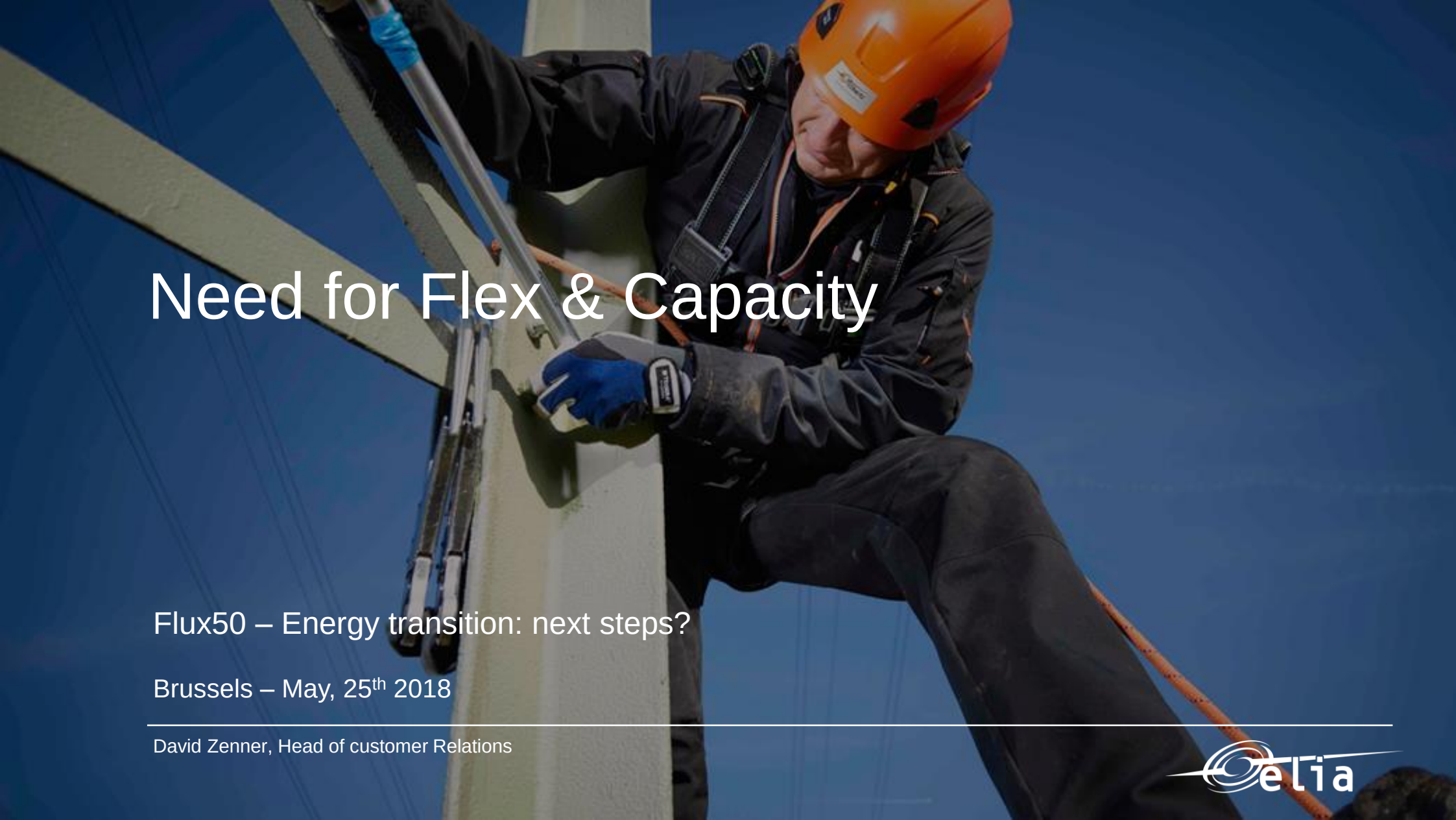


Need for Flex & Capacity

Flux50 – Energy transition: next steps?

Brussels – May, 25th 2018

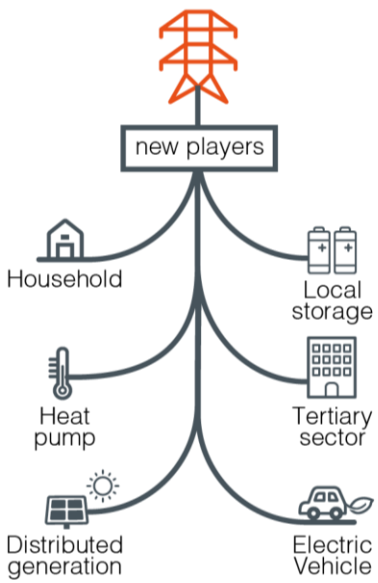
David Zenner, Head of customer Relations

Part I: Need for Flex

Major trends impacting the power system

The development of intermittent generation

Decentralisation, digitalisation & new players



The regionalisation of the electricity sector

Consequences

→ More & long distance transmission & interconnection

→ **More flexibility needs to balancing system** with high amounts of variable RES

→ **More flexibility available at end-user level** & appearance of new business model

→ Intensified coordination local (DSO-TSO) & supranational (ENTSO-E, CORESO, etc.)

