

REVEALING FLEXIBILITY VALUE



PÖYRY

ENTSO-E ELECTRICITY BALANCING WORKSHOP

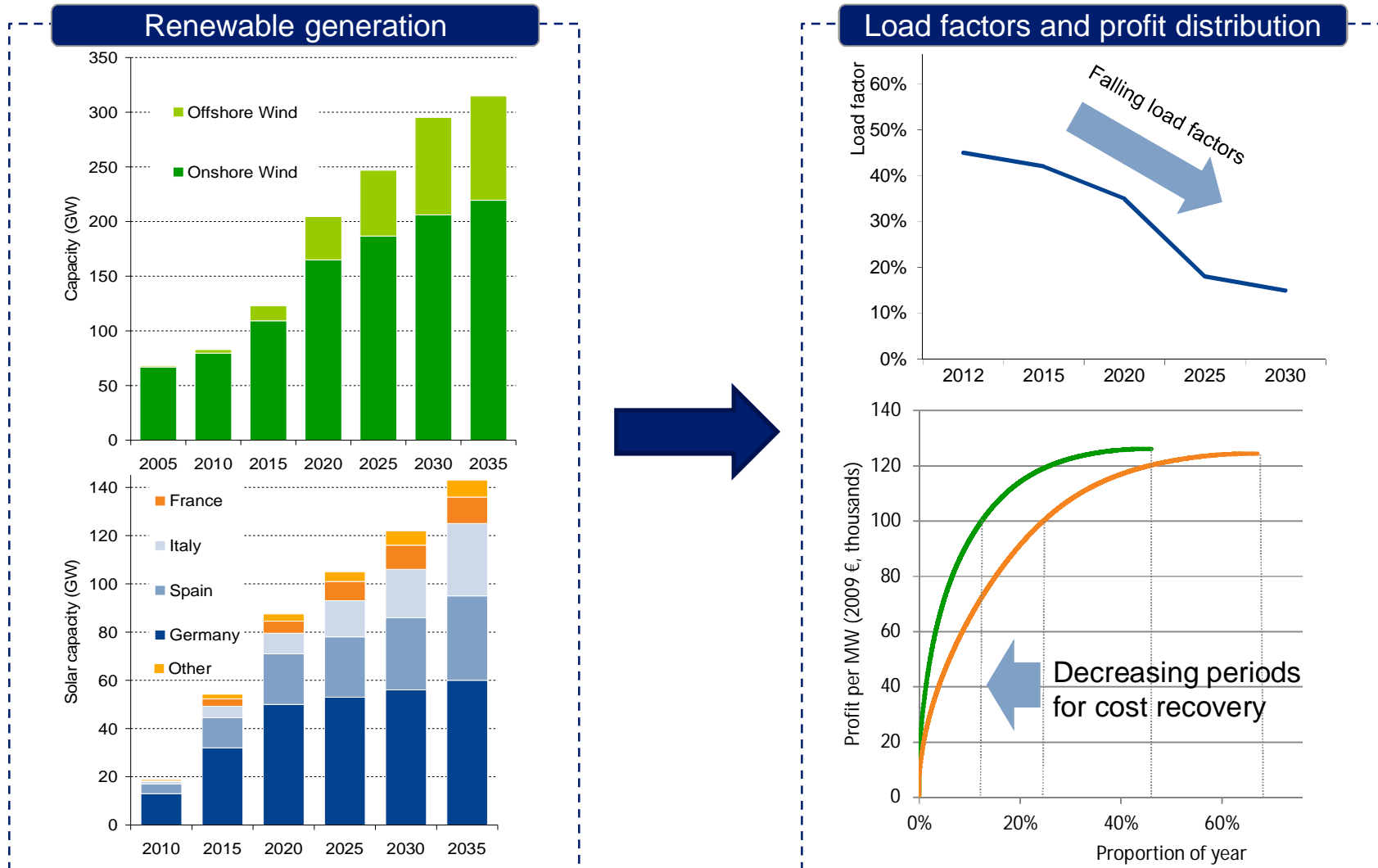
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AGENDA

