



Demand Response: Clarification of the standard processes required between BRPs and independent aggregators

This paper provides a high-level clarification of the standardised processes required for smooth market function between the independent aggregator and the balance responsible party (BRP). It also discusses the complementary roles of Implicit and Explicit Demand Response. This is written with the view to enable independent aggregation in order to foster competition between service providers and the growth of Demand Response in Europe.

Demand Response brings unique benefits to electricity markets. It increases system efficiency and substantially reduces the need for investment in peaking generation by shifting consumption away from peak hours - i.e. evolve from generation adequacy to system adequacy significantly improving the efficiency in the process. It also acts as a cost effective balancing resource for wind and solar generation. Adding stability to the system, it lowers the need for coal and gas fired spinning reserves – must run power plants, burning fuel continuously in order to be ready to supply additional power at short notice. In addition, Demand Response can decrease the need for local network investments, as it can shift consumption away from peak hours in regions with tight network capacity. Most importantly, Demand Response pays customers for the value of their demand-side flexibility: this amounted to over €2.2 billion in the USA in 2014. Finally, Demand Response increases market competition, by allowing the participation of third-party service providers (aggregators) and rewarding innovative, service-oriented retailers.

Demand Response delivers these benefits by providing consumers – Residential, Commercial¹ or Industrial, with control signals and/or financial incentives to lower or adjust their consumption at strategic times. In doing so, Demand Response offers end consumers the opportunity to benefit directly from market competition and the Smart Grid.

¹ The term Commercial is used here to mean all buildings and businesses which are not directly industrial or residential. In other words, municipal buildings, SMEs, businesses such as hotels, office spaces, etc.

1. The importance of enabling both Explicit and Implicit Demand Response

In **Explicit Demand Response schemes** (sometimes called “incentive-based”) the aggregated load is **traded** in electricity markets, providing comparable services to supply-side resources, and receiving the same prices for those services. Usually this takes place within the balancing, capacity or wholesale energy markets. Consumers receive **direct payments** to change their consumption upon request (i.e., consuming more or less), which is typically triggered by activation of balancing services, differences in electricity prices or a constraint on the network.

Consumers can earn from their flexibility in electricity consumption individually or by contracting with an aggregator. The latter can either be a third-party aggregator or the customer’s retailer.

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) that partly reflect the value or cost of electricity and/or transportation in different time periods and react to those price differences depending on their own possibilities and constraints (no commitment).

It is important to note that neither form of Demand Response is a replacement for the other. Many costumers participate in **Explicit Demand Response** through an aggregator, and, at the same time, participate also in **Implicit Demand Response** programme, through more or less dynamic tariffs. The requirements and benefits of each are different and build on each other. The two serve **different purposes within the markets**. They are also valued differently. While consumers will typically 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.

Perhaps most importantly, Explicit Demand Response provides a valuable and reliable **operational tool** for system operators to adjust load to resolve operational issues. Implicit Demand Response, on the other hand, is not an operational tool, but rather allows consumers to benefit from price fluctuations in the wholesale energy markets to the extent they are willing and able. Therefore, a dynamic pricing programme does **not** allow a customer to participate in a balancing market (or a capacity market), which are currently the greatest sources of revenue for consumers. It will also not allow for regional demand-side services for TSOs and DSOs, and it does not provide the system as a whole with a dispatchable resource. On the other hand, Explicit Demand Response does not have the same market reach as a retailer-enabled dynamic pricing programme. Both forms are therefore required to allow consumers to **fully participate in the markets** and benefit from their flexibility.

Implicit Demand Response requires adequate communication and measurement technologies for each consumer, updated settlement and billing structures on the part of the retailer and feedback/communication mechanisms for consumers. It also requires provision of accurate guidance, such as through comparison websites, so that customers are not penalised by a dynamic pricing programme that does not suit their consumption patterns and adequate consumer protection measures for vulnerable consumers.

