nationalgridESO

2020-21 Mid Year Report Evidence Chapters

21 October 2020

Contents

Operating the electricity system through the COVID-19 Pandemic

Changing energy usage

The COVID-19 pandemic has impacted all aspects of life in the UK, as well as across the world. Home working and lockdown periods have meant a decrease in energy use from commercial and industrial consumers and contributed to a decrease in electricity demand. The lockdown coincided with the traditionally lower demand period, as warmer, longer days require less electricity for lighting and heating than in winter months. The growth in generation connected at distribution level also lowers the demand seen on the transmission system during windy and/or sunny days. At times, electricity demand in Great Britain has been 20% lower than we would otherwise expect, and on 28 June it dropped to its lowest ever level of 13.4GW (prior to 2020 the lowest national demand figure observed was 15.8 GW).

As the pandemic hit, the ESO had to deal with new operability challenges as well as implementing new ways of working due to social distancing. Our priorities during this period were firstly to keep our people safe, followed by keeping the lights on, financial management, meeting our licence obligations, managing and meeting expectations, and carrying out activities to prepare for the upcoming RIIO-2 price control.

Keeping our people safe: We enacted our Business Continuity plans: reducing access to the control room, restricting travel between sites, asking all staff to work from home where possible, introducing social distancing and enhanced hygiene regimes into our control rooms, and re-training individuals in order to widen resource pools. This careful planning ensured that we protected our teams during this unprecedented situation.

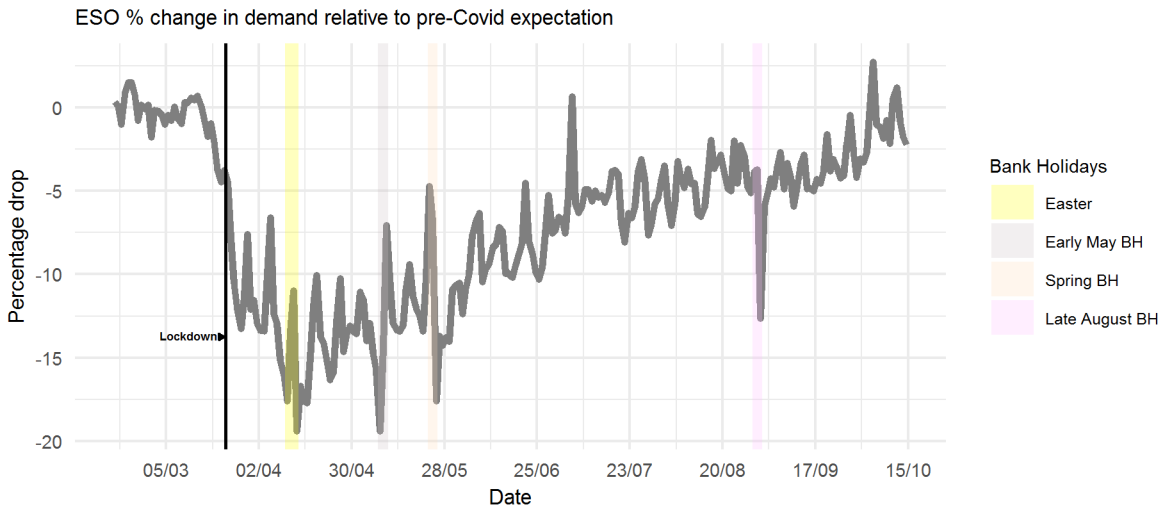
Keeping the lights on: Ahead of the lockdown, we had carried out extensive analysis of how the restrictions would impact on levels of demand. We were periodically analysing the impact of the pandemic on the electricity demand in other European countries. We had estimated that demand levels could be as low as 80% of what otherwise would have been expected. Although we have continually refined our models to take account of the latest data, our initial predictions were proven to give a good view of conditions during the period where demands were at their lowest. Our scenarios were shared internally and externally (in the Summer Outlook Report) and it allowed us to mitigate risks and prepare to manage system security during the unprecedented low demands. The low demands also led to a number of operability challenges, which we explore in the next section.

We recognised that, during this period of uncertainty, stakeholders would value more frequent opportunities to engage with us. We introduced weekly webinars (now known as the ESO Operational Transparency Forum) where we provide stakeholders with updates and an opportunity to ask questions.

Operability challenges associated with low demand

As a result of the low demand described above, a lower volume of generation was required to meet demand. The economics of the energy market meant that this led to a mix of generation plant which was formed mainly of renewable and nuclear generation. To maintain system stability the control room needs to balance generation and demand, maintain system frequency, achieve sufficient negative reserve and procure high frequency response. The plant mix led to reduced levels of inertia on the system, and fewer options for taking actions to reduce generation output (downwards regulation). Under these record low demand levels, additional flexibility was needed in a short timescale to maintain system integrity. This gave rise to a set of complex engineering challenges, and the predicted low demands and associated uncertainty meant that there was a risk that we could not operate the power system securely with our existing suite of tools.

The graph below shows the average daily drop in demand, relative to what would have otherwise been expected in the absence of the effects of COVID-19.



Commercial solutions and new activities

The key challenge resulting from low demands due to the COVID-19 lockdown was ensuring enough downward flexibility whilst meeting all other requirements on the system in terms of thermal, frequency, voltage, stability and restoration. We already had several tools available, which were used as required over the summer period:

- Using the Balancing Mechanism (BM) to access footroom on thermal generation
- Using actions within the Balancing Mechanism to reduce the output of wind generation
- Using actions within the BM to adjust the output of new units resulting from Wider Access to the BM
- Trading with interconnector counterparties to reduce flows on importing interconnectors
- Utilising pumped storage to create additional demand and offset the downward regulation requirement
- Working closely with transmission owners to re-plan transmission outages and return reactive compensation equipment to service quickly, to ensure that voltages stayed within limits

The ESO acted quickly to work closely with the market to develop new commercial products and solutions to ensure system security and operability at the lowest possible cost during this period, which included a number of new activities:

- Optional Downward Flexibility Management (ODFM): ODFM was designed, developed and implemented within a few weeks to meet the need for downward flexibility, bringing a time-limited product to market in record-breaking time. Simple and clear service terms were developed, and processes established with market participants and DNOs to ensure the successful operation of this new service, which to date has been used on five days over the summer period. More detail is provided in the ODFM consumer benefit case study.
- Sizewell Contract: we developed a cost-reflective contract with EDF to reduce output at Sizewell B nuclear power station, creating space on the system and delivering financial and operational benefits from reducing the largest single infeed.
- Super Stable Export Limit (SEL) contracts: we have agreed additional contracts with providers to give access to a reduced minimum active power level, enabling us to reduce generation at times of low demand. For each generator signed up to the service, the ESO can instruct the generator via the Balancing Mechanism to reduce its output to the new lower output level defined by its new lower SEL.
- Battery trial: in April 2020 we wrote to the market to understand plant availability over the summer period, and whether any additional flexibility could be offered. We received a number of responses to this, one of which resulted in the battery trial. This trial allows the ESO to request the availability of sustained upwards and downwards reserve from batteries through existing operational arrangements, and demonstrates that batteries offer a cost-effective option for upward and downward reserve. The trial ran in 3 phases, with multiple participants joining in the third phase.

- Fast tracking the Accelerated Loss of Mains Change Programme (ALoMCP): we introduced a fast-track process for the ALoMCP to reduce increased loss of mains risks and costs resulting from the reduction in electricity demand

- Code Modification for Emergency Disconnection of Embedded Generation: we raised Grid Code modification GC0143 (Last resort disconnection of Embedded Generation), legally clarifying that under emergency conditions and as a last resort the Electricity System Operator (ESO) may instruct a Distribution Network Operator (DNO) to disconnect embedded generators connected to its system.

- Code Modification for Deferring BSUoS charges: We worked with Ofgem and the wider industry to find solutions that would provide short term relief from increased BSUoS costs associated with the summer period. We also worked with the TOs to provide credit relief for electricity suppliers for TNUoS, working with the ENA to provide a scheme that mirrored the relief that was being provided to DNOs. These solutions protected industry, suppliers and consumers from the financial impact of the additional costs associated with balancing the system during the COVID-19 pandemic.

- Future Energy Scenarios update: we produced an update to the 2020 Future Energy Scenarios (FES), assessing the likely impact of COVID-19 on electricity demands over the next five years, as well as the impact on generation capacity. This involved using recent demand data and stakeholder input to revisit the assumptions made in the original FES, and producing a range of estimated impacts of COVID-19 (upside, central and downside) on the scenarios each year out to 2024-25. This report will be used by the Electricity Market Reform (EMR) modelling teams in both the ESO and BEIS, to support analysis for the Capacity Market auctions.

Other actions considered

We also considered a range of other options to manage this year's operability challenges, which we discounted:

- Utilising existing options only, including issuing Negative Reserve Active Power Margin (NRAPM) notifications and Emergency Instructions: This was rejected: as a prudent system operator we took action to ensure alternative actions were available, so that we were not planning to use emergency actions.

- Accessing DER through existing DNO flexibility markets: this would involve discussions with DNOs of the volume of flexibility available through their markets, and setting up a process for instruction and settlement. This was explored, however the volumes available in these markets were significantly smaller than the ESO's requirements. As there was limited time available, this option was not pursued.

- Setting up a within-day flexibility service for non-BM providers, via the Platform for Ancillary Services: this was considered, as a closer to real-time service would offer greater flexibility to the ESO, allowing us to be more confident in the system need. However, this was rejected, as onboarding the required volumes of participants in the required timescales was not feasible.

- Signing up more bilateral trading agreements with wind farm providers who are not available in the Balancing Mechanism: this would give access to additional volumes of wind generation ahead of real time. However, our preference was to create an open competitive market where possible, rather than bilateral arrangements, and therefore we set up the ODFM service.

- Demand Turn Up (DTU): DTU had previously been used to encourage large energy users and generators to either increase demand or reduce generation at times of high renewable output and low demand. This was not progressed due to the timescales involved in overhauling the existing service to make it more attractive, and the changes in technology types and processes which had occurred since the service was last used. It was deemed to be more efficient to set up a new service, based on an open competitive market: this became the ODFM service.

- Switching out much larger numbers of transmission circuits to assist with voltage control: This was not necessary, as studies and strategy development work between the ESO and Transmission Owners provided the right capability based on an evolution of current strategies.

Impact on balancing costs

As a result of the challenges described earlier in this section, the outturn balancing costs experienced during the 6-month period from April to September 2020 have been significantly higher than the benchmark, and significantly higher than the costs incurred in previous years.

Lockdown restrictions have impacted on the size and shape of GB electricity demand, with demand suppression of approximately 15% at the beginning of lockdown, a slower pick-up in the morning, and flattened peaks. Renewable generation output has also been high in comparison to previous years, with record-breaking events such as the maximum level of solar generation (9680 MW) and longest period running without coal power (67 days). Conventional synchronous generation has had increasingly less incentive to run, requiring the ESO to take additional actions to manage the five operability challenges of thermal, voltage, stability, frequency, and restoration.

As well as the new activities described earlier in this section, we optimised our actions considering the impact of particular actions on each of the operability challenges, for example voltage and inertia requirements are assessed together, and actions for constraints are often taken on wind generation such that other operability challenges such as voltage, inertia and frequency are not detrimentally affected. We have also worked closely with the Transmission Owners and Distribution Network Operators to agree changes to the outage plan, and optimised network configurations to increase boundary capacity, both of which reduced constraint costs.

More information about Balancing Costs can be found in Metric 1A.

Prioritising our projects during COVID-19

The new activities described earlier in this report had to be given priority to ensure that the new tools were in place to manage this summer's low demands. However, this meant that there was less resource available to carry out other activities. In order to widen the resource pool for the control room to implement the contingency measures described earlier in this report, we also recalled expert control room users to work in the control room rather than supporting projects, which impacted on the timelines for some of these projects.

We worked with Ofgem to agree regulatory flexibility for a number of projects, which resulted in revised delivery dates which we set out in the Forward Plan Addendum. While compiling the Forward Plan Addendum, which was published in July, we also took the opportunity to address some of the feedback provided in Ofgem's Formal Opinion: this resulted in more milestones and explanations being provided for some deliverables, and more challenging benchmarks for some metrics. We also included the small number of deliverables which had not been completed during the previous year. Since July, our incentive reports have reported our progress against the deliverables and metrics as set out in the Forward Plan Addendum, which sets out our latest view of all deliverables and metrics for 2020-21.

There was still a risk that the ESO would still not have sufficient resource to complete the activities as set out in the Addendum, as short-term operability work was prioritised within teams across the ESO. We therefore carried out an exercise to prioritise the different deliverables from a system operability perspective, to ensure that our resources were focussed on those activities which were most critical to ensure security of supply.

We considered each of the five operability workstreams (frequency, stability, voltage, thermal and restoration) and considered the impact of deliverables within these workstreams being delayed. We categorised the expected impacts of a delays for each deliverable, differentiating between delays which could lead to a security of supply risk or licence breach (red category), those which would lead to a significant increase in operational spend or where mitigation actions were possible (amber category), and delays which would have a minor operability impact (green category).

We then used this information to determine how best to focus our internal resources, noting that a limited pool of key experts are often involved in multiple workstreams. Where deliverables have been delayed beyond the dates set out in the Addendum, in many cases this is the result of key resources focussing on higher-priority projects, to avoid a delay which would have had a more significant negative impact. Although we recognise that regulatory flexibility is only applicable to certain projects, we expect that the evaluative nature of the incentive scheme will allow for the wide-reaching consequences of the COVID-19 pandemic to be taken into account in the evaluation of the ESO's performance.

DNV GL Independent Review

In its independent review[1] of the precautions and actions taken by the ESO to ensure security of supply during summer 2020, DNV GL stated that it…

"has found ESO well prepared to meet a probable extremely low demand scenario, in combination with a high level of renewable generation and reduced traditional synchronous generation. By building on existing approaches and

[1] https://www.nationalgrideso.com/document/178341/download

ways of working and thinking around the operability challenges to tackle the unprecedented COVID-19 scenario, ESO has and is able to react in an agile fashion and bring about an approach to deliver analysis and requirements for this extreme situation."

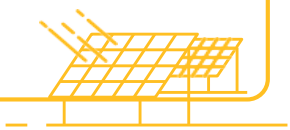
Role 1

Control Centre operations

Role 1: Control Centre Operations

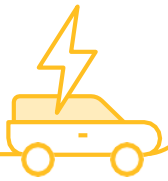
Evidence of consumer benefits

- Wider Access API has removed barriers to market entry, making it easier for new parties to participate in the Balancing Mechanism
- New ODFM service was instructed on 5 days, meeting a shortfall in downwards margin which would have otherwise required emergency actions to be taken
- Power Available signal from 105 renewable generators integrated into our control systems and processes, improving situational awareness in the Control Room



Stakeholder views

- Wider Access API went live on 17 September in close collaboration with industry partners
- We have expanded the range of data on our data portal in response to stakeholder feedback, including machine-readable System Operating Plans
- We are developing a plan for increased transparency of dispatch and trading decisions
- The Operational Transparency Forum has provided unprecedented levels of transparency of our data and decision making



Plan delivery

- Operated the system safely and securely during the COVID-19 pandemic
- Wider Access API went live with Tesla as the first industry partner
- Increased transparency: weekly webinars, System Operating Plan (SOP) publication, progress towards “skip rate” tool
- Power Available signal integrated into Control Room systems and processes
- Updated PEF roadmap and improved our forecasting capability
- Three phases of flexibility trials for battery storage
- Second phase of Ancillary Services Dispatch Platform went live
- New release of Platform for Ancillary Services (PAS)
- Three VLP units actively participating in the BM through Wider Access
- Disappointed in delays to TERRE due to IT issues, now considering the implications of recent update from European Commission

Performance metrics and indicators

Metric/ Performance Indicator	Performance	Status
1a Balancing cost management (metric)	The balancing costs were £803.3m outturn against the £409.0m benchmark.	●
1b Energy forecasting accuracy (metric)	After the first half of 2020-21, the Mean Absolute Error (MAE) of the day ahead demand forecast is 544MW. The Mean Absolute Percentage Error (MAPE) of the day ahead wind forecast is 5.22%[2] Both are in line with expectations in relation to annual targets	●
1c Security of supply (metric)	There were no excursions on both voltage and frequency.	●
1d System access management (metric)	There were 2.76 delays or stoppages per 1000 outages	●
1e Customer value opportunities (metric)	In total we have achieved 8,142 GWh of extra generation capacity (worth approximately £530m).	●
1f CNI system reliability (performance indicator)	In the first half of 2020-21, the BM has experienced 7 minutes of unplanned outages, and the IEMS has experienced 50 minutes of unplanned outages.	N/A

● Exceeding expectations ●Meeting expectations ●Below expectations

[2] Corrected on 28 January 2021

A.1 Evidence of consumer benefits for Role 1

In this section we present tables of our high-level deliverables to evidence the consumer benefits which result from our activities, explaining how the completion of each deliverable will benefit this year's and future consumers. We also include some case studies, which cover specific activities in more detail. We have chosen three case studies for each role.

We would expect Role 1 to deliver consumer benefits mainly within year: Role 1 is focussed on real-time and operational activities associated with the Electricity National Control Centre. As such, for Role 1 we have included case studies relating to the Wider Access (WA) Application Programming Interface (API), Optional Downward Flexibility Management (ODFM) and Power Available to demonstrate the benefits we have created for today's consumers.

We note that some of the activities covered by the case studies deliver consumer benefits both within year and in future years: where applicable, this is explained within the relevant case study. We note that it would be an extensive exercise to approximate the consumer benefit of all of our activities, and therefore we have just focussed on providing a small number of case studies and a high-level explanatory table.

The table below illustrates how our high-level deliverables in Role 1 benefit energy consumers, focussing on the following aspects of consumer benefit:

- Improved safety and reliability
- Reduced environmental damage
- Lower bills than would otherwise be the case
- Improved quality of service
- Benefits for society as a whole

2020-21 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
Upgrade of information systems	Upgraded our IT infrastructure and delivered plans for future upgrades. April saw the first Virtual Lead Party (VLP) unit active in the BM following Wider Access arrangements go live in December 2019. Two further VLPs went live in September 2020. Delivered the final stages of the Wider Access (WA) Application Programming Interface (API). Changes ensure we can continue to operate the system effectively, thereby benefitting the end consumer.	Removing barriers to entry, creating more affordable ways to meet the Balancing and Settlement Code (BSC) and providing equal opportunity through: • Widening access to the API • Streamlining the BM registration process • VLP modification • Creation of web-enabled modern technology interfaces Leads to increased liquidity in the market and, ultimately, lower bills.
Transparency of data used by our ENCC in our close-to-real-time decision making	Increasing transparency of our operational decision making through: • System Operating Plan (SOP) publication • Super-SEL (Stable Export Limit) instruction publication • Trading transparency webinar • Weekly Electricity Operational Transparency Forums	Increased transparency of our actions will allow market understanding of how we make decisions and in turn visibility of what we value. This will increase confidence in the market and contribute to lower consumer bills.
Support access for Intermittent Generation	Delivered phase 1 of Power Available (PA) project. Key enabler to unlock potential, remove barriers to entry and open up markets further to intermittent generation and supporting	Tool development to integrate intermittent generation into our systems removing barriers to entry, increasing liquidity and leading to system operation

2020-21 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
	ambition of zero carbon system operation by 2025.	with higher proportion of renewable generation.
Whole system operability	First supplier (GE) inertia metering system is live, and has been demonstrated using test data. The TOs will shortly provide live PMU data which will allow us to further tune and operate the system. The ability to measure inertia improves system safety and reliability.	Implementing novel tools to measure system inertia in real-time will significantly improve the accuracy of measurement and optimise the ESO's real-time operation. A more accurate monitoring system should lead to lower balancing costs (due to less reserve and response being held), and improved system security and reliability.
Product Roadmap for Restoration implementation	Enhanced visibility of available opportunities – both in terms of location, and the timescales for which these opportunities are available. Established a standardised technical criterion to enable non-traditional Black Start providers to participate, should they meet the requirements. Both these improvements in year have driven a consistent quality of service.	Increased competition through tendering for Black Start contracts. Standardisation encouraging non-traditional providers to offer Black Start services, contributing to improved system security and increasing the diversity of the Black Start services, enabling us to securely operate a carbon free network. Greater diversity of providers means reduced environmental damage and contributes towards our 2025 ambitions.
Electricity Operational Forum and stakeholder engagement	During the COVID-19 pandemic, weekly ENCC webinars are being held to maintain stakeholder engagement and provide operational information. These webinars have now evolved into weekly 'ENCC Operational Transparency Forums' to increase transparency and stakeholder engagement with our operational activities. By collaborating with stakeholders, this has created an enhanced quality of service to allow them to understand our business objectives and deliverables and help us understand theirs.	By helping stakeholders to better understand our operations, we will improve their confidence in their business models and increase participation in additional markets. In the future, this will drive more competition for balancing services which should reduce this component of consumer bills.

A.1.1 Case Study: Wider Access API

Activity	The Wider Access Application Programming Interface (API) went live on 17 September. This opens up the market for non-traditional participants to provide the required market data through a simpler and more cost-effective web-based route. Tesla became the first user to go live with the new API, using its automated real-time trading and control platform Autobidder to manage first-time BM access for the 7.5 MW/15 MWh Holes Bay battery energy storage plant commissioned by Fotowatio Renewable Ventures (FRV) and Harmony Energy in Dorset. The API introduces a new way for providers to connect and communicate in real-time with the ESO's systems and the BM. It utilises a new open-source messaging protocol technology that does not require expensive or dedicated system installation. It marks an innovative way of enabling new technologies to complement the ESO's established core network. Asset owners can use this to provide operational metering for BMUs, with reduced cost and time for initial set-up. Market participants can develop their own API solutions to interface with the ESO's new API, with the ESO providing a secure development and testing environment, and certification on completion. This will open the market to a wider range of providers and technologies, bring better value for consumers, and take us a step closer to being able to operate a zero-carbon grid by 2025. The API roll-out marks the latest development in the ESO's plans to remove barriers to access for a wide range of providers, and to boost the real-time flexibility of the system. Current thresholds for units using the API are 1-100MW. We are progressing plans to expand the limits to up to 300MW for a combined sub-site, and 1GW via a single Control Point via a modification to the Grid Code. This builds on last year's work under the role 2 deliverable: Wider access to Balancing Mechanism Roadmap implementation.
Role	1. Control Centre operations
Key Forward Plan Deliverables	• Upgrade of information systems – Wider Access API
Current benefit	Implementation of the API removes barriers to market entry and increases market participation in the BM by providing a 'plug socket' for entry and reducing costs for adding additional BM units once an API has been developed. There has been increasing interest from market participants in the API since the external announcement of go-live.
Future benefit	The Wider Access API will facilitate entry for a greater number of smaller market providers, increasing competition, market liquidity and ultimately reducing costs to end consumers.
Basis of expected benefit	Increased participation in the Balancing Mechanism will increase competition and increase the options available for the ESO to balance supply and demand, which should have a natural effect of driving down prices.
How benefit is realised in the consumer bill	Reduction in Balancing Costs which feeds into a reduction of BSUoS charges, will filter through to end consumers.
Additional non-monetary benefit	**Reduced environmental damage:** Reduced barriers to entry gives opportunities for a diverse set of energy resources to enter the market, likely to be reduced or zero carbon footprint. **Improved safety and reliability:** Increased optionality in the BM and visibility of small generation units will help control room make better decisions in real time.

Assumptions	Reduction in barriers to entry.

A.1.2 Case Study: Optional Downward Flexibility Management (ODFM)

Activity

The ESO considered a range of options to meet the operational challenges resulting from low demands associated with the COVID-19 pandemic. This included accessing existing DNO flexibility markets, setting up a within-day flexibility service for non-BM providers, signing up more bilateral trading agreements with wind farm providers, and considering whether it was possible to access demand turn up through the discontinued demand turn up service. However, the preference was to create an open, competitive market where possible.

The Optional Downward Flexibility Management (ODFM) product was a new optional balancing service, either for small scale renewable generators to receive payments from the ESO if we asked them to turn off their generation of electricity, or for providers who can increase their demand during the periods when the service is required.

We engaged widely with our provider base through webinars and using trade association communications to share the service information with new providers whom we may not have engaged with previously. We ran a formal consultation on the terms and have changed aspects of the service in line with this feedback including the penalty structures in place in the contract. At the same time, we worked closely with the DNOs to ensure a smooth operational process across transmission and distribution. The was a true whole system solution, designed at pace with the DNOs and executed through new communication and processes to ensure that the solution remained within the limits of the distribution system.

This new balancing service gave market access to a whole new set of providers, as the providers who signed up for this service were units that were not in the Balancing Mechanism, so the control room had no other way of accessing them. This gave our control room an additional tool to operate the system, by reducing the amount of electricity supplied at the local distribution network level. We're pleased with the response from industry and initial take up in the service (4.77 GW of generation, including 1.2 GW of Solar and 2.7 GW wind were registered) and are looking at options as to how we can incorporate this into our day to day work.

The volume of ODFM instructed was that which was required to meet the shortfall in a downwards margin. The table below shows the occasions on which ODFM was instructed.

Delivery date	Delivery period	Forecast MW of ODFM	MW capacity of ODFM[3]	Fuel type
10 May 2020	04:00-07:00	238	411	Wind and demand turn up
23 May 2020	23:00-19:00	1006 at 06:00 1920 at 16:00	2633	Combined Heat and Power (CHP), demand turn up, load bank, solar and wind.
24 May 2020	23:00-10:00	855 at 08:00	1610	CHP, demand turn up, solar and wind
25 May 2020	09:00-18:00	1048 at 02:00	1578	CHP, demand turn up, solar and wind
5 July 2020	00:00-20:00	1288 at 05:00 2045 at 10:00 2194 at 12:00	3177	wind, solar, load banks, energy from waste, biomass, CHP and demand turn up

Role

1. Control Room Operations
2. Market Development and Transactions
3. System Insight, Planning and Network Development

ESO Ambitions

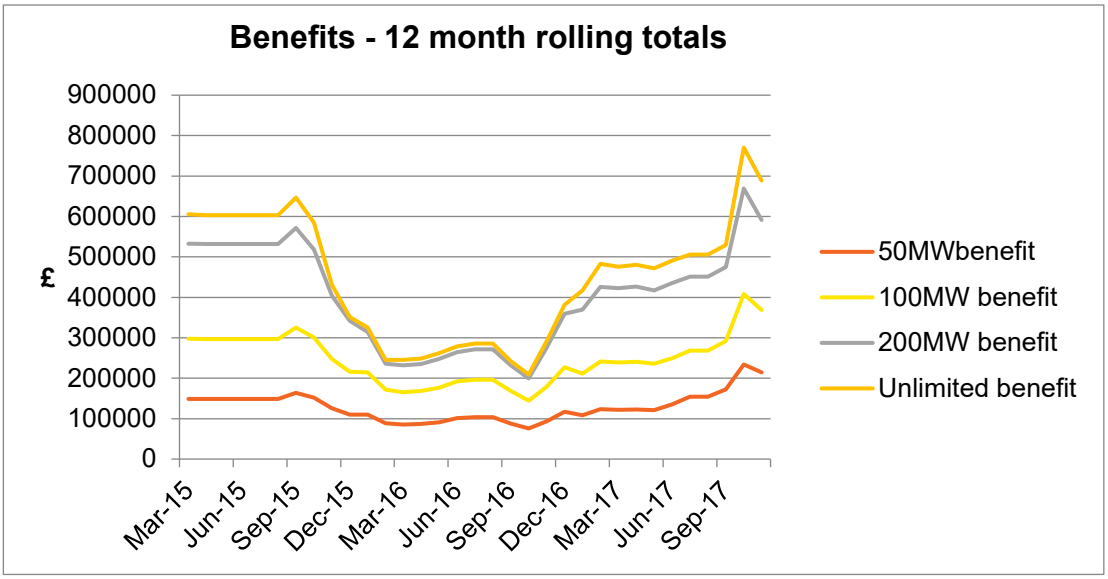
- Competition everywhere
- The ESO is a trusted partner

[3] The ESO instructs and pays for a particular capacity of ODFM, and uses a forecast of the intermittent generation to work out the forecast MW

Key Forward Plan Deliverables	This is a new deliverable to manage the impact of COVID-19.
Current benefit	The introduction of ODFM was necessary to ensure security of supply was maintained, minimising the potential impact of COVID-19 on consumers, with the potential implications of emergency actions and the associated disruption being even greater. The market information and instructed volume reports were published on our Data Portal, which improved the quality of service by increasing the transparency of information around our activities.
Future benefit	There will continue to be benefits from a service similar to ODFM in future years, where ODFM can be further developed into a tool where non-BM providers are able to participate in a downward flexibility market close to real time. We will use the lessons we learned from this summer to further develop ODFM, particularly around the need for Active Network Management (ANM) coordination and the costs feeding into the cash out price.
Basis of expected benefit	Ensuring that the system can be operated safely and reliably is a key benefit that the ESO delivers to consumers. The ODFM service was introduced this summer to help manage changing system conditions. It improved the security of supply by instructing additional generators to guarantee downward margins under critical demand conditions which avoided emergency control room actions. We were able to draw on ODFM to avoid demands dropping so low that emergency control room actions were triggered.
How benefit is realised in the consumer bill	Although the ODFM service introduced an additional cost to the consumer bill, it allowed the ESO to maintain security of supply during this challenging period.
Additional non-monetary benefit	**Improved safety and reliability:** The ODFM service allowed the ESO to operate the system safely and reliably **Improved quality of service:** We engaged with stakeholders and provided clarity of operational decision making by publishing all data in our Data Portal. There is a benefit of trialling coordination processes with the DNOs to ensure service viability and coordination with existing DSO flexibility services.
Assumptions	Flexibility from wind and solar generation is less useful in periods when the output from wind and solar generation is lower, e.g. solar on an overcast day and wind on a still day. To reflect this, an effective price is calculated and applied in the assessment using ESO forecast load factors for each unit. For some technology types (e.g. demand turn up) the load factor is 100%.