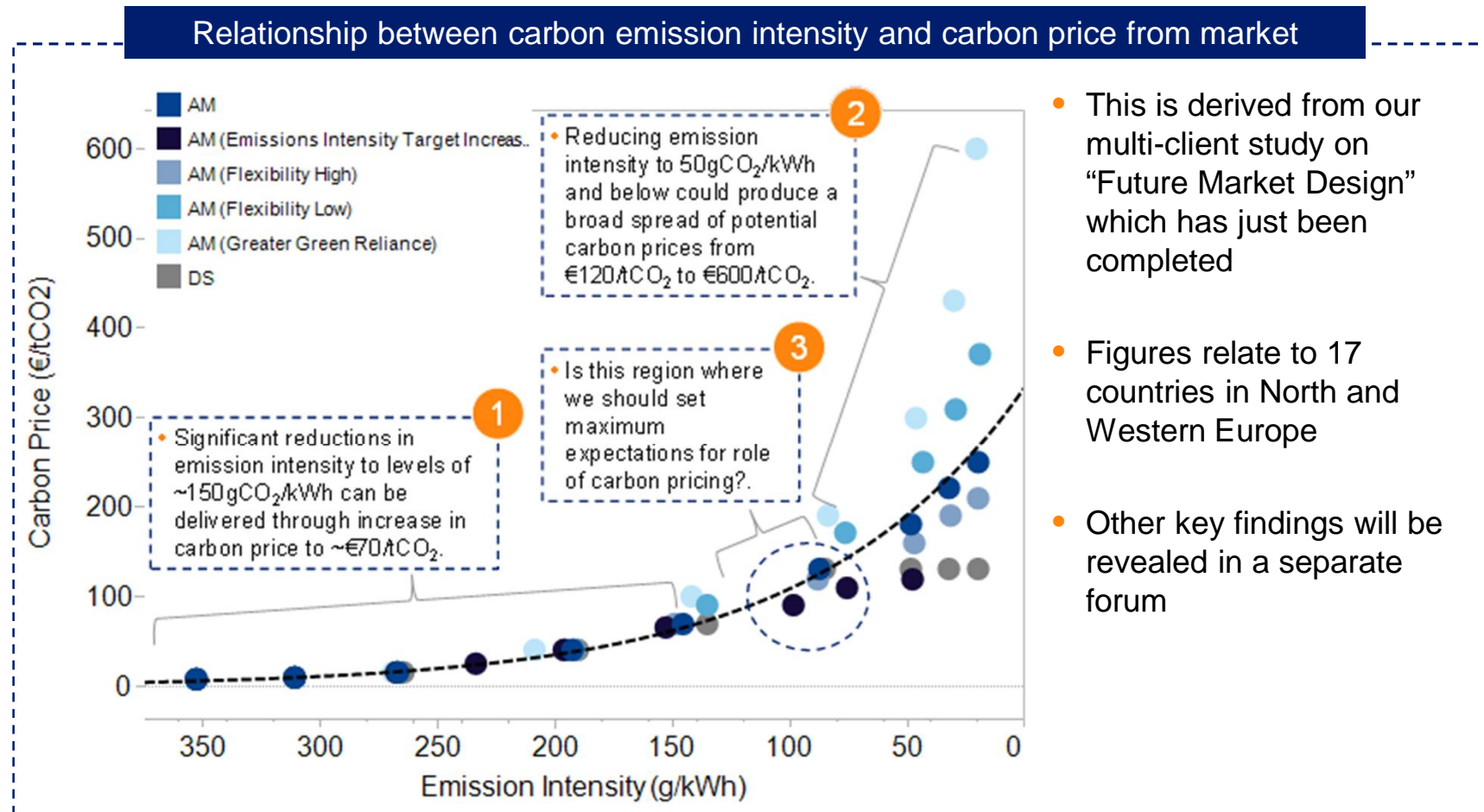
1. > Review of 'to be' arrangements
2. 'Strawman' for trading flexible capability
3. Pöyry's '*Revealing Flexibility Value*' study

Significant growth in autonomous renewable generation will have a knock-on effect on thermal plants and reduce their utilisation



