Markets Forum
28th September 2022

nationalgridESO

Agenda

Time	Agenda
09:15-10:00	Arrival
10:00-10:05	Welcome
10.05-10.20	Introduction and welcome from Head of Markets
10:20-11:20	Short-term priorities: Approach to Winter 2022
11.20-11.35	Break
11:35-12:30	Medium-term priorities: Updates on new projects such as demand flexibility and upward firm regulating reserve
12:30-13:25	Lunch
13:25-14:10	Long-term priorities: Net Zero Market Reform
14.10-14.15	Close to online delegates.
14:25-16:00	Breakout Collaborative Sessions
16:15-16:45	Summary, Q&A and Close
17:00-18:30	Networking event

Net Zero Market Reform

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Overview


Context
Recap
Case for Change
Shaping Packages
Next Steps


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Evolving context

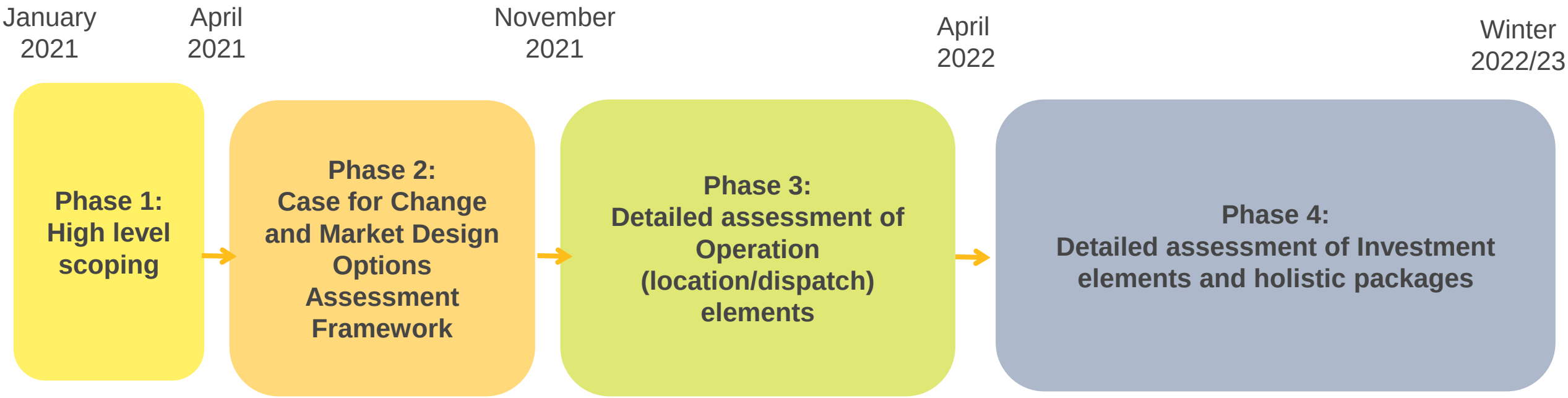
- What has changed since our May publication?
  - **gas price and cost of living crisis**
  - high priority **short-term interventions** to protect consumers, especially the most vulnerable, this winter
  - **GB long-term market reform** debate initiated (REMA and NZMR Phase 3)
    - Launch of Government's REMA consultation
    - Ofgem assessment on locational energy pricing; discussion/feedback on ESO NZMR Phase 3

- Huge challenge of **meeting net zero obligations** remains:
  - **Accelerated investment** in low carbon resources required across the **whole electricity system**
  - Need **vision for net zero power** and **long-term roadmap** for net zero **markets** and **policy**
  - Must deliver system that is **coordinated, efficient and secure, minimising costs and risks for consumers**

This is why REMA is so important, and **our NZMR programme aims to support REMA** by recommending an optimal reform package(s) for net zero, and the pathway to getting there

Recap

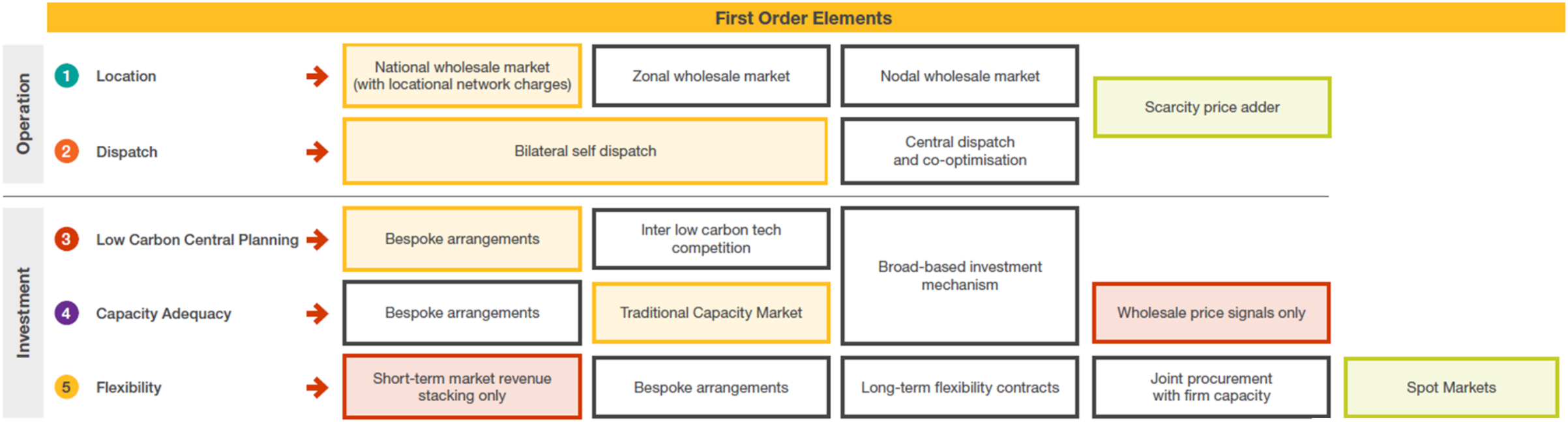
NZMR Project Timeline



Engagement with industry stakeholders and policymakers throughout

BEIS REMA consultation

Market Elements recap



Indicates predominant status quo arrangements

Indicates option eliminated in Phase 2

New option added for Phase 3

Second Order Elements

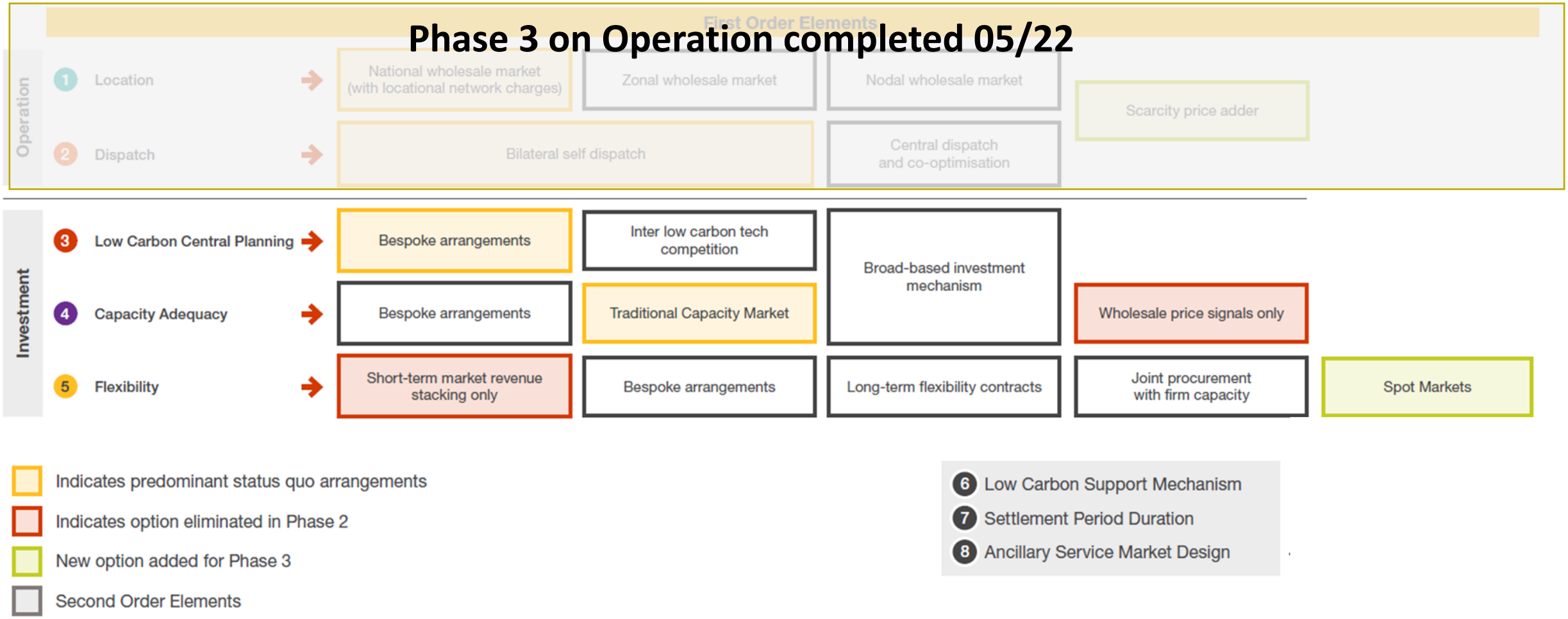
6 Low Carbon Support Mechanism

7 Settlement Period Duration

8 Ancillary Service Market Design

Market Elements recap

Phase 3 on Operation completed 05/22



Net Zero Market Reform
Case for change

Key future needs

There is a need to manage dramatic energy imbalances with **flexible and firm technologies** across both supply and demand