It is important to note that not all Member States are investing in the requisite technologies or empowering their retailers to update their settlement and billing processes to enable Implicit Demand Response. In addition, few states have plans to introduce sites to compare offerings or to add protection measures. As of today, only the Nordics, France and the UK, offer customers the opportunity to participate in Implicit Demand Response. While Austria, Ireland and a few smaller

Member States will enable programmes within the next few years, Germany, Spain, Italy² and Poland do not offer this potential nor is there legislation currently in place to enable it in future. While Implicit Demand Response is relatively simple from a regulatory perspective, it requires public investment and a change to retailer processes, which seems to be slowing progress throughout Europe.

Explicit Demand Response requires appropriate programme participation rules (See SEDC Demand Response Map 2014 for further details), adequate communication and measurement technologies, and creation of standardised processes between BRPs and independent aggregators. Protection measures for consumers are less complicated as the consumers can only benefit – if they do not change behaviour when requested, they will simply miss the direct payment. Instead, the aggregator will assume the performance risk, using the portfolio effect of its providers to ensure that collectively they provide the required level of response.

Today the requirements for Explicit Demand Response have been outlined within the Network Codes. Belgium, France, Ireland, the UK (and Switzerland) have made the most progress in enabling this form of consumer-centred programmes. In Explicit Demand Response, the required measurement and communication technology is usually installed by the aggregator and, therefore, is **not** part of a larger public investment. The main costs derive from the regulatory adjustments required and, possibly, the added administrative burden on TSOs if they participate within the standardised process. The other costs are paid directly through the programmes themselves.

The following section reviews the roles of the aggregation service providers within Explicit Demand Response.

2. Benefits of aggregation

The aggregator (a service provider who may or may not also be a supplier of electricity) represents a new role within European electricity markets. Most consumers do not have the means to trade directly into the energy markets because, for example, they are too small to manage the complexity. They require the services of an aggregator to help them participate. Aggregators pool many different loads of varying characteristics and provide backup for individual loads as part of the pooling activity, increasing the overall reliability and reducing risk for individual participants. Aggregation service providers are central players in creating vibrant demand-side participation and Demand Response. **The aggregator** “aggregates” consumers’ flexibility to “build” reliable Demand Response services: they negotiate agreements with industrial, commercial and residential electricity consumers to aggregate their capability to reduce energy and/or shift loads on short notice. They create one “pool” of aggregated controllable load, made up of many smaller consumer loads, and sell this as a **single resource**. These loads can include fans, electric heating and cooling, water boilers, grinders, smelters, water pumps, freezers, etc.

It is important to recognise that the activity of aggregating consumers’ loads requires a number of very specific competencies unique to this role. For example, the aggregator needs significant industry knowledge and experience to identify the flexibilities in various industries, technical assets and processes, and the limitations of those flexibilities – in order to match these to specific requirements in a specific market. Consumers often do not know about their own flexibility potential, requiring expert support. In addition, aggregators need the technical capability to physically connect the

² The TOU tariff in Italy is set by the regulator and has only a €0.011 price differentiation between night and day, and also does not seem to match the real requirements of the market as voiced by market participants, who see a strong need for demand-side flexibility to support the integration of renewables. It is therefore not counted as ‘dynamic’ by the SEDC. Dynamic pricing for the SEDC means that the price differentiation is meaningful and supports real market needs, while creating measurable consumer benefits.

customers and integrate their load into their aggregated pool. These activities require a sophisticated communication infrastructure (hardware and software) and a central IT system capable of dealing with a wide variety of loads with different properties.

Aggregation can achieve performance levels that fulfil market requirements for reliability and are comparable to or better than the performance of generation. The ability to aggregate individual customers means that the system operator can utilize the aggregated demand-side capacity as a single resource. This provides the system operator with a diverse portfolio. One of the key benefits of aggregation is the diversity of the aggregated portfolio (i.e., many small loads making one large resource), which ensures that the committed capacity will be delivered by the aggregator even when some individual consumers may not be able to perform³.

