Automatic Frequency Restoration Reserves (aFRR) in Germany and France from the perspective of aggregation

Next Kraftwerke
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Key data

NEXT KRAFTWERKE

Sales:
283 million euros (2016)

Employees:
136

Subsidiaries:
10

Aggregated power:
4,583 MW

Aggregated assets:
5,477

Power delivery:
140 GWh

FCR:
67 MW

aFRR:
779 MW

mFRR:
1,160 MW

Offering grid stabilizing services in Germany, Belgium, Austria, and the Netherlands

A Virtual Power Plant for Europe

2009
Cologne

2011
Hamburg

2012
Tübingen

2013
Erlangen

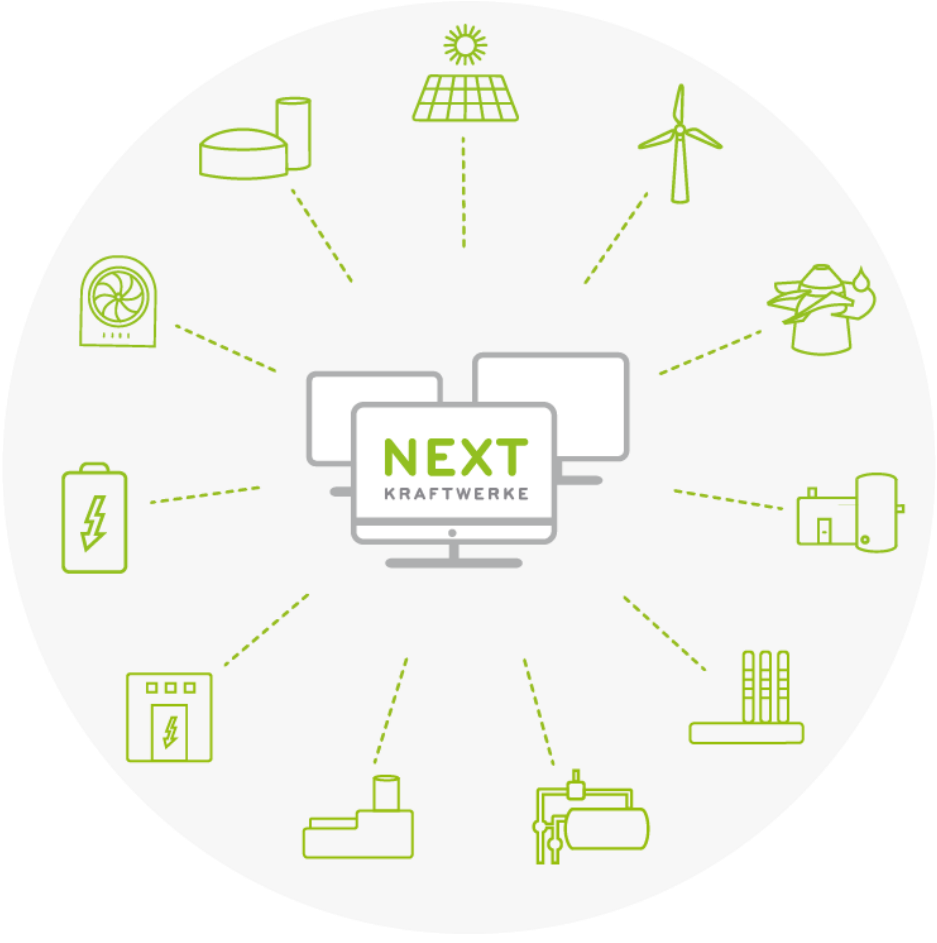
2014
Brussels
Vienna

2015
Paris

2016
Warsaw

2017
Milan
Bern

Who is taking part in a VPP?



