Ancillary Services from fast DER

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Advisor

System development Balancing markets

Statnett

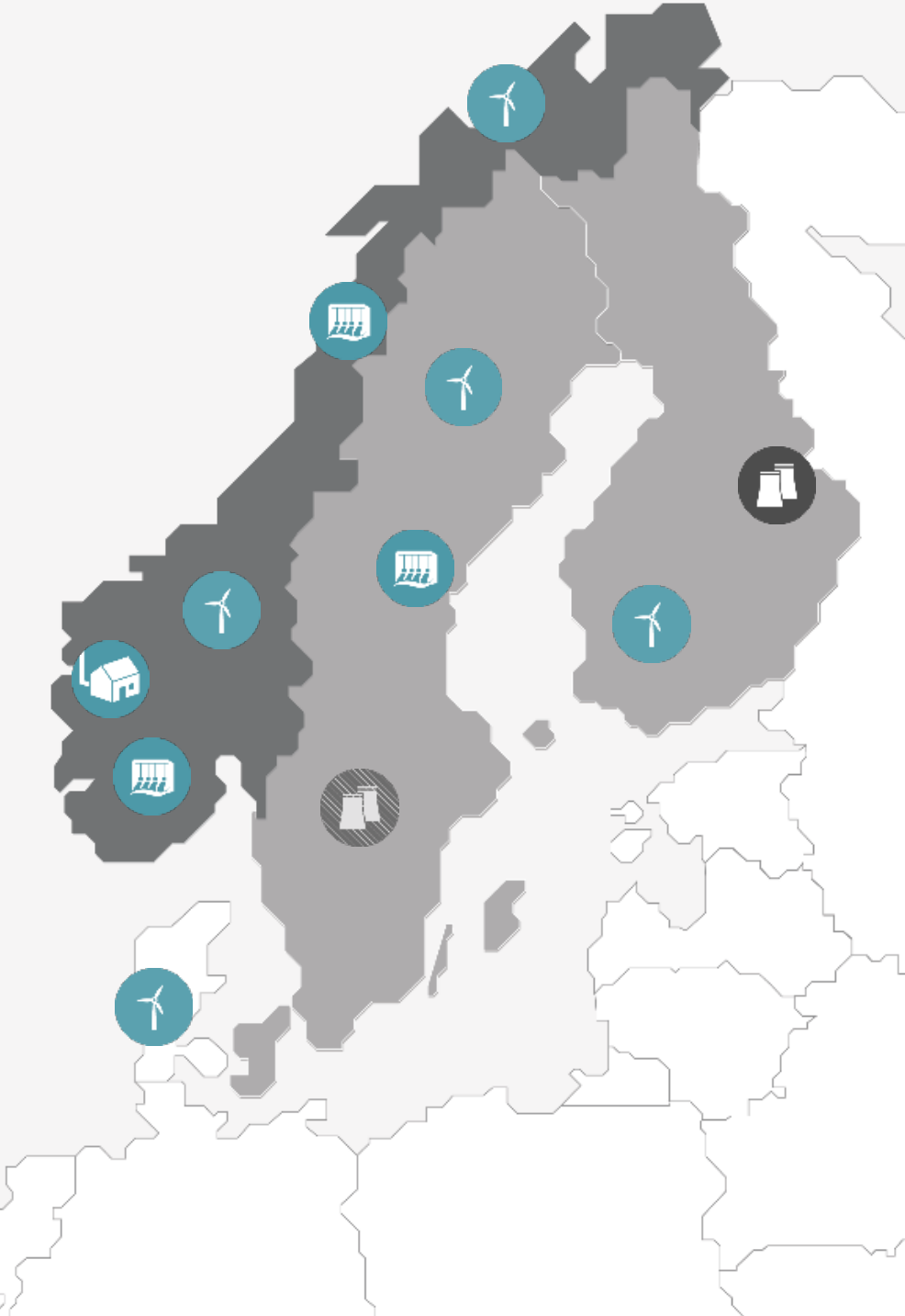
Det **grønne** taktskiftet

