

actility

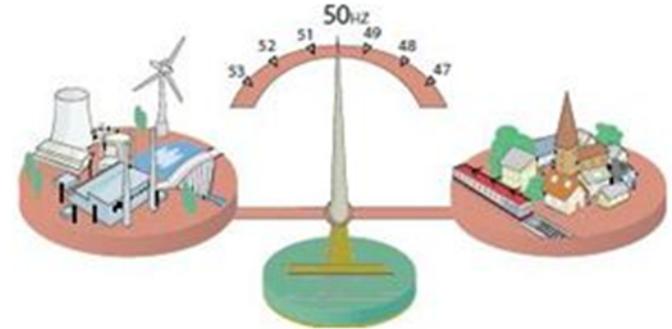


Making Things Smart

Providing Flexibility with Demand The Aggregator Perspective

Challenge

System balance



Long term:
Investment decisions

Short term:
Operational decisions



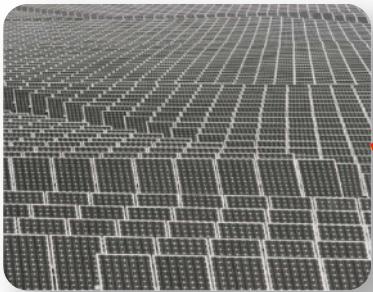
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Transition

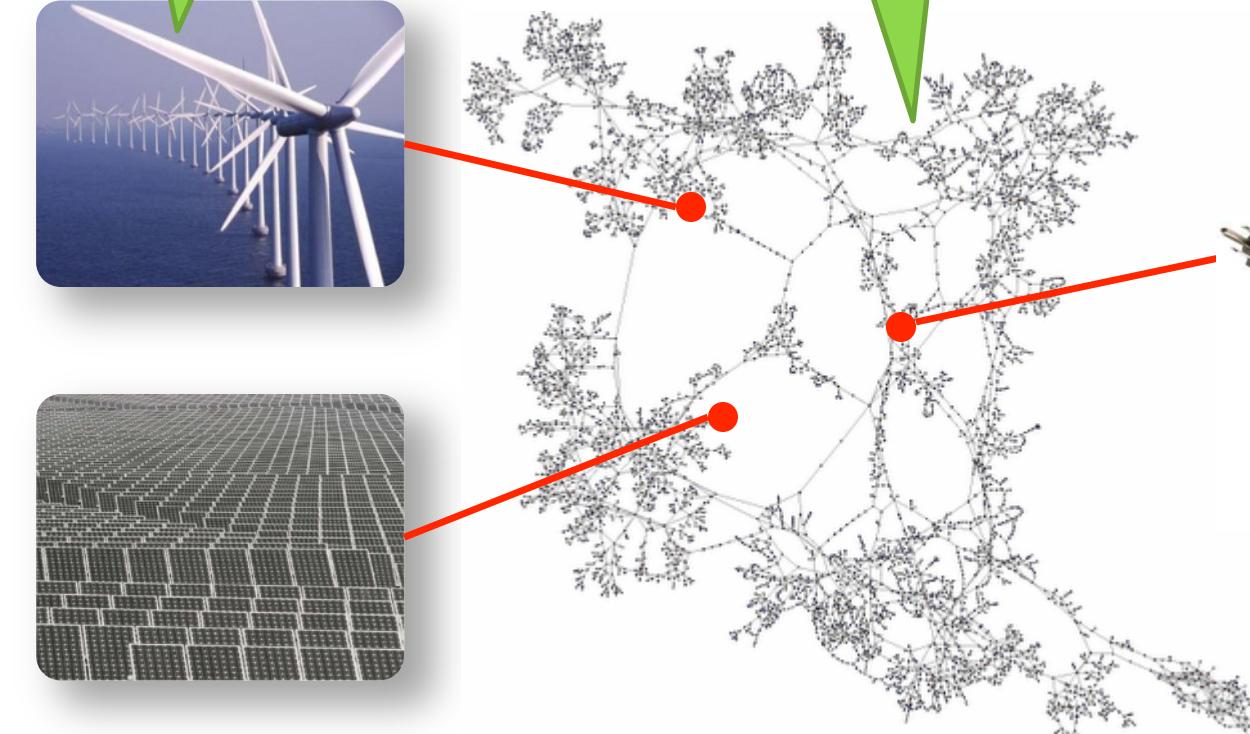
Random production from renewables



Distributed generation



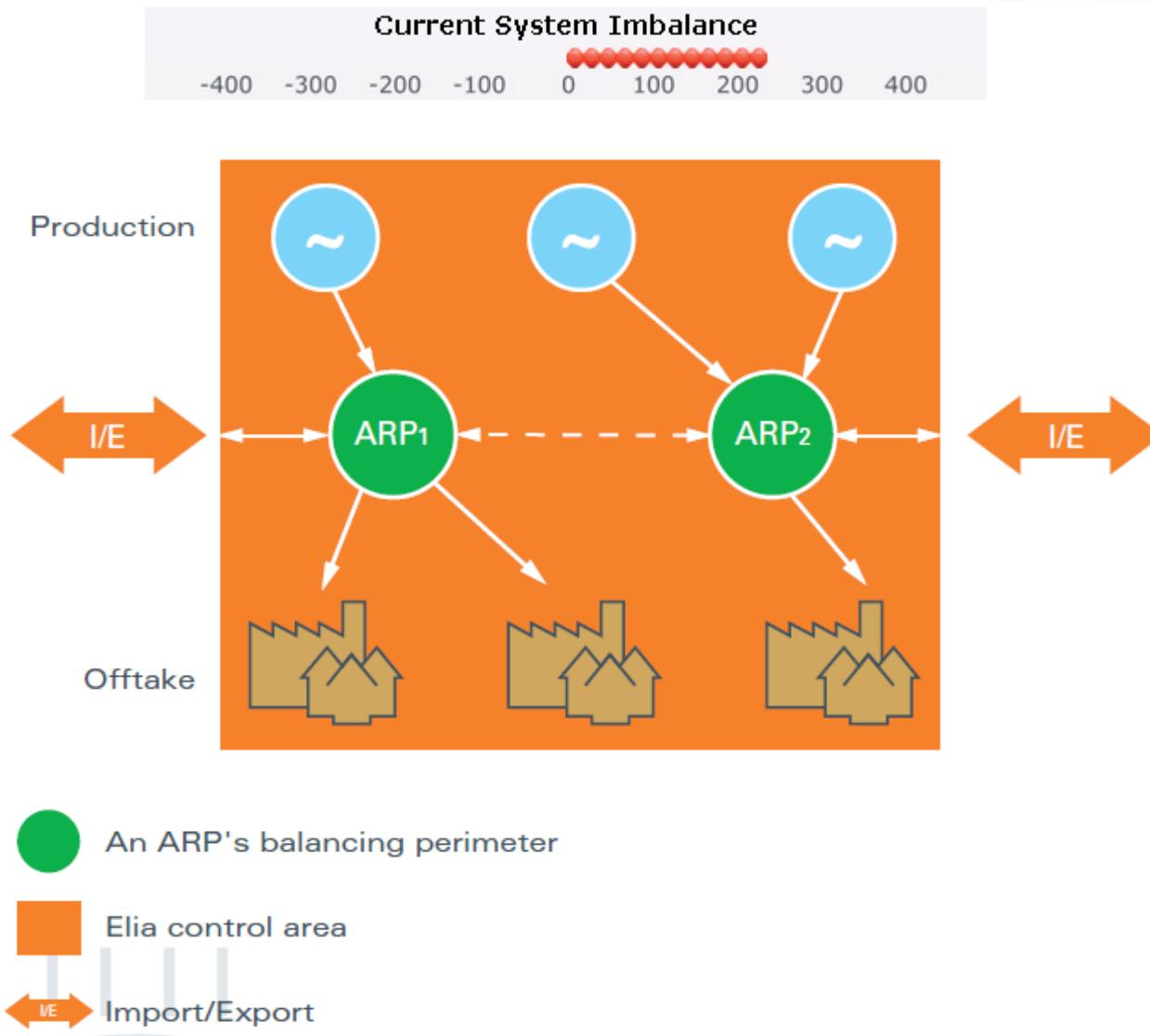
Intelligent consumption



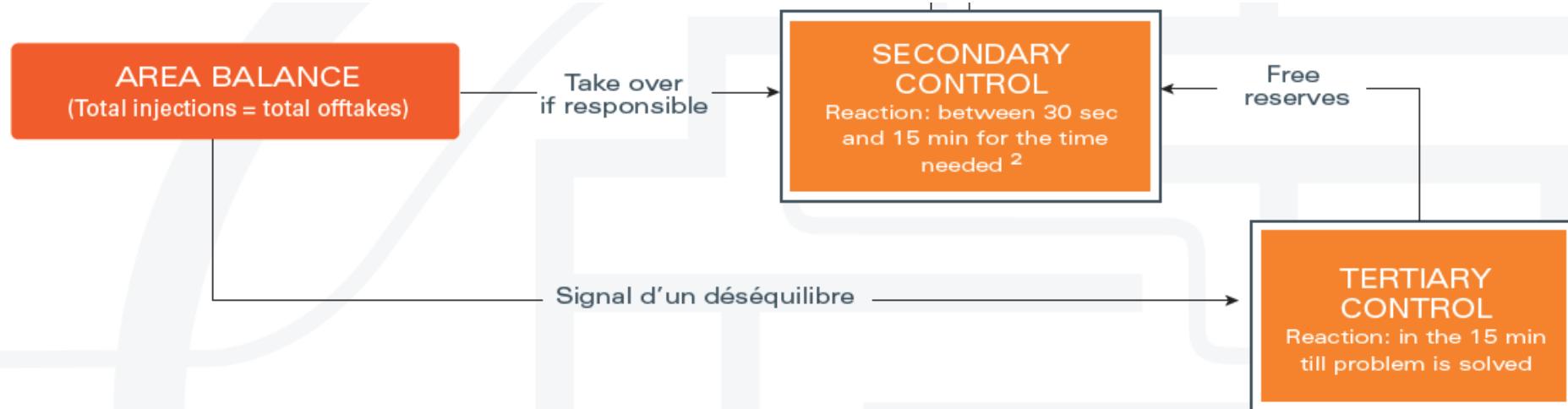
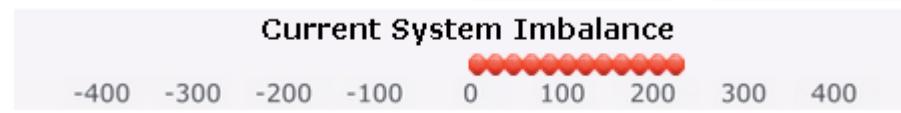
TESLA