Asset types in a Virtual Power Plant

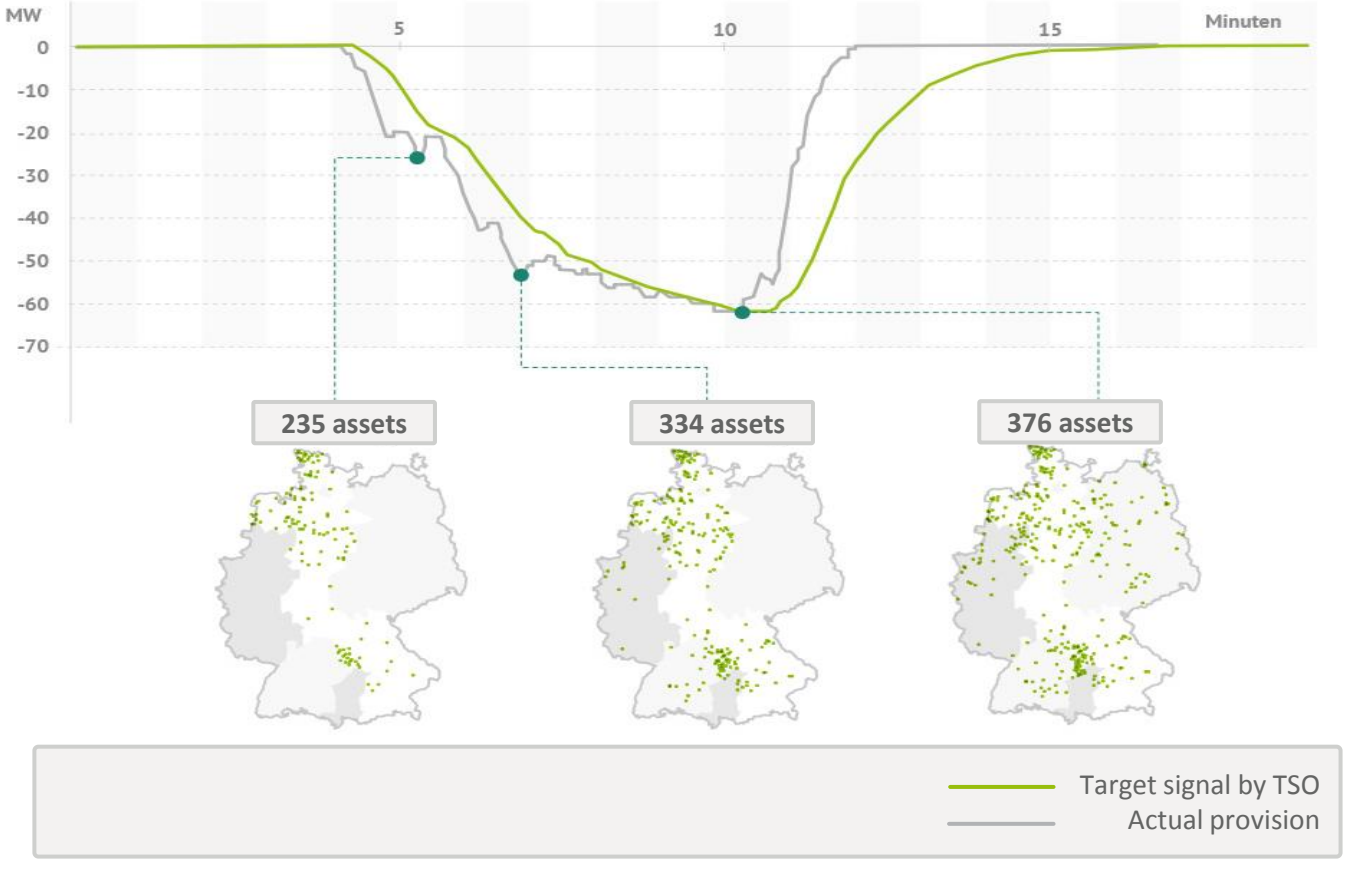
- Biogas
- Solar
- Wind
- Hydro power
- CHP
- Renewable power plants
- Power-to-X
- Power consumers
- Utilities / aggregators
- Batteries
- Emergency power generators

Interfaces / technologies

- Next Box
- Protocol interfaces
- APIs

Is it possible to provide aFRR by renewable energies?