'Flexibility' is one of the keys to unlocking market-based decarbonisation

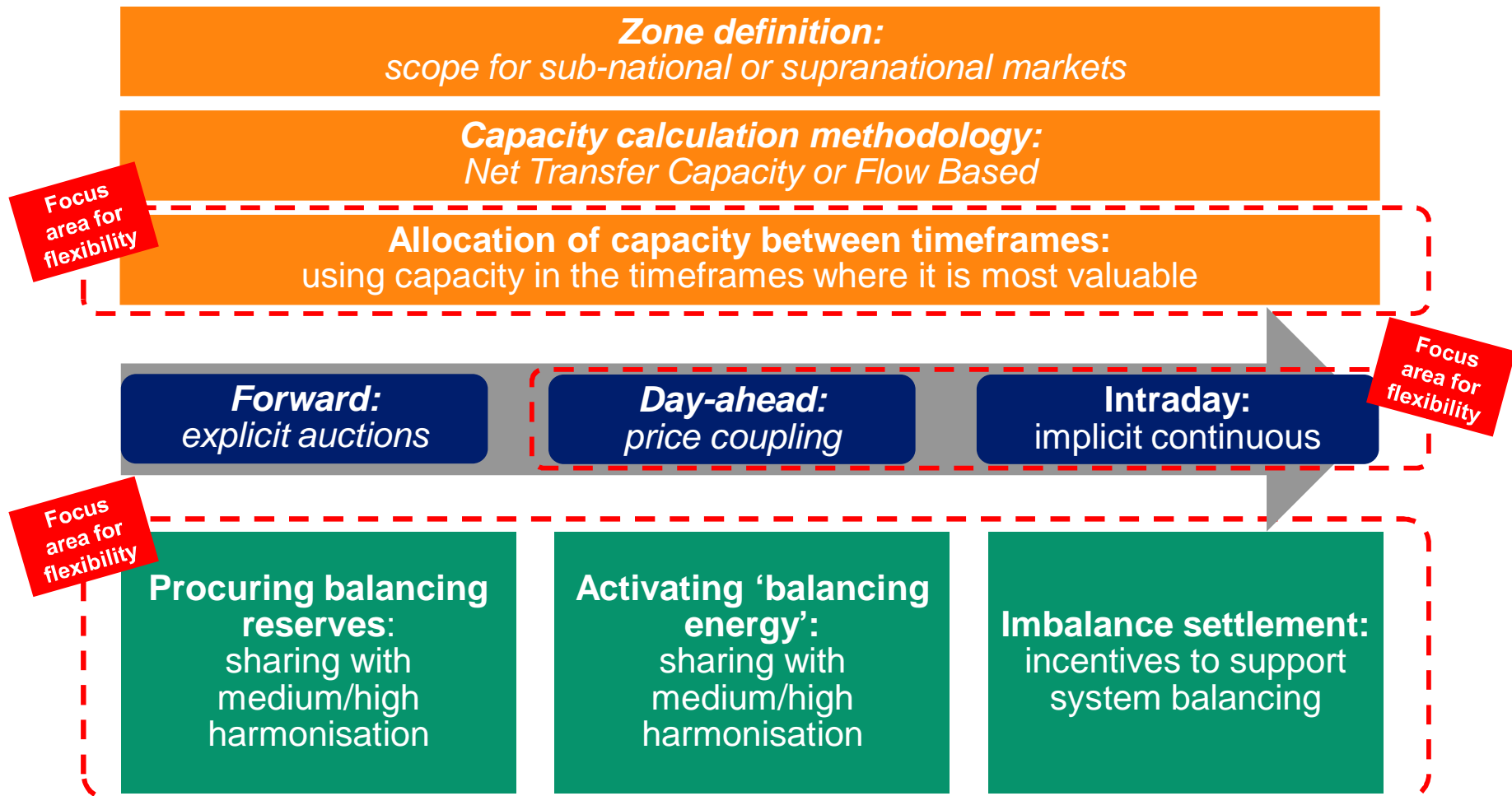
Achieving intensity below 100gCO₂/kWh through market means is dependent on supporting developments, including availability of 'flexibility' in various forms



Based on Pöyry Future Market Design Study

Network Codes define detailed requirements of the 'Target Model'

In principle this is a balanced set of arrangements which would reveal the value of 'flexibility' over different timescales



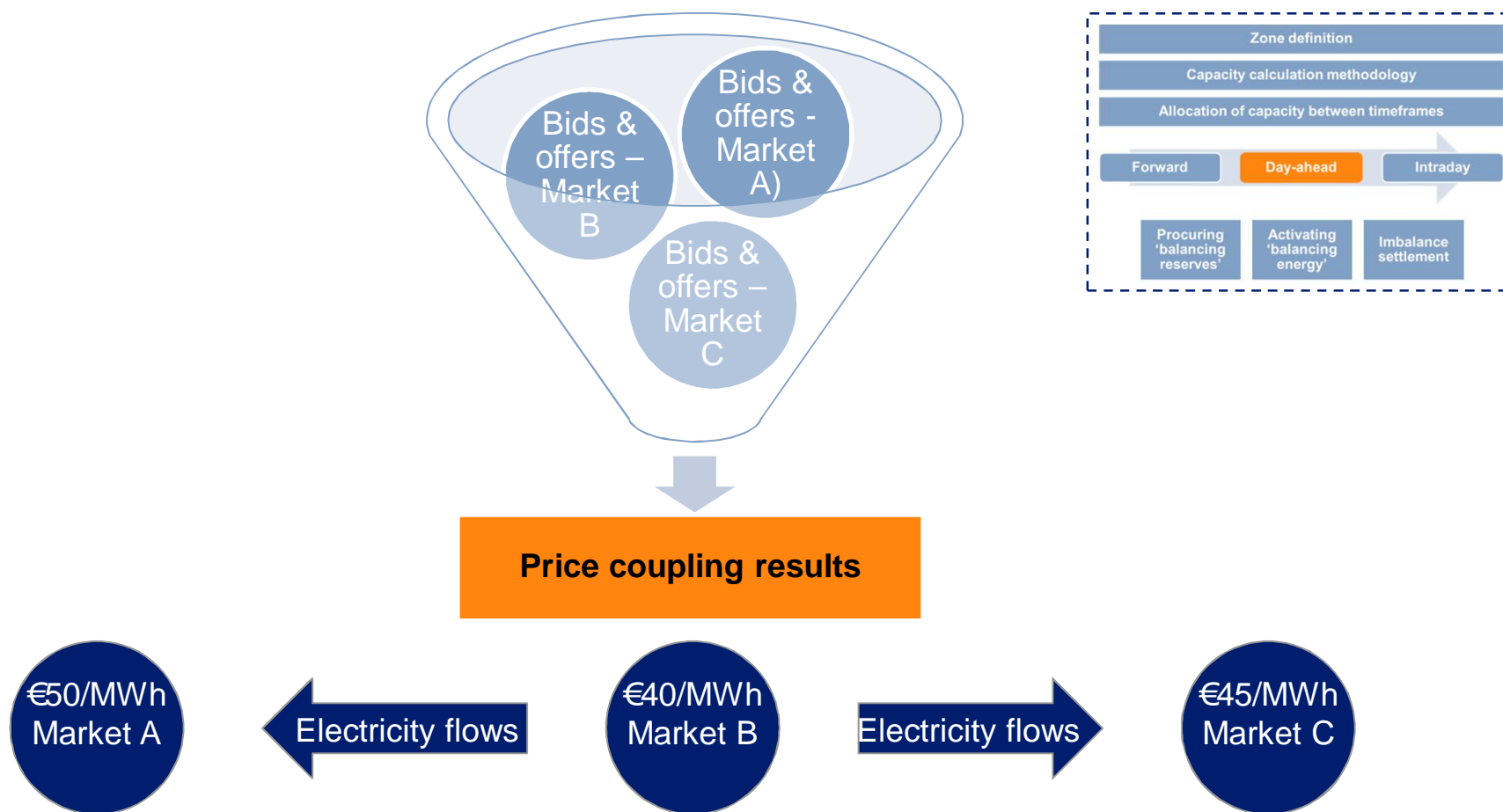
The framework for flexibility will be determined by provisions across all three 'Target Model' Network Codes

