

THE DANISH ANCILLARY SERVICE MARKET

Demand for flexibility

Line Kamp Bräuner, Energinet

ENERGINET ENSURES BALANCE **MINUTE BY MINUTE**

Energinet has the day-to-day and long-term TSO responsibility for the overall electricity system in Denmark.

Balance is secured, among other things, by well-functioning energy markets – both nationally and across borders. This contains trading in all respects and ancillary service markets.

The green transition creates a demand for new tools in order to secure a robust and balanced electricity system



CHALLENGES IN A 100 % RENEWABLE ELECTRICITY SYSTEM

Wind and PV in DK in 2020 (approx.)

Onshore wind	4.325 MW
Offshore wind	1.700 MW
PV	1.025 MW
Total	7.050 MW

Wind and PV in DK in 2030

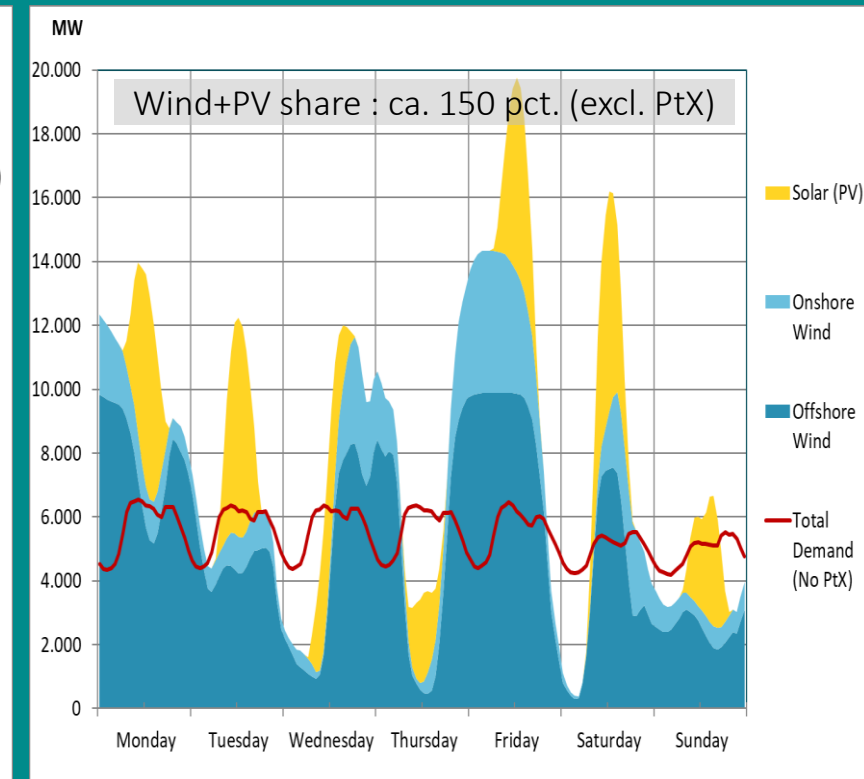
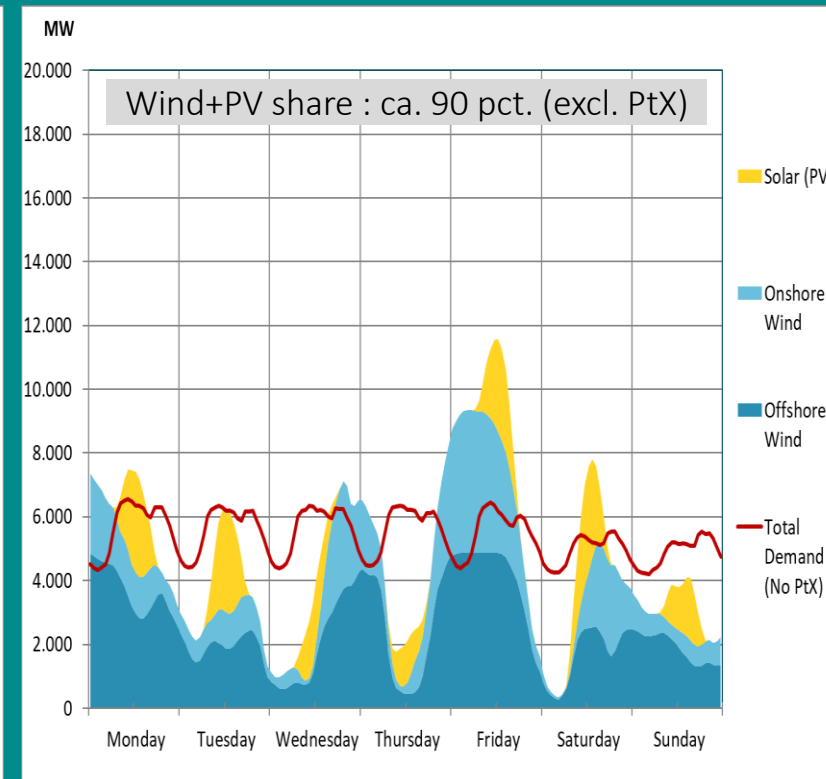
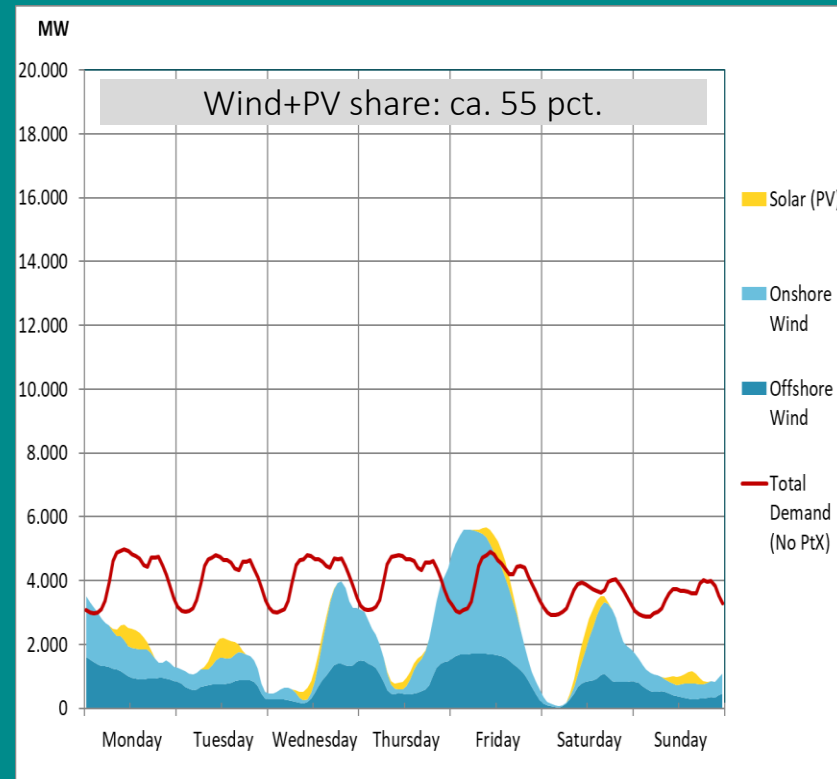
Cf. AF2019

