

# *Market integration vs temporal granularity: how to provide needed flexibility resources?*

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## **Overview**

In June 2016, the French energy regulator (Commission de Régulation de l'Énergie- CRE) published a deliberation [1], giving its approbation to the French TSO (Réseau de Transport d'Électricité- RTE) to join the Frequency Containment Reserve (FCR) Cooperation. This Cooperation is aiming to create a European integrated call for tender for FCR, also called primary reserve. Germany, Netherlands, Austria and Switzerland are already included in that Cooperation. Apart from France, Belgium and Denmark are also planning on joining it.

The French regulator had already asked to RTE to change its market-design in order to comply with the recommendations of Network Codes [2] [3] produced by the ENTSO-e. Indeed, provision in France is not organized through a market mechanism (call for tender) but through a regulated mechanism: provision of reserve by large producers is mandatory and remunerated at a flat regulated tariff. Consumption units, decentralized generation and storage units can only sell their available reserve to large producers through bilateral secondary market. New entrants have no public price signal to assess the viability of their investments.

The CRE was first considering two options: create a national call for tender, by adapting existing rules or join the existing cooperation. In its deliberation, CRE opted for the second option. It was considered that participation to this cooperation would allow to import and export reserve when it is economically efficient, thus increasing social welfare, and that participating to this project could allow RTE to support its position to change market-design of the cooperation.

However, some limits were identified by French market participants in a consultation process:

- FCR call for tender takes place every week on Tuesday before delivery and selected bidders have to provide their reserve for the entire week (base product of 168 hours from Monday 0am to Sunday 24pm)
- Bids are symmetrical, meaning that selected bidders have to provide as much upward volume than downward volume

In [4] and [5], authors identified that such rules hinder participation of Distributed Energy Resources, which could constitute new low cost sources of flexibility for the system. French products were more favorable for these sources of flexibility, since procurement was organized day-ahead, with a time-step of half an hour, and with the possibility to offer asymmetrical products.

In a context of increasing share of Renewable Energy Sources, provision of flexibility is a particularly sensible topic, since reserve requirements should increase in a medium-term perspective [6]. The French regulator, through its deliberation, has made an arbitrage in favor of market integration against temporal granularity. These could certainly be two ways to secure the procurement of reserve, but the efficiency of these two solutions should have been further assessed, i.e. how to procure sufficient reserve at the least cost.

## **Methods**

The aim of this paper will be to give a contribution to this question, through a case study of an Electric Vehicle (EV) fleet. Through modelization of trip patterns of an EV fleet, based on [4], we will assess how much flexibility is lost by changing the market-design from day-ahead, 30 minutes products to week-ahead, week long product. We will build an offer which will comply with the requirements of the French market design and the German market-design, including uncertainties due to the distance between market clearing and delivery. We will take into account specific requirements for batteries which are stated in [2], already implemented in the German market-design [7]. We will then propose some solutions in order to allow participation of the aggregators, assessing the impacts both for the aggregator and the TSO.

The paper will be organized as follows: In Section II, we will look in detail at former French market design and German market design and analyze it based on the framework of [4]. In section III, we look at the rationale beyond market integration and analyze possible benefits. Section IV is a case study on an aggregator of Electric Vehicles to assess implications of the French decision and propose some improvements to the FCR Cooperation market design.

## Results

We will provide an in depth analysis of the implications of the French decision, both with a qualitative framework and a quantitative analysis.

Our quantitative analysis is based on simulations of fleets of EVs. We use dispatch algorithm of [4]. Simulations are run with different sizes of fleet (50, 500 and 5000 EVs) and different scenarios of market design (former French market design, FCR Cooperation market design and different proposals of new market designs).

## References

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