Smart Energy Systems ERA-Net | Spotlight

# REGULATORY AND MARKET DEVELOPMENT

## 2017 Edition

This series of documents keeps experts updated on the ongoing activities and intermediate results of the ERA-Net Smart Energy Systems Knowledge Community. Spotlights concentrate on specific topics with high relevance for project participants and practitioners. In that sense, this spotlight represents a condensed version and extract from the respective ERA-Net SES Living Document "Regulatory and Market Development".

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Table of content

## Introduction

The current EU energy policy is based on three pillars, security of supply, competitiveness and sustainability. Well-functioning markets are seen as drivers and enablers to achieve these goals, being currently guided by the provisions of the common rules for the internal market in electricity.[1] The main objective of these rules is the creation of a competitive internal energy market. Whereas market regulation of TSOs is quite settled, with regard to the distribution-level resources and the role of consumers, the regulatory environment has been largely associated with a high degree of uncertainty, due to the new challenges introduced by the rapid changes of the power system, and particularly by the increasing penetration of DER. For a while the new innovative business models and market actors have been evolving as a result of system transformation and technological development rather than regulatory support. However, the issue of the new "Clean Energy for All Europeans" Package[2] in November 2016 has marked new developments for energy markets. Although still in form of proposals from the European Commission awaiting adoption, the "Clean Energy for All Europeans" Package provides good insight into the current initiatives and focal points of the new regulatory framework. As a contribution to the discussion, in this spotlight, which is mainly addressed to new market actors and regulators, we report on preliminary results of ERA-Net Smart Grids Plus Projects that suggest how market rules and regulatory frameworks could be adjusted to enable cost-efficient ancillary services for flexibility by new market participants.

## Finding 1: Ancillary services (or short-term) markets for small-scale distribution level resources

DER deployment is introducing new operational challenges in the power system, while at the same time making the provision of new services possible. Small-scale resources (that have a lower capacity than the minimum required to enter the market) located at the distribution level can support the grid and solve technical problems with a more prominent locational value. In particular, small-scale distribution level providers of flexibility as well as microgrids

[1] Directive 2009/72/EC http://eur-lex.europa.eu/legalcontent/EN/TXT/?qid=1510337953044&uri=CELEX:32009L0072

[2] This package presents a compendium of communications, directives and regulations proposed by the European Commission and meant to substitute - upon its adoption - the current Third Energy Package: http://eurlex.europa.eu/legal-content/en/TXT/?uri=CELEX:52016DC0860

or aggregated Virtual Power Plants need to be enabled to provide both frequency regulation and non-frequency ancillary services. The market design needs to be adjusted taking into account the different characteristics of distributed energy resources. A primary rule of market design is to provide fair access to all interested commercial parties: hence, adjusting the design of short-term markets (day-ahead, intra-day and ancillary service markets) should ensure this principle. Here some actual barriers (which have been identified by the ERA-Net Smart Grids Plus Projects m2M-Grid [1], ReStable [2] and uGrip [3]):

- An overestimated bid size for entering the market could be a significant barrier for aggregators, since they might need to engage a significant number of customers to reach a critical size. Recent trends are encouraging, since regulators started to lower the minimum bid size to 1 MW or lower.
- Symmetric bidding requirement (with respect to upward and downward frequency regulation) is still present in some reserve markets and this is a strong requirement for most of the distributed energy resources; aggregation can mitigate the problem by clustering resources with different characteristics, but the symmetric bidding remains a significant barrier.
- As for activation times, some ancillary services markets requires the contracted resource to be online up to 10 hours, which is not compatible with short-term duration load and generation [2].
- In order to reduce the barriers for the provision of demand response products in the reserves market, especially for the secondary and tertiary reserves, the frequency of contracting phase for the provision of reserves in the capacity market – which is at present on an annual basis - should be increased to a weekly or daily cycle [3].

**Project showcase**

The project "ReStable" estimates that the possibility to provide asymmetric bids, to reduce the size of the bids and the time frame of the activation frame would increase the volume of ancillary services offered by renewables. In particular for this last parameter, in a preliminary study it was found that:

- The volume of automatic Frequency Restoration Reserve (aFRR) offered by a Virtual Power Plant of different renewable sources (wind and PV) on the German market for this ancillary service would rise from 18% to 22% of the installed capacity if the duration of the product decreases from 1 day to 4 hours. Higher gains are observed for a duration of 1 hour, but results must still be validated.