The power system is changing

2020:
94% hydropower, ~6 % wind

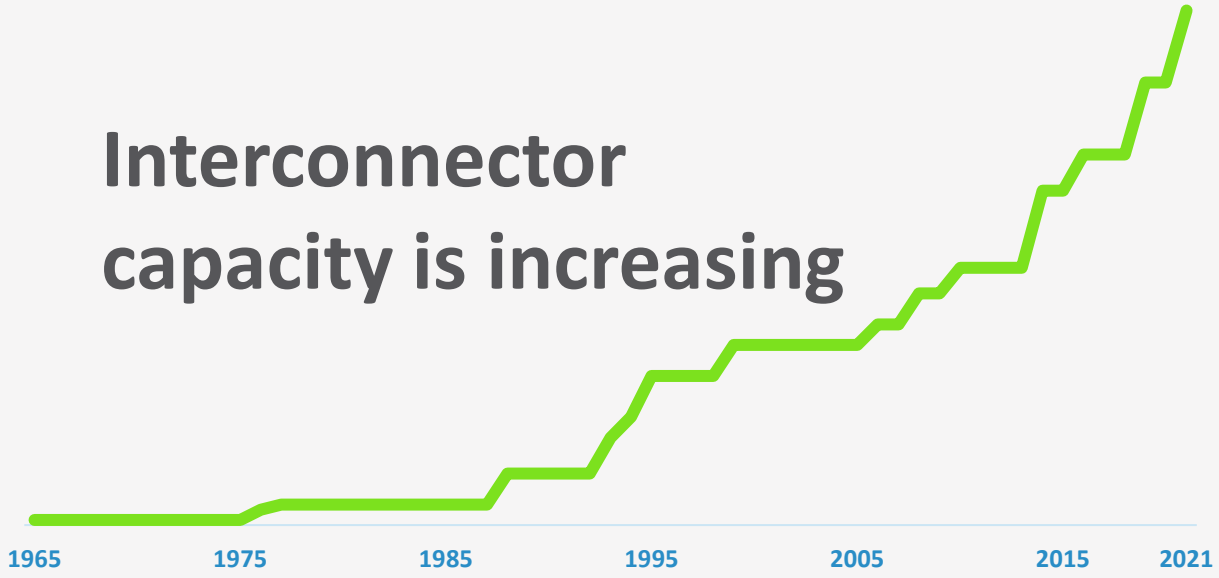
2030:
84 % hydropower, ~14 % wind, ~2 % solar

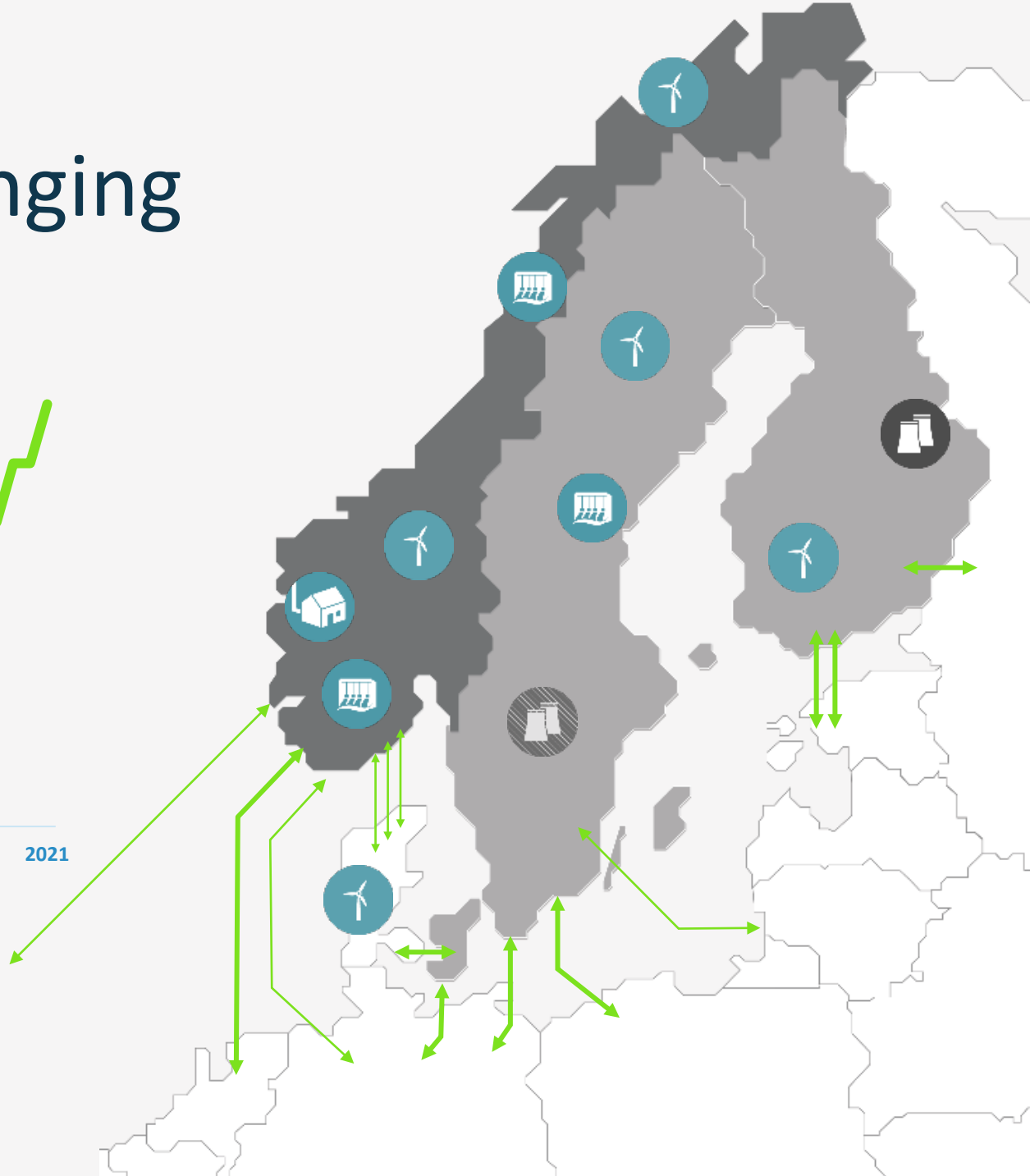
2040:
78 % hydropower, ~20 % wind, ~2 % solar



