TSO-DSO cooperation in extracting distributed flexibility in Belgium

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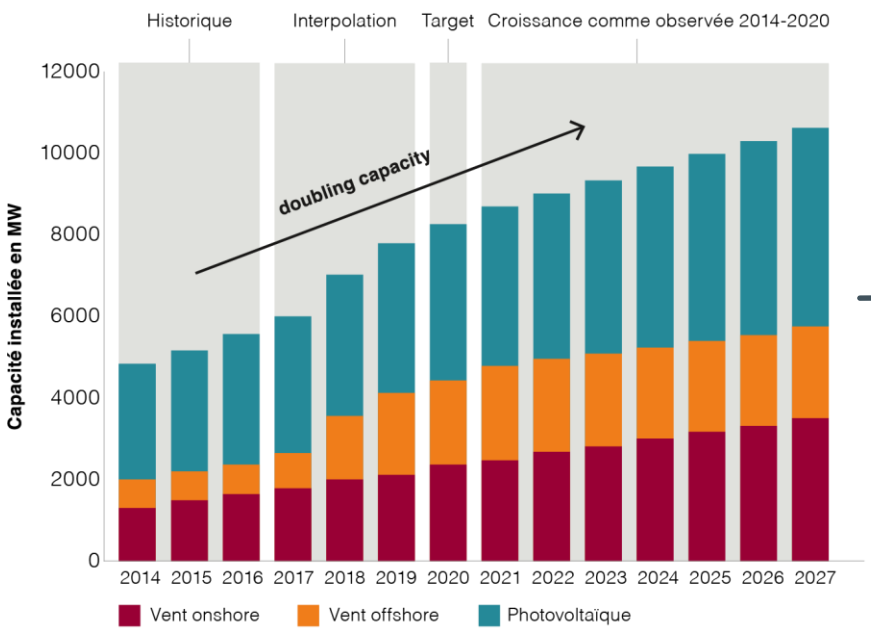
Elia Group, a unique positioning at the heart of Europe

The Elia Group encompasses two leading TSOs in two European regions, with **Elia in Belgium**, **50Hertz in Germany**

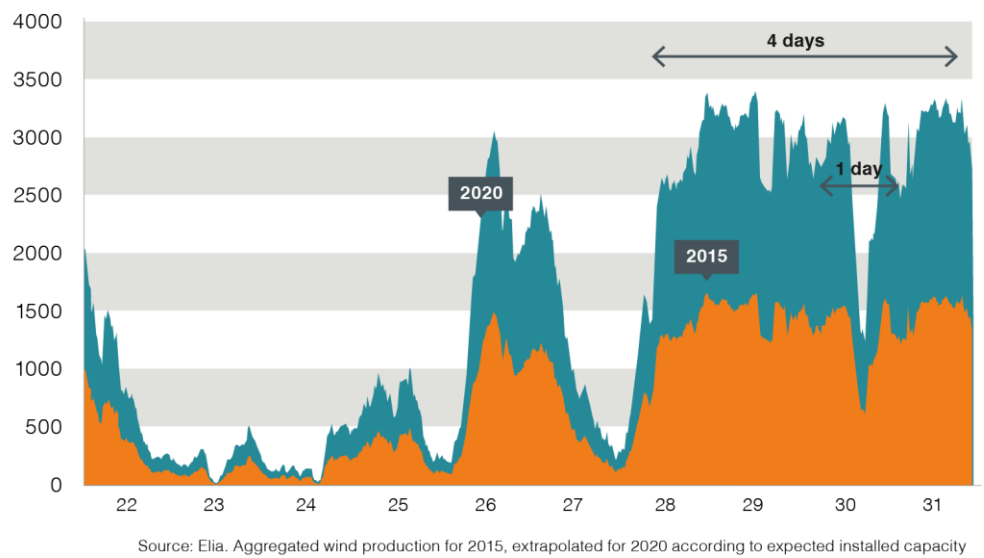
Setting the scene: changing context

Integrating more renewables challenges the way we balance the system

Installed renewable generation capacity in Belgium – "Base" scenario



Example of wind generation in Belgium during some days in March [MW]



Source: Elia. Aggregated wind production for 2015, extrapolated for 2020 according to expected installed capacity

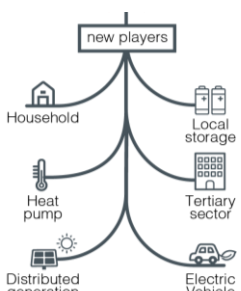
The variability of renewables need to be managed at different time-frames: not only daily but also weekly and seasonal.
Need for (more) flexibility in the system is a consequence of the integration of (more) renewables.

