



National and Zonal electricity market designs for Great Britain

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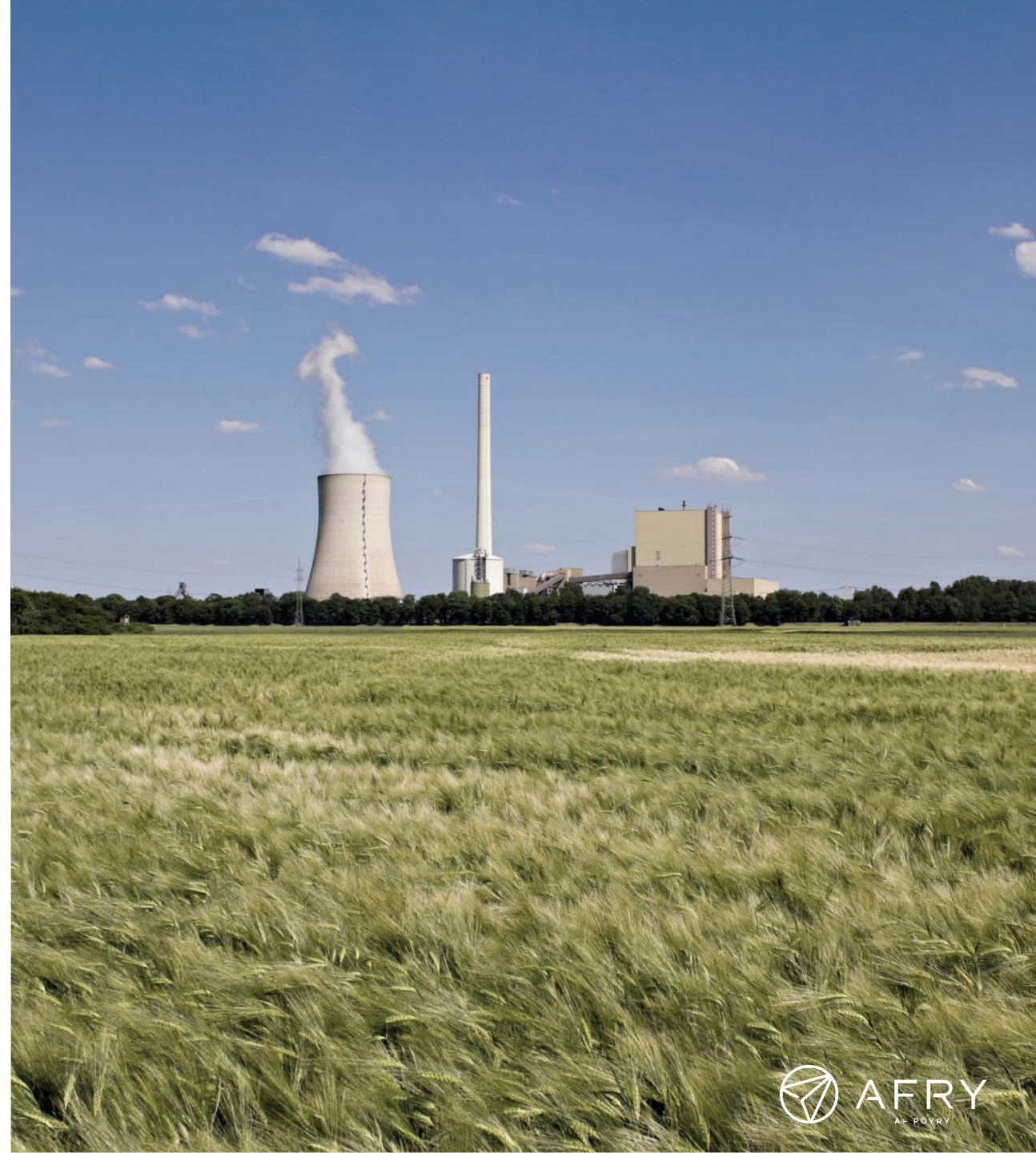
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Before we start...

- Please ask questions throughout the webinar using the question panel – we'll cover as many as we can at the end.
- The slide pack and recording will be available on our website to all attendees as soon as they're available.



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AFRY has completed a multiclient study on options for revised national and zonal power market designs for Great Britain

BACKGROUND

- DESNZ launched its Review of Electricity Market Arrangements (REMA) consultation in July 2022, covering nearly all aspects of electricity market design in Great Britain, with the objective of ensuring they remain suitable for achieving full decarbonisation of the power grid by 2035.
- AFRY has previously carried out a two-phase multi-party study examining options for reform, concluding that an evolutionary rather than a revolutionary approach would be advisable to maintain the investment required to achieve full decarbonisation of the power system by 2035.
- The second REMA consultation was published in March 2024, ruling out further consideration of nodal pricing, and restructuring the remaining options for reform around four key challenges.
- AFRY has responded to the second consultation following another multi-party study, focusing on the challenge of operating and optimising a renewables-based system cost-effectively.
 - AFRY has also recently completed work for National Grid ESO on the case for change from the current scheduling and dispatch arrangements¹.
- We have qualitatively examined four market design strawman based on zonal or national pricing, with and without centralised dispatch.