There is a need to **invest** at unprecedented scale and pace

There is a need to incentivise assets to **locate** and **dispatch** where they can minimise whole system costs

Operation case for change (phase 3)

We identified four key issues:

1. Constraint costs are rising at a dramatic rate

2. Balancing the network is becoming more challenging and requires increasing levels of inefficient redispatch

3. National pricing can sometimes send perverse incentives to flexible assets, that worsen constraints

4. Current market design does not unlock the full potential of flexibility from both supply and demand.

Case for change:
Update on case for change with focus on Investment elements of the assessment framework

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EMR successfully facilitated early-stage investment in low carbon technologies, but the economic, policy and system context has changed

Late 2010s energy challenges

Retirements
20% of 2011 electricity generation to close by 2020

High cost nascent technologies
High capex and cost of capital for immature technologies

Missing money & carbon
Missing value due to market design & carbon policy

Moderate carbon ambition
80% reduction in carbon emissions by 2050 and 15% by 2020.

EMR Success

- ✓ Delivered contracts worth ~30GW of capacity by 2030
- ✓ Lowered cost of capital for investment
- ✓ Return of revenues above strike price to consumers (£39m in the last 3 months of 2021)
- ✓ Competitively procured firm capacity, consistently meeting peak demand
- ✓ Rule changes to encourage DSR and distributed assets
- ✓ Supplied the 'missing money'
- ✓ CPS+EPS largely phased out coal

Challenges for REMA

New generation mix and need for flexibility
Significantly more renewable and small / decentralised generation, requiring scale up of flexibility

Need for investment at unprecedented scale and pace
Need high volume of low-cost finance for investment in high-capex (but mature) low carbon resources

Managed exit of fossil fuel
Dispatchable high-carbon plant exiting market - need to ensure orderly exit of plant and replace with low carbon alternatives with 'right' capabilities

Ambitious climate targets
Electricity system needs to be fossil fuel free by 2035

In order to deliver the 2035 decarbonisation objective cost-effectively and without worsening system security issues we must:

1. **Get the most efficient resource mix invested in the right place, entering/exiting service at the right time, but:**

    a. currently there is asymmetry in policy and market design; and
    b. we are not sending the right locational signals.

2. **Ensure all operational signals fully and accurately reflect system needs (internalise marginal costs and externalities - operability, carbon), but:**

    a. market signals are insufficiently granular;
    b. inconsistency in magnitude and targeting of signals through policy and markets; and
    c. policy sometimes shields assets from system value signals or distorts signals.

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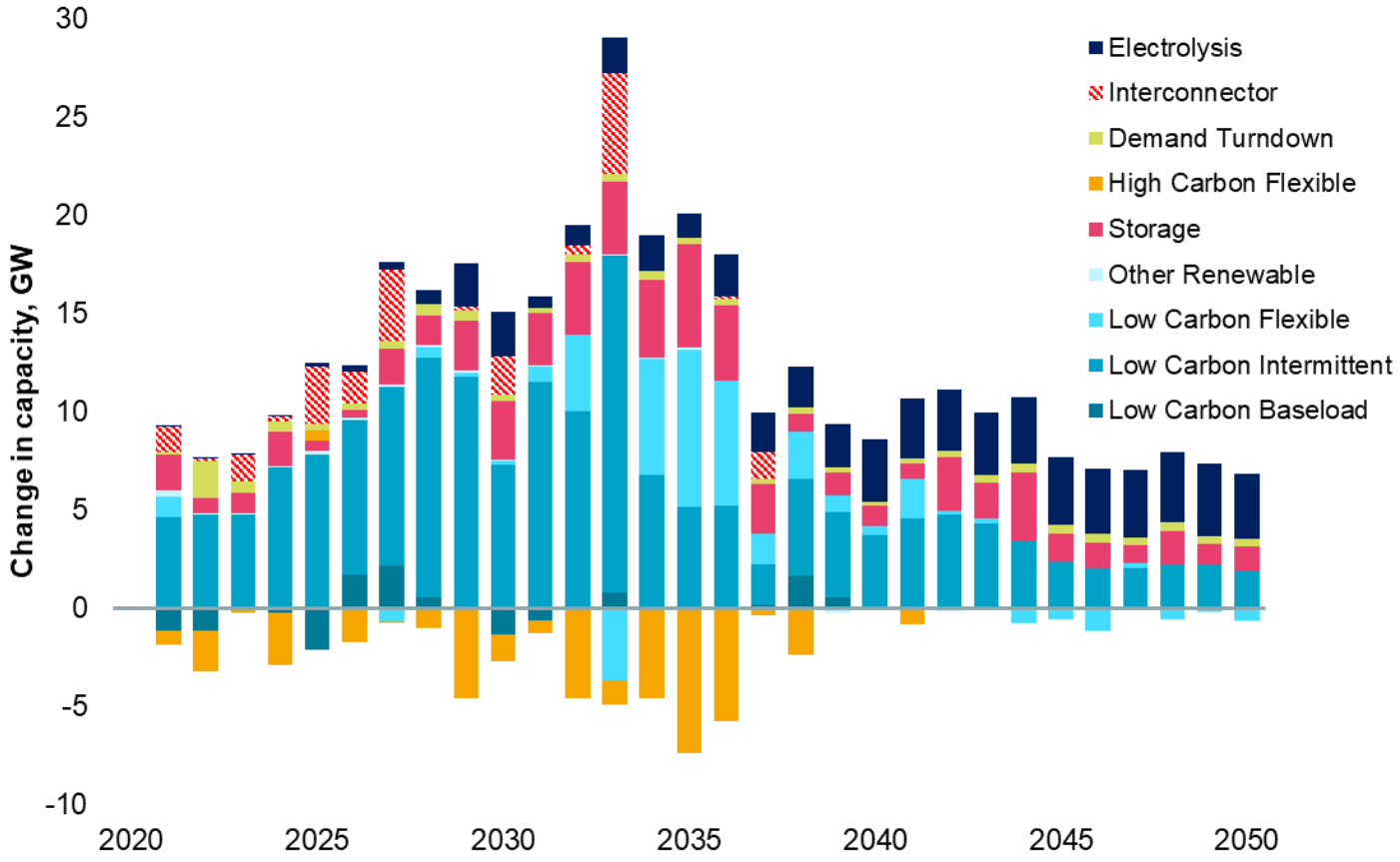
As investment dramatically accelerates, asymmetry in market design and policies must be rebalanced to deliver a cost-optimal system.

- Need to better **coordinate policy and de-risking support** across the whole system:
  - **optimal ratio** of variable renewables to flexibility
  - **implications** for networks, markets and wider system
  - **symmetry of treatment** between producers and consumers, supply / demand, e.g.:
    - **energy efficiency** not for market design to solve - needs massive policy ambition rebalancing;
    - **demand response** impact demand-side opportunities
- **Fuel switching** (electrification) requires **coherent carbon price signals across vectors**

Huge investment needed but lower costs in scenarios with higher demand-side ambitions (e.g. below – Leading the Way)



Long-term expectation of declining baseload wholesale prices reveals need to dramatically scale up flexibility

Baseload Power Price/ Total CfD Support (FES 2020 Leading the Way)

- Declining baseload wholesale prices expected under current market / policy arrangements:
  - more challenging for **merchant resources** to compete, increasing need for support
  - **reduced investor confidence** in future wholesale market
  - **increasing payments to generators** as the CfD top-up to strike price increases. Pass through of these costs to retail bills will **dilute demand response incentives**.

