periods of high demand or prices.

Principles for more efficient electricity distribution tariffs

An efficient electricity distribution tariff should send a price signal to consumers incentivising them to act in a way that promotes efficient usage of the grid. This in turn contributes to overall higher efficiency of the total energy system, generation, transmission and distribution. This will benefit consumers as the costs for getting access to electricity will be lower.

Different tariffs for different grids



Source: Tekniska Verken i Linköping AB

All electricity grids are different. The load situation varies between a rural grid in Northern Europe, an island in the Mediterranean or a city grid in a central European capital. Some grids have seasonal peak loads, in many cases connected to the need for heating. Others have their peaks in a hot summer day when cooling is needed. It's important that regulation on electricity tariffs is not designed to fit all DSOs in Europe. DSOs need sufficient freedom when it comes to designing their distribution tariffs for them to be an appropriate tool for an active operation of their grid.

DSOs should be allowed to develop their own tariff structure without unwarranted regulatory restrictions. The 2021 CERRE study *Optimal regulation for European DSOs in 2025 and beyond*¹ not only found this but also found that a large number of DSOs think that the tariff structure is one of the biggest barriers for their company becoming a more active DSO.

¹ Optimal regulation for European DSOs in 2025 and beyond, CERRE, April 2021, https://cerre.eu/wp-content/uploads/2021/04/CERRE_Optimal-regulation-for-European-DSOs-to-2025-and-beyond_April-2021_FINAL.pdf

Capacity-based instead of energy-based

With capacity-based pricing, the distribution charge is at least partially priced from the highest grid peaks over a certain time. This can be combined with a specific subscribed capacity agreed upon with the DSO. According to many studies, a capacity-based electricity distribution tariff is the most efficient way to create a price signal for consumers that leads to overall efficiency of the total energy system, including generation, transmission and distribution.

A capacity-based tariff creates incentives for lowering consumption in the grid's peak periods, thereby reducing the need for capacity in the grid. This frees up capacity that can be used for connecting new loads, such as renewables, EV charging or electrical heat pumps. A capacity-based tariff approach can easily be combined with local capacity markets, where the DSO can trade with household loads to the benefit of the overall energy system.



Source: Tekniska Verken i Linköping AB

Many electricity distribution tariffs have a time-of-use component. This means that the price is higher or lower than average at certain times when the grid is under pressure or there is a lot of excess capacity available. A simple and well-known version of time-of-use is day and night tariffs. The application of time-of-use tariffs varies between different grids. One DSO with a high degree of electrical heating may want to reduce the load during wintertime as that's when there is a higher price for power. A different DSO may have a peak load from EV charging at certain times or trouble to handle high solar PV production.

GEODE believes that time-of-use tariffs can be a valuable component in the pricing of electricity distribution, but DSOs must have sufficient freedom in how to implement them. A challenge with time of use tariffs is that if the consumer adapts too well to them, their contribution to overall grid efficiency is reduced. For example, if a DSO has a peak for EV charging at noon, and raises the prices for that time period and all EV charging is moved to another time, then the peak is only moved, not reduced. Such development must be closely monitored by the DSO. This is also a reason for why time-of-use regulation is undesirable on the EU level.

Simplicity is key

Simplicity is essential for consumers' ability to efficiently adapt their electricity usage to the distribution tariff. Consumers need to understand the tariff. Too many components will complicate the introduction of smart technology as well as the risk of being contractionary to other market aspects such as retail prices. The tariff structures also need to be simple enough so that the market actors (for example suppliers and aggregators) will be able to provide services to the consumer considering both the retail and grid distribution price.

Objective, non-discriminatory and cost reflective tariffs

Smart meters in combination with electricity distribution tariffs allow price signals to not only be precise but distributed to consumers. Distribution tariffs should be objective, non-discriminatory, and cost reflective. Both national, regional and local politicians may have interest in subsidising certain types of costumers such as prosumers, industries or vulnerable consumers. Such efforts should be done by other means than the electricity distribution tariff as it will reduce the price signal thereby incentivising behaviour that increases overall electricity costs for the whole consumer collective.



Source: Tekniska Verken i Linköping AB

The importance of consumer communication

For electricity distribution tariffs to affect the load on the grid, the price signal must reach consumers. It's also important that the chosen tariff structure is understood by them.

The DSO income regulation does not provide incentives for the DSO to invest in consumer communication such as smart phone apps and online services. Such regulation is a direct hinder for efficient distribution tariffs to have the desired effect. Instead, such investments should be incentivised in the regulation

In countries where the supplier is responsible for invoicing grid tariffs, the regulation should demand that the grid costs are clearly separated in a transparent way from the retail price for the price signal to reach the consumer. It should not be allowed for the supplier to "hide" the price of distribution in other price components. Such behaviour is a direct obstacle for efficient electricity distribution tariffs and their ability to steer towards better use of capacity in the network.

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