Table highlights key Articles in each NC for each building block

Building block	FCA NC	CACM NC	EB NC
Allocation of capacity between timeframes	40&41: Splitting cross-zonal capacity between timeframes	42-49 Algorithm development and amendment	29-33 Cross-zonal capacity for balancing
Intraday		59-71: Continuous implicit & pricing capacity 92-95: Explicit capacity as transitional measure	20 No overlap between intraday and balancing timeframes
Procuring balancing reserves			17&19 Standard products 22 (55&56) Reserve Procurement algorithm
Activating balancing energy			17&19 Standard products 25 Marginal pricing 27&28 (55&56) Activation
Imbalance settlement			47-50 TSO-BRP

A common view is that the Target Model is focused on day-ahead markets when optimising interconnector flows

Prices and flows determined simultaneously in a one-shot auction – Electricity flows low-price zones to high-price zones with no consideration of option value



Outstanding questions

- Will flexible capability be appropriately valued in the market, and how?
- What is the interaction between timeframes – forward, day-ahead, intraday and balancing?
- Will there be barriers to the participation of potential buyers and sellers of flexible capability?
- What is the impact of proposed capacity mechanisms on value of flexibility?
- Will the availability of flexible capability intraday influence whether renewables accept balance responsibility?
- How (and under what circumstances) will intraday capacity be priced?
- Is 'common merit orders' a realistic prospect?

Three key areas from the NC EB

- Approaches for the provision of cross zonal capacity for balancing
- Pricing for balancing energy
- Imbalance pricing

Cross zonal capacity for balancing

For procurement and use of Balancing Services in an efficient, economic and market based fashion there is need to facilitate market integration (including Balancing Services procurement outside the TSOs' area)

Approaches for the provision of cross zonal capacity for Balancing Reserves

Probabilistic

(...on borders where congestion is unlikely)

- Capacity almost always available in real time (and therefore could be used for Balancing Services)
- No need for allocation or reservation

How often is **almost always** ?

Allocation

(... on borders where congestion is likely)

- Co-optimisation of balancing and energy markets
- Value of network capacity is priced in the same way as in the energy market

How to reveal the true value of balancing in a market with a single buyer?

Reservation

(...allowed only outside other market timeframes)

- Either direct reservation or through a predefined nomination methodology (subject to NRA approval)
- CBA to be performed by TSOs

Act as an interim step? Potential contamination of the DA and ID ?

Pricing for balancing energy

Common decision by all TSOs for pricing to provide correct pricing incentives, efficient use of DSR and an effective Common Merit Order List



- Issues around TSOs operating Central Dispatch Systems where changes of bids and offers over the dispatch process can lead to sub-optimal dispatch and high costs
- Market participants might take advantage of prior knowledge of plant dispatch and increase bid prices
- Limited scope for change of bids after the Day-Ahead stage (subject to NRA approval)
- Is a common merit order desirable, and/or achievable?