- Issues can be addressed over time through market / policy reforms that enable **system value to be accurately revealed through prices**.

Source: LCP/ FES 202 Leading the Way

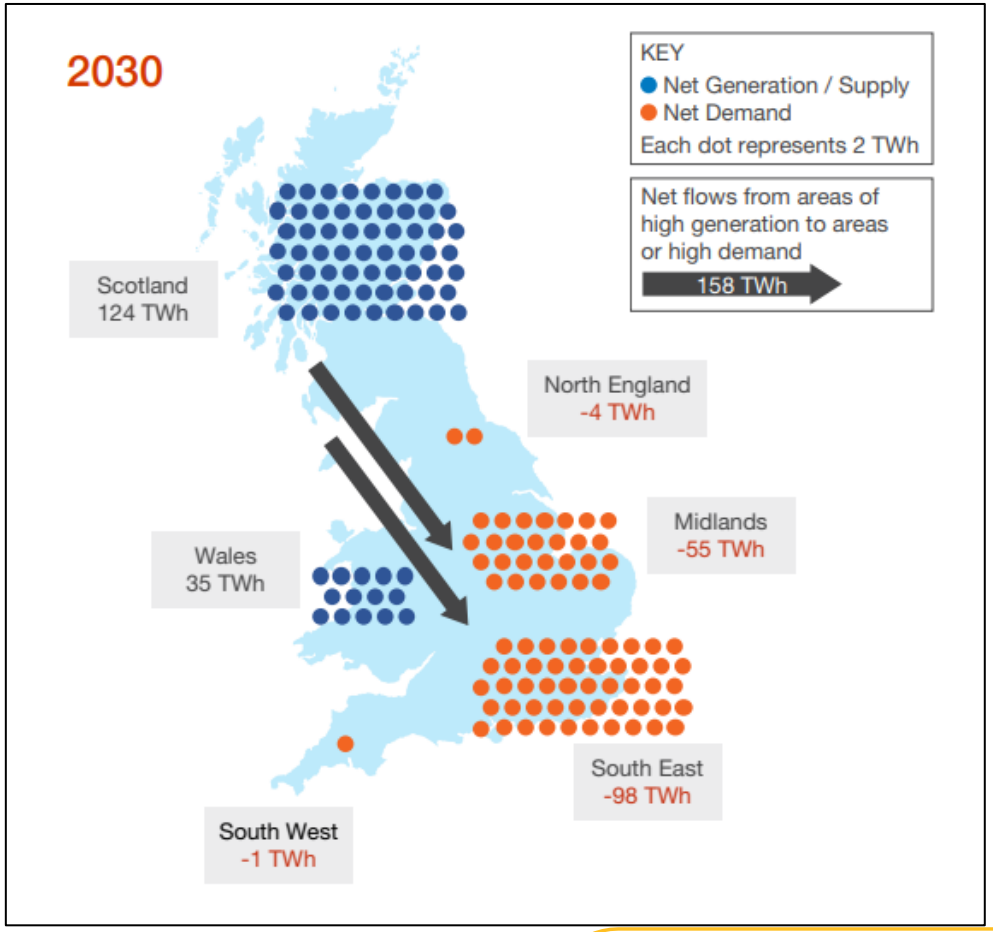
Substantial whole-system efficiency savings can be realised from stronger locational siting incentives

- **~£81.5bn** onshore & offshore transmission investment 2025 – 2050 (CSNP)
- Opportunity for **substantial capacity** to respond to **stronger locational signals**, reducing renewables' **curtailment** and **network development costs/risks**, and improving **industrial competitiveness**

Demand → North & West
- Hydrogen electrolysers
- Electricity-intensive industry
- Data-centres

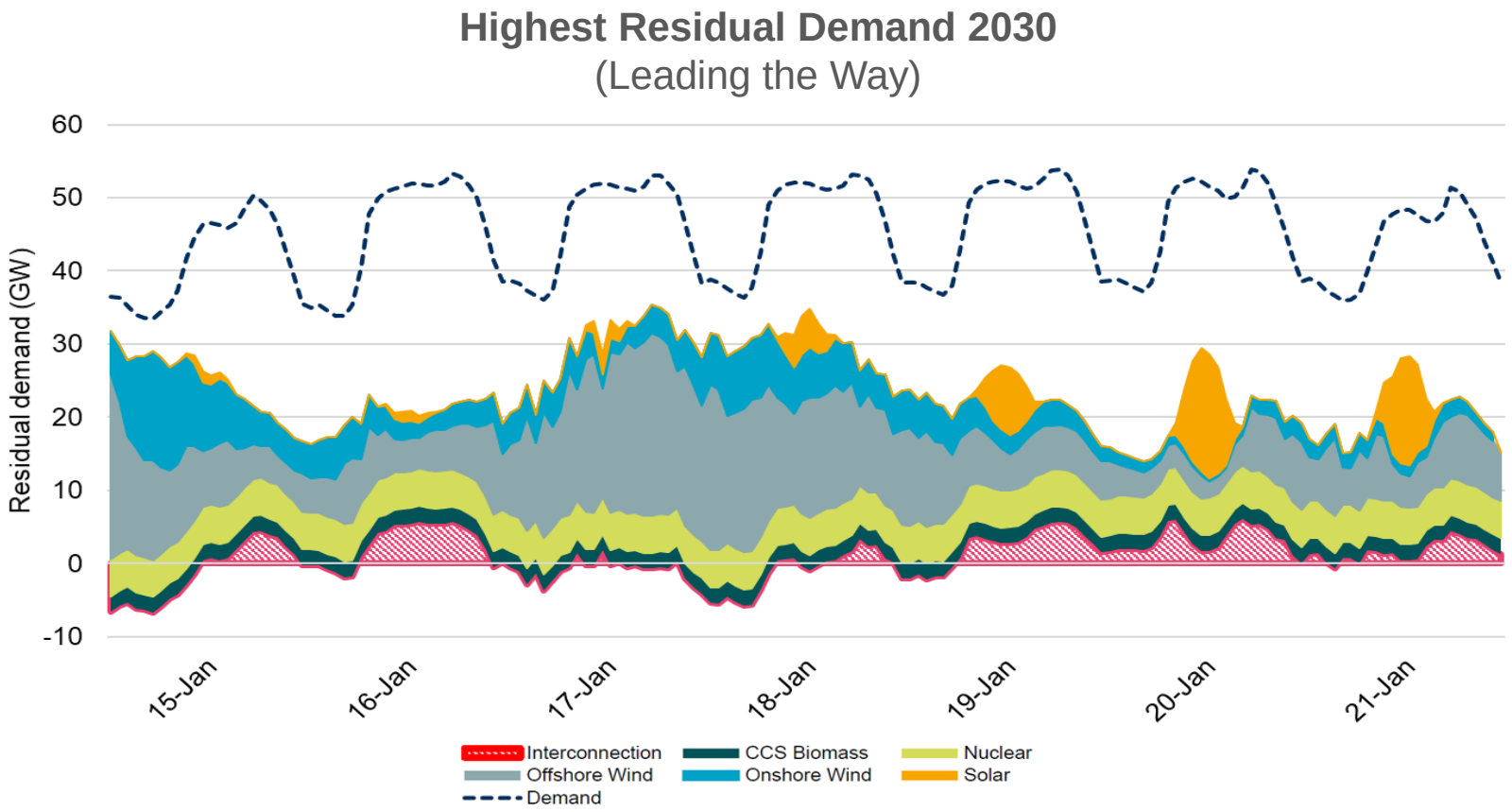
Supply → South & East
- Shift in some wind
- Batteries
- Solar
- Gas/CCS

Regional flows on the electricity transmission network in Leading the Way



Source: FES, Leading the Way

Current market signals (particularly the CM) do not reflect temporal requirements of the system



- CM designed around procuring sufficient capacity to meet **highest estimated winter peak demand,** with compensation targeting providers of that capacity.
- **Sustained response, two-way response, ramping** and other capabilities (and carbon intensity) increasingly needed for **system security** as duration/magnitude of supply/demand imbalances grows and net demand (not served by weather-dependent renewables) becomes more difficult to predict. Resources with these capabilities are **under-rewarded** by the CM for the value they provide.

Note: Worse case week (15/01 to 22/01) based on 10 previous years weather data. Average excess, 21.3GW.