Short term

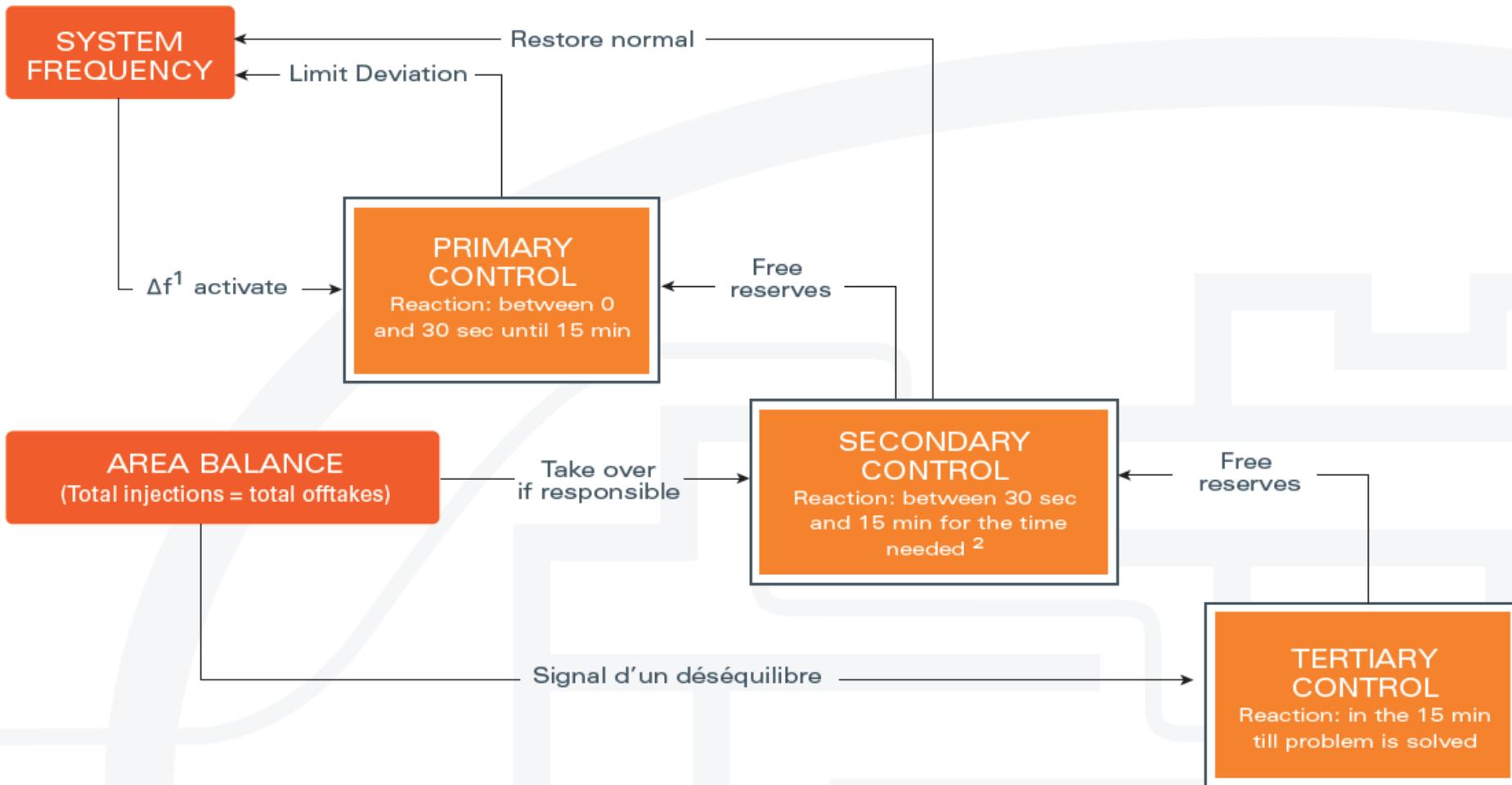
System balance



System balance

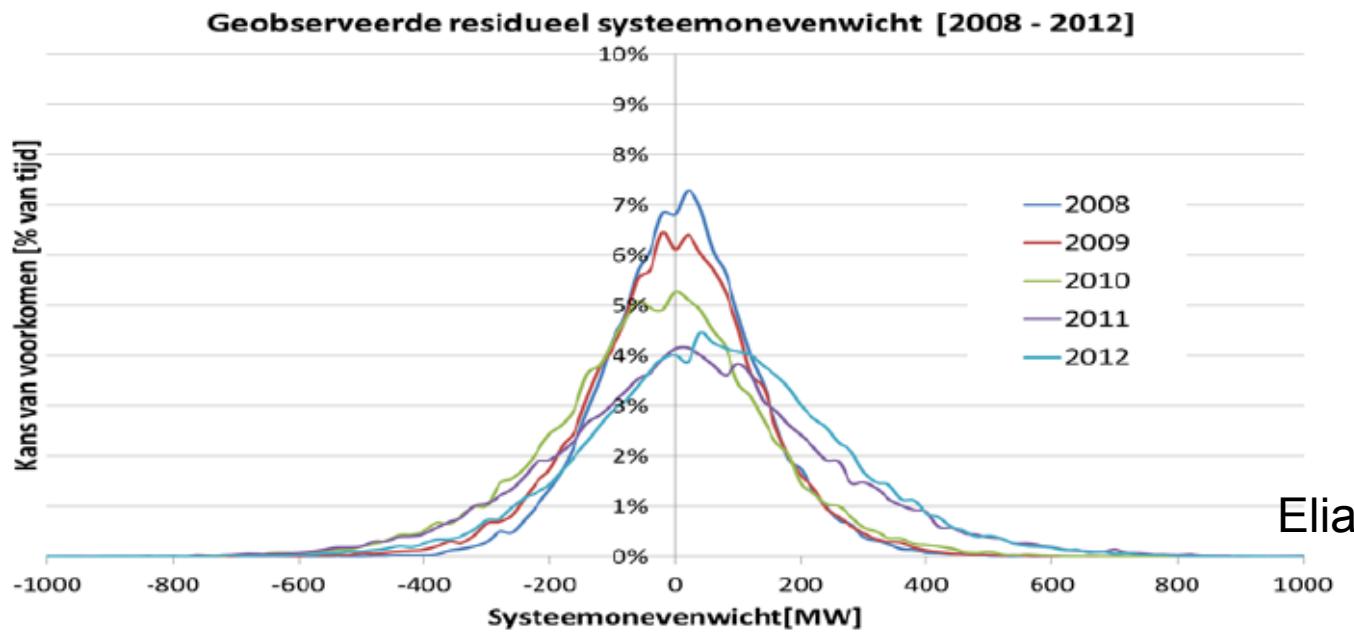


System balance



Challenge

- Aging production park – phase out
- Decrease of profitability for CCGT: Decrease of classic flexible means
- Need to balance renewable



3 different approaches

1) Exploit cross-border synergies

1) Exploit cross-border synergies

- Reduce the system imbalance: netting

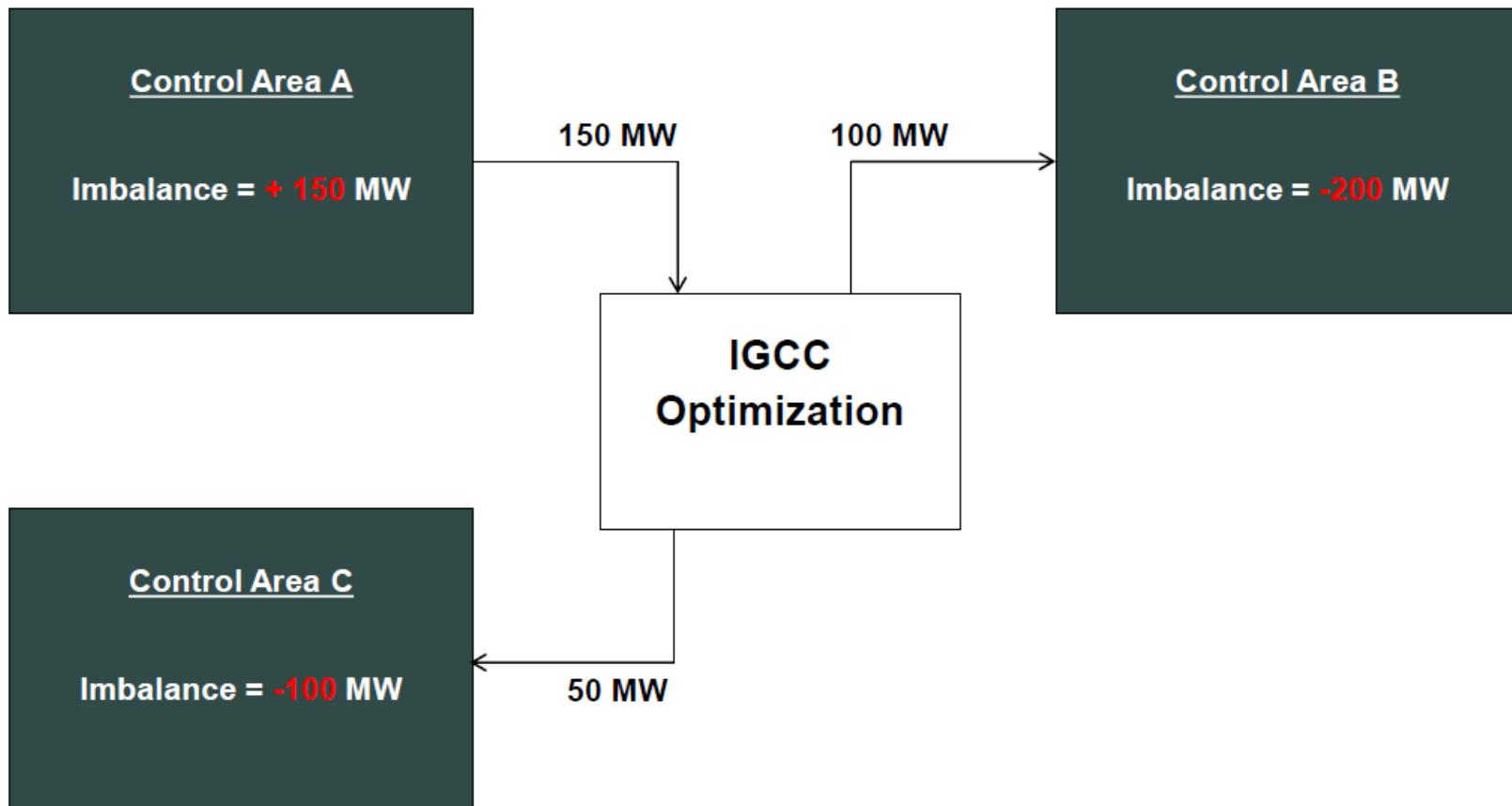
- International Grid Control Cooperation – initially:

- 4 German TSOs
 - Energinet.dk (Denmark)
 - CEPS (Czech Republic)
 - Swissgrid (Switzerland)
 - TenneT NL (Netherlands)

- IGCC aims to prevent counteracting deployment of secondary reserves in separate control blocks, by exchanging opposing imbalances between TSOs

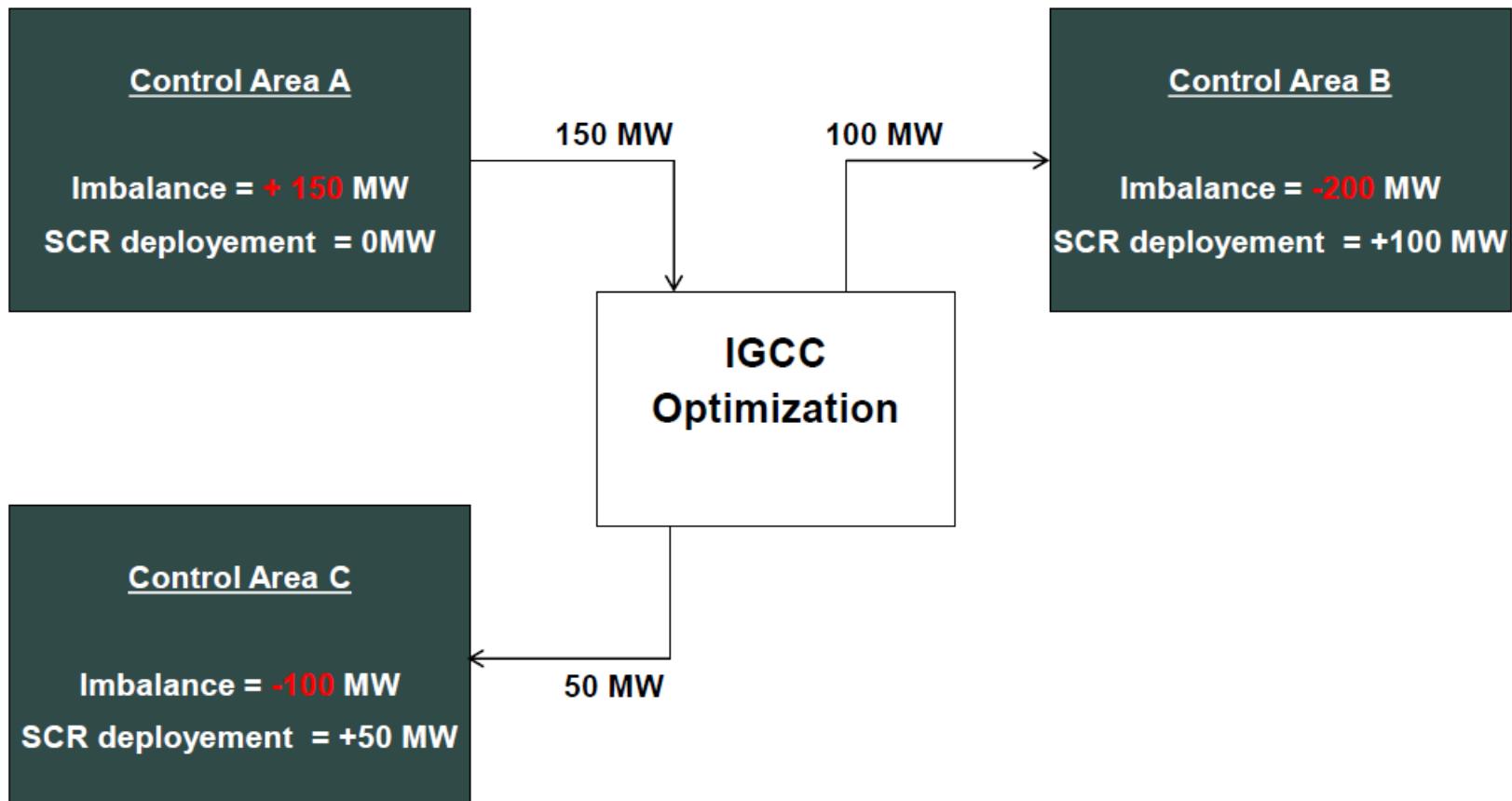
1) Exploit cross-border synergies

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- Reduce the system imbalance: netting



3 different approaches

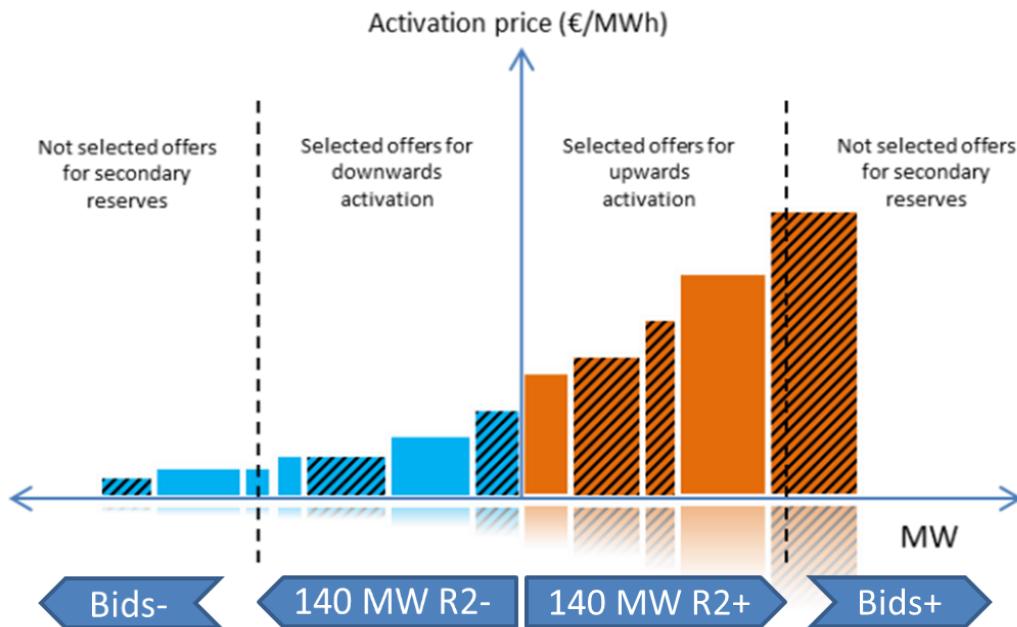
- 1) Exploit cross-border synergies**
- 2) Reactive balancing market**

2) Reactive balancing market

- It is an incentive for BRPs to prepare their balancing until real time and readjust their position on order to help the zone.
- TSO's balancing actions taken in function of actual residual imbalance (\neq forecast: proactive)

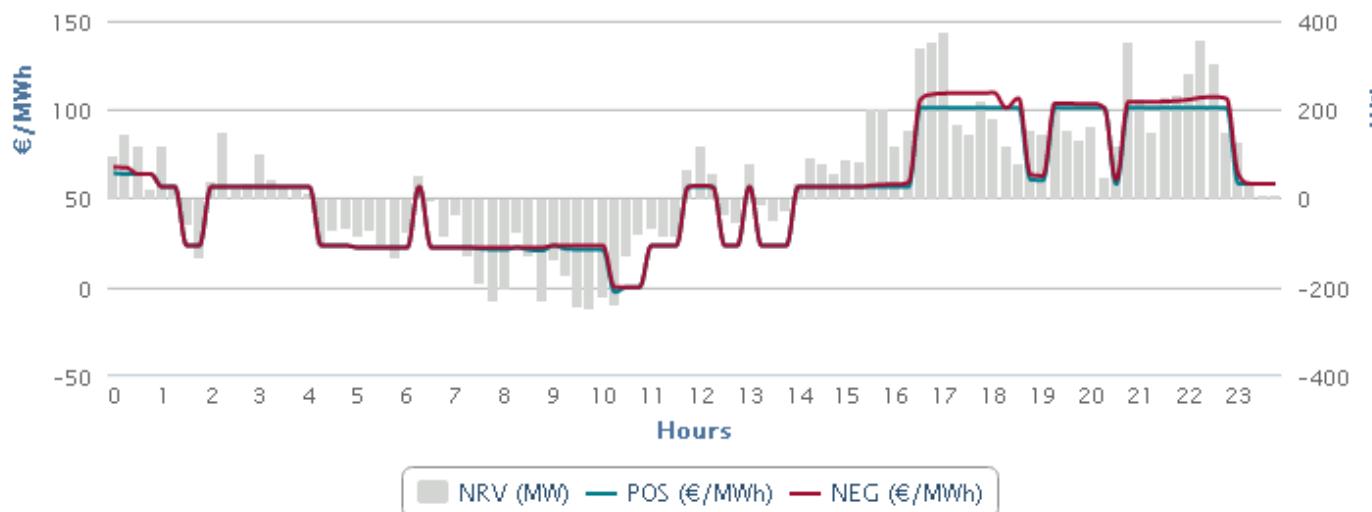
2) Reactive balancing market

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- Single marginal imbalance tariff :
 - Marginal : incentive for BRP's not to rely on TSO's actions