Onshore wind	4.600 MW
Offshore wind	4.900 MW
PV	4.900 MW
Total	14.400 MW

Wind and PV in DK in 2030 (+10 GW)

Cf. AF2019 + 5 GW offshore wind og 5 GW PV

Onshore wind	4.600 MW
Offshore wind	9.900 MW
PV	9.900 MW
Total:	24.400 MW





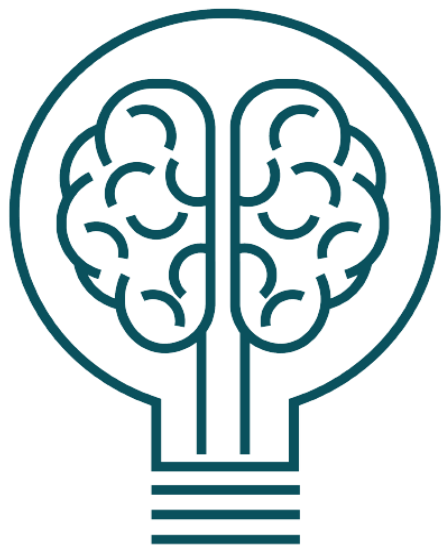
HOW TO BALANCE A 100 % RENEWABLE ENERGY SYSTEM?



FLEXIBLE CONSUMPTION

Consumers must play their part in maintaining balance in the grid

THE MARKET SHALL BE THE DRIVER OF NEW SOLUTIONS



The **good idea** emerge in the market and is driven by the market player



The market player use **Energinet** as sounding board to uncover new possibilities



The market player puts the **idea into action** if feasible

MARKET DEVELOPMENT TOGETHER

How can we speed up processes and integrate new market players better?

Less talk – more action on entry barriers

Pilot projects on real market conditions

Easy access to data

Clear communication



RENEWABLE ENERGY SOURCES

must take part in securing the
necessary balancing reserve capacity

CAPACITY RESERVES FROM RENEWABLES

Assumptions: Forecasting precision and tools have high enough quality to meet firmness requirements.

