



# Bringing new technologies into the balancing markets – Pilot examples from Statnett

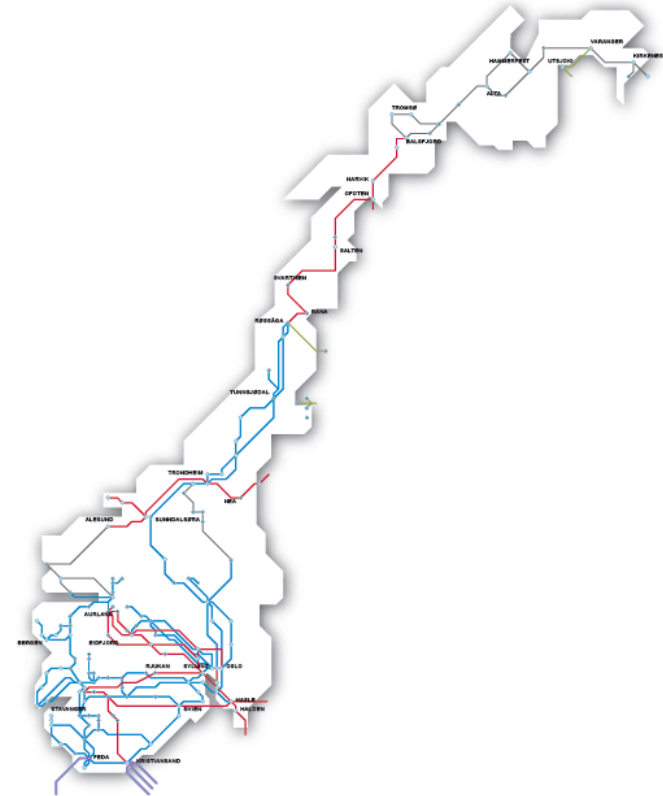
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IEEE – 21st October 2020

**Statnett**

# This is Statnett

- Statnett is the system operator of the Norwegian power system
- Statnett operates around **11,000** km of high-voltage power lines and **166** substations and **1,400** km of subsea and land cables
- The National and Regional Control Centres continuously monitor the grid to ensure stable power supply
- Statnett is also responsible for interconnectors to Sweden, Finland, Russia, Denmark and the Netherlands



# The need for flexibility is rising in the Nordic power system

-  More renewables
-  Climate change
-  New technology
-  More interconnection
-  Active consumers
-  European regulations



- Facilitate market access
- New and existing market players
- Improve markets, IT systems, infrastructure and data access
  - Roles and relations
  - Flow of data and information
  - Financial flow and settlement

# Statnett is working actively to increase the flexibility in the power system

- Statnett is working to enable new types of market players and technologies in multiple projects - pilot [eFleks](#) is one of them
- New product: Fast frequency reserves [FFR](#) (response 0,7 – 1,3 sec)
- R&D project on local flexibility markets in [Norflex](#)
- R&D project on price sensitivity among consumers in [iFleks](#)

# Economic incentives for the consumer – smart consumption management can have many purposes

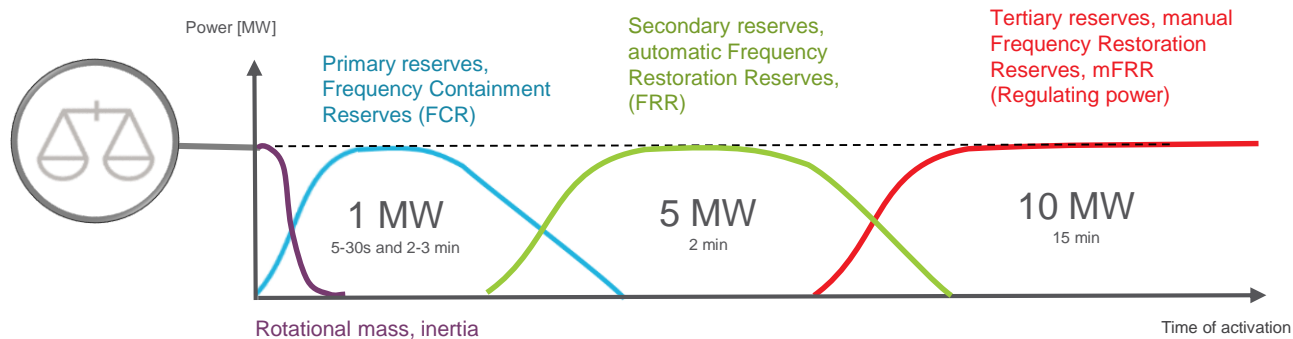
Move demand

Reduce demand




- Tariffs
- Energy markets
- Local flexibility markets
- Balancing markets


# The TSOs use balancing markets as tools for system operation



# Having a dialogue about balancing markets



Flexibility



mFRR


Requirements

**Statnett**  
Fremtiden er elektrisk

Påbudt med  
hjelme

NO BRENNING  
LIVSFARE!

