
THE ROLE OF THE DEMAND SIDE IN THE POWER SYSTEM

ECI Inputs for the Public Consultation on a New Energy Market Design

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INTRODUCTION

The consultation on a new market design represents an opportunity for the European Union to embark on a course to increase the weight of demand in the power system. Traditionally, consumers have been considered as passive users, but continuing this view in an increasingly renewable electricity system will lead to very high costs for energy storage and standby power generation, and potentially high cost of non-availability. There is a better way, in which demand and supply carry an equal weight. This is the main purpose for European Copper Institute's response to this consultation.

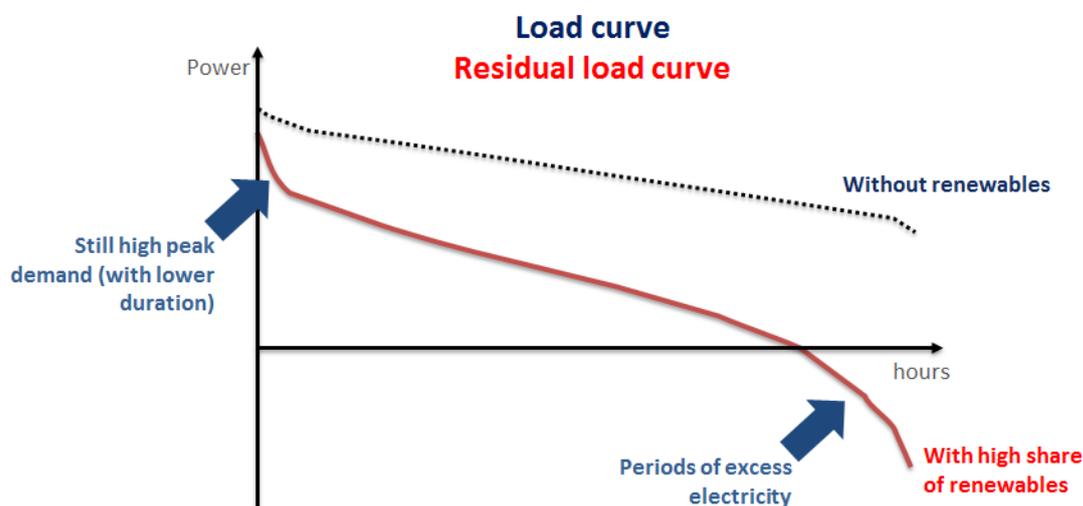
QUESTION 1

Would prices which reflect actual scarcity (in terms of time and location) be an important ingredient to the future market design? Would this also include the need for prices to reflect scarcity of available transmission capacity?

SCARCITY IN TIME

Generally, prices should reflect scarcity, and transparent prices are an important ingredient for future market design. This is especially true to indicate situations of generation scarcity and oversupply. In these situations, the demand side resources should be enabled to react effectively to price signals and provide load reduction in scarcity situations and load increase in times of oversupply. This saves investment and operational cost of peak power plants and avoids curtailment of renewables.

In markets of higher shares of variable renewables, price signals in short-term markets as well as reserve markets become more important. Hence short-term markets need to be as liquid and transparent as possible. Cross-border integration of intraday markets, aligned measuring intervals and gate closure times contribute to this goal. Furthermore, barriers for the participation of demand-side resources in these markets should be removed.



Residual load duration curve for an electricity system with or without high penetration of renewables¹

¹ See <http://www.leonardo-energy.org/white-paper/power-system-flexibility-strategic-roadmap> chapter 1.2.1

SCARCITY IN TERMS OF LOCATION

Within a bidding zone, market participants are able to trade energy without capacity allocation. Hence the TSO needs to manage congestion within bidding zones by redispatching resources. Here, demand should be fully eligible for use as a redispatch resource.

CONGESTION MANAGEMENT ON A DSO LEVEL

To realise a cost-minimal network expansion strategy, DSOs need to find an optimal balance between network expansion and the use of flexibilities, especially interruptible loads². A DSO needs to be able to close long-term contracts which assign a long-term option to the DSO to access flexibilities available in the system.