Need for additional flexibility: a multi-dimensional approach

Context

A rapidly changing environment …

RES development



Decentralisation, digitalisation & new players

The regionalisation of the electricity sector

Impact for Grid Operators

… with challenges & opportunities …

Flexibility needs

More important & more volatile

Flexibility sources

New technologies & players

Necessary Answers

… requires an ambitious but pragmatic approach

Keep "needs" under control

- Enforced Balancing Responsible Party (BRP) role
- Dynamic "needs" dimensioning

Cover "needs" efficiently

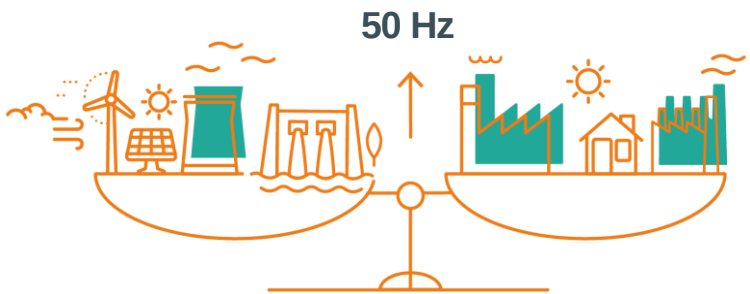
- Reserve sharing
- Cross border integration
- Shorter term procurement
- Open market to all
  - ✓ All technologies (batteries, load,..)
  - ✓ All players (independent BSP)
  - ✓ All voltage levels (TSO & DSO levels)

Increased need for flexibility

Balance Management: central role of the market participant

Needs

- Variability of the consumption
- Variability of the production, especially renewable sources
- Production incidents



Sources

- Flexible set up of production units
- Flexible demand (demand response)
- Interconnections
- Storage

Uncertainty

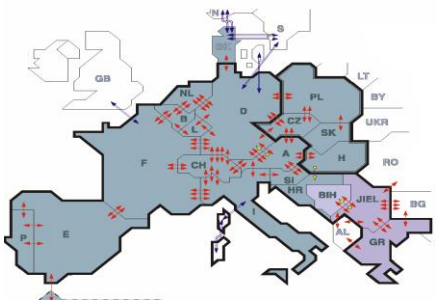
Day-Ahead Market	Intra Day (ID) Market	ID to Real Time (RT)	RT Balancing Market
▪ Each Balancing Responsible Party (BRP) nominates hour per hour its portfolio in balance based on predictions ▪ To reach for a balanced portfolio every hour of the day, diverse flexibility needs are deployed, via contracts or own flexibility means	▪ Adjustment of the portfolio based on the new prognoses: ✓via Intra Day Market (until 1 to 2 hours before Real Time) ✓with own flexibility means	▪ Incentivation via Elia's balancing tariff to keep the portfolio balanced ▪ Additional deviations (outages, wind …) can still be settled bilateral between market parties or by proper means	▪ Elia regulates the residual global imbalance of the system: ✓with reserves (FCR, aFRR & mFRR) & with "free bids" • Elia's regalulatin actions determines the Imbalance Tariff that shall incentivice BRPs to stay in balance

Market Parties/ Balancing Responsible Party ← **Elia**

Imbalance Tariff

Balance Management: R&R TSO vs market parties (BRPs)