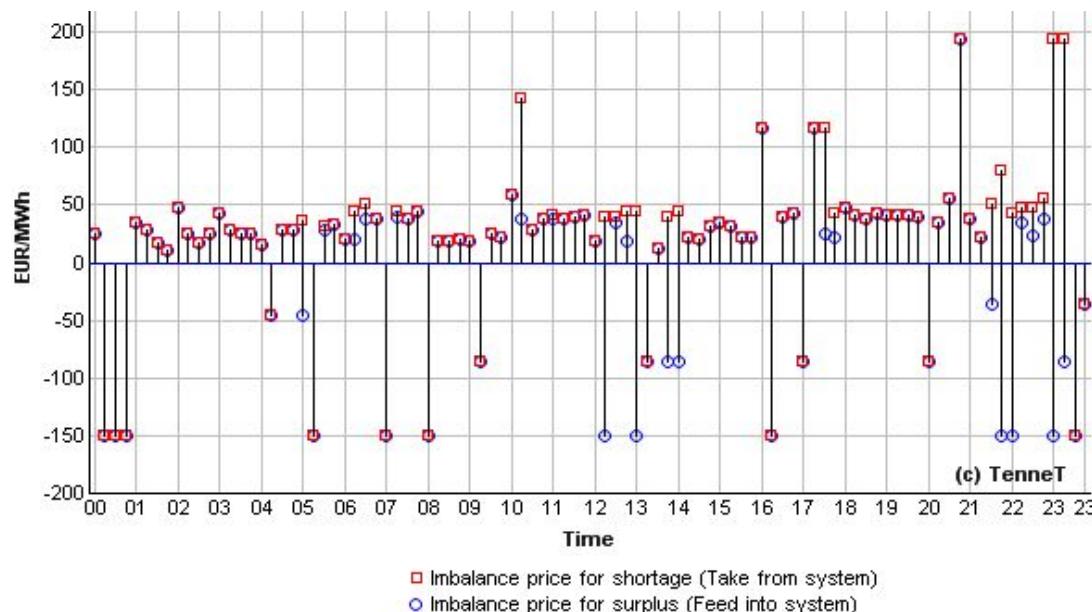
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2) Reactive balancing market

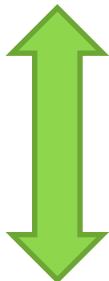
- It is an incentive for BRPs to prepare their balancing until real time and readjust their position on order to help the zone.
- BRP contract that authorizes Real Time imbalances in the “right” direction
- Transparency: Real Time publication of relevant parameters

3 different approaches

- 1) Exploit cross-border synergies**
- 2) Reactive balancing market**
- 3) Diversify resources providing balancing services**

3 different approaches

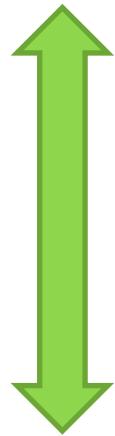
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- 2) Reactive balancing market
- 3) Diversify resources providing balancing services

3 different approaches

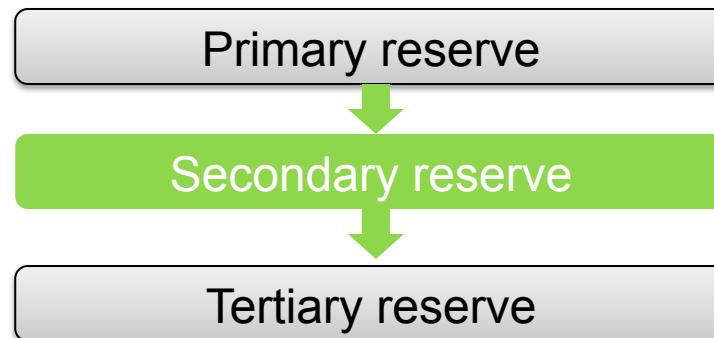
- 1) Exploit cross-border synergies
- 2) Reactive balancing market



- 3) Diversify resources providing balancing services

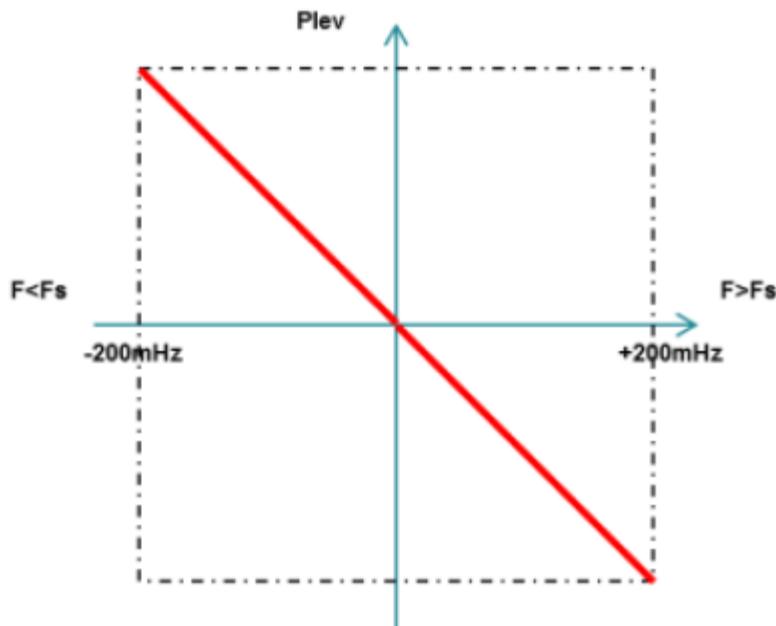
3) Diversify resources providing balancing services

Create the opportunity for market players to offer, on top of centralized production units, balancing flexibility on load and decentralized production units.



Primary reserves

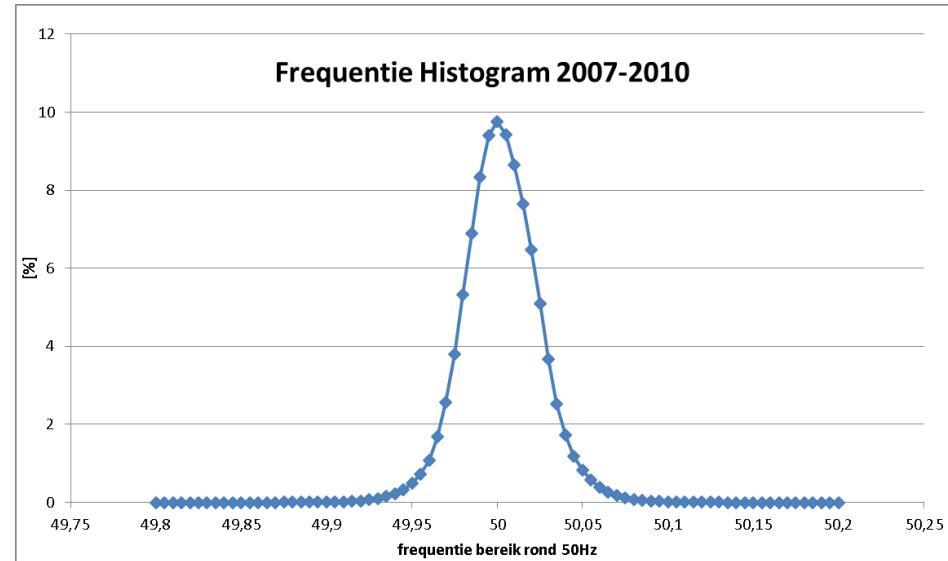
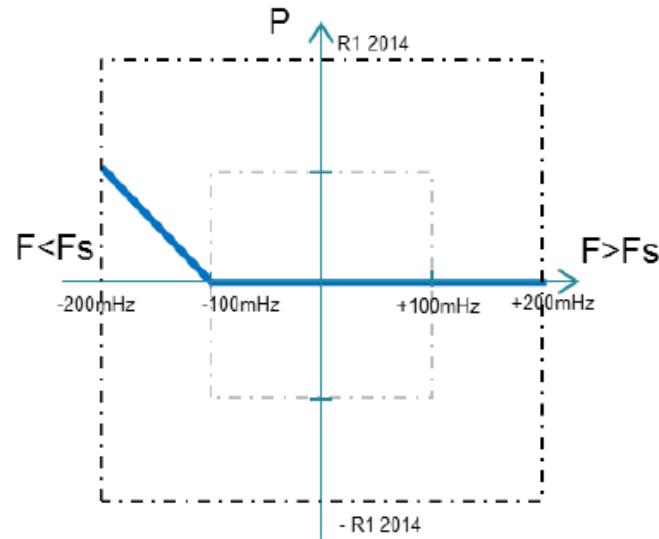
R1 = Linear and continuous modulation of the profile based on frequency deviations. Entire volume deployed within 30seconds.



Primary reserves

Elia developed a combination of asymmetric and symmetric R1 products in order to allow a demand side participation.

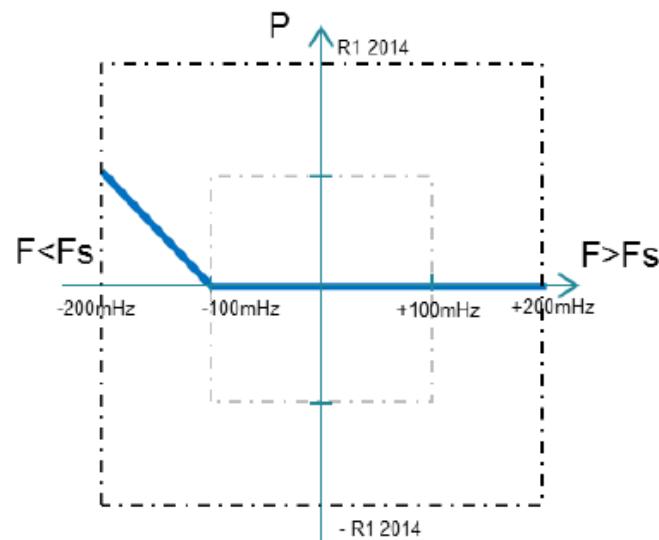
A limited number of activations per year and thus limited impact on the industrial processes.



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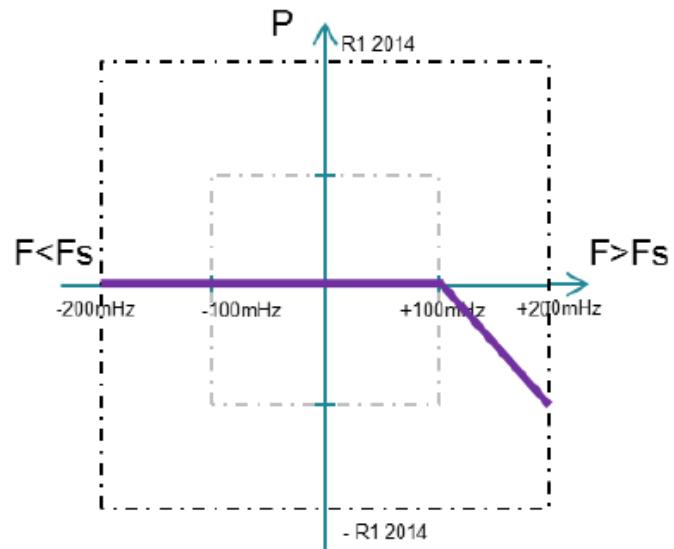
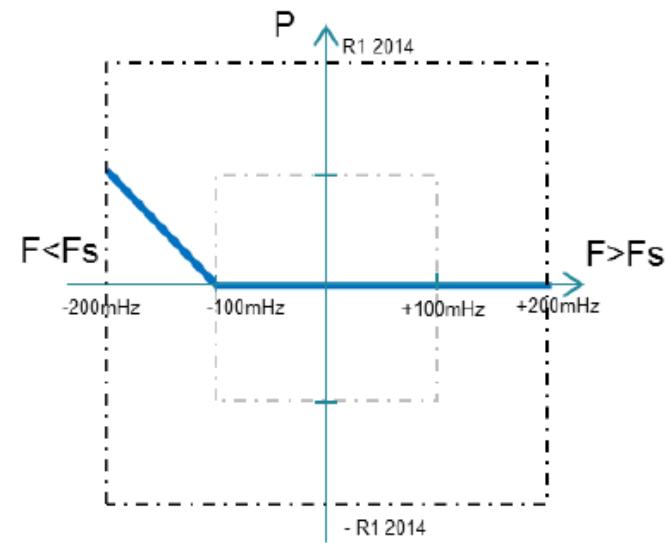
A limited number of activations per year and thus limited impact on the industrial processes.



Grid users or a pool of grid users (aggregator) connected to the ELIA grid can participate in the tendering.

