ESO Markets Advisory Council:
Pre read

1 Introduction

At the Markets Advisory Council meeting on 3rd May, we will be discussing:

- Low regrets/ high value market reform options which can be implemented before any government decision on wholesale market reform.
- What would need to be in place for nodal pricing to be successfully implemented.

Our objective is to gather input and guidance from the MAC as we prepare to publish our NZMR Phase 4 report. The conversation will not focus on the arguments for and against nodal pricing; however, given ESO's rationale for advocating locational pricing has not been fully discussed at the MAC, we felt it was important to provide an update on ESO's current position ahead of the meeting.

2 Recap of ESO assessment of wholesale market design options

In Phase 3 of the Net Zero Market Reform program, ESO assessed the 'operational' components of electricity market design: the wholesale market structure and dispatch mechanism. We identified four challenges facing the current GB electricity market:

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

In comparing the current single national price against zonal and nodal pricing, we found that these issues are arising because locational signals are not dynamic. The report concluded that nodal pricing presents the optimal way to introduce dynamic locational signals. The European model of zonal pricing would be an improvement on the status-quo but entails significant issues including intrazonal congestion and gaming.

3 Current ESO position on wholesale market reform in the context of REMA

3.1 Locational wholesale pricing is required to coordinate renewable and flexible resource in operational timescales

The debate on nodal pricing has tended to focus on the extent to which locational pricing would reduce balancing costs and the relative importance of balancing costs against the potential for increased cost of capital.

While reducing balancing costs remains a priority for ESO, we consider insufficient attention is being given to the underlying issue: that with a single national price, the wholesale market is increasingly unable to produce a secure operational schedule. Waiting to gate closure before unwinding wholesale market decisions is resulting in:

1. Reliance on the Balancing Mechanism and other actions, such as trades, to maintain system security
2. Unnecessary curtailment of renewable generation
3. Under-utilisation of flexible resource that schedule without reference to constraints

(See Appendix 5.1 – 5.3 for more information.)

Our primary objective in advocating for locational energy pricing is to enable wholesale market participants to manage and exploit GB’s renewable resource in operational timeframes.

3.2 Investment policy that aligns with accurate wholesale market signals is critical to decarbonising the electricity system

Reforming the wholesale market will be complex and introduce uncertainty at a time when investment in low carbon resources must continue at unprecedented scale and pace. Our assessment of the ‘investment’ aspects of electricity market design will be published this summer. It will discuss how investment policy can support the accelerated build out of renewable and low carbon flexible technologies to support the UK’s carbon targets.

The report will also emphasise the importance of accurate real time prices to investment decision-making. Market expectations of the spot price determine how assets trade in forwards markets and inform future investment decisions. If the spot price is not predictive of physical dispatch, as today, there is a risk of under-investment where the underlying drivers of system value are not clear to the market.

3.3 Locational pricing is needed alongside accelerated transmission buildout

Last year, ESO published the Holistic Network Design (HND), which provided connection recommendations totalling £21.7bn for 23GW of offshore wind and the associated transmission network infrastructure, alongside connection plans for existing projects. Assuming successful rollout of the HND, ESO’s 'NOA 7 ‘Refresh’ found that GB will continue to see extremely high volumes of thermal congestion through the 2030s.

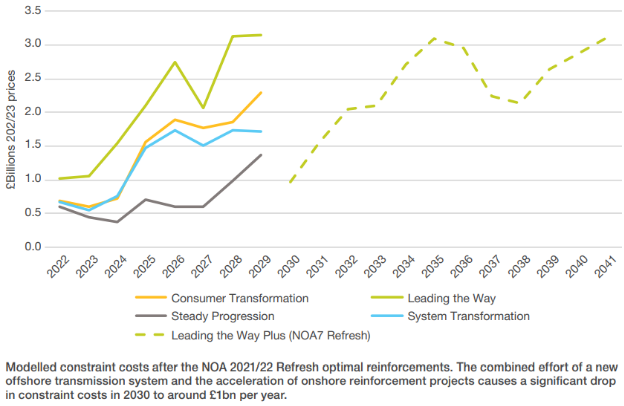


Figure 1: 1.1 Modelled constraint costs after NOA 7 and NOA 7 Refresh optimal reinforcements

The NOA makes economic recommendations by comparing the cost of managing system constraints against the cost of reinforcing the network. Reinforcement options that increase the capacity of the network but cost more than the avoided constraints cost are rejected. Each prevailing NOA therefore represents the most optimal transmission buildout based on potential combinations of reinforcement options proposed by the Transmission Owners.