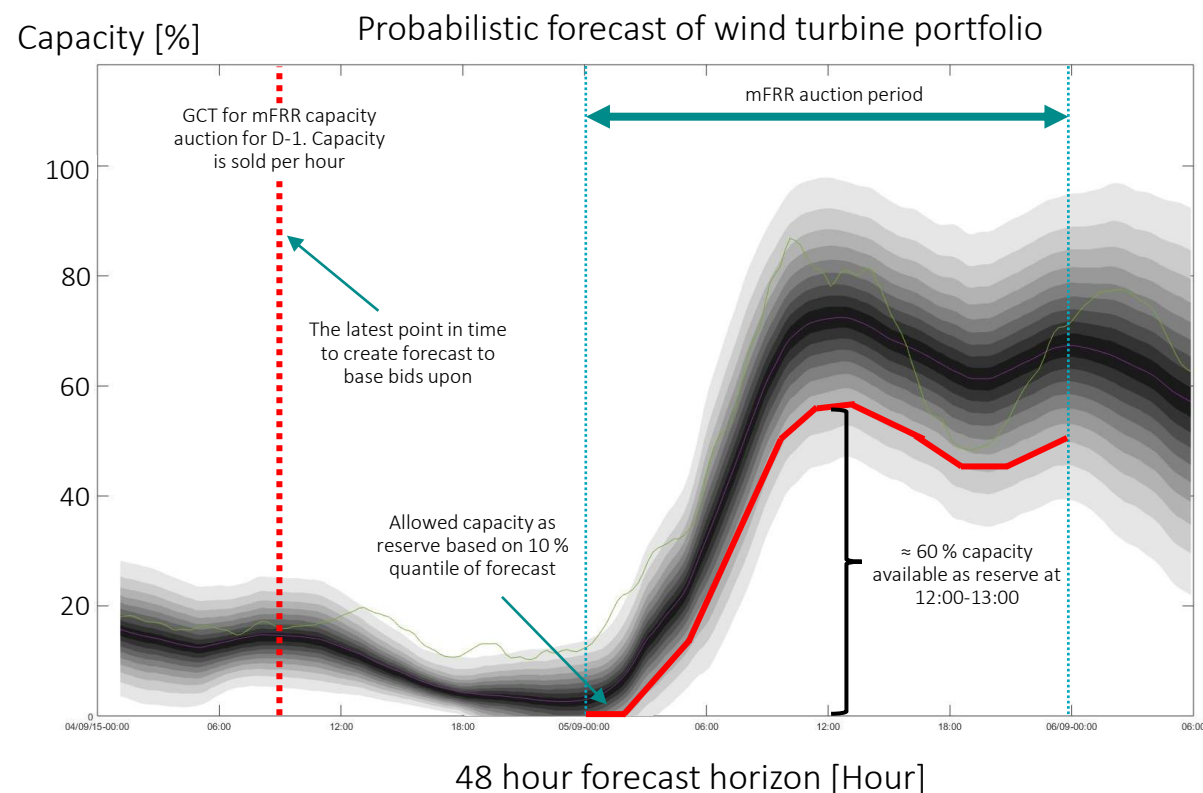
Result: Increased liquidity and better utilization of existing resources.

Method: Precision of forecasting must be proven based on at least 3 months of historical data.

Renewables will be allowed to bid in capacity equal to the **10 % quantile of a probabilistic forecast**, to ensure that the capacity is available.

The rest can be bid into the energy markets, day-ahead and intra-day from the 10 % quantile and up.

At times with the largest uncertainties the spread is larger, and hence the capacity that can be bid into the market is reduced (to maintain firmness).

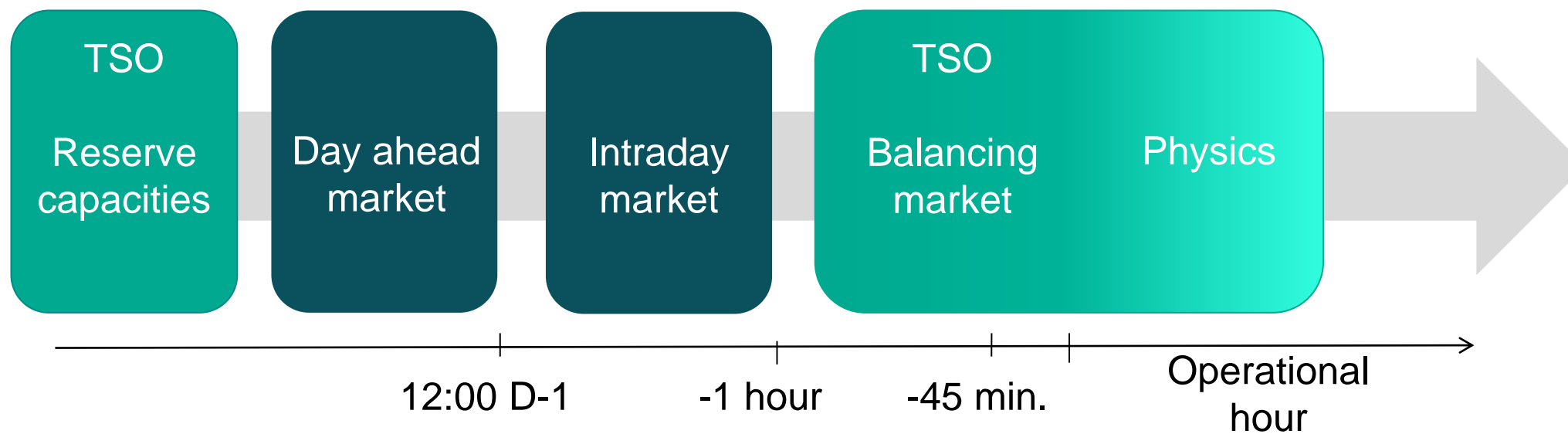


The Figure shows the spread of production from a wind turbine portfolio, where every shade represents 5 % quantile.