Managing 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

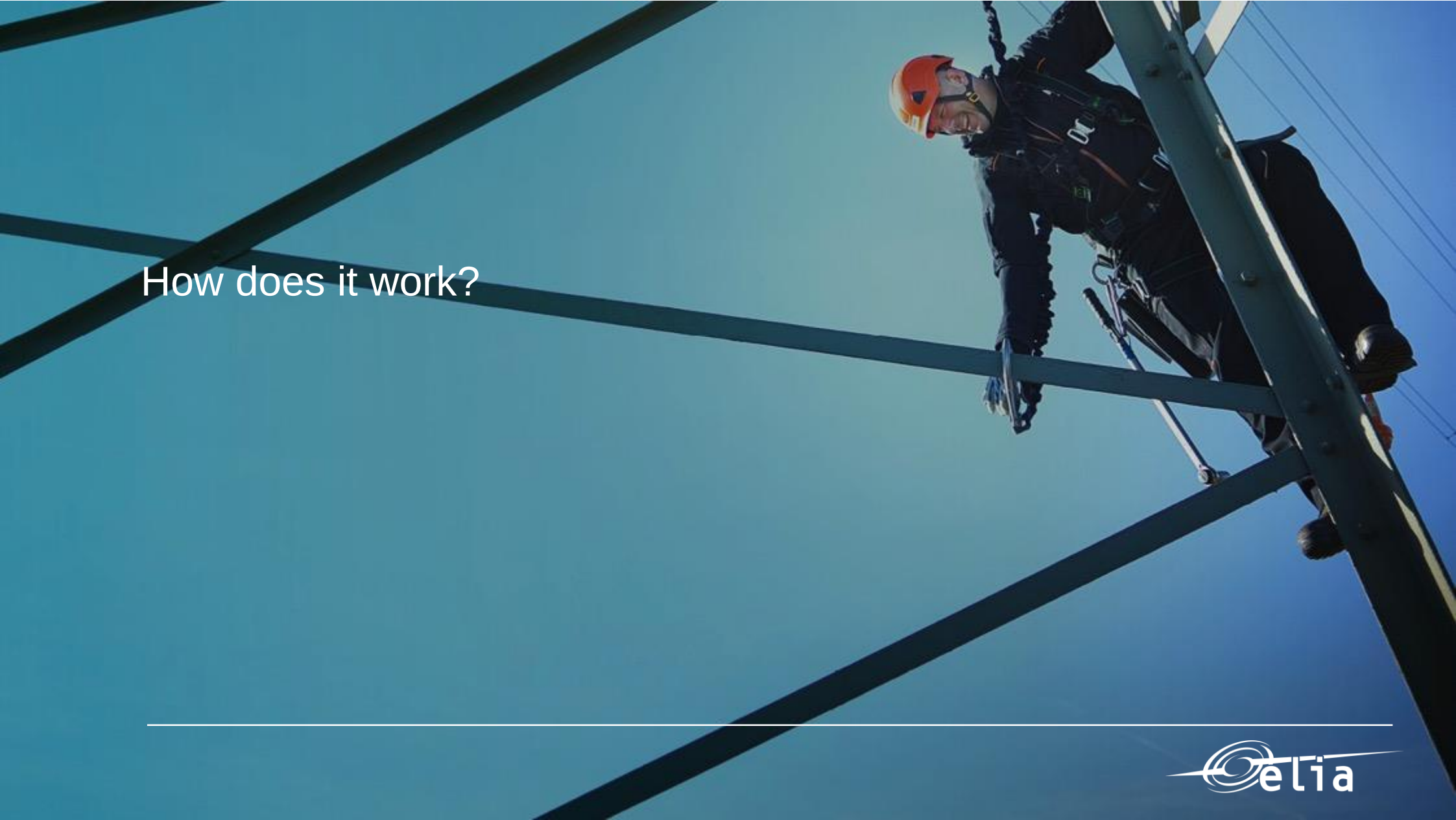
Keep "needs" under control

- Enforced Balancing Responsible Party (BRP) role
- Dynamic "needs" dimensioning
- Develop robust DA and ID markets

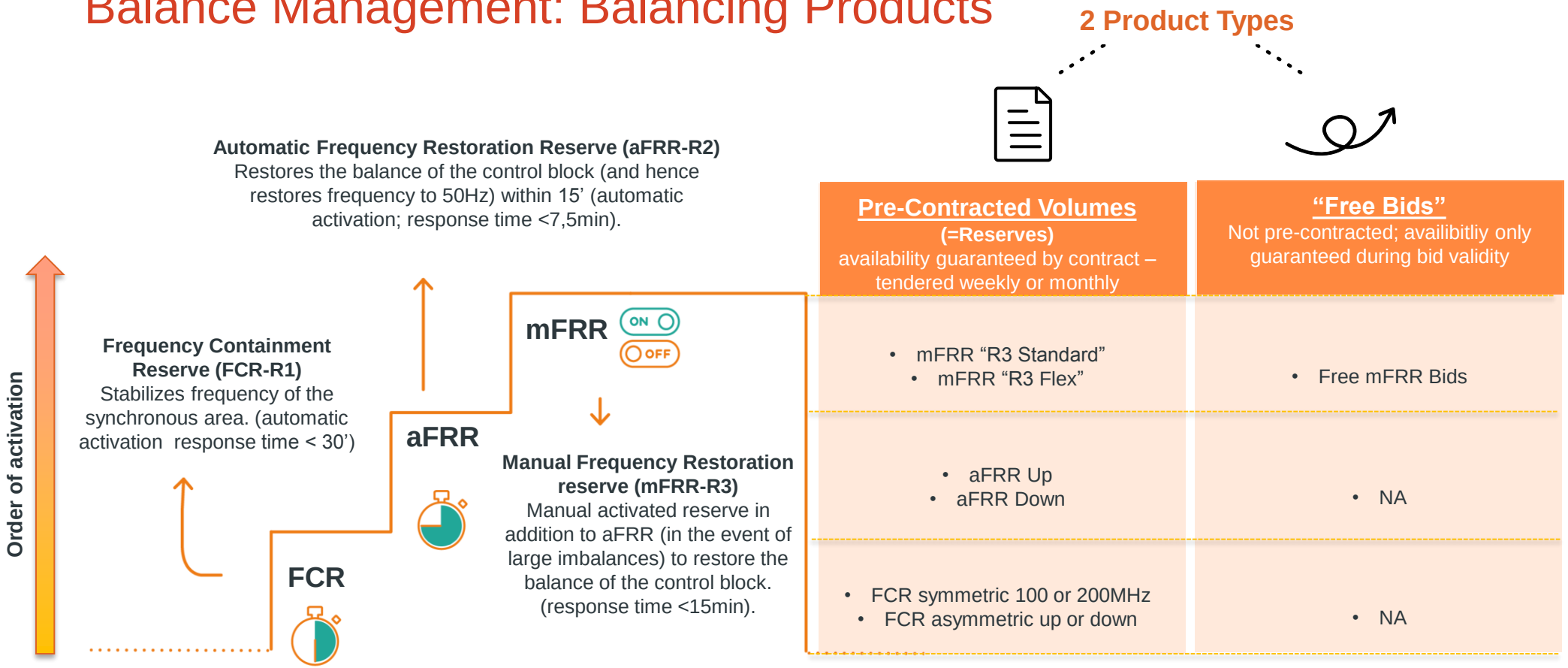
Cover "needs" efficiently

- 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)

How does it work?