Solidarity mechanism between TSOs to keep freq = 50Hz

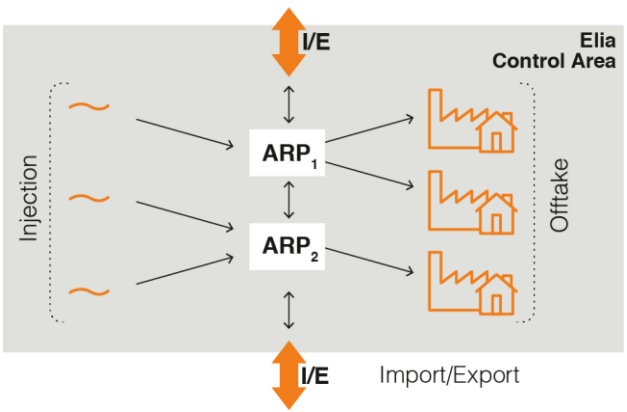


How?
Automatic activation of **FCR** in synchronous area upon frequency deviations

Each TSO is responsible to keep its control area balanced

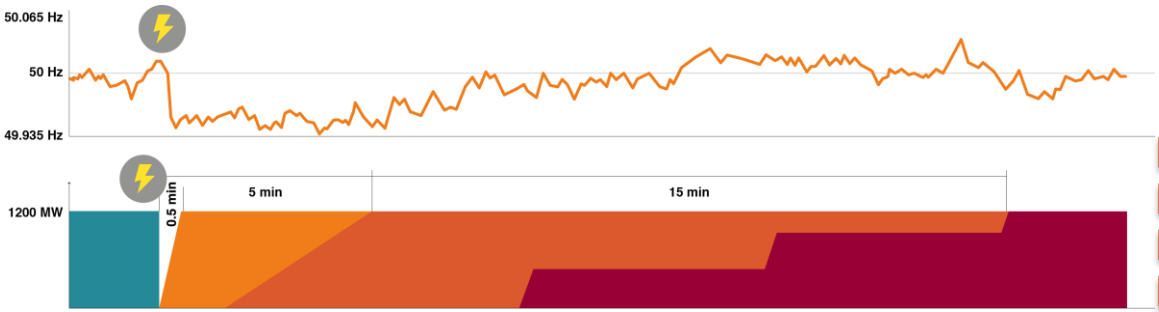
How?
Activation of **automatic FRR** (for small imbalances) and **manual FRR** (for bigger imbalances). To this market is referred to as the **"Balancing Market"**

Each Balancing Responsible Party (BRP) is responsible to keep its portfolio balanced in a 15 min basis



How?
Through adequate planning/forecasting and real time adjustments. BRPs use for this own flexibility as well as DA/ID trading opportunities

Balance Management: BE balancing products



mFRR

Manual Frequency Restoration reserve (mFRR)
Manual activated reserve in addition to aFRR (in the event of large imbalances) to restore the balance of the control block. (response time <15min).

aFRR

Automatic Frequency Restoration Reserve (aFRR)
Restores the balance of the control block (and hence restores frequency to 50Hz) within 15' (automatic activation; response time <7,5min).

FCR

Frequency Containment Reserve (FCR)
Stabilizes frequency of the synchronous area.
(automatic activation ; response time < 30')

BE Pre-contracted volumes (2018):

830 MW mFRR
+ free bids avail.
Demand-side mgmt

139 MW aFRR
no free bids avail.
Loading..

81 MW FCR
no free bids avail.
Demand-side mgmt

An ambitious roadmap

FCR Roadmap

1

Beginning 2016

FCR product type	Technology (except limited energy content)		
	TSO GEN>25MW	TSO Non-conventional	DSO connected
Asym down	✓	✗	✗
Asym up	✓	✓	✗
Sym 100 / 200 Mhz	✓	✗	✗

2

08/2016: International integration

3

Since Oct 2016

FCR product type	Technology (except limited energy content)		
	TSO GEN>25MW	TSO Non-conventional	DSO connected
Asym down	✓	✓	✓
Asym up	✓	✓	✓
Sym 100 / 200 Mhz	✓	✓	✓

4

05/2017: R1 open for technologies with limited energy content (e.g. batteries)

R3 : “Reserve products”

