NordREG's common opinion on general principles of tariff design

– What can we agree on in the Nordics?

In February 2021, NR WG published a report on tariff design (NordREG, 2021).[1] The report gives an updated view on Nordic tariff design for electricity distribution tariffs, including an overview of the theoretical framework for tariffs and the main arguments for cost-reflective tariffs. The report also presents the customer-focused challenges, which may arise from a change in the tariff regimes. The report is primarily descriptive and does not present a common Nordic view on tariff structures. As a follow-up to this work, NR WG has agreed to some general principles for tariff design, which would be desirable to follow for a more efficient usage of the electricity grid. This common Nordic opinion does not entail a commitment from the Nordic NRAs to change their current tariff structure. The listed principles are NordREG's suggestions on what to strive for when the tariff system should be designed in a more efficient way. The principles are presented below.

In this paper the term "tariff" covers the price for transportation and distribution of electricity at the DSO level. We do not include the connection fees or try to solve the question on how the tariff should be distributed among customers, for instance how residual costs should be divided and how to price distributed generation.

Background

The previous report (NordREG, 2021) identifies a need for the DSOs to review their tariff-structure due to a rapid change in the energy landscape. New consumption- and generation-patterns, together with new legislation, are driving a change in the load factor for many networks. More distributed generation in combination with prosumers and high power outtakes, e.g., from electric vehicles (EVs) and heat pumps, creates the need to handle the fluctuations that arise from the changed load in the grid, in a way that capacity constraints are not violated, and power quality requirements are met (e.g., balancing and frequency). The changes in production and consumption entail new services, actors, and customer groups.

In the new energy landscape, the traditional household tariff, which consists of a fixed component (often based on the fuse) and a static volumetric component, might have distortionary effects. Since the cost inflicted on the grid by the household customers is not reflected in the tariff.

[1] NordREG, 2021: http://www.nordicenergyregulators.org/wp-content/uploads/2021/05/20210216-NR-WG-Tariff-report.pdf

Not a one-size-fits-all solution

Due to the different prerequisites of the electricity DSOs, it is not plausible to find one specific tariff that will give incentives for an efficient grid utilization in all the networks. Some factors, that influence the cost structure for each grid, are time and geography. Where some network areas have excess capacity, other network areas suffer from congestion. Also, the consumption (and production) pattern of electricity in one network area might differ from the pattern in another area, creating the need for different structures for each grid and/or network area.

Even though there is not one correct answer to the tariff design, it is still possible to form some overall principles, which are essential principles to have in mind, when designing a new tariff structure. This is presented below.

It is the Nordic opinion that cost-reflectiveness is the key for an efficient network utilization

In the report (NordREG, 2021), a theoretic overview was presented, and important principles described. The principles are divided into network-oriented principles and customer-oriented principles. Based on economic theory, in order to achieve an efficient network utilization, the tariff should be cost-reflective. Thus, the tariff should provide a price signal based on the short run marginal cost, for example costs of network losses and congestion. Furthermore, the tariffs must also be designed in a way that customers understand the price signals and know how to react on them, which will be elaborated later.

In each of the Nordic countries, national legislation as well as EU-legislation it is directly or indirectly stated, that the tariffs should be cost-reflective. It is also clear that tariffs should promote an efficient network utilization.

The fundamental part of the DSOs' costs can be divided into two categories; costs that vary with the amount of distributed electricity (variable), and costs that are independent of the amount distributed in the grid (fixed). The variable part of the costs can be divided into costs related to energy or to power. The cost based on energy is the cost for distributing one extra kWh (losses and the energy-component of the TSO tariff). The cost based on power outtake is the cost for providing one extra kW (congestion and possible TSO-tariff). It should be noted that the variable part of the tariff should only reflect the costs that arise specifically from the energy distributed and/or the capacity claimed. With excess capacity in the grid, the marginal cost of one extra kW is likely to be close to zero.
The fixed part of the DSOs' costs can be turned into customer specific costs (metering and reporting) and residual costs (e.g., costs related to historical investments).

But there are other factors of vital importance

Historically, the customer interest in distribution network tariffs has been low. This has partly been due to the relatively low share of household income that is associated with the network tariff. It has also been due to the lack of possibilities for household customers to influence their tariff. In the changing energy landscape, new possibilities arise from more information and new actors, for customers to change their consumption pattern, store energy in batteries, produce own electricity, and thereby contribute to an efficient utilization of the grid. To activate the customers, it is important that the tariffs are simple and predictable and gives the active customer a correct remuneration.