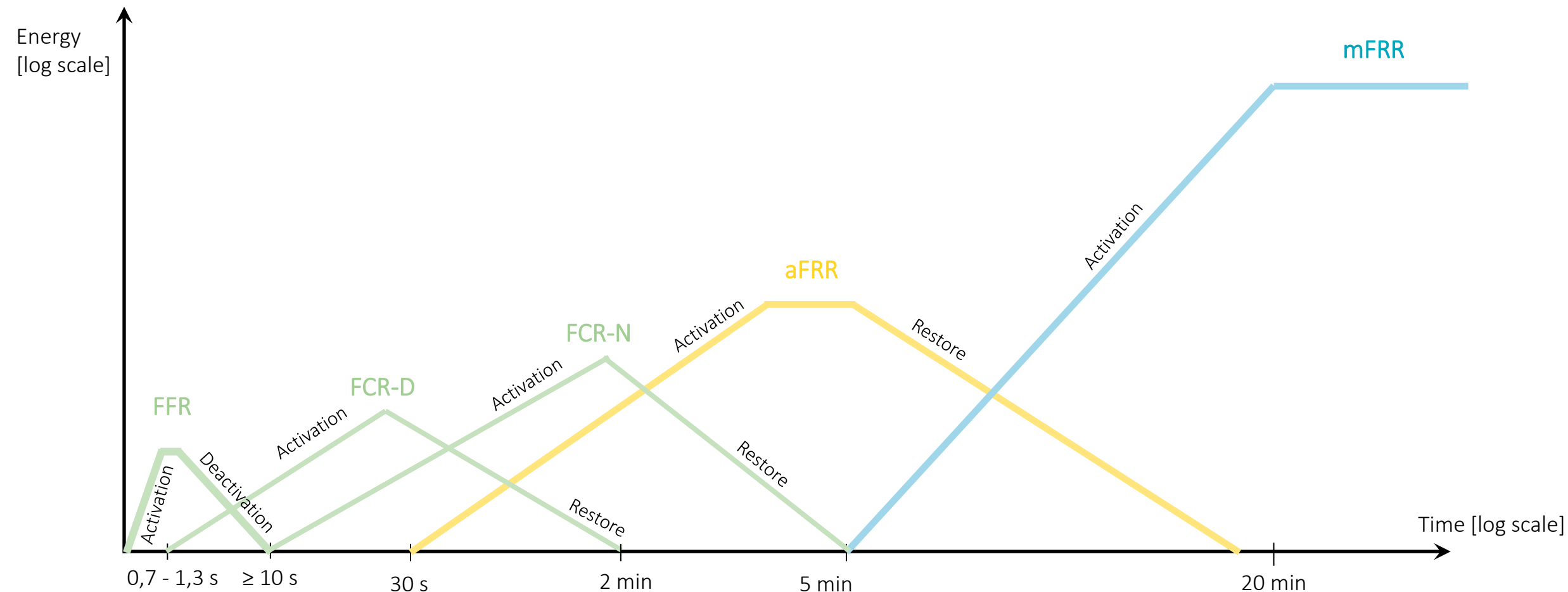
BALANCING THE SYSTEM WITH ANCILLARY SERVICES

THE ENERGY AND RESERVE MARKETS



BALANCING THE SYSTEM

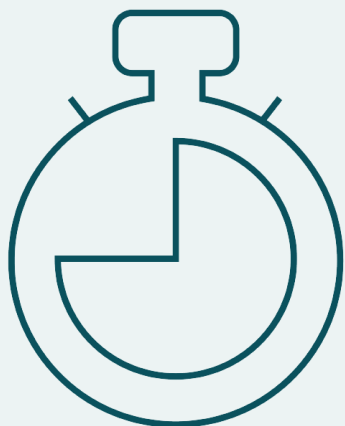
Small differences between DK1 and DK: Only one product in DK1



BALANCING REQUIREMENTS → BUSINESS OPPORTUNITIES

RESPONSE TIME

How quickly the unit is able to turn up or down its consumption or production?



+

TIMEPERIOD

How long should the unit be able to provide the service?



+

SIZE

How much can the unit deliver during the period?








=

BUSINESS OPPORTUNITIES





ANCILLARY SERVICES : TECHNICAL REQ.