Imbalance pricing

Imbalance price to be related to what the TSOs (or TSO) have done or avoided to restore system balance or frequency

TSO activating	Balancing Responsible Party Imbalance	
	Short	Long
Upward	Imbalance price \geq weighted average price of FRR and RR	
Downward		Imbalance price \leq weighted average price of FRR and RR

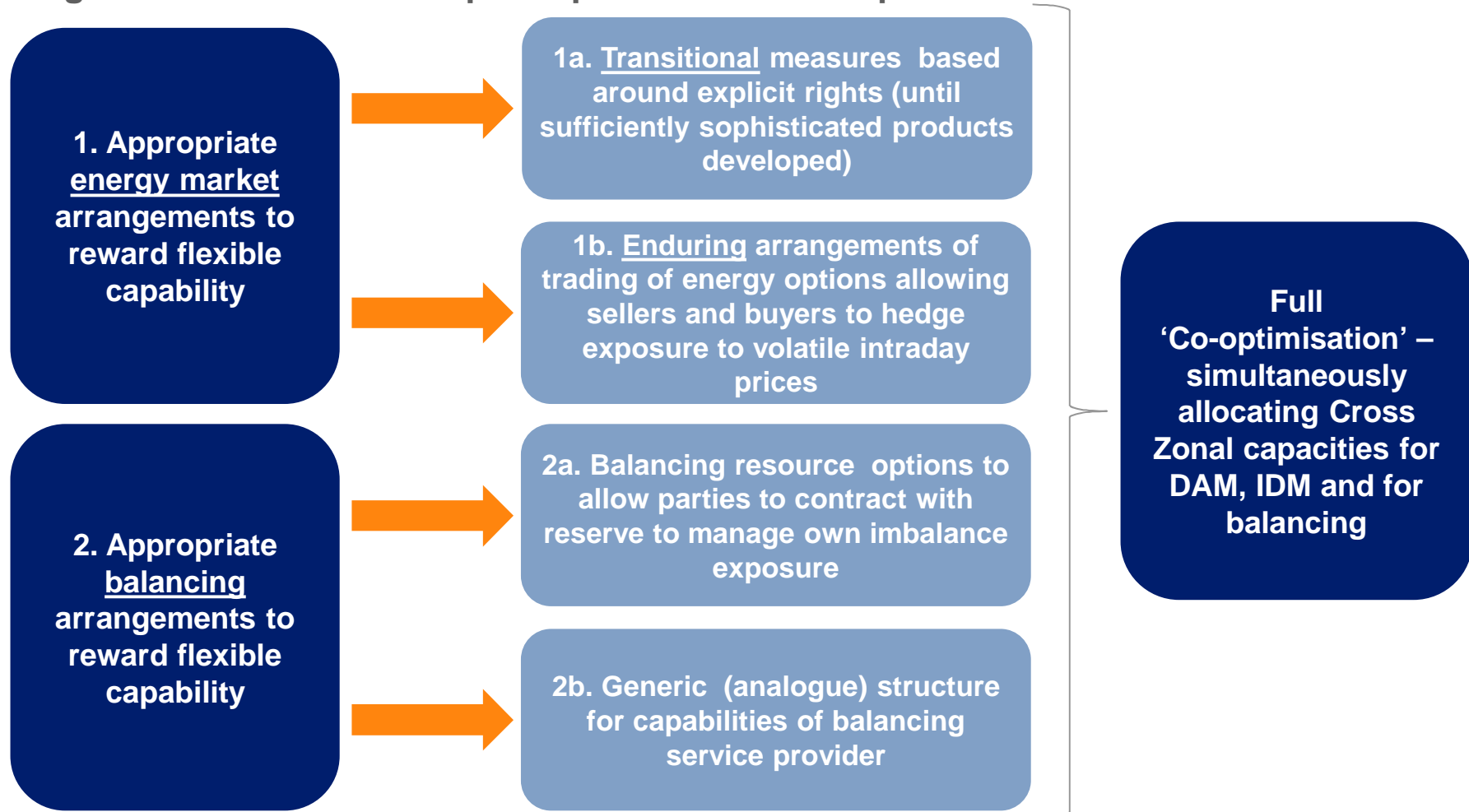
- For marginal pricing of Balancing Energy the average price will equal the marginal price thus giving the right signals to BSPs to provide requested volumes
 - but 'pay as cleared' implies distinct products with common merit orders
- What is the price when the BRP is 'helping out' the system ?
- How are reserve/option fees included in the balancing prices?