THE FOUR CHALLENGES IN THE SECOND REMA CONSULTATION

 - Focus for AFRY's May 2024 study on national and zonal market design



Challenge 1: Passing through the value of a renewables-based system to consumers



Challenge 2: Investing to create a renewables-based system at pace



Challenge 3: Transitioning away from an unabated gas-based system to a flexible, resilient, decarbonised electricity system



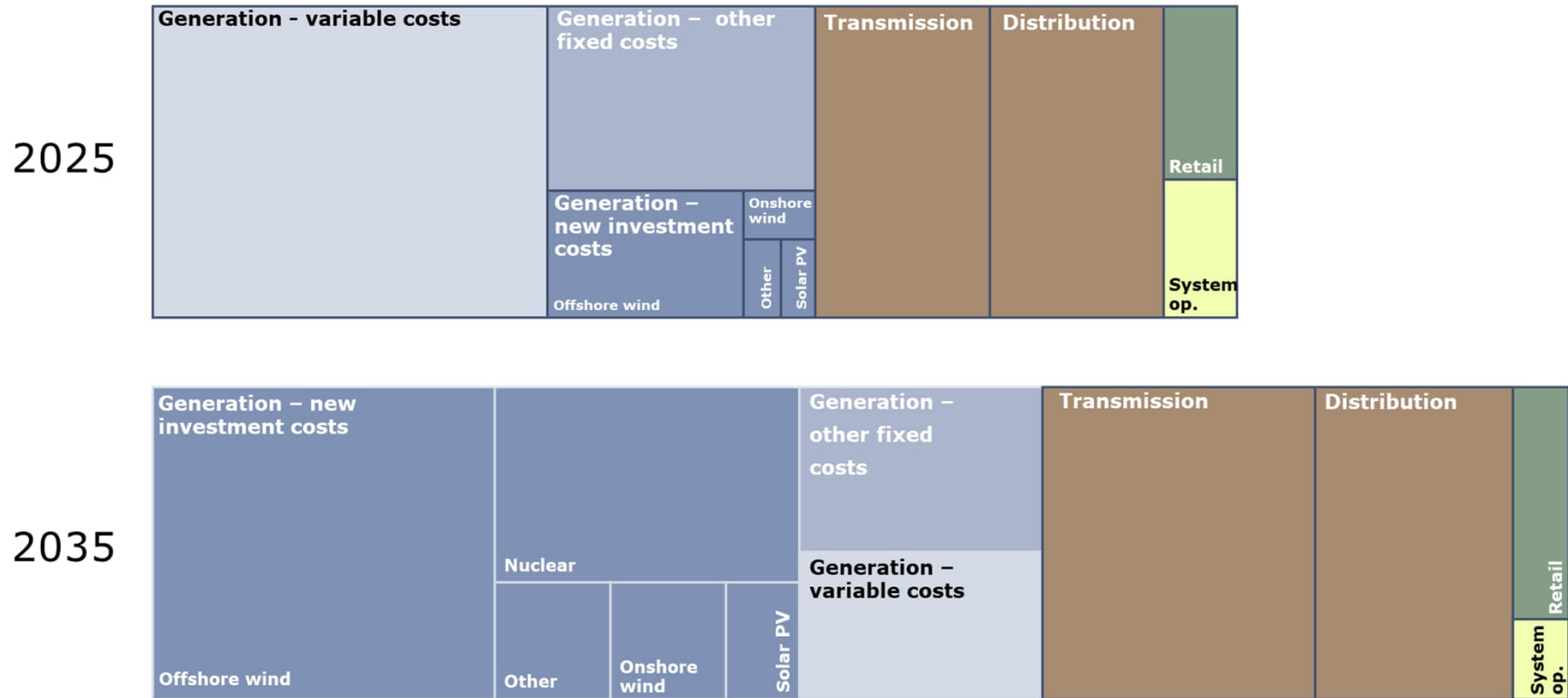
Challenge 4: Operating and optimising a renewables-based system, cost-effectively

- We are grateful to the 13 industry members that have supported the work, both financially and through their active participation in the debate. We also extend thanks to the 5 observer organisations who have participated in discussions.
- The study findings represent the independent opinion of AFRY and may not be attributed to any of the parties who supported the process.

¹ National Grid ESO's Net Zero Market Reform project <https://www.nationalgrideso.com/future-energy/projects/net-zero-market-reform>

Possible benefits of improved operational efficiency from revised market arrangements have to be weighed against potential increases in investment risk

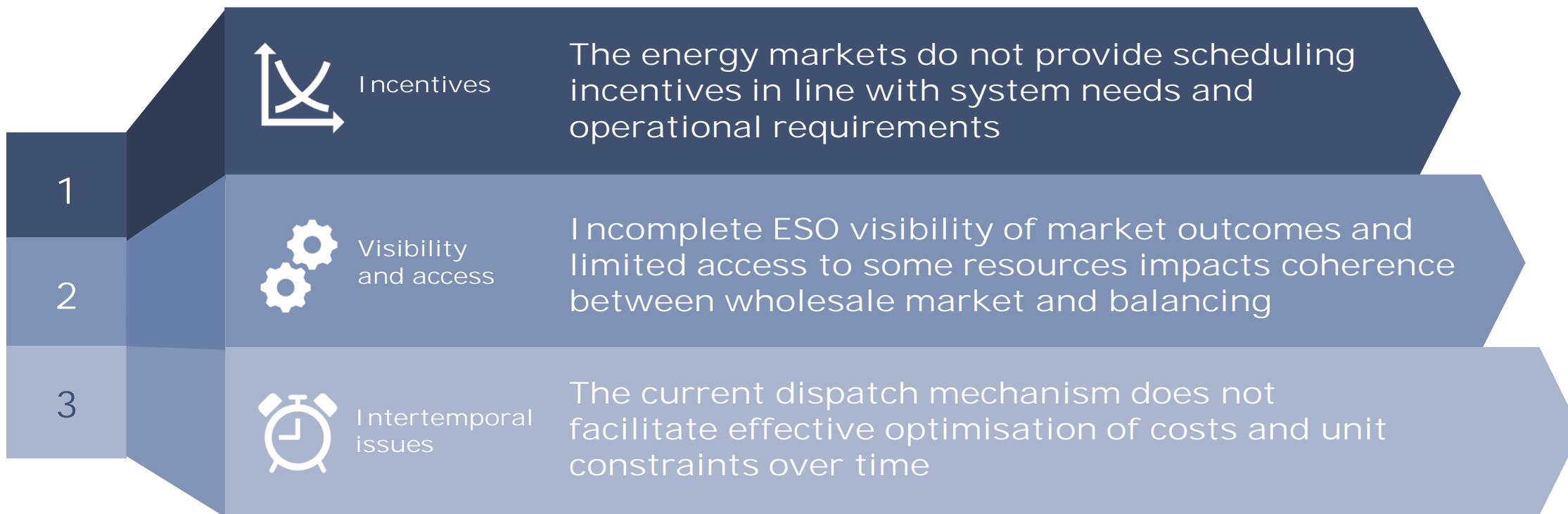
EVOLUTION IN ANNUAL GB POWER SYSTEM COSTS TO 2035¹



