Position Paper: Demand Side Flexibility (Electricity)
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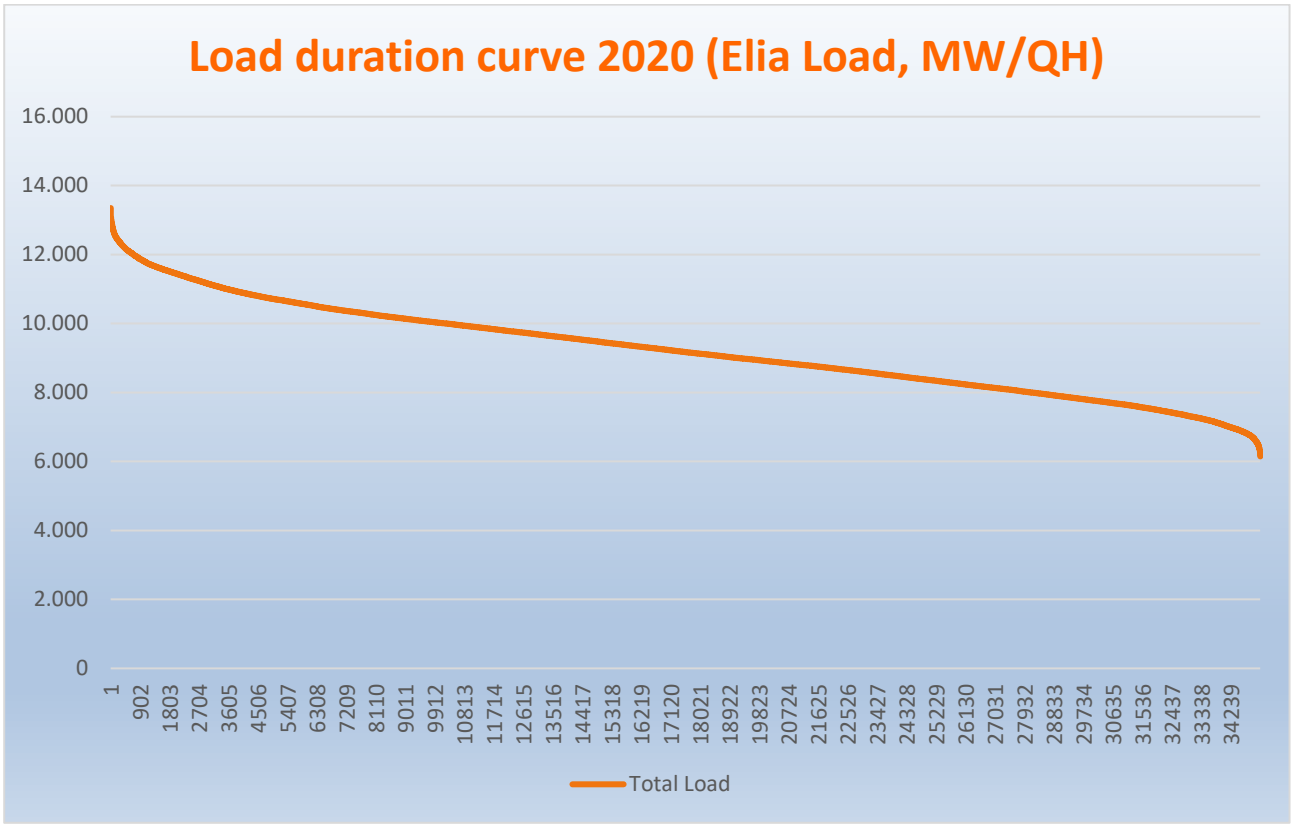
Description

After the liberalization of the electricity market, the context of the electricity system changed from a regulated and centrally controlled and planned system to free competition between market parties, both incumbents and new entrants, also across borders. The increase in competition stemming from a liberalised market leads to increased market price volatility, but should also bring more efficiency to the system, by improving dispatching and lowering the reserve capacity margin significantly compared to a regulated system, which in its turn should lower the total cost of the electricity system. Moreover, the rapid increase of intermittent renewable generation capacity in the electricity system increases volatility and thus requires more flexibility from other sources (generation, load and storage). Flexibility in general but demand side flexibility in specific (as will be argued below) is a very interesting instrument for the electricity system to cope with the last few 100(s) of peak MWs of the load duration curve, which will only be solicited for a very limited number of hours (e.g. in 2020 the last 400 MW of the load duration curve in Belgium were used for less than 7 hours, or 0,08% (!) of the time, and the last 1000 MW for about 72 hours, or about 0,82% of the time) and this at the most efficient cost for the system.