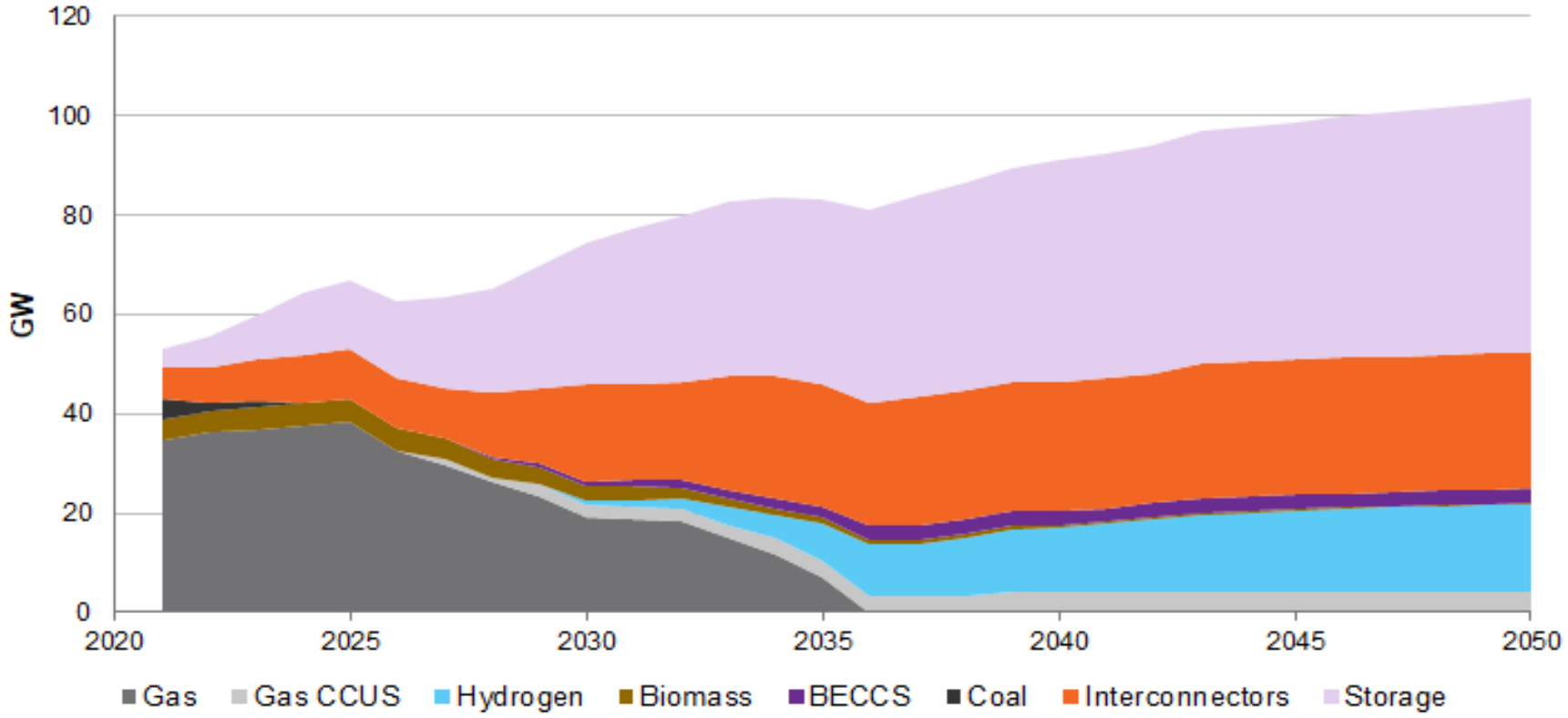
Current market signals (particularly the CM) do not reflect temporal requirements of the system

- **Ambitious, cost-effective and secure carbon reduction** is **dependent on growth and operation of flexible assets** and **efficient orderly exit** of high-carbon plant

- Markets need to **fairly** and **accurately reward** low carbon flexible assets on both the demand and supply sides of the system so **times of system stress** can be precisely mitigated **whenever** and **wherever** they occur

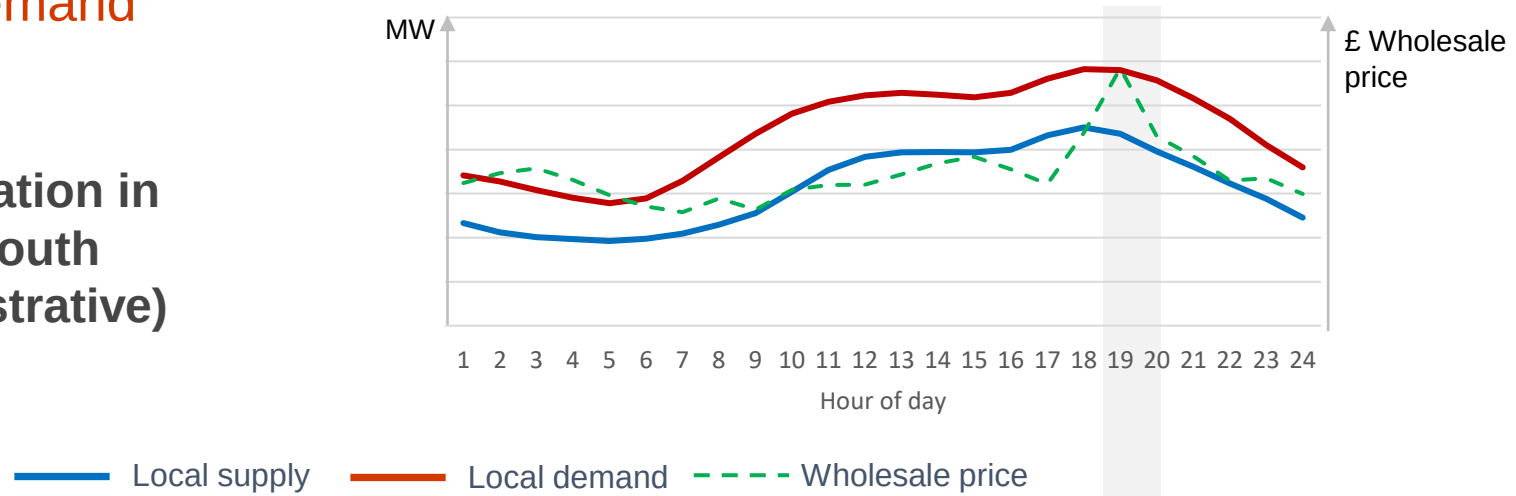
Dispatchable electricity supply sources to 2050

(Leading the Way)



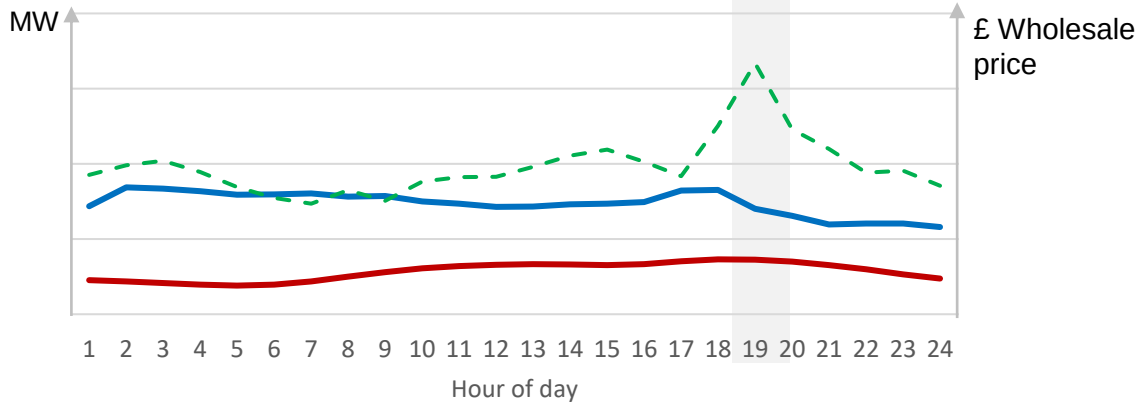
NZMR Phase 3 - lack of temporal and locational granularity in current energy price signals means weak (sometimes perverse) incentives for supply and demand

Location in South (illustrative)



Demand is incentivised to reduce load to address scarcity… (although not as much as it could be)

Location in North (illustrative)