¹Based on the National BAU case for the Consumer Transformation scenario as modelled in Phase 2 of AFRY's GB market design project https://afry.com/sites/default/files/2023-12/gb_electricitymarketdesign_phase2_publicsummaryreport_v500.pdf

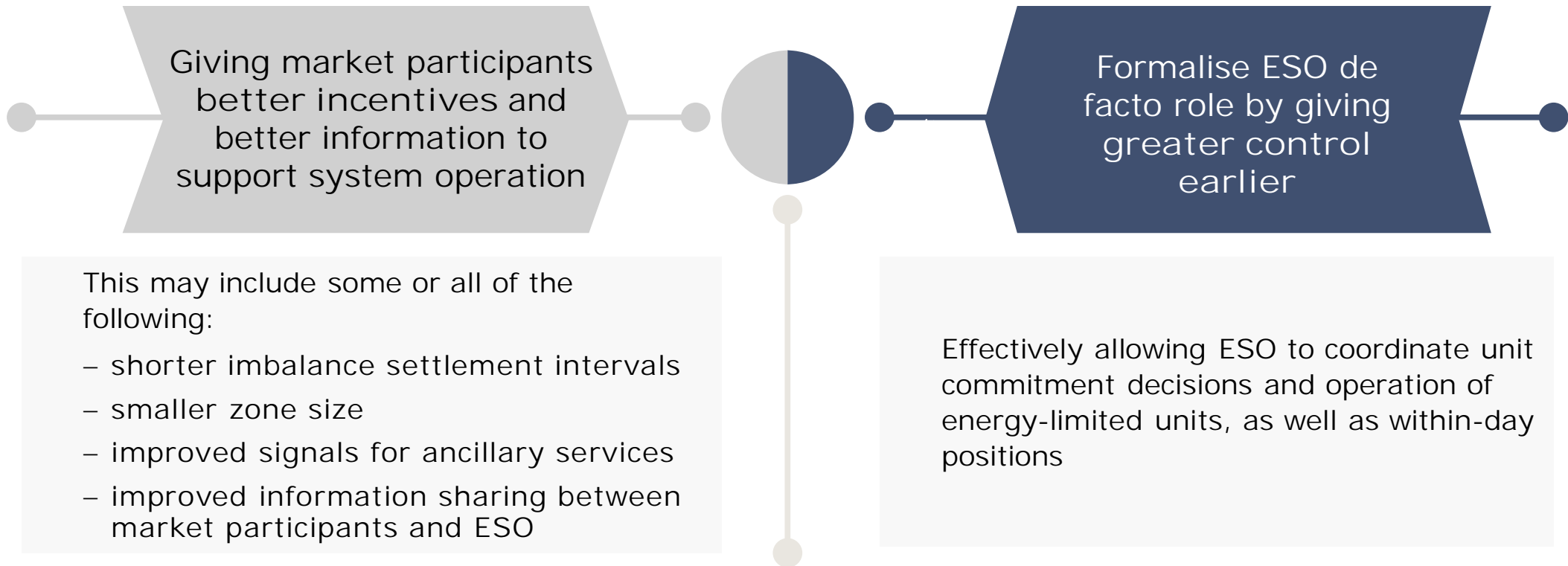
There is a clear case for change of the 'status quo' as the underlying conditions have changed since NETA was introduced

What are the key limitations of the 'status quo' scheduling and dispatch regime?

