Balancing Capability Strategic Review 2022

Answers to your questions

10 June 2022

Introduction

This document holds all the questions we have received in relation to strategic review of balancing capabilities that National Grid Electricity System Operator (ESO) announced on 31 March.

Thank you to everyone who has engaged with us so far, especially to those who have asked question at our webinars. If you have any questions that are not covered below, please contact our Balancing Programme at box.balancingprogramme@nationalgrideso.com.

You can find out more about the review in the Balancing Programme area on the ESO website including:

- Our open letter to the industry of 31 March
- Recordings from the webinars

Contents

We have grouped the questions into themes to make it easier to view our responses. We will update this document regularly with responses to all the new questions we receive from stakeholders. The document currently covers questions received up to **25 may.**

Question themes:

- Adopting new technologies
- Current operational issues
- Delivery approach
- Delivery timescales
- Wider BM review

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Adopting new technologies

Received	Number	Question	Answer
7 Apr	AT01	**How does duration limited resource contrast with traditional notions of Headroom/Footroom? Ie. could all Operating Reserve come from batteries? What duration?**	The ESO has a requirement for positive and negative reserve. The volume of reserve is determined by historic factors to cover the largest losses and known frequency correction. So basically, reserve that is utilised over relatively short periods to correct frequency drift and reserve that is required to cover longer durations such as the loss of the largest generator on the system. Reserve requirements, positive and negative, could be met by batteries as long as we had enough capacity to cover the capacity and duration required to be filled until the underlying imbalance can be corrected. An important part of this will be the capture of the state of energy and this is within our planned RIIO-2 deliverables to address.
7 Apr	AT02	**What consideration are being made for data flow volumetric issues. We are seeing volume issues being reflected in late BSAD to Elexon for example.**	With respect to BSAD submissions, we are aware of some data inconsistency issues and those were presented to the Operational Transparency Forum on 16 March. We have made improvements to our processes and there is an ongoing stream of work actively focused on developing tools that will improve the efficiency of the process and will ensure data inconsistencies in BSAD are resolved in an efficient and timely manner. Updates will be reported back to the Operational Transparency Forum when available.
7 Apr	AT03	**With more 'smaller participants' in the market will new systems be designed with equal access in mind.**	Yes – this is fundamental to our whole system and competition everywhere ambitions. Our current systems are increasingly a blocker to this.
8 Apr	AT04	**I looked at the integration of DSR requirements into your new systems. As it looks like a 'start from scratch' exercise, I am unsure of the weight that relatively new technologies (such as buildings Demand-Side Response) in your new systems setup. The system of the future will be quite different from what we have experienced in the last 100 years+. What provisions are you taking to make sure that incumbent technologies do not cannibalise all your resources, and that you build effectively for the future?**	We agree with the sentiment that Units that provide services to National Grid ESO will be different, and that the ESO will need to adapt quickly to changes. We have a dedicated workstream who are looking into fuel type, unit types and service types, they are building out a very flexible platform so we can configure new innovations without the need for structural change to the platform. The method also allows any new innovations to be used by existing fuel types, subject to Grid code rules allowing us to do so. NG ESO are facilitating many initiatives that are looking at reducing the barriers to market entry of domestic flexibility assets, such as Power Responsive or the recent market trials with Octopus Energy.

Received	Number	Question	Answer
8 Apr	AT05	**There are already massive issues with the 'single markets platform', which might hinder the integration of large numbers of assets, and look heavy administratively. Consideration should be made on simplifying the integration of behind-the meter assets into large flexibility groups. Also, do we need grid points? Could systems of the future work on a national basis? Lastly, datafiles are complex, and hinder smaller capacity players' participation to the UK grid systems. Datafiles and structure could move up to the 21st century. This is an opportunity to re-write the rule books, and simplify access and operations to all market players.**	The Single Market Platform is following agile and adaptive approach, with new releases each quarter that have improved functionality for the consumer. There are future plans to improve the process specifically for aggregated units, which will enhance the onboarding experience. Monthly calls are held by the Single Markets Platform team, where stakeholders can raise improvements they would like to see. From a control room perspective, the ESO has ensured the Grid is operated within security standards and within reasonable cost. To enable this, we need to model the Grid accurately so we can forecast and manage constraints and requirements such as voltage support, energy reserve, line outages etc. To be able to model this we need data at GSP level. That being said, all new products and services will always be designed with the best value for money for end consumers in mind, and therefore operability requirements need to balance with the merits of technologies that can provide balancing services. Our future platforms are being designed in such a way that they will be able to handle an array of different aggregation logics, such as node, GSP Group.
14 Apr	AT06	**It's encouraging to hear about increasing desire to focus on 'unit' level rather than individual assets (within a unit) to accommodate smaller assets (DERs, DSR etc) into balancing services. However, when will we start to see this translating into lighter touch / more proportionate registration and testing requirements that enable greater participation of DERs & aggregated DERs in balancing services? There is huge opportunity to recruit DERs to provide balancing services, but it is still disproportionately difficult to do so.**	We want to avoid being over prescriptive with any service and have already made improvements (through the Wider Access API) to help open the Balancing Mechanism to more market participants. We agree that we are seeing an increase in the number of interested aggregated and DER assets, and that registration and testing processes need to be proportionate to type of services these assets can offer. We are actively collaborating with market participants through market trials such as Powerloop and the Domestic reserve scarcity trial, to understand the current barriers in registration and market frameworks to smaller assets. A key output from these trials will be to understand a pathway forward to maximising the potential of these assets in the balancing of the system. Power responsive is an industry forum organised by NG ESO also looking at the issues facing domestic flexibility, again trying to break down the barriers to market entry for smaller assets.

