National Grid ESO

Net Zero Market Reform: Phase 3

Assessment of market design options

FTI CONSULTING

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Contents

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Executive summary

In this report we have used the 9 assessment criteria from Phase 2, with an additional criterion concerning flexibility potential

	Criteria	Description
1	Decarbonisation	Provides confidence that carbon targets will be met
2	Security of Supply	Ensures that adequacy and operability challenges can be met
3	Value for Money	Ensures that the electricity system (network build, short-run dispatch and long-run investment) is being delivered efficiently
4	Investor Confidence	Investors are exposed to appropriate risks (e.g. risks they can manage) and finance costs are minimised subject to appropriate risk allocation
5	Deliverability	Transition from current market design to target design is deliverable in an appropriate timeframe
6	Whole System	Facilitates decarbonisation across other energy vectors
7	Consumer Fairness	The costs of the system are fairly shared across all consumers
8	Competition	Facilitates competition within and across technologies, between generation and demand and across connection voltages
9	Adaptability	A market design that can adapt to changes in technology or circumstances with limited disruption within a reasonable timeframe
10	Full-chain Flexibility	Market design enables the flexibility potential from all assets at all levels of the electricity system to contribute

Key: contribution towards a Net Zero market

Significant -ve impact · Moderate -ve impact · Minor -ve impact · Unclear impact; depends on detailed mechanism · Minimal impact · Minor +ve impact · Moderate +ve impact · Significant +ve impact

Summary assessment of the location element

		National wholesale market	Zonal wholesale market	Nodal wholesale market	Rationale
1	Decarbonisation	Minor -ve impact	Minor +ve impact	Minor +ve impact	*The level of decarbonisation is driven primarily by the amount of low carbon support. However, a nodal or zonal market design may help to foster greater "fiscal credibility" and curtailment reduction which could enhance the effectiveness of decarbonisation investments*
2	Security of Supply	Minor -ve impact	Minor +ve impact	Minor +ve impact	*The level of security is driven primarily by (1) the reliability standard; and (2) policies / regulations to deliver that standard - not by locational market designs. However, a nodal or zonal market design may provide greater value for money with capacity adequacy investments.*
3	Value for Money	Significant -ve impact	Moderate +ve impact	Significant +ve impact	*Consideration of transmission limits results in more efficient dispatch, while more granular locational price signals are likely to lead to more efficient long-run investment outcomes. Transfers from consumers to generators of constrained-off payments are removed.*
4	Investor Confidence	Moderate -ve impact	Minor +ve impact	Moderate +ve impact	*More granular locational price signals allocate greater locational risks to investors – this is more efficient as generators now have to consider their wider impact on the transmission grid in the wholesale market. Financial instruments allow hedging of this risk and there is limited evidence that investors are exposed to risks they cannot manage.*
5	Deliverability	Minor +ve impact	Minor -ve impact	Moderate -ve impact	*Case studies on the cost of transitioning to nodal markets show significant (gross) costs associated with locational market reform. However studies show that costs are likely be far* lower than the benefits. *Transition to new market design can be implemented relatively quickly with a streamlined and effective stakeholder engagement process.*
6	Whole System	Minimal impact	Minor +ve impact	Moderate +ve impact	*Greater locational price signals could reduce the cost of decarbonisation in other energy vectors by incentivising more efficient siting decisions.*
7	Consumer Fairness	Overall bill impact: Significant -ve impact / Variation in retail bills: Moderate -ve impact	Overall bill impact: Moderate +ve impact / Variation in retail bills: Moderate +ve impact	Overall bill impact: Significant +ve impact / Variation in retail bills: Significant +ve impact	*A nodal market could enable bill reduction for consumers in aggregate and provides policymakers with more policy levers when compared with national market (e.g. consumers can be exposed to the national, nodal or blended price).*
8	Competition	Moderate +ve impact	Moderate +ve impact	Moderate +ve impact	*All designs help support competition in wholesale electricity markets, including in terms of liquidity. Market power issues, which arise under all designs, can be mitigated.*
9	Adaptability	Moderate -ve impact	Moderate +ve impact	Significant +ve impact	*Nodal designs (and zonal markets to a lesser extent, through a manual boundary update process) are able to adapt to changes in demand/generation/network conditions automatically, whereas national design cannot since they are 'blind' to the transmission network configuration.*
10	Full-chain Flexibility	Moderate -ve impact	Moderate +ve impact	Significant +ve impact	*Nodal market design (and zonal markets to an extent) would allow more market participants, including DER and DSR, to respond to more granular locational signals more easily.*

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Summary assessment of the dispatch element

		Central dispatch: Centralised commitment	Central dispatch: Self-commitment	Self-dispatch	Rationale
1	Decarbonisation	We have not assessed this option as unlikely to be suitable in a GB market where liquid forward trading is desired.	Minimal impact	Minimal impact	*Level of decarbonisation driven primarily by the amount of low carbon support, and not by dispatch market designs per se.*
2	Security of Supply		Minimal impact	Minimal impact	*Level of security is driven primarily by the (1) reliability standard and (2) policies / regulations to deliver that standard, and not by dispatch market designs per se.*
3	Value for Money		Moderate +ve impact	Moderate -ve impact	*A central dispatch market design could provide greater value for money to consumers as it enables the system operator to manage high volumes of intermittency on a system-wide basis.*
4	Investor Confidence		Moderate +ve impact	Moderate +ve impact	*Both dispatch market design options would have a positive impact on investor confidence towards Net Zero, due to ability to hedge their risk appropriately.*
5	Deliverability		Moderate -ve impact	Unclear impact; depends on detailed mechanism	*Moving to a central dispatch model will require a full market reform, which could potentially be costly (in gross terms). Long term sustainability of maintaining self-dispatch market design towards Net Zero is currently unclear.*
6	Whole System		Minimal impact	Minimal impact	*Both dispatch market design options would have a negligible impact on other energy vectors.*
7	Consumer Fairness		Minimal impact	Minimal impact	*Both dispatch market design options would have a negligible impact on consumer fairness.*
8	Competition		Moderate +ve impact	Minor -ve impact	*A central dispatch market design presents limited upfront costs for prospective new entrants (these costs would be similar across all market participants including incumbents), meaning lower barriers to entry and greater market transparency.*
9	Adaptability		Moderate +ve impact	Significant -ve impact	*A central dispatch market design is more adaptable to changes in technology and real-time market conditions as it can (1) enable delivery of all locational market design elements; and (2) better facilitate co-optimisation between energy and ancillary services (e.g. reserves).*
10	Full-chain Flexibility		Moderate +ve impact	Minor -ve impact	*A central dispatch market design is likely to more efficiently accommodate the flexibility potential of all assets in the energy system.*

Assessment of the location element

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Summary assessment of the location element