Additionally, a coordination mechanism needs to be introduced to allow flexibility resources to participate in system level markets whenever the flexibility is not used locally by the DSO for managing local congestions.

QUESTION 2

Which challenges and opportunities could arise from prices which reflect actual scarcity? How can the challenges be addressed? Could these prices make capacity mechanisms redundant?

More homogeneity in regulatory practices is needed, in particular regarding demand-side participation in wholesale and balancing markets. Aggregators and individuals should be able to participate in markets everywhere, under the same market rules. This latter point is important to develop industrial strategies at European level (e.g. enable European aggregators).

Challenges: at the residential level, high price spikes can be an issue, as residential consumers are less prepared to respond to such signals. In large tertiary and industrial facilities, such reflectivity makes more sense, since these sectors are professionally organised to manage their energy consumption.

DSM in industry is being thoroughly analyzed by the H2020 project IndustRE (www.industre.eu) 2015-2017. A number of business models are explored, in which the industry interacts with the market at various time scales and/or with the transmission system operator also at various time scales (from long-term to balancing markets). A stakeholder consultation takes place in October 2015 that should give relevant feedback on what is feasible under the current rules in 6 different countries (BE, DE, ES, FR, IT, UK). Obstacles will be identified and suggestions to tackle them will be presented.

Under a scenario where prices reflect scarcity, capacity remuneration mechanisms would be made largely redundant.

and <http://www.leonardo-energy.org/webinar/how-demand-flexibility-will-develop-german-power-system>
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² E.g. for peak shaving, there are many good examples in this CIREN special report
<http://www.cired2015.org/files/download/175> (checked October 2015)

QUESTION 5

Are long-term contracts between generators and consumers required to provide investment certainty for new generation capacity? What barriers, if any, prevent such long-term hedging products from emerging? Is there any role for the public sector in enabling markets for long-term contracts?

Long-term contracts could be encouraged between the renewable energy sector and large consumers (or aggregated loads), where consumers offer their flexibility to cope with renewable energy fluctuations in exchange for affordable prices.

QUESTION 7

What needs to be done to allow investment in renewables to be increasingly driven by market signals?

A distinction between cost-competitive and emerging renewable technologies can be made. Cost-competitive renewables no longer need economic support. Examples of such technologies are residential and commercial scale PV systems in large areas of Europe, and even utility-scale PV systems in some areas³. For such systems, the barriers are non-financial, such as regulatory, or other barriers. Emerging technologies still require some economic support (premium payments on top of remuneration from the electricity market).

For emerging technologies, see question 9.

For cost-competitive technologies:

- A harmonization should be introduced in the field of prosumers. Self-consumption of PV generation is treated in a very heterogeneous way by Member States. Some countries such as Spain currently ban self-consumption, while other countries such as Germany subsidize renewable generation and even energy storage. With common RE targets for the EU, policy should not vary to such extremes.
- Under a prosumer scenario, the fixed costs of the electricity system (transmission and distribution system investments and operational costs) can no longer be covered on the basis of consumed energy (as net consumed energy will progressively go down to zero). However, prosumers still benefit from the support of the electricity grid. A two-part tariff structure is needed with capacity and energy components. This aspect also requires harmonization.

QUESTION 8

Which obstacles, if any, would you see to fully integrating renewable energy generators into the market, including into the balancing and intraday markets, as well as regarding dispatch based on the merit order?

SUPPORT SCHEMES AND NEGATIVE PRICES

Most renewable energy generators in Europe are receiving support payments based on their feed-in of energy (fixed feed-in tariff, fixed/variable market premium). Due to support payments, the price signal is distorted. This distortion becomes relevant if prices are very low or negative, since renewables have the incentive to continue production even if market prices become negative. RES-E production at negative prices contributes to

³ See Photovoltaic Grid Parity Monitor, a joint project since 2012 between Creara and European Copper Institute: <http://www.leonardo-energy.org/photovoltaic-grid-parity-monitor>

oversupply situations and stabilises negative prices at the expense of consumers who need to pay for the negative price via the support scheme.