 Max time for activation
 Min delivery time
 Min aggregated bid size

 Up and down adjustment of energy from a system perspective is purchased symmetrically
 Only upward adjustment of energy is purchased

DK1

 **FCR**
 15-30 sec.
 15 min.
 1 MW







 **aFFR**
 15 min. (5 min. ≈2024)
 60 min.
 1 MW


 **mFFR**
 15 min.
 60 min. (15 min. ≈2024)
 5 MW (1 MW ≈ 2024)


DK2






 1 sec.
 10 sec.
 0,1 MW






 **FFR**

 50% 5 sec. 100% 30 sec.
 15 min.
 0,1 MW
 Both up and down asymmetrically in 2022
 **FCR-D**

 150 sec.
 60 min.
 0,1 MW

 **FCR-N**

 5 min.
 60 min.
 1 MW
 ≈ 2022
 **aFFR**

 15 min.
 60 min. (15 min. ≈ 2024)
 5 MW (1 MW ≈ 2024)

 **mFFR**

ANCILLARY SERVICES : MARKETS

- Deadline for submission of bids
- Delivery hour
- Requirements
- Average historical price (2019-2020)

DK1

FCR

The day before the operating day

4 hours

+/- 20 MW

50-70.000 DKK/MW/month (availability)

Common market with Continental Europe

aFFR

The week up to the operating month

1 month

+/- 90 MW

200-250.000 DKK/MW/month (availability)

Min. DA price + 100 DKK/MWh (energy)

Potential Common Nordic market in the future

2023/2024 Common market for energy activation with all of Europe

Common market for energy activation with nordics

DK2

FFR

1 sec.

1 hour

0-40 MW

200.000 DKK/MW/month (availability)

FCR-D

1 or 2 days before the operating day

1 hour

+44 MW

50-100.000 DKK/MW/month (availability)

FCR-N

1 or 2 days before the operating day

+/- 18 MW

100-150.000 DKK/MW/month (availability)

aFFR

The day before the operating day

15 min.

+/- 12-30 MW

NA

NA

Common capacity market with Nordics (incl. DK1)

mFFR

+/- 684 MW

Ca. 3-5.000 DKK/MW/month (availability)

up: 600 down: 50 DKK/MWh (energy)

mFFR

The week up to the operating month

+ 623 MW

30-50.000 up: 1000 DKK/MW/down: 200 month DKK/MWh (availability) (energy)