		National wholesale market	Zonal wholesale market	Nodal wholesale market	Rationale
1	Decarbonisation	Minor -ve impact	Minor +ve impact	Minor +ve impact	*The level of decarbonisation is driven primarily by the amount of low carbon support. However, a nodal or zonal market design may help to foster greater "fiscal credibility" and curtailment reduction which could enhance the effectiveness of decarbonisation investments*
2	Security of Supply	Minor -ve impact	Minor +ve impact	Minor +ve impact	*The level of security is driven primarily by (1) the reliability standard; and (2) policies / regulations to deliver that standard - not by locational market designs. However, a nodal or zonal market design may provide greater value for money with capacity adequacy investments.*
3	Value for Money	Significant -ve impact	Moderate +ve impact	Significant +ve impact	*Consideration of transmission limits results in more efficient dispatch, while more granular locational price signals are likely to lead to more efficient long-run investment outcomes. Transfers from consumers to generators of constrained-off payments are removed.*
4	Investor Confidence	Moderate -ve impact	Minor +ve impact	Moderate +ve impact	*More granular locational price signals allocate greater locational risks to investors – this is more efficient as generators now have to consider their wider impact on the transmission grid in the wholesale market. Financial instruments allow hedging of this risk and there is limited evidence that investors are exposed to risks they cannot manage.*
5	Deliverability	Minor +ve impact	Minor -ve impact	Moderate -ve impact	*Case studies on the cost of transitioning to nodal markets show significant (gross) costs associated with locational market reform.* However studies show that costs are likely be far lower than the benefits. *Transition to new market design can be implemented relatively quickly with a streamlined and effective stakeholder engagement process.*
6	Whole System	Minimal impact	Minor +ve impact	Moderate +ve impact	*Greater locational price signals could reduce the cost of decarbonisation in other energy vectors by incentivising more efficient siting decisions.*
7	Consumer Fairness	Overall bill impact: Significant -ve impact / Variation in retail bills: Moderate -ve impact	Overall bill impact: Moderate +ve impact / Variation in retail bills: Moderate +ve impact	Overall bill impact: Significant +ve impact / Variation in retail bills: Significant +ve impact	*A nodal market could enable bill reduction for consumers in aggregate and provides policymakers with more policy levers when compared with national market (e.g. consumers can be exposed to the national, nodal or blended price).*
8	Competition	Moderate +ve impact	Moderate +ve impact	Moderate +ve impact	*All designs help support competition in wholesale electricity markets, including in terms of liquidity. Market power issues, which arise under all designs, can be mitigated.*
9	Adaptability	Moderate -ve impact	Moderate +ve impact	Significant +ve impact	*Nodal designs (and zonal markets to a lesser extent, through a manual boundary update process) are able to adapt to changes in demand/generation/network conditions automatically, whereas national design cannot since they are 'blind' to the transmission network configuration.*
10	Full-chain Flexibility	Moderate -ve impact	Moderate +ve impact	Significant +ve impact	*Nodal market design (and zonal markets to an extent) would allow more market participants, including DER and DSR, to respond to more granular locational signals more easily.*

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Nodal and zonal markets could have a moderate positive impact on achieving decarbonisation targets in the longer term

Assessment score

	Criterion	National wholesale market	Zonal wholesale market	Nodal wholesale market
1	Decarbonisation			

Description of the criterion

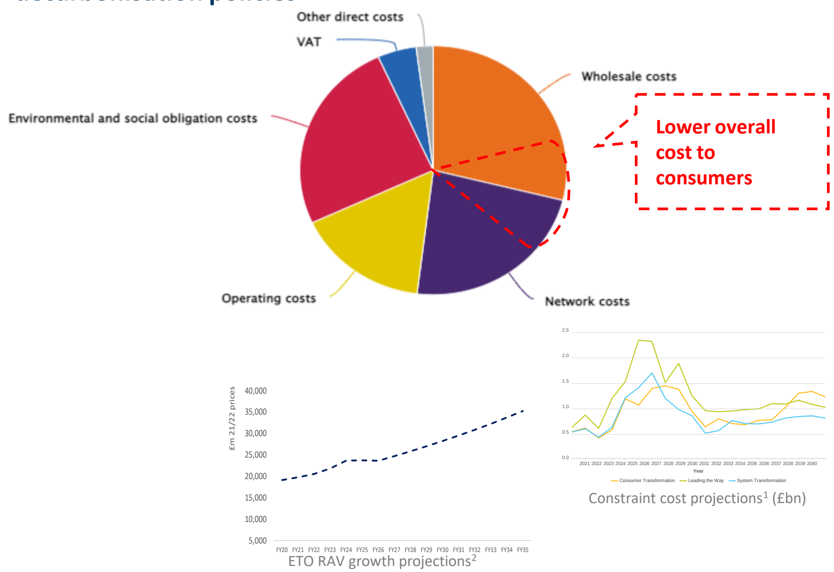
- This criterion reflects the impact of each locational design option on "confidence that carbon targets will be met"

Key findings

Rationale and evidence

- The level of decarbonisation in each jurisdiction is typically driven by the amount of low carbon support (to bring forward investments) and not by locational market designs *per se*.
- However, over the long-term, a nodal market design (and zonal to an extent) may provide greater value for money in the terms of achieving Net Zero.
  - First, over the long-term, a nodal market design potentially incentivises renewable generation to locate in sites where there is likely to be less curtailment. This would result in greater output, and hence greater impact on decarbonisation.
  - Second, the overall cost to consumers in a nodal market is expected to be lower due to lower congestion costs (up to £19bn[1] to 2035) and the reduced need for new transmission investment (in excess of £16bn [2]). Although some of this may be offset from the perspective of the end consumer, through wholesale prices, policymakers are likely to have greater "fiscal space" to enact low carbon policies that better meets the national decarbonisation goals.
  - Third, sharper price signals may incentivise greater demand-side response and storage to improve siting and operational decisions.
- Despite the potential long-term benefits of nodal and zonal designs towards decarbonisation, direct low carbon support mechanisms would still be the main driver of achieving net zero.

Lower consumer bills can provide policymakers more fiscal space for decarbonisation policies



Sources: *Ofgem (August 2021); FTI annotations*

Summary

- Nodal and zonal markets could have a positive impact on achieving decarbonisation targets in the longer-term.

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Notes: [1] *ESO modelled constraint costs after NOA6 Optimal Reinforcements under Leading the Way FES scenario .*
[2] *£16bn is total projected transmission investment over next 20 years (NOA 6-approved projects).*

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Nodal and zonal markets could have a moderate positive impact on achieving security of supply targets in the longer term

Assessment score

Criterion		National wholesale market	Zonal wholesale market	Nodal wholesale market
2	Security of supply			

Description of the criterion

- This criterion reflects the impact of each locational design option to ensure that "adequacy and operability challenges can be met"

Key findings

Rationale and evidence

- The level of energy security in each jurisdiction is driven primarily by (1) the reliability standard; and (2) policies / regulations enacted to deliver that standard. This might be through, for example, energy-only markets (potentially augmented by scarcity price adder signals), capacity adequacy mechanisms and many others. These drivers are largely independent of locational market designs.