This incentive to continue production, combined with a lack of interconnection capacities and missing local flexibilities to absorb the oversupply, may cause extended periods of negative prices. These “artificial” negative prices in oversupply situations caused by the support scheme are an incentive for investments in flexibilities, which can make use of the excess power (e.g. storage, power-to-gas). The demand side in particular receives an incentive for additional consumption if power consumption is not charged but remunerated. Hence support payments for RES-E at negative prices can be interpreted as an unintended support scheme for flexibilities as a by-product of priority dispatch of renewables.

However, support schemes - as any other policy intervention - should be consciously tailored to eliminate market failures, not as a by-product of other support schemes. For instance, barriers to the participation of demand in power markets have to be removed explicitly (see answer to question 10).

EU State-aid guidelines prevent the allocation of a positive market premium from the support scheme if wholesale prices are negative for more than 6 consecutive hours. This EU regulation is not based on economic considerations but is a result of a negotiation process. Hence support scheme design should ensure that generators curtail themselves at negative prices and that adequate incentives are provided to accommodate excess generation, to avoid spillage of a resource that is freely available (wind or solar energy).

RESERVE MARKETS

Product definitions and pre-qualification requirements provide significant barriers for renewables and demand aggregators. These barriers should be reduced and pre-qualification requirements harmonised in the long-run. In the short-run, the Commission should consider defining recommended practices as a minimum.

QUESTION 9

Should there be a more coordinated approach across Member States for renewables support schemes? What are the main barriers to regional support schemes and how could these barriers be removed (e.g. through legislation)?

Investment in renewables should circulate more freely. The renewable energy directive introduces optional cooperation mechanisms between Member States, which allows them to agree on the extent to which one Member State supports the energy production in another and on the extent to which the energy production from renewable sources should count towards the national overall target of one or the other Member State.

It seems that such cooperation mechanisms have not been used extensively by Member States, leading to a situation that has been criticized by the World Economic Forum⁴. The obstacles for such projects and the design options to overcome them have been well documented⁵. Considering the huge financial losses due to

⁴ Europe's renewable energy deployment 'sub-optimal', report says

<http://www.euractiv.com/sections/energy/europes-renewable-energy-deployment-sub-optimal-report-says-311435> (checked October 2015)

⁵ RES Support Schemes and Cooperation Mechanisms in Europe,

<http://www.ecofys.com/en/publication/renewable-electricity-support-schemes-and-cooperation-mechanisms-in/> (checked October 2015)

suboptimal deployment of renewables, a more coordinated approach across Member States for support schemes makes more sense.

QUESTION 10

Where do you see the main obstacles that should be tackled to kick-start demand response (e.g. insufficient flexible prices, (regulatory) barriers for aggregators / customers, lack of access to smart home technologies, no obligation to offer the possibility for end customers to participate in the balancing market through a demand response scheme, etc.)?

INSUFFICIENT FLEXIBLE PRICES

The structure of prices for final customers is currently not very flexible. They tend to be not time-variable (no time-of-use or real-time pricing), for several reasons:

Firstly, the current wholesale price volatility is too low to provide sufficient incentives to suppliers to pass on volatility to final customers. However, this is likely to change in the future, when situations of generation scarcity will be reflected by high prices. Especially in countries without capacity markets, price spikes are expected and accepted by policymakers.

Secondly, the wholesale price volatility is low compared to the total level of final tariffs (which include network charges, taxes and other charges on the energy price). This reduces the relative importance of the volatility.

Hence concepts exist to enhance the price signal artificially. For example, Germany is currently examining whether the renewable energy surcharge (currently at 6.2 ct/kWh) should be time-variable with the spot price of electricity ("dynamic EEG-surcharge")⁶. This enhanced price signal could trigger additional demand response and investments in other flexibility options.

