Why Demand Response is not implemented in the EU?
Status of Demand Response and recommendations to allow Demand Response to be fully integrated in Energy Markets

Paolo Bertoldi, Paolo Zancanella
European Commission Joint Research Centre

Benigna Boza Kiss
Central European University

Introduction 1

- EU energy policy has three main pillars:
  - sustainability and de-carbonisation of energy production and consumption;
  - security of energy supply (secure energy supplies to ensure the reliable provision of energy); and
  - competitive energy market resulting in affordable energy supply for end-users.

- The EU electricity market is progressively liberalised to give more power and options to customers and to make the market more competitive through un-bundling and cross border trade.

- The third package covers five main areas (2009):
  - unbundling energy suppliers from network operators
  - strengthening the independence of regulators
  - establishment of the Agency for the Cooperation of Energy Regulators (ACER)
  - cross-border cooperation between transmission system operators and the creation of European Networks for Transmission System Operators
  - increased transparency in retail markets to benefit consumers

Introduction 2

- The **2020 energy and climate targets** have been adopted in 2007:
  - 20% reduction in EU GHG emissions from 1990 levels;
  - Raising the share of renewable in the EU energy consumption to 20%;
  - Improving energy efficiency to achieve a 20% savings on the EU primary energy consumption.

- Recently more ambitious targets have been adopted for **2030**:
  - 40% cut in GHG compared to 1990 levels
  - at least a 27% share of renewable in final energy consumption
  - at least 27% (30%) energy savings compared with the business-as-usual scenario (same scenario used for the 2020 target)

- In 2014 the share of renewable electricity generation was **27.4%**.

- Renewable energies, especially PV and wind generation, tend to fluctuate over time due to weather conditions and other factors. The penetration of renewable energies has created the need **for additional balancing and other ancillary services** for keeping the network operating.

Ancillary Services and Balance Responsible Party (1)

- Wholesale markets include futures markets but also intra-day and spot markets. After 'gate closure' the **TSO is responsible to maintain balance** to the micro second prior to consumption. This is done through balancing markets and ancillary services.

- **Retailers** look to buy sufficient energy either from their own generators or from the market, to supply their customers. In order to maintain balance they should buy the same amount of energy for any given time period, as their customer's will consume.

- This is part of their balance responsibility and each retailer will therefore have such a **Balance Responsible Party** (BRP).

- Traditional **Ancillary Services** were provided by integrated utilities mainly with generation options or with some demand side options controlled by generators.

Ancillary Services and Balance Responsible Party (2)

- **Retailers** may be required to **pay** the **TSO** for these services according to the amount that they were off in their balancing calculations. [However the company's generators may also earn from providing balancing and ancillary services to the TSO!]

- **Efficient balancing markets** ensure the security of supply **at the least cost**. An important aspect of balancing is the approach to procuring **ancillary services**. Ancillary services markets provide a range of capabilities which TSOs contract so that they can guarantee system security.

- Electricity demand can be flexible and offer cheaper and "cleaner" solutions to balancing the grid than traditional options. Demand participation in balancing activity is defined as **Demand Response (DR)**.

- DR is first established within the **balancing** and **ancillary services** markets.

.

Demand response definition and types (1)

DR is a **tariff or programme** established to incentivise changes in electric consumption patterns by end-use consumers in response to changes in the **price of electricity** over time or when **grid reliability is jeopardised**.

DR programmes can be categorised into **two groups**:

A) Explicit Demand Response is the type of DR referred to in Article 15 of the EED. DR competes directly with supply in the wholesale, balancing and ancillary services markets through the services of aggregators or single large consumers, through the control of load **traded** in electricity markets, providing a comparable resource to generation, and receiving comparable prices. Consumers receive **direct payments** to change their consumption upon request (i.e. consuming more or less).

B) Implicit Demand Response (sometimes called "price-based") refers to consumers choosing to be exposed to *time-varying electricity prices* or *time-varying network tariffs* (or both). These prices are **always part of their supply contract**. Implicit DR does not therefore allow a consumer to participate alongside generation in a market.

Demand response definition and types (2)

- **Complementarity between the two types**. Many customers participate in Explicit Demand Response through an aggregator, and at the same time, they also participate in an Implicit Demand Response programme, through dynamic tariffs. Consumers receive a **lower bill** by participating in a dynamic pricing programme, they will receive a **direct payment** for participating in an Explicit Demand Response programme.

- **Explicit Demand Response** provides a valuable and reliable operational tool for system operators to adjust load to resolve operational issues.

- **Implicit Demand Response** (dynamic pricing) **does not allow** a customer to participate in the balancing or ancillary services markets, or in most existing capacity markets and it does not provide the system as a whole with a **dispatchable resource**.