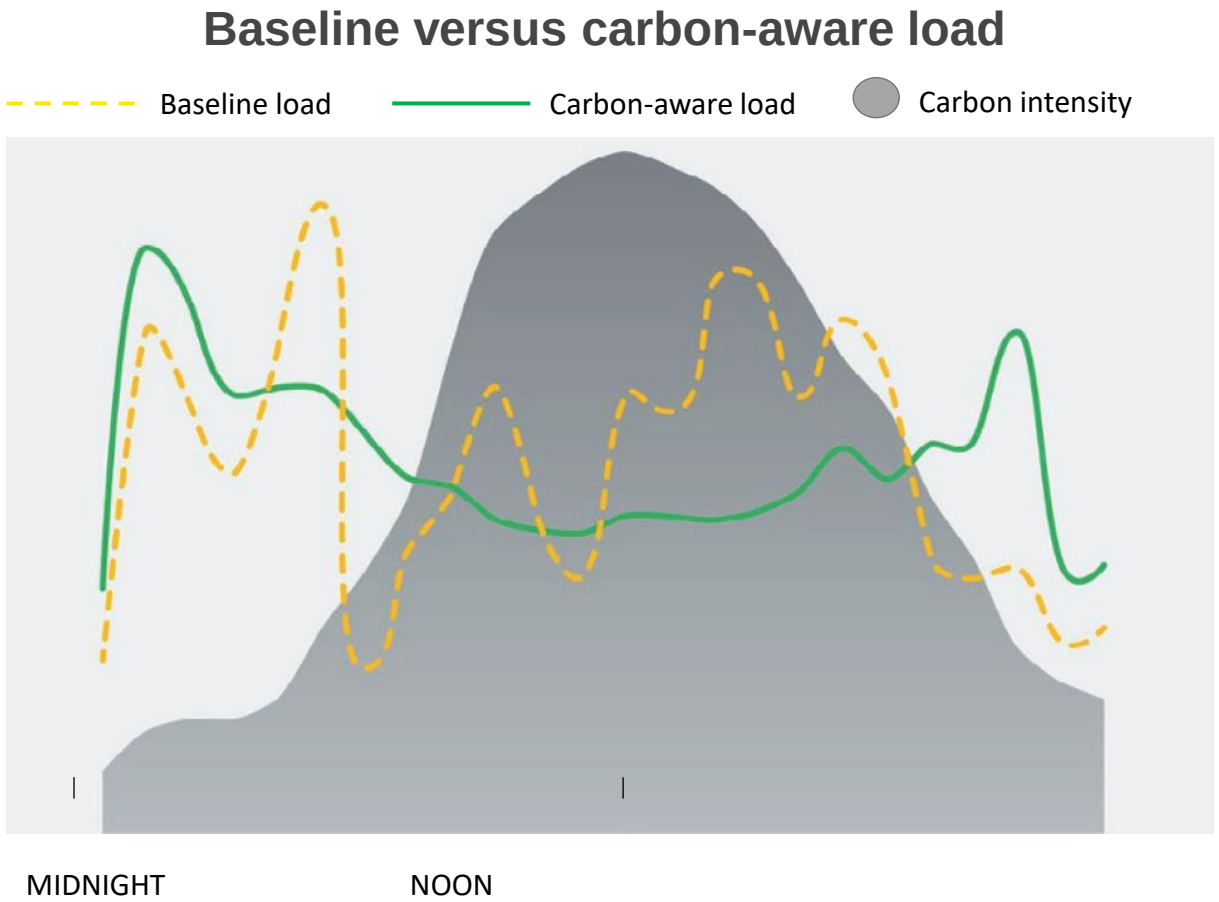


….but low demand location is also incentivised to reduce demand despite no scarcity issue

….and at times exacerbates constraints

Greater granularity of carbon signals would help drive low-carbon investment and flexibility

- **UK ETS emissions cap** covers several sectors that will decarbonise slower than power
- More low carbon capacity does not efficiently reduce emissions if renewables curtailed and redispatch is carbon-intensive. The **carbon intensity of electricity that is both generated and consumed matters.**
- **Temporal carbon signal in market is relatively weak** for some low-carbon resources, particularly those providing low-carbon adequacy or flexible technologies.
- Consumers have **poor visibility** by time/location of **actual carbon intensity** of **delivered/purchased electricity** though consumer demand for 'green tariffs' is strong



Source: Google - https://blog.google/inside-google/infrastructure/data-centers-work-harder-sun-shines-wind-blows/

Inconsistency in magnitude and targeting of signals through policy and markets

- **Missing value** for flex/adequacy in **wholesale market** while value in **procurement mechanisms** outside wholesale market inefficiently growing – CM, BM, Ancillary Services – and **less accessible** for **DER/demand-side resources** compared to **wholesale market** due to high transaction costs (right)
- The costs of these **procurement mechanisms** are passed to consumers via **charges and levies**, (e.g. BSUoS, CfD Supplier Obligation, CM Settlement Costs Levy), which in effect **dampen price signals for accurate demand response**
- **Smart Export Guarantee** for small generators (<5MW) does not accurately reflect system value and these small generators are not eligible for CfDs (auction eligibility starts from >5MW)

Wholesale market missing value for flex/adequacy (e.g. congestion):
Distortions, missing marginal costs, externalities not internalised

↓

More value can consequently and inefficiently end up in **procurement mechanisms**

↓

But compared to the wholesale market, these **procurement mechanisms are less accessible** for small/distributed/demand-side resources

↓

Restoring value to wholesale market would bring efficiency and competition benefits

Policy sometimes shields assets from system value signals or distorts signals

Contract for Difference (CfD) design can distort system integration incentives

- CfD generators **not incentivised to respond to low wholesale prices**
- CfD value impacts **incentive to participate, or changes bid behaviour,** in BM/AS markets

Capacity Market (CM) can interact with spot markets in distorting ways

- Availability payments can impact **spot market bids,** dampening **scarcity value** and **volatility** in prices needed by flex
- Ex-ante de-rating factors averaged for location/time - **risk of inaccurate reward**

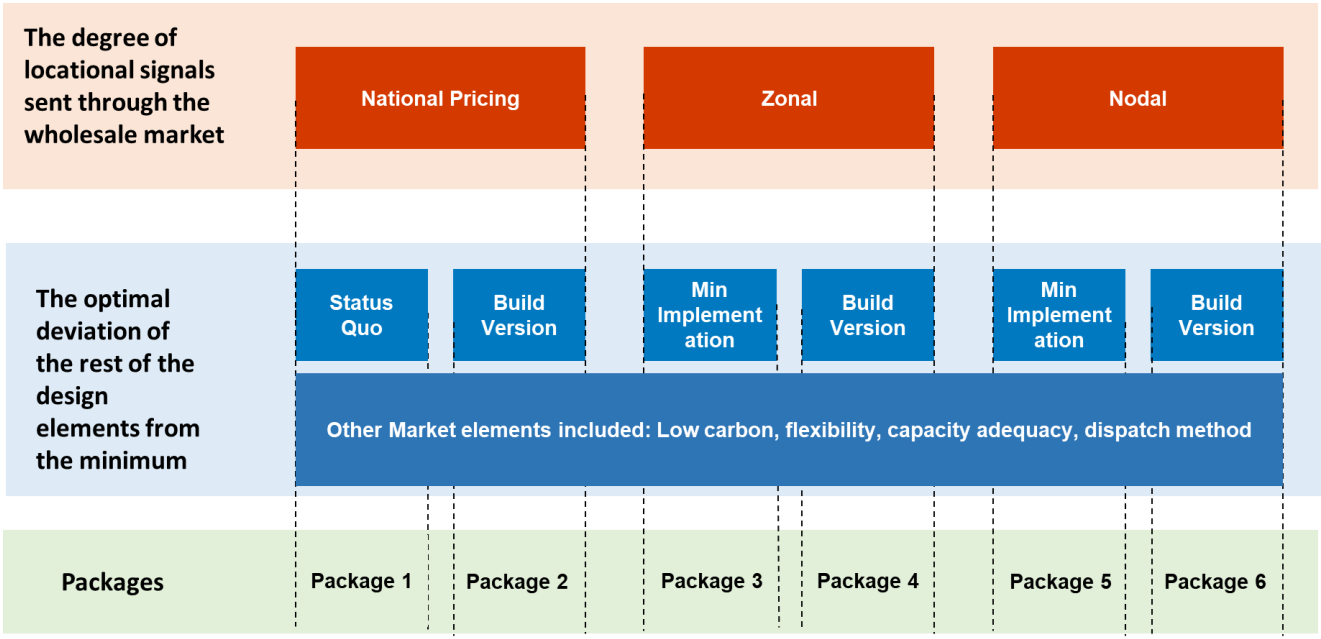
Demand shielded from opportunity to respond to wholesale prices and consumers' price signals distorted

- **Slow implementation** of enabling reforms e.g. MHHS
- **Retail market issues:** incentives for consumers/suppliers for demand response
- CM/AS/BM/CfDs as levies on retail bill - **price signal issues for demand response**

Shaping packages and next steps

Phase 4 Investment options assessment (topic of breakout session)

- **Enhanced assessment criteria -** We have enhanced our assessment criteria
  - Broad categories remain the same, apart from one change to definition of security of supply
  - Sub-categories have been added which allows better scrutiny of our assessment decisions, building on feedback we received in Phase 3
- **Assessment of different market design options** using enhanced criteria
  - Analysed each in isolation
  - Considered how they could be combined to form a complementary package
- **Construction of 6 coherent packages** that we believe will meet vision and objectives to varying degree. Packages vary by:
  - Degree of locational signals through wholesale market; and
  - Deviation of design elements from minimum necessary, in order to achieve better outcomes / confidence



NZMR Next Steps

Current Phase of Analysis

- Detailed assessment criteria
- Assessment of individual market design elements
- Assessment of holistic market design packages against assessment criteria

Publications sequence

- Baringa's Assessment
- ESO's REMA consultation response
- Detailed ESO NZMR report including Phase 4 assessment results and conclusions

We will continue engagement with industry stakeholders and policymakers.