For the DSOs' customers to be able to use the grid in an efficient manner, the price signal in the tariff must reflect the cost of using the grid. The actors that want to use the grid must also understand the price signal and be able to react based on their preferences. Hence, simplicity and predictability in the tariff design are of great importance.

Cost coverage through a more cost-reflective tariff

As mentioned earlier the DSOs' costs can be divided into different categories based on how they vary with consumption. Due to the cost structure in the grids, a tariff needs to be split into multiple parts. Costs that vary with consumption should give a clear price signal, and costs that does not vary with usage of the grid should be covered in a way that does not affect the short term utilization of the grid. The components that can and should be used to construct a cost-reflective tariff are:

- **Energy component** – *Price/kWh*: The energy component can be designed as either a static (fixed or time of use, ToU) or dynamic (ToU) component. It should mainly be used in the tariffs to recover variable costs. ToU-tariffs can be used to signal congestion through higher energy price during peak time. The energy component of the tariff influences customers short run behavior and should therefore not be used to recover costs that do not vary with consumption. The benefit of the energy component is that it is relatively easy to understand and is harmonized with the retail price, where the customers also pay per used kWh. The disadvantages of the energy component are, that it might give distorting price signals if it does not reflect the DSOs cost structure. For household customers in the Nordics the energy component tends to be too large today when striving for a cost-reflective tariff design.

- **Power component** – *Price/kW*: The power component can be designed as subscribed capacity (a fixed cost paid per presumed usage of power outtake kW e.g., each month) or measured capacity (a variable cost paid per actual power outtake kW e.g., a specific period, e.g., month or high load hours). The installed capacity in the system has high correlation with network cost and is one of the main cost drivers for the long-term maintenance and expansion of the grid. A power component might therefore be a component for covering infrastructure costs in the grid. A variable power component (e.g., critical peak pricing, CPP) can be used to signal

congestion with higher prices. It is typically perceived as more complicated to understand for customers than an energy component, which is a disadvantage of this component in the tariff. The benefits of the power element are that it can better reflect the cost of congestion or the cost of expanding the grid, which makes it more cost-reflective in areas where congestion is a problem at a given time. A fixed component based on subscribed capacity is a good way to recover residual costs related to historical investments. A variable component gives good price signals for congestion.

- **Fixed component** - *Price/year*: A fixed component should be used to recover costs that does not vary with the transport of electricity through the grid (either by power outtake or energy transferred for both short and long term). This element should include the fixed customer related costs. To say how it should be distributed among the users of the grid is a complex question that needs further study. The fixed component should not give incentive to change behavior either in long or short run and should be used to recover residual costs.

It is NordREG's opinion that we need to strive towards more cost-reflective tariffs that the customers can understand and respond to

In the report (NordREG, 2021), it is indicated that all of the Nordic countries currently have a tariff system, where a too large share of the tariff for household customers is based on a static volumetric component, seen in relation to the cost the households inflict on the grid. This might lead to distortionary price signals that do not encourage a flexible customer behavior in using the grid. The static tariffs do not signal congestion. It might also give the wrong incentives for acquiring solar panels or electric vehicles. It would be beneficial if the tariffs to a greater extend reflected the actual costs for the DSOs, which would give correct prices signals and stimulate a more flexible customer behavior. It should be noted that there is an ongoing process in the Nordic countries to adapt to this aim of more cost-reflective tariffs and increased customer response, where different projects are started or already in action; some as a consequence of the new EU Directive and Regulation ("Clean Energy Package").

Another point to highlight is the importance of knowledge and interest among customers regarding the distribution network tariffs. The information must be clear enough for the customers to respond to price signals based on their preferences. The customer needs to have predicable tariffs and know the effect of adjusting their behavior both in monetary terms but also know which impact a change in their consumption pattern may have on the utilization of grid due to capacity constraints.

More information to customers is needed to activate flexible resources and achieve a more efficient utilization of the grid. More information will also help new actors, e.g., aggregators, other flexibility services, as well as prosumers, to be able to participate on markets under the right conditions.