A.1.3 Case Study: Power Available

Activity	The Power Available (PA) signal combines live wind speed readings with turbine capability to provide the ESO with a dynamic, real-time indication of the maximum available output from wind generators. Integration of the Power Available signal accompanied by changes to response calculations, overcomes problems faced by only using Maximum Export Limit (MEL), Stable Export Limit (SEL) and Physical Notification (PN) as reference points. These problems relating to the calculation of accurate headroom have previously led to control room users not being able to use Power Park Modules (windfarms) for response. Since May 2020, we've integrated the PA signal from 105 renewable generators into our control systems and processes, providing greater visibility to our control room engineers. This achievement is the result of collaboration between ESO and the wind industry which means the balancing services market for real time frequency response is becoming even more accessible to renewable generators. Although only PA for wind power is being integrated initially, work is underway to make PA for solar available later. This builds on last year's work under the role 2 deliverable: Intermittent Generation.
Role	1. Control Centre operations
Key Forward Plan Deliverables	• Deliver Power Available integration phase one
Current benefit	Increased situational awareness improves the ESO's ability to operate the system securely and efficiently through: • Visibility and allocation of positive reserve on wind farms operating below MEL • Headroom on constraints reflective of available generation • Manual instruction of windfarms to provide frequency response • Efficient response holding allocation between wind farms • Visibility of output level a wind farm will return to following Bid-Offer Acceptance (BOA) instruction ending and avoiding system disturbance • Improvement of forecasting accuracy • Optimisation of Power Park Module use for Mandatory Frequency Response (MFR)
Future benefit	**Improved safety and reliability:** Access to a wider range of resources for reserve will improve our ability to accurately hold positive and negative reserve on wind power, particularly during high wind / low demand periods. **Reduced environmental damage:** Improved visibility of wind generation will allow us to operate the system securely with an increasing proportion of renewable generation **Lower bills than would otherwise be the case:** It will reduce the cost of bringing on additional units for reserve if the reserve requirement can be held on wind with improved confidence. It will also save money on balancing through reduced forecasting errors and support improved forecasting accuracy. The implementation of PA will benefit end consumers by reducing balancing costs due to increased accuracy of wind data. It is estimated that a £5-10m saving on balancing cost per annum to end consumers could result from utilising wind for response to its full capability.
Basis of expected benefit	The cost of providing high frequency (HF) response from conventional generation was compared with the cost of providing HF response from wind generation for periods where HF response was the dominant requirement. The graph shows the benefit of 50MW, 100MW, 200MW and full availability of high frequency response from wind during periods of value. Benefits are limited because: • Periods when HF response is the dominant requirement are in the minority, e.g. in 2017, this was only typically 10% of all periods. • Price differential between the cost of holding HF on conventional generation (including BOA repositioning costs) and the holding cost of wind HF response is sometimes not large.



In specific periods when HF response is the dominant requirement, there is likely to be substantial benefit in using wind generation to over conventional generation.

This assumes that the current price differential continues, and more wind generation continues to offer competitive prices in the future.

Typical annual benefits could be in the range £4-6k /MW for 50MW of HF response requirement, and £3-4k /MW for 100MW and up.

How benefit is realised in the consumer bill

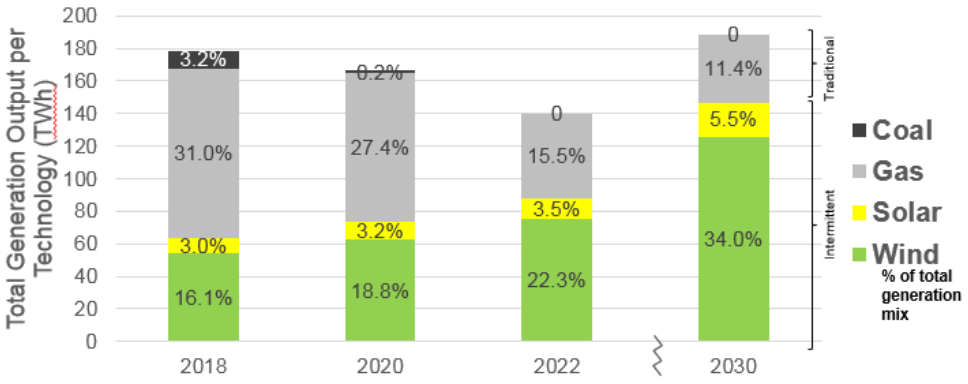
PA will lead to more efficient balancing actions being taken, will give improved confidence in energy forecasting, and will reduce the instances where additional units need to be brought on for reserve and response holding. Phase 2 will provide additional options for dispatching wind farms. All of these factors should lead to lower balancing costs than would otherwise be the case, which should lead to lower BSUoS costs feeding into consumer bills.

Additional non-monetary benefit

Improved safety and reliability: PA improves safety and reliability by increasing situational awareness within the control room, and reduces environmental damage by allowing the system to be operated with an increasing proportion of renewable generation.

Assumptions

The figure below shows the generation mix forecast for the future with intermittent generation set to dominate the generation mix by 2030. Without PA, the ESO does not have a clear and consistent view of the maximum available output from intermittent generation so is less able to use this generation to provide frequency response and other reserve services, resulting in lost revenue for wind farms and higher balancing costs. The issue is becoming increasingly material with an increase in renewable generation on the system and reduction in generation from traditional providers.



Source: data from FES 2017 Two Degrees Scenario
Note: storage would also compete in response markets but is not shown due to zero net output

A.2 Stakeholder views

- In close collaboration with industry partners, on 17 September, we successfully connected the first provider to the Balancing Mechanism through our Wider Access API (Application Programming Interface)
- Datasets available to stakeholders through our Data Portal have been expanded greatly over the past 6 months and we continue to add to these as we receive further feedback and suggestions. One of the new datasets that we have recently delivered to the Data Portal, machine-readable System Operating Plans (SOPs), was a key ask from our stakeholders to really understand how we balance the system.
- We continue to listen to our stakeholders to understand the transparency and data that would support their own decision making. Based on stakeholders' priorities, we are developing a plan for increased transparency of dispatch and trading decisions.
- Underlying our whole engagement plan over the last six months has been the Operational Transparency Forum. This has provided unprecedented levels of transparency of our data and the decisions we make. Stakeholders have had quick and easy access to a panel of experts from across the business to address their questions and concerns.

Upgrade of Information Systems

Wider access to API (Application Programming Interface) System

We have worked with industry to deliver the Wider Access API system and, on 17 September, we successfully connected the first party to the Balancing Mechanism through the API. The project team have engaged with industry over the last year to raise awareness of the potential benefits of this project, and to support the API development work. In the last six months, we have maintained engagement with wider industry, whilst working closely with individual interested parties, as we completed the system development.

We have received some great feedback from our stakeholders:

- "*We are delighted to be working with FRV and Tesla and to be the first project to come into the GB balancing mechanism using National Grid ESO's new wider access API. The API creates a new opportunity to lower costs and barriers to market participation and we are excited about the role this can play in unlocking the full power of battery storage and renewable energy in achieving a decarbonized society*." – provider
- "*Opening of the BM to new participants through the new API is an exciting moment for renewable and zero carbon flexibility technologies*." - provider
- "*With the increasing market demand for flexibility services, continued progress on National Grid ESO reforms and technological improvements are the best way to allow the participation of new technologies in the BM and other flexibility services. The participation of FRV on this project with Harmony and Tesla as partners, is another successful achievement resulting from FRV's commitment with its stakeholders and its continuous search for innovation*." – provider

Over the next six months, we will continue to engage with industry partners to increase the connection of providers to the API. The detailed API specification has been shared, on request, with 25 energy providers and their software suppliers.

Wider Access– Data Concentrator (Operational Metering) Enhancements:

As covered in the Wider Access API case study, we have developed a new, cost-effective way to interface with our existing systems. Stakeholders have been very positive about this new development:

- "*We have worked very closely with National Grid ESO to establish this new route to market technology and the speed and ease with which we can now integrate battery assets is astounding. I'm sure that very soon it will become the standard, but we are very proud to have been the first to market with this new technology*" - provider

Improving information access

In December 2019, we launched the ESO Data Portal[4], and since then we have been engaging with consumers of our data to understand their needs and the features that they would most like to see added to the Data Portal. As a direct result of the feedback we received, we have added several new features including most recently a subscription and notification feature and a data dictionary for suitable data files.

Over recent months we have also added many new datasets such as the regional, national and country carbon intensity forecast, and Optional Downward Flexibility Management (ODFM) data.

We have several emails with positive feedback regarding the data portal over the last six months, such as:

- *"I'd like to say the data portal is a wonderful idea!"* - Consultant (Data analytics and engineering)
- *"This is brilliant – the data, the infographics, and the fast helpful response. Thank you so much!"* - Member of the public
- *"The new space looks very clean and easy to navigate! We have found these reports really useful"* - Optimisation and trading services provider
- *"Your ESO data portal is a great resource"* - Energy insights provider
- *"Our teams had been accessing and making use of a lot of the data available, and that it was a very good initiative. I just wanted to pass on the positive feedback!"*- Supplier

We will be undertaking a series of interactive online engagement sessions in October with the aim to discuss new features, support future developments of the ESO Data Portal, and to identify potential new datasets to add in the future.

Transparency of data used by our ENCC in our close-to-real-time decision making

Publication of System Operating Plan

Following consultation with our stakeholders in June 2020, we started publishing our System Operating Plans (SOPs). The SOP is produced and optimised in our Balancing Mechanism (BM) systems. In order to deliver this commitment to stakeholders as soon as possible, the SOPs were initially published as images.

- *"The new System Operating Plan (SOP) dataset is extremely useful but very difficult to read into our systems due to its jpeg format".* – Supplier

All feedback that we received indicated that the data provided in the SOP is valuable to our stakeholders. However, we have also received feedback that the image format makes it difficult to use, which led us to introduce the machine-readable version of the SOP on 30 September 2020[5].

Data to support better understanding our dispatch decisions

As part of our ongoing commitment to increase transparency, we are developing enhanced reporting, to provide greater resolution of the actions we take in the Balancing Mechanism (BM). Stakeholders tell us that better understanding the actions that we take will support their own decision-making processes.

We presented our proposals at the Transparency Forum on 29 June 2020, which was well received by participants. We have also been in regular discussions with industry representatives as part of regular liaison meetings.

We are also working to increase trading transparency. We have engaged with industry through the ESO Transparency Forum where we presented on our ambitions for transparency and how industry can help guide us on what information they would like to see in relation to our trading activity. We have received a high level of interest in this area, and we are working to deliver stakeholder priorities over the next six months.

[4] data.nationalgrideso.com

[5] https://data.nationalgrideso.com/system/system-operating-plan-sop/r/system_operating_plan_-_data_table

Support access for Intermittent Generation

Reserve from BM Storage Trial

On 30 April 2020, we published a letter to industry inviting market participants to engage in a new, temporary Optional Downward Flexibility Management (ODFM) service[6] and as part of this invitation we also asked providers to contact us if they had other flexibility options which we could potentially utilise.

In response to our invitation for flexibility options, Arenko proposed a flexible reserve service utilising their fleet of battery assets. We worked with Arenko to establish a trial methodology to determine the viability and cost-benefit of accessing additional flexibility in this way, looking at both upward and downward reserve.

Over the last few months, the project team have held regular engagement sessions at the ESO Transparency Forums. These sessions have always generated a lot of interest and questions, which has helped to shape the trial methodology and to increase participation from other parties. Other stakeholder groups have also been engaged, such as the Energy Storage Network.

- *"Arenko conducted two trials with the ESO to try to prove this capability for the control room and now the ESO has decided to take it further and conduct an expanded trial with more batteries in September. We think trials and learning by doing are a great way to innovate and would like to thank all those who worked on this trial, both from the ESO and Arenko*" - provider

Product Roadmap for Restoration implementation

Deliver competitively tendered Black Start contracts

We made contact with each participant during March or April and followed up with emails in June asking for any specific impacts, or feedback on the published timelines that providers might experience due to the pandemic.

We received comments from a small proportion of projects asking for further extensions, and also requesting that any change in contract award date was reflected in a subsequent adjustment to the service commencement date. The original contract start date is an important component for delivery of our medium-term restoration strategy for ensuring provision of service. This was shared with providers during the ongoing discussions, and taking into consideration the feedback received, we amended the timescale approach to target dates which we believe will suit all participants but also meet our restoration strategy requirements. Some of the feedback we received as follows:

- *"We appreciate the effort National Grid is making in trying to accommodate some of the issues providers are facing during COVID-19."* – Provider
- *"Thank you and your colleagues for being flexible and supportive in these difficult times."* – Provider

Electricity Operational Forum and stakeholder engagement

Managing COVID-19

We adopted a transparent and open approach to the challenges faced due to the pandemic; collaborating with industry partners and sharing information across organisations. This transparency was based on the following key areas:

- Data Portal
- Knowledge sharing
- Industry Engagement:

[6] https://data.nationalgrideso.com/plans-reports-analysis/covid-19-preparedness-materials/r/covid-19_update_letter_30.04.2020

Industry Engagement

Over the last six months, we have utilised the following new and existing industry-focused engagement forums to maintain a strong engagement with industry:

Name	Audience	Frequency
DNO Operability Forum	Distribution Network Operators (DNOs)	Weekly
NGESO Operational Transparency Forum	Electricity industry participants, including generators, balancing service providers, aggregators, smaller embedded generation etc.	Weekly
Summer Operational Liaison Meeting	DNOs, TOs, OFTOs, BEIS and Ofgem	Annually

The Transparency Forum, which started as the COVID-19 preparedness webinar, has been a key focal point for stakeholder engagement over the last six months. Much of the engagement described elsewhere in this report, has been followed up and reinforced during the weekly Transparency Forums. The forums have offered industry access to the latest information and data available to provide an insight into how we operate the electricity system and to understand the decisions we make. Participants have the immediate opportunity to respond to this information and question a panel of experts at a Q&A session during the forum.

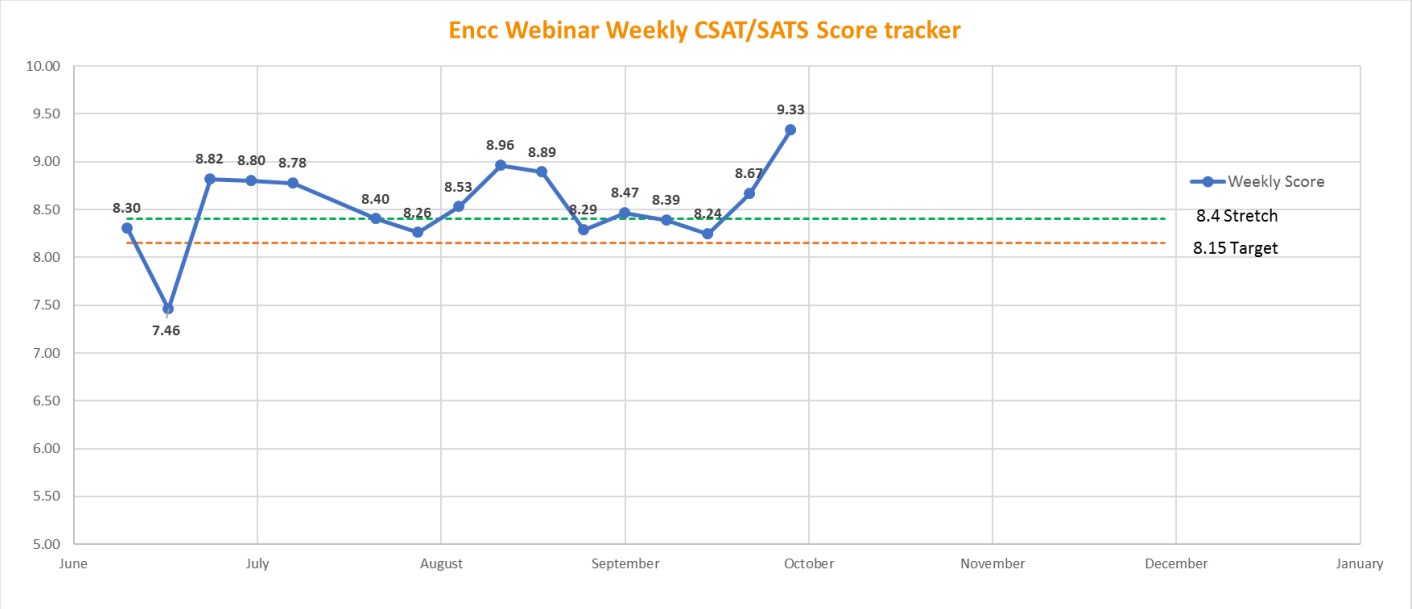
NGESO Operational Transparency Forum

The Transparency forum has maintained a shared understanding across the whole industry of the operability challenges during the spring and summer. It has supported the development of new products and services, and reinforced existing processes.

Following positive feedback from participants, we have decided to continue the forum with an extended range of topics as the industry prepares for autumn/winter, EU Exit and other events potentially impacting the electricity system.

We have seen sustained weekly audiences of over 100 people, with peak audiences over 200 during the height of COVID-19 uncertainty. The invitation continues to be open to all and is promoted both through our webpage and through a mailing list of over 1300 people which is open for anyone to join.

We have achieved consistently high feedback scores from webinar attendees across the event, providing us with feedback on the overall quality of the event and its content, usefulness of the information provided, and quality of the panel responses to audience questions. We have also used this mechanism to extract information on what is most useful to the audience to guide topics for the next week, or establish what content is valuable to continue providing updates on.



Through the Q&A section of the forum, our panel of experts can immediately respond to most questions asked by participants. Any questions that we are unable to provide a full response to, are taken away and followed up, either individually or during a future forum.

We have regularly reacted to challenging questions by taking a deep dive into topics including Trans-European Replacement Reserve Exchange (TERRE), the Sizewell B contract, Negative Reserve Active Power Margin (NRAPM), interconnector trades, and many more specific queries.

We have received positive customer and stakeholder feedback from various sources:

- *"The forums have been 1st class and I appreciate all the effort that has gone in"* - DNO
- *"Examples of challenges are really helpful. e.g. the GALLEX slide for example. And in ops forums the "difficult day" presentations."* – Energy company
- "*It's really good to understand why actions taken over an event where made, and to understand how certain events/issues were created in the first place e.g. regarding NRAPM etc. so just to keep going through them*" - Generator
- "*I think the level of transparency you are showing and your engagement with the industry is very valuable. Please continue these webinars*." - Provider
- "*Overall, very useful and insightful session. Thank you."* – Regulator

Summer Operational Liaison Meeting

The Summer Operational Liaison Meeting (webinar) held on 23 June 2020 provided an opportunity to update the industry on the actions the ESO is taking to prepare for the operability challenges this summer. There were 32 attendees from NGESO, TOs, DNOs, OFTOs, BEIS and Ofgem. The webinar shared our views on the outlook this summer. It also provided an update on some of our longer-term activities, such as the NOA Pathfinder Projects, as well as some individual projects and initiatives. The Q&A section in the meeting provided an opportunity to raise concerns, share ideas and receive valuable feedback from the industry. Our stakeholders highly recommended this webinar with "excellent update" and "great information so far" according to the meeting feedback. The next Operational Liaison Meeting will be held in November 2020 and look forward to winter challenges.

We received an overall 8.5 out of 10 rating for the Summer Liaison meeting this year, and some great individual feedback:

- "*The subjects were varied and relevant to the current situation as well as forward looking*" - DNO
- "*Excellent. The ESO hosted perfectly & the engagement is what we (DNO/DSO) have wanted for some time hence ticked numerous boxes. Thank you!*" - DNO

Stakeholder views on ODFM

Following the introduction of the new ODFM service, lessons learned sessions were held with the DNOs:

- *"The introduction of the service to reduce the likelihood of EI for DER has been a success in that we have not had to disconnect any of our customers."* – DNO
- *"It has been open and transparent - proves worth of working together and we haven't had to use EI!"* – DNO
- *"Better appreciation of the future and what the DSO world would look like - good to dip our toe."* – DNO
- *"I think ODFM was a great scramble by NGESO, responding to circumstances that were unforeseeable, which brought to market previously untapped flexibility. Ultimately, this avoided the need for emergency disconnections. It demonstrates that there is value to the energy customer through transparency and simplicity (as opposed to an overemphasis on cost reflectivity). That said, it is a hastily assembled workaround. I am sure the enduring arrangements will be significantly more efficient from an operational perspective."* – Provider
- *"I wish to thank everyone at NGESO for their hard work on this project. They have all been very professional and understanding whilst obviously under a lot of pressure to implement this service"* - Provider

There will continue to be benefit from a service similar to ODFM in future years, where ODFM can be further developed into a tool where non-BM providers are able to participate in a downward flexibility market close to real time. We will use the lessons we learned from this summer to further develop ODFM, particularly around the need for Active Network Management (ANM) coordination and the costs feeding into the cash out price.

A.3 Plan delivery

A.3.1 Highlights

- We operated the system safely and securely despite the engineering and logistical challenges presented by the COVID-19 pandemic
- The Wider Access Application Programming interface (API) went live in September 2020, with Tesla as the first trading partner
- We have increased the transparency of our activities, hosting weekly Transparency webinars to keep our stakeholders informed during the COVID-19 pandemic, and publishing the System Operating Plan (SOP) on the Data Portal. We now publish a machine-readable SOP, are providing increased transparency of our trading decisions and are working towards a "skip rate" tool
- We integrated the Power Available signal into our control room systems and processes
- We published an update to the Platform for Energy Forecasting (PEF) strategic project roadmap and improved our forecasting capability, trialling for the first time explicit forecasts for distribution connected photovoltaic (PV) and wind generation at each Grid Supply Point (GSP)
- We undertook three phases of flexibility trials for battery storage
- The second phase of the Ancillary Services Dispatch Platform (ASDP) went live, providing new functionality and reporting capability
- We deployed a new release (release 4) for the Platform for Ancillary Services (PAS), saving balancing costs via removing 'spill payments' for non-BM Fast Reserve (FR) and Short-Term Operating Reserve (STOR)
- We have seen three Virtual Lead Parties (VLPs) actively participating in the BM through the Wider Access arrangements, and we are in conversations with 19 participants who would like to use the VLP route.
- We have continued with our restoration tender events – with minor changes to timescales following provider consultation
- However, we were disappointed that it is now not possible to facilitate GB participation in the Trans-European Replacement Reserve Exchange (TERRE) project before the end of 2020, due to issues with IT systems. We also note the recent statement[7] from the European Commission (EC) which explains that the UK will not be able to participate directly on dedicated European platforms from January 2021 and are considering the implications of this for the TERRE project.

This section reports our performance against the deliverable descriptions and dates set out in the Forward Plan Addendum[8]. The Forward Plan Addendum sets out our revised view (as of July 2020) of what we would deliver during 2020-21. During the period of regulatory flexibility, we shared with Ofgem a number of our deliverables where there were known impacts of COVID-19; these are clearly identified in the Addendum. However, we note that the impact of COVID-19 has been felt across many areas of the ESO's work.

[7] https://ec.europa.eu/info/publications/getting-ready-changes-communication-readiness-end-transition-period-between-european-union-and-united-kingdom_en

[8] https://www.nationalgrideso.com/document/173131/download

A.3.2 Deliverables

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
Upgrade of information systems			
Widen access to API (Application Programming Interface) System	Q1-Q2 2020-21	Target date met	API Go-Live occurred on 17 September 2020 The scaling requirement is an ongoing process to allow a wider range of connections for market participants. The Communication Standard which defines the capacity limits will go to the Grid Code panel for approval. Code changes are being progressed to allow for a wider range of connection options.
Expand dispatch facility to handle a large number of small Balancing Mechanism Units, subject to market take-up	Q1-Q4 2020-21	On track	There have been three Virtual Lead Parties (VLPs) connections. In total, we are in conversations with 19 participants who would like to use the VLP route. We are continuing to ensure our existing systems are able to handle the future pipeline of new participants. As part of the activities building towards RIIO-2 we are gaining an in-depth understanding of the requirements to replace our existing systems to ensure these are adaptable and compatible with the transformation for carbon free operation in 2025. This will ensure efficient IT CAPEX spend across the portfolio of IT work and avoid regret spend. An extensive planning exercise to deliver this transformation is currently underway. In the meantime, we will continue with incremental development, in line with operational requirements.
Interconnector programmes	Ongoing	Ongoing	IT programmes for new interconnectors are progressing in line with interconnectors' expectations. Net Transfer Capacity (NTC) consultation work is ongoing with the interconnector participants, this should be complete by end of 2020-21. Industry engagement on the 2025 roadmap is set up in line with stakeholder expectations.
Significant upgrading of IT systems to prepare for European Network Codes	Q3 2020-21	Paused	The ESO was granted a derogation from Ofgem in respect of project TERRE, which was valid until the end of June 2020. The impact of COVID-19 delayed the forecast go-live to Q3 2020-21 at the earliest (as agreed by Ofgem as part of the regulatory easement). Unfortunately, it is now not possible to participate in TERRE before the end of 2020. This delay is due to a combination of: • The IT change pipeline on the BM system being impacted by the failure of an IT maintenance hot patch in July - resulting in a consequential delay to TERRE go-live to mid-December at the earliest. • The European Commission's position that non-EU countries are unable to make use of European Platforms. The UK will become a Third Party, following withdrawal from the EU on 31 December 2020. A free trade agreement would be needed between the UK and EU government to resolve and ensure access. We have taken the decision to put the Project TERRE programme on hold until there is greater legal certainty. Despite this decision, we are committed to continue working through these issues together with colleagues across the industry. We are continuing to finalise the solutions in order to be ready for implementation to lessen the impact on external parties who are changing their systems, thus providing a stable and tested code base for future developments. This will also minimise the impact on the change pipeline for the ESO systems and provide a clear plan of restart to go-live upon conclusion and ratification of the new Trade Agreements. A fuller explanation was provided to the industry on 4 September 2020 and can be found via the ESO website[9].

[9] https://www.nationalgrideso.com/document/176006/download

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
Frequency and Time Equipment version 3 (FATE-3) Project	Q4 2020-21	Ongoing	The FATE-3 project has a dependency on new phasor data infrastructure and establishing a connection to Scottish Power Transmission. Our Inertia Monitoring projects also require this, so we have adjusted the timing of the FATE-3 project such that it will be delivered in line with when the new infrastructure is available to use. The new timing also aligns with the availability of new data centres, hence optimises code development for FATE-3.
PI gateway refresh	Q2 2021-22	Ongoing	The PI Gateway project has completed software development with our software supplier and has all test environments in place. Delivery was delayed due to difficulties aligning suppliers and stakeholders, and due to the requirement to make changes to equipment, causing a delay from Q4 2019-20 to Q2 2021-22. The existing PI link can be maintained until we further upgrade our systems.
Platform for Energy Forecasting (PEF)	Q1-Q4 2020-21	On track	A new version of Strategic Roadmap was published on 25 June 2020[10]. 2 - 14 Day Ahead Demand Forecast being published on the Data Portal as of 23 September 2020.
Design Authority/ Technology Advisory Council[11]	Q3 2020-21	On track	We are currently engaging a number of stakeholders from a diverse range of organisations about potential chair or membership positions. We engaged the ESO RIIO-2 Stakeholder Group (ERSG) to seek their feedback on the remit of the group and will look to take this into account when shaping the group in the near future.
Improving information access	Q4 2020-21 - Q4 2025-26	On track	The timescales we are working to are: • Digital and Data Strategy – December 2020 • Data Roadmap and Investment Plan – Q4 2020-21 • Data and Analytics Systems Architecture – Q3 2020-21 • Data Foundation project (begin implementation of the foundational elements of the architecture) – Q3 2020-21
Transmission Outages, Generation Availability (TOGA) replacement	Q3 2020-21	On track	We are now targeting a functional Go-Live date in November 2020 across both the TOGA replacement system (Electricity Network Access Management System eNAMS) and GOAMP replacement. User Acceptance Testing (UAT) has been progressing well with the three onshore TOs and initial feedback is encouraging. Opportunities for defect fixing and optimising the product have been captured, and issues identified by stakeholders have been assessed, prioritised, and delivered where appropriate. Engagement has recently started with onshore and offshore TOs around Operational Capability Limit Record (OCLR) functionality in Electricity Network Access Management System (eNAMS) and user access requirements. In addition to this, we have been progressing an OC2 code change to support Generator Outage and Maintenance Planning (GOAMP) replacement - GC0130.
Transparency of data used by our ENCC in our close-to-real-time decision making			
More clarity of operational decision making	Q2-Q4 2020-21	On track	Machine readable version of the System Operating Plan (SOP) went live on 30 September 2020 The Super Stable Export Limit (SEL) tool has been created and publication has gone live.

[10] https://data.nationalgrideso.com/backend/dataset/b290ba7c-8076-4122-9e83-de723e1e5425/resource/6573bd88-c17c-41d8-b4d1-6ae89d796e40/download/ngeso-pef-energy-forecasting-strategic-roadmap-june-2020-update.pdf

[11] Following discussion with ERSG, we have renamed the group to better reflect its role. It was previously called the Design Authority.

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
			P399 will feed into this deliverable. A Trading transparency webinar was held and feedback from this has been reviewed. We intend to start publishing skip rate data and a supporting methodology under our Forward Plan deliverable “Data to support better understanding our dispatch decisions”. Our plan is to publish "Skip Rate" data by the end of Q4 2020-21, but in advance of this, we will engage with industry about the format of the published data and methodology used to acquire this data. The “Skip Rate” publication will provide details on the reasons actions were taken out of price merit, which will therefore support understanding system needs and how the market operates. Weekly Electricity Operational Transparency Forums are being held to improve the transparency of operational decision making and increase stakeholder engagement virtually under the COVID-19 pandemic.
Publishing the BMU ID for trades	Dependent on P399 code change	Ongoing	Work group for modification P399 met on 17 July 2020, four IT solutions were presented to industry by the ESO. The work group voted for option one which refers to publishing the information on the ESO website, whilst adding the additional data in to Balancing Mechanism Reporting System (BMRS). This has now gone to work group consultation and will follow the normal BSC change process. The Assessment Report was presented to the BSC Panel on 8 October, following an Assessment Phase Consultation issued on 3 August 2020. P399 now passes into the Report Phase (including EBGL consultation from 12 October) with the Panel making the final recommendation to Ofgem on 10 December. Ofgem decision expected at the start of 2021. This is being covered by the P399 mod, and impacts all cash out files: Trading, N-BM STOR (Non BM Short Term Operating Reserve), N-BM FR (Non BM Frequency) etc.
Support access for Intermittent Generation			
Deliver Power Available integration phase 1	Q1 2020-21	Target date met	Power Available (PA) phase 1 has now been completed. Further details can be found in the Case Study: Power Available.
Deliver second phase of Power Available integration	Q3 2020-21	Ongoing	In order to provide industry with a view of how balancing service frameworks will evolve, we are producing a “wider strategy for flexibility from intermittent generation” mini-report. The strategy will cover current opportunities for intermittent generation and focus in particular on opportunities for wind. Delays in implementing Phase 1 have caused a knock-on impact to the delivery of Phase 2. Phase 2 delivery has been impacted by the change pipeline in the BM and is expected in Q4 2020-21.
Implement State of Energy signal	Q3 2021-22	On track	Project will build upon Power Available, and the impact analysis has been delayed as a result of COVID-19 (reference FP Addendum) hence any delays to Power Available will have a knock-on effect. Impact Assessment will commence in Q4 2020-21 with go-live in Q3 2021-22.
Whole system operability			
Inertia measurement	Q2 2020-21 (first supplier) Q1 2021-22 (second supplier)	On track	The first supplier GE’s inertia metering system is live and has been demonstrated using test data. The TOs will shortly provide live Phasor Measurement Unit (PMU) data which will allow us to further tune and operate the system. We anticipate the first region (Scotland) to supply this data in Q3. PEF is now providing GSP level Demand, Solar Photovoltaic (PV) & Wind Forecasts for GE Inertia forecasting. As the new tools are embedded, we will evaluate them against our existing techniques: this will allow us to assess the benefit of the new tools.