Balance Management: Balancing Products

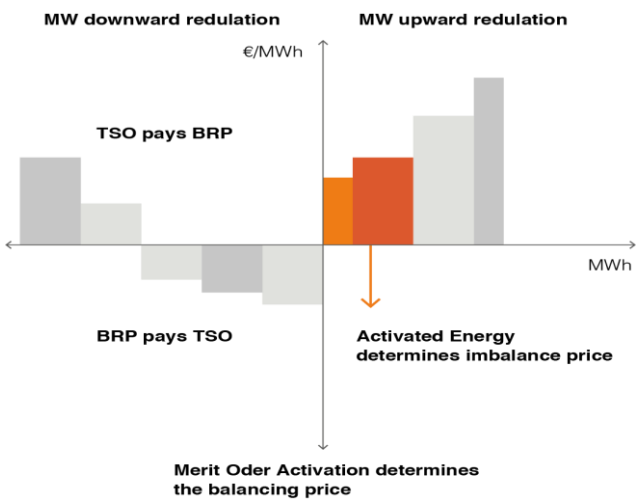


Balance Management: the Balancing Market

Balancing Market Merit Order

*Last resort exchange between system operators

Marginally activated Bid in the merit order activation determines the Imbalance Price



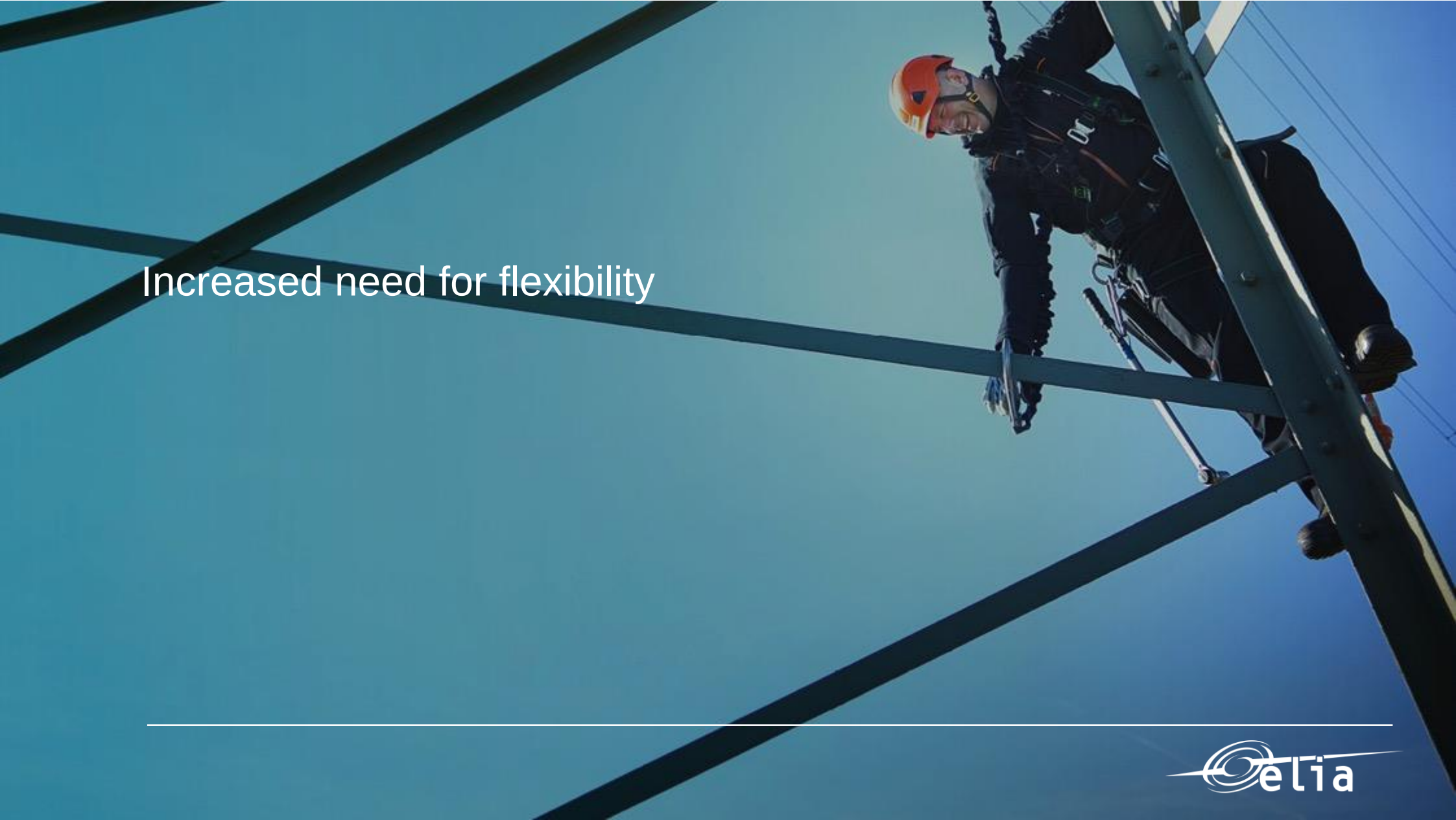
Quarter	NRV (MW)	SI (MW)	MIP (€/MWh)	MDP (€/MWh)	POS (€/MWh)	NEG (€/MWh)
00:00 > 00:15	129,541	-217,094	**55,72**	0,00	55,72	56,66
00:15 > 00:30	-39,334	68,527	55,72	**15,68**	15,68	15,68
00:30 > 00:45	-102,987	155,648	57,70	**13,74**	12,56	13,74
00:45 > 01:00	-158,085	204,666	57,24	**14,11**	12,59	14,11
01:00 > 01:15	-21,356	-6,925	54,34	**11,56**	11,56	11,56
01:15 > 01:30	38,460	-28,364	**53,58**	11,56	53,58	53,58
01:30 > 01:45	53,257	-26,657	**53,54**	15,03	53,54	53,54
01:45 > 02:00	-69,466	111,693	53,58	**15,11**	15,11	15,11

Belgian control area is "short" (neg. SI or System Imbalance), Elia needs to manage the system "upwards" (pos. NRV or Net Regulation Volume") , the Imbalance Price is set by the marginal incremental bid (Marginal Incremental Price or MIP)

Belgian control area is "long" (pos. SI or System Imbalance), Elia needs to manage the system "downwards" (neg. NRV or Net Regulation Volume") , the Imbalance Price is set by the marginal decremental bid (Marginal Decremental Price)

Source: www.elia.be ; data from 21/04/2017

Increased need for flexibility



Context

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  - ✓ All voltage levels (TSO & DSO levels)

Increased flexibility needs for balancing [MW]