- However, a nodal market design (and zonal to an extent) could provide greater value for money with capacity adequacy investments.
  - First, over the long-term, a nodal market design provides <u>more accurate signals for siting decisions</u>.
  - Second, the overall cost to consumers in a nodal market is expected to be lower than in a zonal market, and even lower than in a national market. This provides policymakers <u>greater "fiscal space" to enact capacity adequacy policies</u> that meets security of supply goals more efficiently.

- Despite the potential long-term benefits of these designs towards security of supply, other capacity adequacy mechanisms would be the main drivers of security of supply.

Summary

- Nodal and zonal markets could have a positive impact on achieving security of supply targets in the longer-term.

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Nodal and zonal market designs have a positive impact on delivering value for money for consumers

Assessment score

Criterion		National wholesale market	Zonal wholesale market	Nodal wholesale market
3	Value for money	Significant -ve impact	Moderate +ve impact	Significant +ve impact

Description of the criterion

- This criterion reflects the impact of each locational design option to ensure that the electricity system "is being delivered efficiently" through
  - Short-run dispatch
  - Long-run investment
  - Network build

Key findings

Rationale and evidence

- Short-run dispatch:
  - A **national market** is likely to lead to inefficient short-run dispatch as market participants are not incentivised nor being provided with adequate information to consider transmission line limits when participating in the wholesale market. At best, this results in a financial transfer from consumers to constrained-off generators. At worst, it is likely to result in suboptimal dispatch.
  - A **zonal market** designed along the main boundary constraints is likely to improve dispatch outcomes and/or financial outcomes relative to a national market. However, a zonal market would not account for (1) transmission line limits *within* zones; and (2) dynamics of participants in multiple nodes seeking to flow power across zones.
  - A **nodal market** which considers all transmission line limits in dispatch could lead to more efficient dispatch and eliminates financial transfers from consumers to constrained-off generators. However, in-merit generators in front of constraints will receive greater wholesale prices (in a national market, only specific "out of merit" units are compensated by constrained-on payments).

- Long-run investment & network build:
  - Market designs with more granular locational price signals are likely to lead to more efficient long-run investments (i.e. siting in locations with a lower risk of congestion). Note that providing locational signals through the TNUoS regime appears less effective. The current charging regime is not as dynamic and/or granular, often seen as complex, volatile, sometimes lacking in transparency and requires ex-ante centralised decisions.
  - Market designs with greater locational price signals are likely to lead to more efficient network build as there is likely to be transparency of prices across locations indicating the value of the investment needed.

Experience in GB

Inefficient short-run dispatch, long-run investment and network build is evident in GB where congestion has been a growing issue.

- Congestion cost has increased almost 8-fold from £167m in Jan 2010 to £1,320m in Jan 2022.
- The ESO forecasts that congestion cost may reach a net present value of £2.5bn in 2025, despite an estimated £16bn of additional transmission investment over the next 20 years.
- Additionally, greater generation is anticipated in Scotland beyond 2030 which is likely to exacerbate congestion.

Summary

- A nodal market provides the greatest value for money for consumers, followed by a zonal market. A national market would provide less value for money as locational signals from TNUoS appear to be less effective.

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Nodal and zonal market designs allocate risks to investors more appropriately

Assessment score

Criterion		National wholesale market	Zonal wholesale market	Nodal wholesale market
4	Investor confidence			

Description of the criterion

- This criterion relates to how investors bear risk, and if the risks are allocated appropriately and efficiently

Key findings

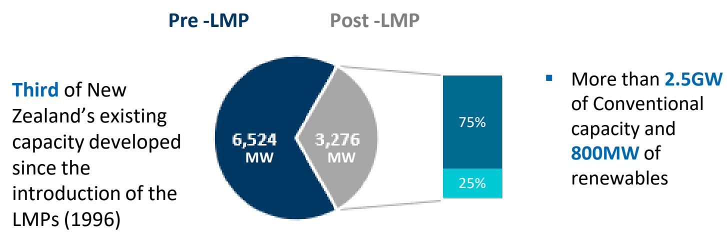
Rationale and evidence

- More granular locational signals shift the risk of congestion from consumers to generators (or holders of Financial Transmission Rights ("FTRs")). This has several effects:
  - First, short-term dispatch would be managed more optimally leading to more efficient dispatch and financial outcomes. In particular, inframarginal rent (the difference between the clearing price and a generator's variable cost of production) will be lower for generators located in congested areas.
  - Second, this may incentivise more efficient longer-term investment decisions.
  - Third, as generators have to consider their wider impact on the transmission grid, they are incentivised to manage their risk through their bidding strategy, purchase of FTRs and investment strategy.
- Transitioning to a nodal market would likely have a significant impact on generators (varying by location). This may include the scale of the transformation, the revenue impact and that FTRs provide incomplete hedges. While this might affect generators' investment cases, there is an overall positive outcome on investor risk allocation:
  - First, other forms of investment mechanisms (low carbon support, CMs and the CFD regime) would likely have a greater effect to sustain investment signals (to the extent they are still required by the energy system).
  - Second, generators already face considerable risk in a national market (e.g. through TNUoS regime and wholesale markets), and the use of nodal pricing and FTRs could promote better risk management for some and reduce the risk from volatile TNUoS.
  - Additionally we also note that both ERCOT (Texas, US) and New Zealand have had significant investments since the nodal market was formed (and even without the presence of capacity mechanisms).

Summary

- A nodal market allocates risks to investors most appropriately, followed by a zonal market. In a national wholesale market generators, by design, do not consider their wider impact on the transmission grid (although TNUoS provides limited longer-term signals).

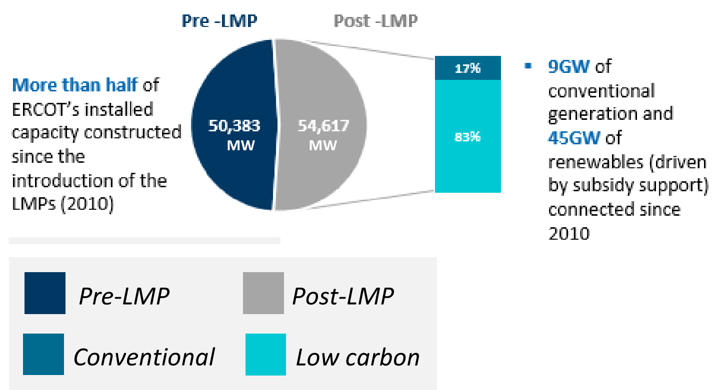
Generation investments in New Zealand (since 1996)[1]



Note: *Hydro represents c.70% of existing capacity pre-LMP.*

Sources: *WSP (link); New Zealand Wind Energy Association (link); NZGA (link).*

Generation investments in ERCOT, Texas (since 2000)



Source: *December 2021 CDR.*

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Nodal and zonal market designs require significant market reforms to be delivered, but challenges also exist in maintaining the current regime

Assessment score

Criterion		National wholesale market	Zonal wholesale market	Nodal wholesale market
5	Deliverability			