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Q&A

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Close to online delegates

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Appendix – Breakout Session

Net Zero Market Reform

Markets Forum

NG ESO

28 09 2022

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Contents

1. Approach to package design
2. Introduce ‘Baseline’ packages
3. Walk-through a ‘Build’ package

20 minutes

4. Group discussion (15 minutes)
5. Playback from the groups (5 minutes)


Duncan Sinclair


Vlad Parail


Tom Carlucci-Davies


Priyanka Shanbhag


Mike Wilks

Approach to package design

1. Develop sub-criteria (see pg 4)
2. Score long-list of options (see pg 5 and 6) against sub-criteria, with Status Quo as the counterfactual
3. Combine options to design packages for National, Zonal and Nodal pricing market designs reflecting least change. Results in 3 'baseline' packages
4. Build on top of 'baseline' packages to design more ambitious alternatives. Results in 3 'build' packages
5. Assess the 3 Baseline packages against each other, using the sub-criteria weighted depending on priorities
6. Assess each Build package relative to their corresponding Baseline, using the sub-criteria weighted depending on priorities

Process of combining options to develop a package

Criteria	Sub-criteria	Option 1	Option 2	Option 3	Option 4	...	Option X	Package 1-2-3
Criteria 1	Sub-criteria 1					...		
	...					...		
	Sub-criteria X					...		
...	Sub-criteria 1					...		
	...					...		
	Sub-criteria X					...		
Criteria X	Sub-criteria 1					...		
	...					...		
	Sub-criteria X					...		

X

Option 4 incompatible with Option 1 - not combined in example package

Combining options 1, 2 and 3 results in a package that scores consistently better than the options on their own

'Baseline' packages

*For a given pricing mechanism (national, zonal or nodal), what is a cohesive set of policies **entailing minimal deviation from the existing policy tool-kit**, which address the key areas in the case for change.*
Implicit in this is the prioritisation of deliverability.

'Build' packages

For a given pricing mechanism, what cohesive set of policies would increase the confidence in achieving the REMA objectives (i.e. score more strongly against the assessment criteria) over the longer term.

The 6 packages

National	Baseline	Build
Zonal	Baseline	Build
Nodal	Baseline	Build

National baseline vs National build

Zonal baseline vs Zonal build

Nodal baseline vs Nodal build

National baseline vs Zonal baseline vs Nodal Baseline

National build vs Zonal build vs Nodal build

Assessment criteria and sub-criteria

Criteria	Sub-criteria
Value for Money	Reduce relative proportion of redispatch
	Improve operational efficiency of interconnectors
	Ensure appropriate risk allocation
	Increase system flexibility
	Reduce inefficient inframarginal rent
Competition	Align markets/avoid distortions
	Better target system costs through market signals
	Promote greater inter-technology competition
	Promote greater market transparency
	Reduce barriers to entry
	Avoid risk of gaming or exploitation of market power
Deliverability	Minimise complexity/interdependencies
	Minimise market disruption
	Minimise implementation cost
	Reduce risk of unproven solutions
	Expedite implementation
Investor Confidence	Respect existing legal framework and rights
	Provide assurance for debt holders
	Provide suitable incentives for equity
	Promote market liquidity
	Minimise ongoing regulatory risk

Criteria	Sub-criteria
Full chain flexibility	Optimise investment in flexibility
	Optimise dispatch of flexibility
	Manage large and extended mismatches between supply and demand
	Promote demand side participation
Whole system	Align investment incentives for cross-vector assets
	Align dispatch incentives for cross-vector assets
Adaptability	Embrace new and evolving business models
	Reduce risk of lock-in or asset stranding
	Adapt to changing technology trends
Consumer fairness	Limit adverse distributional impacts for consumers
	Allow greater consumer choice
	Ensure fair allocation of costs, based on cost-reflectivity
Energy security and system operability	Ensure sufficient capacity to meet peak demand
	Ensure sufficient available energy to manage extended low renewable output
	Ensure sufficient capacity to maintain system operability
	Manage external shocks and unintended consequences
Decarbonisation	Increase probability of achieving decarbonisation objective

List of options considered under baseline and build packages

System dimension	Policy option	Considered for 'Baseline'			Rationale	Considered for 'Build'			Rationale	
		National	Zonal	Nodal		National	Zonal	Nodal		
Mass Low Carbon	Evolved CfD	✗	✓	✓	Changes required to accommodate zonal/nodal pricing	✗	✗	✗	Would be insufficient to remove market distortions as volumes of CfDs increase	
	CfD with deemed output	✗	✗	✗	Significant change	✓	✓	✓	Would remove dispatch distortions	
	CfD with more price exposure	✗	✗	✗	Significant change	✓	✓	✓	Would provide stronger indication of the value of electricity at different times and locations	
	Revenue cap and floor	✗	✗	✗	Significant change	✓	✓	✓	Would reduce dispatch distortions	
	Bilateral CfD/opt out	✗	✗	✗	Significant change	✓	✓	✓	Would allow greater role of market in determining generation mix	New option
	Supplier Obligation	✗	✗	✗	Incompatible with coordinated delivery of large scale infrastructure	✗	✗	✗	As for Baseline	
Capacity Adequacy	Evolved CM	✓	✓	✓	Changes required to promote low carbon flex	✓	✓	✓	As for Baseline	
	Optimised CM	✗	✗	✗	Significant change	✓	✓	✓	Include combination of flex, carbon and locational dimensions in auction algorithm to strengthen market signals	
	Centralised Reliability Option	✗	✗	✗	Significant change	✓	✓	✓	As above, but replacing with financial option that aligns better with centralised dispatch	
	Reverse Reliability Option	✗	✗	✗	New mechanism	✓	✓	✓	Create stronger investment signals for long duration storage/demand turn up to reduce curtailment risk	New option
	Strategic Reserve	✗/✓	✗/✓	✗/✓	Option to bolster security of supply	✗/✓	✗/✓	✗/✓	Option to bolster security of supply	

List of options considered under baseline and build packages

System dimension	Policy option	Considered for 'Baseline'			Rationale	Considered for 'Build'			Rationale
		National	Zonal	Nodal		National	Zonal	Nodal	
Dispatch	Centralised dispatch	✗	✗	✓	Pre-requisite for nodal pricing	✓	✓	✓	Reduces the need for de-dispatch
	Self dispatch	✓	✓	✗	Least change option for national and zonal pricing	✗	✗	✗	Centralised dispatch likely to lead to better efficient operational outcomes
Operability	BAU	✗	✗	✗	Insufficient to promote low carbon flex	✗	✗	✗	As Baseline
	BAU+	✓	✓	✗	Necessary to promote low carbon flex	✗	✗	✗	Assumed co-optimisation with centralised dispatch
	Co-optimisation	✗	✗	✓	Integral to nodal pricing/centralised dispatch	✓	✓	✓	As Baseline
	Local markets	✓	✓	✓	Important for optimising flex locationally. Extension of hybrid DSO-ESO coordination model	✓	✓	✓	Rationale as for Baseline. Co-optimisation model.
Other	Split Wholesale Market	✗	✗	✗	Assuming gas/electricity price de-coupling can be achieved more easily through expansion of CfDs	✗	✗	✗	As Baseline
	Carbon intensity reporting	✗	✗	✗	Improving carbon disclosure	✓	✓	✓	Could be used in conjunction with CfD opt out to ensure large consumers are meeting required decarbonization trajectory
	PTR/FTR	✗	✓	✓	Necessary for managing locational basis risk/grandfathering existing rights	✗	✓	✓	As Baseline
	Shorter settlement period	✗	✗	✓	Integral to nodal pricing/centralised dispatch	✓	✓	✓	Implementable with centralised dispatch
	Scarcity adder	✗	✗	✗	Significant change	✓	✓	✓	In conjunction with wholesale price cap, could help limit market power under locational pricing whilst maintaining strong dispatch signal

New options

Baseline packages

3 of the 6 packages are the 'Baseline' packages shown below, which represent minimal deviation from the existing policy option tool-kit. The national baseline is closest to the existing system.