Received	Number	Question	Answer
26 Apr	AT07	**How will this fit with the digital twin work?**	You'll have seen the recent communications on the Virtual Energy System which has an ambition to connect digital twins and data from right across industry. It's our view that the Control Room systems need to make data transparent to industry and if we design our data and interfaces to be as compatible as possible then that can only be a good thing. It will be great to receive your feedback on how we make our data as accessible as possible to help this Virtual Energy system. We have in the past learned a lot from industry players on data, interfaces, configuration and we want to continue engaging with you to ensure what we deliver matches industry requirements.
18 May	AT08	**If the control room cares more about where on the system a response will appear, how can you move away from individual small DER asset registration requirements?**	Ideally the CR would like to be able to model the system 100%. To increase the volumes and market participation to make the service useable a cap was placed on the total volume of GSP Group instead of GSP specific volumes. If we need to revert to GSP level data as the service matures, we will.
18 May	AT09	**GC0117 and GC0148 increase reg. requirements esp. for small/new assets to enter the market - this is misaligned with policy aim of increasing new flex resources**	Bulk asset registration via API upload is in scope of the Single Markets Platform to hopefully ease the burden on providers when registering lots of sub-assets within an aggregated unit. This will initially be for Ancillary Services markets, but we hope to apply learnings to the BM onboarding journey. We would also consider discussing changes to the Grid Code etc. to support new data requirements and improve service delivery. Our existing processes were agreed several years ago, and we are always open to new suggestions as long as the information given to the ESO allows us to manage the transmission system. This discussion must include the DNOs

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Current operational issues

Received	Number	Question	Answer
7 Apr	OI01	**System transformation takes time, but system balancing costs are in millions per day. Would doubling up the ENCC team save money in the interim, while manual systems remain?**	"At busy times we do staff the ENCC up more than normal to ensure we can manage particular system conditions both efficiently and effectively. But when there is one interface between two systems or when there is one set of data to input to one particular system then you don't have any gains in adding resource to that process. Most of our spend on existing systems and spend to transform will ultimately enable more competition and will also result in a reduction of balancing mechanism spend. So, yes, if the ESO is able to transform more quickly then we can implement new services more quickly, connect more participants more quickly and all of this will lead to balancing costs that would be lower than otherwise would have been the case."
7 Apr	OI02	**Why are interconnector swings a challenge to the ESO?**	The ESO welcomes interconnectors as part of the energy mix. It is economically correct that interconnectors should be allowed to optimise flows as close to real-time as possible in line with other market participants. However, the ESO has, at times, to solve up to several GW of power flow swings at one hour notice. This has provided new challenges to the ESO and the historic process of creating system operating plans which can quickly become out-of-date. This is why the prediction capability has become much more important than that envisaged when we submitted our business plan in December 2019.
7 Apr	OI03	**You've said "zonal management is efficient" but BMUs are often skipped in price stack for zonal management reasons. Isn't this a source of inefficiency?**	We want to work with industry to transform our existing systems so that we have the right capabilities in the ENCC to allow 100% efficient dispatch 24x7 and avoid any risks of skipping BMUs. We want to reduce and eliminate any skips whether it be for zonal-management or for any other reason.