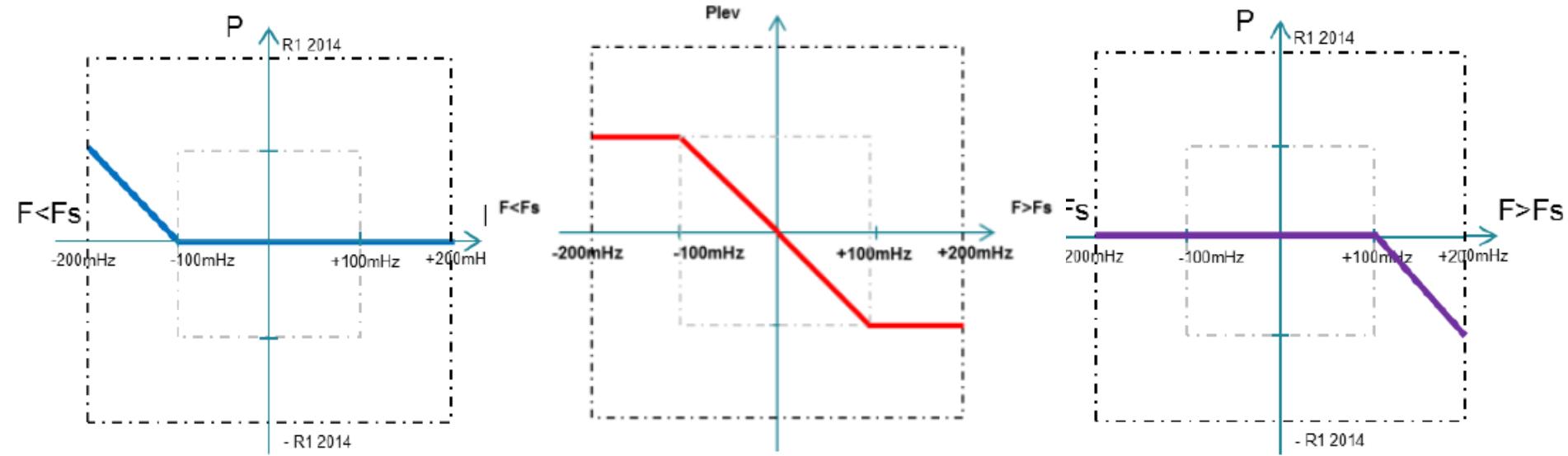
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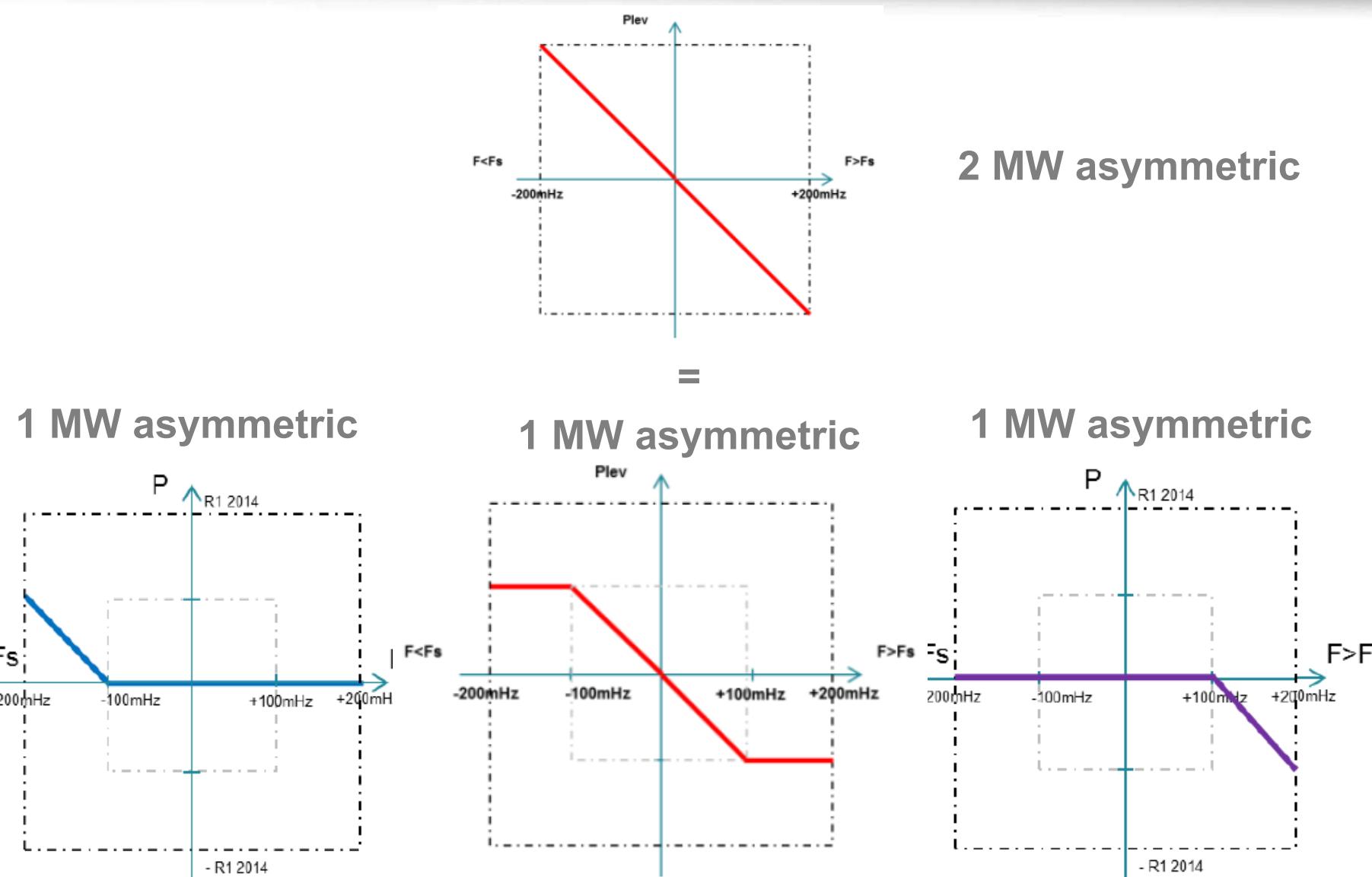


Primary reserves

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Primary reserves



Tertiary reserves: ICH Shedding limit principle

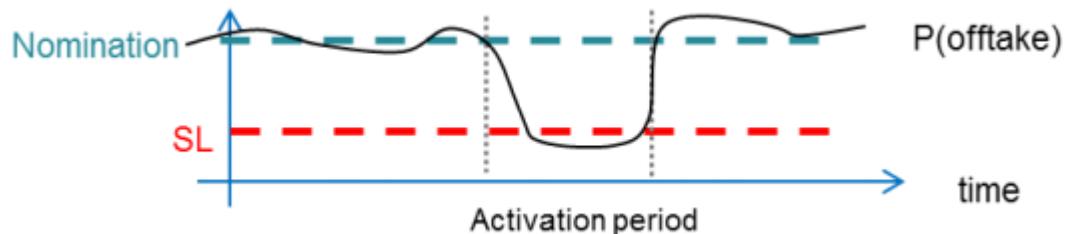
3 Formulas

A2 → 12 activations max for 2h (max 24h total)

A4 → 4 activations max for 4h (max 16h totaal)

A8 → 4 activations max for 8h (max 24h totaal)

3 min response time



Tertiary reserves: ICH

Shedding limit principle

- ICH is the oldest Demand AS and covers an important part of the tertiary reserve
- Since 2013, aggregation allowed grid users who did not fulfill the requirements alone to participate.

Tertiary reserves: R3 Dynamic Profile

Drop Power

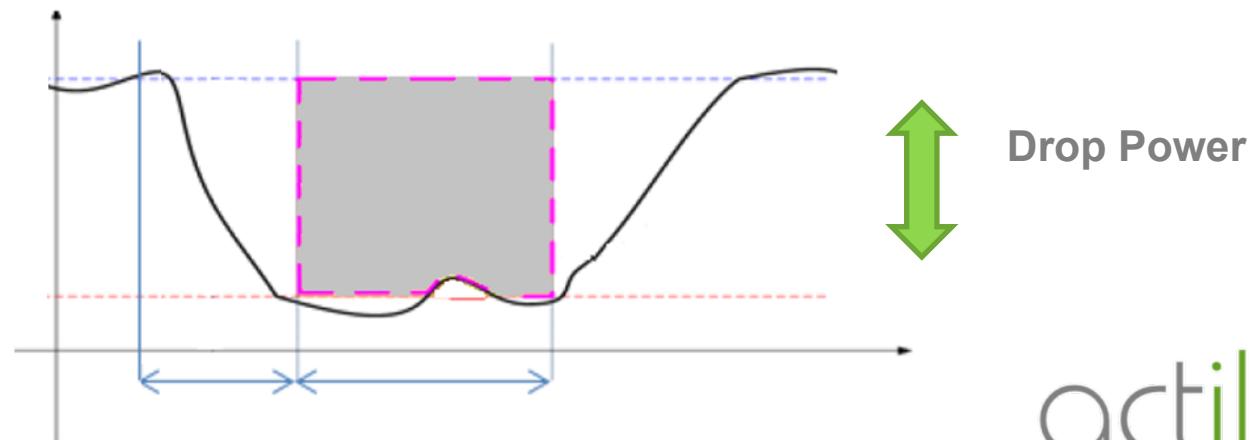
1 formula

40 activations maximum per year

2h maximum per activation

12h minimum between two activations

15 min response time



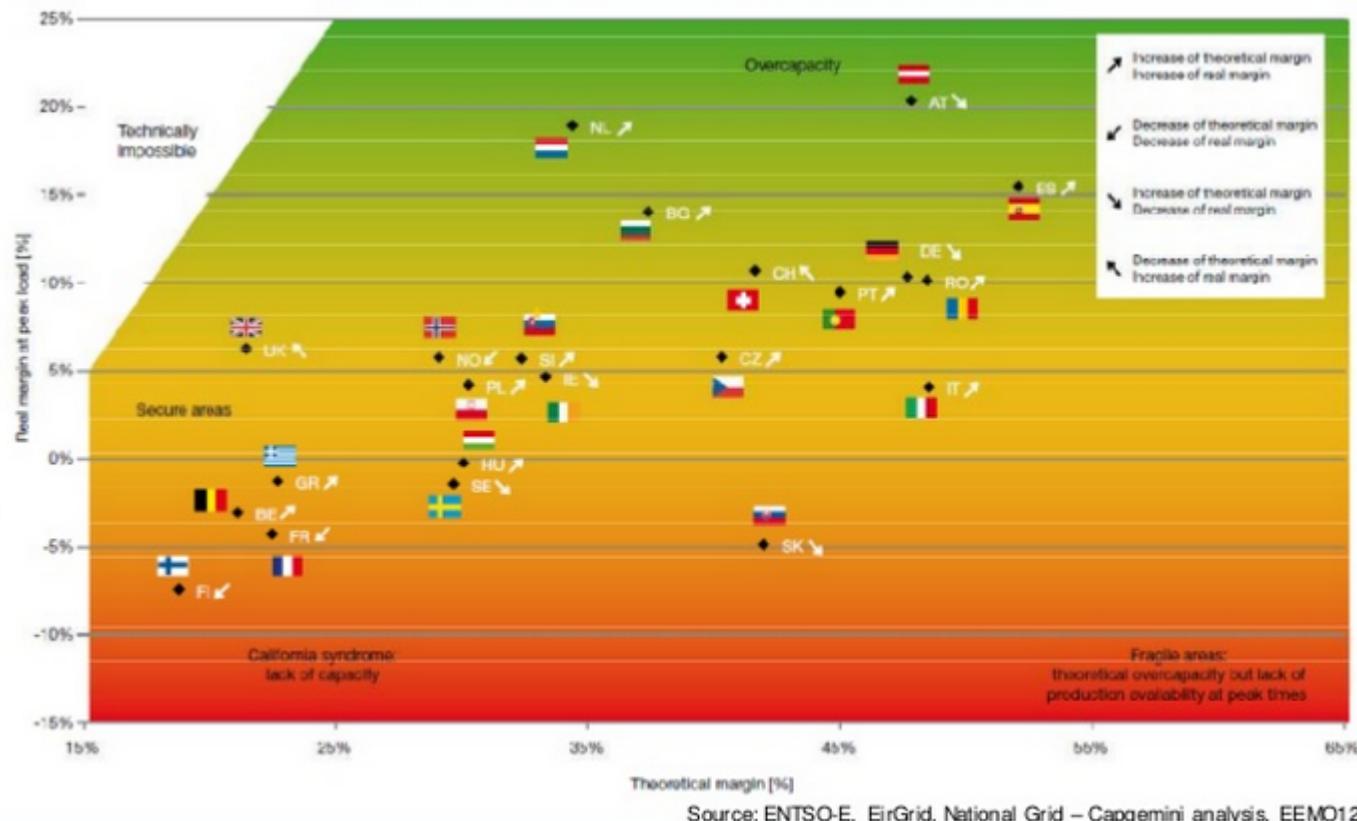
Tertiary reserves: R3 Dynamic Profile

Drop Power

- Aggregation allows high performances for a demand product
- Additional complexity in comparison with TSO products
- Developed in collaboration with stakeholders
 - DSO, Aggregators, large distribution grid users, BRPs, regulators

Long term

Challenge



Need for peak capacity: strategic reserves

Context: Plan Wathélet

- The “Plan Wathélet” is a broad plan initiated by Secretary of State for Energy Wathélet with the aim of guaranteeing Belgian electricity security of supply in the (near) future.
- As such, the “Plan Wathélet” consists of several elements: (based on the government decision of 5 July 2013)
 - Reinforcement of the profitability of existing power plants and thereby avoiding their decommissioning
 - A public tender aiming for 800 MW of new gas-fired units
 - 10 year lifetime extension of the nuclear plant Tihange 1
 - **Creation of strategic reserves**
 - Increasing interconnection capacity
 - Improving demand side participation

Need for peak capacity: strategic reserves

- First, the **legal framework** should be created: The government has initiated the necessary steps to amend the Electricity Law
 - Security of supply is responsibility of secretary of state
 - Secure operation in short term is responsibility of Elia
- Second, the **volume should be set**: the Minister for Energy has to take a decision on the required volume for strategic reserves.
- The first winter with strategic reserves in place: **winter 2014/2015**

Strategic demand reserve

5 hours preparation time + 1,5 ramp time = 6,5 hours

Max 130 hours of activation per winter

4-hour product

12-hour product

Max 40 activaties per winter

Max 20 activaties per winter

- Alternative to Strategic Generation Reserves

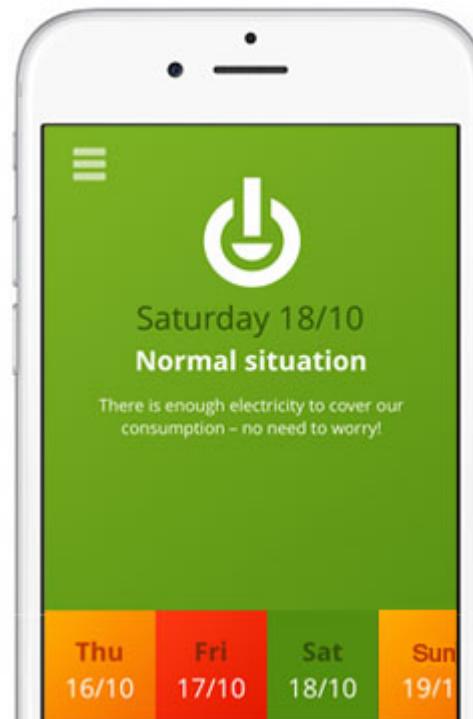
What is next?