These few hours of peak demand should not necessarily be covered by (large) centralised generation units (which is historically the case in regulated systems), as they would on the one hand remain idle most of the time and thus presumably not be very profitable and on the other hand lead to an overdimensioned generation park. in case of overcautious and risk-avers behaviour from (non-market) decisionmakers. More flexible solutions can more efficiently solve the issue of the last and least solicited MWs of the load duration curve and do so at a much lower systemic cost.

Flexibility can take the following forms:

- Flexible generation
- Demand Side Management, and this in all market segments (e.g. residential, offices, services industry, industrial consumers (on the distribution and transmission grid), …)
- Storage

In a competitive market, a permanent trade-off will take place between available flexibility and the need for investments in additional generation and transmission capacity. The latter will only take place if the price signal strongly indicates imminent or increasing scarcity and the need for such generation or transmission capacity. Until that point, the flexibility inherently existing in the system will contribute to balance between generation and load to the extent to which the market design encourages participation of all available resources in a cost effective way.

The recent evolution of an increasing introduction of (often subsidized) intermittent renewable energy sources such as wind and photovoltaic has had a profound impact on the system. Indeed, this new generation capacity, though large in installed base, is neither reliable nor flexible nor predictable in all timeframes, and as such does not help the adequacy issue addressed above. Furthermore, it aggravates the need for flexibility from all other market parties, leading to a higher total cost of the electricity system, specifically through their impact on thes real-time operations of transmission system operators.

In this position paper, Febeliec focuses on the flexibility that industrial end users can offer, either through (pure) demand side response or through other flexibility means on their sites (flexible generation, emergency generators, storage, …) that impact their offtake profile. Gradually, business models for storage solutions are becoming more economically viable, but many forms of storage are currently not yet economically viable or scaled to an appropriate level and are not directly addressed here. Flexible generation is also not addressed in this position paper, except to the extent that such generation and storage can contribute to the modification of the offtake pattern of industrial sites and thus also help the system.

For Febeliec, **Demand Side Flexibility or Demand Side Response (DSR)** is an essential element in covering the last MWs of peak demand at the lowest possible system cost and needs to be further developed. For such development of demand side flexibility, the following elements are key:

- DSR must always be on a **voluntary basis** and must always be fairly **remunerated**; if not, this would imply an enforced curtailment of load, which would destroy economic value and damage our reliability as an investment-worthy industrial region. Large industrial consumers indeed contribute largely to grid stability (stable and predictable baseload consumption) and can by the nature and volume of their activities provide the low-hanging fruits for demand response.
- DSR, especially from industrial consumers, cannot be a solution to issues of structural system adequacy and capacity shortages, as the first objective of the industry is to produce goods. The potential of DSR can be increased but only to a certain point and will come with a progressively accelerating cost.
- DSR should be made possible in all timeframes, from the near real-time balancing timeframe to the intraday and day-ahead markets and to a certain extent even in the forward markets. Transmission and distribution system operators, insofar they have been involved in DSR, have mostly focused on those applications most directly suitable for their operations, e.g. balancing. For industrial consumers, but also for all other consumers, this timeframe is only accessible for those processes that can react within very short time periods. However, this is merely the tip of the iceberg, as many more actors and processes could offer their flexibility to the system if they would have a longer

notice period than that applicable in the balancing products. As such, from a system perspective it is primordial that also all other flexibility can find its way to the markets and the system, to the benefit of a lower overall system cost.

- DSR requires not only remuneration, but also a stable regulatory framework. A special attention should be given to industrial self-generation plants, which can reduce the net offtake of the grids by increasing their production. These can be emergency generators, used for stopping processes in an orderly shutdown in case of an emergency, but can also be very high efficiency (and thus less carbon-intensive) cogeneration units. In both cases they can be very useful tools for solving temporary adequacy issues.
- Febeliec strongly disagrees with the suggestion that in future energy systems with high intermittent generation penetration, load should follow supply, as this is simply not compatible with the reality nor feasibility of industrial investments. To enforce this would fatally undermine industrial activities and accelerate the leakage of jobs and carbon-dioxide emissions, as this would put impossible technical and financial burdens on consumers.

As described above, demand side flexibility is interesting in a market environment as a cost efficient solution to solve issues of generation adequacy for a limited number of hours. In countries where specific system adequacy issues that have arisen over the course of the last years (such as Belgium, GB, France, …), but gradually also in other countries, demand side flexibility has seen progress on many levels. The appearance of new market roles as aggregators and other flexibility service providers, plus the more active involvement of suppliers/Balance Responsible Parties(BRPs) as well as an increased demand for flexibility products from system operators have had a positive effect on the development of this segment.