The performance levels of Demand Response have been proven in existing markets in the US, as well as in Austria, Belgium, Finland, France, Ireland and the UK. An example of the reliability of Demand Response can be seen in the table below, which summarises its performance for PJM’s summer product during the period 2014-2015.

Zone	Committed ICAP (MW)	Reduction (MW)	Over/under performance (MW)	Performance (%)	Re-test (%)
AECO	43	67	24	155%	9%
AEP	1094	1674	580	153%	0%
APS	451	566	115	125%	0%
ATSI	640	868	228	136%	0%
BGE	667	1369	702	205%	0%
COMED	901	976	75	108%	61%
DAY	126	179	53	142%	56%
DEOK	244	287	44	118%	46%
DOM	731	938	207	128%	0%
DPL	122	149	27	122%	2%
DUQ	76	105	28	137%	0%
EKPC	123	132	9	108%	0%
JCPL	120	159	39	132%	39%
METED	188	239	50	127%	0%
PECO	341	408	67	120%	7%
PENELEC	241	270	29	112%	0%
PEPCO	184	253	69	138%	6%
PPL	503	628	124	125%	4%
PSEG	361	400	39	111%	0%
RECO	2	3	1	125%	0%
Total	7158	9668	2510	135%	12%

Figure 1: PJM, Load Management Performance Report – 2014/2015. Load Management commitments, compliance, and test performance (ICAP) for Limited Summer product, DY2014/15,

Clarifying the role of the independent aggregator - is important for the healthy growth of market competition around consumer-centric services. For example, the latest PJM Market Activity Report on Demand Response (from June 2015) shows that 82% of Demand Response capacity in PJM comes from independent aggregators⁴. This trend has been increasing over the last few years. The shares are similar in other jurisdictions that have mature Demand Response markets, such as Western Australia, New Zealand or other US interconnections (e.g., New England and New York). Without competition

³ The aggregator will also never bid his full resource into a market – for example if he has 100 MW of load available, he may only offer 70-80 MW into the market – ensuring that the aggregator can fulfil his reliability requirement with high reliability.

⁴ PJM calls aggregators Curtailment Service Providers (CSPs).

from independent aggregators, no market in the world has yet achieved Demand Response participation of any significance. This is due to the fact that an aggregator can **only** succeed when their customers succeed and benefit from Demand Response. This is not to say that retailers cannot provide aggregation services, it is simply an indication of the need for a market participant for whom Demand Response is their **entire business**. This spurs competition over Demand Response services for customers.

Problem Statement: In order to enable this new market participant to enter the market in a safe and *scalable* manner, it is critical that the role and responsibilities of the independent aggregator is clarified. **In particular, it is important that the relationships between retailers, BRPs, and aggregators are clear, fair, and enable competition.** This paper looks to outline this standardised process.

3. Main principles and starting point clarification of roles and responsibilities

First principle of competitive market design: To promote demand-side flexibility, a market design should guard consumer interests and create a level playing field for all competitors. Consumers that wish to generate revenue from their flexibility should be able to choose freely between all market options and available service providers. They should not be restricted to using a service provider that is tied to or approved of by their retailer.

For this to happen, the aggregation service provider must be able to operate independently from the consumer's BRP/retailer, which is potentially its competitor⁵. Therefore, standardised frameworks and processes should be put in place to enable the smooth functioning of the market and at the same time protect the customer-aggregator relationship. Below is a short overview of the structure of this standardised process between the consumer's BRP and the independent aggregator.

In principle, a standardised framework should:

- Create a level playing field over which (small) new market participants can compete with (larger) incumbent companies, encouraging market competition, improved services and freedom of choice for consumers. This includes provisions that allow aggregators to offer Demand Response services to consumers independently of the consumer's BRP/supplier.
- Be cost efficient, allow for smooth market functioning, and allocate costs and rewards fairly amongst market parties.
- Include processes for correcting the volumes in each affected balancing group, rules for compensation between BRP and aggregator, and provisions for information exchange that safeguard commercially sensitive information.