The role of Aggregators (1)

- **Most consumers** do not have the means to trade directly into the energy markets because they are **too small** to manage the complexity.
- They require the services of an **aggregator** to help them participate.
- An **aggregator** is a service provider who operates – directly or indirectly – a set of demand facilities in order to sell pools of electric loads as single units in electricity markets.
- The service is provided separately **from any supply contract**.
- They create one **"pool" of aggregated controllable load**, made up of many smaller consumer loads, and sell this as a **single resource.**
- A **retailer** may aggregate their consumer's load in order to manage their own balancing risk, along with generation assets. The **consumer will not receive a direct payment** but only a lower electricity cost. The load will be used in the same way by the retailer as a generation asset.

The role of Aggregators (2)

- Aggregation services provided by **an independent player** or a retailer are a necessity for creating **explicit DR programs**.

- There are certain business model factors which can make it **difficult** for many **retailers to provide these services**. These can be broken into two categories, the retailer's potential conflict of interests concerning DR and the required changes in business model.

- DR is outside the expertise area of a retailer. It is a highly specialised service offering centred largely on knowledge of heating and cooling systems, industrial process, and marketing**.**

- DR could disturb the **existing revenue streams from generation and balancing**. For example, retailers who own generation assets, may earn an important part of their annual returns when prices are high. They also charge the consumers for taking on their balancing risk. If they provide DR they lower their income from generation, as well as the income from providing protection against balancing costs.

The role of Aggregators (3)

- Some retailers do rollout DR programs (small independent retailers, who do not own generation assets). A portion of these have made DR a core part of their business model, however the programmes stay small.
- Established retailers who do engage seriously in DR do so because they face at least one of two challenges:
  - A total collapse of wholesale market price, removing the value of their generation portfolio.
  - Ownership of an inflexible generation fleet, such as nuclear or wind, which drives up balancing costs and does not provide the retailer with a means of earning from exceptionally high prices.
- When a customer receives a flat electricity price they do so because the retailer has taken on the balancing risk (the risk that wholesale prices may go higher than planned). This is a form of insurance for the customer. Just as an insurance company will not want their clients and competitors to know what they earn off of the insurance premiums, the retailer may not want consumers to know what they earn from taking on the balancing risk.

.

The Energy Efficiency Directive 1

EED of Art 15 requires:

- **Demand Response** should be encouraged to **participate** alongside supply within the wholesale, balancing and ancillary services markets***;***
- TSOs and DSOs must treat demand response providers, including aggregators, in a **non-discriminatory manner** and on the basis of **their technical capabilities**;
- National regulatory authorities should define **technical modalities** for the participation in these markets on the basis of participants' capabilities;

- **Technical modalities:**
  - *Definition of baselines*
  - *Payment criteria*
  - *Penalties for non-compliance*
  - *Duration of the call*
  - *Size of the bid*
  - *Asymmetric bidding*

Member State reviews (1)

- The JRC reviewed MSs progress of Member States in implementing Art. 15.8 in practice. Analysis done in Autumn 2015 (and again in Autumn 2016)
- In successful cases, TSOs and regulators are using the deregulated and competitive market structures to empower providers and encourage market entry for consumers.
- A significant portion of EU MSs have yet to begin their regulatory review.
- A few MSs have enable Demand Response and are succeeding despite continued challenges.
- A main finding of this report is that many national regulators see the process of opening markets to Demand Response, as complex and confusing.
- For example, two repeated questions were:
  - *Is it enough that Demand Response is not specifically forbidden?*
  - *Is it enough that retailers can aggregate consumer load?*

Member State reviews (2)

- **MSs** that have yet to seriously engage with Demand Response reforms. Obligatory provisions of the relevant EU Directives may have been transposed. While Demand Response may be 'legal', MSs have not for example, adjusted their regulatory structures to enable demand side resources to participate in the markets, begun the process of defining the role of the **independent aggregator** and DR service provider, or adjusted critical **technical modalities**.

- *Portugal, Spain, Italy, Croatia, Greece, Poland the Czech Republic, Bulgaria, Romania, Slovenia, Slovakia, Hungary, the Baltics, Cyprus and Malta* are in this group.

- However, Italy is aware of the issue and is undergoing a regulatory review, and the status may change within 2017-18. Greece has created one auction-based program for large consumers and intends to open the market further. Poland has created two programs, however these are not successful due to the low and controlled prices offered by the TSO.

Member State reviews (3)

- **Some** MSs are in the process of enabling Demand Response through the retailer only.
- They limit aggregators to the role of service providers to retailers rather than independent parties providing independent offerings to consumers. This limits market offerings to those that are positive for the **retailers**, which may not be the same as those which would benefit the **consumer**.
- Customer will not be offered a clear value for their flexibility - rather they will receive this bundled with their electricity bill.
- *Germany, the Scandinavian countries, the Netherlands* and, to a certain degree *Austria*, are in this group.
- Germany is undergoing a regulatory review and this situation may change in 2017-18. Austria has not defined the role of the aggregator but has made some significant progress in adjusting technical modalities.