Some level of network constraint is therefore healthy and part of the normal reinforcement cycle. A network that has excess spare capacity is likely to be oversized and underutilised, meaning consumers would be paying more than necessary.

3.4 The operational alternatives to locational wholesale pricing do not present enduring solutions to the challenges facing GB’s future market

There is interest amongst industry as to whether thermal constraints could be successfully managed in operational timescales through local markets for constraints in which:

1. ESO would forecast thermal congestion volumes (e.g at day-ahead and intraday)
2. ESO would procure response in the correct locations (generation turn down/demand turn up), for example through auctions or via bilateral arrangements

Local markets are an important measure to address congestion in the short/medium term. ESO is launching a local constraint market to help mitigate congestion above the B6 boundary, alongside several other measures to manage thermal congestion in operational timeframes. We do not believe ancillary markets present an enduring solution to signalling locational value in GB's future system. Our concerns include:

1. Asset scheduling decisions would still be done in reference to the wholesale price. This means that, up until gate closure, assets not participating in a local constraint market would continue to schedule without reference to congestion, creating the need for redispatch in the Balancing Mechanism amongst other issues.
2. The scale of forecast congestion means that ESO decisions to procure response would sterilise substantial wholesale market capacity ahead of gate closure, impacting liquidity.
3. Risk of strategic bidding (inc-dec game) in pay-as-bid redispatch markets which clear over different timeframes. This bidding strategy is difficult to monitor and increases congestion. (See Hirth, 2018)

3.5 International experience strongly suggests nodal pricing is preferable to zonal pricing

While zonal pricing would certainly be preferable to the status quo, it would entail substantial implementation complexity with reduced benefits compared to nodal pricing. The experience of European zonal countries suggests the model is less suited to the challenges of net zero than nodal pricing, due to:

1. Failure to rezone in a timely manner resulting in increased regulatory risk and high intrazonal balancing costs (see various reports by ACER and ENTSO-E on their bidding zone review)
2. Risk of rezoning reducing forward market liquidity
3. High prevalence of inc/dec gaming (as above)

4 Next steps

While government are assessing a refined set of options for wholesale market design in REMA, we wish to progress thinking on implementation challenges to nodal pricing and central dispatch in GB.

Recognising that there is substantial opposition to nodal pricing and central dispatch, we will use the MAC May 3rd meeting to discuss what measures would need to be in place to ensure existing assets are protected, to maintain investment in low carbon technologies and to protect consumers.

5 Appendix

The following examples are intended to illustrate how the absence of locational energy pricing is impacting ESO operational decision-making. We expect Ofgem's Technical Assessment of locational pricing, which models the GB wholesale market under national, zonal and nodal pricing, to further evidence the relative scale of redispatch under different models.

5.1 Reliance on the Balancing Mechanism and other actions, such as out of market trades, to maintain system security

Thermal constraints arise when the amount of energy that would flow naturally from one region to another exceeds the capacity of the circuits connecting the two regions. Thermal constraint costs and volumes have risen in recent years as more renewable generation has connected at the network periphery.