This block illustrates the concept of flexibility in balancing markets. It features a waterfall image pointing to a speech bubble labeled 'Flexibility'. Below it, a worker in a Statnett uniform is shown from behind, standing at a substation. Two callout boxes labeled 'mFRR' and 'Requirements' point to the worker. The worker's vest has the Statnett logo and the slogan 'Fremtiden er elektrisk'. The substation door has safety signs: 'Påbudt med hjelme' and 'NO BRENNING LIVSFARE!'.



*Flex*

010110  
011011  
010010

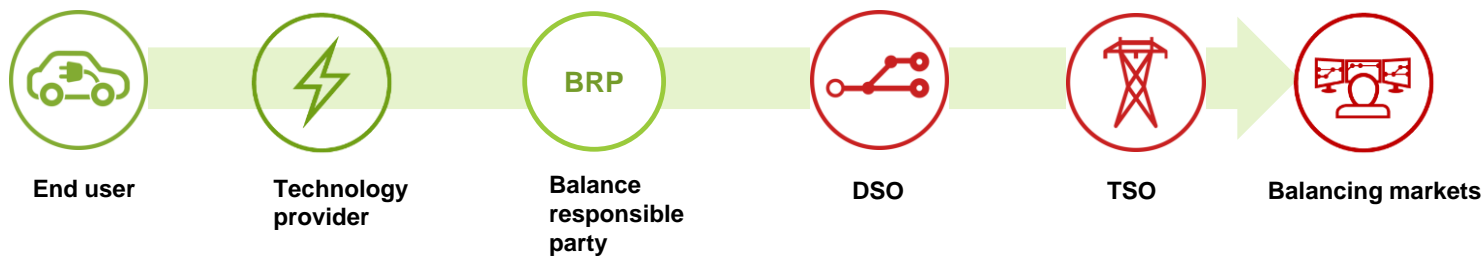
mFR-  
what?

Customers  
with  
consumption

This block illustrates the dialogue about balancing markets. It features a person sitting at a desk working on a laptop. A speech bubble labeled 'Flex' points to the person. To the right, a circular graphic contains binary code. Below it, two speech bubbles contain the text 'mFR-what?' and 'Customers with consumption'.

# 1 MW mFRR bids with electronic bid ordering

## 2019 – 2020



### Why:

- Increased need for flexibility in the mFRR market
- Mature providers, grid companies and Statnett's operation and IT-systems for bids down to 1 MW
- Taking a step towards more automatization of the value chain

**What:** 1 MW bids with requirement to use electronic bid ordering





# The pilot enables end users to participate in mFRR market

1 MW



Stop in **charging** of an aggregated portfolio of **electrical vehicles and residential heaters**