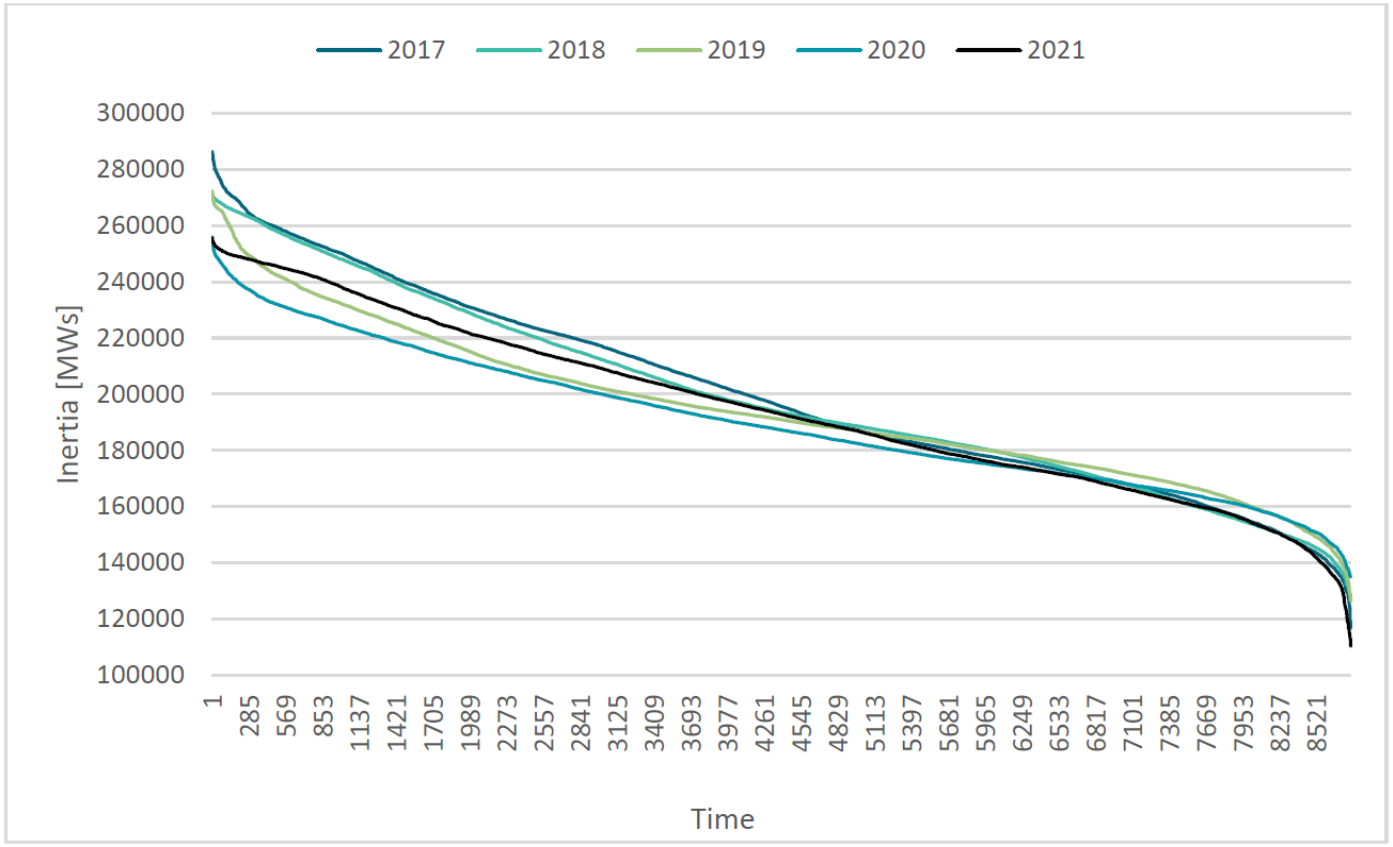
The power system is changing

Interconnector capacity is increasing





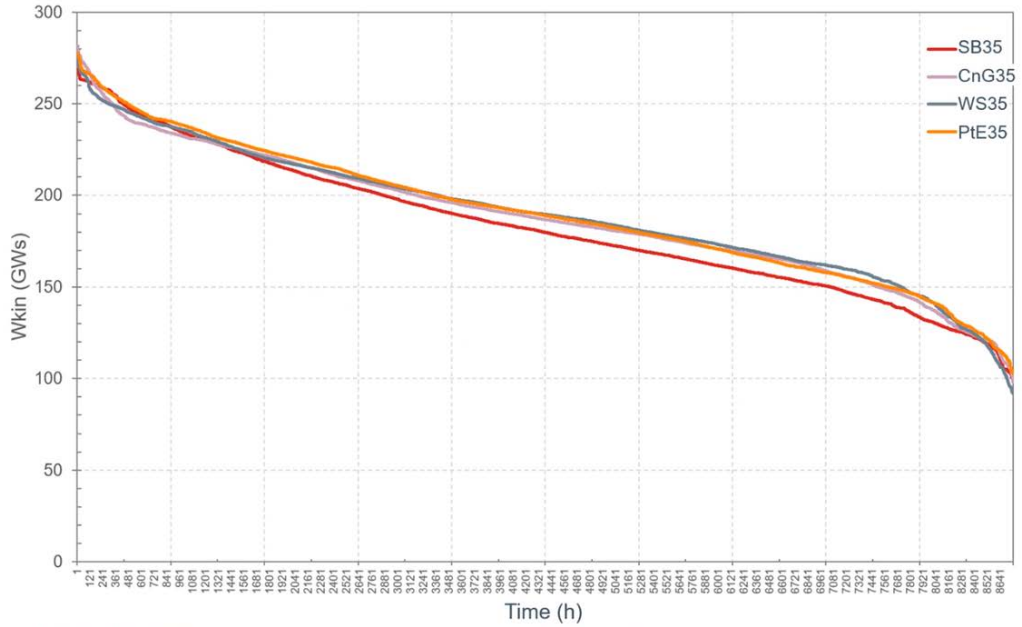
Change in Inertia (kinetic energy) in the Nordic power system