Opening our products

	≥ 25MW	<25MW
Standard product	R3 Standard	**R3 Standard**
Specific product (limited energy)	**R3 Flex**	R3 Flex

2017: product opening

TSO GEN>25MW	TSO Non-conventional	DSO connected
✓	✓	✓
✓	✓	✓
✓	✓	✓

R3 Std

- **Unlimited # activations but max 8 hrs / day**

R3 Flex

- **Max 8 activations of 2 hrs / month**

Non-reserved tertiary control power
BidLadder Pilot Project

NEW
Non-reserved tertiary control power

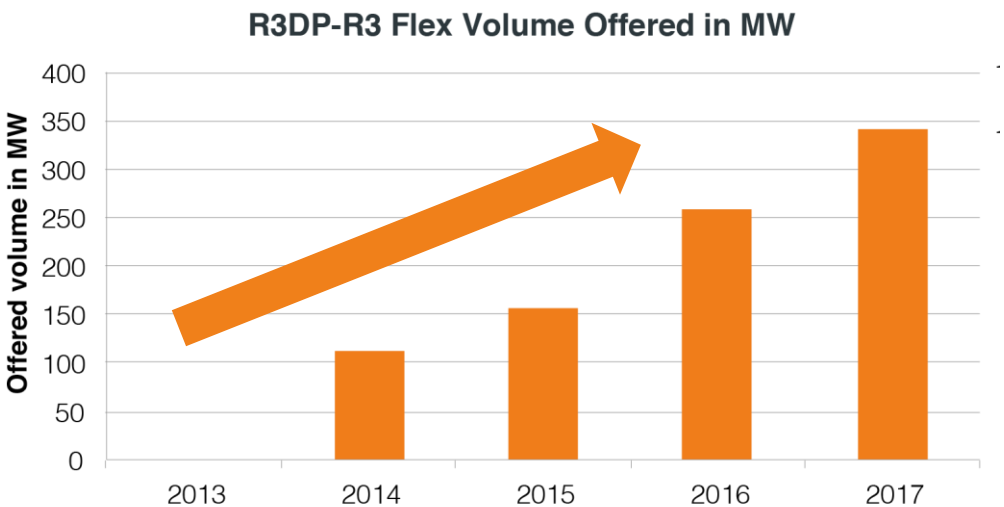
The BidLadder Pilot creates a platform to allow free bids for energy balancing from TSO-connected generation (<25MW) and load offered to Elia by a Balancing Service Provider, i.e. independent aggregators, grid users or BRPs.

The bigger "balancing" picture:

Today: Free Bids only by BRPs via GEN > 25MW
BidLadder project: BSP offering smaller generation and load

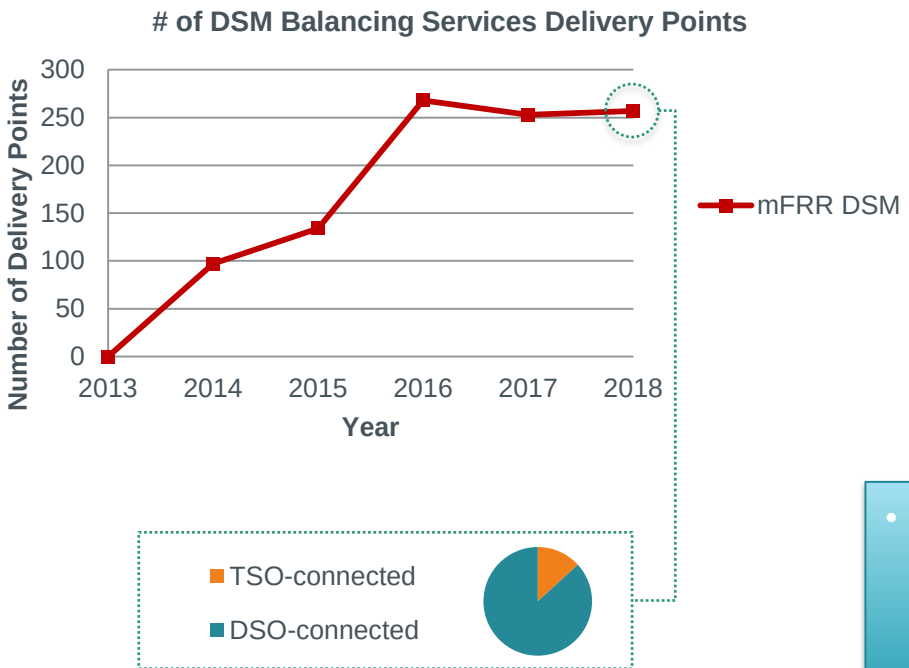
T/DSO cooperation in extracting flexibility