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
			Second supplier, Reactive Technologies' system is planned to go live in August 2021 (Q2 2021-22) following a slightly longer than planned tender process for the modulator.
Product Roadmap for Restoration implementation			
Deliver competitively tendered black start contracts	Q1-Q2 2021-22	On track	South West / Midlands tender: On track for this quarter. However, actual contract award date has been amended and republished. Historically dates for tender were reviewed with participants. In light of COVID-19, amendments have been made to procurement timelines and service commencement dates. Early delivery has been incentivised. Northern: Procurement timeline has been amended following consultation with providers, this may have an impact on commencement dates for contracts. Awarding of contracts have been delayed to March 2021. South East: On track. We have received internal approval for our strategic approach for the South East tender, and shared our plans with Ofgem in our August monthly catch up.
Electricity Operational Forum and stakeholder engagement			
Electricity Operational Forum	Changed format and delivered throughout the year.	On track	Weekly ENCC webinars are being held to maintain stakeholder engagement while social distancing measures are in place and have been well received by industry. An online version of the Operational Forum is being considered for later this year.
ENCC visit days	Changed format and delivered throughout the year.	On track	Weekly ENCC webinars are being held to maintain stakeholder engagement while social distancing measures are in place

A.4 Outturn performance metrics and justifications

1A. Balancing cost management	The balancing costs were £803.3m outturn against the £409.0m benchmark.	●	The reduction in electricity demand associated with the COVID-19 lockdown, coupled with high levels of solar PV generation and periods of strong wind, gave rise to a number of operability challenges, which the ESO acted quickly to resolve.
1B. Energy forecasting accuracy	After the first half of 2020-21, the Mean Absolute Error (MAE) of the day ahead demand forecast is 544MW. The Mean Absolute Percentage Error (MAPE) of the day ahead wind forecast is 5.22%[12]. Both of these figures are in line with expectations in relation to the annual targets.	●	The COVID-19 pandemic changed the daily demand shape which was more challenging to forecast accurately. The main driver of large wind generation forecast errors was adverse weather conditions.
1C: Security of supply	There were no excursions on both voltage and frequency.	●	We have carried out extensive analysis, continually refined our models and worked closely with the market to find commercial solutions to ensure that the system could be operated securely throughout the summer period.
1D. System Access Management	There were 2.76 delays or stoppages per 1000 outages	●	COVID-19 restrictions have introduced significant upheaval in the outage plan, with all TOs updating their work to accommodate new working practices, requiring the ESO to assess an increased level of changes to the plan.
1E. Customer Value Opportunities	In total we have achieved 8,142 GWh of extra generation capacity (worth approximately £530m).	●	In collaboration with our stakeholders (TOs and DNOs) we have identified and recorded just over 100 instances (80% increase from last year) where our actions directly resulted in adding value to end consumers, and our innovative ways of working facilitated increased generation capacity to connected customers.
1F. CNI system reliability	In the first half of 2020-21, the BM experienced 7 minutes of unplanned outages, and the IEMS experienced 50 minutes of unplanned outages.	N/A	This is a performance indicator for increasing the transparency of the unplanned outages for the BM and IEMS.

Table 1: Summary of metrics and performance indicators for Role 1

● **Exceeding expectations**

● **Meeting expectations**

● **Below expectations**

[12] Corrected on 28 January 2021

1A Balancing cost management

April - September 2020 Performance

The approach we use for measuring our Balancing Costs performance is based on a linear trend in a five year rolling mean, based on annual Balancing Services Costs (excluding Black Start). In order to meaningfully employ a linear trend, the data points need to handle one-off permanent changes to the system network which would not be captured by the five-year trend. So far, the only change modelled in this way has been the Western Link. We also make adjustments for significant events which we expect to have an impact on balancing costs, whether this is an upwards or downwards adjustment. These are trends which we would not expect to be captured in the 5-year rolling average, because they relate to either new assets or new trends in market behaviour. Additional information regarding balancing costs calculation and benchmark adjustment can be found on our website[13].

Low demand periods are challenging to manage and the volume of actions required by the ESO to ensure the system remains secure lead to higher costs. During the period where demand is impacted by the COVID-19 pandemic, the ESO's balancing costs spend is expected to be significantly higher than the benchmarks stated here. During this period, we will continue to report our performance in comparison to the benchmark, but will focus on providing a detailed narrative which explains the costs we have incurred. We have also provided information to support Ofgem's review of the high balancing costs incurred over Spring and Summer 2020.

Please note that the benchmarks were re-calculated in July 2020 to remove the ElecLink adjustor since the interconnector go-live date has been delayed.

	Apr	May	Jun	Jul	Aug	Sep	Total
Benchmark cost (£m)	67.0	48.2	82.6	65.5	102.0	103.7	469.0
Additional cost forecast due to WHVDC fault (£m)	0	0	0	0	0	0	0
Benchmark adjusted for WHVDC (£m)	67.0	48.2	82.6	65.5	102.0	103.7	469.0
Outturn cost (£m)	121.4	159.0	135.1	135.6	117.5	134.7	803.3
Status							

Table 2: Apr-Sep 2020 Monthly Balancing Cost Benchmark and Outturn

	Oct	Nov	Dec	Jan	Feb	Mar	Total
Benchmark cost (£m)	126.9	82.8	126.6	133.2	142.5	118.3	1199.3
Additional cost forecast due to WHVDC fault (£m)	0	0	0	0	0	0	0
Benchmark adjusted for WHVDC (£m)	126.9	82.8	126.6	133.2	142.5	118.3	1199.3
Outturn cost (£m)							
Status							

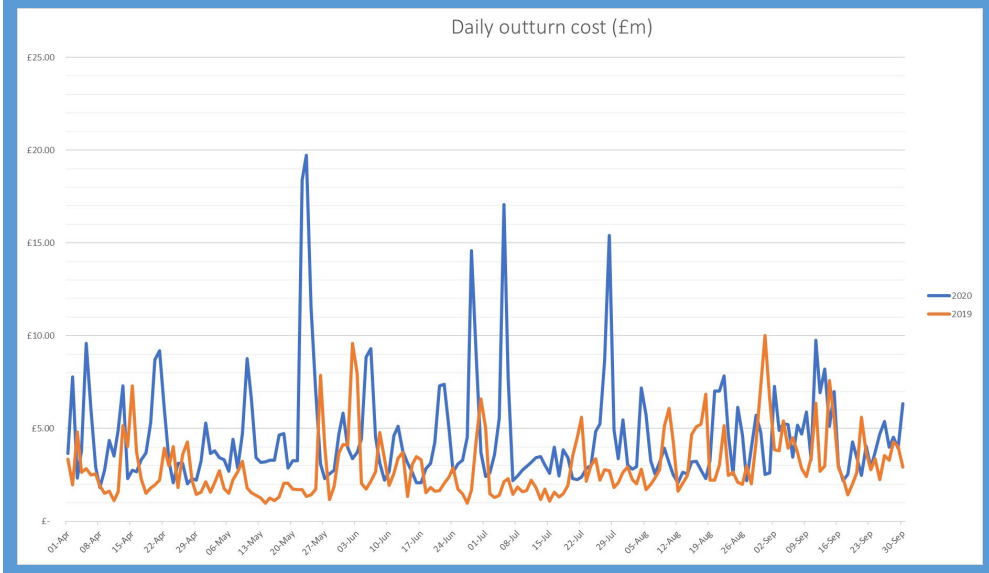
Table 3: Oct 2020-Mar 2021 Monthly Balancing Cost Benchmark and Outturn

[13] https://www.nationalgrideso.com/document/166231/download

Supporting information

Introduction

The graph below shows the daily outturn cost for the six month period from April to September 2020 inclusive. It is clear that the overall spend is higher than the spend during the corresponding period in 2019, and that there are then a handful of very high cost days in addition to this. This deviation from benchmark is apparent in the Balancing Costs metric and additional detail is provided in the following paragraphs to bring clarity about the environment in which the ESO was operating and the challenges present. Detail is also provided about the products developed by the ESO to manage operability challenges which were not resolvable through the tools, services and products available prior to the lockdown period, alongside an overview of the actions taken by the ESO on a regular basis to prevent high costs since the start of this performance year. Some case study information of high cost days is included to bring insight into the challenges faced on the highest spend days.



Operational environment

The COVID-19 pandemic rapidly changed the environment in which much of the UK was living and working. Home working, remote learning and 'stay at home' directives meant that the majority of the UK's population moved to be home-based, with offices and industry closing to all but an essential few.

As mentioned in the *Operating the electricity system through the COVID-19 pandemic* section, the demand has been significantly suppressed throughout the "lockdown" period. With many people working and learning from home, the demand shape has also been affected: a slower pick up in the morning and flattened peaks are reflective of the more relaxed lifestyle that many have been experiencing. Since the reopening of schools in September, the shape of the demand has reverted to a more typical shape.

When high wind levels have been experienced simultaneously in the UK and in Continental Europe, the flows on the Continental interconnectors have been volatile. Demand suppression has been experienced across Continental Europe in addition to the effects seen here in GB. As the GB system makes up a small proportion of total European system demand, we have experienced the effects of suppressed demand across the continent more keenly through more periods of greater imports over the Continental interconnectors.

Operability challenges

The reduction in electricity demand, coupled with high levels of Solar Photovoltaic (PV) generation and periods of strong wind have helped renewable energy sources dominate the energy mix for much of the Spring and Summer.

Notable record-breaking events over the first half of 2020-21 include:

- maximum solar, 9680 MW on 20 April 2020
- longest period running without coal power, 67 days ending on 16 June 2020
- minimum carbon intensity, 46 gCO2/kWh which occurred on 24 May 2020

As the installed capacity of wind is increasing and the demands are decreasing there is increasingly less incentive for conventional generation (with higher fuel costs) to run.

Operating the system requirements is significantly more complex than simply balancing supply and demand. We can distil actions required on the system to fall into one or more of the operability challenges, but it must be considered that any action taken will have a direct or indirect impact on all of these challenges.

- Thermal
- Voltage
- Stability
- Frequency
- Restoration

During the spring and summer months, a busy outage plan is in place to maximise the system access for Transmission Owners to maintain, upgrade and replace their assets. Changes to ways of working to ensure social distancing guidelines can be followed led to a re-planning and reprioritising exercise completed by the TOs and fully supported by the ESO. This, alongside the drive to complete works prior to the end of the RIIO-T1 price control period, has led to a high volume of outages being placed during the very low demand periods of the year.

Synchronous generation is a source of voltage support on the system and is used to supplement compensation equipment and actions to suppress voltages such as switching out high gain circuits, to keep the voltages on the system within standards.

The transmission system needs a certain level of inertia in order to dampen the effects of small (or large) disturbances such as generation or demand losses and much of the inertia on the system at any time is provided by synchronous generation.

The transmission system also has a requirement for frequency services, many of which are provided by synchronous generation.

With lower demands, fewer synchronous generators will choose to self-dispatch due to market economics and therefore additional machines are required to be run to meet the voltage requirements, increase the system inertia and provide frequency services. While reconfiguring the generation on the system, there is a balance to be found between meeting the voltage, inertia, frequency requirements and not eroding the negative reserve on the system. The result of this is that further non-synchronous generation would need to be removed from the system to create space for the addition of synchronous generation.

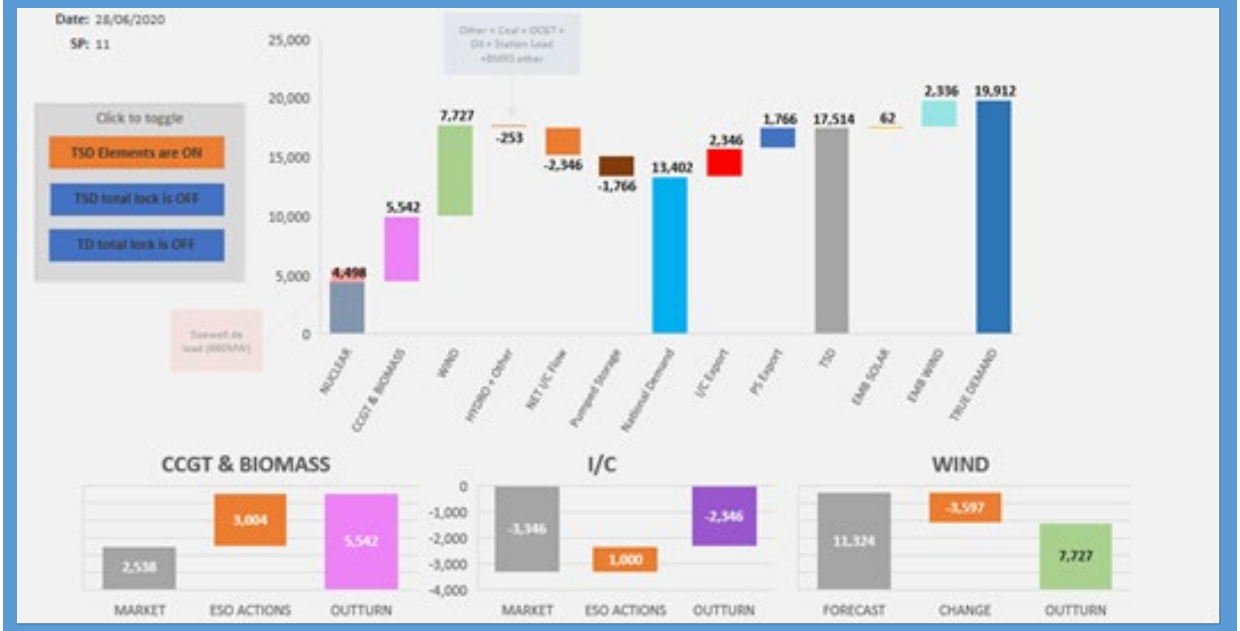
Actions on the system are planned considering the impact of the action on other operability challenges, for example:

- voltage and inertia requirements are assessed together to find the best combination of inertia contribution, voltage support and cost.
- actions for constraints are often taken on wind so that the other operability challenges (voltage, inertia, frequency) are not detrimentally affected.

The chart below shows a snapshot of how the minimum demand on 28 June 2020, the lowest demand seen on the system, was operated. In this scenario,

- the market had created a majority balanced scenario where generation roughly equalled demand, this is not always the case.
- ~3 GW of ESO actions were required to synchronise Combined Cycle Gas Turbine (CCGT)/ biomass units to meet the voltage and inertia requirements.
- the continental interconnectors were exporting and ~1 GW ESO actions were required to decrease the flows to below the RoCoF trigger limit.

- ~3.5 GW of ESO actions were required on wind to create space for synchronising CCGTs/ biomass units to meet our inertia and voltage requirements.
- Additional pumped storage actions were taken (~1.5 GW) to create 'pumping demand'. This is an alternative action to buying off non-synchronous generation to ensure generation does not exceed demand.



With the reduction in demand throughout the summer, we have seen a number of very challenging days, and the volume of actions has increased across the board. In addition, periods of very low and sustained low demand have called for increased intervention by the ESO which brings greater cost.

Actions taken and products developed
In the low demand scenarios forecasted for early summer, our experience showed that there may be insufficient negative residual.

Negative residual = Demand – [Min operating level of all units + Negative reserve]

In low demand scenarios many generators cannot offer us the flexibility we need, for example nuclear must-run Combined Heat and Power (CHP) and renewables. Additionally, for voltage, inertia and response we need to synchronise additional conventional machines. This effectively increases the must-run generation that cannot offer us downward flexibility.

Service	Procured for		Cost to ESO	Estimated cost saving
	Security	Cost		
ODFM	Y		~£12m	N/A
Sizewell deload	Y	Y	~£73m	Central forecast £50m Upper bound forecast: £85m Lower bound forecast: £32m

The service for Optional Downward Flexibility Management (ODFM) was created to reduce the probability that we need to use Emergency Instructions to create the negative residual required. The spend associated with this service is beyond what was expected at the beginning of the performance year as the spend is to avoid emergency action rather than acting as a truly commercial service.

A de-load contract with Sizewell B was procured to create enough downward regulation space to add machines in order to provide essential system services. The choice of Sizewell gave the additional benefit of removing the largest single loss from the system which reduces the response requirement on the system.

Throughout the COVID-19 period thus far, the ESO has used various tools to develop strategies to operate the system in the most efficient and economic manner. The Short Term Operability Obeya (regular meeting) was started as a central place to discuss, prioritise and develop strategies to manage operational challenges in the immediate future with representation from across the ESO. This ensured that activities were coordinated and that feedback from control room real-time experience could be swiftly incorporated. This was a new way of working developed due to the challenges experienced and foreseen. Many tools in existence prior to the COVID-19 period were used alongside the Short Term Operability Obeya to ensure a coordinated approach to managing operability and balancing spend. The paragraphs below give further details:

- Regular touch points were used to dive into short term strategy development for the pinch points in the week, for example a weekend strategy meeting to discuss the details for managing the very low demand periods of the week.
- Short term changes to the outage configuration in periods of high wind optimised system access whilst minimising constraint spend, for example, the delayed start of an outage in the North West by three days to avoid a high wind period coinciding with a weekend led to a cost saving of approximately £4m.
- Network configuration optimisation in planning and control room timescales, particularly when constraints are active and costing, led to savings. For example, a change to network configuration led to an increase in a boundary capacity of 800 MW. This boundary was active and costing so the impact was that 800 MW less volume must be constrained at cost.
- Regular review and optimisation of voltage requirements meant that more options were able to be considered to meet the requirement. This led to a lower overall spend due to the increase in competition driving prices down.

Spotlight on high cost days

	Total cost	Minimum demand	ODFM used?	Wind output (after action)
22/05/2020	£18.4 m	15,390 GW		8.9 GW
23/05/2020	£19.7 m	14,813 GW	Y	9.2 GW
24/05/2020	£11.5 m	14,500 GW	Y	7.7 GW
28/06/2020	£14.5 m	13,367 GW		8.9 GW
05/07/2020	£17.1 m	14,514 GW	Y	9.7 GW
28/07/2020	£15.4 m	16,458 GW		7.9 GW

The volume of actions required to be taken by the ESO was significant for each of these low demand and high renewable output days.

Performance benchmarks

- **Exceeding expectations:** at least 10% lower than the figure implied by the benchmark
- **Meeting expectations:** within 10% of the figure implied by the benchmark
- **Below expectations:** at least 10% higher than the figure implied by the benchmark

1B Energy forecasting accuracy

April - September 2020 Demand Forecast Performance

As outlined in the Forward Plan Role 1 Energy Forecasting Accuracy metric (Metric 1b), the ESO's forecasting performance will be assessed at the end of the performance year. Annual performance targets have been calculated with exceeding, in-line with and below expectations values set out. To allow transparency of our performance during the year, each month we will report an indicative performance for both metrics.

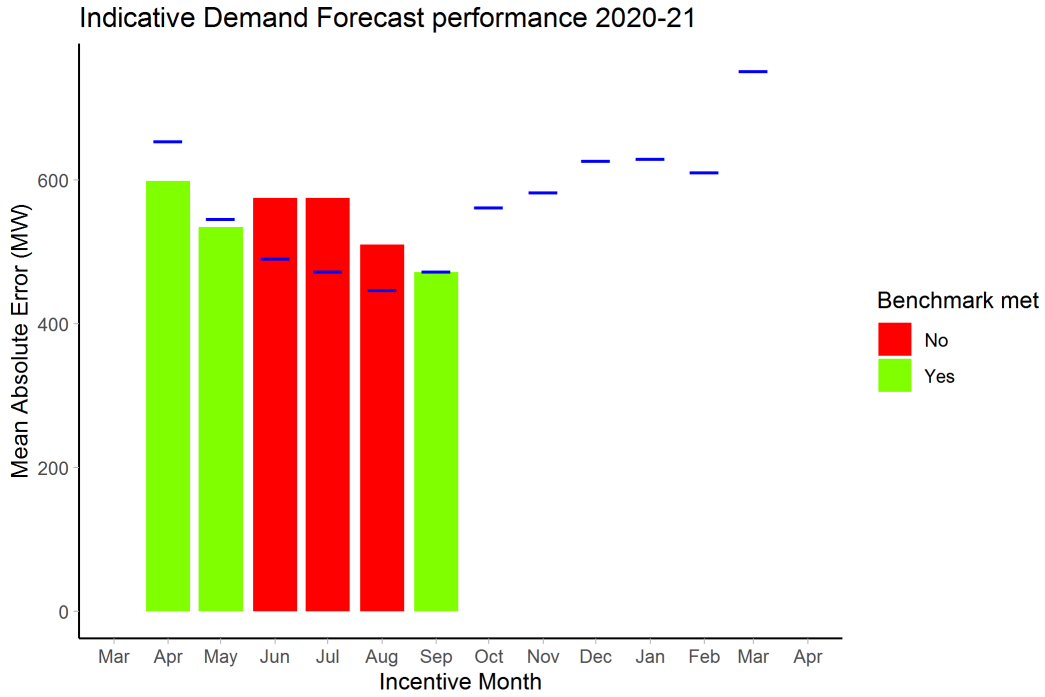


Figure 1: Demand Forecasting , shows our performance from April to September

Day ahead demand forecast benchmarks for financial year 2020-21			
Month	**Benchmark (MW)**	**Month**	**Benchmark (MW)**
April	654	October	562
May	546	November	583
June	491	December	627
July	473	January	630
August	447	February	611
September	473	March	752

Table 4: Demand Forecasting Benchmarks

Supporting information

DA Demand Indicative Performance for September: 544MW

After the first half of the year, the Mean Absolute Error (MAE) of the day ahead demand forecast is 544MW. In relation to the annual target, ESO is meeting expectations.

In September 2020, our day ahead demand forecast indicative performance was within the benchmark of 473MW. September's MMAE (monthly mean average error) was 472MW (no Optional Downward Flexibility Management (ODFM) service was enacted- when enacted this could increase transmission connected demand by curtailing distribution connected generation).

Between April and September 2020 there was an equal number of successful months when the indicative monthly target was not met, as seen on the graph below. The summer months (June to August 2020) had very ambitious targets, all below 500MW (MAE). This means that the last three years used to calculate the target benefited from relatively stable and preferable conditions.

The first half of 2020-21 could be summarised as unstable and peppered with low demand levels never seen before. The COVID-19 pandemic changed working patterns, school closures disturbed the school holiday patterns, and restrictions to foreign travel affected families' vacation patterns. Closures of entertainment and hospitality affected the daily demand shape. In general, people's behaviour in relation to electricity usage was significantly different from the historical data. This meant it was much more challenging to forecast accurately.

At the beginning of the pandemic, ESO operational teams prepared a range of forecasting scenarios to picture the possible impacts on the transmission system. Because there was no history of electricity forecasting during a pandemic, the forecasting team used our expertise and insight to anticipate how the GB system was likely to respond to the new conditions. We continually monitored our assumptions against what we were observing. We also used comparisons with the experience of other system operators and data from ENTSO-E, to sense check our assumptions.

We have built up a picture for how demand has behaved during the pandemic and are continuing to use this knowledge to further inform our forecasts as the pandemic, and local impacts, progress.

April - September 2020 Wind Generation Performance

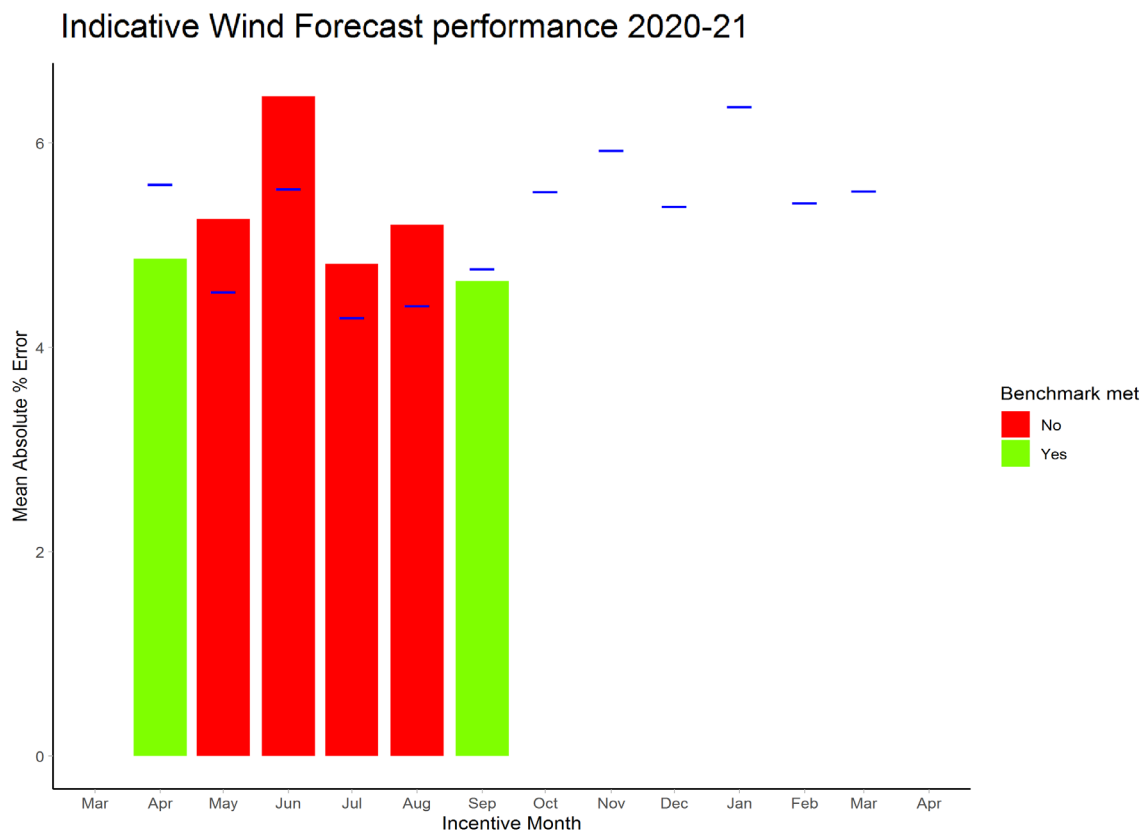


Figure 2: Wind generation forecasting, shows our performance from April to September[14]

BMU wind generation forecast benchmarks for financial year 2020-21			
Month	**Benchmark (%)**	**Month**	**Benchmark (%)**
April	5.60	October	5.53
May	4.54	November	5.93
June	5.56	December	5.38
July	4.29	January	6.36
August	4.41	February	5.42
September	4.77	March	5.54

Table 5: Wind Forecasting Benchmarks

[14] Corrected on 28 January 2021

Supporting information

DA Wind Indicative Performance: 5.22[15]

After the first half of the year, the Mean Absolute Percentage Error (MAPE) of the day ahead wind forecast is 5.22%. In relation to the annual target, ESO is meeting expectations.

In September 2020, our day ahead wind forecast indicative performance was within the target of 4.77%. September's MMAPE (monthly mean absolute percentage error) was 4.65%[15]

April
The forecast error was mainly driven by strong winds at the start of the month driven by warm and cold air masses meeting over the UK. This led to a phase error in the forecast.

May
Large forecast errors were driven by low demands on the second May bank holiday causing negative market prices which caused large windfarms with Contract for Difference (CfD) arrangements to reduce their output automatically. CfD triggered actions are not accounted for in the benchmark, and so show up as very large forecast errors.

June
Large forecast error caused by low pressure weather systems passing over the UK. The timing track and intensity of these systems is difficult to predict accurately.

July
Forecast error was mainly caused by a low pressure system passing over Scotland, where the timing of its arrival and departure were mis-forecasted. This gave errors greater than 20% on the 27th and 28th July.

August
Significant thunderstorm activity in the second half of August drove increased wind power forecast error. This was combined with the influence of Storm Ellen and Storm Francis.

September
Forecast error was mainly influenced by newly constructed wind farms and autumnal weather systems crossing the UK.

Performance benchmarks

- **Exceeding expectations:** Error which is at least 5% lower than the benchmark
- **Meeting expectations:** Error which is within 5% of the benchmark
- **Below expectations:** Error which is at least 5% higher than the benchmark

[15] Corrected on 28 January 2021

1C Security of Supply

April - September 2020 Performance

Quality of service delivered in running the electricity network by providing the number of reportable voltage and frequency excursions that occurred during the previous month, and a total for the year to date.

	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Voltage excursions	0	0	0	0	0	0						
Frequency excursions	0	0	0	0	0	0						

Table 6: voltage and frequency excursions over 2020-21

Supporting information

There were no excursions on both voltage and frequency during this very challenging summer. We had carried out extensive analysis, continually refined our models and worked closely with the market to find commercial solutions to ensure that the system could be operated securely throughout the summer period. Our Security of Supply performance was exceeding expectations during the first six months of 2020-21.

Performance benchmarks

- **Exceeding expectations:** 0 excursions for both voltage and frequency over 2020-21
- **Meeting expectations:** 1 excursion for either voltage or frequency over 2020-21
- **Below expectations:** More than 2 excursions in total over 2020-21

1D System Access Management

April - September 2020 Performance

Publishing this metric encourages the ESO to investigate the causes of outage cancellations and amend processes where appropriate to prevent a repeat. We ensure that we seek to minimise costs across the whole system and all timescales when making a decision to recall or delay an outage on the transmission system.

