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INSIGHT

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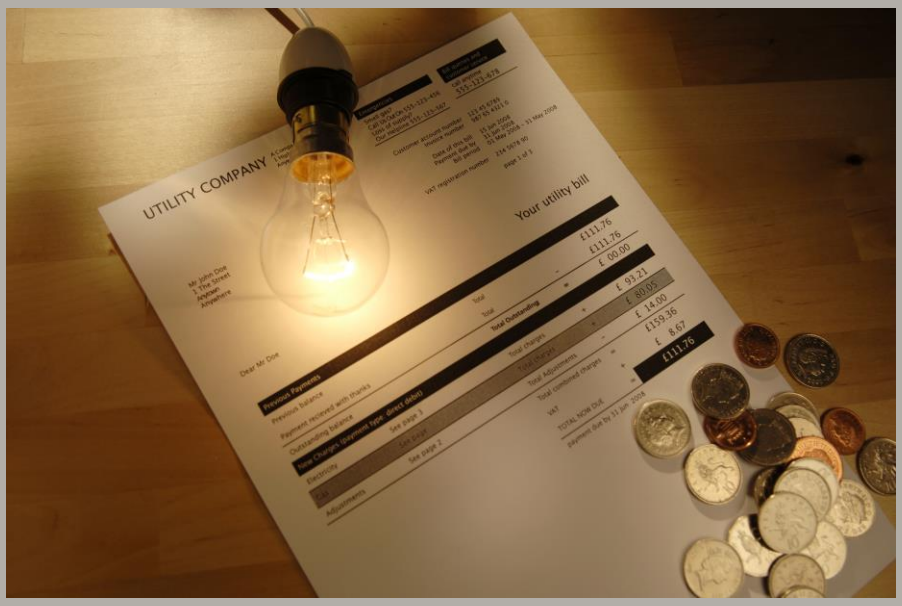
DEMAND RESPONSE PROSPECTS FOR BELGIUM

A STUDY OF THE TOTAL DEMAND RESPONSE POTENTIAL AND MARKET BARRIERS FOR DEMAND RESPONSE IN BELGIUM



Introduction

Rising shares of decentralized solar and wind energy generation are shifting energy generation to the distribution network and making the power supply increasingly unpredictable and intermittent. In order to cope with these challenges, there is an increased need for flexible supply and demand-side resources. One of the solutions currently being leveraged in Belgium is demand response – i.e.: adjusting demand according to the needs of the electricity system.

In this study, Sia Partners analyses the current situation of demand response (DR) in Belgium and maps the total market potential for each sector in Belgium. Moreover, this study highlights the market barriers that need to be alleviated before further DR adoption.

Context

In the wake of the European energy transition, the Belgian government has committed to achieve the ambitious target set by the European Commission, namely to have a 40% share of renewable power production by 2030 [1]. PV and wind capacity will play a vital role in achieving these targets. However, both technologies have important disadvantages; a limited predictability and intermittency. As their shares rise in the total power generation, power supply will become increasingly variable, making it more complex for Elia, the Belgian TSO, to balance the network.

Where there used to be a handful of power plants on the transmission network, there will be thousands, potentially millions, of decentralized renewable generators in the future. These generators, mostly PV installations, will be scattered over the distribution grid. As a result, large peaks in supply are expected in summer on the distribution network, especially in regions with significant PV capacity. In addition, the expected electrification of consumer needs - and associated surge in demand for heat pumps and EVs - will increase the demand for power, especially in winter. Consequently, Distribution System Operators (DSOs) might have to deal with occasional peak loads that far exceed their current grid capacity. In order to cope with these challenges, policy makers and energy actors have turned – among others - to Demand Response (DR) as a solution.

Demand response potential in Belgium

Demand Response is based on a basic principle; provide consumers with financial incentives to adjust (up/downward) their consumption at strategic times. In 2013, Elia has already progressively embraced demand response as a source of flexibility by opening up its primary and tertiary reserves for DR services. Since then, market facilitation by aggregators and regulators has fostered the evolution of the DR market, resulting in a total capacity of more than 850 MW upward and downward DR capacity (the equivalent of one gas fired power plant) leveraged as ancillary service in 2018 [2].