Description of the criterion

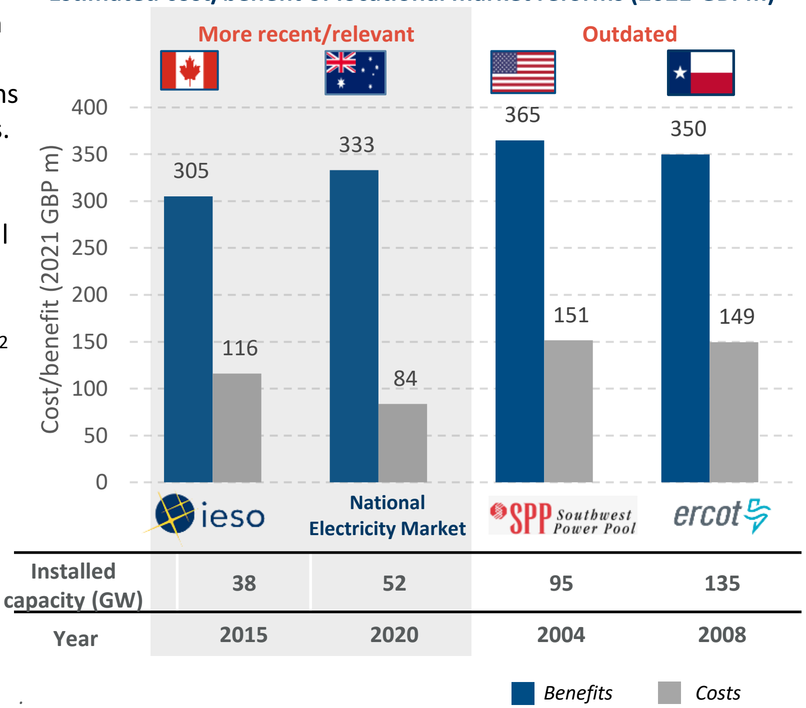
- This criterion relates to the ease, cost, and time-frame of transitioning from the current market design to the target market design

Key findings

Rationale and evidence

- Locational market reforms, despite the potential benefits, are expected to be costly (as seen in the chart on the right). The complexity of delivering locational reform include:
  - ESO system implementation costs:[1] One-off costs to enhance the processes, new IT & software systems and capabilities which often carry the risk of incurring higher cost and extended timeline delivery risks. The international review indicates costs between £32m and £75m.
  - Market participants costs:[1] One-off costs to update system and capabilities. The international review indicates cost will vary between £50k and £600k depending on experience. We expect cost differential to have substantially lowered since, as "off the shelf" solutions developed in the US are available.
- In conducting the analysis, we have assumed ongoing costs of operating in the current market to be negligible, especially when considered in the light of counterfactual costs of managing network constraints.[2] However, we note that there have been increasing costs associated with keeping the status quo design as evidenced in the increasing SO balancing actions (see slide 11).
- Timeframe of transition to nodal design predominately depends on the efficiency of the stakeholder engagement and usually takes between 4-8 years.
- Notably, these reforms are likely to have a wide distributional impact which will need to be assessed through more detailed Cost Benefit Analysis ("CBA"). However, several measures could be used to smooth the transition and provide market participants with time to adjust, such as grandfathering and aggregated pricing for suppliers (albeit at a potential cost of diluting the benefits).

Estimated cost/benefit of locational market reforms (2021 GBPm)



Summary

- Transition from current market design to nodal and zonal designs requires significant market reforms which is likely to be costly; international benchmarks indicate that costs are likely to be far lower the benefits.

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Notes: [1] Ongoing costs (contrafactual) are assumed to be negligible (near identical to the current ongoing costs).
[2] System constraint costs anticipated under NOA6 to be in a range of c.£13bn to £19bn to 2035 (£1-1.5bn/ p.a.)

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Locational market designs have a potential impact on delivering benefits across other energy vectors

Assessment score

Criterion		National wholesale market	Zonal wholesale market	Nodal wholesale market
6	Whole system			

Description of the criterion

- This criterion assesses the effects across other energy vectors such as the decarbonisation of heat and transport

Key findings

Rationale and evidence

- A nodal market (and zonal to an extent), may provide some benefits to other vectors, in relation to the co-location of electricity-intensive infrastructure to cheaper generation sources.
  - For example, more granular locational price signals would increase cost reduction potential for electrolysis facilities for hydrogen if located nearer cheaper generation resources that may be otherwise (in a national design) frequently constrained-off.
  - Furthermore, all else equal, more efficient signals will promote more efficient co-location of generation and demand which could reduce electricity transmission requirements.
  - Additionally, consumers in areas with lower wholesale prices would face a greater incentive to convert to more decarbonised technologies such as heat pumps and EVs.
- This effect may also aid centralised decision-makers, for example, to coordinate investments (and associated subsidies) in favourable locations to provide greater value to consumers.

Summary

- Nodal and zonal locational market designs can have a positive impact on delivering benefits across other energy vectors.

1 **Location – Consumer fairness**

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

A nodal market design seems likely to deliver the greatest bill reduction for consumers relative to other locational market designs… (1/2)

Assessment score

Criterion		National wholesale market	Zonal wholesale market	Nodal wholesale market
7	Consumer fairness	Overall bill impact: Significant -ve / Variation in retail bills: Moderate -ve	Overall bill impact: Moderate +ve / Variation in retail bills: Moderate +ve	Overall bill impact: Significant +ve / Variation in retail bills: Significant +ve

Description of the criterion

- This criterion assesses how costs are shared and if they are "fair". In particular, we measure two aspects of fairness:
  - How large is the overall bill paid by consumers – this is discussed in this slide
  - The allocation of the overall bill between consumers

Key findings

Rationale and evidence

- Transition from current to nodal/zonal market design is likely to introduce a set of costs and benefits onto consumer bill. The main expected benefits of a nodal market implementation are:
  - Congestion is incorporated into the wholesale price at each node, removing the need for the ESO to provide **constrained-off payments**.
  - Centralised dispatch supported by nodal prices is likely to support **more efficient dispatch**, make full use of all available resources and fully utilise the capacity of the transmission system
  - A nodal market would incentivise more **efficient siting decisions** for new generation, demand and storage. At the same time, **the value of networks** would be revealed more easily through the nodal prices (and value of FTRs), potentially incentivising more efficient network build.
- However, transition to nodal market design could introduce new cost:
  - Wholesale prices in areas in front of the constraints could be higher under nodal market (in a national market, only units that are constrained-on would receive this amount).
  - Policy-driven costs which will depend on detailed policy design choices, including:
    - ☐ Policies to mitigate impact of nodal market (e.g. grandfathering some of existing generators)
    - ☐ CFDs and CMs, although different generators could be impacted differently due to the locational variation of wholesale prices. The overall net impact would depend on specific policy design choices.
- International empirical studies indicate the impact from transition to nodal market design to be a 2.1%[1] (CAISO) to 3.9%[2] (ERCOT) reduction in operational costs faced by market participants. Additionally, the Western EIM estimates cumulative benefits to market participants of almost $2bn since end-2014 to end-2021.[3]

Key factors affecting overall consumer bills[#1]

Gross benefits to consumer bills
- Removal of constraint payments
- More efficient dispatch
- Greater DSR facilitation
- Improved siting incentives
- Lower wholesale prices (behind constraints)

Potential costs to consumer bills
- Grandfathering policies
- Impact on CM[#2]
- Impact on CFDs[#2]
- Higher wholesale prices (in front of constraints)

Notes: *#1) Excludes implementation cost and other transitional issues; #2) Could be net positive depending on detailed design*

Summary

- A nodal market system could deliver the greatest bill reduction for consumers.