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We have developed a strawman option as a starting point for discussions

The ideas behind the strawman option have been discussed with a range of organisations and market participants across Europe



Intraday capacity could be traded explicitly (interim), later moving to trading of energy options as a basis for 'co-optimisation'

There are a series of questions to be answered in defining the strawman options for intraday trading of flexibility across borders

	1a) Transitional	1b) Enduring
What are the options for allocation of cross-zonal capacity for intraday? (in addition to continuous implicit)	Explicit allocation – only after DAM or included in DAM algorithm?	Implicit based on 'coupling' of energy options markets
What are the rules for use of the capacity?	Mandatory or voluntary?	Defined by 'expiry' time of option
How to price the cross-zonal capacity?	Zero priced explicit bids and offers only?	Based on price differences between options in two markets (but options have two prices)

We have considered the rules for the pricing of bids (and offers) for explicit capacity allocation? – Zero price only or not?

This is key decision as to whether explicit bids directly affect intraday capacity price

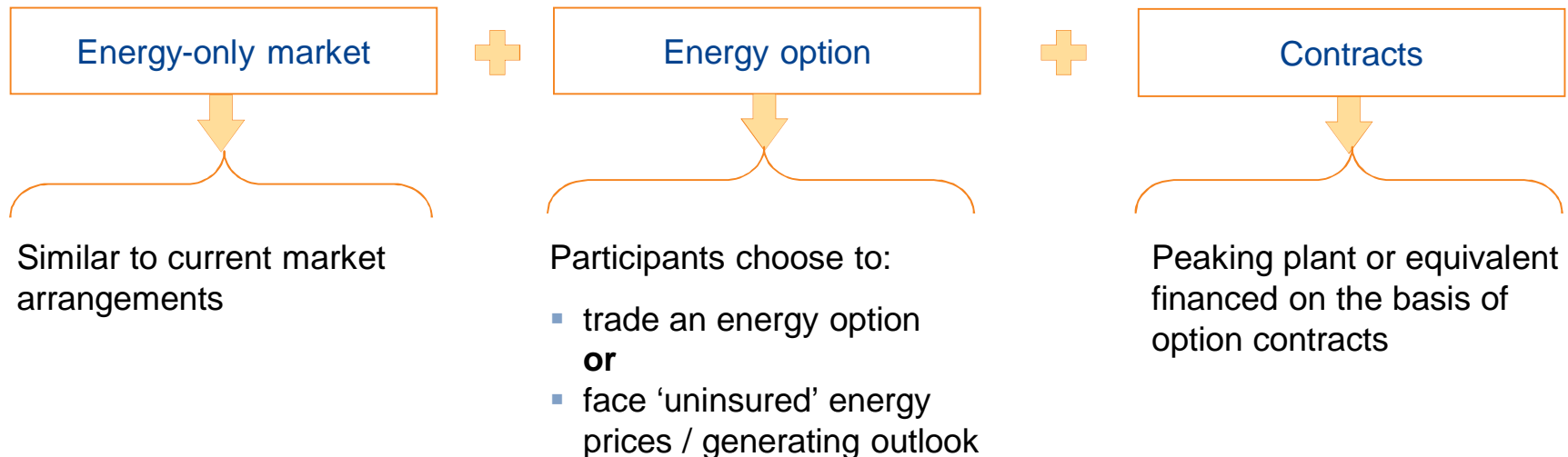
- One view of the world is that explicit capacity rights are a ‘necessary’ evil during transition to enduring implicit solution, only required to facilitate OTC trading:
 - this would support the use of zero priced explicit bids only
 - explicit allocation would never happen in preference to implicit allocation
 - capacity release by TSO would be the only trigger for intraday capacity pricing
 - would fit best with mandatory use of explicit capacity rights
- One of the challenges is that “later traders cannot get access to capacity at any price (assuming congestion)” - non-zero priced explicit bids would allow this, and would:
 - provide a second possible trigger for capacity pricing
 - allow value of explicit allocation to be taken into account in all circumstances in which capacity is priced
 - facilitate non-mandatory rights
 - complicate the algorithm, particularly at times of capacity release

Energy options could provide a route to flexibility trading in the long term

Market based approach for delivering generation adequacy while valuing the ability to adjust i.e. flexible capability