Delivery of aFRR through a VPP



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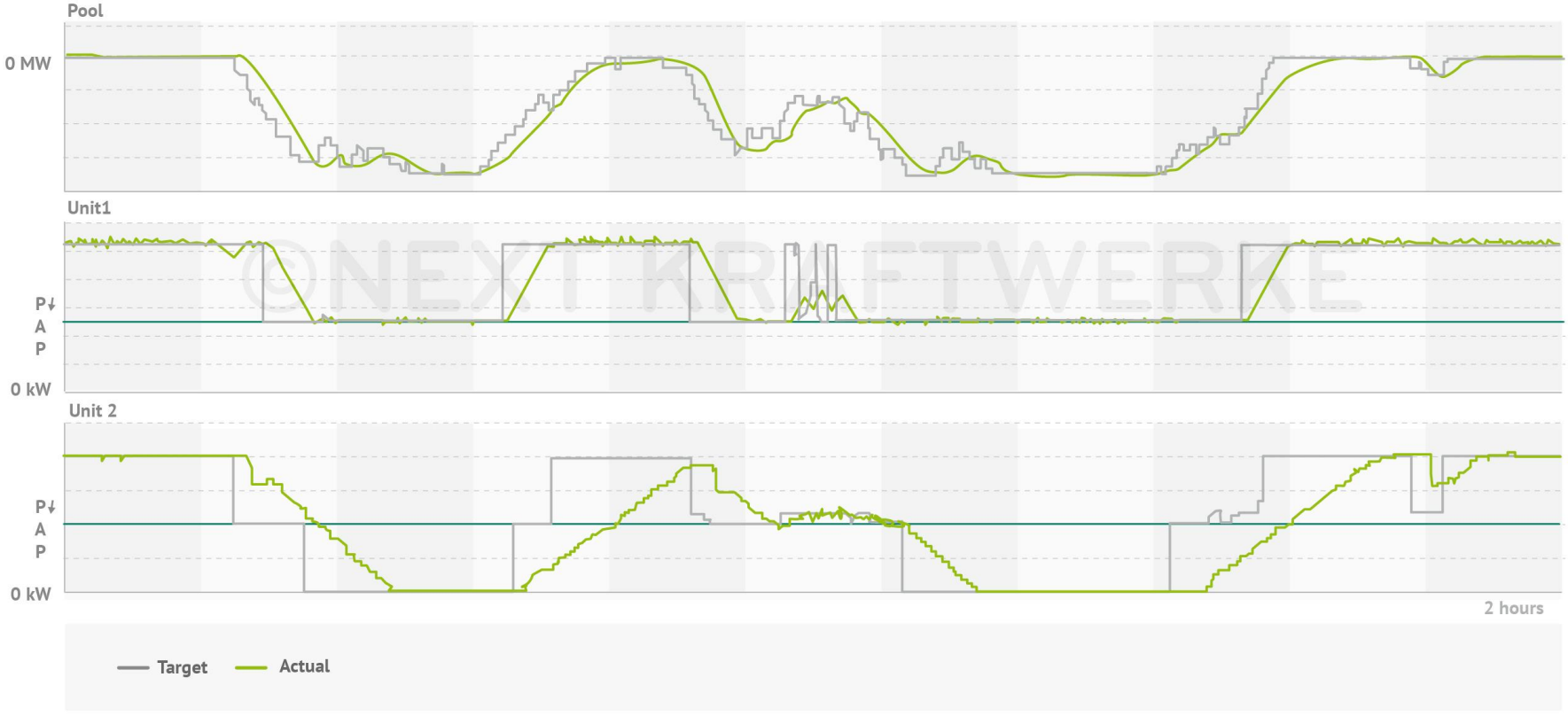


Under which conditions can aFRR be provided by renewable energies?