NEEDS ≠ VOLUMES

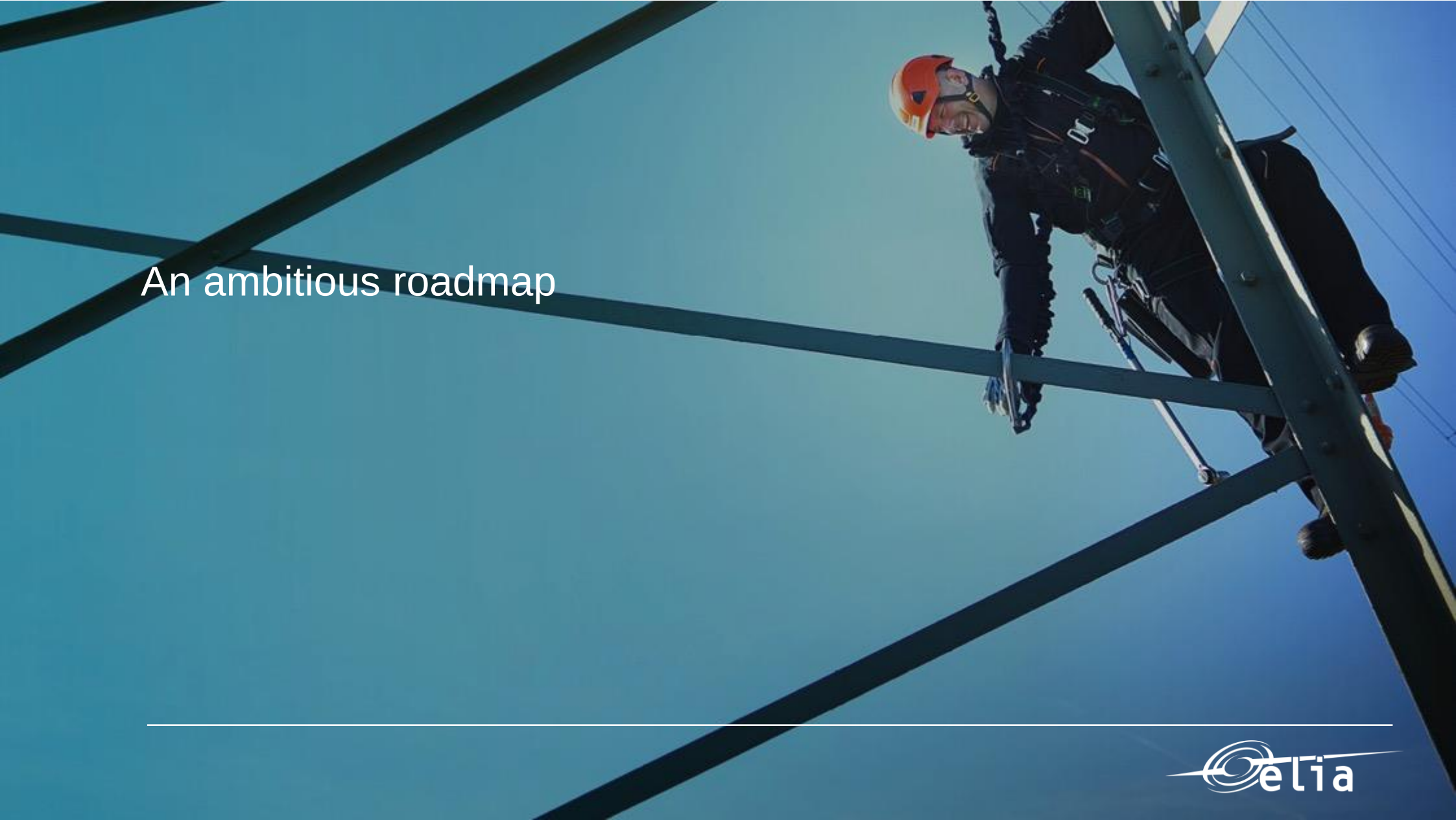
FCR	R1
aFRR	R2
mFRR	R3

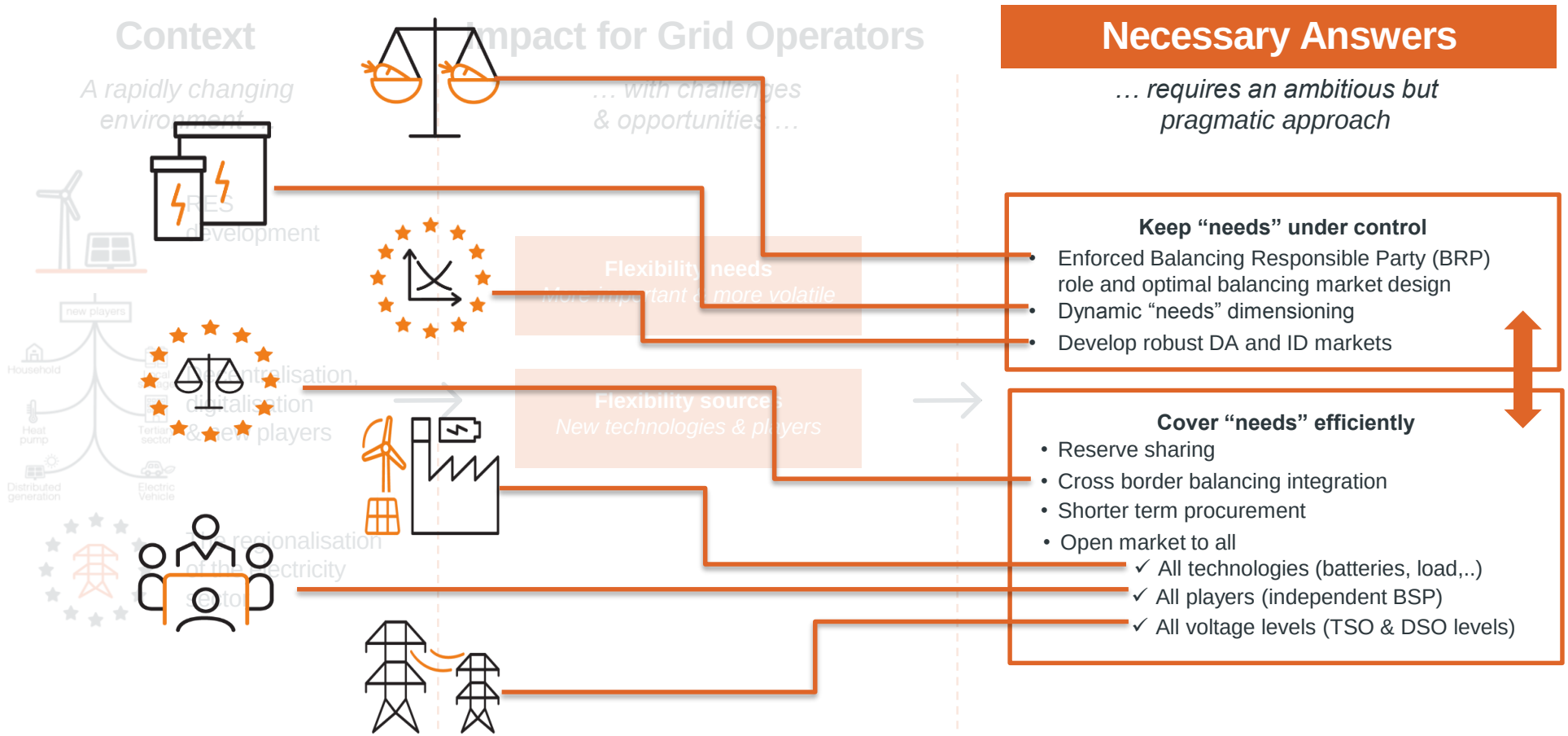
NEW

Year	FRR+	aFRR+	mFRR+	FRR-	aFRR-	mFRR-
2017	924	144	780	144	144	-
↓						
2021	1240	175	1065	1000	175	825
2023	1240	175	1065	1000	175	825
2027	1240	175	1065	1000	175	825
TREND		↑	↑		↑	↑