Incompressibility

readyforwinter.be

- Normal situation
- Risk of shortage
- Risk of outage
- Outage planned

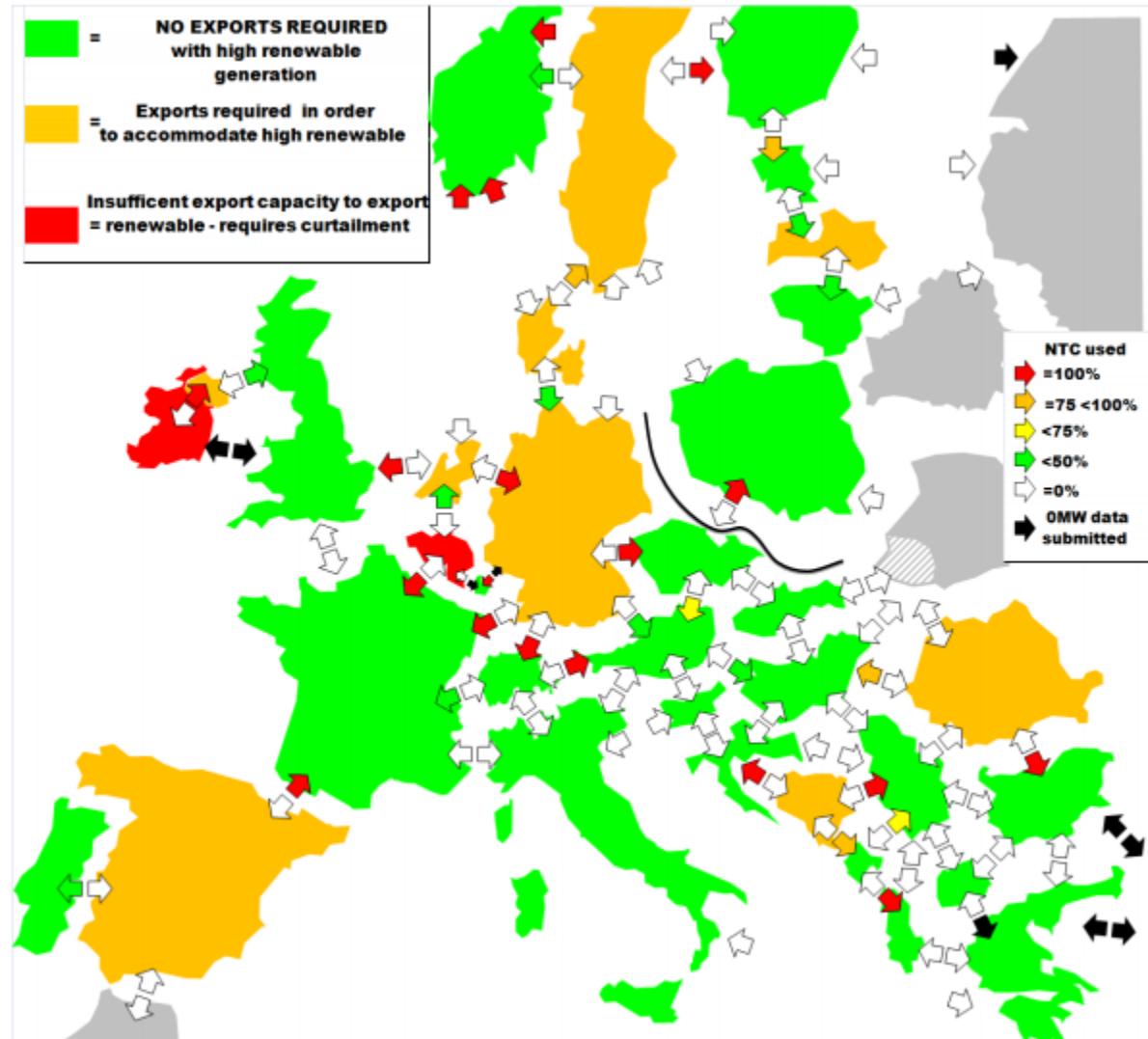
 powerinbalance.be



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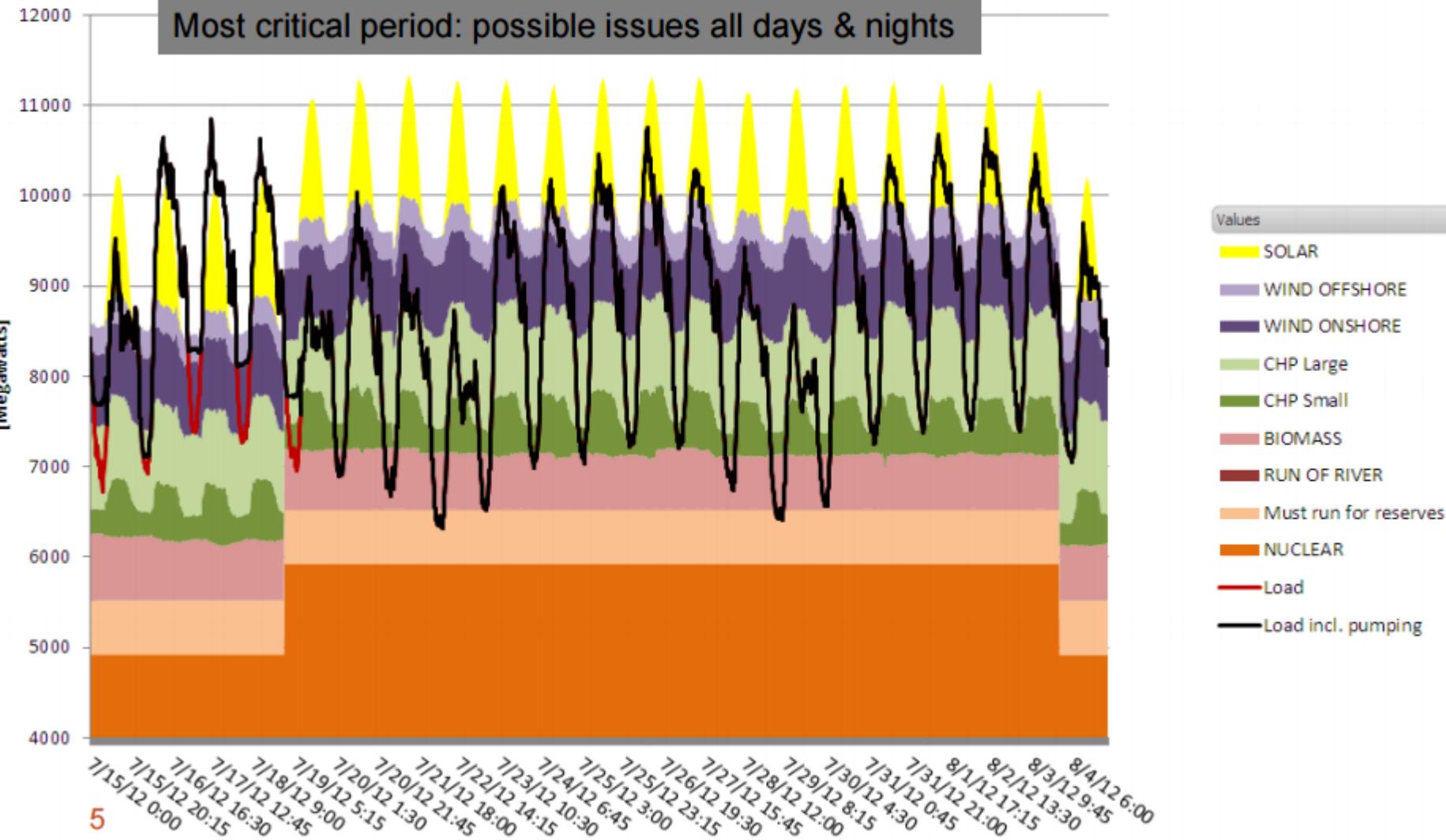
Incompressibility

Downward adequacy analysed for first time

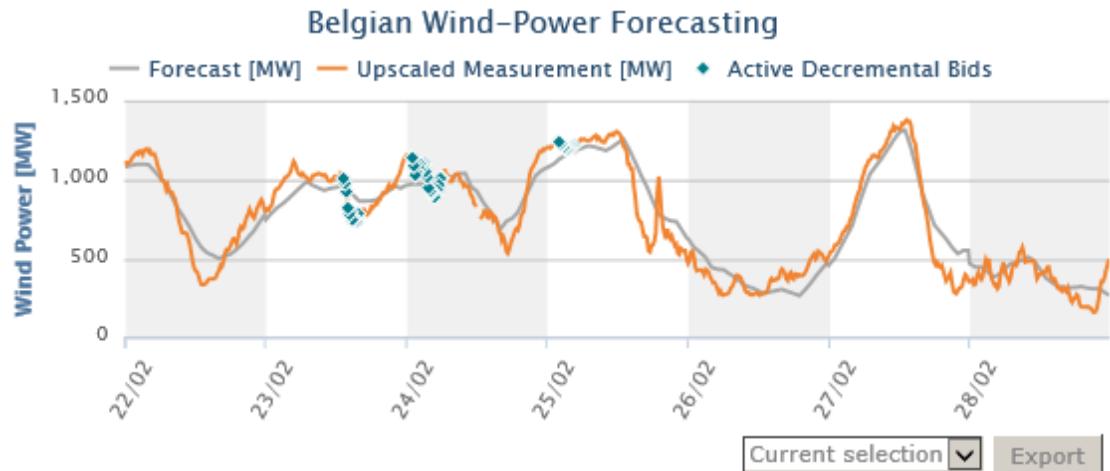


- Combination of high renewables in feed and inflexible generation leads to high exports to Surroundings countries.
- Not all excess energy can be evacuated out of these countries because of limited XB transfer capacities.
- Measures could be required to limit generation surplus.