Sources: [1] *Measuring the benefit of greater spatial granularity in short term pricing in wholesale el. markets (2011).* [2] *Quantifying the benefits of nodal market in the Texas Electricity Market (2021);* [3] *CAISO Western EIM Benefits Report – 4Q 2021 (2022).*

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

… however, the impact on retail bills to different consumer groups would depend on how the concept of fairness is understood (2/2)

Assessment score

Criterion		National wholesale market		Zonal wholesale market		Nodal wholesale market	
7	Consumer fairness	Overall bill impact	Variation in retail bills	Overall bill impact	Variation in retail bills	Overall bill impact	Variation in retail bills

Description of the criterion

- This criterion assesses how costs are shared and if they are "fair". In particular, we measure two aspects of fairness:
  - How large is the overall bill paid by consumers
  - The allocation of the overall bill between consumers – this is discussed in this slide

Key findings

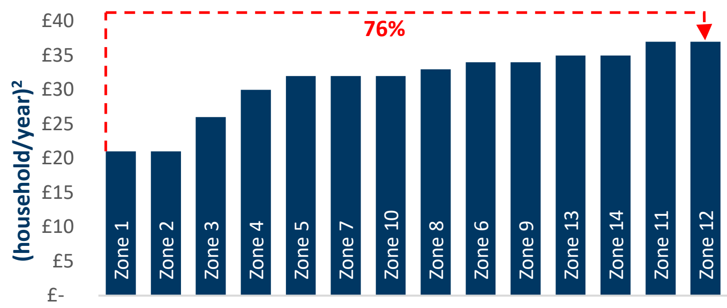
Rationale and evidence

- The concept of "fairness", in terms of the allocation of the overall bill between consumers, cannot be unambiguously defined and often needs to consider the trade-offs between a range of concepts (equity, equality and need). The definition of what "fairness", in terms of consumer bills, means, could range from:
  - Consumers should bear equal retail tariffs irrespective of location to; and
  - Consumers should bear a cost-reflective tariff (reflecting the cost they impose on the system).
- Currently in GB, even though domestic consumers are not exposed to locational wholesale prices, the cost-reflective principle already exists in setting electricity network charges[1]. Observed regional variation in electricity network charges vary by over 75% and represent a principal driver of regional differences in retail prices. In addition, past regulatory reviews concluded that there "*does not appear to be any clear justification for national network charges in terms of the regional concentration of vulnerability*".[2]
- Assuming a cost-reflective principle is favoured then both GB and nodal/zonal market designs would have retail tariffs that are considered as fairer than national tariffs.

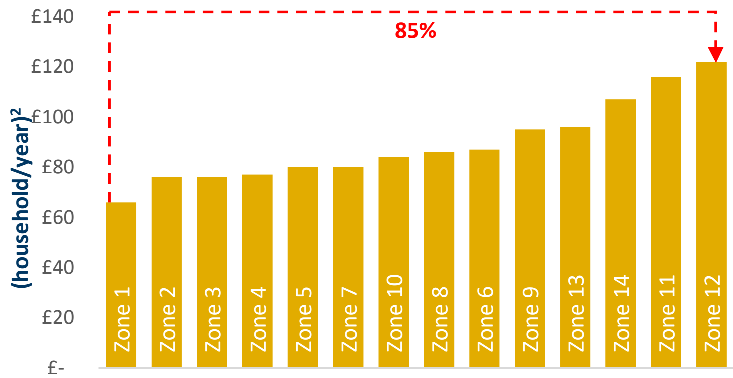
Mitigating exposure to wholesale prices

If policymakers desire to mitigate the impact of a nodal design (i.e. different wholesale prices across consumers in different locations), there are several policy options that can be implemented. Examples include (1) amending regulations to retailers to mandate equal tariffs; (2) providing the option to consumers to only be exposed to a single price (e.g. used in Ontario) or average consumer prices in load zones (e.g. CAISO there are three load pricing zones, while generators receive nodal prices); and (3) Allocate FTR & losses revenue rights to consumers to offset the locational differences in wholesale prices.

Variation in Electricity Transmission Charges[2]



Variation in Electricity Distribution charges[2]



Summary

- A zonal or nodal market system may lead to end-consumers being exposed to wholesale prices that vary by location. This could be considered as more "fair" to consumers in line with existing locational charges on transmission in GB. Equally, depending on concept of "fairness" and the desired policy preferences, consumers can be shielded from wholesale prices that vary locationally by the smearing of nodal prices.

Sources: [1] *As set out in the Transmission Licence - Standard Conditions C5; and Electricity Distribution Licence - Standard Condition 14.*
[2] *Ofgem, Regional differences in network charges, 2015.*

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Each locational market design will present different competition challenges, with mitigation measures available

Assessment score

	Criterion	National wholesale market	Zonal wholesale market	Nodal wholesale market
8	Competition	Moderate +ve impact	Moderate +ve impact	Moderate +ve impact

Description of the criterion

- This criterion reflects desire to facilitate competition:
  - within and across technologies;
  - between generation and demand; and
  - across connection voltages

Key findings

Rationale and evidence

- With appropriate regulations, each locational market design can foster greater competition in energy markets. However, some commentators have noted that a nodal market (and zonal depending on the number of zones) may lead to issues with (1) liquidity; and (2) market power. We discuss each in turn.
- Liquidity:
  - Some commentators have considered that a transition to a nodal market design could reduce liquidity as the number of nodes increases.
  - Liquidity is difficult to measure due to (1) an absence of a standard definition; and (2) that the contract market structures differ across market designs.
  - Nodal market designs evolved in the 2000s, particularly in the US, to create "trading hubs" which are a subset of nodes over which a price index is calculated as the weighted average nodal price. Increased number of participants in the trading hub improves liquidity and international review indicates trading hubs are typically very liquid.
  - CBAs on the transition to a nodal market consider that "*the introduction of LMP will not lead to a deterioration of contract market liquidity*" and it would increase *"the overall liquidity and transparency of the Ontario market*".[1]
- Market power:
  - Generator market power is a potential feature in all electricity markets. This may typically arise due to a generator's location on the network and the prevailing system conditions around it (e.g. transmission network constraints), irrespective of the market design.
  - This means that market power could manifest in various ways across different market design, which would hence require different mitigation measures. For example, in the GB, market power could manifest in the BM. As such, regulations under the Transmission Constraint Licence Condition ("TCLC") have been implemented to mitigate potential market power issues. In nodal markets, generators may have market power related to the pricing at each node. Tests have been developed to mitigate these potential issues.
  - Additionally, more granular locational price signals in short-run dispatch may lead to greater competitiveness across technologies and from distributed energy resources and DSR. This is discussed further in the 10th criterion (full-chain flexibility).