National Baseline

National pricing

Self dispatch

'Evolved CfD'

'Evolved CM' i.e. Existing CM with refinements e.g. locational de-rating factors

Other policies
Tighter EPS
Sharper TNUoS signal

Zonal Baseline

Zonal pricing

Self dispatch

'Evolved CfD' – CfD with national system Market Reference Price

Existing CM

Other policies
Tighter EPS
PTRs

Nodal Baseline

Nodal pricing

Centralised dispatch

'Evolved CfD' - CfD with national system Market Reference Price

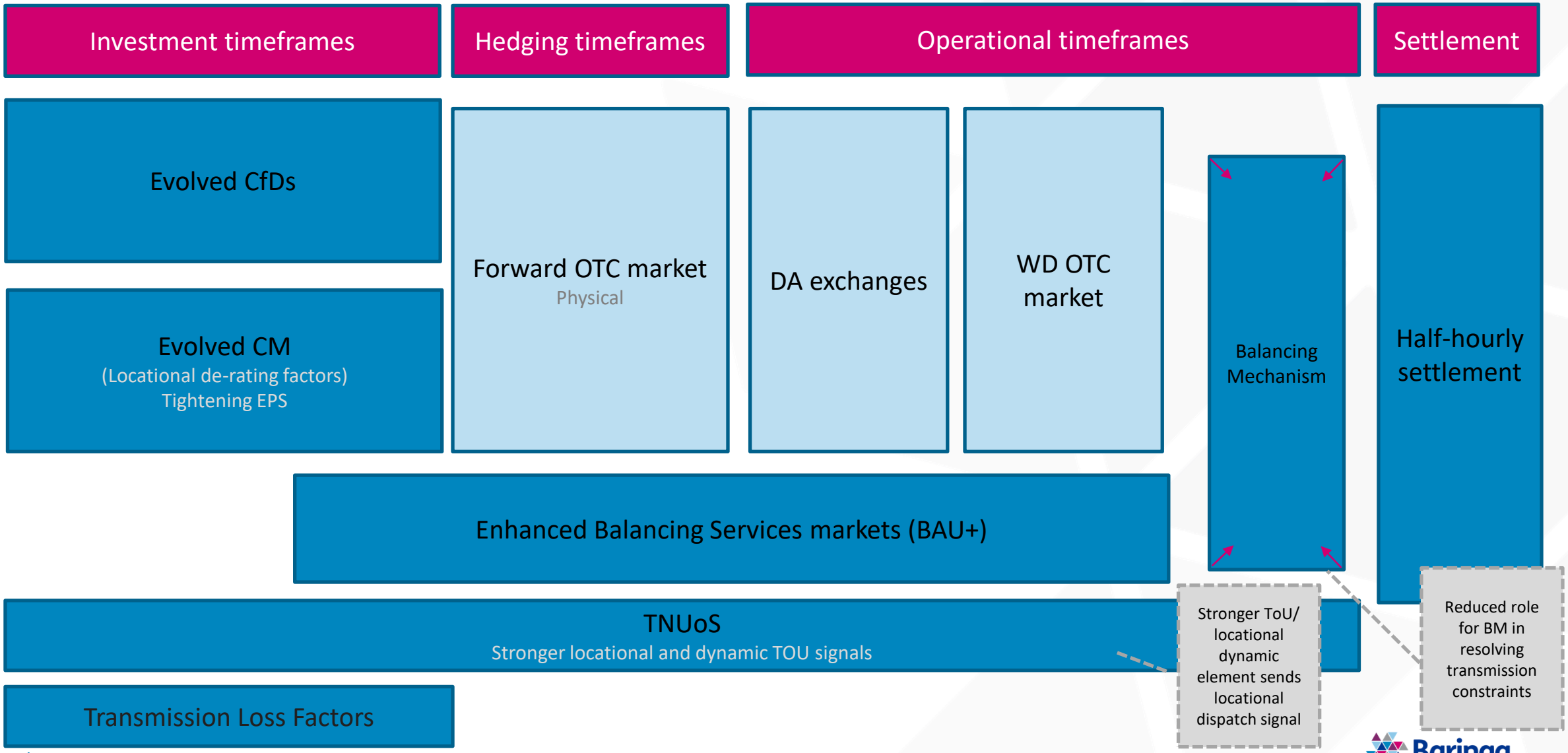
Existing CM

Other policies
Tighter EPS
FTRs
5 minute settlement period

Differences with existing arrangements shown in red

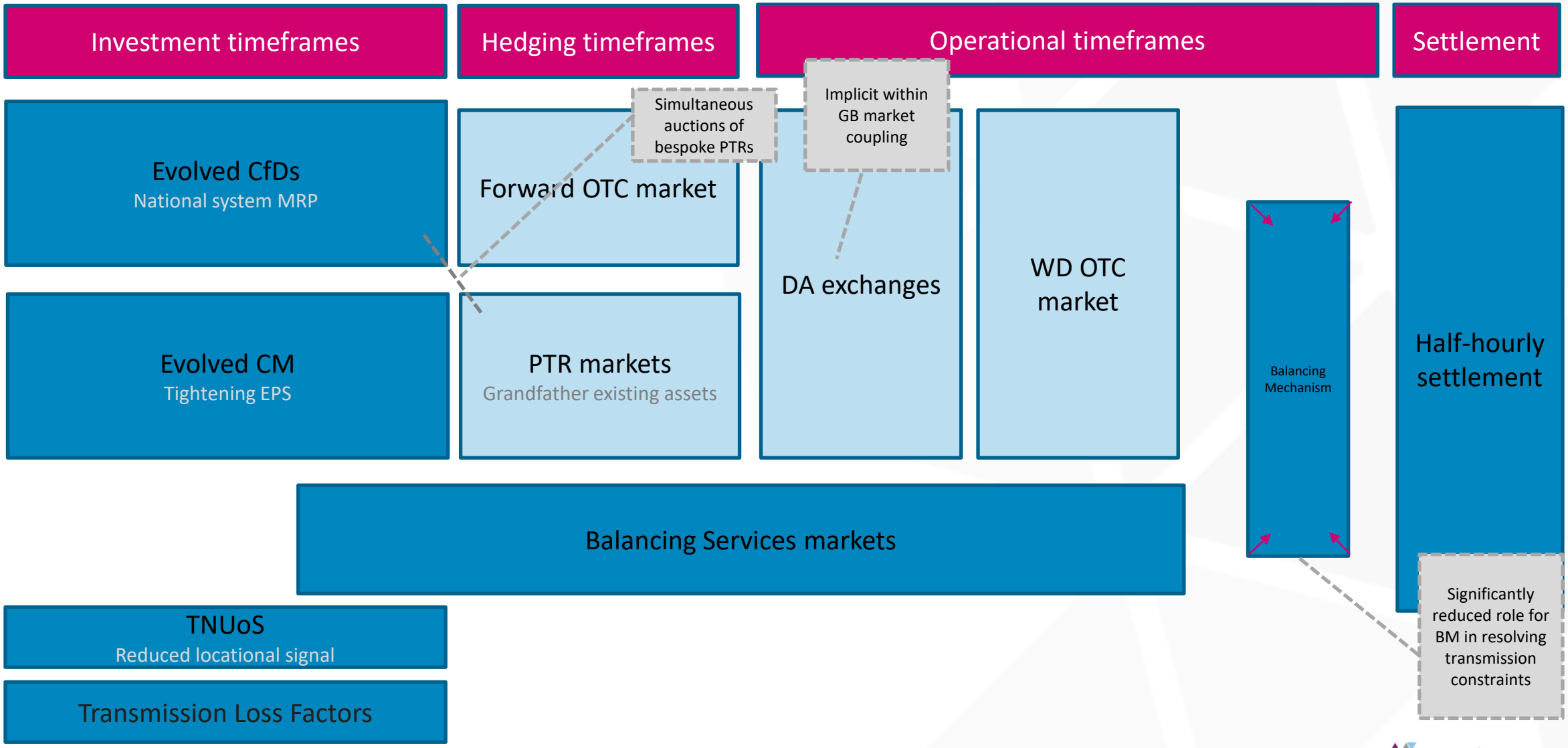
National Pricing – Baseline

Evolution of CfDs and CM, with stronger TOU locational signal through TNUoS reform