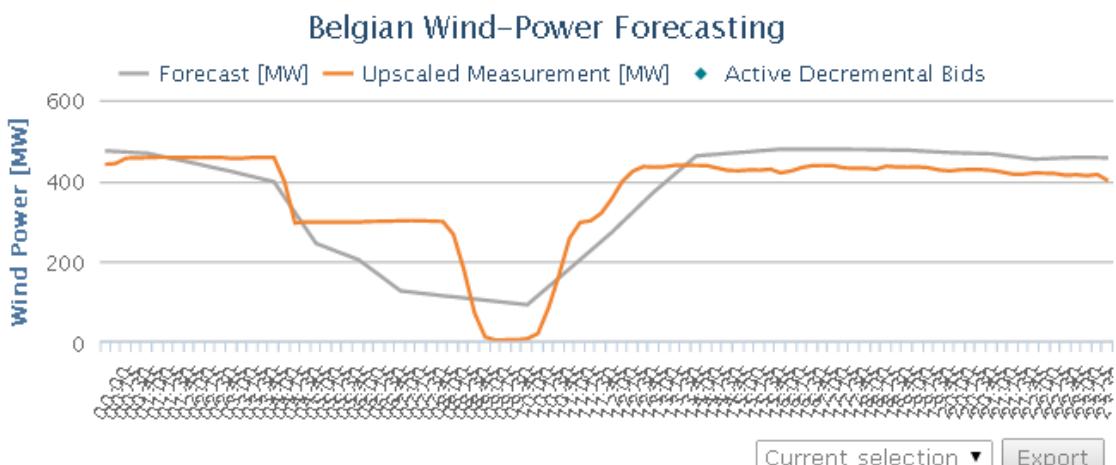
Incompressibility



Incompressibility



○ Curtailment as system reserve



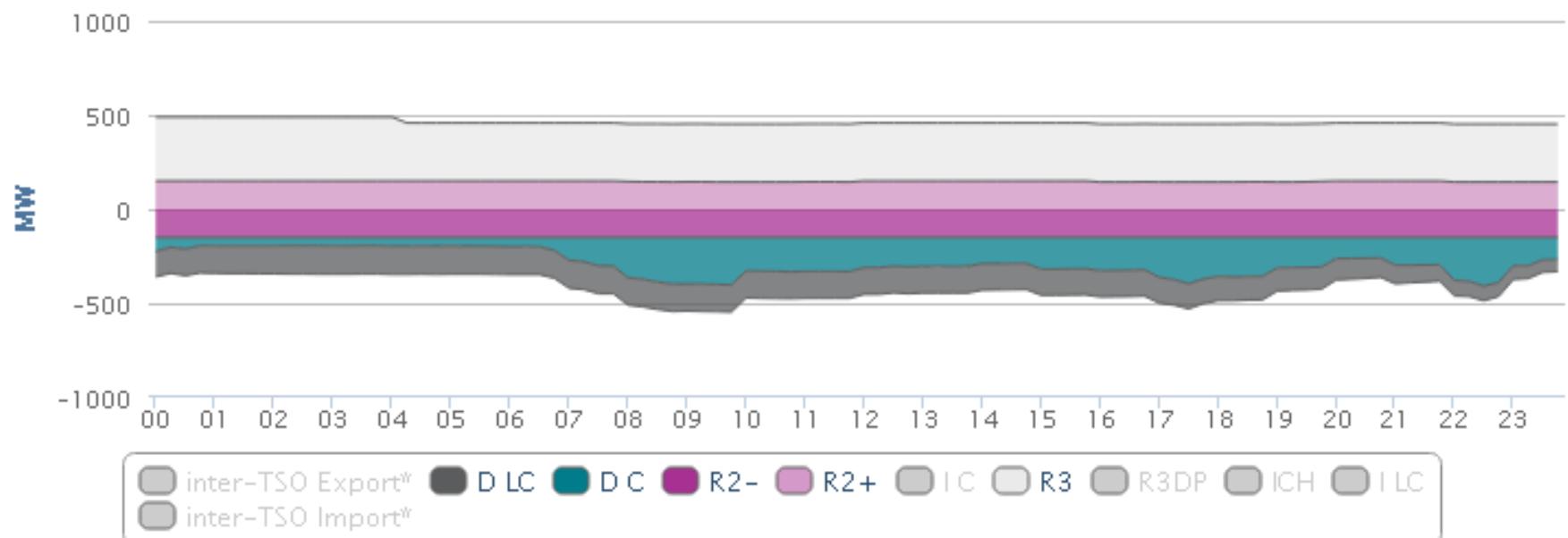
○ Curtailment as protective measure

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Incompressibility

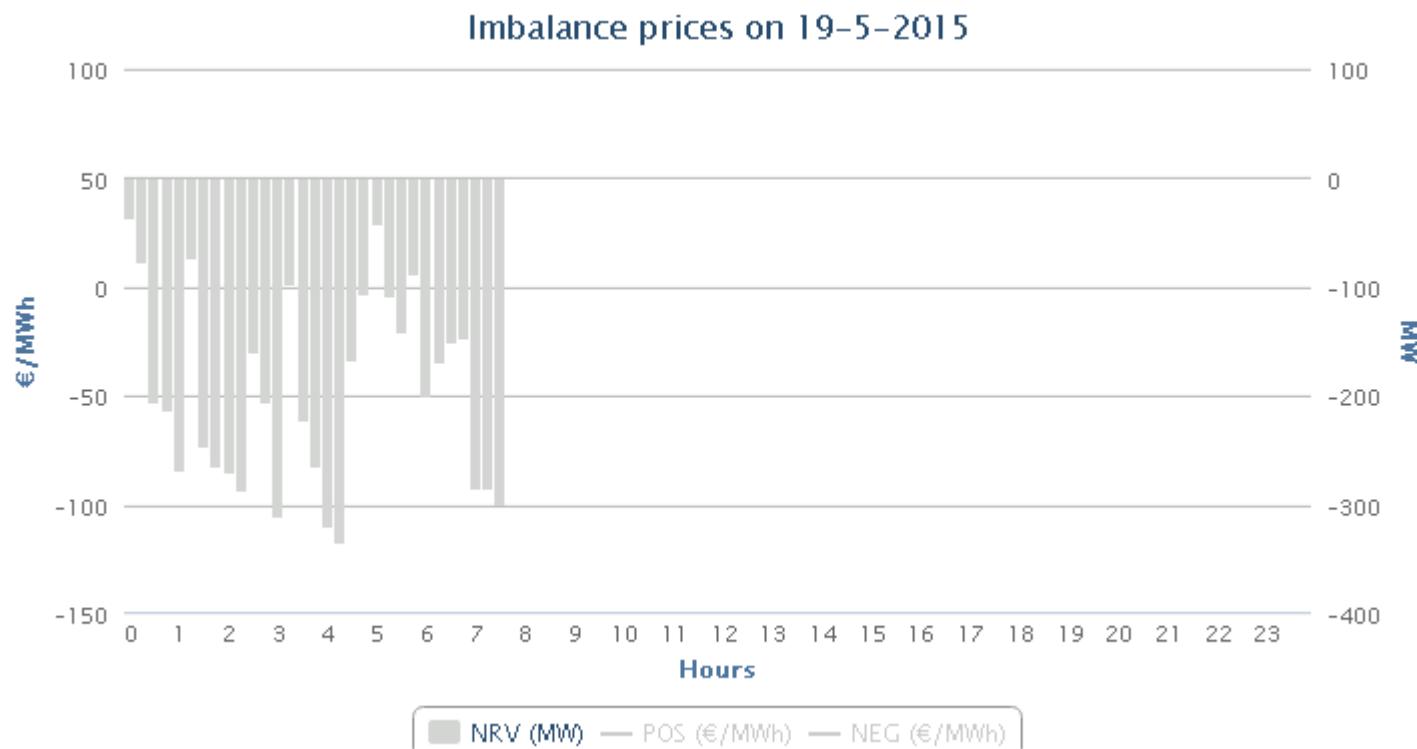
19/05/2015 

Available volume per product
Available balancing energy volumes

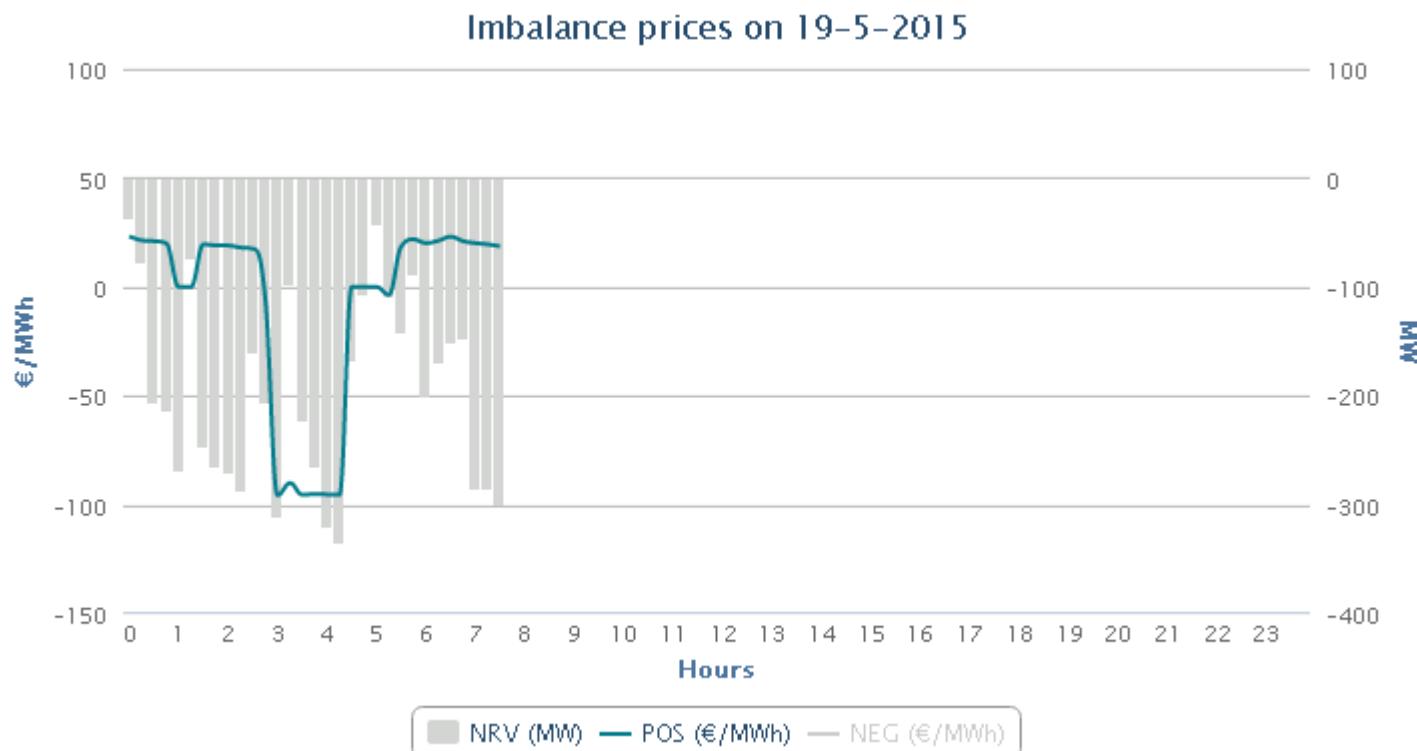


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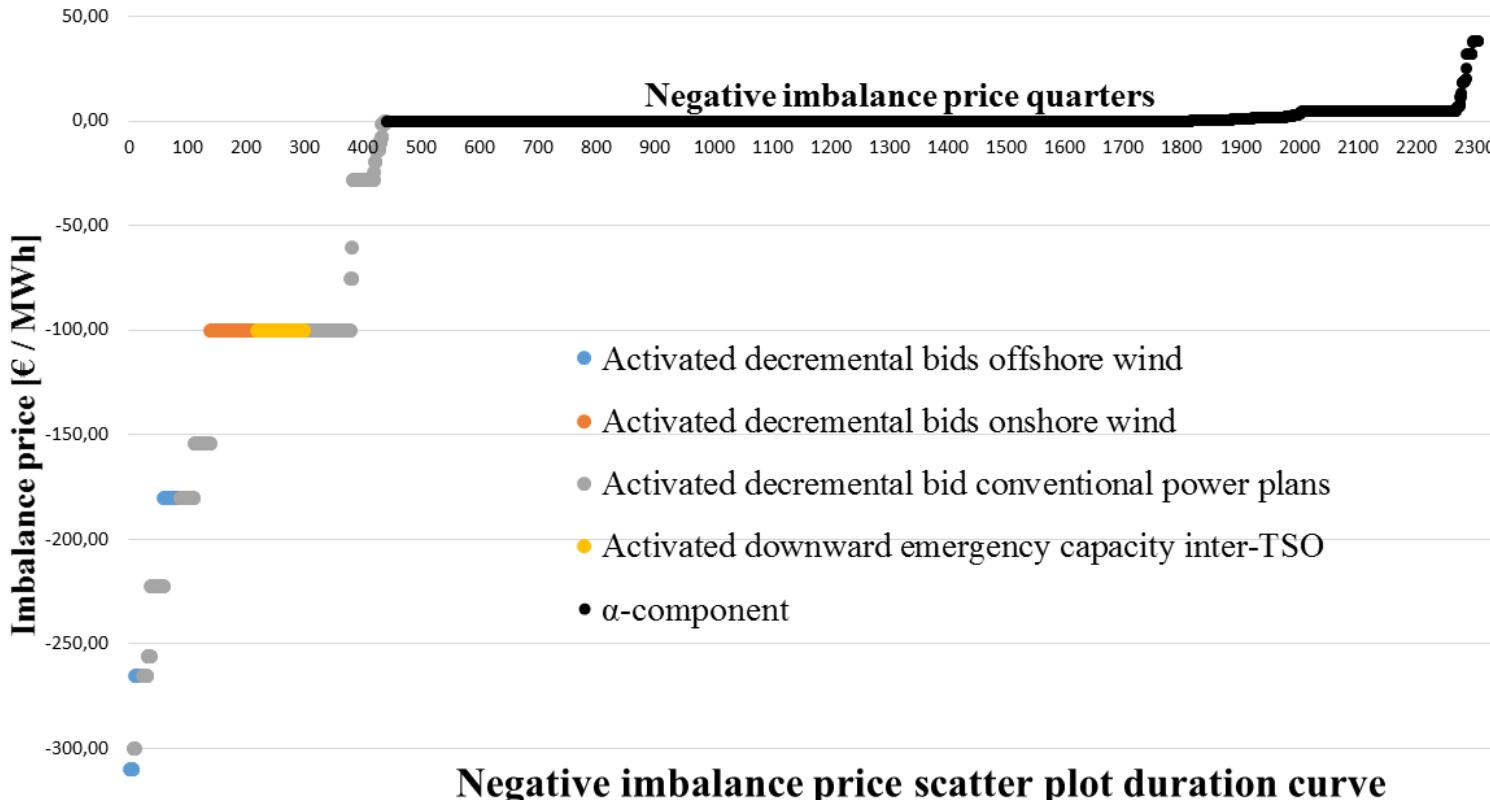
Incompressibility



Incompressibility



Incompressibility



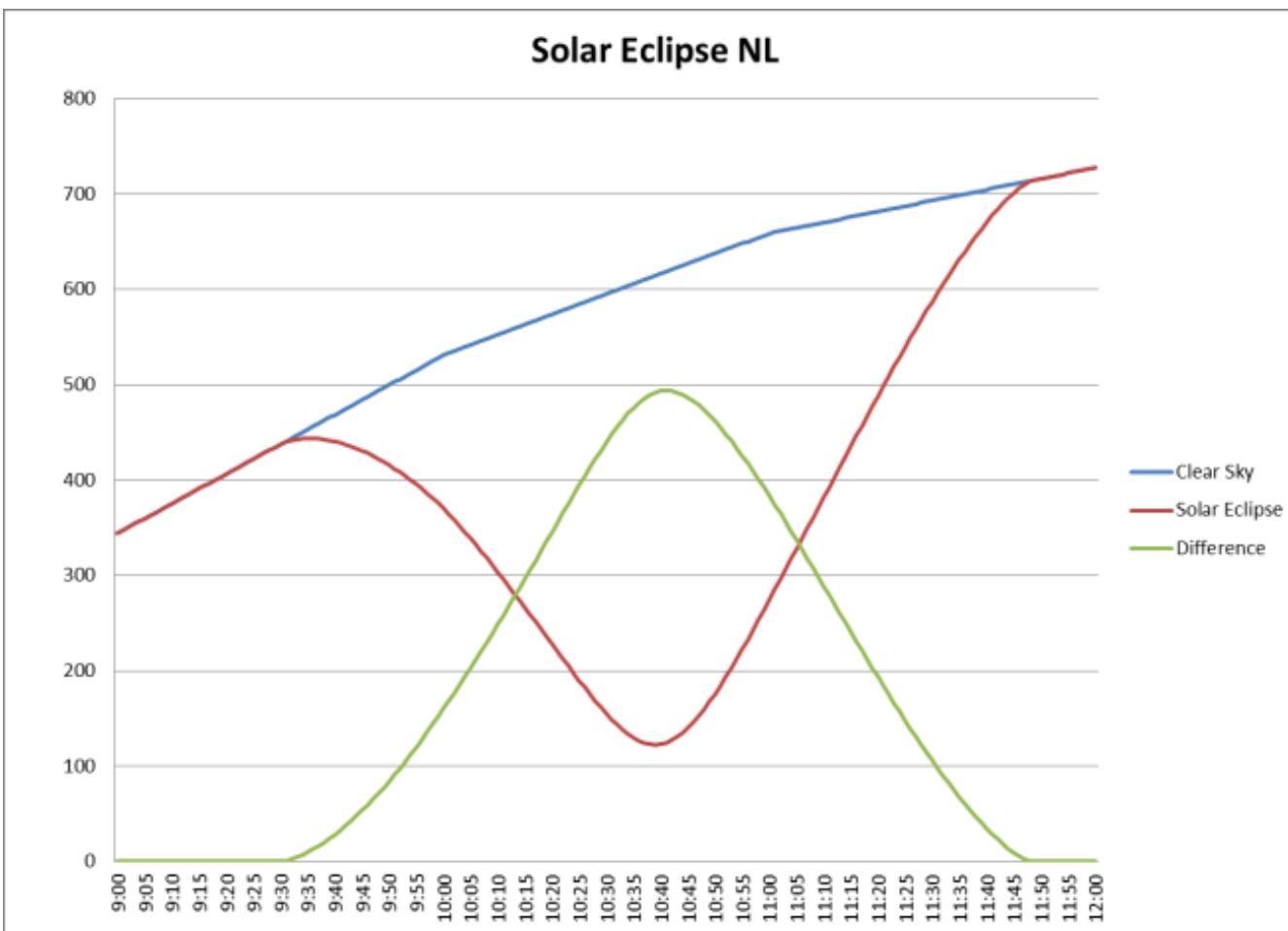
Source: Tom
Brijs

Source: Elia

Afschakelprijzen (inschatting subsidie + Marktprijs 30€/MWh)	
	MW Price
WKK fossil	2882 40-100 €/MWh
WKK biomass	516 40-100 €/MWh
Windonshore	1019 80-110 €/MWh
Wind offshore	495 107-137 €/MWh
Solar	1680 >200 €/MWh

