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A Review of the European Grids Services Markets Suitable for Distributed Loads

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Background

Survey

TSO Findings

DSO Findings

Background

Within the context of the EU H2020 project data was required for the ancillary services markets and knowledge about the underlying business logic of these markets

Insufficient and unreliable data led us to carry out a survey aimed at collecting data and information from European transmission and distribution system operators for the purpose of understanding the markets' capacity for accommodating distributed loads as balancing service providers.

- Availability Prices
- Utilisation Prices
- Contracted and activated volumes
- Activation probabilities

Grid Services

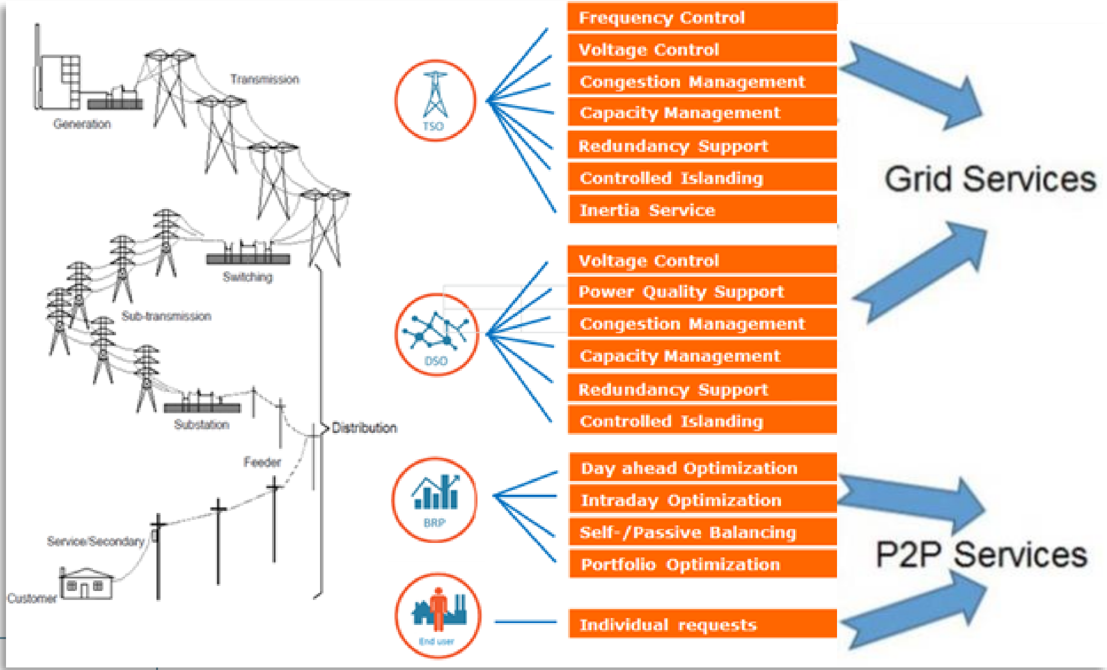
Conventionally known as ancillary services grid services are a range of services requested by electrical grid operators to maintain a reliable and balanced electrical power system.

They are used to address:

- imbalances between supply and demand
- maintain a proper flow and direction of electricity
- help the system recover after a power system event.

Primarily provided to grid operators by big generation units and large-scale industrial loads

Provided under obligation or through an ancillary service market with both bilateral agreements and auctions



R. van Gerwen and H. de Heer. (2015).

Grid Services under consideration:
TSO: Primary, secondary and tertiary control reserve
DSO: Voltage control and congestion management

Survey

1 36 TSOs from 30 countries*	» 12 out of 36 TSOs responses » Non-responsive: Italy, France, UK, Belgium, Bulgaria, Spain, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Luxemburg, Portugal, Romania, and Slovakia
2 143 DSOs from 30 countries*	» 6 out of 143 responses » Respondents: Spain, Bulgaria, Ireland, Latvia, Slovenia and Czech Republic.
3 Non responsive countries	» Literature and expert interviews supplemented some of the findings for non-responsive countries