However, several obstacles and barriers currently still exist, hampering the development of the full potential of the demand side flexibility available within the electricity system. These barriers include:

- **Commercial and legal constraints**:
    - The ownership of the load flexibility is not always clear. In Belgium, substantial progress has been made on the issue of transfer of energy (ToE) in several products of the balancing timeframe and the strategic reserve. However, it is still required to complete this exercise for all other balancing products as well as for the day-ahead and intraday timeframe, in order to allow all consumers to valorise their available flexibility across timeframes and flexibility service providers (or directly) without any undue legal and commercial barriers
    - Exposure to market prices: many market players with flexibility within their consumption patterns and production cycles have no incentive to make it available as they have no exposure to market prices (either because of fixed-price or non-flexible contracts, or because of lack of adequate meters such as hourly measured or smart meters). The Clean Energy Package for All Europeans has several provisions to this extent and the decision on smart meter roll-out has been taken in most Belgian Regions, but Febeliec urges all involved stakeholders to proceed as quick as possible to unlock this vast untapped potential.
    - Legal stipulations can exclude certain types of flexibility (e.g. definition of demand response excluding participation of emergency generators to certain demand response products as they do not reduce consumption). These barriers should as soon as possible be dissolved in order to unlock all available flexibility and thus reduce as much as possible the total system cost.
- **System constraints**: The minimum size, duration, frequency, notification period, and other technical constraints of demand side response varies between sectors and industrial processes, and products are sometimes not compatible with the technical and safety constraints.
- **Grid codes and tariffs**: Grid codes and tariffs should not penalize demand side flexibility participation, e.g. related to the rebound effect, where grid tariffs can penalize industrial consumers who want to catch up with production

loss after activation of their flexibility or who offer increased demand in times of surplus electricity. Although already some efforts are made to mitigate the negative impact of tariffs and grid codes, this topic should remain at the centre of all future grid code and tariff redesigns, in order not to create new or additional entry barriers.

- **Transparency**: Consumers wishing to participate in the market should have access to essential information (e.g. real-time metering data), while at the same time transparency on products and selection outcomes can still significantly be improved. Current practices are usually designed for generators, not for demand side participation.

Febeliec wants to emphasize that **all** (demand side) flexibility must be able to find its way to the market or to system operator products to solve the peak adequacy issue at the lowest and most efficient total cost for the electricity system, and this either directly or through the intermediation of Flexibility Service Providers (FSPs). Febeliec welcomes the initiatives from new market roles as aggregators and FSPs to enable all interested parties with flexibility to market and valorise their flexibility as often consumers would not be able to fulfil existing DSR product requirements alone; nevertheless, Febeliec remains a strong proponent of allowing direct participation by parties with demand side flexibility to the market in order to maximize their benefits. Ownership of the flexibility resides with the end consumer, who should be able to market his flexibility without barriers imposed by system operators, balancing responsible parties and other market actors that limit his access to the market.

Industrial demand response can take many forms, with longer or shorter activation and response lead times. Febeliec keeps pleading for opening up all balancing as well as day-ahead and intraday markets to participation from DSR by removing all remaining barriers. Demand Side Flexibility presents substantial potential in all different timeframes and products should thus be designed to allow Demand Side Flexibility to reach its full potential in all timeframes:

1. The timeframe up until day-ahead market clearing as well as the intraday timeframe, either explicitly or implicitly through the demand curve (increasing its elasticity) and thus integrated within the market price signal;
2. The Balancing timeframe, incorporating primary, secondary and tertiary reserves, where DSR can be delivered by very flexible production processes that can react on short time notice, going from within a quarter to even a few seconds;
3. Regulated products, either inside or outside of the market, (e.g. Capacity Remuneration Mechanisms or Strategic Reserves that are called upon by the transmission system operator based on economical or technical triggers). A bidladder approach where owners of DSR could at any time offer their flexibility to the system (e.g. for strategic reserves) should be put in place to allow all available flexibility at any point in time to contribute to system adequacy.

Objectives of Febeliec

The increasing share of intermittent generation will make the power system balancing more costly and increase the need for flexibility. For Febeliec, all load flexibility must be able to find its way to the market or to system operator products, to all timeframes, and this either directly or through the intermediation of Flexibility Service Providers, in order to bring down the balancing and adequacy cost of the system. The goal is to solve any adequacy issue at the lowest and most efficient total cost for the electricity system. Participation in demand side flexibility must be voluntary and remunerated with a fair compensation. Demand side flexibility cannot provide a structural solution for generation adequacy and cannot replace investment in generation capacity whenever shortages become structural rather than punctual. Under no circumstance can Febeliec accept a market design which forces the industrial consumer to adapt his offtake to the availability of (intermittent) energy sources.