1- 4 MW



Control of **building management systems in commercial buildings**



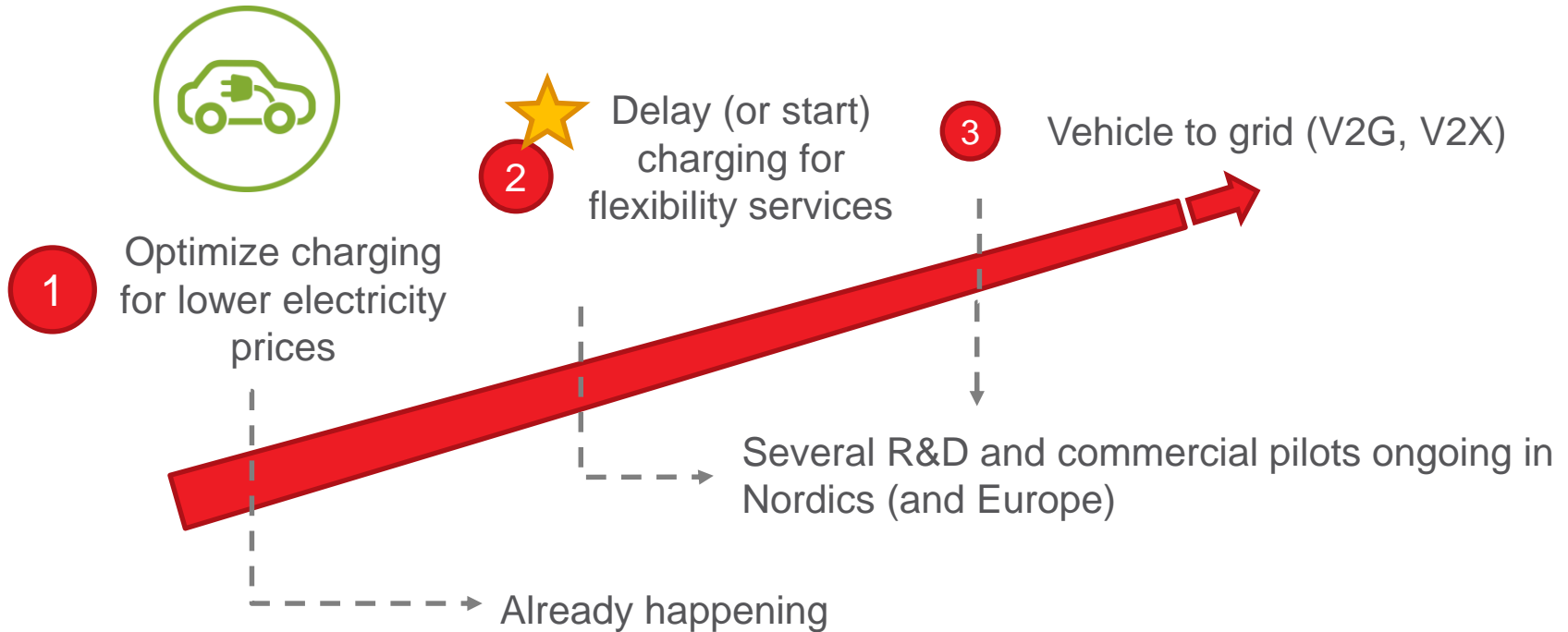
2- 4 MW



Control of **industrial processes**



# Flex from EVs can be simple or advanced



# Project progress

- The companies Tibber and Entelios have made their respective solutions for disconnecting consumption with the help of automatization and electronic bid ordering
- Tests performed spring 2020 and will continue testing autumn 2020
- Project to be concluded end 2020 – evaluation report will be written

# Sequence



**1.** Place bid in the mFRR market



**2.** Bid becomes part of TSO market merit order list

**4.** Automatized activation



**3.** Electronic bid order sequence



**6.** Transaction completed



**5.** Settlement

# Future sequence



1. Place bid in the mFRR market



2. Bid becomes part of TSO market merit order list



4. **Automatized** activation



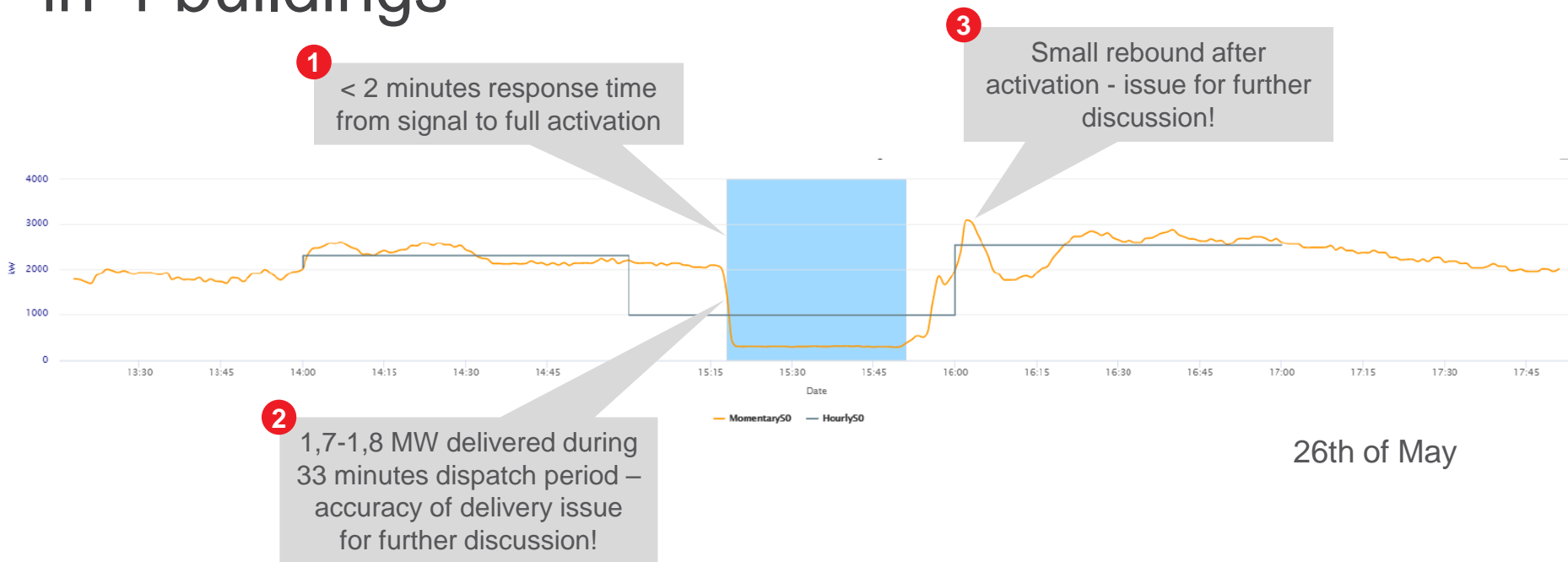
3. **Automatic electronic bid order** based on predicted need for regulation in the different regions in the Nordics for each 15 min