Source: Adequacy study and assessment of the need for flexibility in the Belgian electricity system - April 2016, available on www.elia.be
Disclaimer: indicative volumes – non binding – based on the 2016 applicable volume determination methodology – excluding any additional measures/volumes that would be require to deal with exceptional situation (e.g. storm risk) ; these volumes have as sole purpose to give an idea of the future trend wrt volume needs and do by no means substitute for the legally/regulatory determined volume assessment process in place between Elia and the CREG

An ambitious roadmap




Context
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RES development
Flexibility needs
More important & more volatile
Flexibility sources
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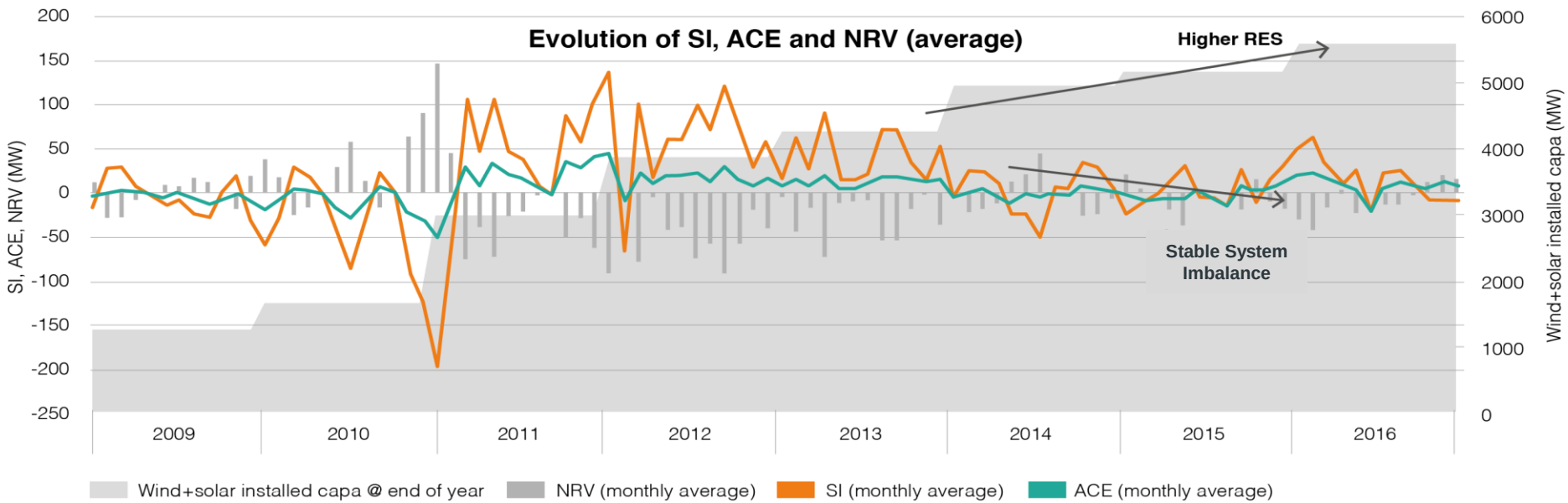
Necessary Answers
… requires an ambitious but pragmatic approach
Keep “needs” under control
• Enforced Balancing Responsible Party (BRP) role and optimal balancing market design
• Dynamic “needs” dimensioning
• Develop robust DA and ID markets
Cover “needs” efficiently
• Reserve sharing
• Cross border balancing integration
• Shorter term procurement
• Open market to all
✓ All technologies (batteries, load,..)
✓ All players (independent BSP)
✓ All voltage levels (TSO & DSO levels)

Despite higher RES penetration – stable system balance due to improvements of balancing market design



Key Improvements:

- **Reactive balancing possibility**
- **Single Marginal Pricing**
- **Continuously improved published Forecasting Data**
- **Continuously improved transparency data**

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)

aFRR roadmap

R2 is the most important balancing product for Elia

- 85% of the balancing energy activated
- Setting the imbalance price for at least 80% of the time
- Together with R1 accounting for 60-70% of the AS budget

Challenges

- Needs for reserve volumes are slightly increasing
- Future of historic providers (conventional power plants) is uncertain and expensive (must run)

Potential solutions

- Cross border integration: technically very complex and requires Cross Border capacity (=will take time)
- Diversification: Wind (pilot R2 wind), CHP & Load

Current situation

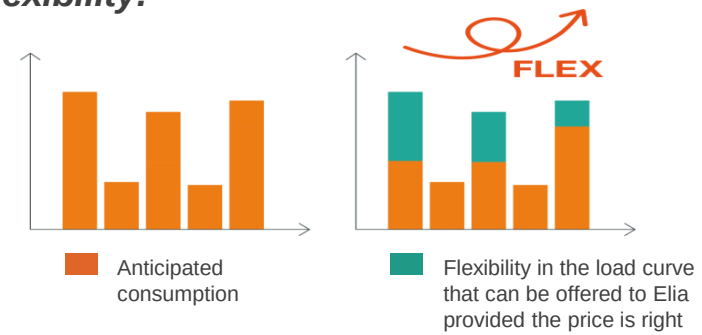
aFRR	Technology		
	TSO GEN>25MW	TSO Non-conventional	DSO connected
Up	✓	✗	✗
down	✓	✗	✗

Elia is investigating opportunity to set up EU pilot cross border aFRR market together with FR, NL, DE and AU

Elia has initiated a pilot project with willing industrial consumers or aggregators to develop an R2 (aggregated) product that would be open to all technologies

Full Market Opening for flexibility

Market players should be able to valorize flexibility:



Opening Balancing Market to :