NEXT KRAFTWERKE

Liberalized Markets

------> Consequence:

- Higher number of aFRR provider

Covered Opportunity Costs

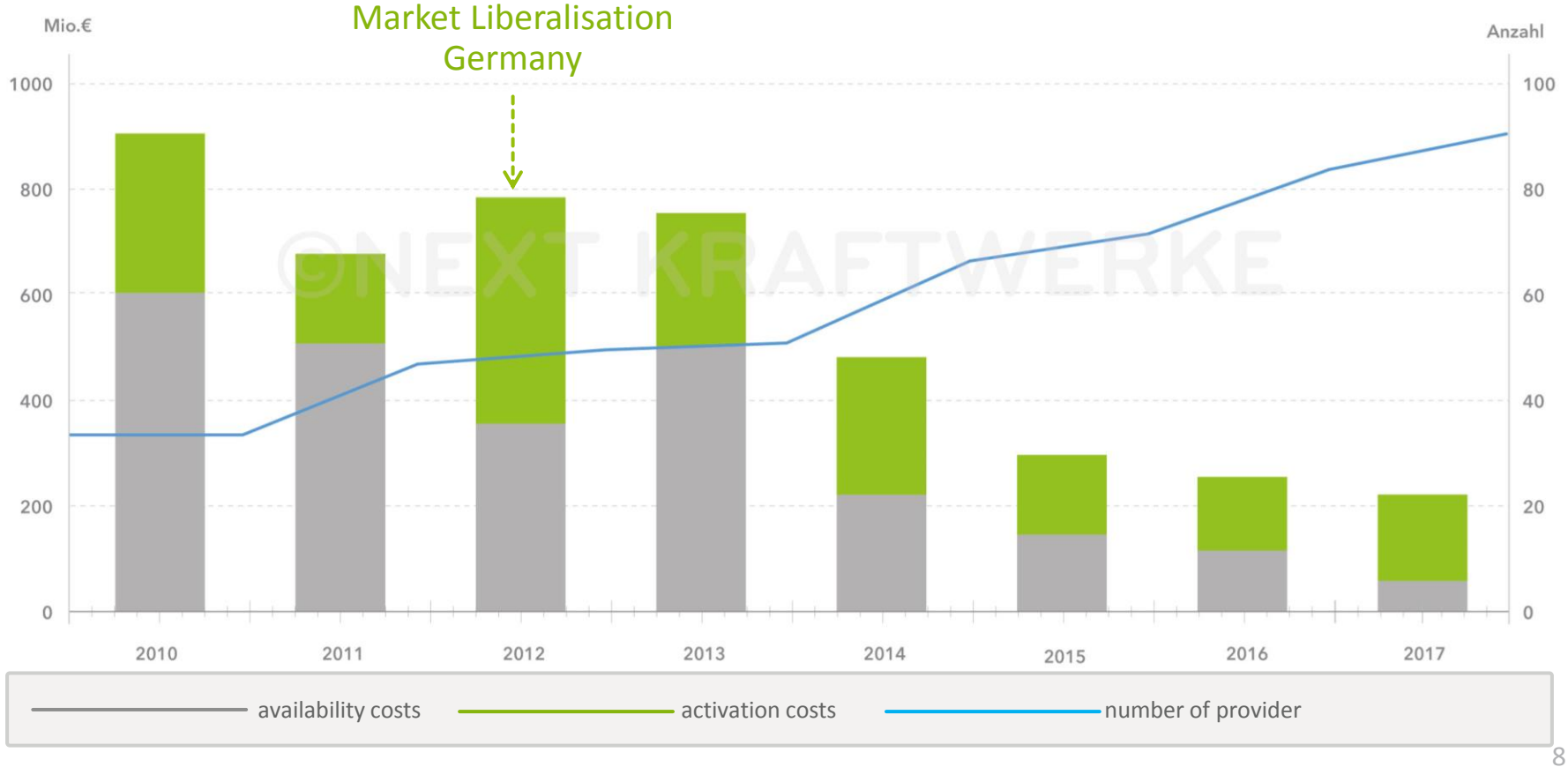
------> Consequence:

- No risk of losing of the subsidy payments
- Incentive to provide aFRR

In what way does the system benefit from liberalized markets?

Development of the Reserve Energy Market 2010 – 2017 in Germany

With respect to costs of flexibility and number of participants



How can you make sure that opportunity costs are covered?