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Solar eclipse



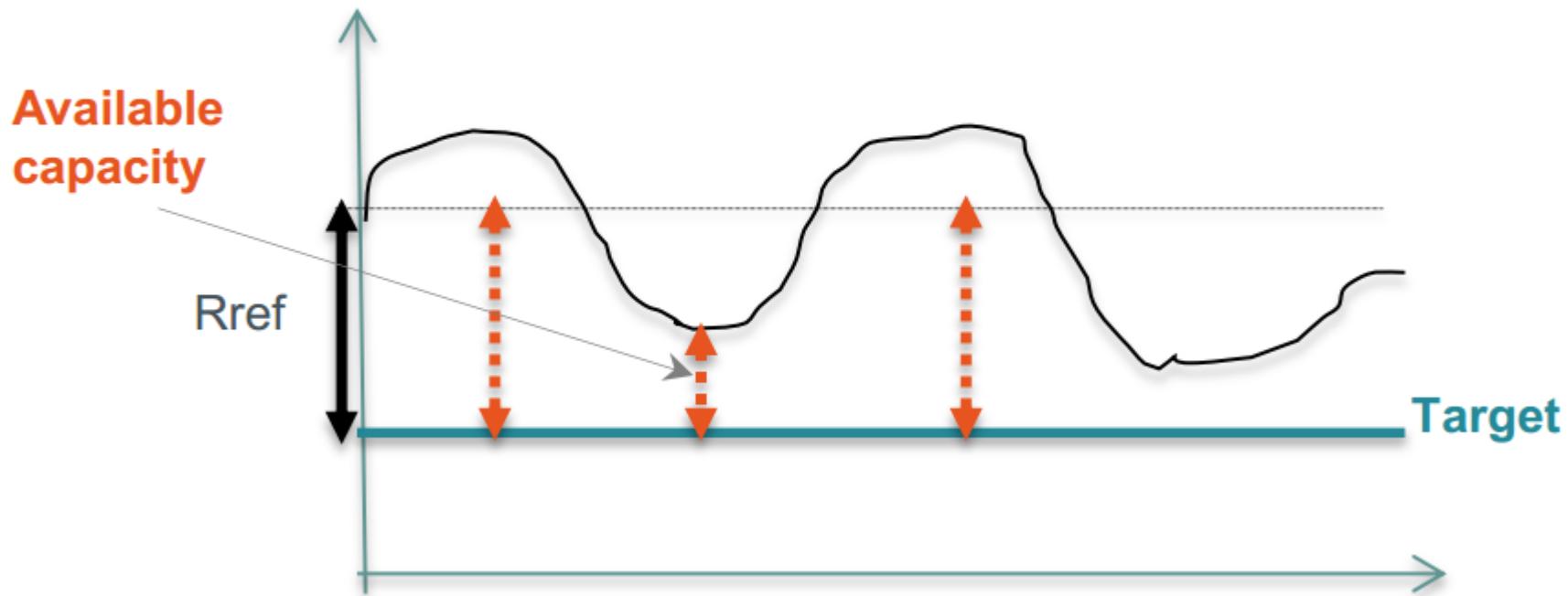
Loss of largest exporting unit



How to design new products?

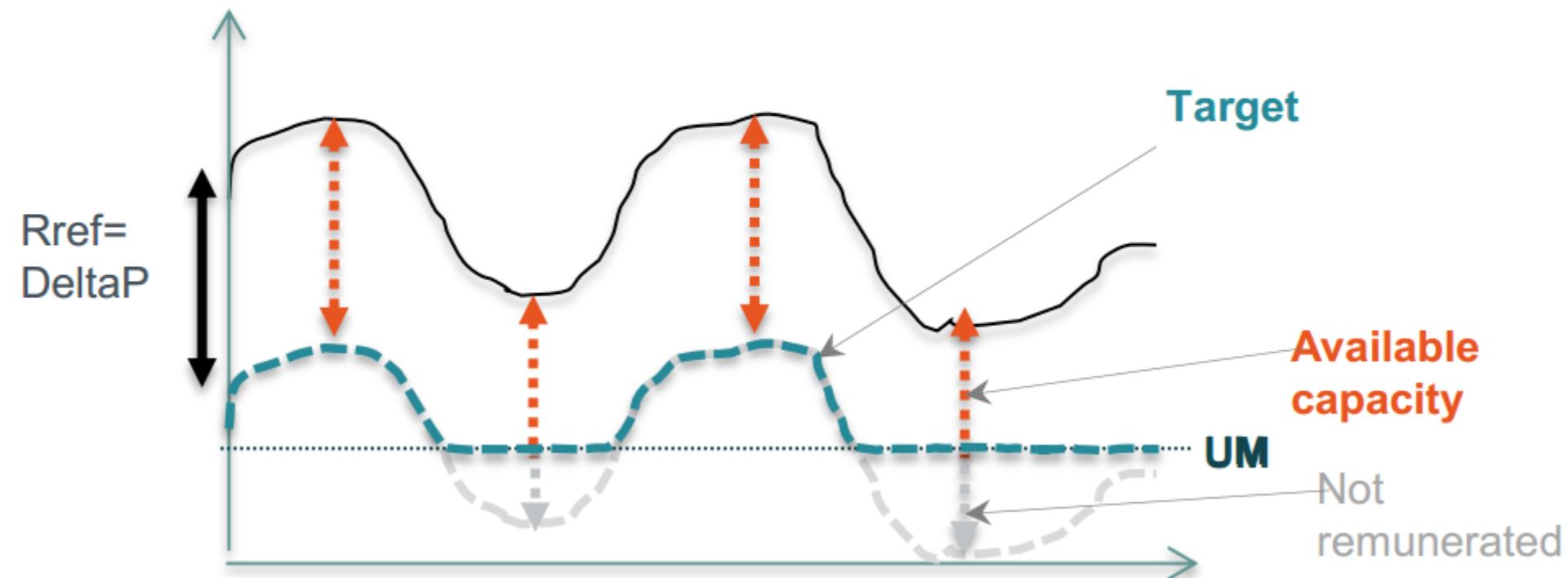
Which service do you provide

DROP TO a fixed Shedding Limit



Which service do you provide

DROP BY a fixed Power (ΔP)



Remuneration

- Availability:

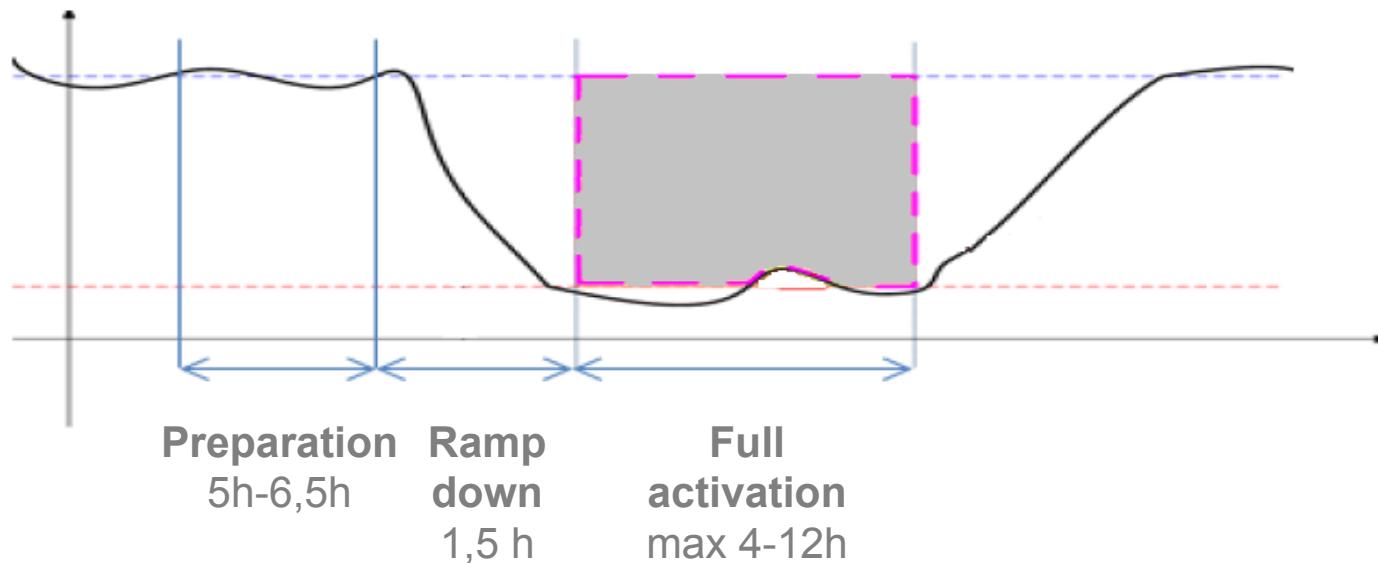
- Typically for reserve products
- Result of tender process
- Pay as bid/marginal pricing

- Activation

- Not for all reserve products
- Only if called upon
- Pay as bid/marginal pricing



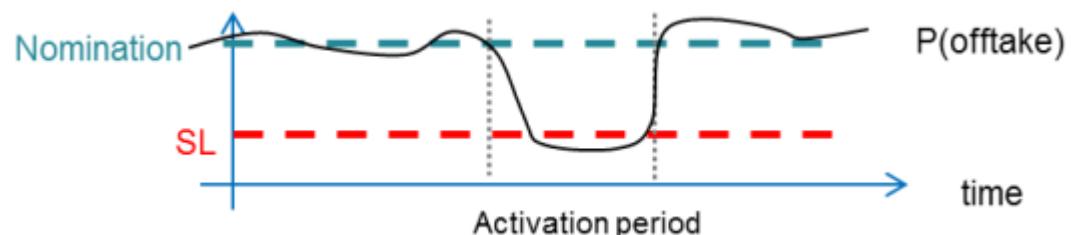
Remuneration



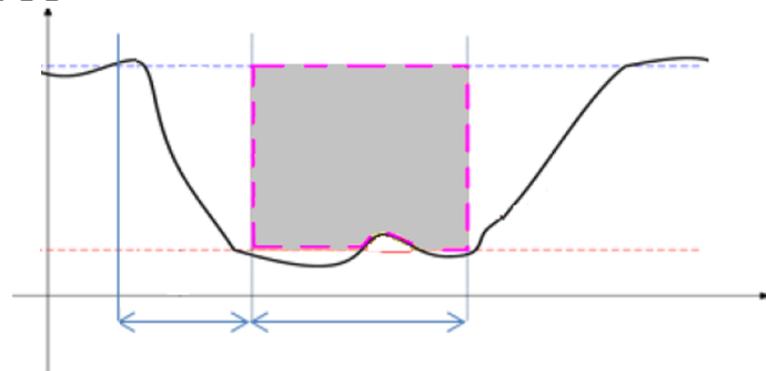
- Strategic reserves: additional remuneration
 - Start up
 - Prolongation

Measurements

- Metering:
 - Validated head meters
 - Submeters
- Reference consumption during an activation
 - Nominations are available for TSO-sites



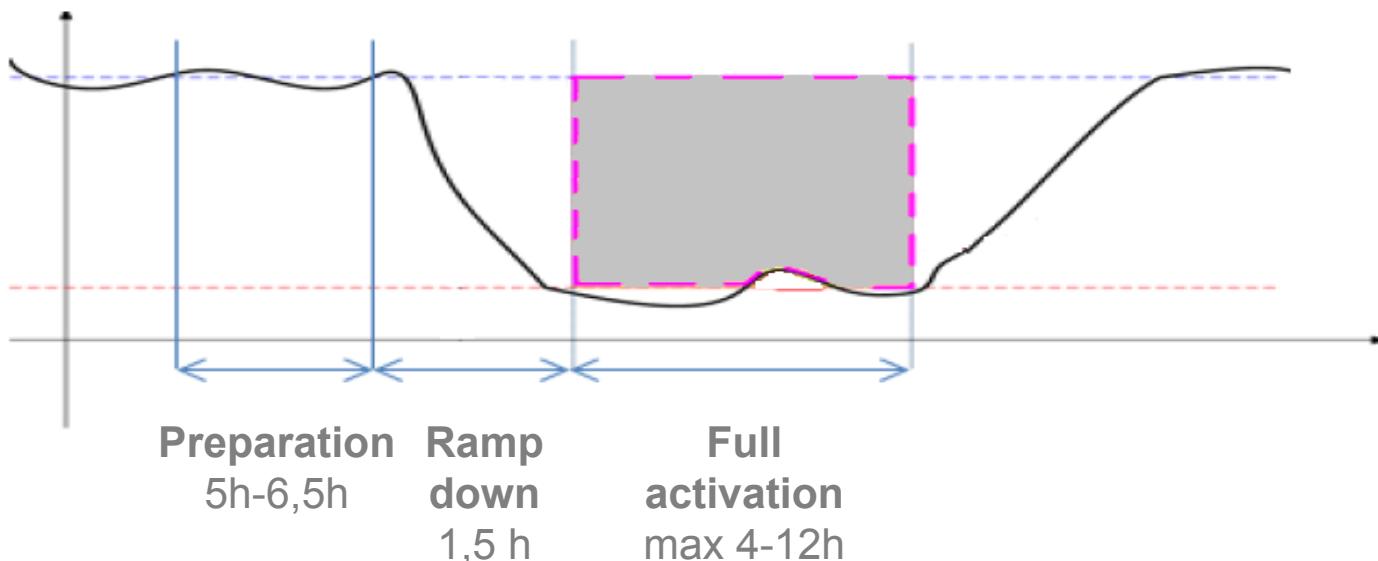
- Previous quarter-hour for balancing reserves



Measurements

- Reference consumption during an activation

- DSO sites?
 - Submetered volumes

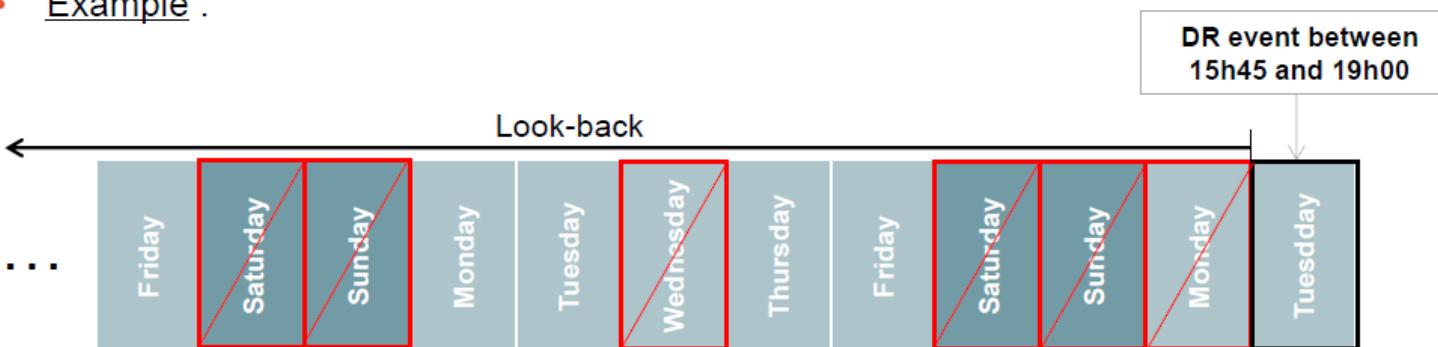


Measurements

○ Need for benchmarking

High X of Y

- Type of days
 - ❖ Weekday
 - ❖ Week-end day and holiday
- Excluding days
 - ❖ Days on which a demand response event has occurred
 - ❖ Days on which a strategic reserve trigger (both economical and technical) has occurred
 - ❖ Non-representative days meaning days on which a specific event (related to the customer) has occurred.
- Example :



