

# Delivery of secondary control (aFRR) by wind farms

## Users' Group

10<sup>th</sup> of December 2015



# aFRR- Wind project: technical pilot project

## Involved parties



Owner wind farm  
of Estinnes



Manufacturer  
wind farm



BRP  
R2 contract



TSO

## Scope of pilot project

- Check technical capability of wind farms to provide downward aFRR (R2)
- Perform a two month period test where wind farms participate in downward secondary control (aFRR-) at Elia

## Wind farm of Estinnes

- Direct driven (variable speed) synchronous generator / full convertor
- 10 x ENERCON E-126: 7,5 MW
- 1 x ENERCON E-126: 6 MW



# Ancillary services in Belgium: context (1)

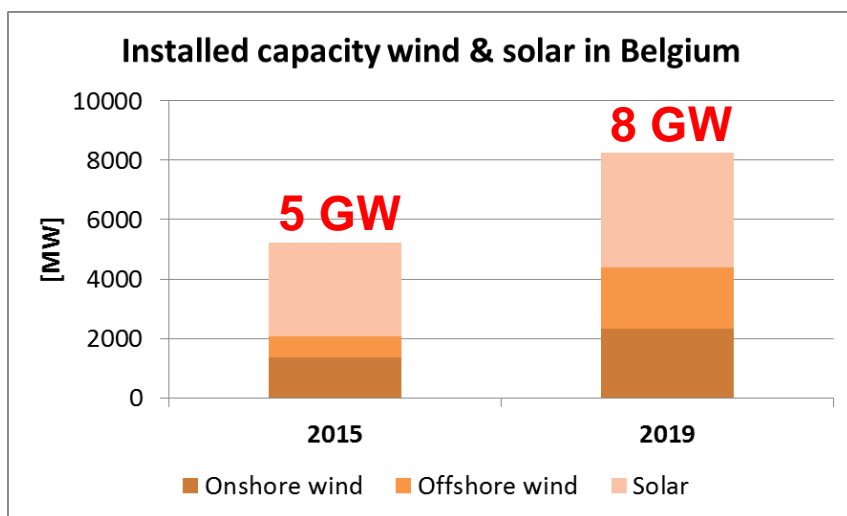
Keeping the balance between generation and offtake



Large scale integration of intermittent renewables represents a balancing challenge...

... intermittent renewables can be flexible and should be part of the solution

With increasing volumes of renewables in the grid

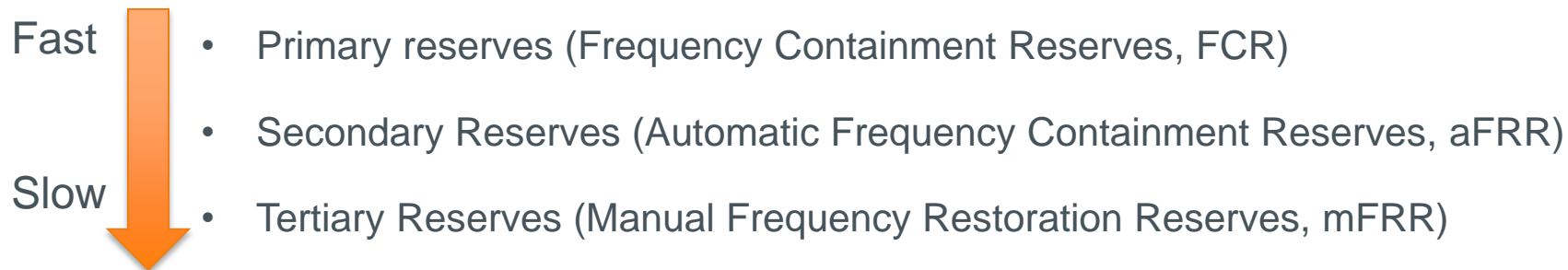


BE peak load:  
13 – 14 GW

High share of non-flexible baseload

## Ancillary services in Belgium: context (2)

TSO contracts reserve capacity for balancing its control area



In Belgium the contracting of aFRR capacity (spinning reserves) often leads **to start-up of gas units, that are out of the money**, in particular with high share of nuclear, to **deliver the service** to the TSO