**EU-28 plus Switzerland and Norway*

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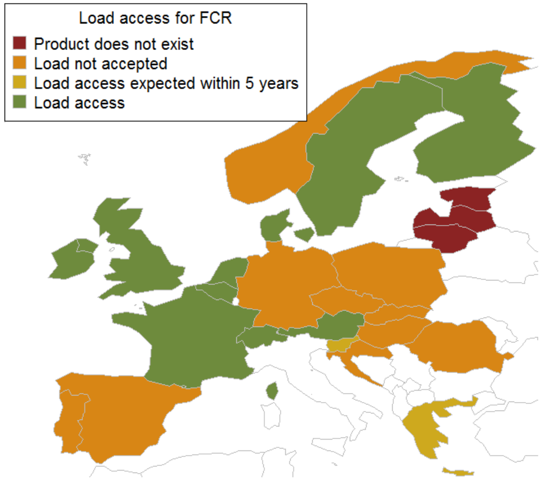
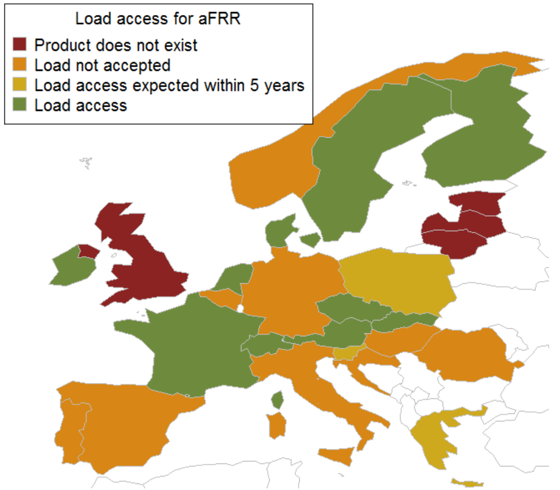
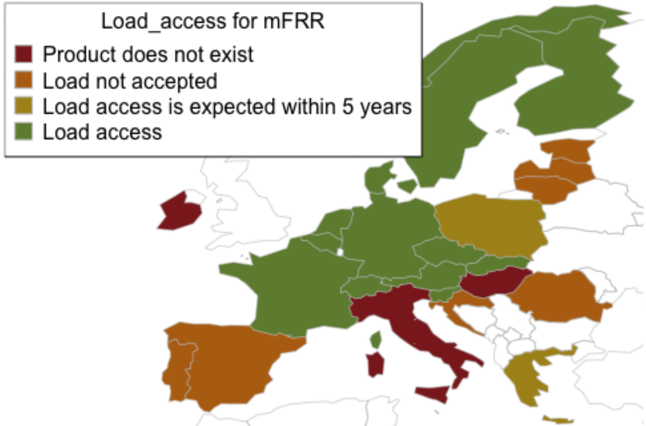
TSO Findings
Load Access

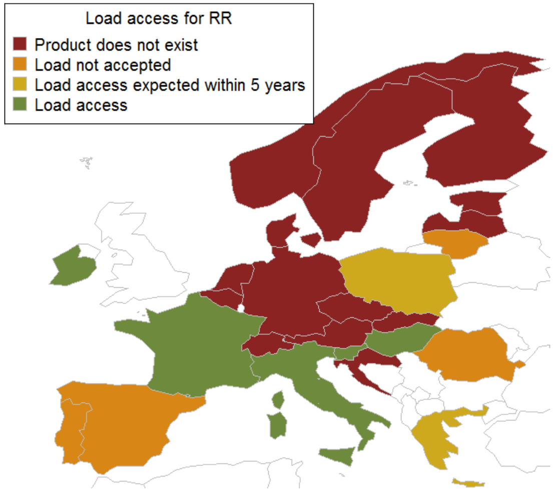
mFRR is the most accessible market for distributed loads

Greece and Poland are expecting their balancing markets to be more accessible by 2021