All technologies

All voltage levels

All players

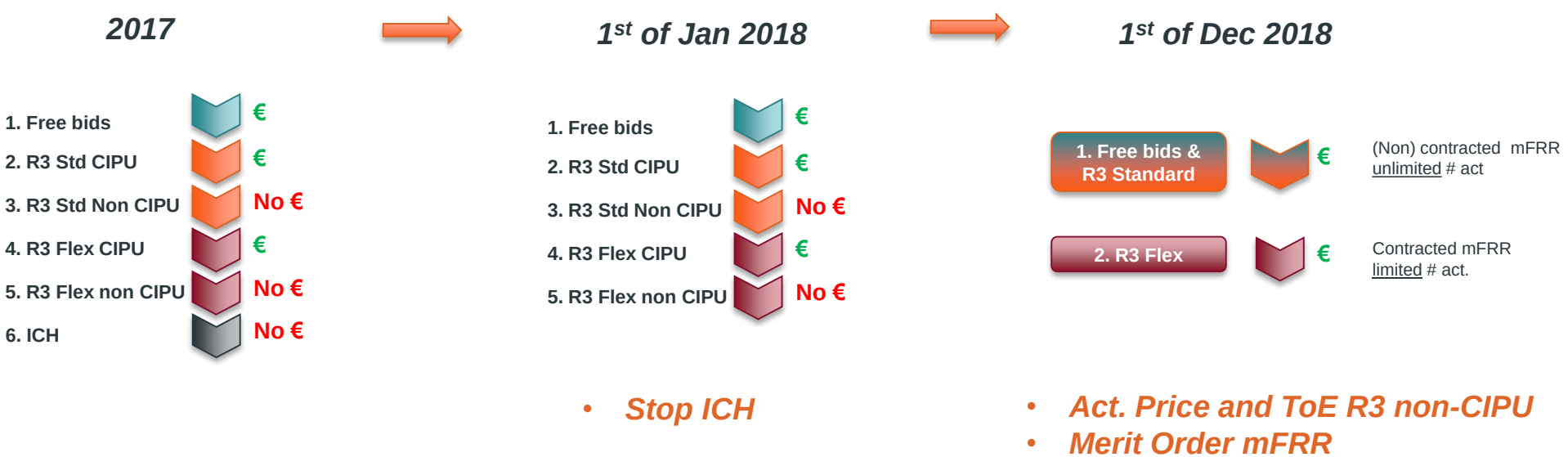
Elia's answer: An ambitious roadmap

Bidladder

	FCR / aFRR		mFRR "Free Bids"		mFRR R3 Standard	mFRR R3 Flex	Inter TSO
Opening to all technologies & Voltage levels	FCR (apr. 2017)	aFRR (PoC results dec. 2017)	TSO connected (Jul. 2017)	DSO connected: (Jan 2018)	(Jan 2017)	(Jan 2017)	
Access via ToE	NA		Target* June 2018		Target* End 2018	Target* End 2018	

R3 2018 in a nutshell

- Activation price and ToE for R3 non-CIPU
- Common merit order activation for mFRR energy bids with unlimited number of activation (free bids and R3 Standard)



- *Stop ICH*

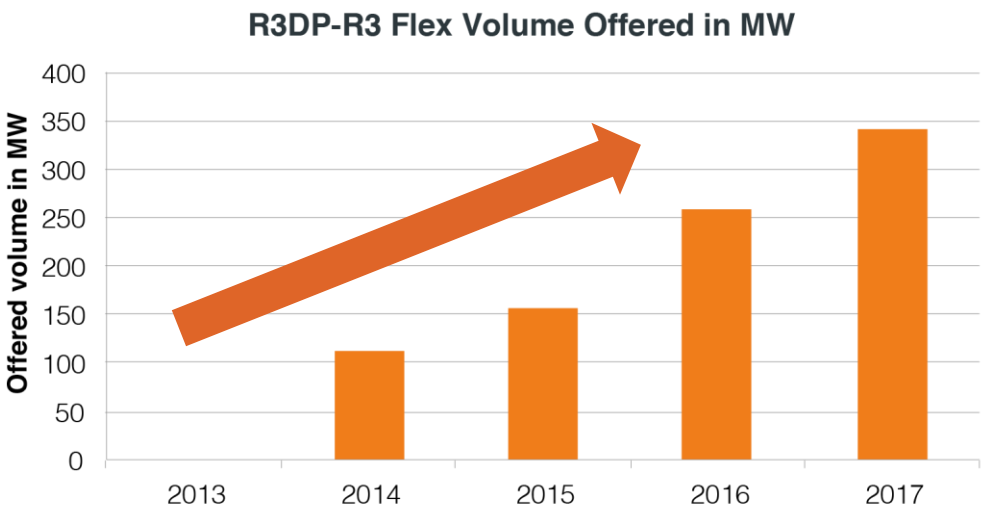
- *Act. Price and ToE R3 non-CIPU*
- *Merit Order mFRR*

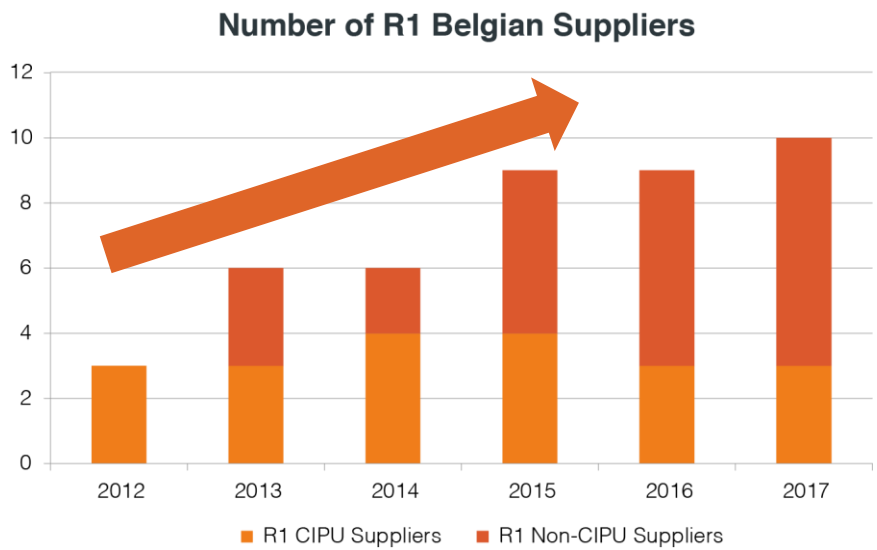
Overview of Balancing Reserve products

	Characteristics	Volume 2018	Historic price levels (2017)
Primary Reserves (Frequency Containment Reserve or FCR)	Very fast (seconds) Automatic activation in response to frequency deviations Service Types Symmetric 200mHz, Symmetric 100mHz, Asymmetric Up, Asymmetric Down	81 MW (100% short term - weekly)	Sym 200mHz & 100mHz[(1)]: **15-16€/MW/h** Asymmetric Up: **2,47 €/MW/h** Asymmetric Down: **3,17 €/MW/h**
Secondary Reserves (R2)	Fast (minutes) Automatic activation in response to signal sent by Elia	139 MW (100% short term - weekly)	**27,4€/MW/h**
Tertiary Reserves (R3)	Two reservation products : R3 Standard, R3 Flex Ability to offer also non-reserved volumes Manually activated in less then 15 minutes	830 MW Minimum 300 MW of R3 Standard, the rest can be R3 Standard or R3 Flex (sourced in monthly auctions)	R3 Flex: **3,4€/MW/h** R3 Std: **4,3€/MW/h**

[(1)]: the Symmetric 100mHz reaction requires two times more volume than the Symmetric 200mHz Service Type, so published prices should be divided by two to make an equal comparison with other Service Types.