Received	Number	Question	Answer
9 Apr	OI04	**The main additional issue is how National Grid ESO will address dispatch inefficiency in the period up to delivery of improved systems. This is a crucial period for the development of flexibility; it is not acceptable simply to wait.**	The operational need is moving rapidly from using a few traditional large power stations to balance supply and demand to using thousands of small units. The ESO has set very ambitious targets for 2025 which require additional services, market reform and control system capabilities. Absolutely the ESO is not waiting for a go live once solution in 2025. To ensure dispatch is optimal we are increasing our dispatch capability incrementally which include automation of dispatch processes and flexibility in the number of engineers. We have already increased automation in the dispatch process this year and further improvements are ongoing and will continue to go live in stages. Balancing is becoming more complex as the number of units used increases, the Demand is more volatile due to financial incentives at supplier level which change consumer behaviour, renewable generation vary output unexpectedly with changing weather conditions and interconnector movement increase in capacity and ramp rate. All of these changes require more complex optimisation and dispatch, but they are all helping to reduce the cost to consumers by increasing competition and taking advantage of new technologies.
14 Apr	OI05	**We've seen very little use of small BMUs to help relieve wind constraints, despite advantageous cost differentials. What is the operational reason for this?**	When managing a continuous constraint, how long we need to take action for is one of the key factors that dictates which actions to take. Therefore, the available duration and capacity of units are key considerations. We are keen to discuss what this means for our balancing capability plans. There is also an ongoing workshop through Renewable UK that is looking to optimise storage and small assets to solve constraints going forward.
14 Apr	OI06	**Thank you for the very useful answers. On wind, I'm speaking specifically about resources which aren't bi-directional (they don't flip their PNs) and aren't duration-limited. That is, not everything is a battery. Very interested in attending the workshop you mention.**	RUK are holding workshops with industry and ESO covering the use of storage at ESO level. If you would like more information or be involved, please contact RUK - Yonna.Vitanova@renewableuk.com.
14 Apr	OI07	**Please share details of the RUK workshop thanks.**	Please email Yonna Vitanova at RUK, Yonna.Vitanova@renewableuk.com.
19 May	OI08	**Balancing costs should be included in the ETYS on a daily profile basis**	Not related to this strategic review – but we will pass it over to the relevant ESO team. Daily data is available on the ESO data portal.

Received	Number	Question	Answer
19 May	OI09	**Any BOA that isn't issued based on merit should be flagged, in real time**	In our existing systems, it is not always possible to flag these in real time, because it is sometimes only with hindsight that a “skip” takes place. The data portal has information on dispatch transparency, and this topic is also discussed at the OTF. However, we will consider how we can provide more information closer to real-time in our new platforms.
19 May	OI10	**Control Room internal documentation about decision-making should be made public, so we can model and optimize our assets to provide the best value in the BM**	This is feedback that we have heard during this review and at TAC. We will consider how we can publish more information about our decision making. Some suggestions that have come up include: • Publishing a suitable version of our internal daily status report. This could complement the SOP which we publish at the start of each day. • Process maps for how we balance the system, including the considerations control room engineers need to consider

Delivery approach

Received	Number	Question	Answer
7 Apr	DA01	**If significant systems change is required, is the ESO best placed to do this review / design / implementation and how is the FSO decision affected?**	The FSO announcement demonstrates that Ofgem, government and stakeholders believe the ESO is best placed to take a leading role in transitioning to net-zero carbon operability. We understand the scale of the change, are learning from past delivery and want to be far more transparent in how we deliver and are using groups like the TAC to help us do this. Transforming our balancing capability provides the foundations for the objectives of the FSO.
7 Apr	DA02	**Although your confidence is appreciated, is the ESO best placed to do this significant systems review/design/implementation?**	We understand that our plan is ambitious, but we firmly believe it is necessary to get to net-zero carbon operability. Stakeholders have been right to challenge whether we have the capability to deliver. We do not want to undertake this challenge alone. We hope that by working closely with industry through this engagement and other forums, including the Technology Advisory Council, we can deliver the required amount of change. We have learnt lessons from previous delivery and have made changes. These include moving towards smaller but more frequent releases, ensuring we retain the relevant expertise and not hard coding changes into our new systems but instead ensuring they retain flexibility.
8 Apr	DA03	**On a standalone basis, I think that the need was well explained. However, there was no reference to the existing ENCC IT upgrades that have been previously flagged to the providers of ancillary services. I would like to understand how this review interacts with existing planned projects, especially those designed to allow co-optimised procurement and make it easier for aggregated DER to access ESO markets.**	The Balancing Programme team has been working with other ESO teams (from both business units and IT workstreams) to capture a list of all initiatives that may interact with the developments that we are undertaking. At the webinar on 26 April and at the in-person meeting on 5 May we will be sharing this information. We would very much like your views on this list to be sure we have not missed anything you may have fed back in other forums.