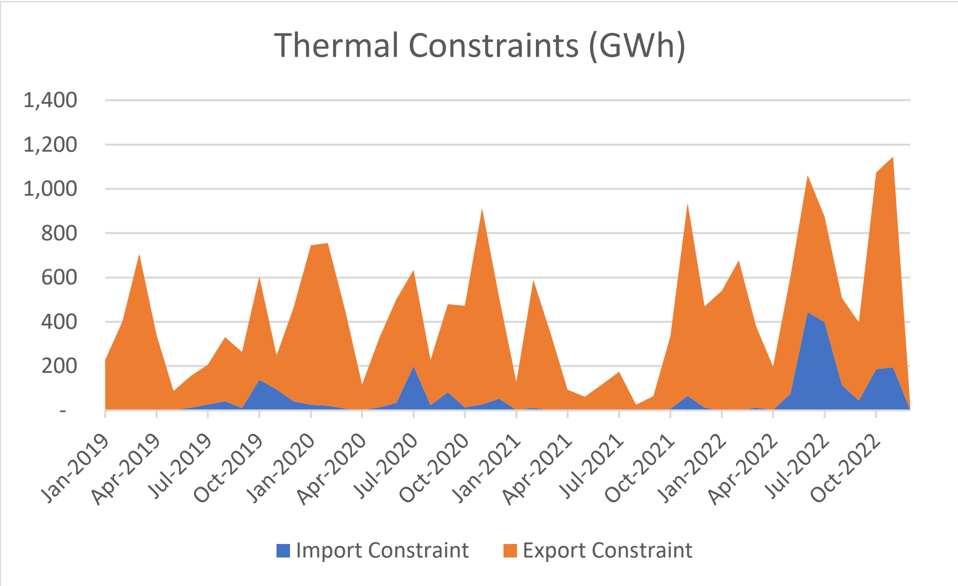


Figure 2: Import and Export Constraints (GWh) from 2019-2022

Constraints are driven by the interactions between network topology, outage patterns, weather and the behaviour of generation and demand. They are therefore highly dynamic. ESO is developing new markets and services to address constraints (see Markets Roadmap, p.31); however, the exact constraint volume is not fully visible to ESO until gate closure, one hour before delivery, when market participants commit to generating/consuming at a particular level. Under the current design, ESO therefore primarily relies on the Balancing Mechanism to resolve congestion.

5.2 Under-utilisation of flexible resource that schedule without reference to constraints

Analysis of storage asset behaviour in 2022 illustrates how flexible assets cannot realise their full system value under the single national price. The charts show how battery and pumped-hydro storage plants scheduled during constrained periods.

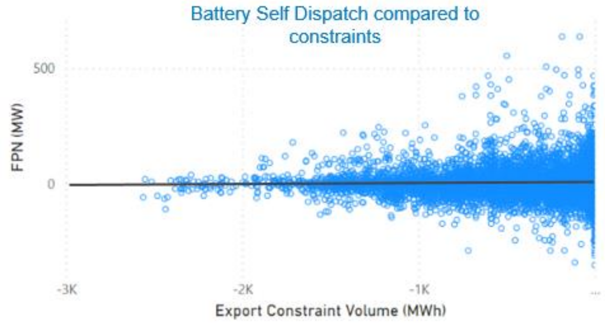
As export constraint volumes increased, batteries reduced their schedules to avoid exacerbating the congestion. This means units were typically available in the Balancing Mechanism to support constraint management but did not proactively alleviate the congestion by charging.

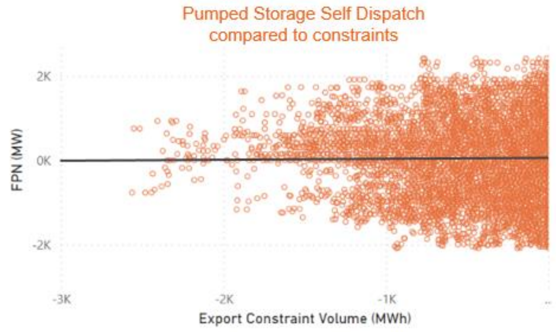
For Pumped Storage units there was no strong correlation between constraint volumes and FPNs indicating that their self-dispatch behaviour could exacerbate or alleviate constraints dependant on market conditions.

For both technology types, under locational wholesale pricing, there would be a correlation between export constraint volumes and negative FPNs:

1. The wholesale price would be low, so the storage asset would charge to consume the cheaper energy

2. Because the wholesale price is low, the asset would not be incentivised to discharge (and therefore exacerbate the constraint)





5.3 Unnecessary curtailment of renewable generation

Relying on redispatch after gate closure means that opportunities to mitigate or avoid renewables curtailment are missed.

The example below shows import volumes on the NSL interconnector in two days in April, against volumes of accepted wind bids. The NSL interconnector is located just above the B6A and B7 boundaries. These constraints are often significantly active when there is a high wind transfer from Scotland and are also exacerbated when Cumbrian and Humber wind is high.

On these days, the interconnector imported during peak hours, in response to relatively high prices versus Norway. To reduce the impact of the interconnector import, ESO accepted 1100MW of wind bids.

The chart below shows NSL flows importing during peak hours. Positive values are where the interconnector is importing. Due to NSL importing, additional wind bids were accepted (shown in grey). When NSL was exporting, ESO was able to avoid curtailing wind.

Under locational pricing, we would expect to see the interconnector movement more closely correlated to the local weather pattern. The wholesale price in the B7 region would be low, reflecting that the energy could not be transported South to demand. The low price would allow the interconnector to export the wind to Norway, mitigating or avoiding curtailment actions.