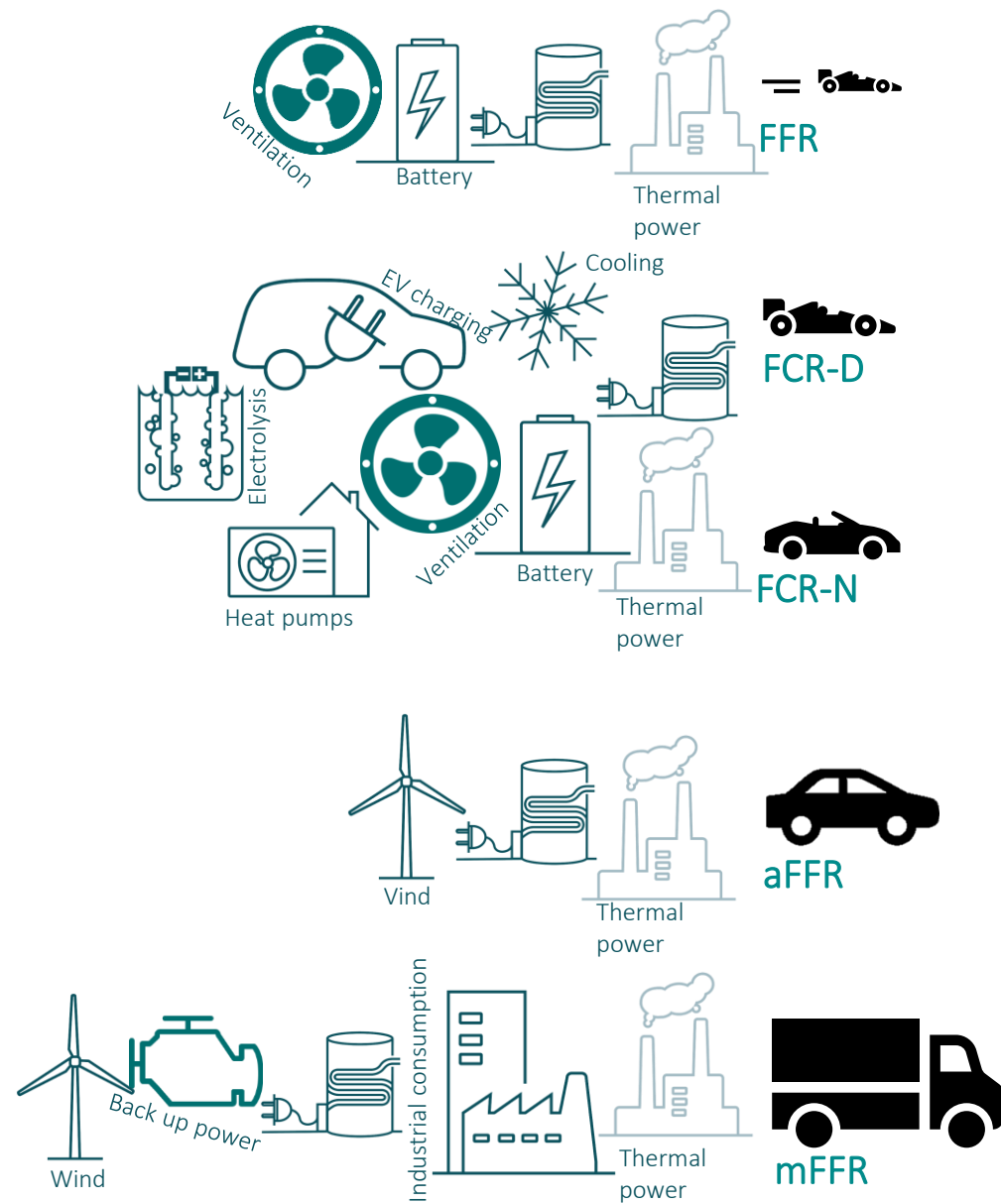
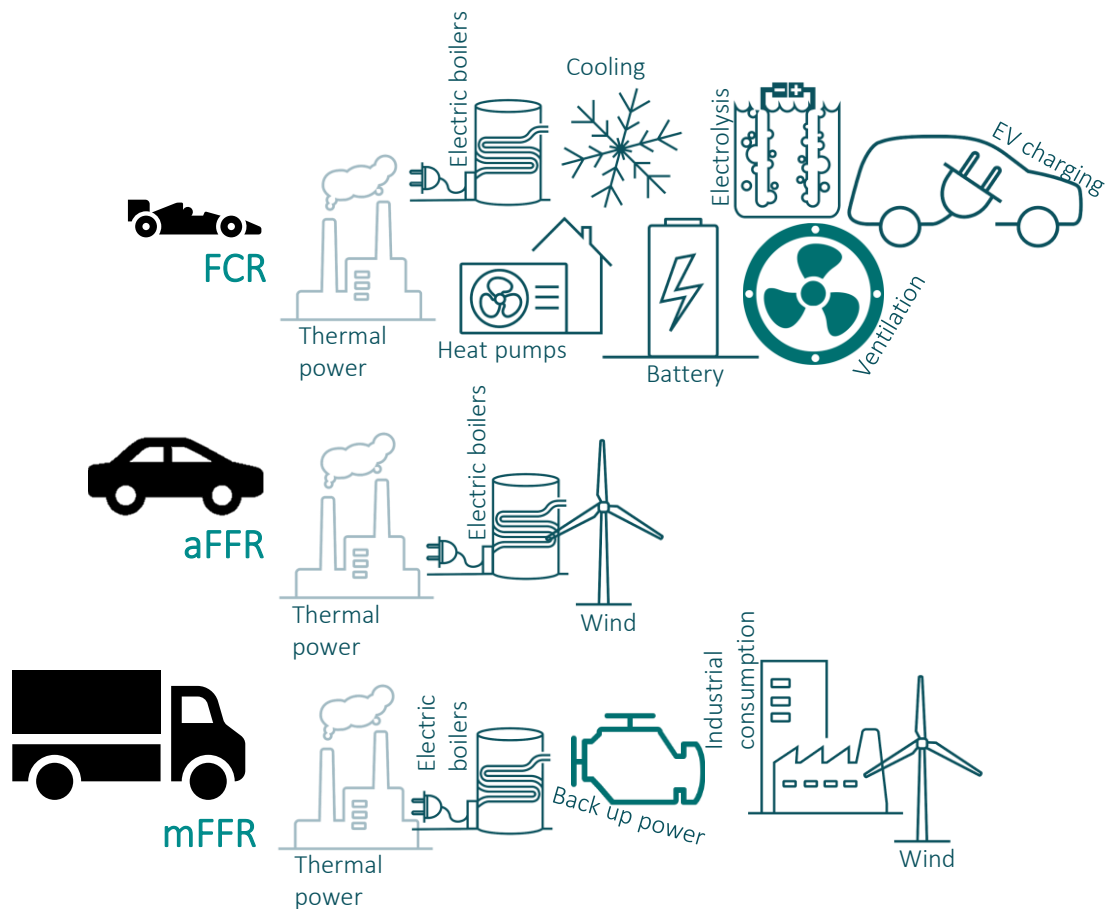
from 2022