Received	Number	Question	Answer
8 Apr	DA04	**I'm not clear on the timing of this review, beyond the dates shown for the initial engagement work with stakeholders - i.e. please give an indication of key dates beyond June 2022. I'm not clear on how this interacts with existing announced upgrades to the ENCC systems. Is there a risk that this review could end up delaying the delivery of improvements that providers of flex from smaller DER assets have been asking for?**	As part of this review we would like your views on how you would like to be part of the programme going forward. We appreciate that different parties may have different needs (some may be happy with regular reports while others may want to be involved in the detail of how some functionality is being developed). While we are carrying out this review we are continuing with work - we have not paused anything. However, as part of this review, it may be concluded that we need to re-prioritise some of our work, but this will be developed in an open and transparent way with participants as part of our consultation during April and May.
8 Apr	DA05	**As always, industry needs time to implement any consequential changes to its own systems. However, it's the constraints of the ENCC systems that often create challenges for industry in accessing ESO markets, so we are keen to see improvements ASAP.**	The new platform we are developing is designed to be flexible and configurable. One of our key objectives is to have an IT solution that enables the implementation of new services faster. Our existing IT (as shown in our webinar on 7 April) means that processes are supported across multiple IT systems which were built many decades ago. Removing these barriers is an essential success criteria for the project.
8 Apr	DA06	**Please provide regularly updated roadmaps so that stakeholders have a clear view of project status and expected timing of deliverables. This is important so we can build the changes into our own business planning. A challenge with the current Future of Balancing Services work is that we get lots of engagement from the ESO and then everything goes silent for months (while the ESO is working internally).**	We are very keen to understand what you need from us going forward and this will be part of the consultation over April and May. Our aim is that this balancing capability review will effectively create an industry-endorsed roadmap. After which we want to engage regularly with you (definitely not going silent) so you can continue to help us prioritise and input into the roadmap and plans. We are interested in understanding your views on the shape and form of the ongoing industry engagement.
14 Apr	DA07	**IT takes a long time, even when it goes well. What changes in working practices can we make now to ensure the BM is used efficiently in the interim? Small BMUs have been active in the BM for four years, and the diversity of resource types in those BMUs is poised to grow very quickly. We cannot afford to have these BMUs ignored. That would inoculate pioneer customers against flexibility, when we could have them helping drive the recruitment.**	In real time operations, we always want more flexibility and welcome the increase in smaller BMUs. We value the extra flexibility that smaller BMU's provide to operate the system. We have already delivered capabilities into the control room that allow efficient dispatching of smaller BMUs, these include; • Automating the dispatching of several smaller BMU's in response to volume requirement • Automated repeat instructions Through this review we want to ensure we are aware of the challenges faced by all industry parties, and ensure we develop our systems in such a way to overcome these.

Received	Number	Question	Answer
14 Apr	DA08	**IT improvements take years, even when they go well. Also, things changed so much in the last 3 years that the original plan is just not cutting it anymore, which is why we are here.** **This is good, but can we make sure that, whatever the output of this exercise is, we don't end up in a similar situation in 3 years' time?**	We understand your concerns and as previously stated we are not saying that we are not able to manage the changes or that we are starting again. It is about recognising that there are several changes in external system and market conditions, a number of market initiatives that are designed to respond to them and a need to actually develop the new tools. All this needs to be done at the same time, which is why we want to make sure that the roadmap is agreed with you. We are confident that we won't end up in the same position in three years' time because work is already underway. At the upcoming workshops we will present options for how we can deliver these to get your feedback. Going forward, we want to work with you so that you are fully informed of any future challenges as they arise.
14 Apr	DA09	**In the next catch up would it be possible to include an overview of how the current systems and processes are used to optimize balancing now and what the proposed step changes are. The lack of visibility makes it hard to bring the industry along. This would be similar to the overview that Jean just provided.**	Yes, we are keen to bring you on this journey with us, and therefore understanding what the current systems and processes look like is crucial. We have shared an example technology transition slide in the webinar on 26 April. We would like your input to create the capabilities required, and together with a robust cost-benefit assessment, this will determine the technology choices and transition.
14 Apr	DA10	**Since the dispatch transparency data has been published, it became apparent there were some internal rules/processes that the market didn't know about (e.g. the Geometry rules). Will there be increased visibility of control room processes alongside the IT changes?**	Through this review we will be as transparent as possible with the current suite of systems and processes, to help increase understanding of the challenges we are looking to overcome as an industry. We welcome challenges from industry as we go through this process, as understanding the impacts from a broad range of stakeholders is how we can ensure the capabilities we look to deliver are right. As NG ESO we aim to be as transparent as possible and again welcome feedback on areas industry parties we could improve this, our Operational Transparency Forum is held weekly and allows market participant to raise such suggestions.