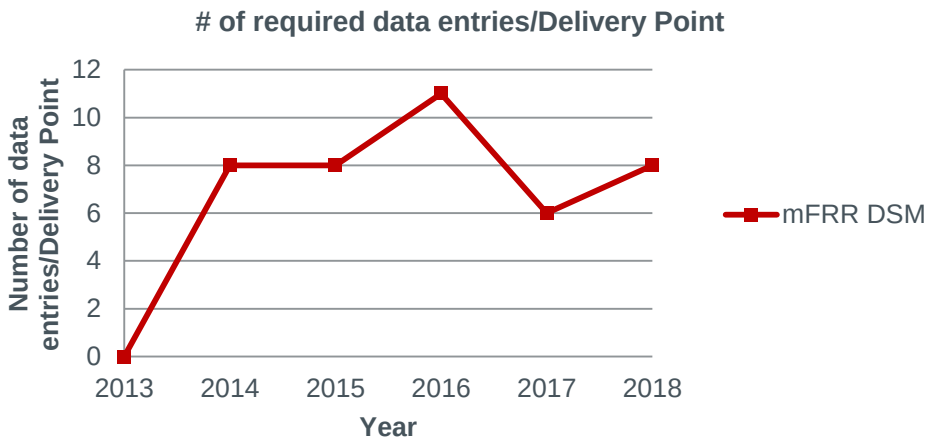
Increase of offered volumes



Offered volume of mFRR from Non Conventional Units (including demand response) has been growing over the years, in line with product opening/redesign

Evolution of information exchange for DSM products





- **Clear market interest**
  in DSO-connected Delivery Points for Balancing products
- **Increasing amount of data**
  exchanged between DSO & TSO for operation of flexibility products

DSM = Demand-Side Management

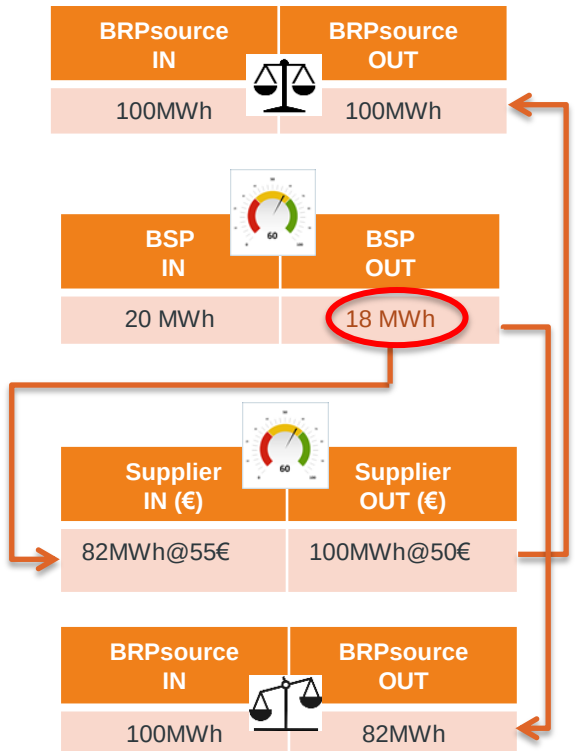
What happens when explicit Demand Response occurs in Balancing?

A supplier has sourced (via his Balancing Responsible Party) an amount of energy in the day ahead market that is equal to the forecast of its customers' demand. Hence, the BRP perimeter is balanced.