from 2024

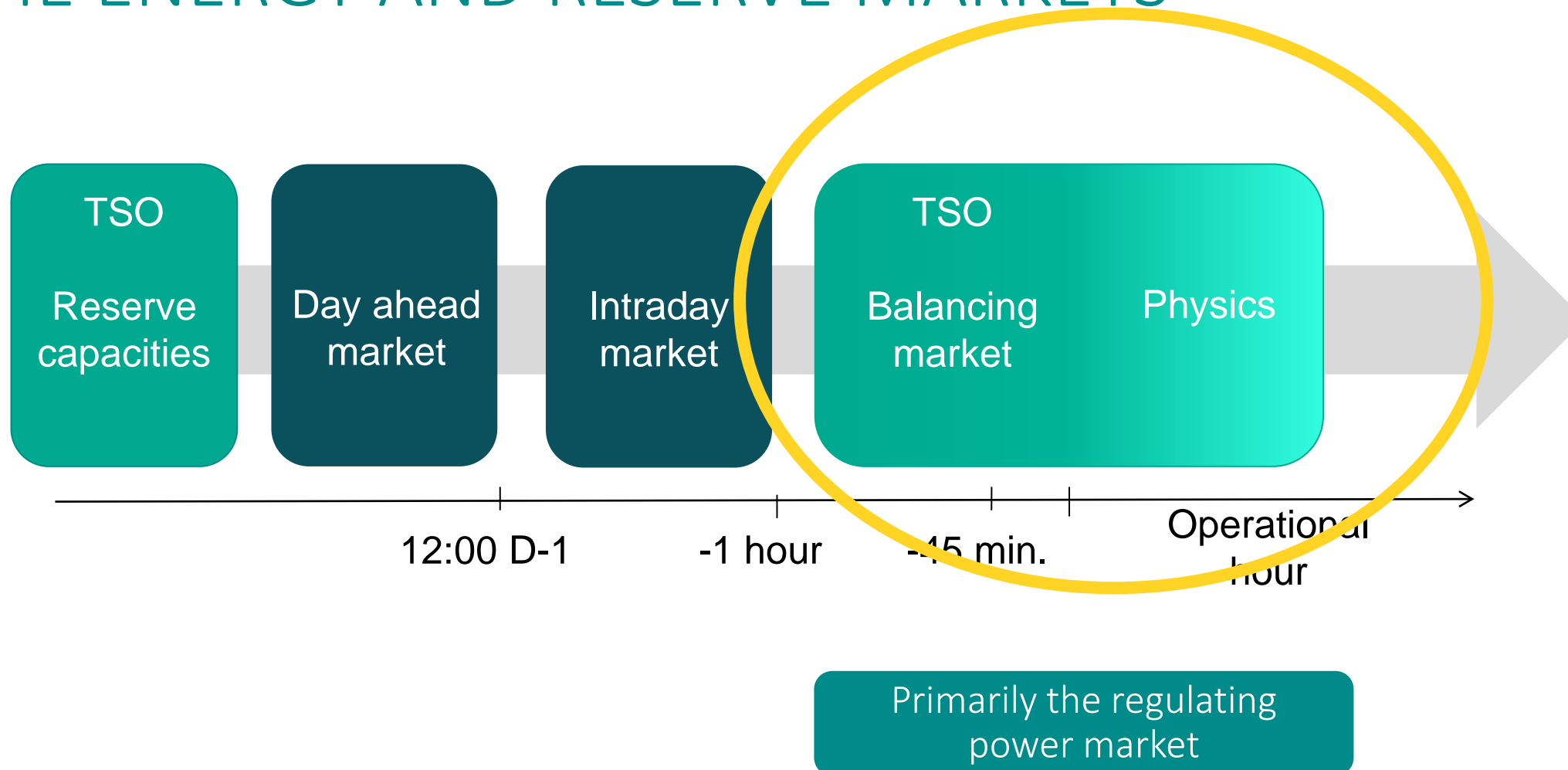
Common market with Sweden

ANCILLARY SERVICE : TECHNOLOGY

The technologies that provides the different services today. Wind power is able and expected to provide FCR soon.