Member State reviews (4)

- **The third group** of Member States enables both Demand Response and independent aggregation.
- This includes *Belgium, France, Ireland and the UK*.
- Belgium and France have both defined the roles and responsibilities around independent aggregation.
- These markets have also made progress adjusting technical modalities and market entry requirements in order to facilitate consumer participation.
- Therefore though further work is required, the number of MW of demand side resources more than tripled between 2013 and 2015.

Conclusions 1

- **Market design should enable the participation of Demand Response.**

- European market design should enable the participation of Demand Response as Virtual Power Plants (VPP) in all markets (wholesale, balancing, ancillary services), to the same degree they facilitate centralized generation units.

- *Provide both Energy and Availability Payments* in at least one ancillary services market: the customer is paid for providing capacity to the system.

- Design elements include *frequent auctions, short time durations (such as 15-30 minutes), small minimal bid sizes, and the acceptance of asymmetrical bids*.

- There is now enough good knowledge of best practice concerning this market design and this should be implemented.

Conclusions 2

An important consumer enabler is to define and allow full Aggregation of Consumer Load:

•Qualification for participating in a market should be prequalified and measured at the aggregated pool level, rather than for each consumer individually.

•The aggregated pool of consumer load shall be treated as a single resource, maximising the group's joint potential.

•Aggregator can act as mediator for the consumer, protecting them from onerous and complex technical pre-qualification measures.

•Some TSOs in Europe are capable of accepting pre-qualification of the pooled load

Conclusions 3

The roles and responsibilities of the independent aggregator should be defined:

•Regulation should ensure the consumer's right to freely choose their service provider.

•The standardised process between BRP/retailer and the aggregator is a significant enabler as it creates the framework by which aggregators can have a clear path to market.

•This framework includes:

- *Volumes*: Standardised processes for assessment of the traded energy.
- *Data Exchange:* A clear definition of what data needs to be provided to the BRP through the TSO, to ensure both the aggregator and the BRP can fulfil their obligations whilst **not** having to share commercially sensitive information.
- *Governance structure:* An appeals process and an appeals body, in case any issues need to be resolved.

Conclusions 4

Technical modalities enabling Demand Response should be defined:

- Due to positive developments in some MSS, the technical modalities needed to enable consumer entry into a market are now known and tested.

- They should be standardised and replicated across Europe.

- These include registration, prequalification and risk assessment requirements, which are proportionate to the resource, appropriate tested baseline methodologies, and appropriate measurement and verification requirements.

Conclusions 5

- No single Member State has succeeded in incorporating all the elements required to fully enable DR participation in the markets.

- However these elements **complement each other** and bring about a **constructive unity**. They are in fact a **repeatable template** for realistic and positive enablers of Demand Response and Aggregation in Europe.

- Together, they use the competitive and dynamic deregulated market structures to enable consumer participation.

- What is now needed is for these solutions to be **unified**, **communicated** and **replicated across Member States**.

Thank You for Your Attention

For more information contact me at

paolo.bertoldi@ec.europa.eu

http://re.jrc.ec.europa.eu/energyefficiency

EED Art.15

Art. 15. 4 requires Member States to:

"Ensure the removal of those incentives in transmission and distribution tariffs that are detrimental to the overall efficiency (including energy efficiency) of the generation, transmission, distribution and supply of electricity or those that might hamper participation of Demand Response, in balancing markets and ancillary services procurement".

"Ensure that network operators are incentivised to improve efficiency in infrastructure design and operation, and, within the framework of Directive 2009/72/EC, that tariffs allow retailers to improve consumer participation in system efficiency, including Demand Response, depending on national circumstances".

Art. 15.8 of the Directive establishes consumer access to energy markets, either individually or through aggregation. In detail the Article states:

"*Member States shall ensure that national regulatory authorities* ***encourage*** *demand side resources, such as Demand Response, to participate alongside supply in wholesale and retail markets.*"

"Subject to technical constraints inherent in managing networks, Member States shall ensure that transmission system operators and distribution system operators, in meeting requirements for balancing and ancillary services, treat Demand Response providers, including aggregators, in a ***non-discriminatory*** *manner****, on the basis of their technical capabilities****."*

"*Member States shall promote access to and participation of Demand Response in balancing, reserves and other system services markets, inter alia by requiring national regulatory authorities […] in close cooperation with demand service providers and consumers,* ***to define technical modalities*** *for participation in these markets on the basis of the* ***technical requirements of these markets and the capabilities of Demand Response****. Such specifications shall include* ***the participation of aggregators****."*

Conclusions X

Analysis of compensation of retailers for sourcing costs*:*

•The payment of sourcing costs are demanded by utilities and accepted by many aggregators. Sourcing cost refers to the energy the retailer bought, which the consumer does not consume because they are participating in Demand Response.

•There is widespread acknowledgement that the retailer loses income through their balance responsibilities during a Demand Response activation by an independent aggregator.

•In markets where there is a significant energy component (such as wholesale markets) this mechanism may do significant damage to consumer's ability to earn from Demand Response.

•Careful review of this issue is therefore appropriate.