(REGULATORY) BARRIERS FOR AGGREGATORS / CUSTOMERS

Product definitions

Compared to the size of conventional power plants, the size of demand units is relatively small. Hence units need to be aggregated in order to trade them. The aggregated products need to fulfil the required product definitions. Especially for reserve products, the prequalification requirements of TSO can be a barrier. These requirements refer to properties such as the minimum unit size, required reliability levels (which define the necessary pool size), product length, the lead-time before activation etc. These product definitions can be a substantial barrier for the participation of the demand side in power markets.

Barriers for independent aggregators

Independent aggregators do not have an energy supply contract with final customers. They are focused on aggregating demand response potentials, selling the aggregated product on energy and/or reserve markets. However, in countries such as Germany, independent aggregators cannot enter the market, since they cannot bypass current suppliers which are balancing responsible parties. The current suppliers are not interested in

⁶ Such approach would also be valuable to limit periods of surplus generation.

cooperation with independent aggregators since they do not want to give away business. What is missing here is a regulation that gives independent aggregators direct access to the balancing market.

(given point) lack of access to smart home technologies

In the current regulatory framework, there is an intention to put consumers in charge, for example by letting them profit from reducing their own load or from lower tariffs during periods of surplus generation. Demand response benefits system operators, for instance, by enhancing the use of existing grids, facilitating integration of RES or reducing grid losses. It benefits large energy users who can participate in markets and actively manage their energy use.

But does demand response also work for residential consumers? There are currently no clear advantages for small consumers to participate. Moreover, the value gained by small consumers through demand response is limited. To the extent that these gains occur at the distribution level, a regulatory regime should be developed or adjusted allowing DSOs to benefit from demand aggregation, and then perhaps regulating them in order to transfer their gains to consumers.

A further barrier is the lack of sufficient bidirectional real-time metering, and incentives to install them. Even where installed, real-time metering systems are not bidirectional (i.e., they do not allow automatic response of load to real-time price signals), but just allow one-side metering (i.e. they measure load in real-time). The existence of bidirectional real-time metering is a necessary condition to benefit from demand response. Moreover, there is a different penetration of real-time metering in Europe, which leads to a difficulty to implement a European framework/strategy for demand response, as well as to allow for European investments. Finally, there is no European standard for real-time metering, therefore reducing room to develop a European industry.

Home automation systems⁷ allow automation of home energy services based on predefined settings or control through a console or apps. These systems are currently not widespread but should be installed by default in everyday life.

Demand response incentives are needed to support homeowners to invest in bidirectional metering, home automation and smart appliances.

ENCOURAGE SUPPLIERS TO OFFER THE POSSIBILITY FOR FINAL CUSTOMERS TO PARTICIPATE IN THE BALANCING MARKET THROUGH A DEMAND RESPONSE SCHEME

Participation in the reserve market should be open to any customer, either directly with the SO (typically in case of big industrial facilities) or through aggregators (for SMEs, tertiary and possibly residential customers).

There is an additional avenue for support of the system balance without engaging in a formal scheme with SO or aggregators. Demand can respond very well in real-time to the situation of the whole system by adapting its consumption level (load reduction if the system is short; load increase if the system is long). This “casual” and flexible contribution could work provided: 1) there is real-time information on the system situation (running short or long); 2) suppliers (balancing responsible parties) are encouraged to set agreements with their customers for such unconventional response. Demand needs to receive a compensation for its response;

⁷ Integrated Home Systems (6 chapters) - see <http://www.leonardo-energy.org/ebook/integrated-home-systems-chapter-6-controlling-heating-ihs>

however, such compensation is received in a first step by the supplier. An agreement is needed between the supplier and the consumer to transfer (part of) the compensation to the latter.

STRUCTURE OF NETWORK CHARGES AS A BARRIER TO DR

A demand response action triggered by system requirements and reflected by a price peak or by a reserve call might lead to a high load increase. If the structure of network charges is such that this demand peak leads to a high payment for the network capacity, this increase in network charges is a financial barrier for demand response.

A possible approach to remove this barrier would be to introduce rules of exemption to the structure of network charges. This could mean that no charges apply if a TSO calls the reserve and initiates a demand increase for system balancing purposes⁸.

⁸ This exception should also apply to the above-mentioned scheme (NL model).