Received	Number	Question	Answer
26 Apr	DA11	**What process did you go through to decide that a big bang implementation was not the right solution? How do you know agile approach will work with legacy systems and you can move to this master system in a transition?**	We did a lot of engagement on our delivery approach with our stakeholders on our RIIO-2 plan back in 2019. There were three main reasons why we believed the agile approach would be the way forward instead of the big bang approach. Firstly, an agile approach allows us to add value early and delivering change incrementally. Market requirements, the energy landscape industry and consumer expectations are changing quickly that means we do not think a big bang approach is right. The feedback we received was that we needed the ability to be flexible and able to respond quickly to change. Secondly, our container-based architecture lends itself to agile delivery, value prioritised modules can be built in sprints or programme increments and integrated easily into service through automated testing and DevOps methods. Moving to a modular approach, not a big bang means that outcomes will be realised much earlier and and failures can be corrected for. This module approach ensures that our systems are flexible to change to ensure that we can capture the changing requirements of the industry over the development stage and beyond.. Finally, learning from our previous experience from EBS and other projects (inside and outside ESO). Industry best practice is to move away from big bang approach and towards a more agile delivery approach. Clearly there are constraints in our legacy systems, therefore we will need to be realistic about how much of a truly agile approach we can adopt, but where possible and necessary we will be delivering functionality and improvements incrementally.
26 Apr	DA12	**Who will be carrying out this development?**	All developments and deliveries will be carried out using a combination of in-house engineering teams and external IT vendors with a proven record of delivering transformation programmes.

Received	Number	Question	Answer
26 Apr	DA13	**With REMA, NGESO's own new market proposals, etc., how do you know what you are trying to build?**	Flexibility is key with our transformed systems and platforms. New services need to re-use code which has already been written so that we can work on the principle of reconfiguration rather than always having to redevelop each time and test end to end each time which is the situation we find ourselves in with our existing systems. Also, by taking an agile approach we can ensure that we can deliver prioritised capability which delivers strong benefits at worked out costs. In terms of market reform, we have tested our new Open Balancing Platform architecture against the potential flavours of market reform. We find that the new proposed architecture supports market reform whereas the existing systems do not. So this potential market reform is another driver to transform from old to new Control Room systems.
26 Apr	DA14	**What is your internal governance process to manage the roadmap?**	We are proposing reviewing the roadmap every three months internally and presenting progress to our governance boards. We also want to replicate this externally and engage with you on a 3-monhtly basis so we can get your regular input and make sure we are continuing to deliver industry needs, wants and desires on our way to net-zero. As part of this process we want to hear feedback from you though, and understand how often you want to review this roadmap with us.
26 Apr	DA15	**A very general question, which may be a terminology question more than a substantive one.** **Does the balancing capability strategic review encompass algorithms as well as platforms. I think both, but much of the discussion is on platforms and deployment. I would just like to be clear where I should be directing suggestions/questions.**	Yes, optimisation algorithms are part of the balancing programme transformation. We have a dedicated Optimisation team made up of internal and external specialist and Subject Matter Experts (SMEs), who are looking at the engineering and scientific optimisation problems we'll need to solve as part of the energy transformation. Optimisation algorithms are planned to be implemented on market leading optimisation COTS products.

Received	Number	Question	Answer
26 Apr	DA16	**What is implied by the 'Open' bit of OBP?**	The Architecture is based on RedHat OpenShift technology. It's based on the concepts of Microservices and Application containers. Open Balancing Platform is designed to be highly flexible, fast to develop on and crucially, easy to integrate internally and externally- hence we called it the Open Balancing Platform. We should add Openness does not come at the expense of Security.
26 Apr	DA17	**Can you explain why the same initiative appears in multiple swimlanes are there different requirements for each swimlane?**	Yes you are right, we have different requirements that map to different systems or processes, therefore you can see an impact is rippling through our systems.
26 Apr	DA18	**Is this centralised approach the most optimal? Should the ESO be interacting with other actors or localised markets that can reduce complexity, rather than pursuing this centralised approach?**	In some cases, yes the central approach is optimal. Currently the ESO facilitate the Balancing Mechanism market and as such require central platforms to optimise. We have to be able to model at GSP and Unit level to enable secure transmission constraint flows, so we need a central view to ensure we can fulfil our role as residual balancer. We have a licence obligation to ensure a safe and secure system, and we wouldn't want to delegate that responsibility to a 3rd party. Having said that, we are exploring options for using 3rd party platform developers for non-critical services, such as the Local Constraint Market for managing constraint costs at the B6 boundary. We are also working with the DNOs through the Open Networks programme to come to whole system approaches for all aspects of network management.
26 Apr	DA19	**Will you be running a follow up visit to the Control room or just the 5th?**	May 5th is the only visit planned to the ESO's Electricity Control Centre during this 2-month engagement. Please do send a company representative to this workshop next week if you can. If there are some of you who cannot make it then we can see about arranging a more bespoke visit at a later date.