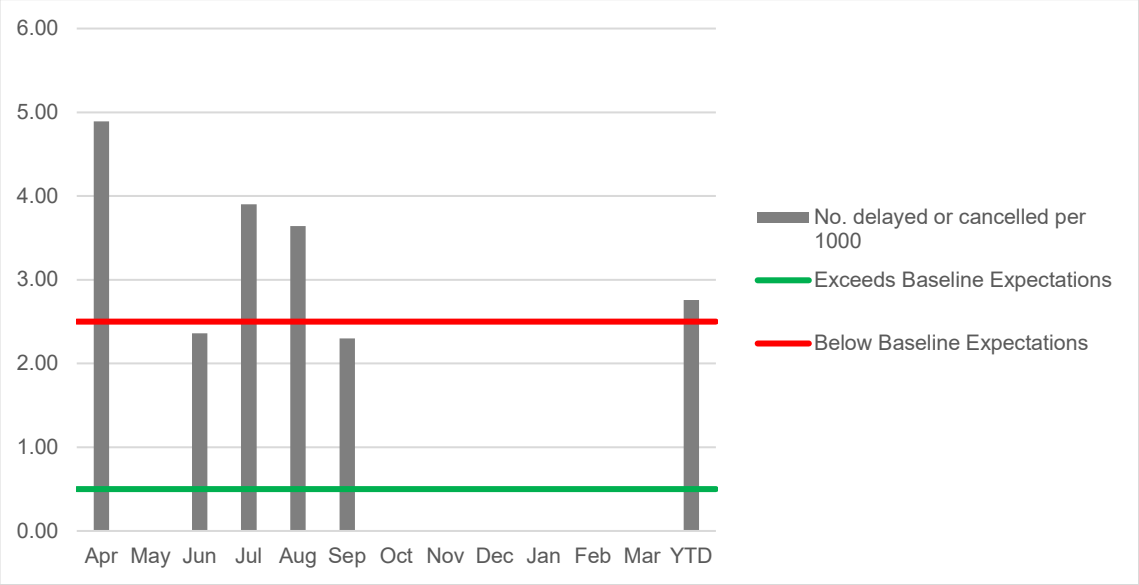


Figure 1: Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

	Number of outages	Outages delayed/cancelled	Number of outages delayed or cancelled per 1000 outages
Apr	409	2	4.89
May	629	0	0
Jun	847	2	2.36
July	769	3	3.9
Aug	824	3	3.64
Sep	870	2	2.3
Oct			
Nov			
Dec			
Jan			
Feb			
YTD	4348	12	2.76

Table 7: Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

Supporting information

In the first half of this year, the number of delays or stoppages per 1000 outages is 2.76 which is currently below expectations. There have been 4348 outages and 12 delays/ stoppages.

COVID-19 restrictions have introduced significant upheaval in the outage plan, with all TOs updating their work to accommodate new working practices requiring the ESO to assess an increased level of changes to the plan.

We have identified common modes of failure and introduced additional steps in our outage planning processes to prevent re-occurrence. In addition to this, new control room processes will begin trials in January 2021 which will help to identify issues with outage delivery earlier. We also expect to return to normal levels of churn when TO outage plans stabilise, as new work plans are established to accommodate COVID-19 restrictions. With these in place, we anticipate being within the 'Meets Expectations' target by the end of the year.

There were two events in September.

- The first delay or stoppage was due to an outage which was identified as insecure during the weekend. The ENCC could not see any mitigations and could not contact the ESO or TO planning engineers on a Sunday afternoon, so this outage was unable to be released and communication of this issue delayed.

- The second event was due to a short-term request from the TO to cancel one of two outages impacting a directly connected customer. When contacted, the customer was only aware of one of these outages which resulted in a delay to the remaining outage. A learning note has been shared on how to prevent this issue from occurring again, by ensuring that all customers are notified of all bookings.

Relating to the first event, an arrangement has been reached for those occasions when outages are identified as insecure by the ESO control room or planners at weekends or bank holidays. Whilst TO planners and regional ESO planners are unavailable outside of standard working hours, the National ESO planner is always available and will now be responsible for issuing updates to the plan and communicating with all parties. This will prevent any insecure outages which should not be released making their way to the control room.

Because of the second event, our DNO liaison meeting(s) now include a review of stoppages or delays where they have been involved. This has been acted upon in a recent near-miss event driven by a DNO and the learning points have been shared with all parties: ESO/DNO and TO. Furthermore, we are continuing to hold regular meetings, monthly and weekly, with the TOs and DNOs to discuss outage prioritisation and any complex outages in advance, this is to ensure a smooth planning process where all parties are aware of any potential complications and agreeable.

Performance benchmarks

- **Exceeding expectations:** < 1 outage cancellations per 1,000 outages
- **Meeting expectations:** 1 - 2.5 outage cancellations per 1,000 outages
- **Below expectations:** > 2.5 outage cancellations per 1,000 outages

1E Customer Value Opportunities

April – September 2020 Performance

The TOs need access to their assets to upgrade, fix and maintain the equipment. They request this access from the ESO and we then plan and coordinate this access. This metric will sharpen our focus on creating and capturing added value for the customers and stakeholders as part of the network access process.

We will look for ways to minimise the impact of outages on energy flow and reduce the length of time generation is unable to export power into the network. We will measure the outcome of the metric in terms of avoided MWh lost (or constrained 'off').

This work can benefit end consumers if we spend less managing system constraints, and can benefit connected customers (e.g. generators) if the volume of MW and/or duration they are constrained off is reduced (particularly if they have non-firm connections agreements). There are indirect benefits to the end consumer as a result of the direct customer benefits, for example the less time a wind generator is constrained off then the less time it is being prevented from providing low-carbon energy to the system. Another indirect consumer benefit of minimising constrained generation is that it reduces the impact on market liquidity and competition.

Ofgem's Formal Opinion feedback indicated that some of our metric benchmarks should be more ambitious. We have reviewed the feedback provided by Ofgem, and made changes to our benchmarks for this metric to take account of last year's performance, and make the benchmarks more challenging.

The total outturn customer value created from both direct and indirect savings in 2019-20 was 11,518 GWh. We add a 10% increment of 11,518 GWh to work out our baseline of 12,500 GWh. We further stretched this target to 15,000GWh as the benchmark for exceeding expectations.

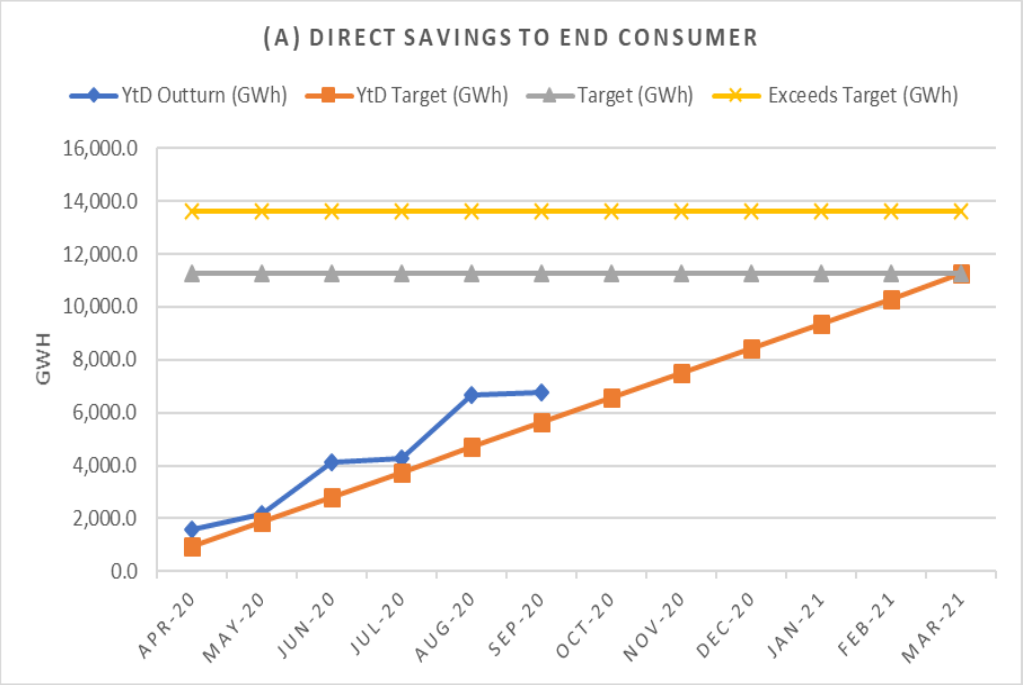


Figure 2: Direct Savings to End Consumer

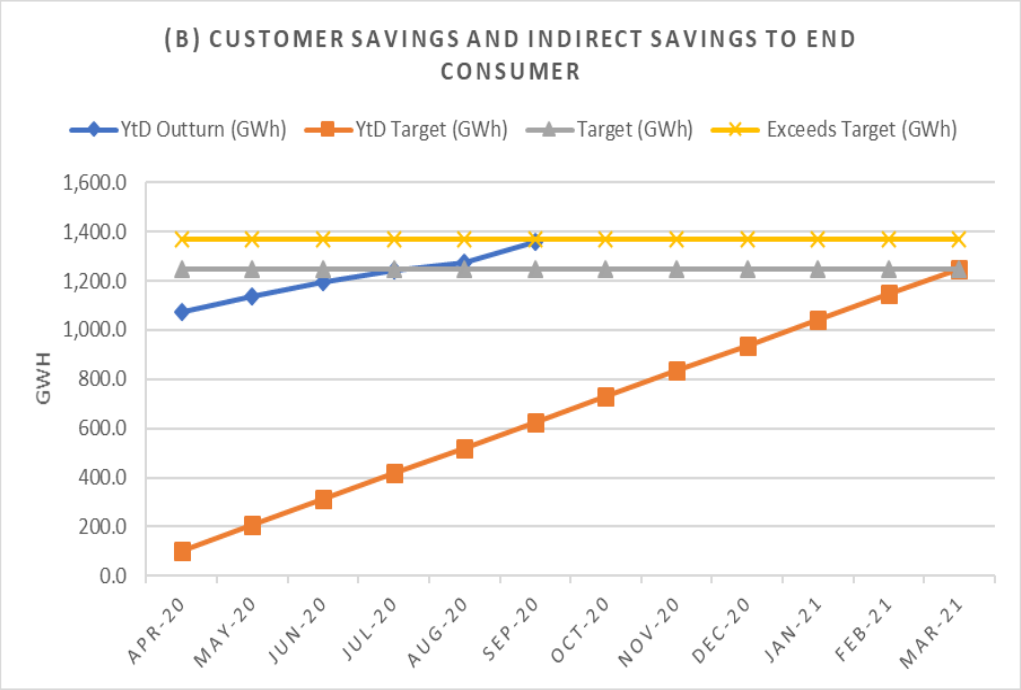


Figure 3: Customer Savings and Indirect Savings to End Consumer

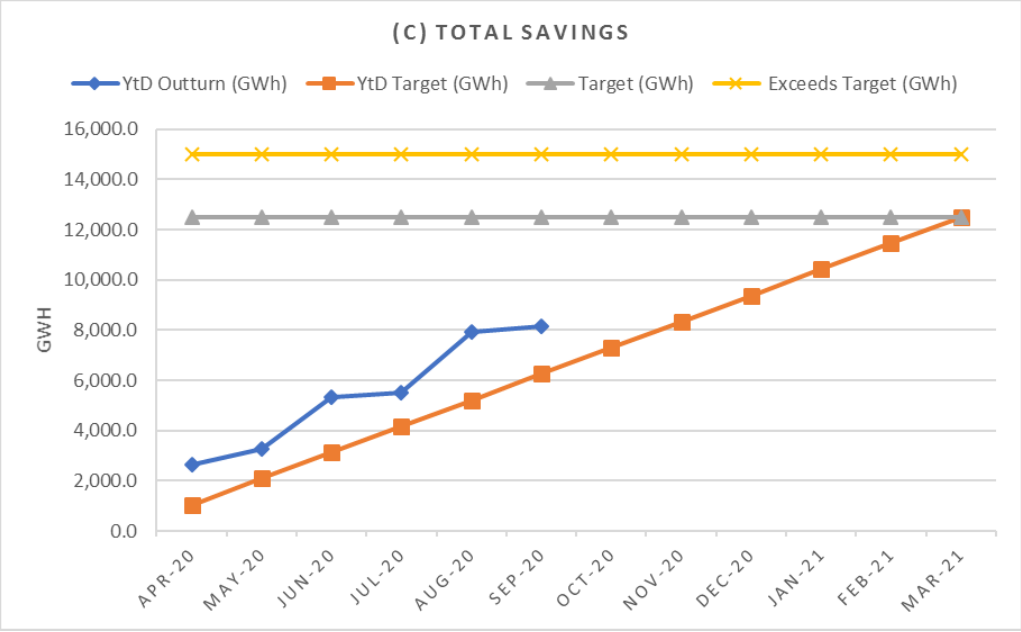


Figure 4: Total Customer and End Consumer Savings

Supporting information

Following Network Access Planning's (NAP) success with the Customer Value Opportunities metric in the first quarter of 2020, all teams in NAP have continued to improve and find more innovative ways of planning system access to deliver savings and benefit to the end consumer.
The NAP team has made excellent progress this quarter, and we are currently in line with our metric target for direct savings to the end consumer[16] and exceeding the target for the indirect savings to the end consumer[17]. In total, we are exceeding expectations for this metric[18].
In the first half of the year, the Network Access Planning team in collaboration with our stakeholders (TOs and DNOs) identified and recorded just over 100 instances (80% increase from last year) where its actions directly resulted in adding value to end consumers, and its innovative ways of working facilitated increased generation capacity to connected customers.
This represents 6,783 GWh of direct savings to the end consumer and 1,359 GWh of indirect savings to the end consumer. In total we have facilitated 8,142 GWh (approximately £530m) of extra generation capacity, which would have otherwise been constrained at a cost to the consumer[19].

Performance benchmarks

Total Savings:

- **Exceeding expectations:** Greater than 15,000GWh
- **Meeting expectations:** Total savings between 12,500GWh and 15,000GWh
- **Below expectations:** Less than 12,500GWh

Direct savings to end consumer:

- **Exceeding expectations:** Greater than 13,630 GWh
- **Meeting expectations:** Between 11,250 GWh and 13,630 GWh
- **Below expectations:** Less than 11,250 GWh

Customer savings and indirect savings to the end consumer:

- **Exceeding expectations:** Greater than 1,370 GWh
- **Meeting expectations:** Between 1,250 GWh and 1,370 GWh
- **Below expectations:** Less than 1,250 GWh

[16] Shown in Figure 2.

[17] Shown in Figure 3.

[18] Shown in Figure 4.

[19] We used average values of £78/MWh for wind and £55/MWh for other generation to estimate the cost.

1F CNI System Reliability

April – September 2020 Performance

This is a Performance Indicator to report on unplanned outage minutes, for a subset of the CNI (Critical National Infrastructure) systems, as an indicator of our control system performance. Reporting this on a quarterly basis allows us to establish a suitable benchmark level, ahead of RIIO-2 where it could be used as a metric to measure our performance.

Unplanned CNI System Outages (mins)				
	Q1[20]	**Q2**	**Q3**	**Q4**
Balancing Mechanism (BM)	0	7		
Integrated Energy Management System (IEMS)	10	40		

Table 8: Unplanned CNI System Outages

Supporting information

In the first half of 2020-21, the BM has experienced seven minutes of unplanned outages, and the IEMS has experienced 50 minutes of unplanned outages.

In Q1, we had a total outage time of ten minutes consisting of one outage across the systems, and in Q2, we have an outage time total of 47 minutes, consisting of three outages across the systems. In all cases, appropriate measures have been implemented to help monitor the systems and prevent reoccurrence

[20] Note: Q1 times have been reviewed and revised. Some time reported as outage was found to be a loss of performance or functionality, and not a system outage.

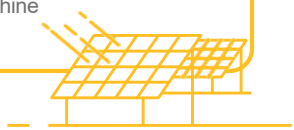
Role 2

Market development and transactions

Role 2: Market development and transactions

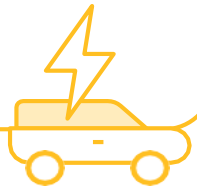
Evidence of consumer benefits

- Code modifications raised to defer additional BSUoS charges associated with additional services resulting from COVID-19, with £16m of support provided so far
- Led second BSUoS task force and published a report of recommendations, which is expected to result in lower consumer bills due to lower risk premia and removal of wholesale price volatility
- Progressed Grid Code modification relating to GB Grid Forming capability, formerly referred to as Virtual Synchronous Machine (VSM) capability, which could save consumers tens of millions of pounds per annum.



Stakeholder views

- Dynamic Containment product developed and launched with significant support from industry
- Responded to stakeholder feedback to remove barriers to participation in weekly response auction trial
- Captured stakeholder feedback on design of ODFM service: this will be factored into our Reserve Reform activities.
- Worked collaboratively with stakeholders on second BSUoS taskforce and received positive feedback
- Charging Futures forum webinar received a high score and good feedback
- Code Administrator improvements completed and have been well received



Plan delivery

- Acted quickly to ensure that system remained operable during periods of low demand due to COVID-19- including developing the new Optional Downward Flexibility Management (ODFM) product and progressing code changes GC 143 and CMP 345/350
- First new faster acting frequency response market: Dynamic Containment product developed (and launched on 1 October)
- Frequency Response Auction Trial evaluation report published
- Code Administration continued to improve and received positive feedback
- Progressed significant code changes to facilitate the energy transition
- Provided thought leadership across a range of charging issues (Targeted Charging Review, BSUoS task force report)
- Improved our communication around the impacts of the Clean Energy Package
- Disappointed in delays to TERRE due to IT issues, now considering the implications of recent update from European Commission
- Disappointed that new activities to manage COVID-19 have delayed aspects of reserve reforms

Performance metrics and indicators

Metric/ Performance Indicator	Performance	Status
2a Reform of balancing services markets (metric)	This shows the combined performance of Q1 and Q2: Frequency response Reserve Reactive Black start Constraints	
2b Code admin stakeholder satisfaction (metric)	Average rating of 8.83	
2c Charging futures (metric)	The latest Charging Futures Forum in July 2020 received a score of 8.1. The last BSUoS taskforce in August 2020 received a score of 8.9.	
2e Month ahead BSUoS vs outturn monthly BSUoS (metric)	4 months of Absolute Percentage Error (APE) greater than 20% and 2 months between 10% and 20%	

● Exceeding expectations ●Meeting expectations ●Below expectations

B.1 Evidence of consumer benefits for Role 2

In this section we present tables of our high-level deliverables to evidence the consumer benefits which result from our activities, explaining how the completion of each deliverable will benefit this year's and future consumers. We also include some case studies, which cover specific activities in more detail. We have chosen three case studies for each role. We would expect some roles, such as Role 2, to deliver consumer benefits mainly in future years.

Role 2 is focussed on creating the markets and frameworks which will deliver the energy system transition in the future. As such, for Role 2 we have included two case studies relating to activities which are expected to benefit future consumers: our support of the Balancing Service Use of System (BSUoS) Taskforce and the Virtual Synchronous Machine (VSM)/vGrid Forming code modification to enable synthetic inertia.

Although Role 2 activities are mainly focussed on future consumers, the benefits of some activities will be felt by today's consumers. An example of this is our third case study on deferring charges for COVID-19.

We note that some of the activities covered by the case studies deliver consumer benefits both within year and in future years: where applicable, this is explained within the relevant case study. We note that it would be an extensive exercise to approximate the consumer benefit of all of our activities, and therefore we have just focussed on providing a small number of case studies and a high-level explanatory table.

The table below illustrates how our high-level deliverables in Role 2 benefit energy consumers, focussing on the following aspects of consumer benefit:

- Improved safety and reliability
- Reduced environmental damage
- Lower bills than would otherwise be the case
- Improved quality of service
- Benefits for society as a whole

2020-21 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
Product Roadmaps for Response, Reserve and Reactive implementation	We have continued progressing our work on Dynamic Containment (DC) to solve short-term operability challenges. This will result in lower balancing costs than would otherwise be the case. We're also procuring much closer to Real Time which significantly reduces barriers to entry for renewables and Demand Side Response (DSR). We have shared our learnings with industry on our auction trial. The auction trial has driven increased competition, putting downwards pressure on consumer bills and reduced barriers to entry.	By reviewing and reforming our response and reserve products to align with future operability needs, this gives stakeholders a view of how these products will progress in the future and how all our developments fit together. This drives increased competition, leading to lower bills than would otherwise be the case. We are now also procuring many of these products from a wider variety of sources, reducing our reliance on conventional generation which will lead to reduced environmental damage. However, several deliverables have been paused due to COVID-19.
Power Responsive	To progress projects to unlock demand flexibility, such as the NIA Residential Response project, we have been working with several companies through the summer insights series and held Steering Groups focused on identifying barriers to entry.	By continuing to engage with industry, we are ensuring we successfully integrate balancing services procurement across transmission and distribution. By delivering a more efficient system, we will make more economic use of resources which will lead to reduced costs for the end consumer.
Improving the way we facilitate code change	By taking an active role as code administrator, updating our governance processes and documents, supporting pre-modification proposals and refreshing our website, we are ensuring that stakeholders	In order to operate carbon free, appropriate changes to industry codes need to be clearly communicated and implemented to enable market reform. Improvements to charging arrangements will also increase competition

2020-21 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
	receive the information they need to understand electricity codes. In improving the onboarding process, we are removing barriers to entry and increasing competition.	and ensure that charges are aimed at the most suitable parties. This in turn leads to better outcomes across the wider community.
Facilitate electricity network charging reform through Charging Futures	In facilitating and implementing this important piece of work and engaging with both current and future users of the electricity system, we are providing a high-quality service to the industry, allowing reforms to progress efficiently, as well as removing barriers to entry and enabling competition	An efficiently implemented and well-designed framework would result in lower bills than would otherwise be the case. It would also fairly distribute network charges between different parties, which should create a level playing field and drive down costs for consumers.
Transform the customer experience for network charging	By improving the quality and transparency of our processes, and the guidance and data we provide to our customers, we are allowing our customers to provide appropriate and accurate information to end consumers.	Improving our approach to onboarding for new suppliers leads to increased transparency and competition. This increased transparency will in turn allow suppliers to deliver accurate and timely information to end consumers.
Transform industry frameworks to enable decentralised, decarbonised and digitised energy markets	We are continuing our work on the implementation of the charging modifications and have published materials such as the Balancing Services Charges Task Force report[21]. This advised which parties should be liable for Balancing Services Charges, and how these charges should be recovered. It also works towards addressing unfavourable market distortions.	Our leadership in the transformation of electricity access and charging will result in a fair distribution of network charges, bringing benefits for society as a whole.

[21] http://www.chargingfutures.com/media/1477/second-balancing-services-charges-task-force-final-report.pdf

B.1.1 Case Study: CMP345 and CMP350 – BSUoS modifications relating to COVID-19

Activity

Context:

Due to COVID-19 and the associated low demands, the ESO has undertaken increased balancing actions and introduced new services to balance the system. This has increased Balancing Services Use of System (BSUoS) costs due to additional actions being taken in the Balancing Mechanism (BM).

In March 2020 we forecast BSUoS at £420.2m from May to August inclusive, in May this increased to £826.3m for the same period based on the low demands seen at the start of lockdown.

Over the period, we had discussed with Ofgem providing support for both Transmission Network Use of System (TNUoS) and BSUoS. We recognised that the unforeseen rise in costs would have to be borne by electricity suppliers and generators who had not been able to hedge their position in advance. Through the provision of short-term financial relief, we aimed to support market participants weathering this period of uncertainty, helping to minimise any adverse impacts on the end consumer.

On 19 May 2020 SSE raised a modification (CMP345) which proposed to defer £500m of "COVID costs" incurred from 1 June 2020 to 31 August 2020 to financial year 2021-22. The timeline for this modification was exceptionally fast to ensure timely support to industry.

Following Ofgem's decision on 23 June 2020 to implement a £15/MWh cap until the end of August 2020, Centrica raised a new modification (CMP350) to reduce the overall cap, extend the support and introduce a formal cumulative cap of £100m to the support. Ofgem approved a £10/MWh cap on 13 August 2020, which will apply until 25 October 2020. Similarly to CMP345, we facilitated the implementation of the modification against extremely tight timeframes – allowing relief to be provided in a timely manner.

ESO role:

The ESO does not have the balance sheet strength to support the solutions proposed in CMP345, and we recognised early in the process that any eventual approved modification would require the support of our shareholders.

There was significant input across multiple teams in the ESO, with 25 people plus senior management contributing to ensure that there was a support mechanism provided to industry for BSUoS over the COVID-19 period. This is summarised below:

Code Administrator

- Facilitated special panel meetings and created a timeline which allowed for more work group discussion and consultation contributing to the speed of the process.
- Facilitated back to back meetings
- Reports and voting documents were produced overnight to ensure that the work group could progress at speed and deliver consultations in the short timescales
- Ensured that the modification met the very exacting timescales expected by the Panel and Ofgem.

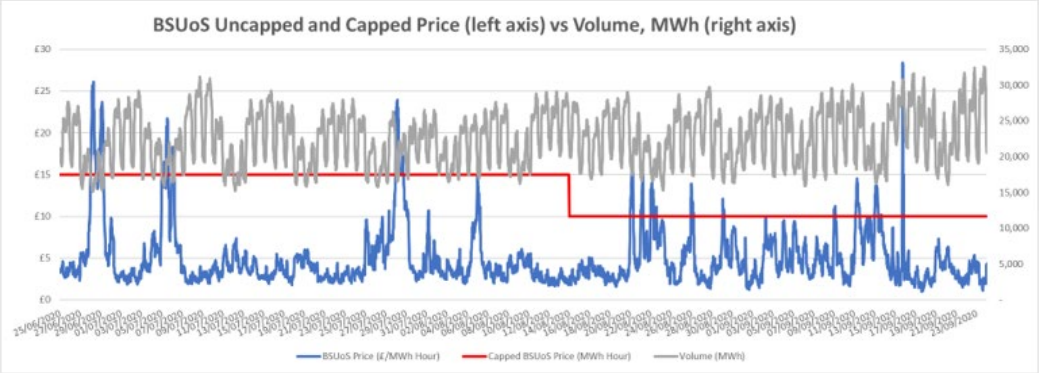
CUSC Representatives

- Were supportive of providing BSUoS support due to COVID-19
- Developed alternative options to the modifications that the ESO was able to support
- Engaged widely with interested industry parties, the workgroup and with Ofgem throughout the whole modification
- Legal text for both modifications and all alternatives were produced overnight to ensure that the schedule was met.

Revenue Services

- In CMP345 the team worked up detail of each of the eight options put forward on how they could be implemented, both from an IT perspective and from a manual workaround perspective. This included providing papers to Ofgem on the detail to help support their decision making.
- Implemented the £15/MWh cap two days after Ofgem's decision, and implemented the £10/MWh cap the day after Ofgem's decision.

- Published weekly tracking on the cap[22] and have responded to any customer queries about the impact on them. The graph below shows the BSUoS capped and uncapped price versus the volume in MWh. This provides an indication of how often the cap has been active.



IT

- Quickly stood up a project team to look at the different options and how much it would cost / how long they would take to implement
- Began developing an IT solution in anticipation of potential decisions from Ofgem, to be able to meet the implementation timescales.

Finance

- Attended every workgroup through CMP345 to answer all finance related questions e.g. on VAT and bad debt, which sped up the process.
- Worked with the shareholder throughout the process to ensure a financially viable solution. The financial support being provided by the ESO cumulatively for BSUoS was capped at £100m through CMP350. The amount of support will directly impact the ESO's end of year profit.

BSUoS Forecasting Team

- Responded to feedback provided from the workgroup and Ofgem and produced multiple forecasts based on different levels of baseline demand i.e. 5%, 10% and 15% demand suppression
- Attended the CMP345 workgroup to answer questions on the detail behind the BSUoS forecasts

The consumer benefit of this work is closely linked to Role 1, as consumers will be protected from the effects of high system balancing costs during the 2020-21 year.

Role	2. Market development and transactions
ESO Ambitions	• Competition everywhere • The ESO is a trusted partner
Forward Plan Deliverables	This is a new deliverable to manage the impact of COVID-19
Is the consumer benefit mainly this year or in future years?	This year due to consumers being protected from unforeseen costs due to COVID-19 in the current financial year.

[22] https://www.nationalgrideso.com/industry-information/charging/balancing-services-use-system-bsuos-charges

Calculation of monetary benefit to consumers	At the end of September 2020, £16,000,942 of support had been provided through the BSUoS support scheme. This figure may be higher by the conclusion of the scheme on 25 October 2020.
Assumptions made in calculating monetary benefit	We have assumed that the whole value of support provided from the ESO to BSUoS liable parties is passed onto consumers.
How benefit is realised in the consumer bill	Suppliers receive lower BSUoS invoice amounts, this in turn drives down consumers bills
Non-monetary benefits	**Lower consumer bills** Reducing the number of suppliers who would cease due to financial constraints over COVID-19, which in turn will benefit consumers. **Benefits to society** Preserving competition in the market, which retains downwards pressure on prices. **Improved quality of service** BSUoS liable users have visibility of increased charges due to COVID-19 which will be charged in FY21-22 and therefore can account for this in their business plans.

B.1.2 Case Study: Second Balancing Services Charges Task Force

Activity

Context

Balancing Services Use of System (BSUoS) charging is a mechanism through which the ESO currently charges suppliers and generators to recover costs incurred for system balancing actions.

As part of the conclusion of the Targeted Charging Review (TCR) Significant Code Review (SCR), Ofgem asked the Electricity System Operator (ESO) to launch a second Balancing Services Charges Task Force under the Charging Futures arrangements to provide analysis to support decisions on the future direction of Balancing Services Use of System charges (BSUoS).

The work undertaken by the Task Force enables the industry to address and remove unfavourable market distortions. This in turn will result in improved competition which will reduce costs to the end consumer.

This work was to consider two specific questions:

- Who should be liable for Balancing Services Charges?
- How should these charges be recovered?

This Taskforce, launched in January 2020, built on the conclusions of the first ESO led BSUoS Taskforce. This work found that Balancing Services Charges should be treated as cost-recovery, as they do not currently provide a useful signal to users, and are ultimately only used to recover the costs incurred by the Electricity System Operator. The bulk of the work undertaken, and the publication of the consultation, interim report, and final report, took place between April and September 2020.

Prior to the COVID-19 pandemic and national lockdown, the Task Force met four times in person, but has since held its business remotely. The Task Force was paused between April and June 2020 at the request of Ofgem.