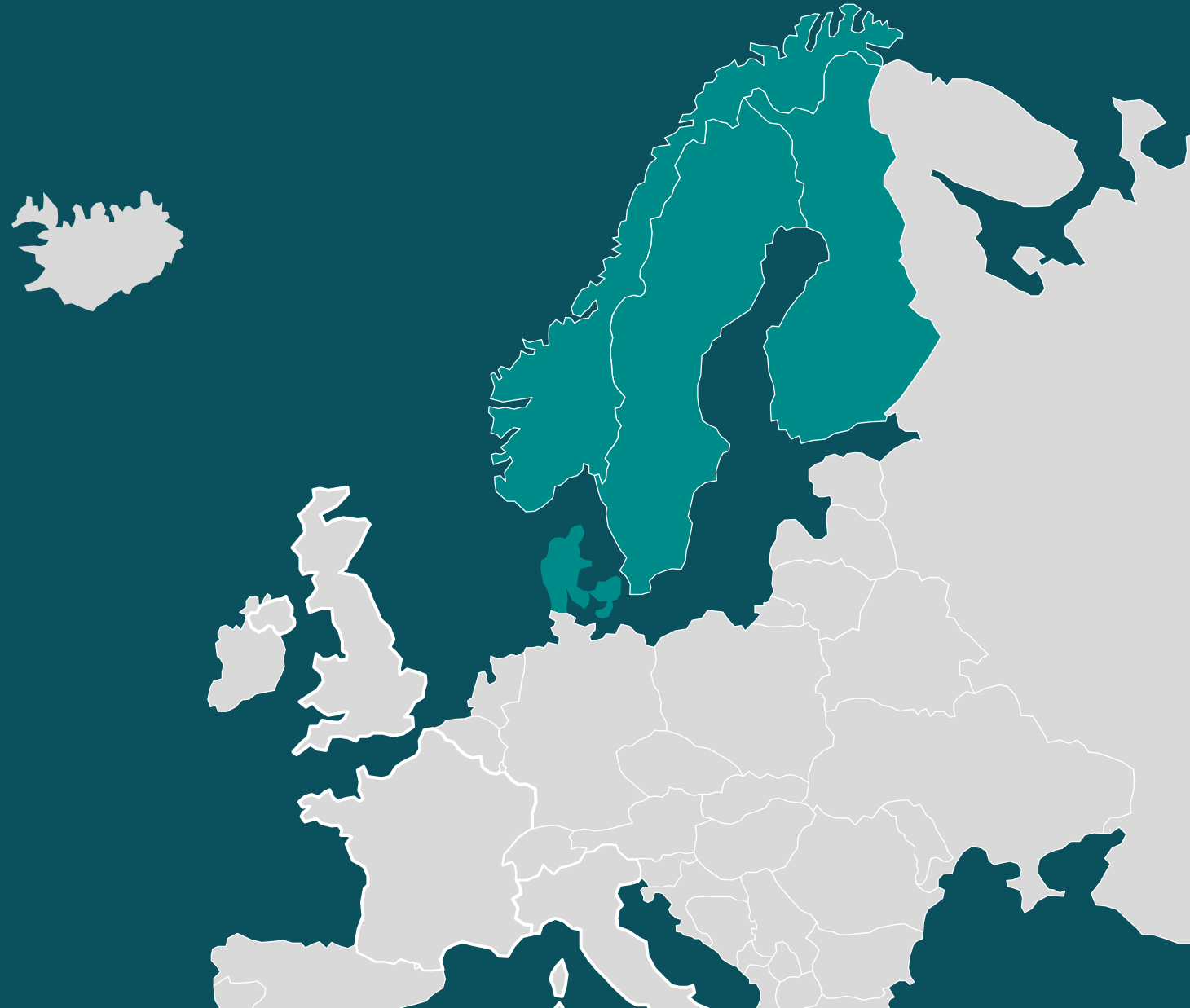


THE ENERGY AND RESERVE MARKETS



NEW NORDIC ENERGY ACTIVATION MARKET

- To be implemented gradually over the coming years in order to be able to on-board the common European energy activation platform for regulation power, MARI
- Is basically about implementing 15 minut time resolution, which demands automated activation processes
- New possibilities for block bids and linked bids





CONSEQUENCES OF THE NEW NORDIC ENERGY ACTIVATION MARKET:

A new model for countertrade

COUNTERTRADE

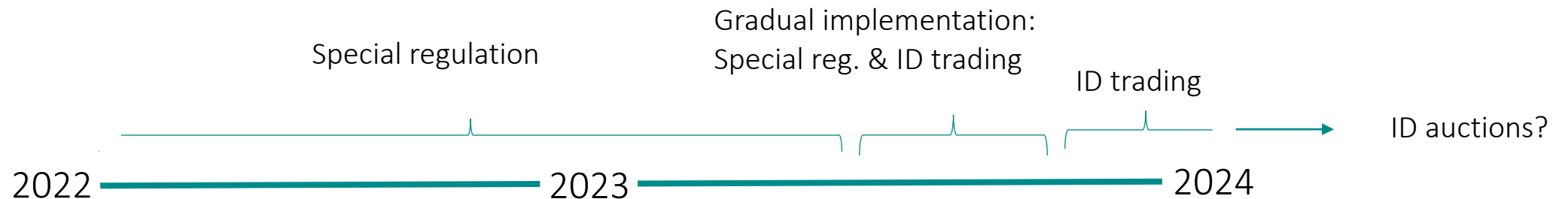
WILL MOVE FROM THE
REGULATING POWER
MARKET TO **INTRADAY**

The structural and planned procurement of countertrade will take place in 1-2 windows. The first window will open at 15.00 (D-1) where as unexpected or adjusted countertrade amounts will be traded up until ID GCT.



GRADUAL IMPLEMENTATION

The volumes traded in intraday will gradually be increased in order to make the transition as smooth as possible.



Q4 2023 all volumes must be procured on ID as special regulation for countertrade is no longer possible Nordic EAM.

QUESTIONS



Line Kamp Bräuner, Energinet – LKB@energinet.dk