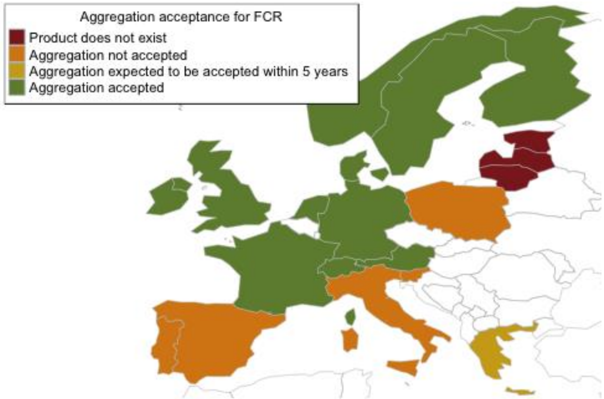
TSO Findings
Aggregation acceptance

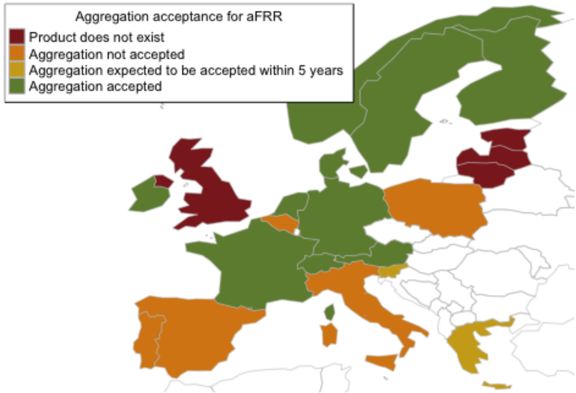
Aggregation is widespread

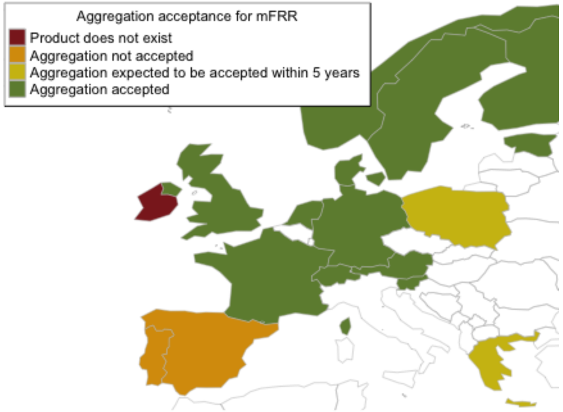
mFRR is the most accessible market for distributed loads with respect to the possibility of aggregation

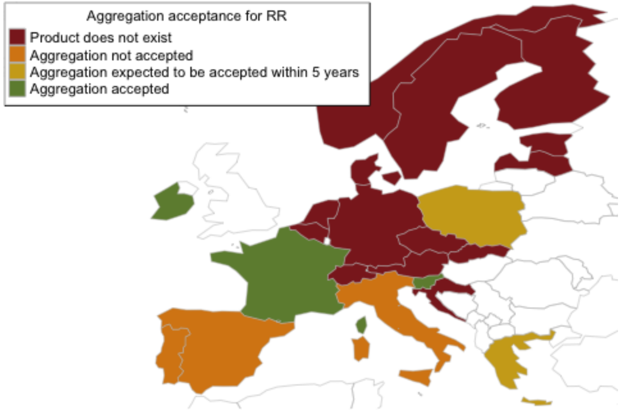
Markets found to be closed to aggregation are:
- Poland
- Portugal
- Spain

With Poland expecting this to change for mFRR and RR by 2021.