ESO Role

The ESO has led and provided coordination and administrative (secretariat) support for the Task Force, as well as writing the final report and undertaking chairing the Task Force itself. The ESO also provided analysis on the two deliverables and associated subject matter[23]. The Task Force consulted on its interim findings[24] in July 2020 and published its final report for consideration by Ofgem in Autumn 2020. The Task Force submitted its final report[25] to Ofgem on 30 September 2020. Ofgem will publish an open letter in November 2020 setting out its view on the framework and the change that should be taken forward.

The Task Force recommended in its final report that BSUoS liability should sit with final demand customers, and should be set in advance[26] and kept constant throughout the following year. This will require the ESO to assume the risk of over- or under-recovery of BSUoS throughout the year. The ESO played an important role in these discussions, exploring many alternatives which are explained in the final report[27].

The ESO agrees that there is benefit in this if a reduction in the wholesale price will lead to a reduction in energy prices for the end consumer. The ESO has also has encouraged the Task Force to consider how the risk - and resulting financing costs - to be placed on the ESO could be managed in order to maximise consumer benefit, whilst ensuring financing arrangements are sustainable for the ESO.

[23] The scope for the Task Force and timetable for delivery of the outputs can be found in the terms of reference.

[24] http://www.chargingfutures.com/media/1456/second-balancing-services-charges-task-force-interim-report-and-consultation.pdf

[25] http://www.chargingfutures.com/media/1477/second-balancing-services-charges-task-force-final-report.pdf

[26] Currently, BSUoS is split between Generation and Demand

[27] http://www.chargingfutures.com/media/1477/second-balancing-services-charges-task-force-final-report.pdf

	Although the total cost will be borne by suppliers, on balance it is likely that these recommendations will bring about a reduction in risk premia applied to the wholesale price by generators (as they will no longer face the volatility of variable BSUoS prices) and suppliers (as they will not have to pay the variable risk premia applied by generators). This would lead to a benefit for end consumers in their final bills, as less risk premia and transactional costs will be passed through to the end user. Consumers should therefore benefit from lower contractual prices from suppliers reflecting the suppliers' reduced risk exposure. The consumer benefit of this work will flow through into Role 1, where it will impact on how the costs of system balancing are shared between different parties.
Role	2. Market development and transactions
ESO Ambitions	• Competition everywhere • The ESO is a trusted partner
Forward Plan Deliverables	• Facilitate electricity network charging reform through Charging Futures
Is the consumer benefit mainly this year or in future years?	The consumer benefits will be realised in future years, subject to Ofgem's decision.
Calculation of monetary benefit to consumers	A quantitative assessment of benefit in terms of a £s million figure is not possible at this stage. However, the Task Force hypothesised that the transfer of BSUoS volatility risk to the ESO through a fixed pricing mechanism would lead to reduced costs for consumers, as the ESO's costs to flatten BSUoS over the year would be lower than the risk premia included by suppliers and generators in current prices. Some consultation responses have indicated a desire for Ofgem to undertake or request some quantitative analysis as part of its final decision-making process on the findings of the Task Force. Qualitative analysis was undertaken by the Task Force which provides evidence allowing comparisons to be made between potential options around the impact in a reduction of risk premia. The Task Force made use of agreed assumptions about the time horizons used to forecast BSUoS and risk premia to quantify the overall cost of BSUoS if levied on different subsets of industry parties. Ultimately, the analysis showed that if BSUoS was fixed in advance, and that if there was a risk transfer to the ESO, then consumer benefit to charging BSUoS solely on final demand could be realised. This can be expected to be in the order of tens of millions of pounds per annum.
Assumptions made in calculating monetary benefit	The monetary benefit of these proposals will only be able to be assessed with a better understanding of the likely risk premia suppliers include within consumer contracts, analysis that may be undertaken at a later date as part of code modifications arising from the Task Force.
How benefit is realised in the consumer bill	We believe that a reduction in risk premia, a transfer of who currently holds BSUoS risk, and a reduction in transactional costs may lead to consumer savings in the order of tens of millions of pounds per annum.
Non-monetary benefits	**Lower consumer bills** The changes recommended by the Task Force will lower the risk premia associated with BSUoS which is passed through to the end consumer. There is also the likelihood that the ESO will bear more risk in terms of over and under recovery of BSUoS resulting from this work. If this is implemented the ESO will be removing burden from market participants ensuring that risk premia will fall which will result in consumer benefits.

	Improved quality of service In chairing the Task Force, the ESO has provided a service to industry and helped drive discussion on how Balancing Services Charges can be changed in order to recover the costs of balancing the system. By chairing and organising the Task Force, as well as providing much needed analysis to support the Task Force's recommendation, the ESO has led the way to put new approaches to BSUoS in front of Ofgem. **Benefits to society and improved safety and reliability** The Task Force has considered throughout how the charge can be constructed/ recovered with the best interests of users of the system at the forefront of their thinking, ultimately leading to benefits for the consumer and for the efficiency of balancing the system.
Assumptions made in calculating non monetary benefit.	The assumptions undertaken by the Task Force are outlined within the First Task Force Report and the Interim Task Force report[28]; in summary the non-monetary consumer benefit of the Task Force relates to its collaborative work with stakeholders from a large cross section of industry. The Task Force has primarily undertaken qualitative analysis in coming to its final recommendations. Some consultation responses have indicated a desire for Ofgem to undertake or request some quantitative analysis as part of its final decision-making process on the findings of the Task Force.

[28] http://www.chargingfutures.com/media/1456/second-balancing-services-charges-task-force-interim-report-and-consultation.pdf

B.1.3 Case Study: GC0137 – Grid Code modification relating to Virtual Synchronous Machine capability

Activity

Context

Traditional synchronous generation is directly coupled to the Grid via large rotating masses or the turbine drive train, meaning the kinetic energy during grid disturbances helps to mitigate frequency changes and therefore potential loss of generation or demand. This support is generally referred to as inertia and is a natural inherent capability of a synchronous generating plant. In addition, synchronous generators also provide high fault currents during system voltage disturbances which is important for retention of voltage, maintenance of post fault system stability and the ability of plant to remain operational throughout fault conditions.[29]

Renewable energy sources are typically connected to the Grid via power converters rather than being directly coupled to the generator. This means that the inherent capabilities of synchronous generation are not replicated, resulting in a deficit of capability to the system during network disturbances. This poses a challenge when maintaining grid frequency and network integrity during grid voltage and frequency disturbances as there is less time for grid balancing services to react during these disturbances.

Grid Forming capabilities are viewed as a key enabler in addressing these challenges. Through Grid Code modification GC0137, we are creating a "GB Grid Forming" specification, formerly referred to as Virtual Synchronous Machine (VSM) capability. Parties meeting the specification will be contributing capabilities which essentially mimic the essential inherent properties of traditional synchronous plant, replacing some of these lost benefits with modern, more environmentally friendly equivalents. The topic has been discussed and studied at length within wider industry for the last 10 years[30] as it has considerable implications for future system operability and myriad resulting benefits to consumers.

The specification is designed to be flexible rather than overly prescriptive and to be used to facilitate the volume required through market based principles. The intention being that potential contributing parties will inform the ESO of their capabilities within a defined set of parameters, which the ESO will then procure based on the regional and national requirement. This will ensure a much more level playing field for parties of different sizes and with different types of technology. This approach would sit alongside the natural capability from both plant running in the basic plant schedule, and that running as part of the stability pathfinder work.

Engaging with the industry to ensure the most appropriate solution is paramount. Progress during 2020 represents an evolution of discussions dating back to the start of 2017[31], and we continue to explore potential solutions to address the immediate and future challenges faced as a result of renewable penetration while also encouraging and enabling a range of providers and technologies to take part.

Currently, the specification is well advanced, with a work group consultation anticipated before the end of the year. There a number of matters relating to testing, compliance, and potential interactions with other ancillary services such as Dynamic Containment[32] to be discussed to ensure cohesion and ultimately consumer value. The next work group will be held around early November so that the momentum can be maintained, reflecting the industry appetite for this solution and the ESO's desire to keep delivering value for its customers.

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[29] *System Operability Framework 2016*, National Grid, p62

[30] https://ieeexplore.ieee.org/document/6036498

[31] Progress during 2020 represents an evolution of discussions dating back to the start of 2017

[32] https://www.nationalgrideso.com/industry-information/balancing-services/frequency-response-services/dynamic-containment

	It is hoped and intended that the modification will be ready to go to Ofgem for consideration during Q1-Q2 2021-22. The impact of this work will feed into Role 1, as it will impact on future balancing costs.
Role	2. Market development and transactions
ESO Ambitions	• An electricity system that can operate carbon free • A whole system strategy that supports net zero by 2050 • Competition everywhere
Forward Plan Deliverables	• Transform industry frameworks to enable decentralised, decarbonised and digitised energy markets: Lead code modifications
Benefits – Current or Future	The benefits of this work will be realised in the future. Grid Forming capabilities are viewed as a key enabler in addressing these challenges; they facilitate the growth of renewable generation and investment in new world-leading technologies, thereby also contributing to carbon reduction targets and a secure, economically efficient network. The modification discussions to enable this are ongoing, but significant progress has been made and the specification is nearing completion. This year has seen a considerable advancement in the creation of the solution and the work groups remain well attended.
Calculation of monetary benefit to consumers & assumptions in calculations	The calculation of benefits is highly uncertain; consumers are currently faced with the cost of features traditionally provided for "free" as by-products of traditional thermal plant, and Grid Forming capability is a first-of-a-kind approach (so market response cannot be accurately predicted at this stage). In order to estimate the potential monetary benefit to consumers, currently we can only look at existing similar solutions alongside forecasts of future system needs, and employ a hypothetical scenario as an example of realistic potential monetary benefits. **Assumptions** The example given employs the following broad assumptions and should be considered accordingly: • Minimum demand level still being broadly equivalent to today when the service is active • A hypothetical price per MWh as "price differential" – this is a price paid to run traditional synchronous plant beyond normal operations, or to take other actions to secure the requirements. • Sub-30GW demand periods of approximately 12 hours per day across four months of the year. • Grid Forming market participants receiving a share of 25% of total cost avoided compared with procuring traditional plant (although this may be a very different figure to the eventual market outcome) • The point at which inertia problems cause Rate of Change of Frequency (RoCoF) will likely have changed by the time the service is active, due to the Loss of Mains Change Programme for distribution-connected generators being due for completion by September 2022[33]. In addition, the Stability Pathfinder will also start to deliver benefits by this time; the two projects are working closely together to ensure consistency of requirements. **Additional Potential** In consideration of wider potential, note that the Stability Pathfinder Phase 1 resulted in 12.5GVA.s of inertia being secured from transmission-connected parties and is forecasted to represent a net-saving over six years of **£52m-£128m**.[34] The commercial service resulting from Grid Forming capability will be complementary to the Stability Pathfinder Phase 2 project, but will differ in a couple of key areas: • It will facilitate procurement of a wider range of benefits beyond inertia (as detailed in the non-monetary benefits section) from both transmission and distribution connected parties; this will drive wider competition and consequently best-value for the consumer

[33] https://www.enwl.co.uk/get-connected/network-information/accelerated-loss-of-mains-change-programme/frequently-asked-questions

[34] https://www.nationalgrideso.com/news/national-grid-eso-outline-new-approach-stability-services-significant-step-forwards-towards

- While Stability Pathfinder contracts are aimed at being multi-year arrangements for longer-term stability, GB Grid Forming will look to procure day/week/month ahead solutions.

Lower consumer bills

In addition to the example given, consumer bills will be reduced as a result of the wider benefits of Grid Forming capabilities, for example there would be a reduced likelihood of RoCoF related issues.[35]. The Loss of Mains Change programme is expected to save £10m per annum from September 2020 onwards, so the benefits of Grid Forming suppliers will contribute further to this in future years.

Non-monetary benefits & associated assumptions

Improved quality of service, safety & reliability

Grid Forming capabilities will provide Short Circuit Level contributions (leading to enhanced voltage stability), inertia contribution, and the greater resilience for generator "fault ride through" capabilities during system faults and disturbances. For the consumer, this means greatly reducing costs whilst ensuring a greater proportion of power is using green energy sources.[36]

The competitive nature of the service will also enable the ESO to be highly selective in choosing which solutions to procure, facilitating a focus on only those most appropriate for the needs at that time.

This in turn should provide greater confidence to the consumer as "business as usual" electricity supply is sustained despite the challenges faced on the Grid.

Reduced environmental damage

Encouragement of investment in new technologies, driving world-leading and innovative projects may have wide-reaching long-term benefits. For example, battery energy storage solutions may connect to the Grid as a Grid Forming solution, providing instant-response to network faults.[37] Such new technologies will continue to replace traditional fossil-fuel synchronous generation which in turn will contribute to achieving the 2025 zero carbon target.

Consumers' needs are considered at all stages, providing reassurance that solutions will be fit-for-purpose and environmentally beneficial. This in part results from improved inter-industry relations. For example:

- The service will be available to parties beyond transmission-connected generators - such as distributed energy generators.
- This project has been undertaken collaboratively with industry (for example, co-creating with Nottingham and Strathclyde Universities, and the Expert Groups) from the beginning of the process.[38]

[35] https://www.nationalgrideso.com/document/166441/download (p32)

[36] https://www.nationalgrideso.com/document/168376/download

[37] https://www.smarternetworks.org/project/nia_ngso0004/documents

[38] https://www.nationalgrid.com/sites/default/files/documents/FFCI%20workgroup%20meeting%2019042018_AJ100418.pdf

B.2 Stakeholder views

- Our extensive industry engagement throughout the development and soft launch of our new frequency response product, Dynamic Containment, has been met with a great deal of positive feedback from providers and energy associations.
- Our continued engagement with industry throughout the peak COVID-19 period helped us to understand the challenges providers would face when connecting to a new service, so we introduced a set of transitional arrangements to aid providers during this unprecedented time.
- Within the DC consultation, we received feedback from a provider that the baselining parameter within DC may form a barrier to entry for residential units. In response to this feedback we have committed to further engagement with industry during the soft launch to ensure we take stakeholders along this journey with us, welcoming ideas to help overcome barriers to entry whilst clearly communicating the operational requirements of a service.
- We have shown how we're co-creating new products and services with industry having responded to stakeholder feedback to remove barriers to participation in the Weekly Response Auction Trial.
- Feedback received from participants on the design and development of our emergency summer demand turn-up product, Optional Downward Flexibility Management (ODFM), has been captured and is to be fed into our wider work on Reserve Reform.
- The second BSUoS taskforce is now complete and the report is published. We worked collaboratively with stakeholders throughout the process and received positive feedback
- The Charging Futures Forum webinar in July 2020 received a high score of 8.1 and some very positive feedback; working collaboratively with Ofgem, the Code Administrator looks forward to continuing to provide useful information to industry on Charging Reform
- The Code Administrator have now updated all its documentation and reports to make the process clearer and easier for stakeholders. These updates have been positively received and demonstrate our commitment to improving stakeholders' experience of engaging in the code change process

Product Roadmaps for Response and Reserve implementation

Implement the first new frequency response product

COVID-19 directly impacted our planned work schedule to develop and deliver Dynamic Containment (DC). We took the decision to postpone the project to maintain the safety of our employees and ensure we could maintain our key role of managing the operational challenges. Having reconvened the project team to deliver DC, there have been a number of engagements held with a wide range of industry stakeholders including webinars, consultations, and workshops to get feedback on proposed ESO and provider processes, and ensure that we are providing the most suitable solution. We have been told that our general engagement has been good in the face of a challenging summer:

- "*I would like to acknowledge that NGESO has made a clear effort to engage on the service design over the past six months and has taken providers' comments into account on a number of parameters, particularly around the need to be able to aggregate over a wider geographical area than GSP."* – Energy Association
- *"……the engagement from the ESO recently has been good from our point of view. I think [ESO colleague] is doing a really good job and is very open and transparent. Of course, Covid-19 has shifted focus but even so it feels that market participants are being kept better informed."* **–** Energy Company
- *"It was a really good webinar! Thank you so much! I think the answers were all very comprehensive and useful."* – Energy Company
- *"I've been following the DC webinars and publications closely and I must say I think you're doing an outstanding job with the introduction of this new service."* – Academic
- *"Excellent session, thanks for this. [ESO colleagues] were really clear in their presentation."* – Utility

- *"Receiving well thought out answers to points raised (regardless of if they agree or disagree with the points made) is gives the impression that providers views are being taken on board and that consultations are real (and worth responding to) rather than box ticking exercises."* – Generator

- *"I saw the recent testing webinar (very informative, thanks to all involved) and also read the relevant elements of the FAQ document (also well structured – thanks!)"* – Independent Technical Expert

As well as the wider industry engagements, we have also undertaken sector specific engagements having held well accepted sessions with trade bodies. This has allowed us to focus on specific areas of interest and answer particular areas of concern:

- *"Many thanks for taking the time to meet with us today – it was a really useful discussion for me and the members and hopefully it was useful for you to hear some storage specific feedback as well."* – Trading Company

- *"Just to say, I think the engagement you've done for this product in the last few weeks has been excellent – lots of opportunities to engage in many different ways. I know you must be flat out to get the product ready, so it's great you've found the time to engage with the industry so thoroughly."* – Trading Body

However, in doing so we've also been made aware that overall trade body opinion and feedback isn't necessarily reflective of the individual. We have therefore engaged extensively with individual stakeholders and providers to ensure that we have captured and understood all opinions. This have been done by addressing all queries that have reached us quickly and efficiently and speaking, where appropriately, with stakeholders on a one-to-one basis:

- *"Thanks for the time on the call earlier today and the increased level of technical engagement generally. To spend a short amount of time in discussion with the subject matter experts greatly advances our understanding of system needs and ensures we are developing our technology in the right direction."* - Consultancy

We use our Customer Relationship Management (CRM) system to track individual stakeholder queries and ensure that they are addressed appropriately. 179 queries relating to DC have been published in the FAQ document online and there are a further three outstanding (but within our internal performance KPIs). No complaints have been recorded. Feedback received from responding to queries:

- *"Thank you for the fast response – really helpful and much appreciated."* – Generator

- *"I cannot stress enough how much I appreciate your help. I understand that the service is currently in the plans and hence details may change, however I am really thankful for clarifying these points for me at this stage."* – Academic

- *"That is really helpful – appreciate the information is provisional but thank you very much, should help us to be ready when needed."* – Aggregator

We have also looked to make improvements on the guidance materials we have shared with stakeholders, both written and digital guidance.

- *"… I've never gone into "Trading" on the top menu, so I learned something too…….the layout and colour coding are really very helpful and it's a great document. Well done!"* – Utility

More market participants were satisfied with the performance of the new DC product.

- *"At 9.30 this morning, a 1GW trip on the French interconnector caused a significant drop in frequency to 49.597Hz. National Grid ESO's 1 day old Dynamic Containment service was called upon, and restored system frequency almost immediately with no disconnections or blackouts, a very impressive trial by fire for the new DC participants!"* – Energy Company

- *"Often in an event like this we see the frequency swing positive after the fault as the system overreacts slightly: Like a driver swerving after a near miss. In this instance the response was near perfect with no over response. Impressive control by the National Grid ESO."* - Generator

- *"First of all congratulations on launching the service! Looking at that tight response to the 1GW fault on Friday I think the suite of services you have designed and implemented are already showing their value. Credit where credit is due."* - Generator

- *"First of all thank you for all your support through the process, particularly from [ESO colleague] who was superb. And congrats again for getting the service in so quickly."* - Generator

Report on auction trial

We released our podcast in June 2020 to explain Auction Trial Phase II progress and next steps. Following feedback from a market survey, we produced a concise version of EPEX user guidance which has now been published.

We have responded to feedback received directly from stakeholders and through our market survey by removing the 20MW unit cap. This has opened up the market to more providers and provided us with access to greater volumes:

- *"We have a 50 MW asset coming into our portfolio in the near future and I was just wondering if it will be able to participate in the weekly FFR auctions – does the 20 MW cap still exist?"* - Provider

When asked to explain the barriers to participation in the Auction Trial stakeholders told us:

- *"20MW cap has kept volume out of this market, it would also be good to increase the 100MW total volume"* - Provider

- *"20MW unit cap, auction volume cap."* - Provider

Positive feedback has been received after we announced the 20MW unit cap removal in the ESO Response Letter to the Auction Trial Evaluation Report.

- *"Thanks for flagging, that is a positive move in our opinion"* – Provider

- *"I saw that the 20MW unit cap was being lifted which is good, and the report which came out of the feedback survey was an interesting read. Nice to see some changes coming out of it."* – Provider

- *"Yes I saw the 20MW cap has been lifted – good news!"* - Provider

Market design and implementation plan for reformed reserve products

Our Reserve Reform programme is just starting to ramp up, and engagement to date has therefore been minimal. We have however engaged with stakeholders to leverage feedback on our short-term emergency product, Optional Downward Flexibility Management (ODFM), a demand turn-up Reserve service that was established over the lockdown period to meet times of low demand/ high renewable generation. Both positive and negative feedback from our market survey will be utilised to help inform both service design, development, and communication. Examples of the feedback include:

Positive:

- *"As the service terms have evolved between each instruction it has made the process far easier."*

- *"Much easier to access. No expensive kit to install. No complex testing to complete."*

- *"The simple dispatch method (email) makes it very accessible without having to invest in new systems."*

Negative

- *"Procurement timescales lock you out of delivery of alternative services."*

- *"Lack of availability payment - is unattractive and different to most other Balancing services."*

- *"Initial sign-up is an administrative nightmare"*

We have also engaged extensively on the implications of the Clean Energy Package (CEP) and in particular the impacts on our Reserve services Short Term Operating Reserve (STOR) and Fast Reserve. We published a podcast in July 2020 to explain derogations, the progress so far, and next steps, whilst in August 20202 our Clean Energy Package (CEP) webinar discussed survey feedback, progress to date and next steps.

Support development and implementation of Pan-European replacement reserve standard products

Our Project Trans European Replacement Reserve Exchange (TERRE) team set up a mailbox for market participants to send us queries and suggestions. We had numerous queries about data formats, test scenarios, and plans which we have responded to and acted upon. We have also conducted numerous calls and virtual workshops with market participants to present detailed test plans, scenarios and give them an opportunity to have discussions with our test teams.

As part of TERRE we carry out regular updates via the Operational Forum. When it became clear that TERRE would be delayed (i.e. beyond the date provided for by regulatory easement) a webinar was held at the end of August 2020, with a letter to industry on 4 September 2020.

Similarly, we had queries and suggestions from interconnectors through our mailbox. As a result we held separate workshops with Eleclink, IFA and IFA2 to discuss plans and testing, and have acted upon their suggestions to adjust our test cycles to accommodate their availability.

Product Roadmap for Reactive implementation

Publish our strategy for the future of reactive power

Having published a tender for the Mersey Voltage Pathfinder in November 2019, we will be publishing our 'Lessons Learnt' shortly that responds to stakeholder feedback from our survey. Our lessons learnt will cover the following areas:

- Communications
- Pre-qualification and compliant bids
- Assessment
- Participation
- Timelines

The lessons learnt document will also capture what stakeholders have told us, and how we intend to respond. For instance:

- *"If NGESO is concerned that proposals are not technically feasible it should impose a bid bond so that parties are financially incentivised to develop a technically feasible and deliverable project."* - Market Participant

Further details will be set out in our lessons learnt document. In response to this particular point, we have considered the possibility of a bid bond, but believe this could be too restrictive for some market participants and could reduce the number of options proposed by any one participant. We are still considering the possibility of a bond which would incentivise the delivery of successful tenders post contract award.

Power Potential trial with UKPN

As part of the stakeholder engagement process with the Power Potential project we regularly engage with project participants through our Regional Market Advisory Panel (RMAP). In our last session held on 29 July 2020 we were able to share significant changes to the project scope, including the removal of opportunity for Distributed Energy Resources (DER) to compete directly with transmission connected assets. Although this was disappointing news for participants, we were open and transparent with the group on the reasons behind this decision well in advance of the trial start. We received feedback from the independent chair of the RMAP that whilst the news was disappointing to DER providers, it was good that the project was transparent and honest with DER on the change, having provided the opportunity for the decision to be challenged.

We have been able to lean on our experience of engagements with the Solar Trade Association to highlight to potential new solar providers the possible challenges and areas to consider in the provision of voltage control. Providers were happy that both support they've received, and previous learning, could be shared to accelerate their potential participation in the trial.

Delivery of the Power Responsive initiative

Power Responsive continue to engage with and support a number of innovation projects, all seeking to unlock demand flexibility from various sources of funding mechanisms and with a range of different stakeholders that form project teams.

We have received positive feedback from project leads over recent months, thanking us for the support we have provided:

- *"Could I just reiterate my thanks to [ESO colleague], who was instrumental in getting the project started, [other ESO colleagues] for their support during the delivery phase, and everyone who attended today's presentation."* - 3rd Party Platform Provider

- *"A big thanks to you both and [ESO colleague] for everything over the past few years – it's been an intellectually stimulating journey that shows that starting from a blank sheet of paper and adhering to key principles can be a way forward for our electricity markets. We have the technological solutions, it's just a question of whether regulation can clear the way for them to be implemented."* - Supplier

We have also received challenging feedback from projects that are naturally a little more complex in their nature, that there may be a perception that we are not being as supportive as we could be. We therefore recognise the need to consider further how we communicate and justify to our stakeholders our commercial and operational barriers, limitations, and challenges to innovation projects that seek to work with business as usual activities as part of trials.

Having been unable to host our annual Summer Reception in summer 2020 due to restrictions imposed by the COVID-19 pandemic, Power Responsive sought to continue engagement via the release of a series of podcasts over two weeks in July – The Summer Insights Series. We opened the series up to industry stakeholders and experts to provide us with content to ensure a balance of ESO and external messaging. Whilst co-creating content was a great success with over 5,500-page views, we also endeavoured to provide deeper engagement through an online Q&A session, after inviting stakeholders to vote for the podcast content they wanted to hear more about.

In April 2020, prior to publishing the Power Responsive Annual Report on Demand Side Flexibility, we recorded a succinct 17-minute vid-cast to industry, highlighting some of the key findings from the report, and receiving positive feedback as a result:

- *"Just wanted to drop a note to thank you for the Power Responsive vidcast. We both found it a useful preview of the report, and have sent it round the team as required watching!"* - Demand side aggregator

The main report itself was also well received as we endeavoured to make improvements on subsequent years. This appeared to be acknowledged by stakeholders, with some agreeing to report on it in their own publications:

- *"Really good report BTW - loads of useful detail, definitely the best one yet."* - Industry news publisher

- *"We shall write something up for Spectrum and also present at our flexibility forum event next week"* - Industry insights and analytics stakeholder

Improving the way we facilitate code change

Due to the impacts of COVID-19, there was no CACoP survey this year. We were disappointed with this decision as feedback is important to ensure all improvements within this year are reflected. However, we note that this might have been an additional burden to industry, during an already challenging time. We have continued with our improvement activities and feel confident that our stakeholders are seeing positive changes and improvements in their interactions with us and the code change process.

The code administrator baseline score for workgroup satisfaction scores in April 2020 was 7.34/10. As of September 2020, our average score was 8.83/10. We note that we are above baseline for our scores in this quarter. We have made a great deal of improvements which we feel is reflected in this high score. One workgroup member noted that the Code Administrator had done, *'…an excellent job of making sure the workgroup stayed on track and got through the work it needed to do in the short time that we had'*.

One area of significant improvement can be found in our customer focussed communications. We have updated all our reports and documents that are used within the code change process. We took a consultative process with

industry. Feedback from the previous CACoP survey told us that customers found our documents outdated and often hard to navigate. We have streamlined all documents and the entire team has had Plain English training to enable them to write about complex, technical information in an easy to read format.

Feedback also told us that new entrants within industry found it hard to understand the code change process. We felt we could and should do more to help new parties navigate the often complicated and lengthy process. In September 2020, we published a new onboarding web page on the ESO website[39]. This page provides a new entrant with basic information on each of our codes, provides useful links and where they can find more detailed information. Most importantly we want new parties to feel like we can be relied upon to provide them with impartial and accurate advice on how to get involved in the code change process.

We hope that these improvements, along with the others across the year, are improving industry confidence in ESO Code Administrator. We have evolved our critical friend process and most recently created a new template to help Panel members with the process of modification prioritisation. Feedback has been very positive so far:

- '*Thanks for your excellent administration of data and spreadsheets – its appreciated.*' Panel Member
- *'It is an efficient suggested approach.*' Panel Member

Facilitate electricity network charging reform through Charging Futures

Due to the restrictions imposed because of the pandemic, we have been hosting our Charging Futures Forums via webinars. These have been positively received with an average score of 8.35 which we are pleased with. We will continue to work with Ofgem to provide the most up to date and helpful information on Charging Reform.

We hosted an Access Webinar in July 2020, and received the following anonymous feedback from attendees:

- *"Great webinar, thanks. I enjoyed the flexibility of not having to travel in"*
- *"I really enjoyed the use of menti and found it all very useful"*
- *"Prefer online format to in person. Removes hours of travelling"*
- *"Great opportunity for Q&A*"

Transform the customer experience for network charging

Industry webinar on five-year view of TNUoS tariffs

As part of the TNUoS charging process, we published the TNUoS 5-year view report by the end of August 2020 covering 2021-22 to 2025-26. To help the industry understand the implications of the ongoing regulatory changes to the charging regime, we also included a number of sensitivity scenarios and hosted a webinar in September 2020 to go through the report with the industry. Over 70 attendees attended the webinar with an average score of 8.6/10. We were pleased with this score, although noted that a small number of parties gave us a score of 4 or 5 due to disappointment with the ongoing regulatory changes. However, over 50% of attendees gave a score of 10 or 9.

In the 5-year view report, we highlighted that based on the incomplete data set received from onshore TOs and the current calculation methodology, the Expansion Constant & Factor could increase significantly. It is one of the key charging parameters which requires a re-set for each price control period and is the factor to drive locational TNUoS charges. The industry appreciated that we flagged the risk and we have kept them informed through different charging forums e.g. Transmission Charging Methodologies Forum (TCMF), Transmission Charging Review Group (TCRG), etc. It was however suggested that it would be more helpful if we could have raised the issue earlier.

BSUoS charge deferrals due to COVID (modification CMP345 and CMP350)

Throughout both of these modifications we both engaged with parties through the workgroup meetings and also bilaterally with stakeholders who were interested in the modification. Due to the significant impact the modification

[39] https://www.nationalgrideso.com/industry-information/codes-homepage/code-changes-beginners-guide

could have on parties, this engagement and simple overview of the modification was well received, particularly by trade groups who represent multiple parties.