Content of the standardised framework: There are four elements to be defined through a standardised framework to allow the market to function reliably while allowing consumers to choose their aggregation service provider. Standardisation sets out "the rules of play":

- *Volumes:* Standardised processes for assessment of the traded energy between the BRP and the aggregator⁶.
- *Compensation:* A price formula to calculate the price for the transferred energy. In the case of demand reduction, the aggregator pays the BRP; in the case of demand enhancement, the BRP

⁵ Refer to EU Services Directive and ruling of the French competition authority on this. It is also important to note that if the consumer's retailer owns generation assets, the consumer's demand side flexibility is also a competitor to the retailer's supply side generation.

⁶ i.e. the transfer of energy between the BRP's and the aggregator's balancing groups following a Demand Response dispatch.

pays the aggregator. This price formula should reflect as closely as possible the average sourcing costs of the energy transferred.

- *Data Exchange:* A clear definition of what data needs to be exchanged between BRP and aggregator to ensure both 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.

Description of standardised framework elements: The four elements, which need to be included in a standardised framework are described in more detail below. Alternative models could be explored by Member States to better suit their particular markets, as long as the general principles of the framework are followed.

1. **Volumes:** The volume of demand variation being sold into the market is assessed against a baseline. Volumes of demand-side flexibility are calculated as the difference between what the consumer normally consumes (baseline) and their actual measured consumption at that hour using appropriate metering. The baseline cannot be measured directly, so it must be calculated based on other available measured data, using an agreed, robust methodology. Member States should adopt a small number of standardised baseline calculation formulas, ideally the same across Member State boundaries.

Measurement and verification should be accurate enough to allow for the definition of the baseline and thereby avoid free riding. Where possible, it should be standardised, taking into account that multiple standard baselines must exist to cover different types of Demand Response activations on a range of different consumption sites. This variety of standard baselines is common practice throughout the different balancing markets in which Demand Response currently participates. The existing baselines from these balancing markets should be a starting point to define standard baseline methodologies, although other markets have found that different methodologies are needed for programmes which have longer dispatches or longer notice periods. Depending on the market, these standards could be decided by the appropriate national authority within each Member State or by the TSO. There is sufficient experience in this matter in Europe and abroad to allow for a sound choice without significant uncertainty.

The volumes certified by the independent third party (e.g. the TSO) should then be used as a basis for:

- Transferring the energy between balancing groups in order to ensure both the BRP's and the aggregator's balancing groups remain balanced following the Demand Response event;
- Any financial compensation between BRPs and aggregators for sourcing costs.

Transferring the respective volumes between balancing groups, and paying compensation for sourcing costs **should be fully standardised**, such that no negotiation between BRP and aggregator is required and ideally handled by a neutral third party (e.g. TSO).

Dynamic tariffs and baseline methodologies: The baseline is the interpolation of the actual behaviour of the consumer. This includes his behaviour in relation to prices, therefore no specific treatment is required to deal with consumers that have dynamic priced retail contracts. Robust baselines today are **already** designed to account for dynamic tariffs.

2. **Data exchange:** Data exchange is important because the BRP needs to know what is taking place within their portfolio to forecast their consumption.

However, beyond data needed to measure and fulfil Demand Response contracts, the consumer has the right to decide which market participant has access to their detailed consumption data and for which purpose. This data is also commercially sensitive for the aggregation service provider as it contains information on its strategy.

It is important to determine what level of data fulfils the BRP's actual requirements while protecting the privacy rights of the consumer and the commercial information of the aggregator. Each BRP should receive aggregated data concerning the total consumption relative to the aggregate baseline (i.e., as if there had been no activated demand-side volumes within its balancing perimeter for each specific balancing point).

The aggregated data on the delivered volume of Demand Response (based on the M&V defined in the appropriate rules) should be calculated and transferred by a neutral third party. In the Balancing Markets, the TSO already has this information and could be the party responsible for this task. In the wholesale market, an adequate information exchange framework should be put in place.