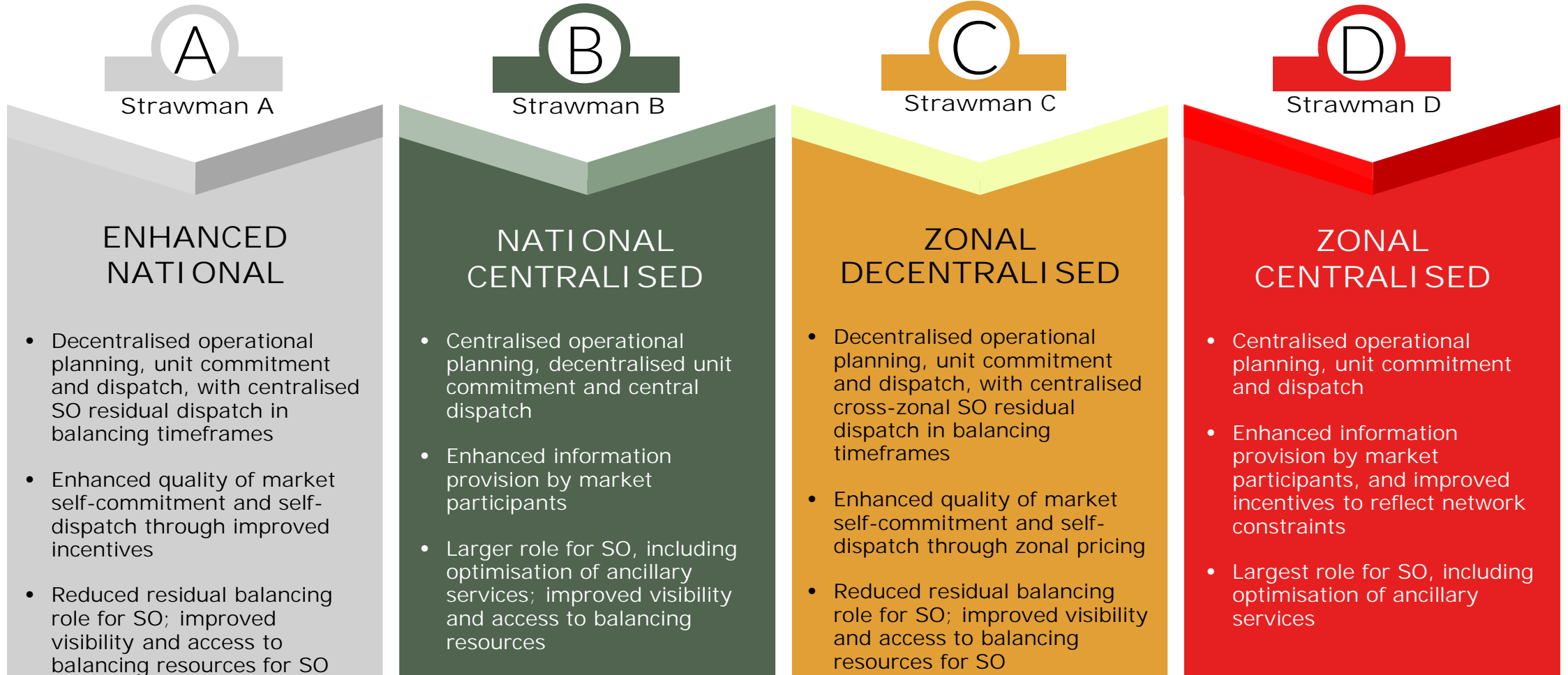


What is less clear is what to change to ...











There are two high-level approaches:



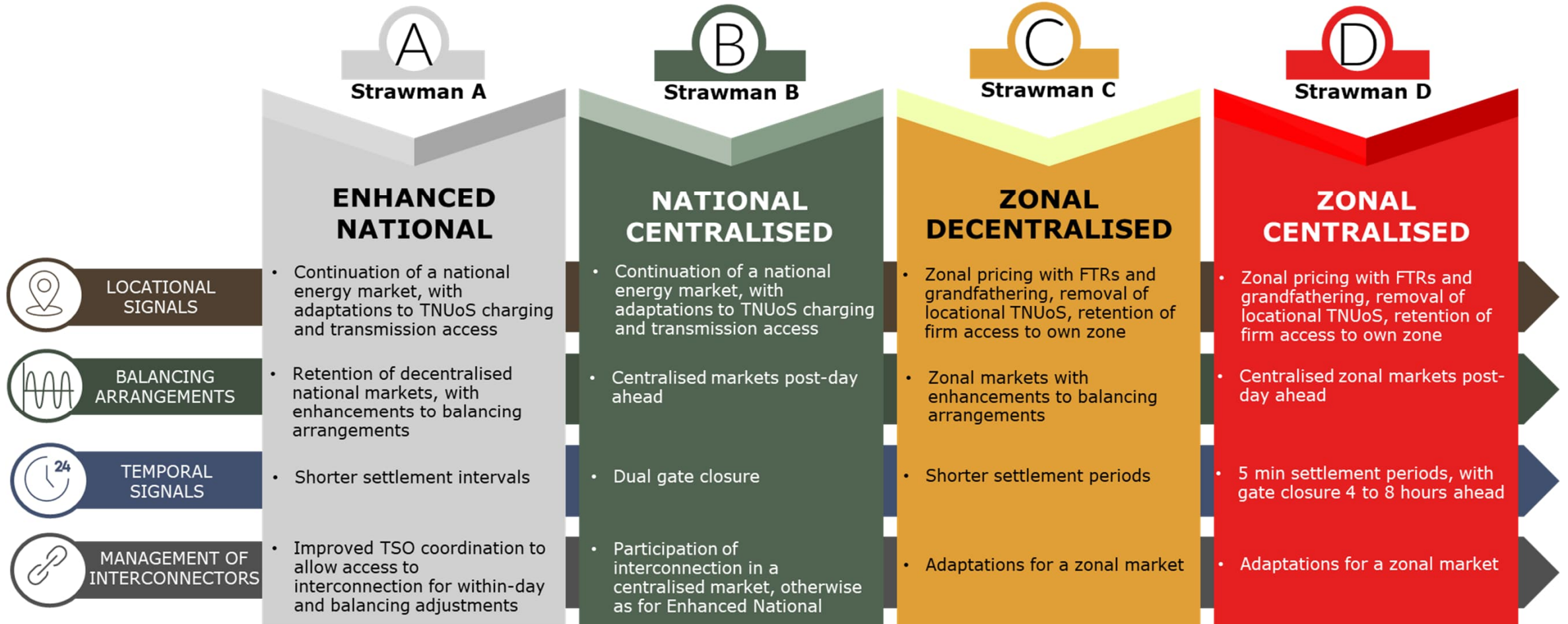
The philosophies of our four strawmen designs are based on a range of improved market incentives and degrees of centralisation