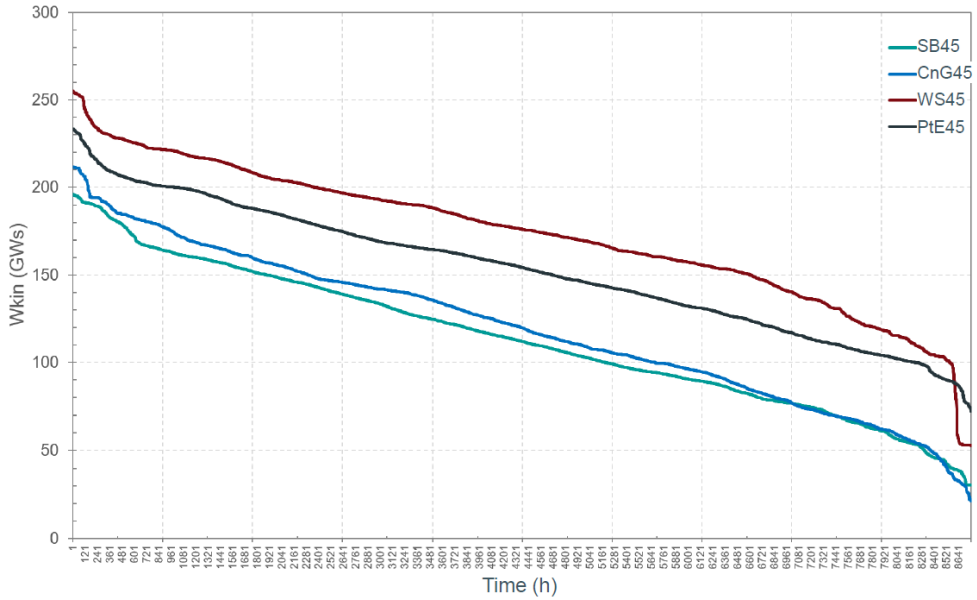
Source: RME Rapport (nve.no)