3. **Compensation:** BRPs are financially (and in some countries legally) responsible for maintaining a balance between their physical injection and consumption of electricity as well as their market position. To keep BRPs neutral to a Demand Response event organised by a independent aggregator, they should be paid for the energy they sourced, but which was not used by their customers due to their participation in the Demand Response event. This process ensures that the BRPs neither benefit from nor are harmed by Demand Response activities within their perimeter.

The consumer who has reduced consumption should be billed on what they actually consumed. *(Unless there is a different contractual arrangement in place: "corrected consumption" systems exist for large consumers in some countries.)*

Within a framework where the BRP should be reimbursed for the sourcing cost related to the energy affected by a Demand Response, a standardised process and regulatory oversight is required:

- *A set of price formulas* referring to publicly-available market prices should be defined to estimate the sourcing cost and facilitate settlement between aggregators and BRPs. The actual sourcing cost and trading strategy of the BRP is commercially sensitive information and not something they should be required to share (many BRPs have, for example, bi-lateral agreements with their company's own generation units...). Price formulas should therefore be defined at the national level given that the true sourcing cost of a BRP will not be knowable from outside. The national methodology can aim to capture the sourcing cost according to transparent market prices and market data.

With the use of a set of price formulas, the money transfer and calculation of costs should be handled by a neutral third party⁷. In the balancing markets, the TSO has this information

⁷ If the prices are set via a formula and the volumes are determined in an adequate way then the transfer of energy can happen bi-laterally on the existing exchange platforms (typically OTC). In this case there is no absolute need for a third party. If the decision is for a more complex way to determine sourcing cost then a third-party becomes a must to safeguard confidentiality.

and could be responsible for money transfers, as they are already paying or charging all market participants.

- The payment should be bi-directional. In other words, when the consumer uses less during a Demand Response action, the aggregator must pay the BRP, whereas when the consumer consumes more during a Demand Response action (e.g. due to low wholesale market prices or the provision of negative reserve to the TSO) the BRP must pay the aggregator according to the same formula.
4. **Governance:** The regulator or national competition authorities should oversee the functioning of the market, as they do any other energy-related market. The standardised contractual framework should provide the parties with solutions regarding a range of risks such as counterparty risk and credit risk. These issues are linked to access rules for the aggregator to the market and should be defined in the legal status of aggregator.

Conclusions

There is growing consensus among policy makers and market participants that Demand Response is a critical requirement for achieving a low carbon, efficient electricity market at a reasonable cost. This is reflected strongly within the European Network Codes, the Energy Efficiency Directive and the European Commission's Energy Union Communication. These measures are part of a government response to widely held public opinions, as voiced by the European Council and Parliament. They are part Europe's battle against climate change, support for clean energy resources and the lowering of energy costs. In other words, it is understood that Demand Response is an important facilitator of public aims and the political promises made in response to these aims. In fact, in the Energy Union Communication, Demand Response is named as an important enabler of, security of supply, renewables integration, improved market competition, consumer empowerment and efficient capacity mechanisms.

However in order for Demand Response to become a true and viable resource, a resource which has a **measurable** positive benefit on the system – it **must** gain sufficient market **momentum** and **volume**. This can only be achieved by introducing players into the market for whom demand side services form the core of their business model, such as independent aggregators, as well as enabling the traditional players, such as retailers. One without the other will not be sufficient. Therefore, just as in Australia and the USA, - Europe will need to clarify the role of independent Demand Response providers – in order to motivate real, measurable change through market competition.

The standardised process described above allows for this competition around demand-side flexibility. Most importantly, it allows aggregators to offer services to consumers independently from BRPs/suppliers. Volume, data transfer and compensation for sourcing costs are critical elements which should be standardised and overseen by neutral third parties in order to create an even playing field and protect consumer interests. The SEDC would therefore call on the European Commission to support national regulators in their work, through strengthening the current Network Codes and ensuring that the future Market Design Initiative, properly describes the role of independent aggregator. Clarity enables financial investment and competition, and service providers enable consumer engagement; both will be required to fulfil the European objectives.