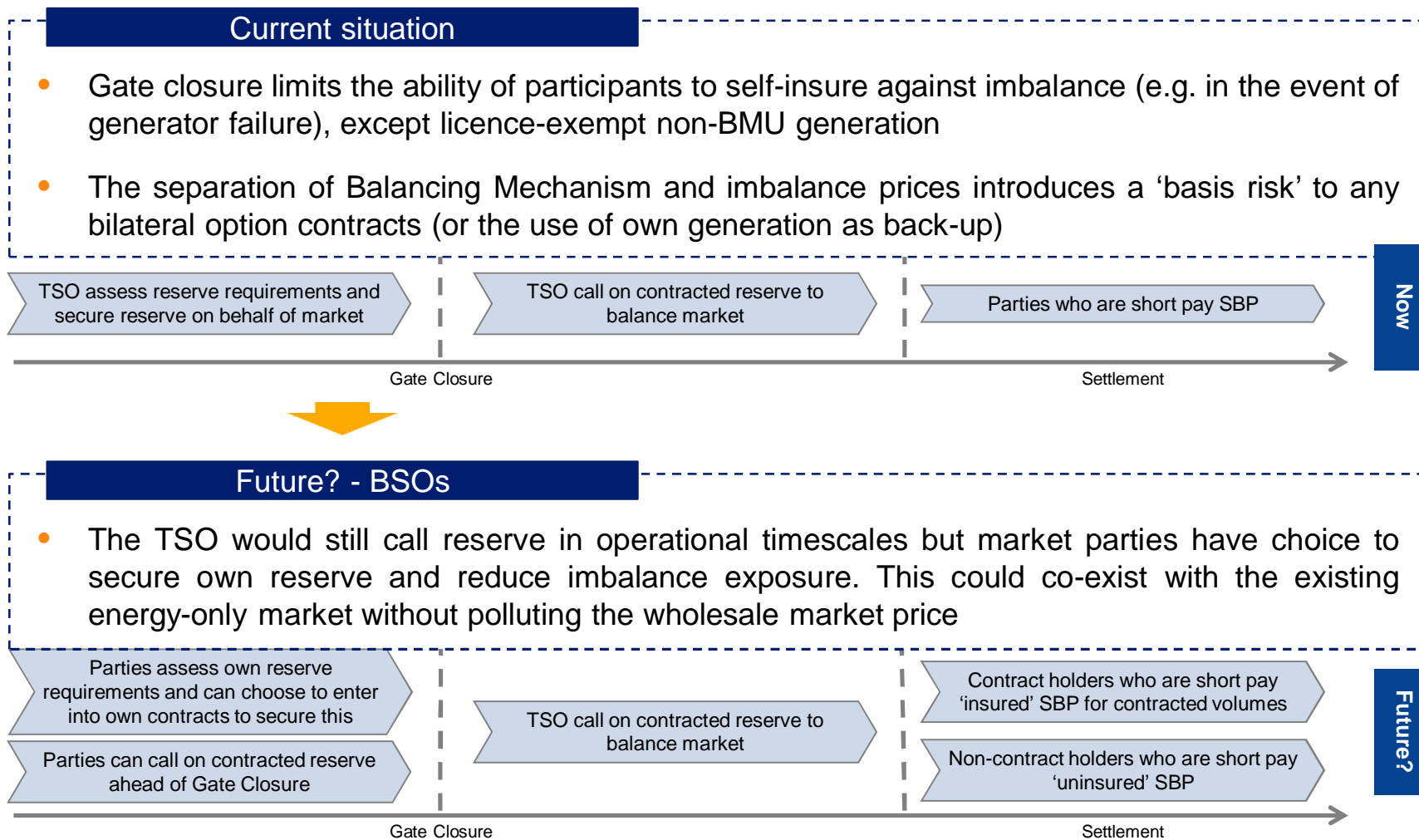
Energy Options

- As present: Flexible generators may not be able to fully cover their costs through prevailing short-term marginal cost based pricing
- This also leads to high peaks in wholesale market price at times of scarcity since flexible generators set their bids to recover their fixed costs over a smaller number of hours
- **Alternative:** Market participants would decide whether and how much to insure against market price fluctuations. This could co-exist with energy-only market without polluting wholesale price