Inertia in the Nordic based on four scenarios

Scenarios 2035 – Inertia

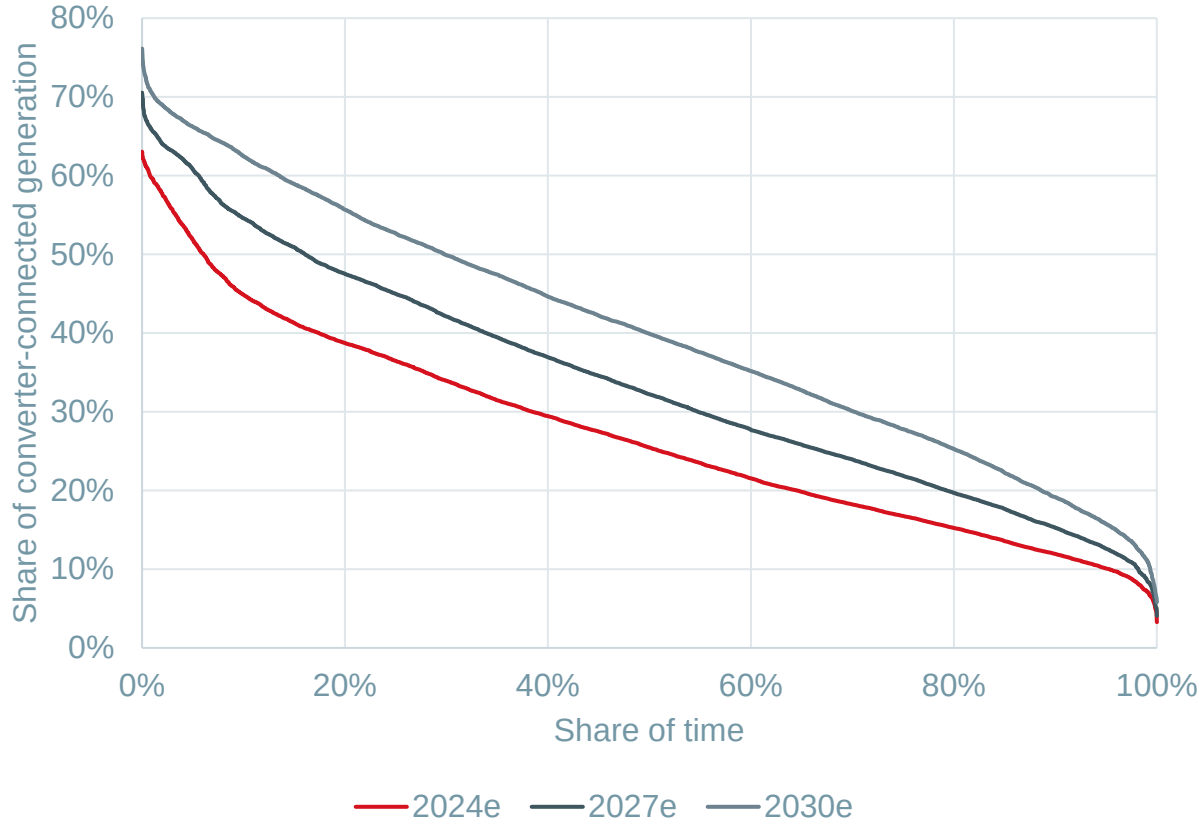


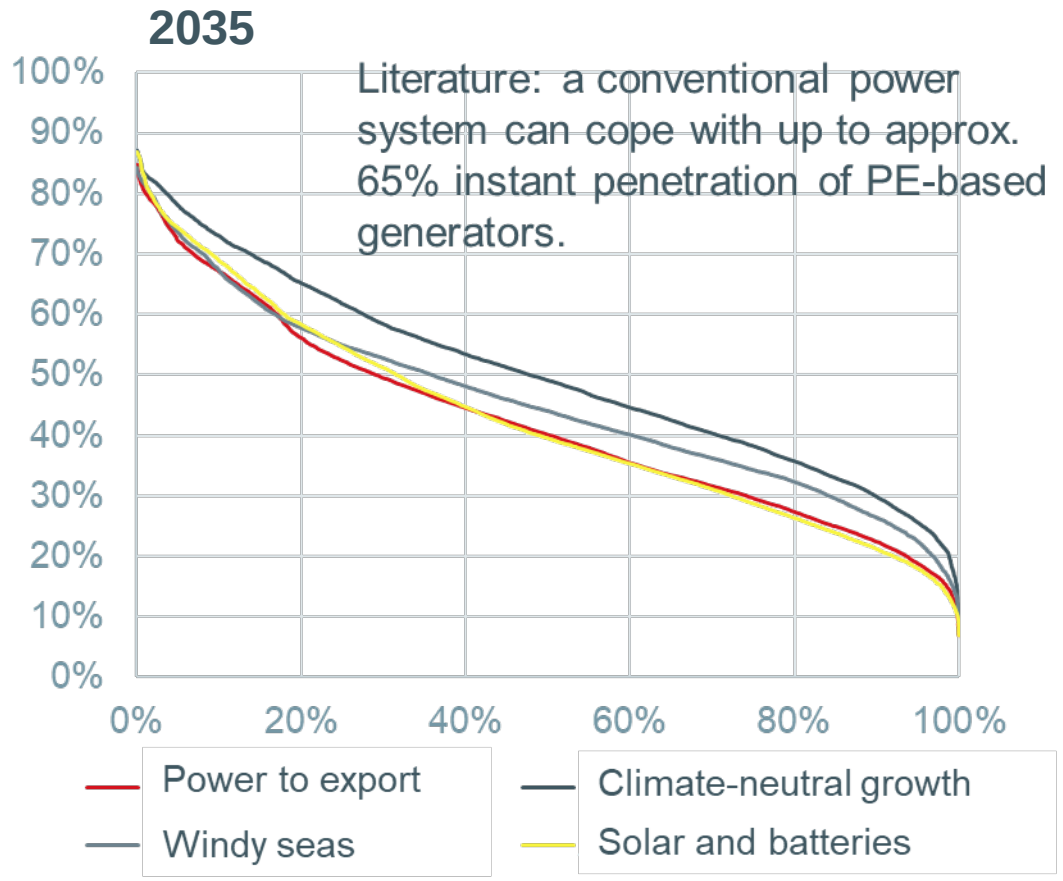
Scenarios 2045 – Inertia



FINGRID

Increase in converter connected production in the Nordics



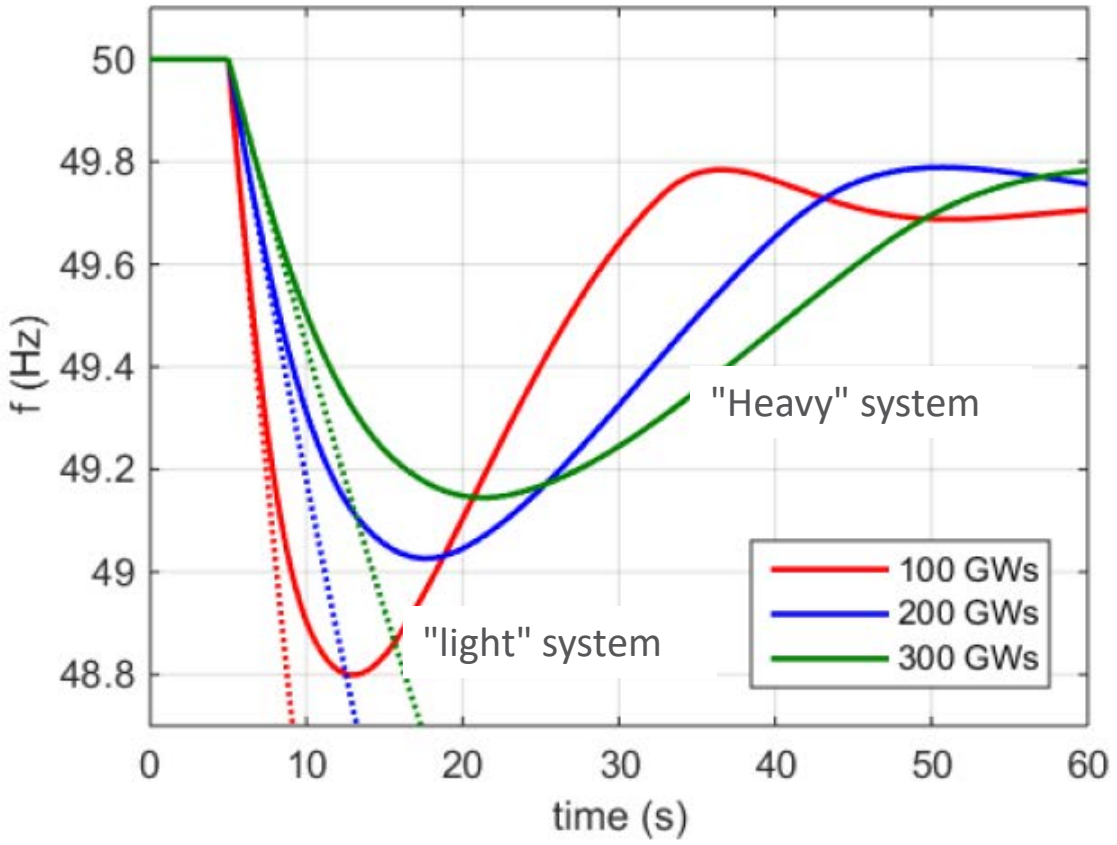


Indications for typical weather year

Possible sollutions

1. Fast Frequency Reserves (FFR)
   - *Fast disconnection of consumtion or injection of power*