- *Thank you once again for giving us your time this morning. I appreciate that this is all extremely fast paced and rapidly developing work for you as well as for us and that you will be taking other concerns and queries as well, so we are really grateful that you took the time to respond to some of our concerns- Industry Association*

- *The individuals from the Code Administrator went above and beyond the call of duty to progress this complicated and urgent modification. The workgroup report was excellently written, with the new format and clear headings within sections making it easy to read and also, crucially, to refer back to as the Workgroup developed – Generator*

Transform industry frameworks to enable decentralised, decarbonised and digitised energy markets

Grid Code modification GC0143: Last resort disconnection of Embedded Generation

The unprecedented societal changes brought about by measures put in place to deal with the COVID-19 pandemic led to a significant reduction in consumer demand for electricity. This created the risk that, in certain circumstances, as a last resort after all Balancing Mechanism actions and other commercially available options had been exhausted, the ESO may need to issue emergency instructions to DNOs to disconnect embedded generators in order to balance the system.

The ESO raised an urgent Grid Code modification (GC0143) on 30 April 2020 to give clarity regarding these emergency instructions ahead of the May Bank Holiday weekend, when the risk was expected to be at its highest. Following industry consultation, Ofgem approved the modification on 7 May 2020, with the change coming into effect on the same day.

A key part of the modification was the inclusion of a 'sunset clause', meaning that the changes would cease to apply after 25 October 2020. The ESO would then raise a subsequent modification to develop an enduring solution, allowing all relevant points of view to be taken into account without the pressure of the urgent timeline that applied for GC0143.

We received a total of 69 responses to the GC0143 consultation. Most respondents understood the need for the urgent modification and the potential threat to security of supply, however a number of concerns were also raised.

We engaged with Ofgem and industry in the following ways:

- We spoke directly to many of the respondents and many other stakeholders regarding their views on the proposal.

- We wrote to Ofgem summarising the consultation responses, outlining the key themes and how we intended to address them either via the enduring solution or beforehand.

- We established a new ODFM (Optional Downward Flexibility Management) service to provide a commercial alternative to disconnection for non-BM parties, which also times out on 25 October 2020, to be followed by a new product for use in 2021. This has been used a number of times from May 2020 to help manage low demand and has avoided the need for any emergency action.

- We worked with the DNOs to publish joint guidance on how the emergency instructions would be applied in practice, to give clarity to stakeholders.

- We raised Grid Code modification GC0147 in July 2020, to develop an enduring solution following normal governance including engagement and consultation.

Supportive comments from stakeholders:

- *"We understand that the situation we find ourselves in due to the Covid-19 restrictions is unprecedented and therefore GC0143 (Last Resort Disconnection of Embedded Generation) is an understandable*

emergency modification to ensure our energy system remains safe and reliable during these extraordinary times." – Embedded Generator

- *"As an emergency action we feel it does help fulfil the operation of an efficient transmission system"* - Embedded Generator

Concerns raised which we have addressed:

- *"It is important that a more considered solution is developed with industry engagement, as intended by the ESO, prior to the sunset clause coming into effect in October 2020."* - Embedded Generator

- *"The sunset clause is particularly important in bringing forward enduring solutions"* - Embedded Generator
    - Development of an enduring solution is now underway, with good engagement from industry.

- *"We would also like to have some information regarding the selection of sites from network operators"* - Embedded Generator

- *"Market participants require clarity from the ESO and DNOs regarding the decision process for curtailing embedded generators."* - Embedded Generator
    - Joint ESO / DNO Guidance was published in May 2020, shortly after the consultation

Grid Code modification GC0137: Grid Code modification relating to Virtual Synchronous Machine capability

Through Grid Code modification GC0137, we are creating a "GB Grid Forming" specification, formerly referred to as Virtual Synchronous Machine (VSM) capability. Parties meeting the specification will contribute capabilities which essentially mimic the essential inherent properties of a traditional synchronous plant.

Stakeholders have been vocal in their support for this modification throughout. Some written feedback extracts from work group attendees are included below:

- *"This is as significant in many ways as the original Grid Code changes that integrated in wind and other converters in 2004 - if not more so in many ways; it's both an opportunity for services from connectees, as much as a solution to integrating ever more non-conventional sources of power onto the network which makes it all work."* – Testing/Simulation Centre

- *"The sessions were really useful and we at [energy company] are very keen to get the best out of them for the industry as a whole."* – Manufacturer

- *"We are looking forward to further discussions around the specification."* – Manufacturer

- *"It's an interesting and very active subject."* – Testing/Simulation Centre

For the consumer, this should serve to highlight how seriously the ESO and wider industry are taking the matters of security of future supply, technological innovation, and economical delivery of the best-value outcomes at all stages.

CMP317 & CMP327: Removing Generator Residual and excluding assets required for connection

We have worked collaboratively with stakeholders to produce 84 sets of legal text, covering all alternatives, and submit all of these to Ofgem on time. We received the following feedback from a CUSC panel member:

- *"Thank you for sending through the revised legal text for CMP317/327 (84 sets). It was a herculean task to complete the review and the ESO team are to be commended."* – Generator

P399: Making the identity of Balancing Service providers visible in the Balancing Services Adjustment Data

P399 seeks to include additional information in the Balancing Services Adjustment Data (BSAD) to identify the assets involved in Non-BM activities such as bilateral trades and Non-BM Instructions. Making this data more

transparent to industry is a crucial step in the ESO's data transparency journey. Industry has strongly emphasised the importance of making this data more visible, and in turn the ESO has reacted and made this a key priority to deliver. We have worked closely with industry, Elexon and our own internal IT teams to find the most cost-efficient way of delivering the change, and have subsequently reduced the costs and lead times of the original impact assessments by incorporating it into our ongoing data transparency work.

We have also sought to exceed stakeholders' expectations by also including Non-BM STOR instructions, to give the market a complete picture of the Non-BM services we trade for and subsequently utilise.

Through applying the principles endorsed by the BEIS and Ofgem Energy Data Task Force, we identified commercial blockers to making this data open and available. After working with stakeholders, it was agreed that while this added complexity and time to the process, utilising the code modification process was the most efficient way to ensure that all data was made open to industry

Overall we have received positive praise from stakeholders for reducing the cost of implementing this modification, and working collaboratively with industry to deliver all of the desired changes whilst being transparent about the costs and timescales involved.

Making Electricity Market Reform (EMR) easier for participants

The Panel of Technical Experts (PTE) scrutinised National Grid ESO's 2020 Electricity Capacity Report on the target capacity for the proposed T-1 Auction for delivery year 2021-22 and the T-4 Auction for the year commencing 2024-25, and presented its conclusions in a report[40] published in July 2020. In this report, the PTE accepted the ESO's recommendations on target capacities, and recognised the ESO's engagement process:

- *"Overall, we were very pleased with the open and constructive process of engagement with National Grid ESO and BEIS. We thank them for their extensive efforts to develop clear and timely analysis and address many of the technical issues which we have raised"*

Distribution Connection and Use of System Agreement (DCUSA) modification to create register of embedded assets

We worked with the DNOs to agree a final set of data to be included in the Embedded Capacity Registers and have committed to helping the DNOs fill any gaps in data they do not currently hold. We are now reviewing the first versions of the registers and are providing supporting evidence to help fill gaps (e.g. storage duration can be populated from the Capacity Market registers).

[40] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/900062/panel-technical-experts-report-on-2020-electricity-capacity-report.pdf

B.3 Plan delivery

B.3.1 Highlights

- New Dynamic Containment product developed (and launched on 1 October 2020) - one of a suite of faster-acting frequency response services which can be deployed after a significant frequency deviation
- We published the Auction Trial evaluation report, summarising our learnings from the weekly Frequency Response auction trial
- We continued to improve our Code Administration performance, receiving positive feedback from workgroup surveys
- We progressed some significant code changes to facilitate the energy transition, such as GC0131 ('Quick Win' Improvements to Grid Code Open Governance Arrangements) and GC0137 (which relates to GB Grid Forming, previously known as Virtual Synchronous Machines)
- We provided thought leadership across a range of charging issues, including the Access Significant Code Review and BSUoS task force
- We improved our communication around the impacts of the Clean Energy Package on Short Term Operating Reserve (STOR), explaining the next steps for procuring STOR at the Day Ahead stage
- We acted quickly to ensure that the system remained operable during the periods of low demand due to COVID-19, including setting up new contracts for balancing services, and rapidly progressing changes to industry codes to mitigate the impact of COVID-19 on suppliers and industry (for example GC0143: Last resort disconnection of embedded generation, and CMP 345 and 350 relating to deferring BSUoS charges associated with COVID-19). We also continued our business-as-usual activities without disruption, including adapting industry events so that they could be held virtually.
- However, we were disappointed that it is now not possible to facilitate GB participation in the Trans-European Replacement Reserve Exchange (TERRE) project before the end of 2020, due to issues with IT systems. We also note the recent statement[41] from the European Commission (EC) which explains that the UK will not be able to participate directly on dedicated European platforms from January 2021, and are considering the implications of this for the TERRE project.
- We note that the urgent activities required due to COVID-19 have delayed other aspects of reserve and reactive reforms, and will turn our focus to these in the second half of the year.

This section reports our performance against the deliverable descriptions and dates set out in the Forward Plan Addendum[42]. The Forward Plan Addendum set out our revised view (as of July 2020) of what we would deliver during 2020-21. During the period of regulatory flexibility, we shared with Ofgem a number of our deliverables where there were known impacts of COVID-19; these are clearly identified in the Addendum. However, we note that the impact of COVID-19 has been felt across many areas of the ESO's work.

[41] https://ec.europa.eu/info/publications/getting-ready-changes-communication-readiness-end-transition-period-between-european-union-and-united-kingdom_en

[42] https://www.nationalgrideso.com/document/173131/download

B.3.2 Deliverables

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
Product Roadmaps for Response and Reserve implementation			
Implement the first new frequency response product	Date is being revised[43]	Completed on 1 Oct 2020	We launched Dynamic Containment on 1 October 2020. Six tenders were received with two battery energy storage units accepted in the first round to provide 90MW of faster-acting response services over 24 hours. Our next step in this project is to review our learnings and work with providers to support their onboarding in the process.
Consult on future frequency response products	Date is being revised	N/A	The learnings from the soft launch of DC will be key to how and when we deliver Dynamic Moderation (DM) and Dynamic Regulation (DR). We will be sharing our plan for the next steps in frequency response reform later in the quarter.
Report on auction trial	Q2-Q3 2020-21	Target date met	We published the report[44] on the Auction Trial in September 2020 and will be hosting engagement activities linked to this report in October 2020.
Market design and implementation plan for reformed reserve products	Date is being revised	N/A	We will be restarting engagement on the design of the new suite of reserve products now that the DC soft launch has been achieved. We are considering the reserve design in light of how the new pan-European Standard product TERRE will be used, and what the impact of wider access will be on the makeup of the Balancing Mechanism. Scope and timeline for reserve reform will be published in November, along with workshops to gather feedback on what new products should look like.
Support development and implementation of Pan-European replacement reserve standard products	Q1-4 2020-21	Ongoing	We have advised the general industry that because of the COVID-19 pandemic we cannot go-live with Trans European Replacement Reserve Exchange (TERRE) in June 2020 but will have to delay until December 2020. In addition, we have had a software release failure meaning that delivery in October 2020 is not feasible. Following a communication from the EU Commission on 9 July 2020 which stated that GB would not be allowed to participate in any EU platforms, we have recommended delaying TERRE until 2021 when we will understand the Final Trade Agreement with the EU. For Manually Activated Reserve Initiative (MARI), we still have obligations under EU law until 31 December 2020, therefore we are starting the process of code mods and fully participating in the central project.
Product Roadmap for Reactive implementation			
Publish our strategy for the future of reactive power	Q3 2020-21 - Q2 2021-22	On track	We are on track to share a high-level strategy on reactive power with industry in Q3 2020-21.
Power Potential trial with UKPN	Q3-Q4 2020-21	On track	We are pleased to confirm that the Power Potential trial commenced on Thursday 15 October 2020 and will now run through until March 2021. Essential learning will be collected through both the optional (wave 1) and market (wave 2) trials prior to project closure next year.
Review learning from Power Potential	Q3-Q4 2020-21	On track	This will be aligned with the delivery of the core Power Potential project.
Power Responsive			

[43] All deliverables with 'Date is being revised' is due to the target date being uncertain at time of publishing the Forward Plan Addendum

[44] https://www.nationalgrideso.com/balancing-services/frequency-response-services/frequency-auction-trial

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
Deliver innovation projects to unlock demand flexibility	Q2 2020-21	Anticipated in Q3 2020-21	We have been working with a number of companies through the Residential Response NIA Project. This project is looking at the various barriers to providing frequency response from domestic assets, such as metering, prequalification, and portfolio management. We ran a webinar on 4 September 2020 where the project team presented the conclusions of the work to the wider industry, in advance of the publication of the final report which will be in Q3 2020-21.
Improving the way we facilitate code change			
Incorporation of all 14 Code Administrator Code of Practice (CACoP) Principles	Ongoing	Ongoing	Two modifications were raised in March 2020 to facilitate the 14th CACoP principle; sandboxing. Due to congestion from high priority modifications, they were given a low priority. The modification will proceed in line with Panel's decision on where it sits in terms of a priority against other modifications. We anticipate that this will not be progressed with any urgency at this stage. We therefore do not have any control over the speed at which it progresses.
Customer focussed communications	Q1 2020-21	Target date met	An email subscription tool has now been implemented alongside easy to read emails. The first Code Administrator Annual report[45] has also been published on our website in direct response to stakeholder feedback asking us for more transparency.
Onboarding process for new industry parties	Q2–Q3 2020-21	On track	The first stage is now complete. The ESO Code Administration team has now created a new onboarding page on the ESO website. This was created in direct response to feedback that told us that new industry parties often found it hard to navigate the complexities of the code change process. We have provided simple, easy to read information and clearly signposted where stakeholders can find more information. In addition to this, we wanted to give new parties additional help and so we will be looking to host virtual training in the near future.
Improving industry confidence in ESO Code Governance	Q1-Q4 2020-21	On track	The ESO Code Administration team has taken on feedback from industry that told us it needed more confidence in us. Since then, we have made our critical friend process more robust. We have undertaken many other improvement activities to help us better facilitate the code change process to be more transparent. Most recently, we created a new process for the Panel to prioritise modifications. We feel examples like this where we can provide the right tools and guidance truly demonstrate one of the ways we are improving industry confidence.
Facilitate electricity network charging reform through Charging Futures			
Facilitate electricity network charging reform through Charging Futures 1. Targeted Charging Review (TCR) 2. Access and Forward Looking Charges	Q1-Q4 2020-21	On track	We continue to offer a programme of accessible events for parties to learn and contribute to electricity charging reform that our stakeholders have come to expect. Despite COVID-19 we hosted our second virtual forum via webinars in July 2020 and the second Balancing Services Charges Task Force published its final report in September 2020[46].

[45] https://www.nationalgrideso.com/document/172316/download

[46] http://www.chargingfutures.com/media/1477/second-balancing-services-charges-task-force-final-report.pdf

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
Significant Code Review (SCR) 3. Reform of Balancing Services Charges			
Transform the customer experience for network charging			
Publications and guidance of the impact of charging reform to our customers	Q3-Q4 2020-21	On track	There are a number of uncertainties underlying the charging regime such as RIIO-2 parameter resets and Targeted Charging Review (TCR) implementation. The TNUoS five-year view (2021-22 to 2025-26)[47] was published on 31 August 2020, which has implemented the TCR changes. To help the industry understand the potential impact from some of the uncertainties, we have also provided five sensitivity analyses. A further update on TNUoS tariffs for 2021-22 will be provided in November 2020 and finalised in January 2021. We will publish a number of guidance documents on TCR, following Ofgem's decision on the relevant CUSC modifications.
Introduce new 'new entrant' e-learning on charging	Q1-Q4 2020-21	On track	Following the publication of the TNUoS five year view, we hosted a webinar on 23 September 2020 to go through the report and analysis with a focus on the new charging methodologies. 70 industry parties attended. The average score for the webinar was 8.6/10. We have published the recorded webinar, Q&A and additional analysis requested in the webinar on our website[48]. The recorded webinars for connection charges have been rescheduled for Q3 and Q4. Recorded webinars for BSUoS have been rescheduled for Q4: this will cover the TCR BSUoS changes taking effect in April 2021.
Improve the digital customer experience for TNUoS, BSUoS and Connection Charging Data; including improvements to existing NGESO billing system to improve user experience	Q1-Q4 2020-21	Ongoing	Due to COVID-19, the priorities have been to assist the industry via two support schemes - TNUoS scheme and BSUoS scheme (CMP345/350). As such, we have experienced delays in the optioneering work. To ensure the timely delivery of the regulatory changes, it is decided to implement the TCR changes in the existing Charging and Billing System. We endeavour to complete the option investigation for the systems by Q4 2020-21.
Establish a 'cross party' approach to onboarding, mapping out whole industry requirements:	Q1-Q4 2020-21	On track	We held an initial discussion with Elexon to align the objectives early this year. Following lockdown and challenges on industry party resource, it is anticipated that it will take longer to complete the exercise than originally thought. However, we are still aiming to deliver by Q4 2020-21
Transform industry frameworks to enable decentralised, decarbonised and digitised energy markets			
Implement Targeted Charging Review (TCR) decision in	Q1-Q4 2020-21	On track	All of the modifications relating to the Targeted Charging Review have now completed the code modification process and are with Ofgem for a decision. Band setting is due at the end of October 2020.

[47] https://www.nationalgrideso.com/document/175786/download

[48] https://www.nationalgrideso.com/charging/transmission-network-use-system-tnuos-charges

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
conjunction with DNOs.			
Supporting the Access Significant Code Review (SCR)	Q3 2020-21 and ongoing	On track	We have provided Ofgem with all of the necessary modelling and information for their cost benefit analysis to be undertaken. We continue to support the Access Subgroup through the creation of papers.
Lead code modifications	Q3-Q4 2020-21	On track	The codes team have progressed all code modifications relating to the Targeted Charging Review and Significant Code Review and these are now all with, or will shortly be with, Ofgem for a decision. The zoning modification is with Ofgem for decision and we await Ofgem's response to the second BSUoS Taskforce report before progressing any subsequent changes to the BSUoS charging arrangements. In terms of other code changes some progress will be made in the remainder of this performance year, however, due to the TCR and other industry congestion it is unlikely that other modifications will conclude in the timescales we originally stated. We expect some of these to move into RIIO-2 and be concluded within 2021-22.
Balancing Services Charges Task Force	Q2 2020-21	Target date met	Completed. The BSUoS taskforce has now concluded and the report[49] published and sent to Ofgem. The taskforce's conclusions support removing BSUoS charges from generators to be paid 100% by final demand and recommend that the charge is fixed in advance by the ESO to remove risk premia from consumer bills. We are engaging with Ofgem now on the next steps and expect them to publish their response in November 2020.
Capacity Market Modelling - Cross-border participation in capacity markets	Q1-Q4 2020-21	On track	ENTSO-E have a mandate to develop the methodology under Regulation (EU) 2019/943 as part of the Clean Energy Package, which will help facilitate direct participation of cross-border capacity in the capacity market. We are participating in the ENTSO-E Task Force to play a leading role in developing the methodology. The impact of COVID-19 presents a risk that could lead to the ESO needing to commit resources to other work priorities that would reduce our involvement in the ENTSO-E work. ACER issued a consultation[50] on the participation of cross-border capacity in capacity mechanisms, which ran until 9 August 2020. The task force has been in operation for over a year and we have been participating throughout 2020-21. The draft methodology was developed in Q1 2020-21. It was put out for consultation over Q1-Q2 2020-21. We expect the methodology to be finalised Q4 2020-21.
Capacity Market (CM) Modelling – facilitating broader participation in the CM to provide security of supply at best value for consumers.	Q1-Q4 2020-21	On track	ESO has been supporting a Distribution Connection and Use of System Agreement (DCUSA) Change Proposal referred to as DCP350 to create a register of embedded assets. This was approved by the DCUSA panel in May 2020 and by the Authority on 1 July 2020. The first version of the data was published[51] in July 2020. We intend to use this data to improve our modelling of embedded generation for the capacity market, which may lead to a change in how we determine de-rating factors. The impact of COVID-19 presents a risk that could lead to ESO needing to commit resources to other work priorities that could lead to this work being delayed. As the capacity market modelling follows an annual process, any delay would be 12 months to coincide with the next annual cycle.

[49] http://www.chargingfutures.com/media/1477/second-balancing-services-charges-task-force-final-report.pdf

[50] https://www.acer.europa.eu/Media/News/Pages/ACER-consults-on-cross-border-participation-in-capacity-mechanisms.aspx.

[51] https://www.energynetworks.org/industry-hub/databases

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
Delivery of the Power Responsive initiative			
Support coordination of Distributed Energy Resource (DER) engagement on flexibility developments	Q1-Q4 2020-21	On track	COVID-19 has delayed a lot of development work and made workshops more challenging, which has delayed some of the work. However, we have progressed with alternative virtual avenues such as the Summer Insight Series podcasts in June 2020. Upcoming milestones include: publication of the updated Guide to Flexibility for DER at the end of October; Major Energy Users' Council (MEUC) webinar session on 14 October 2020; First stage of Piclo and Electron local market trials in November; Annual Report 2020 kick off in November 2020, and Reserve Product Reform workshops in November 2020.
Power Responsive Stakeholder Engagement	Q1- Q4 2020-21	On track	We have been developing alternative virtual content to physical events, starting with the Summer Insights Series[52], which was a series of industry podcasts concluding with a panel session Q&A.

[52] http://powerresponsive.com/summer-insights-2020-industry-podcasts/

B.4 Outturn performance metrics and justifications

Metric/ Performance Indicator	Performance	Status	Justifications
2A. Reform of Balancing Services Markets	This shows the combined performance of Q1 and Q2: Frequency response Reserve Reactive Black start Constraints	 ● ● ● ● ●	A combination of challenging operational conditions as a result of the COVID-19 pandemic, along with the suspension of STOR and Fast Reserve tenders while we move to comply with the Clean Energy Package, has meant that our performance has not met expectations over the first half of the year.
2B. Code Admin Stakeholder Satisfaction	Average rating of 8.83	●	We are “exceeding expectations” in this area
2C. Charging Futures	The latest Charging Futures Forum in July 2020 received a score of 8.1. The last BSUoS taskforce in August 2020 received a score of 8.9.	●	We are “exceeding expectations” in both surveys.
2E. Month ahead forecast vs outturn monthly BSUoS	4 months of Absolute Percentage Error (APE) greater than 20% and 2 months between 10% and 20%	●	BSUoS forecasting has been very challenging through the first half of the year with the impact of COVID-19 causing massive disruption to the energy market.

Table 9: Summary of metrics and performance indicators for Role 2

● **Exceeding expectations**

● **Meeting expectations**

● **Below expectations**

2A Reform of Balancing Services Markets

April – September 2020 Performance

This metric encourages us to provide a high quality service to our stakeholders as well as visibility, transparency and engagement. The reform of balancing services markets should increase competition and lower prices.

Performance is measured using metrics such as total spend and total volume procured. Where possible, we will look to include average market price paid. The measures will be by service area rather than individual market. The data for each measure is split into two categories: competitively procured or competitive bilateral.

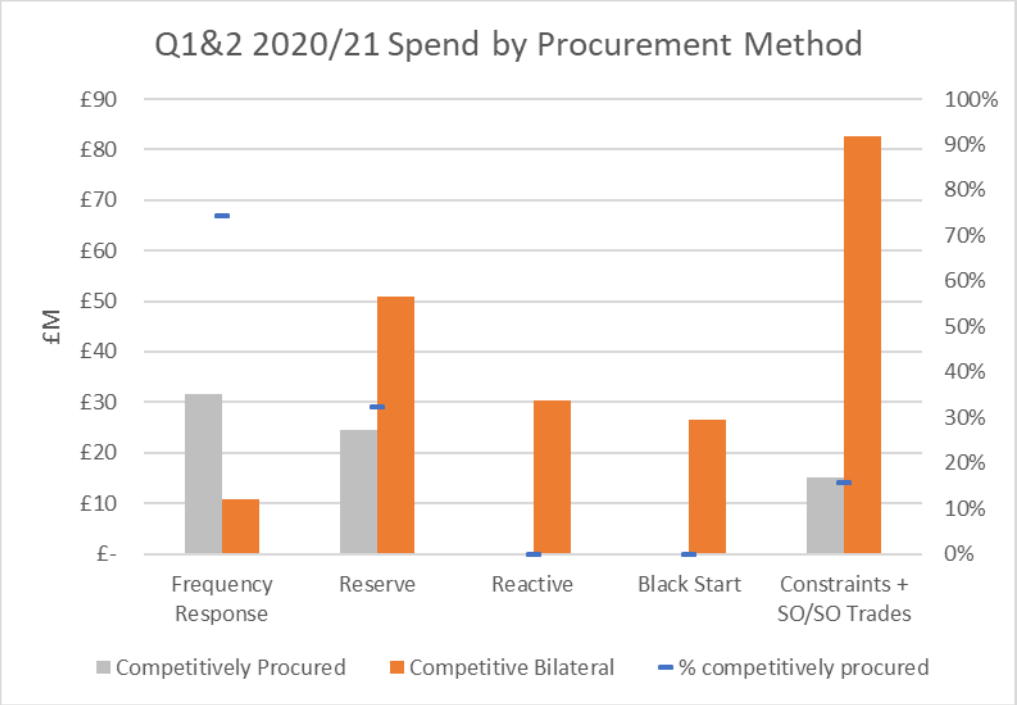


Figure 5: Cumulative spend on services per procurement category in £millions

Service	2019-20 %	Target % for 2020-21	Actual % for Q1 2020-21	Actual % for Q2 2020-21
Frequency Response	81%	85%	69%	82%
Reserve	43%	55%	32%	33%
Reactive	0%	5%	0%	0%
Black start	0%	10%	0%	0%
Constraints	0%	10%	20%	13%

Table 10: Percentage of total spend procured through open and competitive market

Supporting information

Frequency response – Meeting expectations for Q2. Over the summer the amount spent in the mandatory, weekly auction and Firm Frequency Response (FFR) markets remained relatively constant. The lower figure of 69% for market procurement of frequency response in Q1 was due to the extremely low demand conditions experienced during April, which drove a large spend on commercial frequency response from pumped hydro to ensure system security whilst the new Optional Downward Flexibility Management (ODFM) service was introduced.

Average clearing price (weekly auction trial):
Q1: £6.29/MW/h dynamic product;
Q2: £5.84/MW/h dynamic product;
Q1: £5.30/MW/h static product;
Q2: £4.10/MW/h static product.

Reserve – Below expectations for Q2. The figures for reserve have changed since Q1 as a result of final settlement runs changing the annual Short Term Operating Reserve (STOR) reconciliation figures. We spent £9m more on competitive bilateral contracts in Q1 2020-21 compared to Q1 2019-20 as a result of the impact of the Covid-19 pandemic, as well as the suspension of Short Term Operating Reserve (STOR) and Fast Reserve procurement in January. This trend has continued into Q2 as we continue to manage periods of exceptionally low demand over the summer.

Average market prices: Whilst the STOR and Fast Reserve markets are suspended, there are no average market prices available. For optional Fast Reserve instructed within day, average utilisation price is:
April-20: £84 per MWh
May-20: £57 per MWh
June-20: £51 per MWh
July-20: £48 per MWh
August-20: £48 per MWh
September-20: £64 per MWh

Reactive – Below expectations for Q2. We are on track to share a high-level strategy on reactive power with industry in Q3 2020-21. This will include information on proposals to move towards market based mechanisms for reactive power, however these are unlikely to occur in the current financial year.

Black start – Below expectations for Q2. Following the Expression of Interest (EOI) that was launched in February 2019 for services in the SW & Midlands, we launched a second competitive event with an EOI in August 2019 for services in the Northern Region. We are intending to develop the market approach further and plan to launch a further competitive event in Q2 2021-22 for services in the South-East region. We anticipate awarding contracts from the tender for SW and Midlands in October 2020, however these will not commence until 2022 and therefore we are unlikely to meet expectations in this area in 2020-21.

Constraints – Meeting expectations for Q2. The Mersey Short Term Pathfinder tender has driven a small increase in competitively tendered spend, these contracts run from 1 April 2020 to 1 April 2021 23:00 – 07:00. However, the overwhelming majority of the competitively tendered spend is on the temporary ODFM service, which was introduced in May. This increase in competitively tendered spend was offset somewhat by spend on the competitive bilateral contract negotiated with Sizewell to manage low demand conditions over the summer.

Performance benchmarks

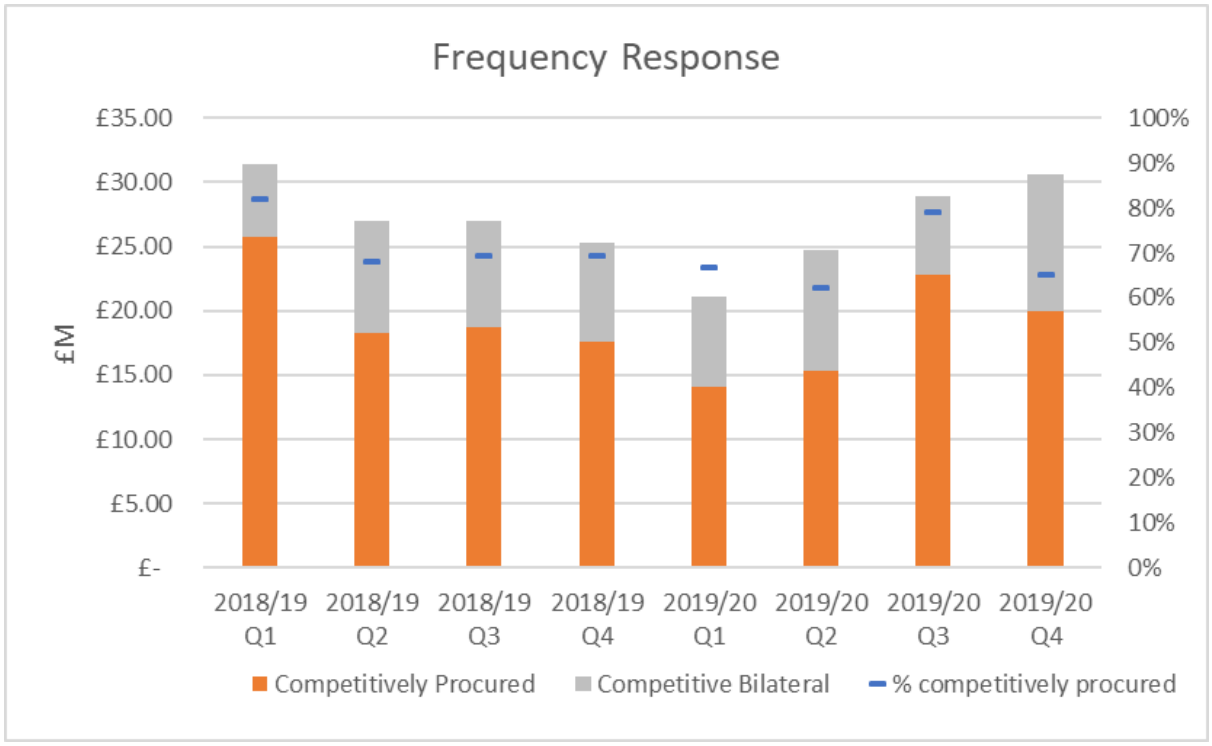
Each performance benchmark is specified as a range.