Received	Number	Question	Answer
26 Apr	DA20	**Have you looked at any systems/functionality that you could use from other TSOs outside GB that may have more recently updated systems?**	Yes, we have been engaging with other TSOs, to understand better what they have been working on and why. We met with Elia, the Belgium system operator, who are undertaking a very similar transformation with their Control Room system. We will continue to engage with them throughout our transformation. We're also interested in your views on who else we should be engaging with. And of course, we have also been engaging with the Technology Advisory Council (TAC) about different case studies, both inside and outside the energy sector.
18 May	DA21	**Will you be circulating the PDFs of the Miro boards? These look very useful.**	They're available on our website - as a locked version alongside all of the information from this review including this rolling question and answer document.
18 May	DA22	**How will you make sure an "agile" IT systems approach is also picked up by market design & development teams? (Seeing lots of very inflexible market changes)**	We need to be having these discussions continuously, across industry and ensuring we are incorporating engagement with market design and the development teams. We are improving how we share information across our team and throughout the ESO, we're also looking at how we share this information with the wider industry. This means that our Markets teams will be communicating more with industry to get requirements and working with our technology providers/developers to ensure we have a joined up roadmap that is clearly communicated to industry in a timely manner.
18 May	DA23	**Whilst scheduling in some systems could be retired, moving to shorter term, if central dispatch comes you will need longer term/DA scheduling. Is this captured?**	Yes. There may be a requirement to have a scheduling process day ahead, depending on the model of market reform that comes forward. However, this would be a different capability than the existing scheduling tools provide today. The new technology needs to be flexible enough to help deliver this capability if it becomes a firm requirement.
18 May	DA24	**What are the targets for the Enhanced Optimization, verses 'increased units'**	Enhanced Optimisation targets multiple aspects - bulk dispatch, co-optimisation (taking into account inertia, response, reserve etc.), service and unit flexibility in terms of harmonised super units and "super services". Within this, it also includes increased number of units.

Received	Number	Question	Answer
18 May	DA25	**In 'enhanced optimization' are you planning to take into account Co2 & reserve as a 'could do'? If not, the optimiser might need re-doing when you're finished**	Within Enhanced Optimisation, we are allowing for additional requirements and factors to be included within the optimisation logic. This approach aligns with recognising that there is a changing need, which is subject to definition in the future. As such, it is not that it requires "re-doing when finished", but that we are expecting a need for continual change as the market evolves, and as such change to account for CO2 is expected and factored in as part of our scaled agile approach.
18 May	DA26	**The lack of early focus on forecasting and testing balancing technology assumptions on the roadmap is quite surprising given the potential benefits**	Enhancements to our Forecasting capability are ongoing and being driven in parallel to the Transformation roadmap. Our current roadmap for the Forecasting capability will deliver improvements to our Solar, GSP, National Demand and Wind forecasts and plans to integrate these with our existing systems to enable early delivery of benefits over the next 2 years. The development of real-time prediction functionality will be initiated next year and integration to our new balancing platform is planned at a later stage.
18 May	DA27	**How will ESO design stability market services, alongside ensuring developers can design and invest to include capability for assets being developed now?**	The design of the stability market is ongoing and this will include looking at eligibility criteria and so we encourage you to have your say on this. We want to ensure that there is broad number of participants and technology type that can offer their capability.
18 May	DA28	**What % of developers are internal vs contracted? Sounds like lots of outsourcing…**	All decision Makers, SMEs, Product Owners and Product Managers are permanent members of staff, long seconded from business roles. We have a number highly committed, long term contractors in Project Management and Business Analysis positions, all on long term, competitive contracts. Our Development and Test teams are supplied by our delivery Partners IBM and TCS. Our DevOps are a mixture of permanent employees and Delivery Partners.
18 May	DA29	**How will you ensure short term IT investments (like ASDP) don't create pointless duplication of communications channels because of legacy handling of BM vs NBM?**	Our aim is to reduce developments in existing/legacy systems as soon as we can. However, we still have an obligation to enable new services and capabilities, and we have received overwhelming industry feedback that we should not delay these which means we need to deliver these in our existing systems. Communications are likely to remain as they are in the short term, but if there are any specifics where this is creating issues to industry colleagues we would like to hear these, so that we can inform our plans in the short term.