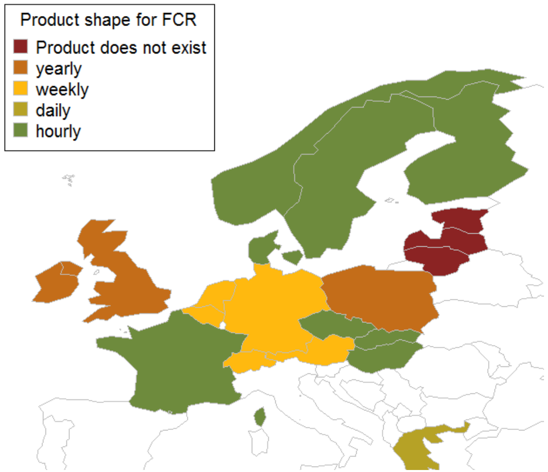


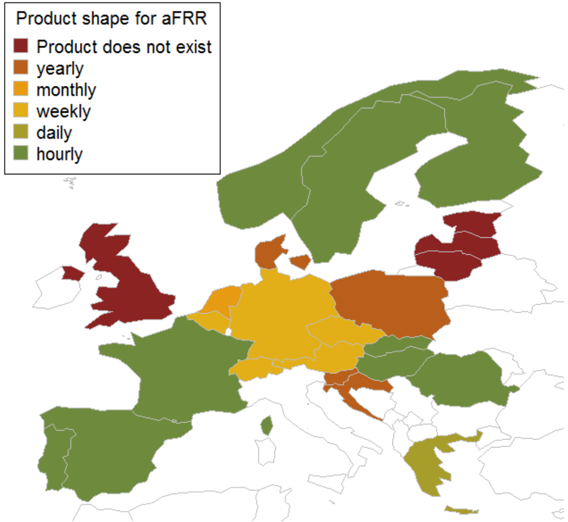


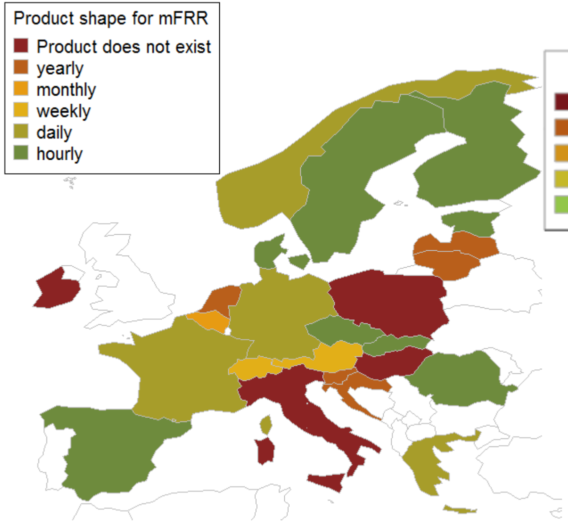


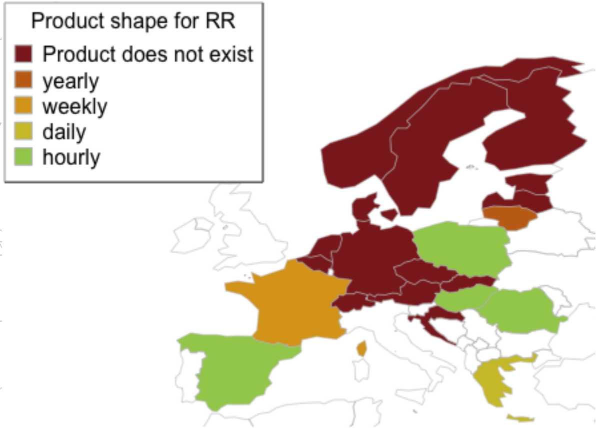
TSO Findings
Product Shape

Product shapes are predominantly hourly









TSO Findings
General Market Conditions

1 Pay-as-cleared vs. Pay-as-bid	» Nordic countries predominantly have a pay-as-cleared settlement rule for the procurement of capacity and energy of ancillary services » A majority of countries utilise pay-as-bid – e.g. Austria, Switzerland, Germany, UK » Others utilise pay-as-bid pay-as-cleared and regulated pricing depending on the markets and procurement type–France
2 Procurement	» Largely market-based » Some countries also make use of a combination of markets and mandatory participation of generators – Denmark, France, Greece, Ireland, Norway and Poland
3 RR	» In many countries RR does not exist » For Nordic countries mFRR fulfils the role of RR
4 Expected changes by 2021	» a shift toward shorter resolution products e.g. hourly to quarter-hourly, » an acceptance of rotating masses or loads for the provision of grid services in those countries where it is not already practiced » an acceptance of aggregation in those countries where it is not already practiced, » a smaller accepted minimum bid size.