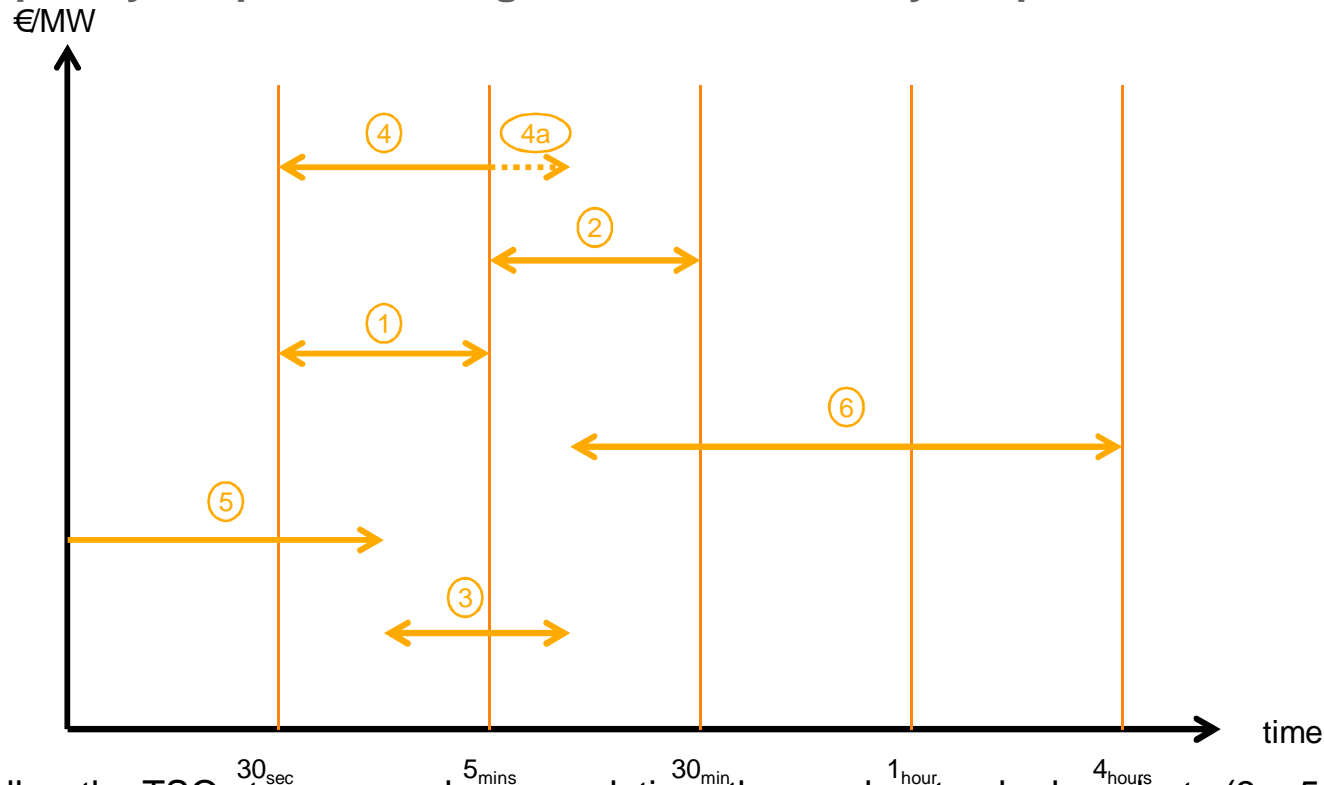
Balancing Resource Options (BRO) are market based alternative for supporting flexible capability through linkage with imbalance

Need to explore interactions with options in intraday market and with cross-border



With appropriate definitions of balancing services, a better result than “common merit orders” is possible

- The concepts can cover everything from the delivery of system inertia and primary frequency response through to more leisurely dispatchable balancing services



- This may allow the TSOs to procure cheaper solutions than under standard products (3 + 5 + 6 rather than 5+1+2+6), and allow innovative solutions from the supply (or demand) side
- How could the Reserve Procurement Optimisation Function be developed to manage this optimisation problem?
- Price discovery could be helped by reporting prices on products that look like standard products

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Objectives of the 'Revealing Flexibility Value' study

Dissemination will be aimed at the audience(s) and the processes which are still on-going; sometimes workstream-specific, other times deliberately addressing cross-workstream issues, and with careful terminology

Market arrangements

- Develop a single market model that provides value for different services
- Explore how to make the market work for selling flexibility whilst simultaneously optimising across locations and timeframes (not sequentially)
- Consider options for market for flexibility, given that the expected change in the generation mix will increase importance of actions in intraday and balancing timescales
- Assess ways of bringing flexibility back into the market (at the right prices)

Products

- Consider how we can move beyond vanilla energy products
- Explore opportunities for new products, including the interaction with existing energy-only products
- Consider which products are needed for electricity markets with high share of intermittent generation, with need to meet requirements of efficient prices, cross-border trading, and maintaining system stability

Market participants

- Consider how System Operators can use products across the interconnectors, including more complex balancing products
- Explore what the Target Model means for interconnector owners
- Assess options for providing more value for flexible plant
- Consider the contribution of flexible hydro including through interconnection

Other

- Explore the impact of flexibility on Security of Supply
- Consider how the Target Model works outside continental Europe

Scope of the study

This will guide the areas in which we differentiate between alternative sets of market arrangements

	Issues for consideration in the study	Issues possibly for consideration in the study	Issues <u>not</u> for consideration in the study
Building blocks of the Target Model	<ul style="list-style-type: none"> • Allocation of capacity between timeframes: DA/ID/BAL • Pricing of I/C capacity in each timeframe • Proposed solutions should be robust to both continuous trading and periodic auctions • Reserve procurement • Definitions of balancing services • Imbalance pricing and quantities 	<ul style="list-style-type: none"> • Capacity calculation methodology: FB / NTC • Forward capacity products (to the extent that they could be taken forward to the intraday market rather than UIOSI at DAM) 	<ul style="list-style-type: none"> • Zone definition (including scope to change over different timescales) • Balance responsibility (the working assumption is that all market participants will have balance responsibility)
Other issues		<ul style="list-style-type: none"> • Capacity payment design • Demand side participation 	<ul style="list-style-type: none"> • Treatment of losses • Planning of interconnector build • 'Countertrading' within zones



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