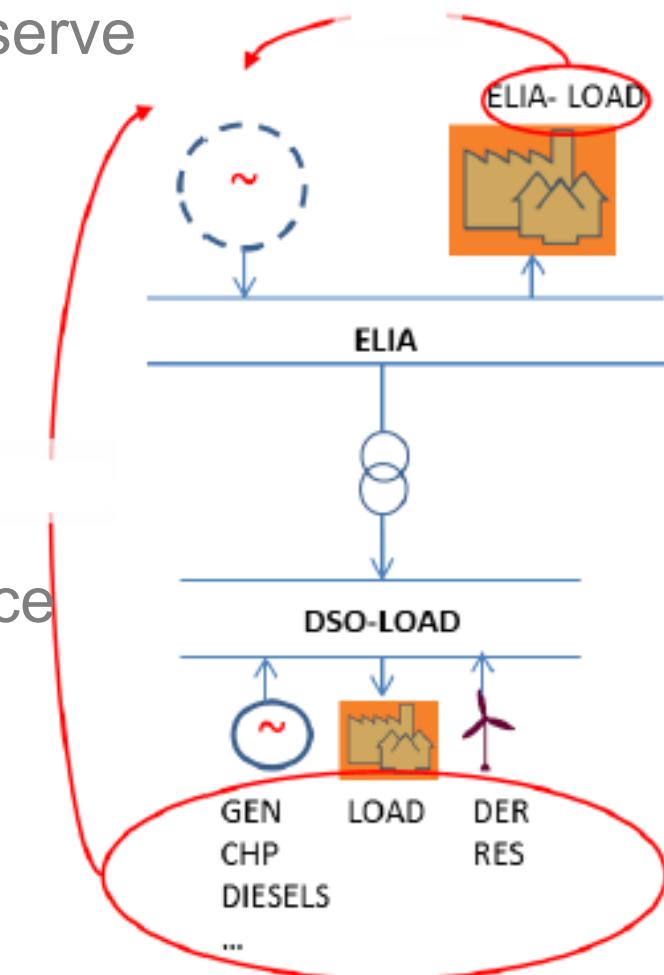
TSO/DSO

- Correction of BRP perimeter

- Aggregator curtails load to offer reserve
- BRP perimeter is long: impact!
- Afterwards rebound: impact!

“Vol d'énergie”

- It is the BRP's energy
- It is the aggregator who delivers service



Eligibility

- Demand & local generation
- Aggregators & grid users
- Prequalification

Personal Data Grid User

Name Grid User	
Adress Grid User	
Telephone Number Grid User	
E-mail Grid User	
EAN Code of meter	

Contractual Data

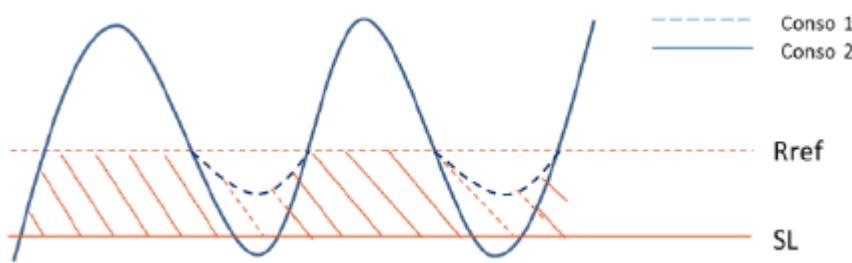
Name BSP	
Number of offered flexible MW R3 DP at EAN	
Main focus of EAN (production/load)	
Period (Peak/off-peak/base) (for information purposes only)	
Current Supplier	
Current BRP	

Technical Data

EAN Code of Meter	
Type of Meter	
Meter Accuracy class	
Voltage level of the connection point (kV)	
If load, Unscheddable margin (MW)	
If generation, Power Maximum(MW)	
Ramping rate (kW/s)	

Eligibility

- Demand & local generation
- Aggregators & grid users
- Certification



- Average hourly Offtake per Winter Period \geq SDR Reference Power + Total SL
- Availability during Critical Hours $\geq 85\%$;
- Availability during Non-Critical hours $\geq 75\%$.

Can services be combined?

○ Technical capability

Combination Possible?	R3 DP with Headmeter	ICH with Headmeter	R1 Load with Headmeter
SDR DROP-TO with Headmeter	No, for R3 DP 2015*	Yes, if TSO AP*	Yes, if TSO AP*
SDR DROP-BY with Headmeter	Yes, if DSO AP*	No	Yes, if TSO AP*
SDR DROP-TO with Submeter	No	No	No
SDR DROP-BY with Submeter	No	No	No

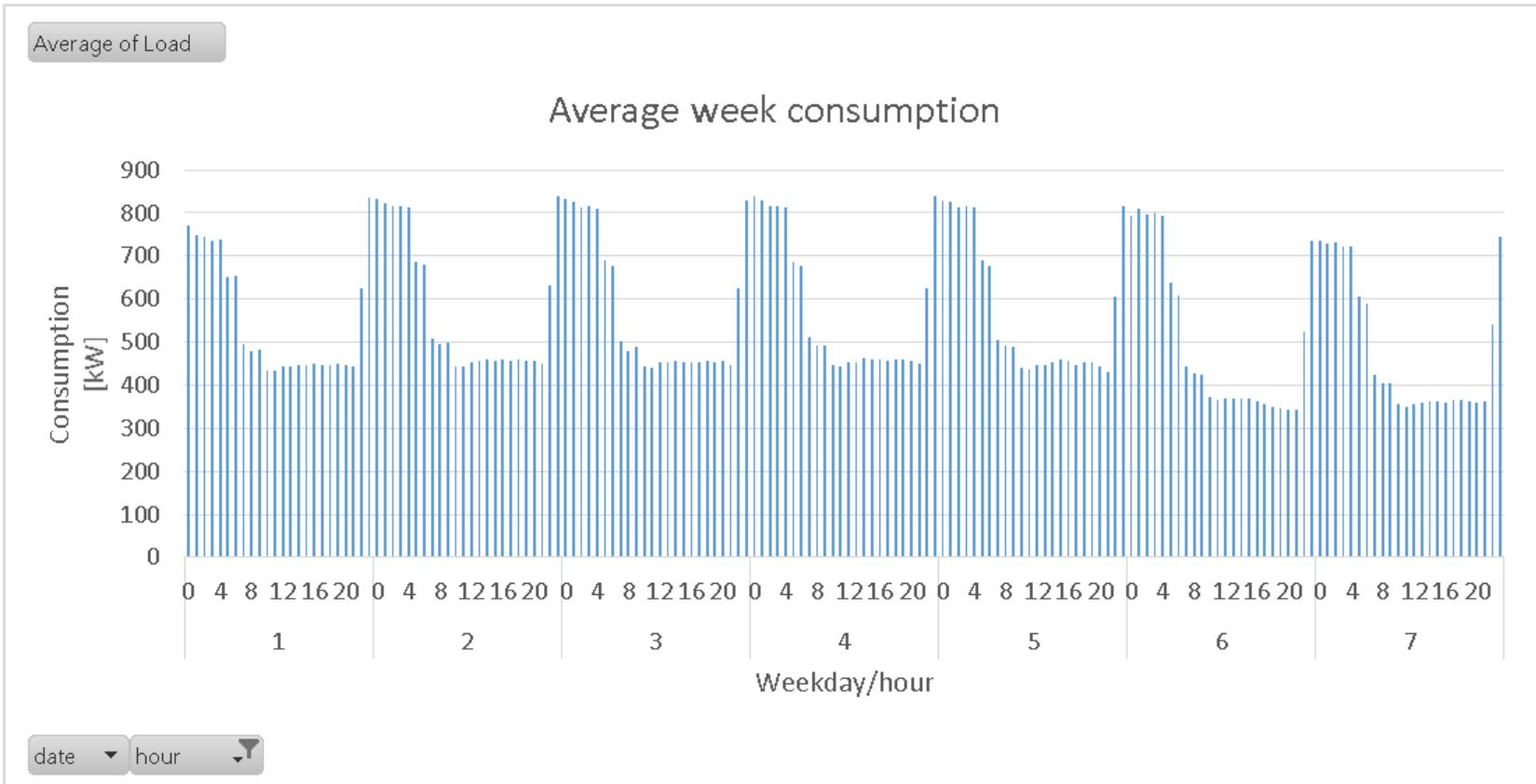
Cases

Cold storage



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Cold storage



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Emergency groups



Mar 17, 2014

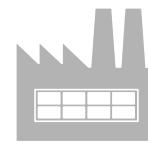
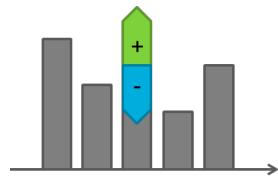
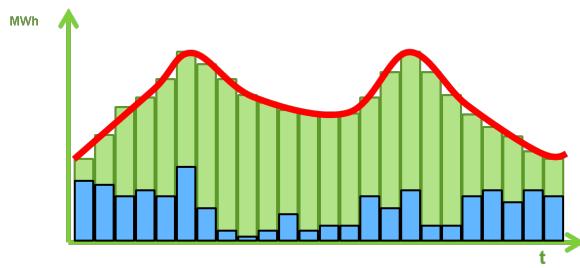
Shredders



Other



Portfolio construction - technical

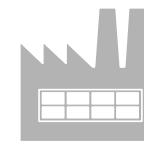
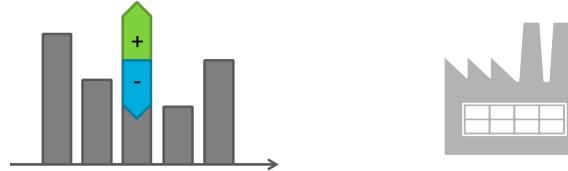
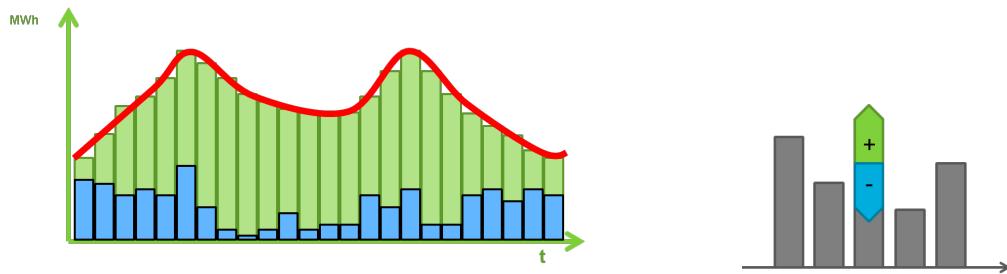


Partner 1

Flexibility specifications

- Upward/downward
- Response time
- Max duration
- “rebound”

Portfolio construction – regulatory & market



Partner 1

Other specifications

- Cost of availability
- Cost of activation: merit order of demand response
- Cooperations with DSO/Supplier – BRP?
- Participation from DSO/TSO level
- Participation from demand/distributed generation

Conclusion

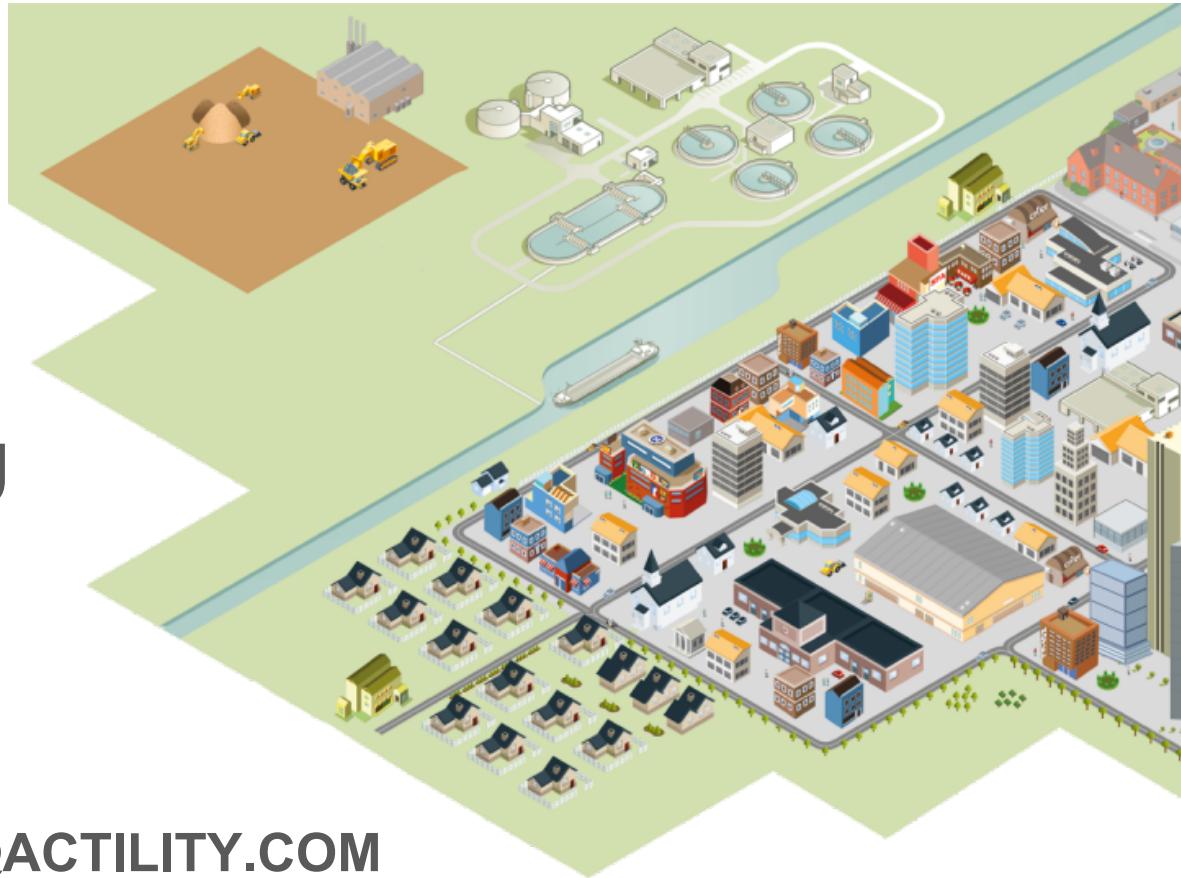
3 different approaches

- 3 different approaches to tackle transition
 - 1. Exploit cross-border synergies
 - 2. Reactive balancing market
 - 3. Diversify resources providing balancing services
- Need for new products
 - Overgeneration/curtailment of renewables
 - Loss of exporting unit
 - Solar eclipse
- Product design addresses several elements

THANK YOU

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