When a demand response dispatch occurs in real-time that is not initiated by the supplier (e.g. DR aggregator acting as a Balancing Service Provider), it changes the actual consumption of its customer base. This creates two distinct impacts:

1. The **BRP/Supplier cannot charge or receive payment for part of the electricity it sourced on the market** (this electricity is consumed by clients of other suppliers).

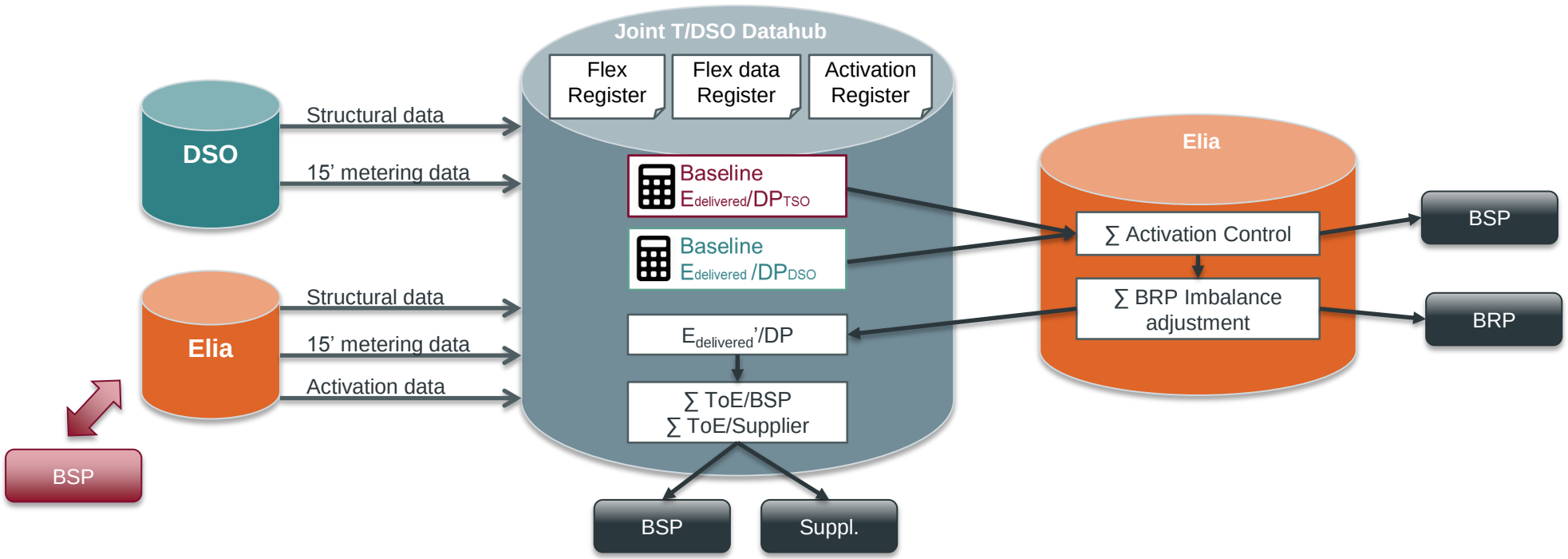
2. While the **BRP is required to balance its portfolio, it is put in imbalance due to the 3rd party aggregator action**.



→ Energy is "transferred" from BRPsource to BSP (who sells it to TSO)

Market Parties (MP) should have sufficient information to ensure proper settlement

System overview



M-1
Structural data exchanged

M
Flex activation by TSO

M+1
Calculations & control of delivvered volumes

M+1
Publication to Market Parties

Conclusions

- **Context is changing rapidly**: distributed flex, aggregators, digitalization, network codes,…
- **Increased need for flexibility** for TSOs and DSOs
- **Adapt balancing/congestion product portfolio** to new context
- **Evolution**….no revolution while keeping pivotal roles intact is primordial
- **Coordinated access** to distributed flexibility is needed to ensure proper active system management
- **Coordinated data exchange** has to support efficient market functioning

→ Adopt perspective of an integrated electricity system approach allowing customer participation to and maximization of flexibility value on all markets

Many thanks for your attention!

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