There are new risks and challenges associated with both zonal pricing and centralised dispatch

New risks and challenges	
Zonal pricing	Centralised dispatch
 Potential for large wealth transfers, requiring extensive grandfathering of existing rights	 Optimal dispatch dependent on all resources being centralised, and all their characteristics being captured fully
 Risk management tools for market participants exposed to zonal prices	 Computational complexity might lead to a trade-off between precision and frequency, limiting operational efficiency
 Zone definition, approach to and frequency of rezoning, and extent of grandfathering for pre-re-zoning rights	 Calculation of price in each period is complicated by need to attribute start-up, no-load and other costs across periods
 Reductions in market liquidity and increased scope for market power within each zone	 Risks of gaming or exaggerated costs around uplift payments for start-up and no-load costs
 Cost of capital impacts from exposure to more volatile and less predictable zonal prices	 The greater detail in bids makes organisation of intra-day trading more difficult

Our strawmen designs attempt to both address the material challenges to the status quo, while limiting the impact of new risks and challenges



The strawmen were assessed against our market design objectives, assuming that the objectives of decarbonisation by 2035 and security of supply are achieved

AFRY OBJECTIVES

 <p>Investment decisions are effective</p>	<p>Investment decisions result in sufficient infrastructure of the right type and in the right location to maximise cost-effectiveness, given the need to achieve a net zero power sector by 2035 and maintain security of supply.</p>
 <p>Operational decisions are efficient</p>	<p>Operational decisions result in total system cost-effectiveness, given the system that has been built (and subject to achieving a net zero power sector by 2035 and maintaining security of supply)</p>
 <p>Appropriate allocation of cost, risk and reward</p>	<p>Charges and payments are allocated appropriately with respect to fairness, cost reflectivity and the delivery of useful incentives. Risks are borne by those best able to manage them.</p>
 <p>Deliverability of the transition</p>	<p>The transition to the new arrangements can be delivered quickly and with manageable levels of risk to enable a net zero power sector by 2035</p>
 <p>Enduring robustness</p>	<p>The new arrangements are robust on an enduring basis (e.g. do not have weaknesses with respect to: freedom of choice; regulatory risk; transparency; liquidity; high barriers to entry; and/or high transaction costs, etc.)</p>

REVISED REMA OBJECTIVES IN THE SECOND CONSULTATION

-  Investor confidence
-  Whole-system flexibility
-  Value for money
-  Deliverability
-  Adaptability

Collectively, the AFRY market design objectives are congruent with the revised objectives for market design set out by DESNZ in the Second REMA Consultation.

AFRY scored the Enhanced National highest overall by a narrow margin over Zonal Decentralised, which scores more highly on enduring metrics

QUALITATIVE SCORING - AFRY

	BAU baseline	ENHANCED NATIONAL	NATIONAL CENTRALISED	ZONAL DECENTRALISED	ZONAL CENTRALISED
Investment decisions are effective					
Operational decisions are efficient					
Appropriate allocation of cost, risk & reward					
Deliverability of the transition	N/A				
Enduring robustness					
Total score (all 5)					
Total score (excl. deliverability)					

COMMENTARY

- The scoring approach is simple and qualitative
- Total scores reflect equal weighting across metrics
- Relative scoring is somewhat arbitrary on the degree of improvement or shortfall relative to BAU
- Overall Enhanced National and Zonal Decentralised do best
- Across all five metrics, Enhanced National has fractionally (1/40) the highest score
- Zonal Decentralised scores highest on the four “enduring” metrics
- Enhanced National: significant improvements to effective investment, with efficiency improvements more dependent on international co-operation. Mechanically easier to implement.
- National Centralised: Relies on centralisation post-day ahead to achieve improvements; difficulties in doing centralised dispatch well tend to offset other improvements
- Zonal Decentralised: high operational efficiency, with market resolving transmission constraints, minimising the difficulties of scheduling and dispatch for the SO. Difficult to deliver the required risk management frameworks.
- Zonal Centralised: zonal pricing enables high operational efficiency; the combination of zonal pricing and centralised dispatch is the worst for deliverability and introduction of new risks

Note: Scores against each metric based on a range between 0 and 8 inclusive
 Total score (all 5) based on a score out of 40
 Total score (excl. deliverability) based on score out of 32

Compared to AFRY, study members scored Enhanced National higher and Zonal Decentralised lower on enduring metrics

QUALITATIVE SCORING – FUNDING ORGANISATIONS

	<i>BAU baseline</i>	ENHANCED NATIONAL	NATIONAL CENTRALISED	ZONAL DECENTRALISED	ZONAL CENTRALISED
Investment decisions are effective					
Operational decisions are efficient					
Appropriate allocation of cost, risk & reward					
Deliverability of the transition	N/A				
Enduring robustness					
Total score (all 5)					
Total score (excl. deliverability)					

- Average funding organisation score higher than AFRY's
- Average funding organisation score lower than AFRY's

Note: Scores against each metric based on a range between 0 and 8 inclusive
 Total score (all 5) based on a score out of 40; Total score (excl. deliverability) based on score out of 32