## Finding 2: Local markets for ancillary services: rules and monitoring practices

The need for including small-scale actors (aggregators, small Virtual Power Plants, DER owners) in the provision of flexibility is recognized as an important step towards the future power system. The establishment of local markets for flexibility could be one of the possibilities. The design of such local markets is a critical issue. The involvement of the Distribution System Operator (DSO) in establishing local markets for flexibility is crucial: the DSO can procure grid-oriented flexibility for solving local problems (such as congestion, voltage issues or phase unbalance). This can theoretically align the interests of commercial parties (profit maximization entities) with grid needs, tackling technical problems raised in the path towards the energy transition. The local market should be designed so that sub-optimization or arbitrage possibilities are avoided (see the preliminary analysis carried out by the ERA-Net Smart Grids Plus project m2M-Grid [1]).

Further, in order to facilitate the possibility for aggregators of small-scale resources to act on both local and wholesale market, it is of great importance that these are aligned and/or at least don't act in contradiction. Nowadays, in most countries aggregators need to be associated with a Balance Responsible Party (BRP) to bid in electricity markets, so they cannot establish contracts directly with the prosumer/DER owner. Legislation regarding the so-called independent aggregator is fully established only in France and Switzerland [1]. Two main steps are needed for the integration of aggregators:

- Lowering barriers to access the energy markets
- Defining a full regulation on how the aggregator will be integrated in the current scheme (e.g. BRP-aggregator compensation

### Project showcase

Critical points in the design phase of local markets for ancillary services have been identified by a preliminary analysis carried out by the m2M-Grid project:

- How to share data between DSO and market parties in order to provide sufficient information for the grid-oriented flexibility provision while avoiding undesired strategic behaviour and gaming.
- How to develop rules and requirements imposing lower barriers for the small-scale actors while still providing sufficient information for system operators to properly manage the grid.
- How to align local market designs with the overlying market in order to eliminate inefficient arbitrage transactions and sub-optimization, harming overall system efficiency.

## Finding 3: New tariffs to promote ancillary service provision by storage and demand response

Current mechanisms settle the use of power system flexibility by the amount of energy that a resource has withheld (or delivered extra) by reducing (or increasing) its load. This is a useful metric for conventional generators, whose variable costs for providing flexibility also scale with the generated amount of energy. That is, the effort that a conventional power plant has to spend to resolve an imbalance is proportional to its variable energy production costs. In contrast to these costs, the cost of storing energy or delaying consumption depends on the amount of energy and the amount of time. Therefore, applying the same pricing structure to reward power plants, storage operators and consumers for their flexibility yields an unfair bias, because the pricing structure is more congruent with the cost structure of one technology.

Conventional power-based tariffs make the provider of storage flexibility carry the risk of storage duration [4.] This is inefficient, since the information of storage duration may actually be available at the source of flexibility demand (e.g. a Balance Responsible Party).

Adjusting bid structures and tariffs to account for the underlying cost structure of flexibility resources may increase the efficiency of flexibility exchange, while also improving fairness of cost allocation. The benefits should be particularly applicable in resolving local imbalances, where a large portion of flexibility is coming from storage or demand response rather than from conventional generation (see results from the 2016 EIT Digital project "Electric Vehicle Aggregator", which is the background of the ERA-Net Smart Grids Plus project “GridFriends” [4]).

This project introduces energy loans as a means to trade ancillary services provided by demand response or storage. By charging varying interest on the energy that is shifted over time (or equivalently 'rent for storage space'), this pricing structure provides a level playing field for a broad range of demand- and supply-side flexibility on all scales. In particular, when compared to trading energy for different delivery intervals independently, energy loans' resulting improved cost competition has been shown to increase allocative efficiency of balancing resources in specific settings.

**Originators**

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**Sources**

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[3] http://ugrip.eu/ - Mateo.Beus@fer.hr

[4] Felix Claessen, Michael Kaisers and Han La Poutré: "Efficient balancing by effort-based activation of demand response services". Innovative Smart Grid Technologies-Europe (ISGT Europe), IEEE, 2016 - pablo.hernandez@cwi.nl; claessen@seita.nl

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