Received	Number	Question	Answer
18 May	DA30	**Need a better breakdown of benefits, especially the monetised values, given the current manual decision hard to see how these estimated values are derived**	Great question and yes, we will provide more breakdowns and communicate these each quarter. We have breakdowns in our published CBA reports on the website. The benefits are dependent on removing the manual processes, hence the phasing (benefits increase over time)
25 May	DA31	**I think that ongoing dialogue is the key to build and sustain confidence. The recent engagement sessions are very welcome - but this is complex, dynamic stuff which is hard to 'sign off' at a point in time. I think there would be a lot of value in having a consistent dialogue - where hopefully we build deeper understanding of one another's needs**	100% agree with that, as mentioned in our final webinars we see this as an ongoing conversation between ourselves and industry, where decisions can be had collaboratively. We are proposing to post updates to the website monthly with more interactive webinars/In-person events to take place quarterly, we will of course keep the format of engagement under review to ensure it is matching the requirements of our stakeholders.
25 May	DA32	**One proposal:** **1. Publish the roadmap (e.g. as a dashboard with milestones)** **2. Regularly update the roadmap with decisions** **3. Allow stakeholders to comment/give feedback about the roadmap** **A bit like what happens in open-source development**	Great idea and thank you for sharing. We will definitely be looking to publish a roadmap at the end of our engagement, we will look to use this as our 'baseline' and build on it as time goes on.
25 May	DA33	**Can you expand on the 2 biggest contributions to the £2,581m benefit - £1,246m for the whole energy system approach to zero carbon operability and £820m for the NOA extension and enhancement. Thanks**	There is a lot more detail of this in the CBA report. In summary, the £1.2 billion benefits essentially come from the pathfinders through commercial solutions and enabling more technologies and services to participate in finding solutions to system issues such as stability, inertia and voltage. The £820 million from NOA extension will look at expanding the NOA process to not only look at solutions to transmission issues, but also consider things such as distribution.

Delivery timescales

Received	Number	Question	Answer
7 Apr	DT01	**Thanks for highlighting your system challenges but this "renewable and volatile world" was something ESO predicted and planned for 5y ago. What has gone wrong?**	Nothing has gone wrong – as mentioned we have heard the challenge and are developing new systems and markets to respond to this. Please don't think of our feedback as a complaint or that we feel helpless - we don't. However, the challenges as we see them are different to those imagined in 2019 plus there is market reform on the horizon. To enable reserve and response reform, Pathfinders and RDPs take time, and we need to enable these and meet your expectations at the same time as developing our new systems. So we have choices to make that we want to engage with you on.
7 Apr	DT02	**Does this review mean expected improvements for DER participation like sub 1MW increments risk being delayed?**	It doesn't imply that they are delayed. But there are choices in front of us - different services that would allow us to enable this (BM, non-BM, ASR, Pathfinders etc) and different systems that we can use to dispatch these (existing vs transformational). This is one reason why we want to engage with industry on our balancing capabilities so that we can ensure they address what you, our industry participants, need and want.
7 Apr	DT03	**After EBS, what is the confidence level of bringing in the required new systems relatively soon when there are still so many unknowns.**	Moving to a modular approach, not a big bang, will ensure our systems are flexible to and help enable change. But we have also learned that we need to keep industry involved and allow regular input. This is another reason for increasing levels of transparency through this review and getting valuable industry input and insight into developing our plans. We want this engagement to continue on a regular basis and are interested in views of how best to do this. We also have the regular dialogue with the Technology Advisory Council (TAC) too.
19 May	DT04	**There is a direct connection between medium-long term planning and balancing costs. Build time for storage and STATCOM/SVC/Reactor/MSCB means**	Agreed, and it is important to make the correct decision overall. That is what our BAU processes like NOA do, but also what are Constraint, Stability and Voltage Pathfinders will do. Our new balancing capability with enable new technologies and services to deliver the benefits we estimate through these initiatives.

Received	Number	Question	Answer
19 May	DT05	**Given the significant benefits of the new systems/processes, is there a way of increasing resource/capacity and accelerating the changes?**	Increasing resource/capacity is not something that can be easily done, due to the technology and skills required to develop our existing systems. We have also challenges in getting SME resources available from our Control Room, due to operational priorities. However, we are aware of the importance of the benefits to be delivered by this programme, which is partly why we are undertaking this strategic review and why we have a newly proposed roadmap. The new plan proposes a prioritised delivery of market initiatives that will enable a more accelerated delivery of benefits.
19 May	DT06	**If the ASDP (for NBM assets) is only going to be supported for another 2 years until retired, why bother continuing to push it given its limited functionality?**	We need to balance the cost of continuing to invest in our systems with their ability to deliver market change. We estimate that ASDP can be used to deliver benefits through response and reserve reform and RDPs.