6. Transaction completed

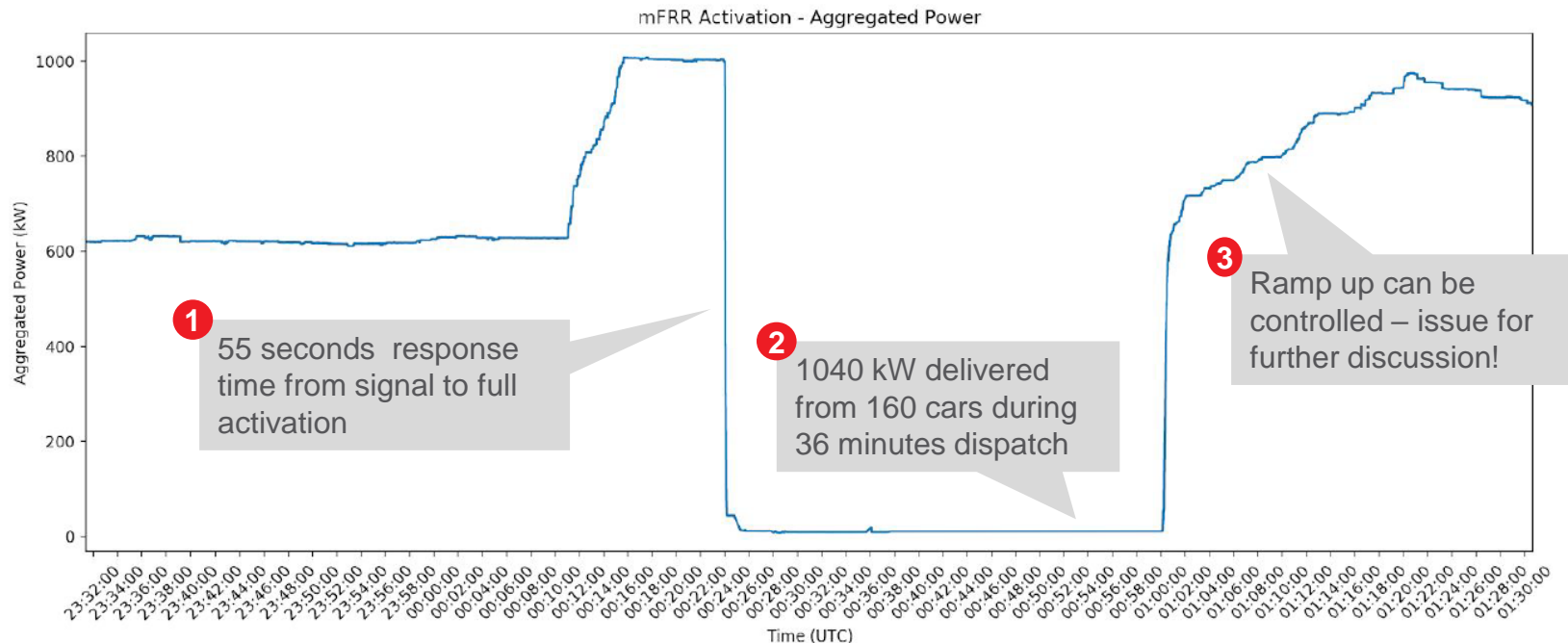


5. Settlement

# Automatic activation of 1 MW electrical boilers in 4 buildings



# Automatic activation of 1 MW equaling 160 cars



29th of May

# Key learnings so far

- **The devil is in the live testing detail** - live testing is key tool for identifying false assumptions or edge cases
- **Pay attention to the non-technical challenges** - they can be harder to overcome than the technical ones and affect scalability
- **Pilots pave the way for market development, and vice versa**; it's key what comes after a pilot in order to attract providers to participate in a pilot in the first place
- **The whole value chain must be handled in order to realize flexibility** – discuss scope of project and progress with stakeholders from the whole value chain