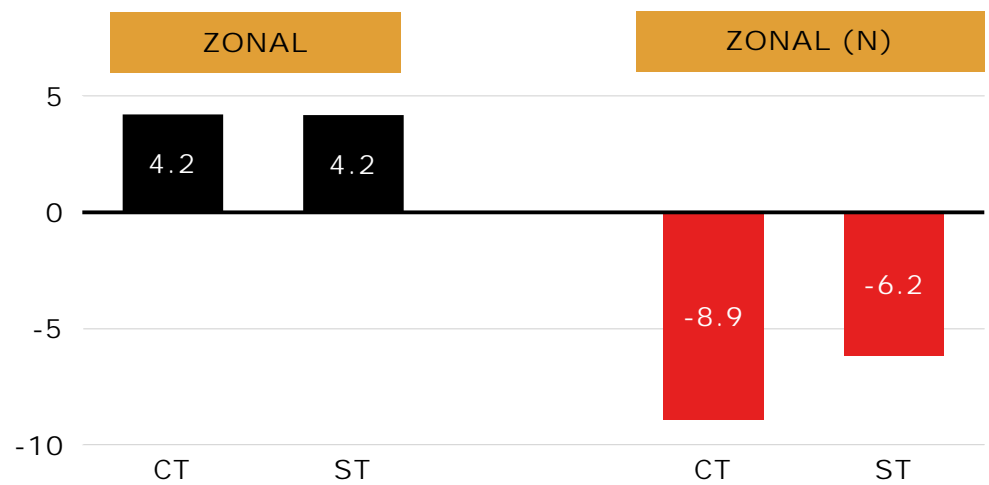
COMMENTARY

- Study member organisations ranked Enhanced National highest overall, with higher scores than AFRY across the four enduring metrics and a similar score for deliverability
- Zonal Decentralised was scored second overall by study member organisations, but with lower scores than AFRY across the four enduring metrics (but also again with a similar score to AFRY for deliverability)
- The National Centralised and Zonal Centralised cases had similar overall scores to AFRY, with fractionally higher deliverability scores
- Overall, the study members scores reflect a more pessimistic view of the investability of a zonal market
- Measures to maintain investability in a zonal market through a comprehensive regime of grandfathering and FTRs (and reforms in other areas such as through the design of CfD arrangements and the Capacity Market) will be essential

Summary of Key Messages (1/2)

1. To best achieve a fully decarbonised power sector by 2035, the possible benefits of improved operational efficiency from revised market arrangements have to be weighed against potential increases in investment risk.
2. To the extent there are operational inefficiencies in the current scheduling and dispatch arrangements, they result from a combination of inadequate market incentives on market participants (relating to transmission constraints and other aspects of system operation), the SO lacking full visibility of the system and access to certain balancing resources, and limitations in managing inter-temporal constraints.
3. A national market with central dispatch would not fully resolve network constraint management or have increased robustness to managing an evolving generation and demand mix.
4. A zonal energy market could provide the greatest improvement to operational efficiency – provided that zones can be defined which capture the main transmission constraints, now and into the future. The improvement would be smaller if the lag in network build could be reduced.
5. Both zonal markets and centralised dispatch would introduce new risks to investment; risk management measures could be developed to address some aspects of locational risk but are harder to envisage for dispatch risk in a centralised regime.

TOTAL ECONOMIC WELFARE BENEFIT BREAKDOWN, ZONAL AND NODAL CASES VERSUS NATIONAL BAU BY SCENARIO



Total consumer bills

Overall benefits
£4.2 billion = c.1%

Notes: Zonal (N) = Zonal with +100bps hurdle rate increase for CfD-supported new-build renewable capacity. Consumer Transformation = CT, System Transformation = ST

Summary of Key Messages (2/2)

6. Both zonal markets and centralised dispatch would face significant deliverability challenges, limiting the scope for any potential benefits to be realised before 2035 (particularly challenging for a centralised zonal market). Deliverability of the Enhanced National model is mechanically easier but would require international co-operation.