2. Grid-forming
   - *Controlled conribution of electrical torque from a unit proportional to the RoCoF measured at the terminal of the unit.*
3. Controlled reduction of reference incident
   - *Nuclear power plant or interconnector*

Fast handling of large frequency deviations



49,7 Hz - 1,3 sec.

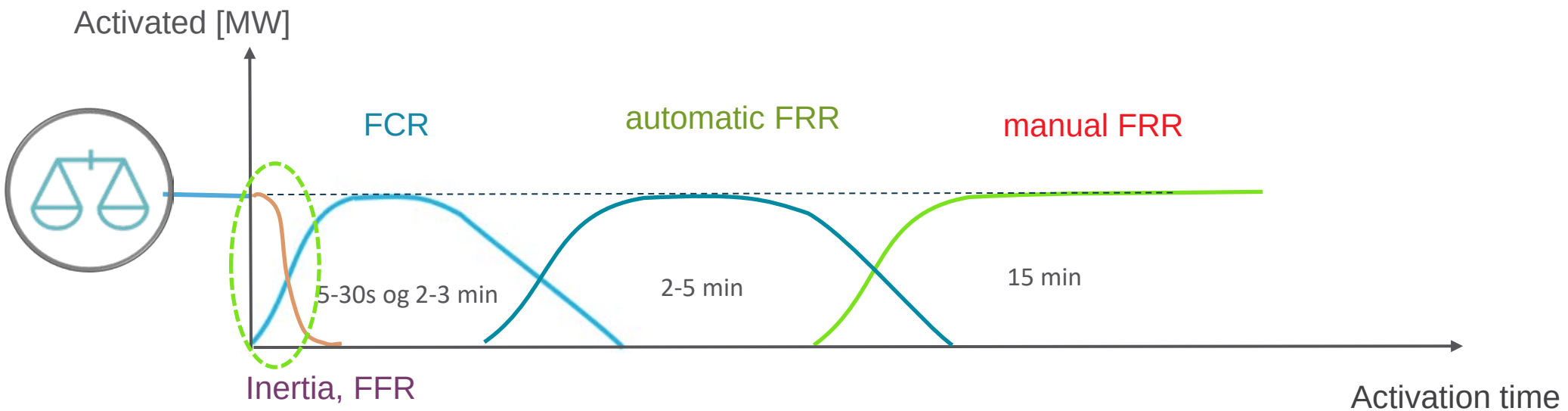
49,6 Hz - 1,0 sec.

49,5 Hz - 0,7 sec.

Duration 5 or 30 sec.

Shall be available again 15 minutes after activation.