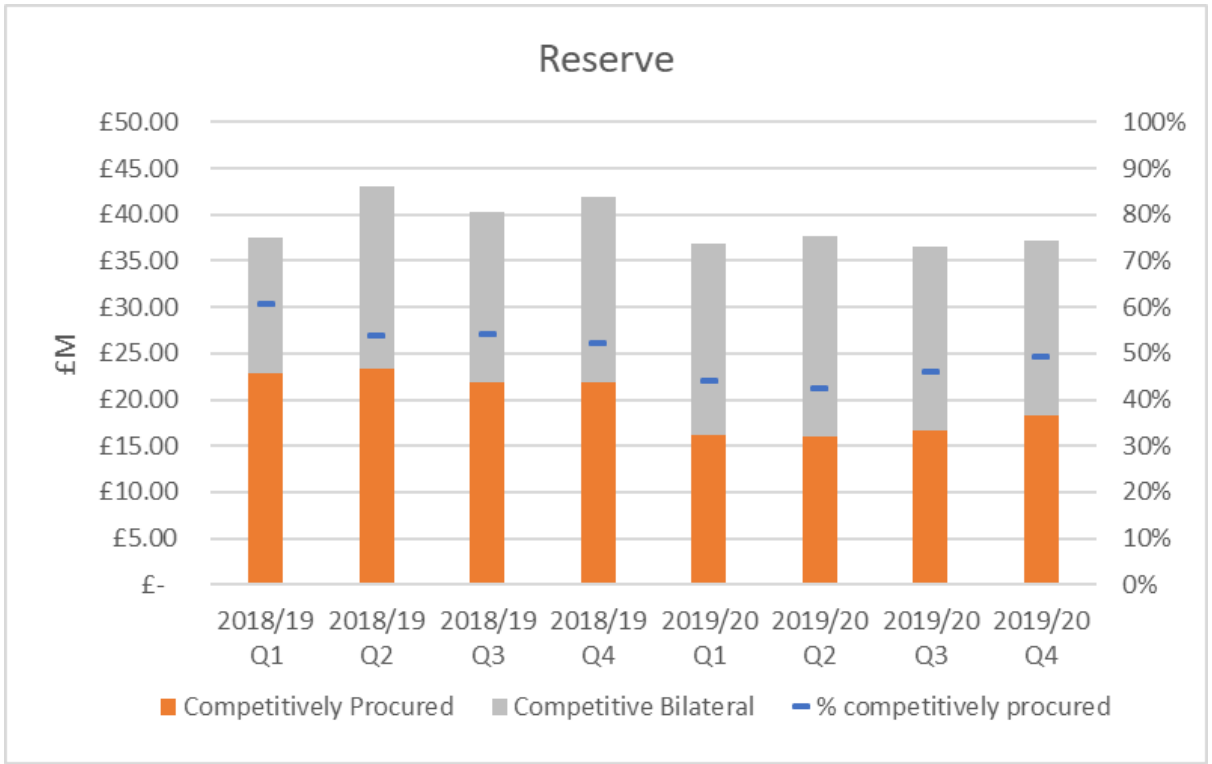
	Exceeding expectations	Meeting expectations	Below expectations
Frequency response	95% or above	Above 75% and less than 95%	75% or less
Reserve	60% or above	Above 50% and less than 60%	50% or less

Reactive	15% or above	Above 0% and less than 15%	0%
Black start	20% or above	Above 0% and less than 20%	0%
Constraints	20% or above	Above 0% and less than 20%	0%

Historical data

The following figures show the metric calculated using historical information. This is provided as context for the current metric. Only frequency response and reserve are included, as the other services have no regular competitive marketplaces.





2B Code Admin Stakeholder Satisfaction

April – September 2020 Performance

The 2020-21 baseline stakeholder satisfaction score is 7.34. Thus, the exceeding expectation benchmark, which is 5% higher than the baseline score, is 7.71.

ESO Code Administrator Stakeholder Survey Performance

Workgroup	Month surveyed	Average rating
CMP324/325	June	9.33
CMP334	June	8.00
CMP337/338	June	9.50
CMP345	June	9.00
GC0131	June	7.00
CMP317/327/339	July	8.67
CMP350	August	8.00
CMP335/336	September	10.00
CMP343/340	September	10.00
2020-21 Average rating		**8.83**
2019-20 Average rating		**7.34**

Table 11: Workgroup Satisfaction Performance

Supporting information

Due to COVID-19, Ofgem made the decision to cancel the annual CACoP survey. As code administrator, we have a central role in making the development of technical and commercial codes a transparent and accessible process. Despite having no survey this year, we are still continuing to work towards our deliverables, and our way of understanding what stakeholders are currently experiencing can be seen in the marked improvements in the feedback we are receiving in the workgroup surveys as well as what they are telling us. There were no results for April or May, which aligned with the change in circumstances brought on by COVID-19 and prioritisation from Panels.

On the basis of our ESO-led stakeholder surveys, we are now exceeding expectations in this area and are pleased with this improvement. We do not have data from a CACoP survey as this was cancelled by Ofgem due to the pandemic.

Performance benchmarks

- **Exceeding expectations:**
  - CACoP – Performance above 5% of the average stakeholder satisfaction score across all code administrators for the 2020 CACoP survey, across all our three codes.
  - ESO led stakeholder surveys – increased performance by at least 5% above our baseline score.
- **Meeting expectations:**
  - CACoP - Performance (within +/-5%) of the average stakeholder satisfaction score across all code administrators for the 2020 CACoP survey, across all three of our codes.

- ESO led stakeholder surveys – Maintain performance within 5% of our baseline score. Our baseline performance is based on average survey scores taken for the 2019-20 period. These results and baseline score are set out in our benchmark calculations section.

- **Below expectations:**

  - CACoP – Performance below 5% of the average stakeholder satisfaction score across all code administrators for the 2020 CACoP survey, across all our three codes.
  - ESO led stakeholder surveys – performance below our baseline score by at least 5%.

2C Charging Futures

April – September 2020 Performance

Charging Futures supports network users by giving them opportunities to learn about the changes, and to contribute to how future arrangements work. Surveys are conducted following Charging Futures Forums and webinars with their attendees.

The baseline score for 2020-21 is the average feedback score received throughout the performance year 2019-20, not including survey results for webinars where the main content is not led by National Grid ESO.

The 2020-21 baseline stakeholder satisfaction score is 7.8. Thus, the exceeding expectation benchmark is 8.19, which is 5% higher than the baseline score.

Charging Futures Forum scores 2020/2021

Event	Month	Secretariat Score
Balancing Services Task Force Webinar 1	July	8.3
Charging Futures Forum, morning session	July	7.9
Charging Futures Forum, afternoon session	July	8.3
Balancing Services Task Force Webinar 2	August	8.9
2020-21 Average rating		**8.35**
2019-20 Average rating		**7.8**

Table 12: Charging Futures Forum scores 2020/2021

Supporting information

The latest Charging Futures Forum in July 2020 received a score of 8.1. There was no Forum between April to July, which was not unusual as the frequency prior to the pandemic, would usually be quarterly, or dependent on when Ofgem feel it is appropriate to update industry. The second BSUoS taskforce webinar in August 2020 received a score of 8.9 which was extremely high. We are pleased with these scores and will ensure all feedback will be used for other meetings where we hope to meet stakeholders' expectations.

We are pleased to report that overall, the secretariat score is classified as "exceeding expectations".

Performance benchmarks

- **Exceeding expectations:** Average scores from surveys undertaken throughout the year are more than 5% higher than the baseline score.
- **Meeting expectations:** Average scores from surveys undertaken throughout the year are within the range of +/-5% of the baseline score.
- **Below expectations:** Engagement scores achieved throughout the year fall more than 5% below the baseline score.

2E Month ahead forecast vs outturn monthly BSUoS

BSUoS forecasts are important to our stakeholders, although we note that our ability to forecast BSUoS is impacted by factors outside of our control. BSUoS costs are factored into the wholesale price of energy charged by generators, and therefore a forecast is vital for those parties when working out where to price their generation.

Due to the volatility in the comparison of our month ahead forecast with the outturn, we report the percentage variance as there can be large swings in accuracy. This metric does not just look explicitly at the volatility, but at the number of occurrences outside of a 10% and 20% band.

April - September 2020 Performance

Month	Actual	Month-ahead Forecast	APE	APE>20%	APE<10%
April-20	4.77	3.69	0.23	1	0
May-20	6.23	3.87	0.38	1	0
June-20	5.16	7.18	0.39	1	0
July-20	4.78	5.56	0.16	0	0
Aug-20	4.18	5.61	0.34	1	0
Sept-20	4.68	5.16	0.10	0	0
Oct-20					
Nov-20					
Dec-20					
Jan-21					
Feb-21					
Mar-21					

Table 13: Month ahead forecast vs. outturn BSUoS (£/MWh) Performance

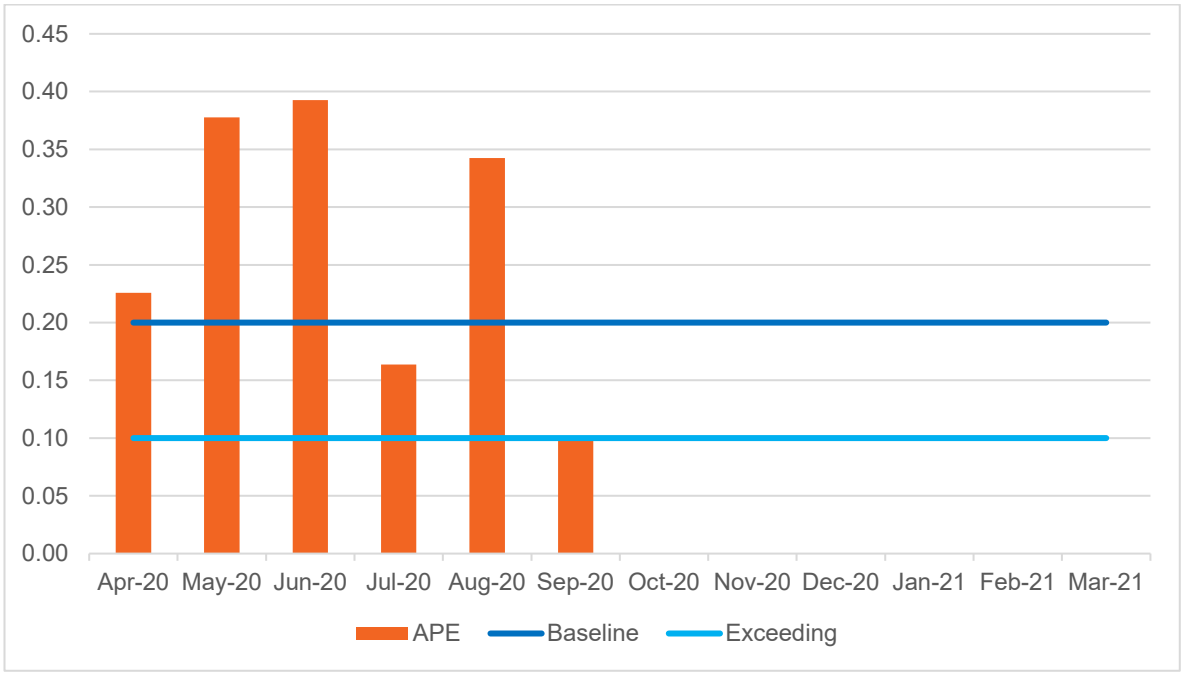


Figure 6: Monthly BSUoS forecasting performance

Supporting information

BSUoS forecasting has been very challenging through the first half of the year with the impact of COVID-19 causing massive disruption to the energy market. The April 2020 forecast was produced in mid-March before the national lockdown was imposed, and as such the impact on both balancing costs and volumes was unknown. As the scale of the operational challenge became clearer and new products were introduced to the market to deal with record low demand levels, we worked hard to produce additional BSUoS forecasts to try to reflect this. In April 2020 we produced an additional set of forecasts later in the month to give a revised view of BSUoS, in May 2020 we produced two forecasts to show the costs with and without the new products being introduced, and from June 2020 onwards we have produced forecasts based on three different demand scenarios. As we have gained more information on the impact of COVID-19 on both costs and demand our forecasts have improved.

In September 2020, demand has continued to trend back to the levels expected pre-COVID-19 and the naturally higher demands have meant less volatility in the BSUoS outturn. Constraint costs were higher than August 2020, as higher wind and system outages led to thermal constraints in the North of England and Scotland. We forecast the increase in costs, but the slightly higher than expected demand pulled the outturn BSUoS down under our forecast, giving an APE of 10.15% for the month.

Performance benchmarks

- **Exceeding expectations:** Less than 5 out of 12 monthly forecasts are above 20% Absolute Percentage Error, and 5 or more forecasts less than 10% Absolute Percentage Error
- **Meeting expectations:** Less than 5 out of 12 monthly forecasts are above 20% Absolute Percentage Error
- **Below expectations:** 5 or more out of 12 monthly forecasts above 20% Absolute Percentage Error

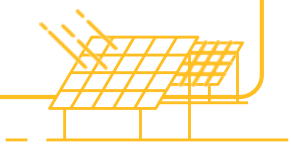
Role 3

System insight, planning
and network development

Role 3: System insight, planning and network development

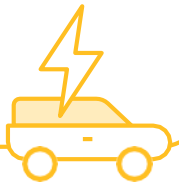
Evidence of consumer benefits

- Short Term Mersey Voltage Pathfinder progressed for next year, with EOI published. The contract put in place this year has ensured SQSS compliance and saved £3m+ over the first 5 months of the contract
- Loss of Mains settings changes progressed, allowing for operational changes to be progressed that will deliver over £10m savings per annum from September 2020 onwards, and £170m per annum from 2022-23 once the programme is complete
- Jointly leading ENA workstream to develop a whole system cost-benefit analysis tool, evaluating whole system options to help achieve net zero, and putting consumer benefit at the heart of industry decision making



Stakeholder views

- Worked closely with DNOs and service providers on the Regional Development Programmes
- Engaged extensively with stakeholders as part of our Pathfinder projects
- Extensive engagement and consultation with industry on our Early Competition work
- Continued to work with the DNOs via the ENA Open Networks project
- Introduced a new framework and design for the FES document in response to stakeholder feedback.
- Continued to progress the Loss of Mains work and engage stakeholders



Plan delivery

- Progressed our Pathfinder projects: RFI and EOI published for Stability Phase 2, EOI published for Short Term Mersey voltage pathfinder, contract awarded for Long Term Mersey Voltage Pathfinder, published decision to tender for Constraint Management Pathfinder
- Consulted on our initial model for Early Competition
- Established a process for non-TO options (Interested Persons) to submit options to the NOA
- Progressed Loss of Mains protection programme
- Agreed changes to the FES Building Block exchange process
- Progressed actions identified following power outage of 9 August 2019
- Handled an increased volume of connection applications despite challenges of COVID-19
- Prioritised work to address new operability challenges experienced due to low demands during COVID-19 pandemic
- Delivery work on N-3 intertripping continued despite COVID-19 restrictions and is now in final commissioning with UKPN

Performance metrics and indicators

Metric/ Performance Indicator	Performance	Status
3a Right first time connection offers (metric)	For the first six months of this performance year we have been meeting expectations.	●
3c Customer connections-customer satisfaction (performance indicator)	The SATs were paused in the first half of this year due to the impact of COVID-19. We have now re-started the SATs part of our insights programme.	N/A
3d Whole system unlocking cross boundary solutions (performance indicator)	155MW of Distributed Energy Resource (DER) within WPD network and 207.2MW within UKPN network accepted for the first half of this year.	N/A
3e Future balancing costs saved by operability solutions (performance indicator)	We successfully released commercial service contracts under Stability Pathfinder phase 1 and the Mersey Voltage Pathfinder over 2020-21, where we expect to save £21.3m in future balancing costs.	N/A
3f Capacity saved through operability solutions (performance indicator)	For 2020-21, the ESO will deliver N-3 intertripping capability with UKPN and will continue to monitor contracted DER volumes in the respective RDP areas against the delivery timelines for the other projects.	N/A

● Exceeding expectations ●Meeting expectations ●Below expectations

C.1 Evidence of consumer benefits for Role 3

In this section we present tables of our high-level deliverables to evidence the consumer benefits which result from our activities, explaining how the completion of each deliverable will benefit this year's and future consumers. We also include some case studies, which cover specific activities in more detail. We have chosen three case studies for each role. We would expect some roles, such as Role 3, to deliver consumer benefits mainly in future years.

Role 3 is focussed on long-term projects which will mainly benefit tomorrow's consumers. For Role 3 we have included two case studies relating to activities which are expected to benefit future consumers, our Whole system Cost Benefit Analysis (CBA) work with the Energy Networks Association (ENA), and the Loss of Mains Protection work (benefits have been realised within this year too).

Although Role 3 activities are mainly focussed on future consumers, the benefits of some activities will be felt by today's consumers. An example of this is our case study on the Short-Term Mersey Voltage Pathfinder.

We note that some of the activities covered by the case studies deliver consumer benefits both within year and in future years: where applicable, this is explained within the relevant case study. We note that it would be an extensive exercise to approximate the consumer benefit of all of our activities, and therefore we have just focussed on providing a small number of case studies and a high-level explanatory table.

The table below illustrates how our high-level deliverables in Role 3 benefit energy consumers, focussing on the following aspects of consumer benefit:

- Improved safety and reliability
- Reduced environmental damage
- Lower bills than would otherwise be the case
- Improved quality of service
- Benefits for society as a whole

2020-21 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
Whole system operability	We have continued to progress the Loss of Mains work despite being impacted by COVID-19. We have worked with the programme to implement the Fast Track change process which is designed to encourage generators with very sensitive RoCoF settings to make a change quickly	The Loss of Mains works will improve system security and reduce environmental damage, as the system will be able to accommodate a higher proportion of renewables without the risk of a sudden change in generation causing a large deviation in frequency. This will also result in lower balancing costs than would otherwise be the case.
NOA Pathfinder projects	We have been progressing the NOA pathfinder projects by actively engaging with stakeholders and providers by ensuring that those participating in the tender receive the information they need in order to generate a fairer process. We awarded 9-year contracts for static voltage support in the Mersey region.	The NOA pathfinder projects seek to identify the most economic way to operate a low-carbon system, contributing to lower bills than would otherwise be the case, and reduced environmental damage where the need for infrastructure build can be reduced.
Early Competition	We have been working with stakeholders to get their views on how Early Competition could work, and launched a consultation to set out a proposed end to end model.	The Early Competition plan encourages innovation and competition in the interest of driving down consumer costs. This could potentially result in lower bills than would otherwise be the case.
Regional Development Programmes (RDPs)	We have worked collaboratively with network stakeholders as these projects have progressed, helping to design a workable solution for consumers and	As more renewable generation is built, and the UK seeks to meet its climate change targets, the Regional Development Programmes will allow more renewables to connect to the

	stakeholders. Feedback is being incorporated into the overall solution design.	system without requiring network investment, contributing to reduced environmental damage, increased competition, facilitating the transition to net zero and reducing costs to the consumer.
Whole System thought leadership	We have continued to be actively involved in the work of the ENA Open Networks project, ensuring a whole system view is taken to the development of Distribution System Operation. This has been supplemented by our own thought leadership providing valuable insights into this emerging area.	As a result of our work on the ENA open networks project, future markets and infrastructure build will be optimised across different voltage levels, leading to reduced environmental damage and lower bills than would otherwise be the case. Our insights into the high-level direction of travel have provided useful context for the market.
Network value assessment tools	We have developed a Historical Data Mining Tool and are progressing work on a voltage needs identification process.	Improved study tools will give us the most complete picture of potential upcoming system operation challenges, informing our recommendations within the Network Options Assessment (NOA) as to which projects should progress, and allowing us to provide high quality information to our stakeholders.
Enhanced customer experience	After actively engaging with stakeholders and customers, the scope of the online portal for connections has been completed and we are continuing to engage with Transmission Owners to begin design. We have been collaborating with external stakeholders to deliver the Transmission Outage and Generator Availability (TOGA) replacement, taking on board and fixing any issues they have identified during User Acceptance Testing (UAT).	We are taking industry feedback into account when designing an ESO interface in RIIO-2, which will provide a single point of reference. This will make it easier for our stakeholders to access the information they need.
Insights documents	In continuing to widely engage industry as part of developing these documents, we are providing a beneficial service by ensuring that high quality engagement and collaboration takes place between stakeholders. This is in addition to making sure that the documents we produce are the best possible reflection of the industry's outlook on the future.	These documents feed into long term network planning, ensuring that bills remain as low as possible, and environmental damage is minimised as infrastructure will only be built where necessary. This is also useful to our stakeholders as the documents set out potential future pathways, which stakeholders can use when planning their activities. Our 'Bridging the Gap' work also identifies what needs to happen to get to net zero.

C.1.1 Case Study: Short term NOA Pathfinder tender for static reactive power absorption in the Mersey area

Activity	**Context** In the Mersey area, over the past few years we have observed increasing voltage constraint costs, and the closure of Fiddlers Ferry power station this year also led to a voltage compliance risk. We have sought to resolve this with short-term NOA Pathfinder tenders (run during 2019-20 and 2020-21, each to benefit consumers in subsequent years), and a long-term NOA Pathfinder tender (run during 2019-20 to benefit consumers from 2022). This case study discusses the short term NOA Pathfinder work: describing the work we have done during 2020-21 to benefit future consumers, and using data from 2020-21 to illustrate the consumer benefit which can result from this type of approach. The short term NOA Pathfinder tenders are complementary to the long term NOA Pathfinder tender event that was run between November 2019 and May 2020. The short-term event looked to address the voltage compliance risk in the Mersey area associated with the closure of the Fiddlers Ferry power station, considering the backdrop of increasing voltage constraint costs in the area. Owing to the lack of contingency for the remaining transmission connected provider (Rocksavage), in October 2019 we ran a tender event that for the first time sought the provision of static reactive power services from embedded providers that are not otherwise obliged to provide the service under industry codes. A single year tender was run to effectively test the market, understand the levels of likely participation, and hopefully promote further involvement in subsequent years prior to any long-term tender participants connecting. This year we have been preparing the contract documents for the Mersey long term service providers, and capturing feedback from participants as part of learning lessons to improve the process for other pathfinders. We have also published an Expression of Interest (EOI)[53] in September 2020 for Short Term Mersey Voltage procurement. The results of the EOI will inform the procurement approach for contracts starting from 1 April 2021 for up to two years, to ensure compliance in the Mersey area prior to long term contract holders connecting. In addition to the extension of participation to new embedded providers, this tender goes beyond our traditional business-as-usual approaches through closer technical interaction with the host DNO (SP Manweb). This interaction has been critical in ensuring that they can take account of any potential challenges with participants' proposed solutions, which can then inform any restrictions that may be required (such as power factors) and confirmation of the locational effectiveness that we could expect to see at the transmission level accounting for geographical location, unit size and what voltage level a unit is connected to. Although the tender was delivered prior to the current year, it is within the current year that the utilisation within the control room has been optimised to deliver the benefits for consumers.
Role	3. System insight, planning and network development
ESO Ambitions	• An electricity system that can operate carbon free • A whole system strategy that supports net zero by 2050 • Competition everywhere
Forward Plan Deliverables	• Mersey Voltage Pathfinder – NOA Pathfinder projects
Is the consumer benefit mainly this year or in future years?	The numerical benefit cited refers to the current financial year. This reflects the term for the contract period agreed to as part of the tender (April 2020 to March 2021). We are currently in the first year of the service and the benefits detailed below are representative of how the utilisation of the service has been optimised operationally within the control room.

[53] https://www.nationalgrideso.com/document/176126/download

	This year we are working to agree a service for future years: follow up contracts will be required for up to two years from April 2021, and therefore the benefits observed during 2020-21 are indicative of the benefits which will be available in future years of the service. We hope that future iterations of the service will benefit from the experience gained this year.
Calculation of monetary benefit to consumers	In the Mersey region, there were only two Balancing Mechanism Unit (BMU) generating stations effective for voltage management; Fiddlers Ferry and Rocksavage. Fiddlers Ferry was a coal fired generator that had declared its intention to close on 31 March 2020. Voltage management in the region is dependent on the wind conditions in Scotland, local demand and local outages. This had historically resulted in an area that is difficult to manage and requires commercial solutions due to the lack of certainty in reactive utilisation. This had typically been through contracts or trading solutions to access voltage support when both units were not actively running or as a guaranteed contingency when the other was on outage. The costs associated with these contracts had been steadily increasing over the previous few years as both units ran in merit less often. A solution to this compliance challenge was required to identify an alternative source of reactive power to the Electricity National Control Centre (ENCC) to assist in voltage control, especially as during the 2020-21 year, Rocksavage had planned one-week outages in May and September 2020. We were also looking to reduce the exposure to voltage constraint management costs in the region more generally, prior to a long-term solution being introduced through the long term Mersey voltage pathfinder. **Tender Outcome** A tender was launched on 11 October 2019 inviting transmission-connected and embedded participants to offer overnight reactive power absorption services to NGESO for 12 months commencing April 2020. A range of fixed and optional contracts were developed to promote optionality in how participants could structure their solution. Six offers were made across four different participants, three of which were embedded in the DNO networks. A fifth offer, also embedded, was rejected as non-compliant at the tender submission stage. We worked with SP Manweb to determine if any restrictions may apply to any embedded offer (i.e. what power factor they would have to adopt i.e. where active power has to flow with reactive power to a lesser or greater extent) and the relative locational effectiveness benefit of each unit being tendered. This effectiveness reflects the geographical distance from the point of our requirement as well as losses associated with operating at a lower voltage level. On 17 January 2020 we published the results of the tender confirming that we were awarding the following contracts: • Optional call off contract with Rocksavage power station for 229MVAr • Fixed availability contract with Inovyn for 70MVAr (63MVAr effective) The contract with Inovyn was insufficient to meet our original requirements. However, further system studies resulted in the development of additional operational options, including enhanced post fault actions, alongside the Inovyn volume to ensure system security in response to the most onerous double circuit fault. **Benefits** We have conducted analysis on levels of Inovyn utilisation between 01 April 2020 and 26 August 2020. Across this time frame (148 nights) we have enacted the Inovyn contract 107 times. We have then compared the fixed contract costs of the Inovyn contract across the entire period with those that we forecast that we would have been exposed to from Rocksavage on an optional basis using an average of historical charges as a proxy. On 69 of these occasions we were not required to trade Rocksavage on or extend any partial running overnight. On other occasions Rocksavage has largely been run for other reasons including for energy, constraint management or RoCoF. This analysis shows that through the use of the Inoyvn contract we are seeing **£3m+ in overall savings.**

	It is worth noting that we expected the value of this contract to be weighted towards the summer where less in-merit running of Rocksavage could be expected and reactive requirements are greater. However, the benefits as calculated are greater than we initially expected: this may be due to historic low demands associated with COVID-19.
Assumptions made in calculating monetary benefit	The assumptions pertaining to utilisation and previous contract costs are deemed confidential, but can be shared directly with Ofgem on request.
How benefit is realised in the consumer bill	This saving is being realised in a reduction in costs that would otherwise be recovered through BSUoS
Non-monetary benefits	**Improved safety and reliability** The key non-monetary benefit of the Short term NOA Pathfinder voltage tender in the Mersey area is ensuring SQSS compliance for voltage support in the defined area. **Reduced environmental damage** Based on the level of running of the Inovyn service there is also an environmental benefit. This comes from accessing a service from an asset that would already be running and offsetting the dispatch of an additional generation asset to access voltage support.

C.1.2 Case Study: Loss of Mains Protection settings

Activity	Context
	The programme was put in place to ensure implementation of the changes to Loss of Mains protection requirement in the Distribution Code introduced by modification DC0079. It is co-ordinated by the ESO and delivered in conjunction with the Distribution Network Operators (DNOs) and Independent Distribution Network Operators (IDNOs) under a Balancing Service contract framework. Currently the main feature of the programme, which encourages participation and hence implementation of DC0079, is the offer of payment for distributed generators to make the necessary protection setting changes to their own sites well within the Distribution Code deadline. DNOs and IDNOs manage the direct interface with distributed generators including providing assurance of implementation under the programme's delivery assurance policy. The ESO provides project management and value assurance capability to the programme. We have developed a programme communication plan and implemented it in conjunction with DNOs, IDNOs and the ENA. This has included promoting the programme through the ESO's existing stakeholder engagement platforms such as Power Responsive. This was through press releases, website blogs and via social media channels. We currently use commercial actions to manage a system operability issue caused by Loss of Mains protection systems on some distributed generators. This spend is an external component of BSUoS, a charge which is eventually passed through to the end consumer. The issue is referred to in the industry as Loss of Mains (LoM) and includes Rate of Change of Frequency (RoCoF) and Vector Shift (VS) protection. Vector Shift based protection systems look for changes in the local voltage to determine whether a distributed generator has been disconnected from the total system by a network fault, and shut the generator down safely if it has. Because the voltage effect is local, over-sensitive VS protection has an impact which is proportional to the locally connected capacity. In other words, if a total of 10GW of electricity being generated at sites with over-sensitive VS protection, you might expect approximately 1GW of output to be lost in response to an event. RoCoF based protection systems measure frequency to detect disconnection. Frequency can generally be considered as a system wide parameter for the total system. This is true for RoCoF protection, meaning that if a total of 1GW of electricity is being generated at sites with over-sensitive RoCoF protection you should expect almost all of that 1GW of output to be lost in response to a high rate of change of frequency. The first year of the programme has now been completed and the following progress has been achieved: • 4,892 applications have been approved from electricity generation sites, for a total of 9.7GW of generation capacity and when completed this will result in payments to the distributed generators making the changes of £17.73m. • 2,753 sites have reported completion of protection changes, totalling 5.1GW of electricity generation capacity. DNOs have verified completion of the changes at 2,054 of these sites, totalling 3.8GW (figures as of 24 September 2020). • As a result of the scale of Loss of Mains settings changes the programme has delivered at sites with Vector Shift we have been able to implement operational changes that will deliver over £10m savings per annum from September 2020 onwards. The first half of the 2020-21 year has seen changes to electricity demand due to the COVID-19 pandemic response, and low inertia on the network caused by high levels of renewable electricity generation and weather conditions. These factors have resulted in a greater operational need to manage Loss of Mains risk. In response to this, we have worked with the programme to implement the Fast Track change process which is designed to encourage generators with very sensitive RoCoF settings to make a change quickly. We have also ensured that a co-ordinated set of direct engagement actions are taken with distributed generators, general engagement and communications are refreshed, and preparations are made for the enforcement of compliance where necessary.