Summary

- The evidence suggests that the transition to a nodal market does not appear to introduce additional market liquidity nor market power challenges relative to a national market. However, market power issues can arise in all market designs, and hence require appropriate monitoring and mitigating tools to be implemented.

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Sources: [1] *IESO, 2017.*

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Nodal and zonal market designs appear more adaptive to changes in electricity market conditions

Assessment score

	Criterion	National wholesale market	Zonal wholesale market	Nodal wholesale market
9	Adaptability	Moderate -ve impact	Moderate +ve impact	Significant +ve impact

Description of the criterion

- This criterion reflects the ease of adapting to:
  - Changes in technology or new circumstances; and
  - With limited disruption within a reasonable timeframe

Key findings

Rationale and evidence

- A nodal market is likely to be more adaptable and resilient than other locational design options as changes in demand, generation and/or network conditions would automatically be reflected in the pricing of nodes and FTRs.
  - This also reduces the burden of the ESO in its balancing role to manage these conditions as markets are given a clear price signal to act accordingly.
  - Furthermore, the incorporation of congestion and losses into wholesale prices is likely to reduce the regulatory uncertainty associated with the locational aspects of transmission network charging (which has been under frequent review in GB).

- Similarly, a zonal market is likely to be more adaptable and resilient than a national market as changes to conditions will be reflected in each zone accordingly. However, a zonal market might require greater administrative decisions when the number of zones or the zone boundary changes in the future, hence is less resilient than a nodal market.
  - For example once the transmission reinforcement along the B6 boundary changes, congestion may shift to other areas. Similar re-zoning issues are likely to arise at other boundaries over time.

Summary

- A nodal market is more adaptive to changes in electricity market conditions, followed by a zonal market, compared to a national market.

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Nodal market designs appear better suited to enable the flexibility potential from all assets in the energy system

Assessment score

	Criterion	National wholesale market	Zonal wholesale market	Nodal wholesale market
10	Full chain flexibility	Moderate -ve impact	Moderate +ve impact	Significant +ve impact

Description of the criterion

- This criterion reflects the ability of the locational market design to enable the "flexibility potential" from all assets at all levels of the electricity system

Key findings

Rationale and evidence

- In a national wholesale market, all locational flexibility is by design procured bilaterally via system operator as price signals are not sufficiently granular. The requirement for "out-of-the" market action by the SO could limit the ability of all the assets across different voltage levels to realise their full flexibility potential. A national market design can also send the wrong signals to market participants e.g. encourage flexibility that harms rather than helps the system (e.g. discharging batteries / hydro behind constraints).
- On the contrary, a more granular price enables all market participants to be exposed to the price revealed at their location and not only those participants bilaterally procured by the SO. This greater price granularity will enable market participants and consumers across all voltages to see the local price, allowing them to respond without a direct contract with the SO. This potentially increases the market depth and could unlock the flexibility potential across all voltage levels. This is evident in the prominence of DSR participation in the US, as shown in the table on the right.
- At the same time, temporal and location differentiation of prices would encourage investment decisions that consider the whole system (e.g. generation/storage co-location, and retailer portfolio optimisation behind a node among other decisions).
- A zonal market would likely provide similar benefits, albeit to a lesser extent, depending on the granularity of the zones.

DSR participation in US ISOs (2020)[1]

	DSR Resources (MW)	% Peak Demand
CAISO	3,290	7.0%
ERCOT	3,939	5.1%
ISO-NE	476	1.9%
MISO	13,024	11.1%
NYISO	1,274	4.2%
PJM	8,915	6.0%
SPP	34	0.1%
GB (from FES 2021)	1,300	2%

Source: *FERC, '2021 Assessment of Demand Response and Advanced Metering' (2021).*

Summary

- A nodal market enables greater flexibility potential, followed by a zonal market, compared to a national market.

Notes: *[1] Figures cited in the table from FERC only includes DSR facilitated by the ISO, and not DSR facilitated by utilities (as many utilities in the US are vertically-integrated). This may mean that DSR may not be directly comparable across ISOs (for example, ERCOT includes DSR participation in ancillary services, but SPP has additional DSR participation within its vertically-integrated utilities which is not visible to SPP).*

Dispatch element

2 Dispatch

Key: contribution towards a Net Zero market

- Significant -ve impact
- Moderate -ve impact
- Minor -ve impact
- Unclear impact; depends on detailed mechanism
- Minimal impact
- Minor +ve impact
- Moderate +ve impact
- Significant +ve impact

Summary assessment of the dispatch element

		Central dispatch: Centralised commitment	Central dispatch: Self-commitment	Self-dispatch	Rationale
1	Decarbonisation	We have not assessed this option as unlikely to be suitable in a GB market where liquid forward trading is desired.			*Level of decarbonisation driven primarily by the amount of low carbon support, and not by dispatch market designs per se.*
2	Security of Supply				*Level of security is driven primarily by the (1) reliability standard and (2) policies / regulations to deliver that standard, and not by dispatch market designs per se.*
3	Value for Money				*A central dispatch market design could provide greater value for money to consumers as it enables the system operator to manage high volumes of intermittency on a system-wide basis.*
4	Investor Confidence				*Both dispatch market design options would have a positive impact on investor confidence towards Net Zero, due to ability to hedge their risk appropriately.*
5	Deliverability				*Moving to a central dispatch model will require a full market reform, which could potentially be costly (in gross terms). Long term sustainability of maintaining self-dispatch market design towards Net Zero is currently unclear.*
6	Whole System				*Both dispatch market design options would have a negligible impact on other energy vectors.*
7	Consumer Fairness				*Both dispatch market design options would have a negligible impact on consumer fairness.*
8	Competition				*A central dispatch market design presents limited upfront costs for prospective new entrants (these costs would be similar across all market participants including incumbents), meaning lower barriers to entry and greater market transparency.*
9	Adaptability				*A central dispatch market design is more adaptable to changes in technology and real-time market conditions as it can (1) enable delivery of all locational market design elements; and (2) better facilitate co-optimisation between energy and ancillary services (e.g. reserves).*
10	Full-chain Flexibility				*A central dispatch market design is likely to more efficiently accommodate the flexibility potential of all assets in the energy system.*

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Dispatch market design options have a minimal impact on achieving decarbonisation targets

Assessment score

Criterion		Central dispatch: Self-commitment	Self-dispatch
1	Decarbonisation	Minimal impact	Minimal impact

Description of the criterion

- This criterion reflects the impact of each dispatch design option on "confidence that carbon targets will be met"

Key findings

Rationale and evidence

- The level of decarbonisation in each jurisdiction is driven primarily by the amount of low carbon support (to bring forward the required investments) and not by dispatch market designs per se.

