ENABLING CHOICE IN A MONOPOLISTIC RETAIL ELECTRICITY MARKET

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Overview

As a central part of its energy and climate policy, outlined in the Energy Strategy 2050, Switzerland aims to decommission its nuclear power plants, promote the use of renewable energies and the electrification of the transport and heating sectors (SFOE, 2018). Future electricity systems will have to adapt to high shares of variable generation and a significant increase in flexible demand assets, which means that conventional generation alone will not be able to balance demand and supply effectively.

Despite the profound change that electricity markets have undergone during the past decades, real-world electricity markets often lack the conditions of an ideal market, such as complete information, perfect coordination, rational behavior, and perfect regulation. As a result, they fail to realize direct price signals (e.g., due to fixed retail tariffs, Borenstein and Bushnell 2019, or monopolistic retail settings). For this reason, electricity consumers are often neither able nor incentivized to fully harness the flexibility potential embedded in their demand assets, such as heat pumps and electric vehicles, as they do not have access to market signals and informational requirements of flexibility usage are too high to be viable for individual entities.

For these reasons, the successful and efficient integration of low-carbon and flexible technologies at the end-consumer level remains as one of the main challenges in decarbonizing electricity systems. In this context, we have identified aggregator firms and novel retail tariff electricity design as two powerful tools that would incentivize both firms and consumers to install distributed energy resources (DERs) and demand side response (DSR) technologies.

Aggregators group multiple agents (consumers, producers, prosumers) and bundle them into one entity, operating in day-ahead, intraday, and ancillary service markets. In this way, aggregators act as intermediaries to leverage untapped flexibility and address the market failures outlined above, increasing overall economic efficiency by reducing peak residual demand and balancing the system through temporal and spatial harmonization of generation and demand profiles. However, regulatory and incentive structures must be well designed to lift the full flexibility potential of aggregation and avoid regulatory arbitrage.

Currently, the Swiss retail electricity tariff remains a monopoly for customers with a yearly consumption under 100 MWh (AEW, 2023). These customers, which are mostly households and small enterprises, face flat or time of use (ToU) tariffs, which prevent them from reacting to price signals and leads to inefficient usage of flexible demand assets. On the other hand, this framework shields customer from large short-term market price variations, as it was the case in Switzerland during the 2022 energy crisis, at the cost of paying a risk premium on the long term.

At the same time, the regulated monopolist utility often faces little incentive to reduce costs and increase efficiency as it can charge at cost. Therefore, the incentives are low for utilities to offer flexible tariffs to customers, which would enable them to harness the flexibility embedded in their devices. Also, the utilities often do not have technology specific knowledge to operate a certain flexible demand asset in the most efficient or customized way. Third party retail electricity suppliers could fill this gap by providing flexible tariffs that are tailored to the assets of consumers and aggregate their flexibility potential. However, given the monopoly context, to date it is not possible, for third party retailers to offer such services.

Additionally, even if there are existing policies regulating the participation of pooling firms in ancillary markets (VSE, 2013), allowing aggregators to operate, doing so in a monopoly setting represents an additional challenge as there could exist frictions between the monopolist and the aggregator. For example, since the aggregator cannot supply the electricity directly to the consumer and if both entities are participating in the balancing market, the management of flexible demand assets will directly affect the monopolist's demand prognosis and would hamper its capability to react swiftly to the grid operator's demands in balancing the system, exposing the monopolist to additional payments in regards to energy already allocated in forward markets and also to potential imbalance penalties.

Methods

To correct this market design issue, we propose a scheme where base and flexible demand assets are effectively decoupled if the consumer chooses this option, with the aggregator managing the flexible demand directly. To account for the potential additional costs that the monopolist would face, back-end compensation transactions between the aggregator and the monopolist would be needed.

At this point in time, we use economic reasoning to present our approach. In later stages we will use economic theory and a formal model to determine the optimal compensation payments from monopolist to the device specific supplier. Furthermore, we are in the process of quantifying the economic benefits for households with flexible assets from having a dynamic tariff.

Expected Results

With such design, the customer would have the advantages of adequate hedging towards market price fluctuations and an efficient and personalized management of its assets by a technology specific aggregator within an electricity retail monopoly.

With the development of the formal model, we expect to identify the scale of the untapped benefits that this regulatory and tariff change could bring and the impact it could have on low-carbon technology deployment.

Conclusions

This research aims to investigate the existing challenges to the roll-out of flexible demand assets from a regulatory and retail tariff design perspective. By combining a theoretical and modelling approach we will be able to test new tariff and regulatory schemes in a monopoly context, allowing us to quantify the economic value of flexible demand aggregation in Switzerland.

Finally, the model's results can derive in robust and innovative regulatory recommendations that could contribute to the decarbonization of the demand side of the energy system.

References

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