nationalgridESO

Wider BM review

Received	Number	Question	Answer
7 Apr	BM01	**How does this work fit in with the ongoing ESO Balancing Market review?**	ESO Balancing Market review is looking at market rules, their suitability and the drivers for recent high costs. This work will feed into wider ESO business activities including future balancing tools. Outputs are expected to principally focus on market design but will be shared both internally and externally.
7 Apr	BM02	**Does the notion of dispatching after GC still make sense? Especially as more storage (needing energy recovery) is dispatched.**	"There is a lot of work going on at the moment about the way the market works – both the balancing and the wholesale market, including our net-zero carbon operability market reform project. This is something that our systems need to enable, if and when a different decision is made. It would be good to test the options developed with industry against a number of what-ifs."
7 Apr	BM03	**This is a transmission system led development. Is it fit for future given the changing nature of the UK electricity landscape? Is more DNO input required?**	This is something we discussed at the last TAC meeting. The FSO announcement yesterday and what we heard at the TAC indicate that there will be role for the ESO – e.g. residual balancer. We are also engaging with DNOs via this industry engagement, TAC, RDPs and through the Electricity Network Association (ENA).
14 Apr	BM04	**I have asked this question before previously in other venues - is there any further learning to share of whether areas are emerging where it is necessary to think about market redesign as well as ESO processes?** **Linked to that, who is driving the current interest in LMPs, and what is the reason? As this would bring GB closer to design of some other markets, could an indirect benefit of introducing LMPs be to make existing software tools (particularly from N America) more relevant to GB?**	On considering market redesign as well as ESO processes, we definitely agree that both need to go hand in hand and therefore welcome comments around current frameworks. Through the delivery of previous systems, such as the platform for ancillary services, we have taken valuable learnings around how market redesign can impact the systems we deliver for the control room. The market reform team are leading on the current interest shown in Locational Marginal Pricing, as announced at the recent March Markets Forum. More details of why this is being explored can be found on the Markets Forum events page on the ESO website, including Fintan's keynote speech from the event. As part of this programme and review, we want to deliver changes that will enable net-zero carbon operability, therefore a key element of all the new systems will be to facilitate market reform instead of act as blocker to change, as can be seen sometimes with the current suite of systems. In terms of software and tools, we are open-minded to new thoughts and ideas in this space and want this review to act as space where such suggestions can be discussed openly.

Received	Number	Question	Answer
14 Apr	BM05	**On the market design issue... isn't the solution to build more transmission lines? Locational Marginal Pricing doesn't fix the lack of capacity and the fact that wind is in Scotland and Demand is in the South East. How will dispatch under LMP be any different?**	There is a lot of work ongoing exploring market reform, some of which our colleagues are in the Markets team are leading on and recently presented at the March Markets Forum. In response to idea of building more transmission lines, we have a trusted and reliable process such as the Network Operability Assessment that will help ensure we strike the optimal balance between network investment and constraint costs. We believe it is important when debating potential market reform that the choices are fully understood by all, LMP for example could result in considerable changes to dispatching activities and this will be explored fully by the market reform team to understand the impacts on all stakeholders. We want to transform the design of our systems to be flexible to all types of market reform that could be coming, therefore enabling and facilitating the change."
14 Apr	BM06	**If the reply on the website can provide a link to information on the analysis presented at the Markets day, that would be much appreciated.**	Information from the recent Markets forum day can be found on the Markets Forum events page on the ESO website. A more detailed report will be published by the end of April, with further analysis on this topic.
18 May	BM07	**Would an increase in gate closure for less flexible assets help ESO with their decision making? Giving more time to make the more complex decisions?**	Fixing the market position over a longer period would make it easier for the Control Room as it would mean less variability. It would however increase the balancing cost as the market (less flexible units) would not be able to respond to changing requirements. An example would be of a unit being unable to increase its PN leading to the CR paying to instruct the unit up.
18 May	BM08	**Would shortening gate closure, and increasing market based self-dispatch help reduce the operational burden on the control room?**	Shortening the BM Gate would give the market more time to react to changing requirements. It would give the optimisers less time to optimise and it would increase the complexity of calculating the most economic dispatch options as the position and prices would change more frequently. Renewable generation (Wind) would be able to correct their PNs more accurately and as the volume instructed and paid for is in reference to PN and not output this error would be reduced. It would promote market competition to self-balance closer to real time. As long as CR optimisers and dispatch capability can accommodate the increase in volatility and price changes operations can do it. It would be more complex for the CR though but might reduce balancing cost as it would increase competition closer to real time.