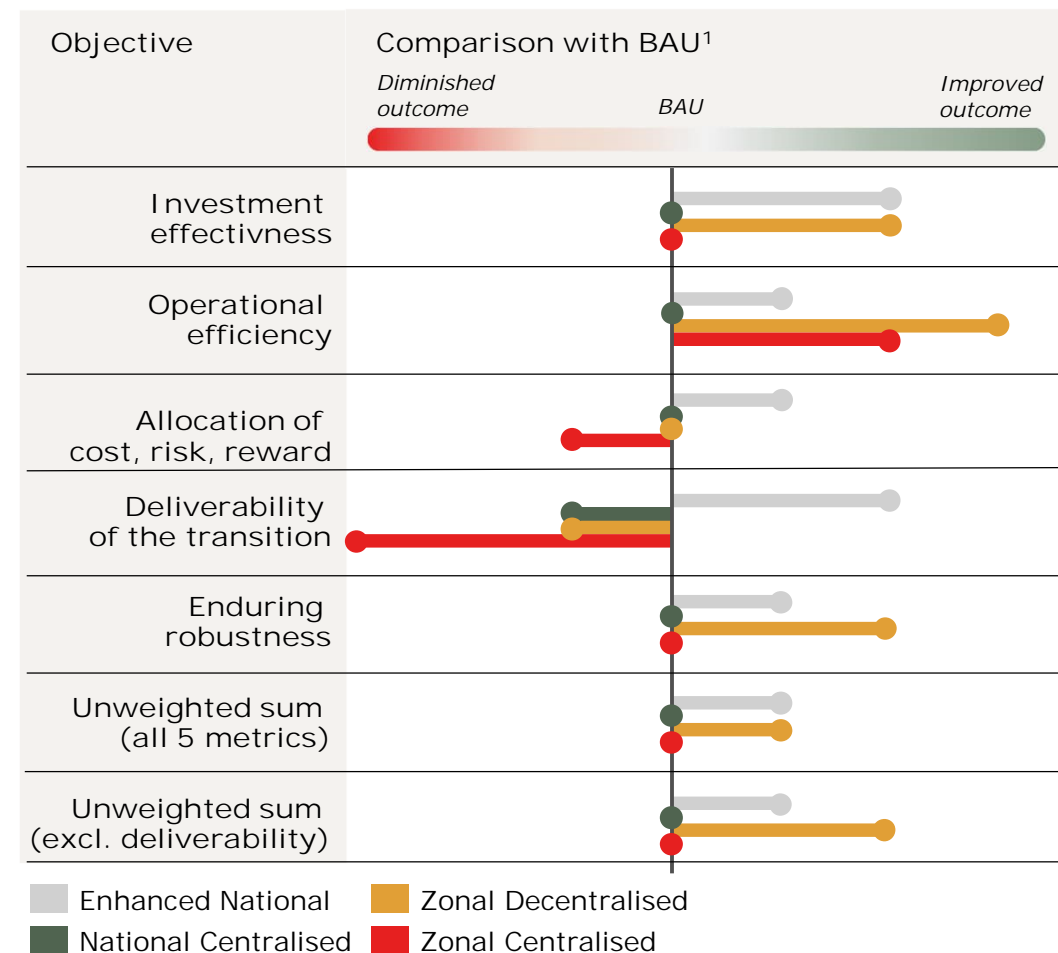
7. An Enhanced National decentralised dispatch market could be the most attractive option overall if all measures identified could be implemented quickly and if the enhancements could achieve a reasonable share of the operational efficiency gains of a zonal market.

8. The economics of location are important, both in investment and operational timeframes. We believe a decentralised zonal market would be the best enduring solution, after overcoming the associated implementation challenges.

9. A zonal market should only be implemented if accompanied by an extensive risk management framework and grandfathering of existing rights to deal with wealth transfers.

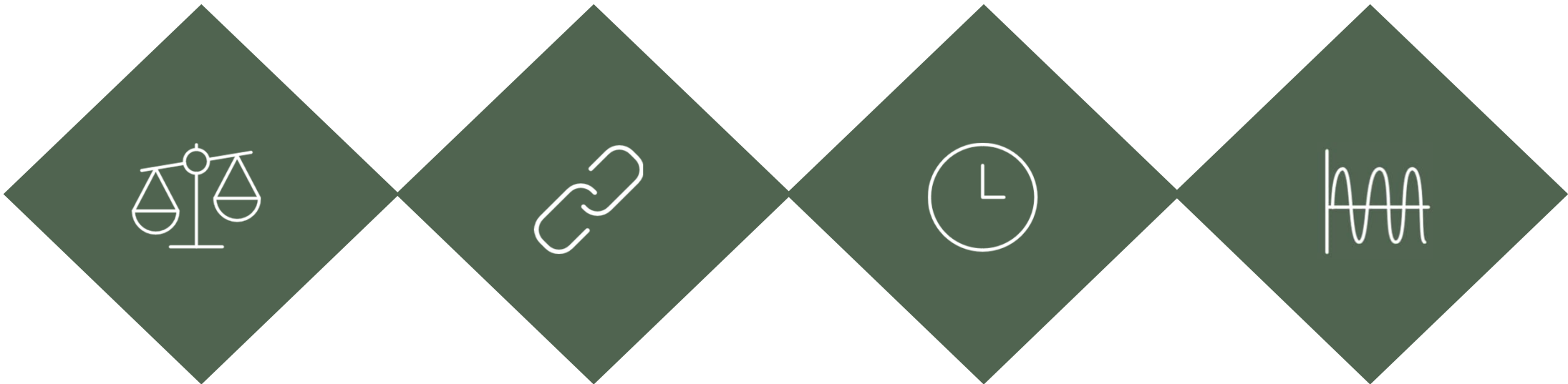
10. If the pre-conditions of zonal market implementation cannot be delivered, the best alternative would be improved investment and operational signals within the existing national market framework, combined with a strong focus on delivering appropriate levels of transmission reinforcement.

AFRY STRAWMEN COMPARISON AGAINST OBJECTIVES



Note: Where there is no bar shown against the objectives, the strawman scores the same as BAU.

The National Enhanced strawman points to a programme of work to better incorporate interconnection and improve temporal and balancing signals



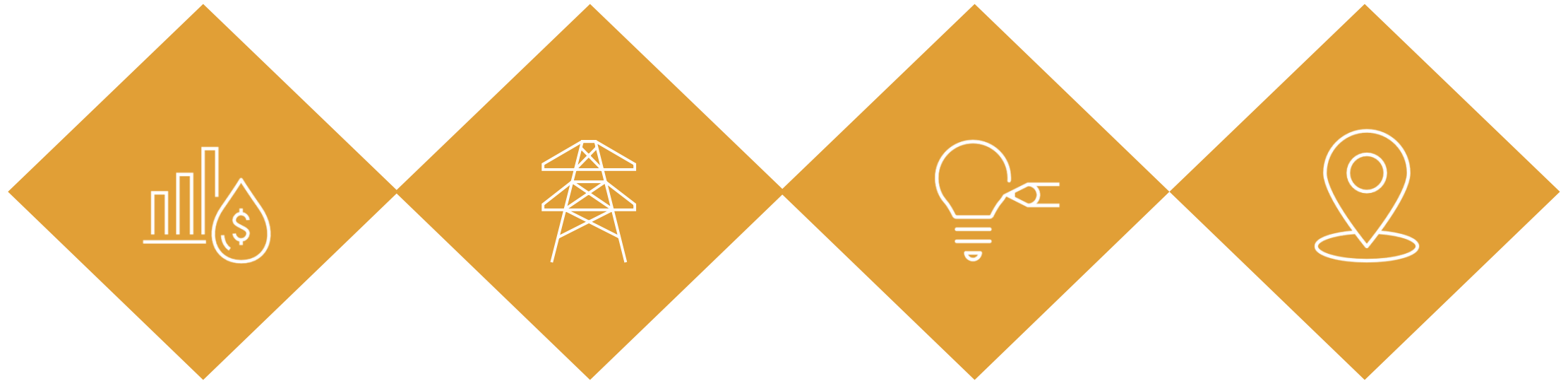
Incorporation of interconnectors into the Balancing Mechanism