Increase of offered volumes and suppliers





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

suppliers increases
FCR diversification not only in Belgium but also at EU level

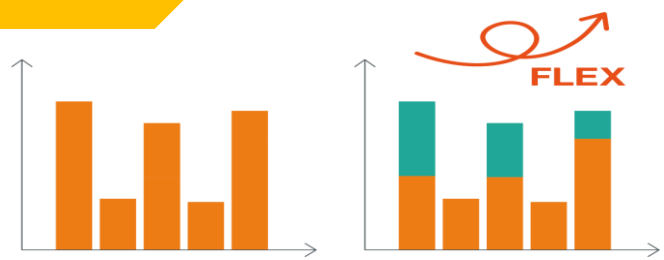
BidLadder: full market opening for flexibility!

FCR/aFRR → mFRR "Free Bids" → mFRR R3 Standard → mFRR R3 Flex → Inter TSO

July 2017: All technologies (TSO connected);
Jan 2018: DSO connected
June 2018: ToE

- Additional trading opportunities for market parties to valorize flex (generation and demand respons)
  → **Optimized energy procurement costs**

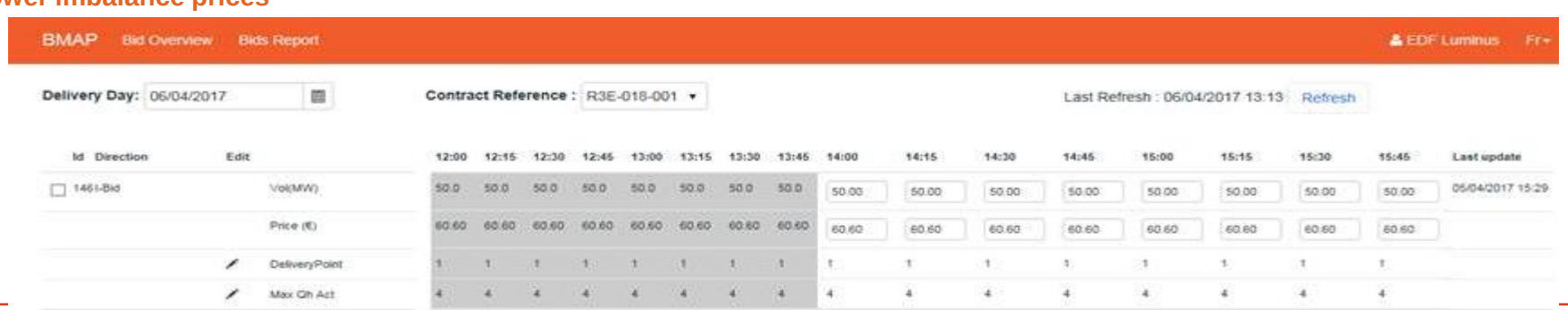
- More liquid balancing markets
  → **More cost efficient balance management**
  → **Lower imbalance prices**



Anticipated consumption

Flexibility in the load curve that can be offered to Elia provided the price is right

Screenshot Bidladder



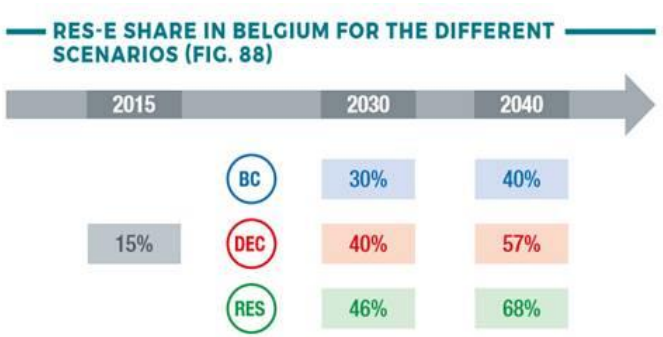
Part II: Need for Capacity

Elia study (Nov'17) identifies a clear need for new capacity in a context of insufficient investment signals in the market