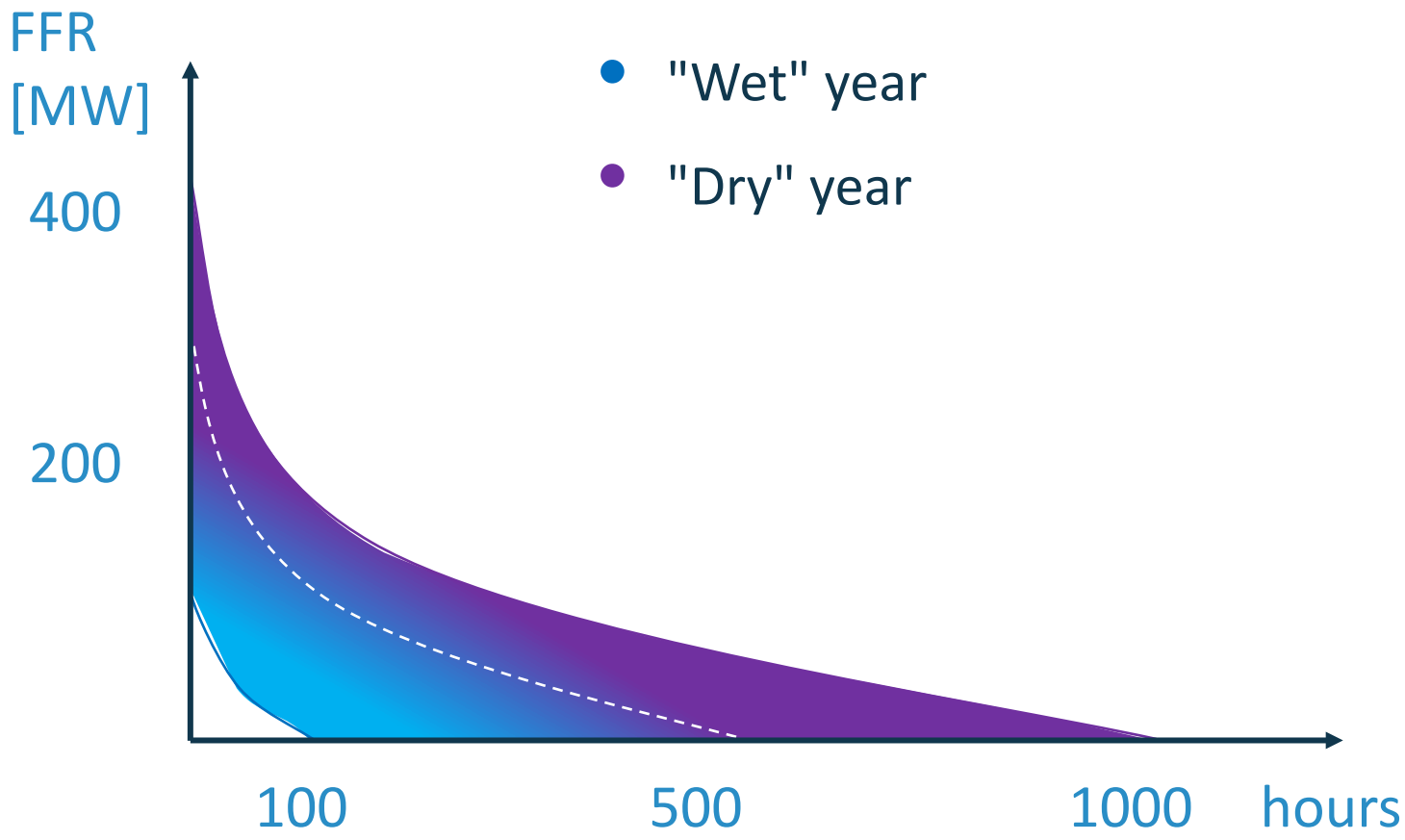
Reservers are used to take care of imbalanses during operation and unforeseen events



"Rotational energy couteracts the change of frequency"

The Nordic FFR-need varies

- From year to year and day to day
- Hydrological conditions in the Nordic region as well as high imports over the interconnectors are decisive for inertia and thus the FFR-need
- Seasonal procurements must be dimentioned based on statistical analyses, but also weather forecasts



Examples of technology and suppliers

Hydro

Fast reduction of **electric current to the furnace**

tibber

Fast stop in **charging** of aggregated **EV**-portfolio

fortum

basefarm

Fast change in power supply from **grid to battery**

BKK

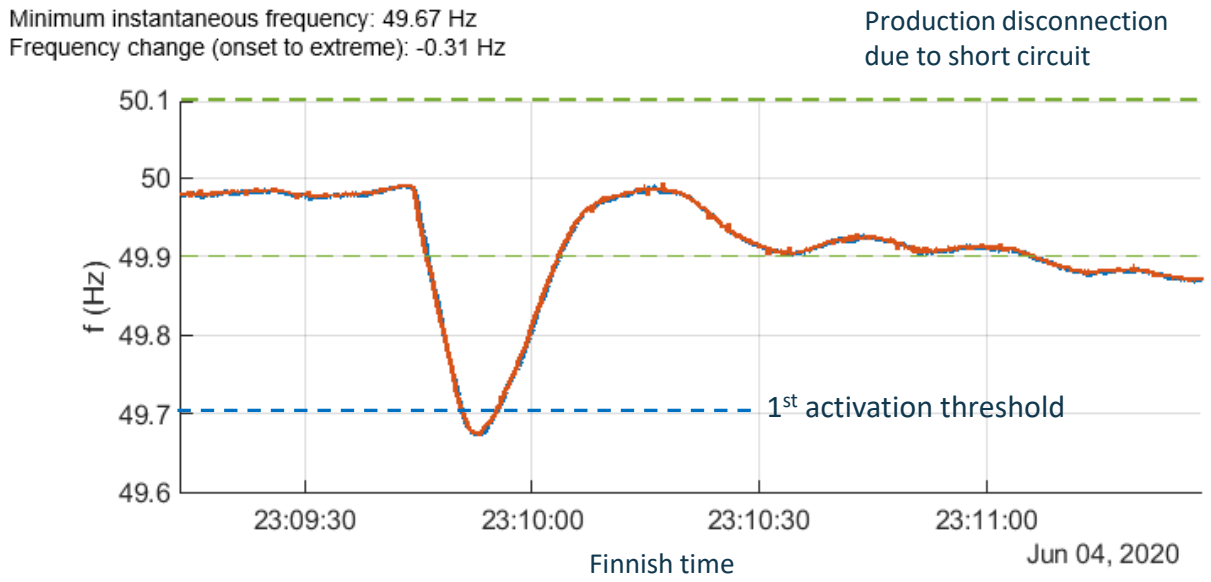
Fast disconnection of **pumped-storage hydropower turbine**