Summary

- Dispatch market design options have a minimal impact on achieving decarbonisation targets.

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Dispatch market design options have a minimal impact on achieving security of supply targets

Assessment score

Criterion		Central dispatch: Self-commitment	Self-dispatch
2	Security of supply	Minimal impact	Minimal impact

Description of the criterion

- This criterion reflects the impact of each dispatch design option to ensure that "adequacy and operability challenges can be met"

Key findings

Rationale and evidence

- The level of security in each jurisdiction is driven primarily by (1) the reliability standard; and (2) policies / regulations enacted to deliver that standard, most notably through capacity adequacy mechanisms.
- Common measures of security of supply, such as the reliability standard and estimated reliability, are uncorrelated with the type of dispatch market design.
- A central dispatch market design may facilitate more efficient balancing of the system as there is more visibility of the market participant inputs and outputs (e.g. dealing with non-convex costs) ahead of the real time. While this may impact the overall cost and ease of balancing, it would likely have minimal impact on the overall security of supply.

Summary

- Dispatch market design options have a minimal impact on achieving security of supply targets.

Sources: Gov.uk; AER; ERCOT; Transpower.

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

A central dispatch market design could provide greater value for money to consumers

Assessment score

Criterion		Central dispatch: Self-commitment	Self-dispatch
3	Value for money	Moderate +ve impact	Moderate -ve impact

Description of the criterion

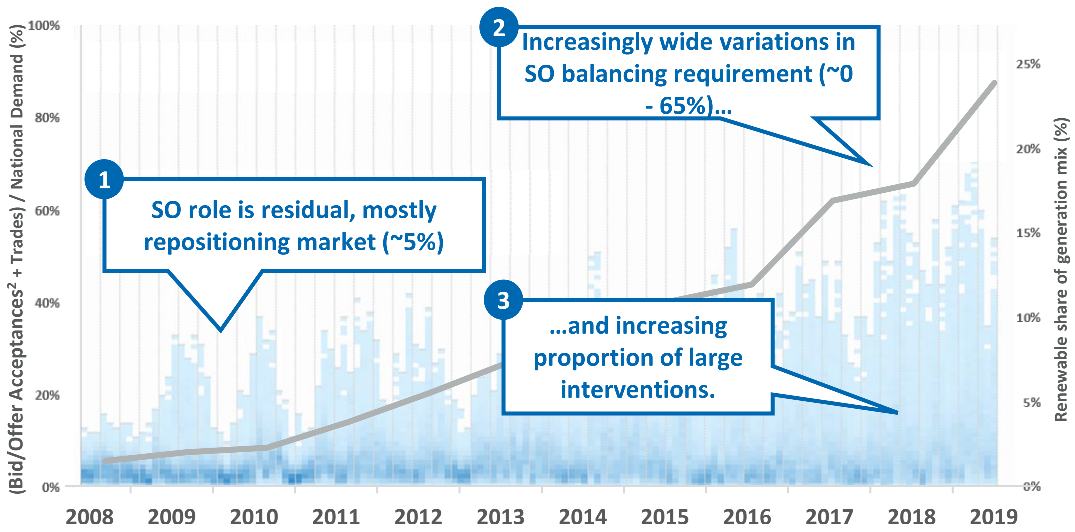
- This criterion reflects the impact of each dispatch design option to ensure that the electricity system "is being delivered efficiently" through
  - Short-run dispatch
  - Long-run investment
  - Network build

Key findings

Rationale and evidence

- Short-run dispatch:
  - Historically, a self-dispatch model was designed to incentivise greater competition between market participants while the SO could act as a residual balancer.
  - However, in recent years, the SO has been managing an increasing proportion of trades as shown on the chart on the right, in part due to the rising volumes of intermittency on the system.
  - This places greater burden on the SO to act akin to a central dispatch SO, but without the appropriate infrastructure and tools such as a centralised day-ahead market and global dispatch algorithms.
  - Additionally, a central dispatch system allows the SO to balance, procure reserves and manage congestion concurrently.
- Long-run investment & network build:
  - Both dispatch options have similar outcomes as they enable market participants to enter into long-term contracts to manage risk appropriately.
  - Both dispatch options have minimal impact on network build outcomes.

SO balancing as proportion of national demand[1] (%) vs renewable share of generation



Summary

- A central dispatch market design would provide greater value for money to consumers as it enables the SO to manage high volumes of intermittency (which the SO has to do an increasing amount of in a self-dispatch market, but with lower efficiency).

Source: *Data provided by the ESO.*
Note: *[1] Darker areas in the heatmap reflect higher frequency of actions*
[2] Instruction issued by National Grid ESO via Electronic Dispatch Logging when accepting a Bid Offer submitted by a Balancing Market Participant.

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Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Both dispatch market design options would have a positive impact on investor confidence, due to ability to hedge their risk appropriately

Assessment score

Criterion		Central dispatch: Self-commitment	Self-dispatch
4	Investor confidence	Moderate +ve impact	Moderate +ve impact

Description of the criterion

- This criterion relates to how investors bear risk, and if the risks are allocated appropriately and efficiently

Key findings

Rationale and evidence

- Both market design options allow generators to hedge their risk exposure appropriately through various channels.
- Participants are also exposed to a transparent day-ahead market, which can support a better estimate of dispatch outcomes. (Note: the self-commitment model could be favourable to smaller participants due to the lower participation costs and the option of being scheduled centrally)

Summary

- Both dispatch market design options would have a positive impact on investor confidence towards Net Zero.

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Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Moving to a central dispatch model will require a significant market reform, which could potentially be costly

Assessment score

Criterion		Central dispatch: Self-commitment	Self-dispatch
5	Deliverability	Moderate -ve impact	Unclear impact; depends on detailed mechanism

Description of the criterion

- This criterion relates to the ease, cost, and time frame of transitioning from the current market design to the target market design

Key findings

Rationale and evidence

- Transitioning to a central dispatch model will require a full market reform. Similar to locational market reforms, the complexity of delivering such a reform would include:
  - ESO system implementation costs – One-off costs to enhance the processes, new IT & software systems and capabilities which often carry risk of incurring higher cost and extended timeline delivery risks, necessitating changes to the process of ESO procurement of balancing services.
  - Market participants costs – One off costs to update system and capabilities.
- It is currently difficult to estimate the cost of transitioning dispatch models as international experience typically combine the move to central dispatch together with locational market reforms. Available cost estimates relate to implementing bundled nodal and central dispatch reforms.
- However, as noted in slide 26, the ESO at this stage is managing a significant amount of trades in the balancing mechanism due to greater intermittency in the system. In this case, the ESO may be considered as already transitioning towards a *de facto* central dispatch role but without the supporting market infrastructure. It is currently unclear whether maintaining a self dispatch model over the long-term towards Net Zero would be sustainable.