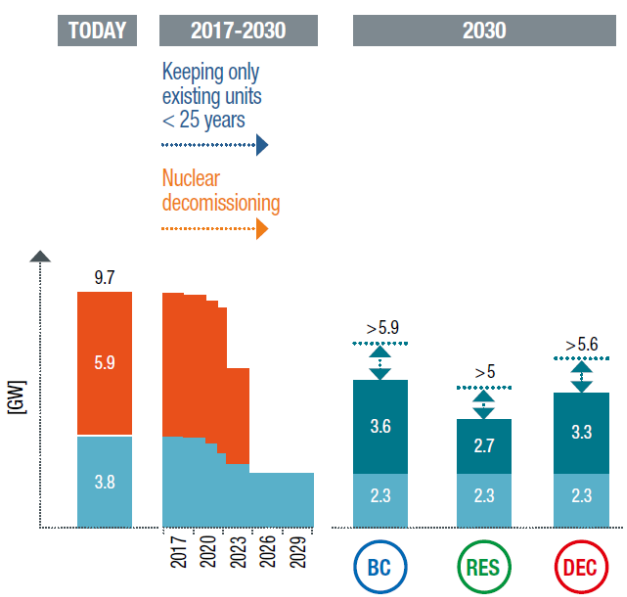
Despite ambitious assumptions…

Overview of a selection of assumptions

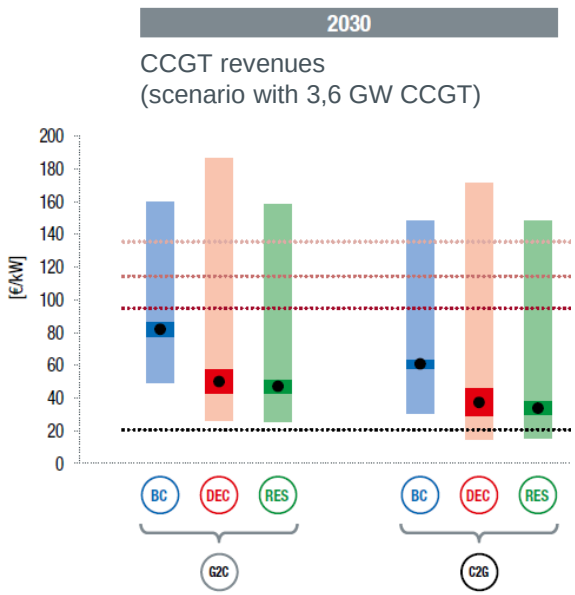
	2016	2030 (BC)
PV	3 GW	5 GW
Onshore wind	1.5 GW	3.3 GW
Offshore wind	0.7 GW	2.3 GW
DSR	0.6 GW	1.1 GW
OCGT/CCGT	3.8 GW	2.3 GW
IC capacity	3.5 GW	6.5 GW
CHP/Biom./Wast	3 GW	3 GW
Storage	1.3 GW	1.3 GW
Nuclear	5.9 GW	0 GW



… some important messages on adequacy needs and market design!



Supply shock and need for at-least 3,6GW new-built (thermal?) capacity already by 2025!



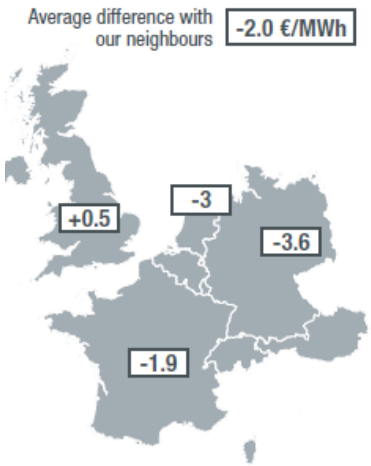
With the current (EOM) market design, the wholesale market will not remunerate the full costs of the necessary investments

More information: http://www.elia.be/en/about-elia/publications/studies

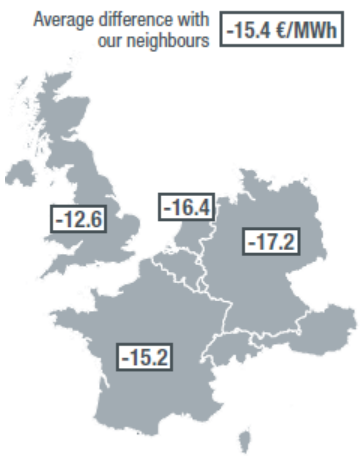
Market design options relying on out-of-market capacity, like strategic reserves, will result in price spikes and cause price divergence with neighbouring countries, leading to a competitive disadvantage.

Market design with all capacity remunerated in the market (tender or CRM)

Assuming that 3,6 GW is remunerated through a mechanism that allows the capacity to remain in the market, the average price difference can be limited and price convergence can be quasi safeguarded.



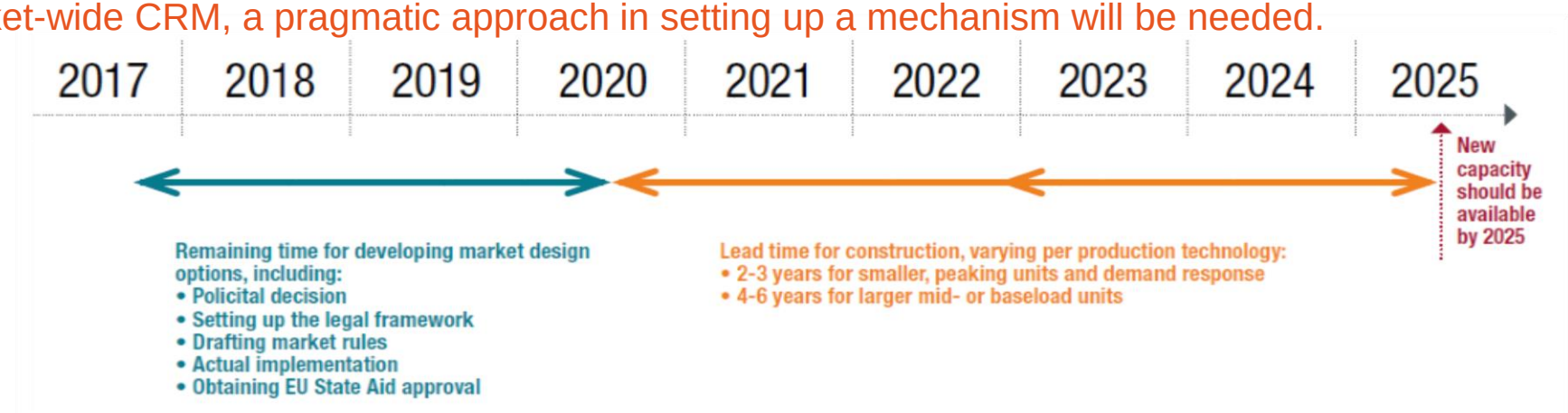
versus



Strategic reserve mechanism operated out-of-market.

Results indicate that the market would have only incentives to invest 1,6 GW leaving 2 GW out-of-market as strategic reserves. As this results in regular scarcity moments, the average price and the delta with the neighbours increases dramatically.

➔ Bearing in mind lead times for construction of new capacity and for setting up market designs like a market-wide CRM, a pragmatic approach in setting up a mechanism will be needed.



A pragmatic approach for installing a CRM in Belgium will be needed…
… with respect for European rules such as State Aid (EEAG) and in the future the CEP

A **phased implementation** of a Belgian CRM will be key for meeting up to the identified challenges.

- Normal CRM lead time (cf. FR/UK) of 6-7 years *versus* only 3 years time to prepare a mechanism for new-built capacity
- Belgium is a highly interconnected, but small market, structurally relying on import (also in the future). Well-functioning cross-border solutions are of even more importance compared to some other markets.

➔ Even though 2025 is clearly the target year for first delivery, a phased approach with respect to (early in the process) facilitating new investments and taking sufficient time to set up an effective cross-border solution are important.

The **Clean Energy Package** will provide for an updated European framework setting contours for any CRM. Despite a generally positive spirit on this matter, to be useful and effective it is important to ensure that:

- The **national SoS context** should not overlooked (e.g. in adequacy assessments and implementation choices)
- **Pragmatic implementation solutions** aiming at enduring solutions of high quality should remain possible.
- A **stable investment framework** is to be provided (e.g. with respect to the lifespan of a mechanism (subject to regular evaluation) and having built-in design safeguards that no undue support is provided)
- Differences between types of mechanisms are acknowledged (e.g. **strategic reserves ≠ market-wide CRM**)

Many thanks for your attention!

Zenner David

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