Comparison of pro-rata & merit order activation

Pro-rata activation

- All assets are activated at the same time with a share of its offered aFRR no matter of their activation costs.
- Risk: Assets are activated although their opportunity costs are not covered.
- Consequence: Renewable assets do not participate.

Merit Order Activation

- All bids are put in an order where bids with smallest activation costs are called first.
- Pay as bid
- Consequence 1: Renewable assets are only activated when their opportunity costs are covered. So they have an incentive to participate.
- Consequence 2: System cost reduction as bids with smallest activation costs are called first.

What is the status in Germany and France?

aFRR specification per country

Product specification: aFRR	Germany	France
Access	Liberalised > 1 MW	Not liberalised >120 MW exist. >50 MW new
Type of activation	Merit-order	Pro-rata

What does the future look like?

Harmonising the European electricity markets

PICASSO

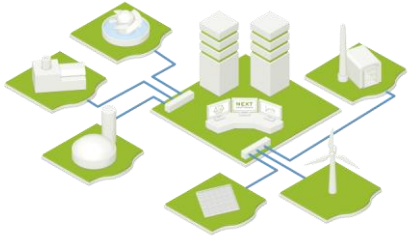
- project on the design, implementation and operation of an integrated platform for aFRR
- Highly relevant due to common merit order activation
- France is part of the project initiators.

VPP perspective

- Merit order activation enables many assets to provide balancing energy
- Whereas pro-rata activation hampers participation
- Liberalized market, heterogeneous assets can participate

Figure 3: Current overview of members and observers

Source : https://consultations.entsoe.eu/markets/ad09fd55/



What does the future look like?

Example: Elia Pilot in Belgium for R2 (aFRR) NON-CIPU

About the Project

- aFRR is the only reserve product which is not liberalized, but obligatory for > 25 MW and with pro-rata activations
- The future of these historical providers becomes uncertain (high availability costs)
- Need to investigate the attractiveness of new flexibility for the aFRR balancing market
- Next Kraftwerke Belgium participated with a pool of cogeneration units (biogas and natural gas)

Some results

- compliancy of non-CIPU units gives equally good results with respect to CIPU units

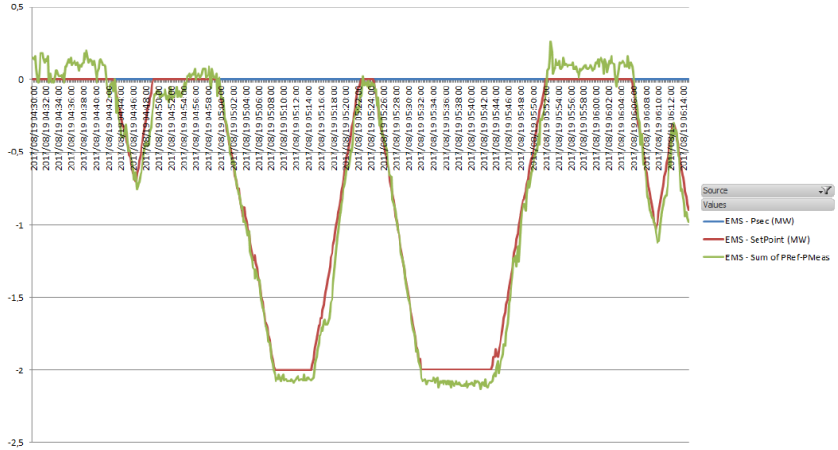


Figure 38: Activation of part A for Next Kraftwerke.

Source :
http://www.elia.be/~/media/files/Elia/users-group/Working-Group-Balancing/20171221_R2-non-CIPU-Report.pdf

Summary and Outlook

Harmonising the European Electricity markets — VPP perspective

- Liberalized markets allow decentral assets to participate
- Merit order activations ensure opportunity costs to be covered
- However, providing aFRR with a pool of decentral assets is still facing barriers in several countries
- Market applications as well as pilot projects show that aggregated decentral units can provide aFRR and take responsibility

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