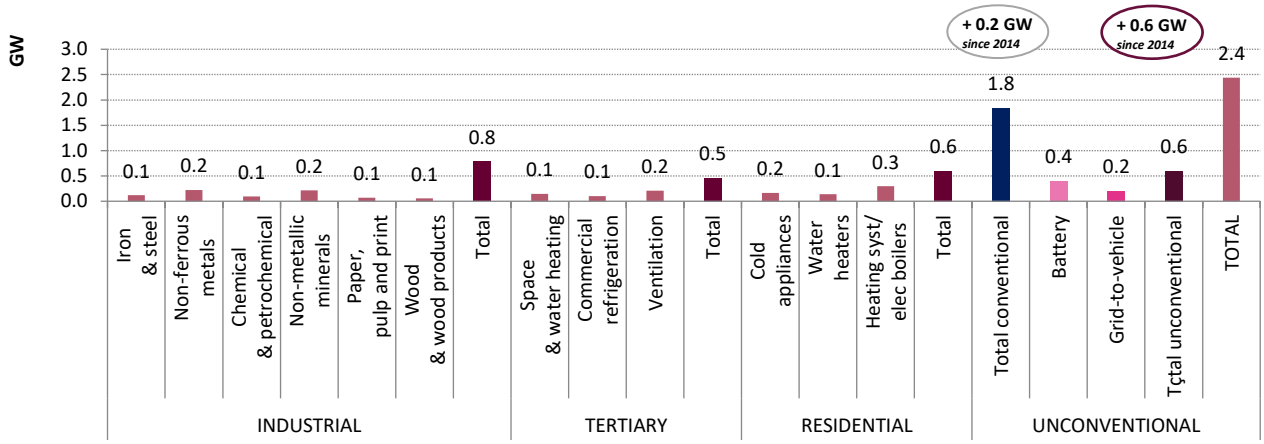


FIGURE 1: DEMAND RESPONSE POTENTIAL IN BELGIUM BY SECTOR

Nevertheless, there is still a significant amount of DR potential that remains unlocked. Previous research in 2014 by Sia Partners, updated with the latest data, shows that there is a total potential of around 1.8 GW conventional DR capacity in Belgium, as illustrated in figure 1 [3]. This conventional DR capacity, which consists out of the residential (0.59 GW), tertiary (0.46 GW) and industrial capacity (0.78 GW), is further complemented by 0.6 unconventional DRM, enabled by new technologies such as EV and stationary batteries by 2030. The total DRM potential equals thus 2.4 GW, representing more than 18% of the Belgian peak load in 2017 (13.5 GW).

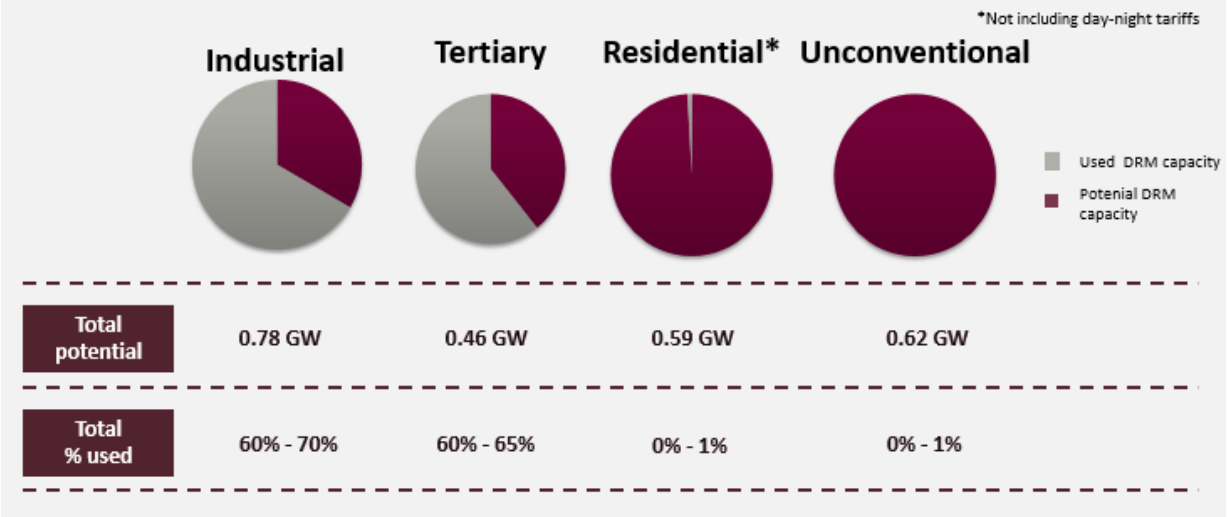


FIGURE 2: DEMAND RESPONSE CAPACITY USED IN BELGIUM

As illustrated in figure 2, further analysis shows that currently between 60% - 70% of the industrial DRM potential capacity and 60% - 65% tertiary DRM potential in Belgium are already leveraged. In sharp contrast to the segments of the residential sector and unconventional DR where the flexible capacity remains largely untouched.