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TSO Findings
2016 Balancing Prices

Availability [€/MW/h]

Norway FCR-N: 3.4
Finland FCR-N: 34.7
x10

Germany aFRR-: 0.85
Finland aFRR-: 19.7
x23

Most financially attractive

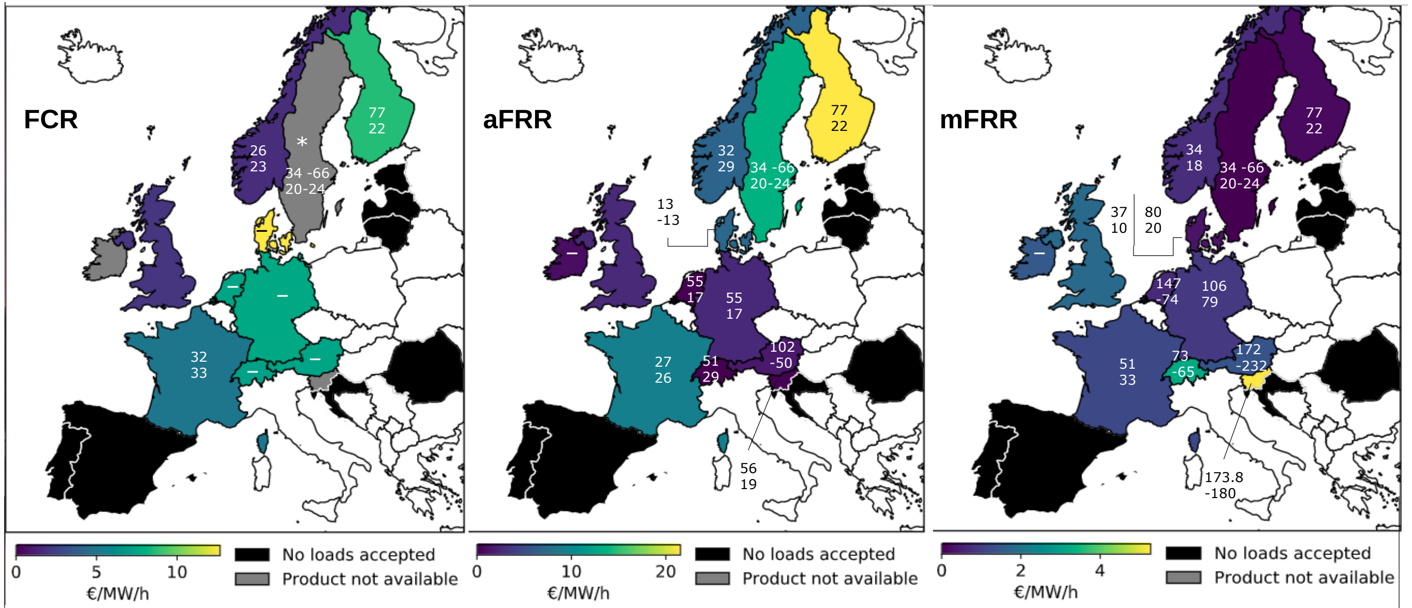
Finland, Switzerland and Denmark

Utilisation [€/MWh]

Most lucrative balancing products

Austria mFRR
Germany mFRR
UK RR

*With respect to economic value added



Availability prices for European balancing markets (colour coded)

Utilisation prices for European balancing markets (shown as figures)

* *Product not contracted in 2016*

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DSO Findings

DSO Findings
General Sentiments from DSOs

Reasons for no bilateral agreements or established ancillary service market on the DSO Level:

1 Demand

- Services are already provided by TSOs or are already provided on the medium voltage level
- Services do not exist on the distribution level
- Not yet warranted given congestion problems not being experienced in some locations

2 Legal Right

- No legal right to procure non-frequency ancillary services (AS)
- Loads have no legal right to provide AS

3 Value

- Load flexibility is not perceived as valuable
- No revenue generation is expected from it in the future due it becoming a mandatory requirement for loads, similar to generators