Achieving the inter-TSO agreement required to enable better real time dispatch of interconnectors

Implementation of 15min imbalance settlement

Design of a real-time pay-as-clear Balancing Market

A comprehensive programme of work on grandfathering and FTRs will be essential for a zonal market design



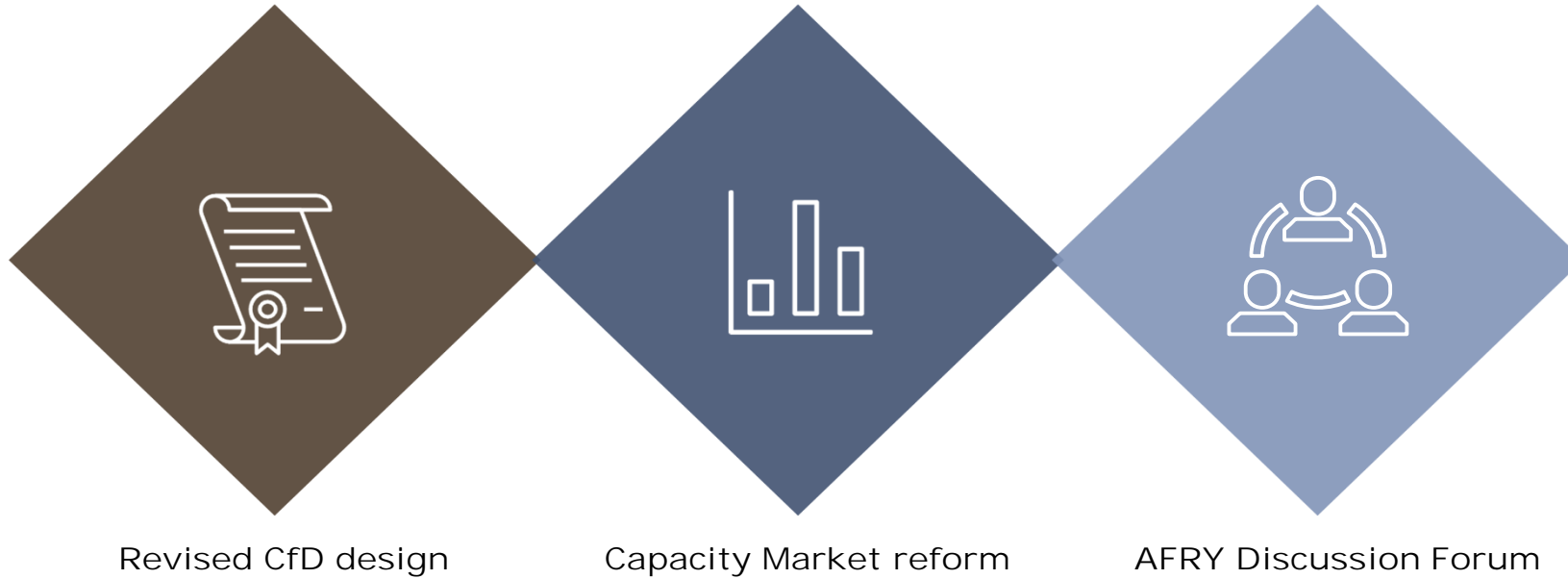
Design of a grandfathering regime to manage wealth transfers and transition risks

Design of a comprehensive and effective regime of Financial Transmission Rights (FTRs)

Implications for the design of Power Purchase Agreements (PPAs)

Other areas of zonal market design (zone definition, etc...)

Revised CfD design and Capacity Market reform were out of scope, but remain important areas in which AFRY can further assist



Q&A

- The link to the slide pack and recording will be available on our website to all attendees as soon as they are available.



CONCLUDING REMARKS

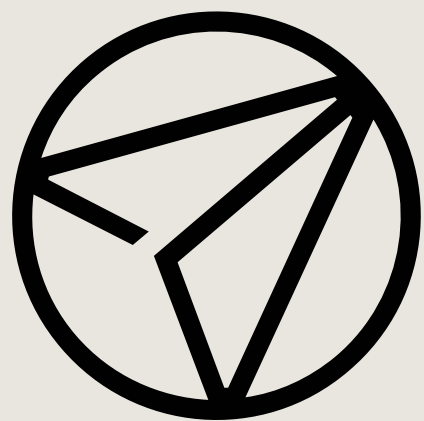
Contact us

- Reach out to us for more information:
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- More webinars will follow with relevant topics, and any update on the evolving situation.

- *Making Better Data-Driven Asset Decisions: Strategic Asset Management for the Energy Industry*
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