Consequently, energy actors can leverage the remaining flexibility of the residential sector and unconventional DR in order to cope with the future energy challenges and generate cost savings:

- DSOs can leverage DR to decrease electricity peaks and minimize the risk of (distribution) grid overloading. Since the size of electricity peak determines the maximum grid capacity, grids could avoid reinforcement or even reduce capacity.
- Suppliers can employ the flexibility of their clients to decrease their procurement cost or avoid imbalance penalties.
- Elia can benefit from residential and unconventional DR by managing it as a block in its strategic reserves.
- Consumers can be reimbursed for their offered flexibility and benefit from the above-mentioned cost savings that trickle down to the consumer in the form of lower prices.

Barriers to further DRM adoption

Before the untapped DR capacity can be unlocked, the DR market model has to be re-designed and remaining market barriers have to be alleviated.

Residential market barriers

Smart meters are essential to incentivize and to measure – and consequently valorize - the flexible capacity offered by consumers while, in Belgium, the smart meter has not been rolled yet. This barrier will be alleviated by massive smart meter deployment in Flanders (starting in 2019), limited deployment in Wallonia (starting in 2020) and the deployment plan in Brussels under discussion. In addition, policymakers have yet to create the right regulatory framework allowing to incentivize consumers to adjust their demand by offering capacity payments or dynamic prices. Lastly, even with the massive deployment of smart meters and incentives, adoption of DR may be slowed down due to lack of adoption of smart load-shifting household appliances, such as smart washing machines.

Unconventional DR capacity market barriers

The main barrier of the uptake of new storage technologies such as stationary batteries and EV remains the cost of the battery. However, tumbling battery prices – up to 15% cost decrease/year until 2020 - are expected to accelerate EV adoption and stationary batteries [4].

In addition, the economic viability of vehicle-to-grid (V2G) operations has been the subject of debate due to the battery degradation and decrease of battery longevity caused by the high number of charging cycles. Therefore, car manufacturers have remained skeptical to adopt V2G as it may imply additional costs for batteries and replacements. However, new research shows that a smart control algorithm with an objective of maximizing battery longevity can reverse battery degradation. In such an approach, the control algorithm only allows access to the battery's stored energy if there are no adverse effects on battery longevity.

Lastly, similar to residential market barriers, there are currently almost no financial incentives to deploy batteries at strategic times as there are no dynamic prices (except for day-night tariff).

Industrial and tertiary DR capacity barriers

Some industry and tertiary market participants remain reluctant to offer their flexibility due to the high implementation costs, complexity, inability to adjust their production schedule and lack of perceived benefits of DR. However, these barriers are (partly) lifted by aggregator service providers that raise awareness of the potential revenues that can be generated by offering flexibility. In addition, aggregator service providers can alleviate the market barriers by offering technical expertise, decreasing complexity and offering the ability to take into account production schedules of the production assets.

Conclusion

Demand Response has become an important instrument to deal with the increasingly intermittent generation and consequently adoption has grown tremendously in Belgium since 2013. However, research conducted by Sia Partners shows that there is still more than 1.5 GW DR potential untapped that could be leveraged by 2030. Much of the low hanging fruit, such as large industrial manufacturers with easily accessible flexible capacity, has already been picked. However, much DR potential remains untouched with more than 1100 MW potential residential and unconventional DR capacity remaining by 2030. Before this remaining DR potential can be unlocked, the most important market barriers will have to be alleviated as follows:

1) Smart meters should be rolled out in order to measure and valorize the flexible capacity offered by batteries and residential consumers.
2) A regulatory framework needs to be created in order to support dynamic prices or capacity based remunerations allowing to incentivize consumers offering flexibility.
3) Energy actors - DSOs, TSOs, suppliers, industry and residential consumers – need be made aware of the market opportunities enabled by DR.

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