SFE

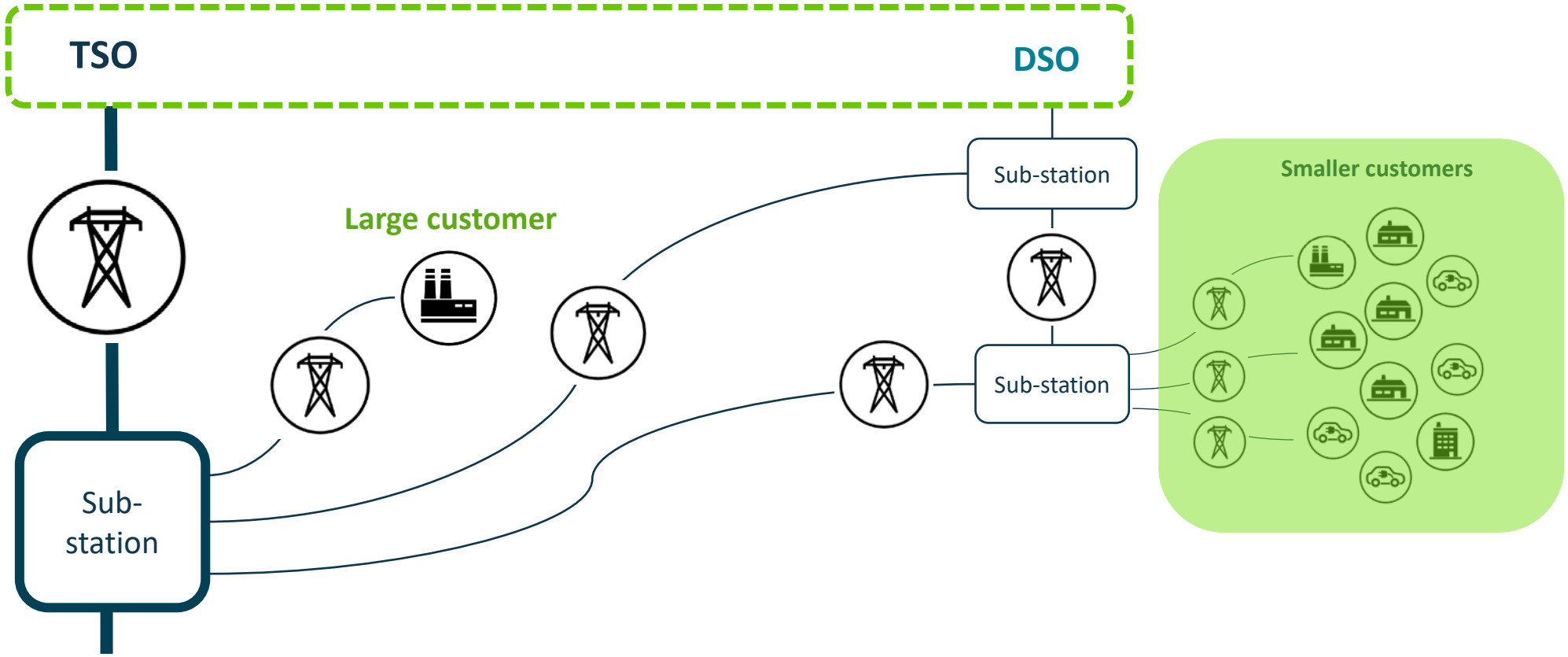
Fast response form **hydropower** in production mode

Operational experiences 2020
FFR activation June 7

- DK2: 1 provider activated 5,1 MW as expected
- NO: 35,1 MW activated as expected
- FI: No activation - all providers have chosen 49,5 Hz activation threshold
- SE: 3 providers activated total 19,5 MW as expected



Most of the customers are connected to the distribution grid



Summary

- The Nordic power system is in its biggest transition and system stability is on the agenda
- Small actors may be relevant for FFR
  - Fast response, short duration, and only (dis-)connection
- The majority of small-scale flexible resources are connected to the distribution grid
  - Good cooperation and coordination with DSOs is important
- Statnett (expect to) allow independent aggregation in the FFR-market next year
  - No need to be a balancing responsible party to participate.

Takk for oppmerksomheten!