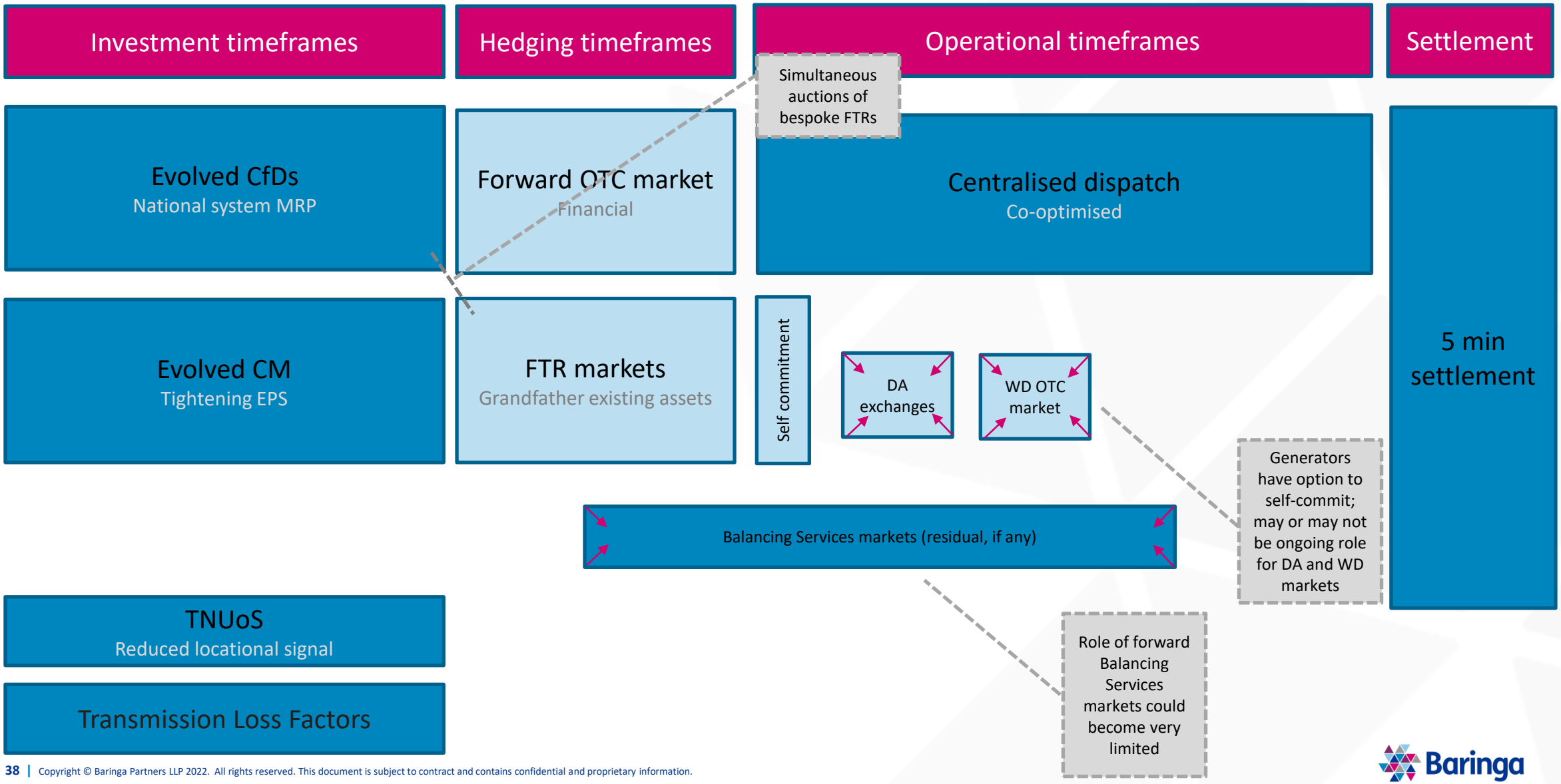
Zonal Pricing – Baseline

Wholesale market split into 10-12 zones; self-dispatch retained; evolution of CfD/CM for zonal pricing



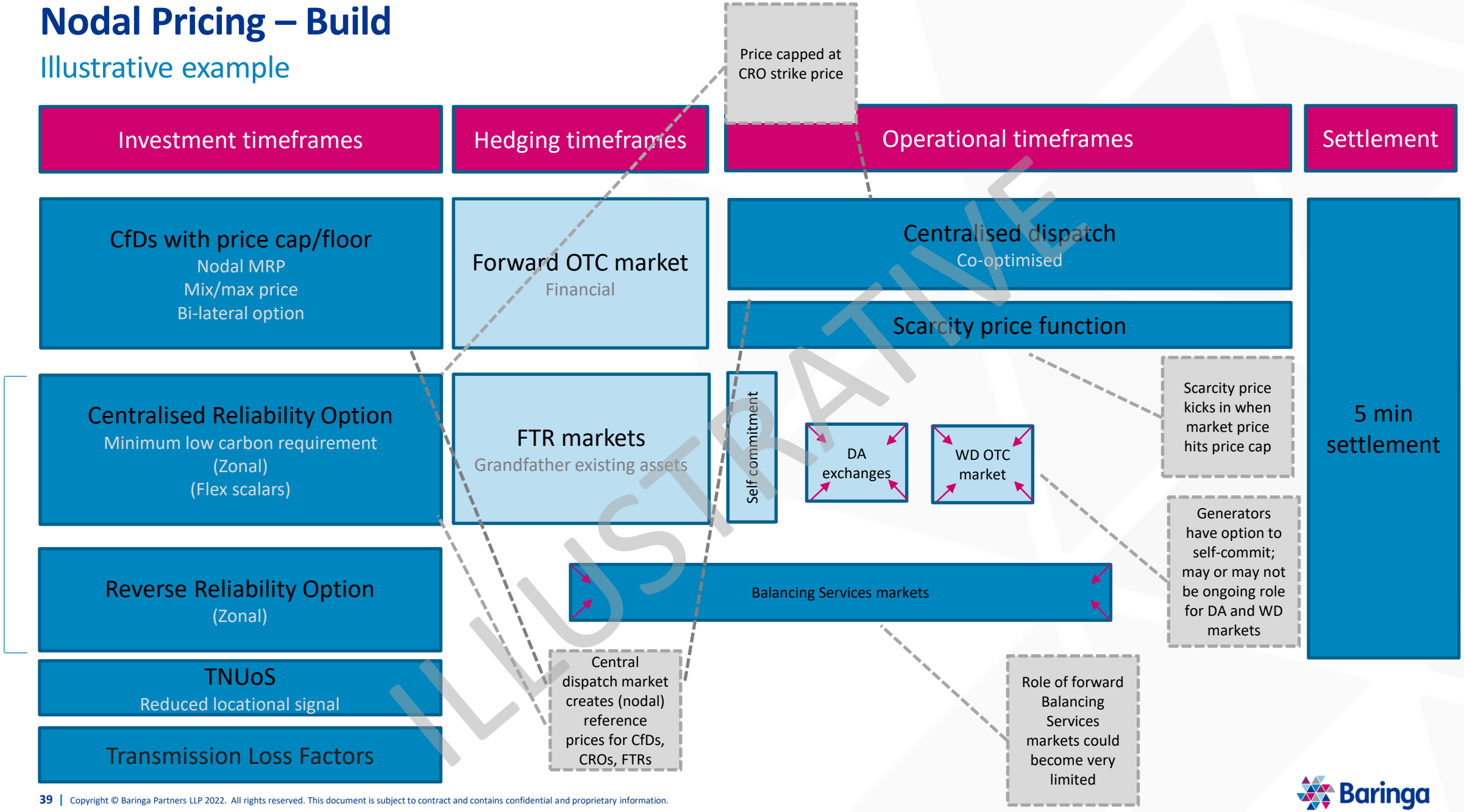
Nodal Pricing - Baseline

Nodal pricing with centralised dispatch; evolution of CfD/CM to accommodate nodal pricing



Nodal Pricing – Build

Illustrative example



Feedback

1. Do you agree with the approach we are using to design packages?

2. Do you agree with the options included in our baseline packages?

3. Do you agree with the options considered in our build packages?