- Situation leads to high “must run”-costs

**Hence diversification of aFRR resources should be considered:**

- Biomass, cogeneration, demand side,...
- **Renewables: wind, solar**

# Ancillary services in Belgium: aFRR product

$P_{ref}$  power profile (defined by producer)



**For a windfarm the  $P_{ref}$  is not known**  
**Active Available Power (AAP)**  
**mechanism:**

- Calculation of the  $P_{ref}$  on the basis of power infeed, pitching of the blades, wind speed, ...
- AAP quality is key: AAP is starting point for regulation

Elia aFRR set point ( $\Delta P$ ) power profile



+



**Wind farms are highly flexible and can follow a set point  $\Delta P$**

Required power output profile of the unit



# Bidding gate closure time & product resolution

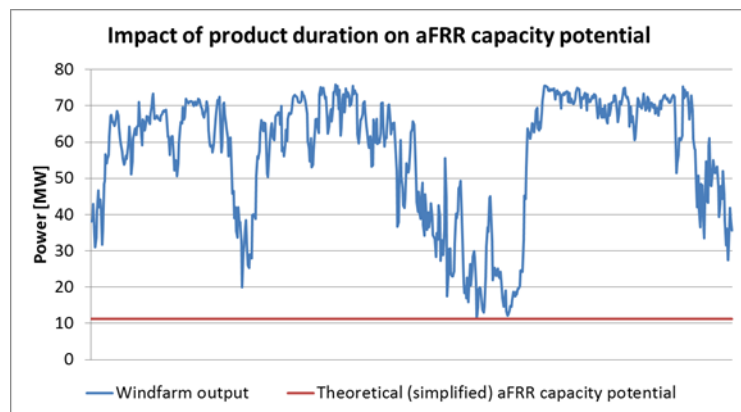
## Today in Belgium:

- Monthly procurement of aFRR capacity
- Product resolution: peak and long off-peak (incl. WE)
- GCT for aFRR energy bids: day-1 at 15h00

## Further investigations:

- Procurement lead time: as short as possible (e.g. DA)
- Product duration: as short as possible (e.g. daily)
- Product resolution: as high as possible (4 or 8 hours)
- High reliability of D-1 nominations: up to 99% reliable nominations for single windfarm

## Weekly wind farm production



## Potential of produced energy that could be offered as downward capacity (if perfect forecasting and no minimum power)

	Product duration / product resolution	Peak & long-off-peak	8h blocks	4h blocks
<b>Onshore wind farm</b>	Month	0%	1%	1%
	Week	4%	5%	8%
	<b>Day</b>	<b>34%</b>	<b>50%</b>	<b>65%</b>
<b>BE aggregated offshore production</b>	Month	1%	1%	1%
	Week	6%	7%	11%
	<b>Day</b>	<b>47%</b>	<b>65%</b>	<b>78%</b>

# Technical pilot project: general conclusions

- Wind farms are highly flexible and can provide ancillaries to the grid
- AAP method very promising to ensure efficient delivery of aFRR capacity by windfarms
- Pilot project identifies both technical and market aspects that need to be investigated and analysed further in detail for provision of aFRR- capacity by windfarms
  - How to handle loss of green certificates in case of downward curtailment?
  - transition to shorter procurement lead time and product duration
  - shorter product resolution
  - reliability of R2 nominations
  - Accuracy of the AAP profile: improvements for AAP calculation,...

# Thanks for your attention!

Kristien Clement

Link to study: <http://www.elia.be/nl/users-group/ad-hoc-werkgroep-balancing/studies-publicaties/R2-wind%20study>

**ELIA SYSTEM OPERATOR**

Boulevard de l'Empereur 20

1000 Brussels

+32 2 546 70 11

info@elia.be

www.elia.be

An Elia Group company