Summary

- Moving to a central dispatch model will require a significant market reform, which could potentially be costly…
- … however, the ESO in the current self-dispatch model, is already managing a significant amount of trades akin to a central dispatch model.

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Both dispatch market design options would have a minimal impact on other energy vectors

Assessment score

Criterion		Central dispatch: Self-commitment	Self-dispatch
6	Whole system	Minimal impact	Minimal impact

Description of the criterion

- This criterion assesses the effects across other energy vectors such as the decarbonisation of heat and transport

Key findings

Rationale and evidence

- Dispatch market designs are unlikely to have a significant impact on other energy vectors

Summary

- Both dispatch market design options would have a negligible impact on other energy vectors.

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Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Both dispatch market design options would have a minimal impact on consumer fairness

Assessment score

	Criterion	Central dispatch: Self-commitment	Self-dispatch
7	Consumer fairness	Minimal impact	Minimal impact

Description of the criterion

- This criterion assesses how costs are shared and if they are "fair". In particular, we measure two aspects of fairness:
  - How large is the overall bill paid by consumers
  - The allocation of the overall bill between consumers

Key findings

Rationale and evidence

- At the margin, a central dispatch design can potentially allow greater market participation and larger market depth at lower cost however the actual impact is difficult to assess and quantify without more detailed analysis.
- Dispatch market designs, which set out how scheduling, unit commitment and dispatch operate, are unlikely to have a direct impact on the size and allocation of the overall bill between consumers.

Summary

- Both dispatch market design options would have a negligible impact on consumer fairness.

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

A central dispatch market design with lower barriers to entry and sufficient market depth is better suited to deliver a Net Zero market

Assessment score

Criterion		Central dispatch: Self-commitment	Self-dispatch
8	Competition		

Description of the criterion

- This criterion reflects the necessity for competition:
  - within and across technologies;
  - between generation and demand; and
  - across connection voltages

Key findings

Rationale and evidence

- In assessing market design options against the competition criterion, there are two main issues that impact all technologies across all voltages:
  - **Barrier to entry** – a central dispatch market design provides a simple route to market as market participants have certainty that they can participate by bidding centrally which maximises the depth of the market. Under self-dispatch market design, participants need to find a counterparty to trade, which represents a potential barrier to entry to smaller players.
  - **Market transparency** – comparability between options is difficult to practically observe due to the different contract structures and operational practices in the market. Our analysis of the level of demand supplied via spot market contracts indicates centralised scheduling and self dispatch provide a comparable level of transparency of market prices. However, under a self-dispatch market, a large proportion of the trades are executed bilaterally or via trade platforms which can limit transparency.[1]

- Historically, a self-dispatch model was designed to incentivise greater competition and minimise the role of the System Operator. However, the ESO identified that Balancing Mechanism (BM) market currently places barriers to entry for a wide range of technologies and providers, especially small scale providers.[1] Central dispatch provides a **simple route to market,** enabling the entire market to participate, so the **depth of the market is maximised,** improving competition across technologies, voltages and a wide range of market participants.

Summary

- A central dispatch market design provides lower barriers to entry with good transparency and market depth.

Source: *[1] As identified in the ESO Markets Roadmap to 2025 report.*

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Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

Central dispatch is more adaptable to changes in technology and real-time market conditions

Assessment score

Criterion		Central dispatch: Self-commitment	Self-dispatch
9	Adaptability		

Description of the criterion

- This criterion reflects the ease of adapting to:
  - Changes in technology or new circumstances; and
  - With limited disruption within a reasonable timeframe

Key findings

Rationale and evidence

- Self dispatch relies on the market participants nominating their position as close as possible to the real time. Most balancing is undertaken by participants before Gate Closure, with ESO originally envisaged to play a relatively small residual balancing role. It was also expected (as it turns out, incorrectly) that ESO's residual electricity balancing role "would further decline over time" as participants learnt with experience to refine the balancing of their own positions and as Gate Closure moved closer to real time.[1]
- However, with greater penetration of intermittent, renewable generation, the level of ESO activity has increased significantly with balancing actions occasionally exceeding 60% of national demand (see slide 26). The residual role envisaged for the ESO at the inception of NETA has not materialised. Instead, at times, the GB system now operates close to central dispatch to balance the system (though under very condensed timescales post-gate closure) but without the appropriate tools. This indicates that self-dispatch currently does not operate as designed and envisaged at its inception, potentially impacting efficient utilisation of market resources and delaying delivery of the Net Zero.
- A central security-constrained economic dispatch would enable ESO to schedule day-ahead and co-optimise energy and ancillary service resources while respecting the transmission's physical limitation and avoiding individual portfolio balancing that is counter to system needs.
- Central dispatch would be **more adaptable** and resilient, in the context of transition to Net Zero, as it better facilitates co-optimisation between energy and ancillary services (e.g. reserves)

Summary

- Central dispatch is more adaptable to changes in technology and real-time market conditions.

Source: *[1] Offer - The review of the first year of NETA (link).*

Key: contribution towards a Net Zero market

Significant -ve impact | Moderate -ve impact | Minor -ve impact | Unclear impact; depends on detailed mechanism | Minimal impact | Minor +ve impact | Moderate +ve impact | Significant +ve impact

A central dispatch market design is likely to accommodate the flexibility potential from all assets in the energy system more efficiently

Assessment score

Criterion		Central dispatch: Self-commitment	Self-dispatch
10	Full chain flexibility		

Description of the criterion

- This criterion considers the target design's ability to incorporate the flexibility potential from all assets at all levels of the electricity system

Key findings

Rationale and evidence

- Under a self-dispatch market design, each market participant is incentivised to find a counterparty to trade with ahead of real-time. Usually, this requires in-house or outsourced trading teams, which might be cost prohibitive and complex for smaller participants (often at sub-transmission voltages). On the contrary, a central dispatch market design provides a single counterparty for market participants and small flexibility providers to sell their output by bidding centrally, reducing the need for specialised trading teams.
- In addition, under a self-dispatch market design, a large proportion of the trades are executed bilaterally and the details are not made publicly available, which limits transparency. However, a central dispatch market design generates cleared prices based on all (or a substantial proportion) of market activity, which are then made public, maximising transparency. Availability of real-time spot prices can also guide more efficient DSO actions. For example, it could enable more efficient use of the existing distribution grid capacity, especially for Extra High voltage and 132KV in the areas where they run in parallel with the transmission network (e.g. East Kent). Furthermore, as valuing the contribution of flexibility providers and establishing an adequate price can be challenging (both for DSO and providers), the introduction of a central dispatch design with LMPs could provide a necessary anchor for which future value of the flexibility service can be derived from.
- Overall, a central dispatch market design is likely to be better suited to utilise the flexibility potential due to the following:
  - Minimises market entry barriers and provides a simpler route to market, which is beneficial for new entrants and smaller players.
  - Promotes real-time price availability and transparency to guide decisions of flexibility providers (price responsive demand, networks and non-dispatchable decentralised resources) across all levels of the electricity system.

Summary

- A central dispatch market design would be able to incorporate resources across connection voltages more efficiently.