Role	3. System insight, planning and network development
ESO Ambitions	• An electricity system that can operate carbon free • A whole system strategy that supports net zero by 2050
Forward Plan Deliverables	• Roll out of Loss of Mains protection settings
Is the consumer benefit mainly this year or in future years?	Consumer benefit will mainly be realised in future years. Once the ESO receives confirmation that relay settings have been changed, then operational processes can be updated, resulting in lower balancing cost spend than otherwise would be the case. Changes to policy will come in time, with the implementation of Security and Quality of Supply Standards (SQSS) modification GSR027 and the associated Frequency Risk and Control Report. Benefits will be more than £170m per year from 2022-23 in the form of balancing costs avoided once the programme is complete.
Calculation of monetary benefit to consumers	The projected short-term reduction in Vector Shift (VS) risk achieved through the Loss of Mains protection changes that the programme is making is expected to significantly reduce the occasions when NGESO needs to take an action to increase the system inertia. This is done to ensure that the loss of generation due to the operation of VS protection alone does not trigger further generation loss due to RoCoF relays. The projected cost of these actions prior to any change in VS relays is currently within the range of £10m to £20m per annum, which after the completion of all VS changes approved in Window one will drop to zero. Residual Vector Shift related costs are likely to fluctuate through to programme completion. The total opportunity for savings from subsequent applications is over £170m per annum, through a combination of further VS changes and the completion of RoCoF changes, with RoCoF being the most significant driver. The £170m per year benefit is based on the cost of balancing actions to address the Loss of Mains issue, which was £144m in 2018-19 and £201m in 2019-20. In the first four months of 2020-21, the cost of managing Loss of Mains risk totalled £147m. This means we are likely to increase the estimated benefits from the programme once we have reviewed this summer's costs. It also means that that the need for urgency in completing the programme has increased. The increase in balancing costs is due to the impact of the COVID-19 pandemic response on electricity demand, weather conditions and low inertia on the system which have collectively led to a significantly higher cost of balancing the system to address Loss of Mains. The forecast cost of the programme is £100m, which will be charged through BSUoS over the relevant timeframe. The cost is included within our BSUoS forecasts alongside the cost of the balancing actions which are expected to be taken to manage this issue before it is resolved. Once the programme is complete, the commercial cost of managing the issue will be removed.
Assumptions made in calculating monetary benefit	We noted the 2018-19 cost of balancing actions to manage the Loss of Mains issue and made assumptions on the growing volume of low carbon electricity generation and as a result a reduction in synchronous generation. These factors contribute to low inertia on the system, requiring action to manage Loss of Mains risk. The higher costs experienced in 2019-20 and in the first four months of 2020-21 demonstrate that the £170m per year savings previously estimated are likely to be a conservative estimate of the overall monetary benefit.
How benefit is realised in the consumer bill	The Accelerated Loss of Mains Change Programme will lead to less costly balancing actions being needed to manage RoCoF issues. This has a direct impact on BSUoS prices, which will lead to lower consumer bills than would otherwise be the case.

Non-monetary benefits	**Improved safety and reliability** The changes to Loss of Mains protection will improve safety and reliability on the system by reducing the risk of inadvertent tripping of generators. **Reduced environmental damage** The programme will also reduce environmental damage by facilitating the transition towards zero carbon operation of the electricity transmission system. This will be achieved by removing the Loss of Mains issue from non-synchronous renewable electricity generation sites such as solar and wind. This will support more renewable generation sites connecting to the network and reduce the need to run synchronous generation to provide the services to manage the LoM issues.
Assumptions made in calculating non monetary benefit.	Improved safety and reliability will be achieved because of Loss of Mains protection being modified at up to 50,000 generation sites through support from the programme.

C.1.3 Case Study: Energy Networks Association (ENA) Open Networks whole system Cost Benefit Analysis (CBA)

Activity	**Context** The ESO is jointly leading the collaborative, cross-network development of a whole system cost-benefit analysis (CBA) tool. This is the first time such work has been conducted across network companies. A whole system CBA is crucial to: • Evaluate whole system options to help achieve net-zero • Help deliver a secure network and optimal value for money to consumers • Put consumer benefit at the heart of industry decision making The project is in three phases: • Phase 1: develop recommendations for broad principles, key elements and scope to be applied to a whole system CBA and the circumstances in which a whole system versus sector specific model should be used. • Phase 2: more detailed specification and parameters to be defined, building on the broad principles, scope and application set out in phase 1. Development of the methodology and model. • Phase 3: further updates and iterations to the methodology and model. Phase 1 was delivered in April 2020 and Phase 2 is scheduled to be complete by the end of 2020. Phase 1 identified a number of use cases for a whole system CBA. These include asset intervention, investment planning, generation connections, local area energy plans and strategic decision making. Phase 2 involves developing a methodology and model that can accommodate these, with a focus on how energy networks influence these. In its RIIO-2 Draft Determinations, Ofgem has signalled that the whole system CBA will form part of the methodology for the coordinated adjustment mechanism[54] that will facilitate cross sector funding for whole system solutions. Phase 3 will test and iterate the model developed in Phase 2. A number of stakeholders across the energy sector have been engaged in development to date. The Product team and the broader Whole System workstream is comprised of representatives across all network companies and the ESO. Wider industry engagement has taken place though the Open Network Advisory Group, Community Energy Forum, Steering Group and Gas Futures Group. Members of the product team have also had engagement with other interested parties, including BEIS, Ofgem, Citizens Advice, Energy Systems Catapult, academics and local authorities. This engagement has shaped the direction of the work, including the input parameters that should be considered, the model design and the methodology process.
Role	3. System insight, planning and network development
ESO Ambitions	• The ESO is a trusted partner • A whole system strategy that supports net-zero by 2050
Forward Plan Deliverables	• Whole system thought leadership
Is the consumer benefit mainly this year or in future years?	• Future years, following delivery.

[54] https://www.ofgem.gov.uk/system/files/docs/2020/07/draft_determinations_-_core_document_redacted.pdf (Paragraph 7.39)

Calculation of monetary benefit to consumers	Monetary benefits will depend on use across the industry. Benefits are likely to accrue via: • Lower bills to consumers - optimal levels of network investment, as measured by TNUoS, DUoS and BSUoS • Safety and reliability, as measured by energy not supplied or value of lost load • Reduced environmental damage, as measured through the carbon price and accepted natural capital and biodiversity parameters • Benefits to society as a whole, measured through widely used social and economic parameters Investments in the cases listed above range from tens of millions to billions of pounds, meaning significant savings are likely to be identified. Whilst the actual benefit delivered is project specific, these highlight the potential scale: • Asset intervention – Annual RIIO-T1 non-load related electricity transmission expenditure is forecast at around £1.2 billion[55] in 2018-19 prices • Investment planning – the 2019-20 NOA recommended £203 million investment in 2020-21, with potential total forecast investment costs of £11.1 billion[56] • Local area energy plans – Bristol has invested £50 million in low-carbon projects since 2012[57] Strategic planning – the Committee on Climate Change indicates the cost of meeting net-zero to be around 1% of GDP per year[58]

Assumptions made in calculating monetary benefit	• Whole system CBA is used in the use cases established. The use cases identified in the Phase 1 report are:
	  ○ Asset intervention
	  ○ Network investment planning
	  ○ Connections and embedded generation
	  ○ Local authority planning
	  ○ Strategic (e.g. UK wide) planning
	• It should be noted that any CBA tool can only ever provide one part of the decision-making toolkit. Stakeholder feedback and commercial/technical judgement must also be considered. The exact benefits delivered will be dependent on the decision made by the decision maker. This could include network companies, local authorities, new connection parties or government.

How benefit is realised in the consumer bill	Lower overall network costs, through optimal overall levels of TNUoS, DUoS and BSUoS charges
Non-monetary benefits	The whole system CBA will help users identify and optimise benefits across all five consumer benefit areas. It will bring benefits to society, improve quality of service, lower consumer bills, reduce environmental damage and improve safety and reliability.

[55] https://www.ofgem.gov.uk/system/files/docs/2020/07/draft_determinations_-_core_document_redacted.pdf Figure 4 - sum of NGET, SHET and SPT T1 (actual + forecast)

[56] https://www.nationalgrideso.com/document/162356/download

[57] https://news.bristol.gov.uk/news/bristol-launches-search-for-partner-to-deliver-uks-first-carbon-neutral-city

[58] https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf Chapter 7

C.2 Stakeholder views

- Worked closely with DNOs and TOs on the Regional Development Programmes
- Engaged extensively with stakeholders as part of our NOA Pathfinder projects
- Extensive engagement and consultation with industry on our Early Competition work. We have continuously sought feedback from stakeholders to see what works and what improvements can be made
- We have continued to work with the DNOs via the ENA Open Networks project. Stakeholders found we were not adequately engaging with some of the activities within Open Networks, particularly in relation to the flexibility workstream. We have listened to this feedback and taken steps to improve our engagement in this area.
- Introduced a new framework and design for the Future Energy Scenarios (FES) document in response to stakeholder feedback.
- We have continued to progress the Loss of Mains work and engage stakeholders

Whole system operability

Addressing actions raised in the E3C regarding 9 August 2019 power disruption

We progressed the actions identified following the power outage of 9 August 2019, including raising Grid Code modifications (which are in progress), completing an internal audit, conducting a review of the current Limited Operational Notification (LON) and Grid Code derogation processes, and implementing the improvements identified by these reviews.

Workgroups are in progress regarding grid code modifications GC0138 and GC0141, which have been well attended by various industry stakeholders. We've also run a workgroup consultation on the SQSS modification GSR027, which is an action arising from the events of 9 August, and are currently collating the responses.

Accelerated Loss of Mains Change Programme (ALoMCP)

We have continued working closely with DNOs and the Energy Networks Association (ENA) to engage distributed generators on progressing the Loss of Mains changes. We have received some great feedback:

- 'Our *company manages a large fleet of wind turbines which required over 250 separate applications for ALoMCP funding. At first this seemed like a daunting task, but the user-friendly registration portal made the process of submitting the applications very easy. Whenever I did have a question or if there was something I did not understand, the teams managing the process, at the DNOs and ENA, were friendly, helpful and guided me through the process. Applying for funding is a no brainer as this is likely to be a mandatory change later anyway but right now the works are paid for.'*- sustainable energy specialist

- *'Aside from informing generator owners of impending grid compliance changes, the ALoCMP has proved to be a well organised transition scheme irrespective of the scale of generator. I encourage (qualifying) generation owners to take advantage while they can!!'* - sustainable energy specialist

- *'The funding application process itself is very straightforward. It's an absolute no brainer.'* - sustainable energy specialist

NOA Pathfinder projects

The NOA Pathfinders are the route to enabling non-TO participation in the NOA process, through a fair and transparent tender process.

Stability pathfinder

We launched the Stability Pathfinder Phase 2 Request for Information (RFI) in June 2020, we then published a 'Feedback Summary and Next Steps' document[59]. In June we held a webinar to go through the RFI, 150 people attended the webinar asking a wide range of questions.

- *'I'd like the thank all the Stability Pathfinder team at NG ESO for an excellent RFI document and a very helpful webinar yesterday – the project is making good progress and we are looking forward to participating.'* – Generator

- *'Thank you team, and good to see the RFI update has been published - well done for getting that out.'* - Generator

We have published the Expression of Interest (EOI)[60] for Phase 2 on 30 September, which closes on 8 January 2021. We will be hosting webinars in October 2020, details of which can be found on our website. The submission to this EOI is required to participate in the later stages of Phase 2.

Ad-hoc feedback we have received is:

- *'I see you have incorporated our feedback on the north east upgrade to 400kV. Thank you'* – Generator

- *'This timely update is gratefully received as is its outcome. Thank you for looking at this and communicating the decision so quickly.* – Battery storage

- *'We have now concluded our review of your effectiveness factors work – I think I have said this already but it's an impressive spreadsheet to create.'* - Generator

Mersey voltage pathfinders

For the Short term tender 2021-22, an Expression of Interest (EOI)[61] was published on 8 September 2020 and closed on 22 September 2020. The results are being collected, and this will inform a decision as to whether a tender should take place. For the Long term tender 2022-2031, the results were published in May 2020 and currently feedback is being collected from all participants to publish a "lessons learnt" document. We have received the following additional feedback:

- '*We would like to thank NGESO for developing and running this process. Opening competition is a bold move which we think will ultimately lead to a more efficient and lower cost system. In any new process we expect there to be "teething troubles" but ultimately, we think that this has been a very positive process.'* - Energy industry expert

Pennine pathfinder

Engagement is ongoing with the TO and DNOs regarding the Pennine pathfinder to agree methods to identify potential work needed for solution providers to participate, this was done based on some of the lessons learnt and feedback from the Mersey pathfinder. We are currently undertaking technical studies to understand the requirement. We have kept stakeholders updated through our monthly Network Development Roadmap newsletter, and have hosted some preliminary meetings with the TO and DNOs to discuss how they can support the Pennine studies; the most recent meeting was held on 25 September 2020.

Constraint management pathfinder

This pathfinder project's ambition is providing a long-term commercial product to manage network constraints. We are exploring the potential to introduce a product that will provide an opportunity for market participants to deliver a service, such as storage, that reduces constraint costs on the National Electricity Transmission System. We intend

[59] https://www.nationalgrideso.com/document/175061/download

[60] https://www.nationalgrideso.com/research-publications/network-options-assessment-noa/network-development-roadmap

[61] https://www.nationalgrideso.com/research-publications/network-options-assessment-noa/network-development-roadmap

to tender for the pathfinder following the Request for Information (RFI) we conducted in February 2020. We have identified a wide range of different ways participants could provide this solution and determined that the best course of action for the first tender is to focus on short term issues. We will do this by looking at participants that are already connected to the transmission system and apply the results of the RFI in a different approach to resolve network constraints.

The design of the service that we intend to tender for will differ from what we proposed in the RFI. We intend to run annual tenders for this service where we will aim to expand the range of providers and technologies that could offer this service.

Over the coming weeks, we will provide further details on the service design, how participants will be able to take part and a timeline of the overall process. We have received the following feedback regarding this project:

- '*I can see what you're trying to achieve with the pathfinder and it's really clear what your motives are.'* - Generator

Early Competition

The Early Competition project published the Phase 2 Consultation in July 2020 which was open until 14 August 2020. Reacting to feedback from stakeholders, we extended the consultation window from four to six weeks. When publishing the consultation, we also hosted a launch webinar and a Q&A session for any clarification or confirmation of the consultation content. We surveyed our stakeholders during both the launch and Q&A webinars.

For the launch webinar we offered stakeholders the opportunity to query any of the consultation content through asking questions using Sli.do, stakeholders generated 37 questions of which 32 were answered in the session. Answers for all questions were published on our website.

We surveyed stakeholders between our presentation of the consultation and the question session. When asking our stakeholders if they found our launch webinar useful 97% agreed and 100% said they would like to see this type of launch presentation for future consultations. At the end of the consultation period we received some of the following quotes:

- *'More clarity on uncertain areas. Q&A very useful'* – Anonymous

- *'It would be helpful for the ESO to document and share the development of its thinking on policy. The approach Ofgem takes is a good example of best practice'* – Anonymous

- *'More two-way engagement would be useful', this question* was asked prior to any two way engagement. *'Also avoiding a day where there is a significant regulatory publication for RIIO-T2 would be much appreciated in the future'.* - Anonymous

The Q&A webinar was structured so the questions would follow the structure of the consultation document. We used Sli.do as our main tool to coordinate through the session including the use of 'rooms' so we could signpost questions to the right subject matter expert. All the Q&A's were published on our website post event. Although the session was well attended, we didn't get much feedback from our survey.

Having been rated a 5/10 by a stakeholder for the Q&A webinar, we asked what more we could do for future events, to which the stakeholder wished for, '*Wider, more informed participation. More time to review consultation before the event'*. They did however like the use of Sli.do and wished for the event to be repeated for our Phase 3 consultation, but felt we could improve on the session by, *'more events focussing on parts of the consultation rather than one on all of it'.* Another stakeholder rated us a 7 and found the use of Sli.do effective and would also like this type of event repeating.

The consultation was open for six weeks, however we didn't get as many written responses as we expected given the engagement at the launch webinars and the workshops we held in May 2020. Based on this and discussions with Ofgem we decided to survey the 31 stakeholders who joined us on the launch webinars to try and understand what stakeholders' barriers were, to ensure we continually improve going into Phase 3. Nine stakeholders responded to the survey. 66% of those who responded scored us a 5/10 and above.

We requested feedback on how we can improve. Stakeholders responded that a blocker to them has been time constraints, based on this we are in discussion with Ofgem about our proposed timelines. Stakeholders also wish us to be more transparent how we have reached some decisions, which is something we are exploring for our Phase 3 consultation in December 2020. Some stakeholders have also highlighted the structure of the document made it difficult to review in bite sized chunks. We are working on the structure for the next phase and will also run more bite sized engagement sessions following on from the feedback we received from launch webinars. All of this feedback has been discussed with Ofgem.

We have had an initial two meetings with the Electricity Networks Stakeholder Group (ENSG), the latter to go through the feedback we have received with regards to the content of the consultation. We have also shared results of the survey for the lower than anticipated consultation response with ENSG. One of the members said they didn't respond as there were so many other opportunities through workshops and webinars and it was felt they already had their say and didn't need a formal response, which would have taken up a lot of time. They also said engagement was very good and above and beyond what was expected. Another of the members did respond but said that companies have many competing priorities and with lots of consultations coming out, it is difficult to respond in the timeframe. The role of the ENSG will be to challenge our stakeholder engagement. Going forward they will be our stakeholder sounding board to ensure we are engaging and listening to stakeholder feedback.

NOA: Enhanced communication

Network Options Assessment (NOA) third party options

We have officially launched the Interested Persons' (IP) options submission process for NOA 2020-21. Even though the drivers were a combination of our ambition to expand the range of options considered in the NOA, and Ofgem's change to licence condition C27, stakeholders were interested in getting involved and were impressed we turned this around before the next NOA .This process will allow third parties to propose new, innovative ideas and supports the ESO's ambition to increase the diversity of options considered within the NOA. This recommendation avoids signalling a need for the IP to spend money on the option, and instead emphasises that we see value in such an option and more work should be carried out in collaboration between the ESO and the incumbent TO to progress it ahead of the next NOA. To date there has been one option submitted: we understand that this was primarily due to the timing of the licence modification change. We have received the following feedback:

- *'It was not clear to us the timing of the launch of the process and we were not aware of the deadlines in sufficient time to allow us to consider submitting potential solutions. We would be interested to hear feedback at the upcoming [feedback] session on how successful this process was on attracting non-TOs to submit potential solutions and how successful they were through the filtering stage by the ESO.'* - independent transmission business

- '*It's not clear what type of projects would be considered by the ESO from Interested Persons. I couldn't find information on the NOA pages indicating examples of the type of projects that the NOA process would consider. I think it would be helpful to add more in this area to aid Interested Persons in coming forward.'* – Provider

As this is a new process, we are refining and improving as we go along by taking stakeholder feedback onboard. It is our goal is to increase participation through the IP process and to use stakeholder feedback to inform this.

Electricity Ten Year Statement (ETYS)

We ran a survey on the proposal for the 2020 ETYS. The survey was completed fully by 13 participants, and partially completed by 12 participants. We subsequently held a workshop within the ESO team to go through the comments and propose improvements. From the industry feedback received we identified some areas of changes in how we prepare the ETYS, which we detailed in a letter to Ofgem. The areas were:

- Step change in the document publication – this is to enable a wider reach and make it more understandable from our audience. This includes updating the format of the document so that it targets a wider audience with key messages that people can easily pick out from the document. We are working closely with our communications team within the ESO, to improve the readability of this document.
- Better document interaction - We're also working on an interactive version of the ETYS, such as bringing more infographics into the document to ensure that it tells a clear story.

- Improving our map accuracy - We were asked to improve our map accuracy and we're working on an interactive map which will provide a step change in how the ETYS is produced and delivered year on year. This is a significant piece of work, which stakeholders have expressed interest in seeing.
- Increased data - We have been asked for more data, and we're working with the TO to see how this can be provided to our readers.
- Finally, stakeholders wanted more content around renewables and the probabilistic approach discussed in the ETYS. This year, we're making more changes to how we do our analysis and considering thought pieces which readers would find interesting, for example about various aspects and issues that arise from focusing on a certain parameter such as renewables.

We are working towards publishing the 2020 ETYS in November and look forward to hearing feedback from our stakeholders on our improvements.

Regional Development Programmes (RDPs)

Regional Development Programmes (RDPs) are inherently collaborative processes where, through closer working with DNOs and TOs, we gain a shared understanding of each other's perspectives, allowing projects that work for all parties to be delivered. Over the summer period we have held a number of Generation Export Management Scheme (GEMS) stakeholder workshops with generators connecting in Dumfries and Galloway. SPT were generally in attendance also. Given lockdown restrictions these were held remotely, and we generally received positive feedback. Quotes received included:

- *'It was very useful, informative conversation over the GEMS on 04 August. The presentation slides provided a good overview of the GEMS control philosophy, how that interfaces with SPD ANM system and principals of commercial arrangement. We appreciate the time you have spent on one-to-one sessions. While project specifics discussions are useful, it would also be useful to collectively share ideas and thoughts across effected parties over the GEMS. We would like to propose National Grid / SPEN host an industry forum. If you could let me know what you think, I would be grateful. Many thanks'*– Generator

- *'Thanks for the session and your email. The session was a very useful detailed introduction to the proposed GEMS system. Although I have heard very high level introductions at D&G seminars in the past this is the first time I have been able to grapple with the detailed interfaces. As such this was a very useful starting point but this is clearly the first step in a long road that will need to involve many others from the construction and operations teams*.' – Generator

- '*We found the call helpful once we managed to get connected. The Webex interface was not accessible by several members of our team, and we believe that Teams or Zoom would be a better way to carry out future calls.'*. – Generator

As the ESO has begun using Teams for all webinars and virtual meetings, communication should be improved.

Whole System thought leadership

Regional Distribution Future Electricity Scenarios (DFES)

In recent years the DNOs have started carrying out analysis similar to the ESO Future Energy Scenarios (FES) for their regions (called DFES or Distribution FES). Across the organisations, we were publishing different sets of data and stakeholders had asked whether we could be more aligned. Common building blocks ensure that the results of the GB FES and Regional DFESs are published to a consistent template making comparison easier as we can now directly compare like for like components. We included the building block data in the FES data workbook for the first time this year, and included a description alongside it. We have also added this data to the ESO Data Portal to make it more accessible and provide it in machine readable format for others to make use of.

We have been working with the other network companies as part of the ENA Open Networks project. The Whole Electricity System FES part of this work seeks to develop processes to coordinate National and Regional Distribution Future Energy Scenarios (DFES) whilst providing improved clarity and transparency to stakeholders around the various scenarios being produced by ourselves and the network companies.

This work is intended to align the GB FES and DFES forecasts further, and to ensure the data presented gives an accurate reflection of the whole industry's best view of the future scenarios. One of the outputs is an agreed set of

common building blocks, of which the GB FES 2020 values are included here. Common building blocks ensure that the results of the GB FES and Regional DFESs are published to a consistent template, making comparison easier as like-for-like components can now be directly compared.

The changes agreed include amendments that will ensure more consistency in the data we share, and also additions such as the inclusion of more data related to the electrification of transport.

Distribution Network Operator NOA engagement

We engaged with one of the DNOs, as they operate an area we see future constraints being an issue. The aim was to investigate if they could provide options from their network that could relieve those constraints and potentially feed into the NOA. They were keen to engage and work with us as a demonstration of collaborative working with the ESO.

Following a teleconference with this DNO, the same data that is supplied to the TOs, showing our projections of future network requirements in their area, was sent to them so they could develop and return some high-level suggestions of options from their network. We are continually engaging with them about further options. The 2020-21 NOA window for new options is now closed, so if we jointly do come up with new options to feed into NOA, this can feed into the 2021-22 cycle.

ENA Open Networks project

We received feedback in the spring that we were not adequately engaging with some of the activities within Open Networks, particularly in relation to the flexibility workstream (workstream 1A). We have listened to this feedback and taken steps to improve our engagement in this area. This includes providing a dedicated resource to lead markets input into Open Networks and other DSO developments, and taking ownership of one of the key workstream 1A deliverables in the Open Networks 2020 work programme.

Network value assessment tools

The voltage screening tool was published in June 2020 on our website[62]. It was also mentioned in the Network Development Newsletter which was sent out 30 June 2020. Verbal positive feedback was received from one of the stakeholders regarding the ESO putting out the expected network's voltage needs and focussed regions early on, so that solution providers could be prepared.

Another area where we have received very positive feedback is from our work with ENTSO-E in this year's Ten Year Development Plan (TYNDP). Significant improvement in the tools and process allowed us to submit all of the required data, and we exceeded their expectation by carrying out CO2 analysis for Great Britain for the first time.

Enhanced customer experience

There has been a continuous increase in the volume of connection applications and connections contracts. We have successfully processed new applications throughout COVID-19 working arrangements. We review all reasons for re-offers and share learning across the teams to ensure we continue to maintain good standards and improve on the customer experience. The feedback we have received is:

- *'The quality of information from NGESO has been as good as expected and as good as we have always been used to both in the 'old' system days and with the new NGESO system.'* – Generator

- *'Information is generally of good quality. There are times when there are some errors that are found within it or points that need further clarification, but I feel is inevitable when dealing with complex arrangements such as these.'* – Generator

Insights documents

Future Energy Scenarios (FES)

Engagement with our stakeholders for FES is an annual cycle which starts and finishes with the launch and publication of the FES document during July. The development process for FES consists of several stages,

[62] https://www.nationalgrideso.com/research-publications/network-options-assessment-noa/network-development-roadmap

including stakeholder engagement, data and intelligence gathering, followed by high level scenario creation and our own detailed modelling and analysis. At each stage in the development process we apply our expertise and judgement to ensure that plausible and credible scenarios are created. This year we introduced a new framework and design in response to stakeholder feedback.

During the week of 27 July 2020, we held a series of virtual events to share the key insight from our FES 2020 analysis. This included a launch on Monday 27 July to present the FES 2020 key messages and the significant findings from the analysis. On Wednesday 29 July and Thursday 30 July, we hosted a series of deep dive sessions to look at specific topics in more detail. In total, 796 individual stakeholders joined during the week with an average of 87% attendees who found the format and content met expectations and 90% of participants in favour of a similar event next year. From the stakeholder feedback, we received the following anonymous messages:

- *"It was a better way to launch the FES"*
- *"The format allowed flexibility to attend and watch on catch up."*
- *"It was overall a good session with great use of technology and ease of accessibility."*
- *"The openness and thought leadership was appreciated, as well as the clear and informative content, with good Q&A sessions."*

We have identified that we can improve on the presentation format, such as bigger slides that stay on the screen longer in addition to increasing the diversity of our presenters. For FES 2021 we will consider longer Q&A session or options to host separate Q&A time on specific topics. We will investigate how we can replicate networking and one-to-one interactions virtually as COVID-19 continues. We will be clear up front why we are covering gas supply and demand – both on the documents and at the launch events.

FES: Bridging the Gap

We have begun work on this year's FES: Bridging the Gap to Net Zero. The report gives a collaborative view from across and outside the energy industry, focussed on going beyond FES to recommend actions to progress the UK towards its net zero 2050 target. With FES 2020 published recently, we are now starting to work on next year's publication. In a year of increased uncertainty, the next report will look at a different topic – how the energy system needs to evolve to manage unpredictable demand. We'll be holding a series of events starting in the autumn to discuss questions on how to address how peaks and troughs could impact the system and consider the levers, enablers and mechanisms that can help us manage the system effectively. So far we have published a blog on our website[63] and groundwork with core stakeholders has started.

[63] https://www.nationalgrideso.com/news/introducing-bridging-gap-2020-peaks-and-troughs

C.3 Plan delivery

C.3.1 Highlights

- We have progressed our NOA Pathfinder projects, publishing a Request for Information and Expression of Interest for Stability Phase 2, awarding a contract for the Long Term Mersey Voltage Pathfinder, publishing an EOI for the Short Term Mersey voltage pathfinder, and publishing a decision to tender for the Constraint Management Pathfinder.
- Officially launched the Interested Persons' (IP) options submission process for NOA 2020-21
- We have consulted on our initial model for Early Competition
- We put in place a process to allow non-TO options (Interested Persons) to submit options to the NOA
- We have progressed the Loss of Mains Protection programme, with 2,753 sites reporting completion of protection changes, totalling 5.1GW of electricity generation capacity
- We are working towards a whole system view, collaborating with DNOs for both FES and NOA
- We agreed, building on the work of Open Networks, consistent high level commercial arrangements with WPD and UKPN for RDPs
- We made continued progress with three DNOs on the delivery of N-3 intertripping despite COVID-19 access restrictions, and final commissioning with UKPN will begin shortly.
- We progressed the actions identified following the power outage of 9 August 2019, including raising Grid Code modifications (which are in progress), completing an internal audit, conducting a review of the current Limited Operational Notification (LON) and Grid Code derogation processes, and implementing the improvements identified by these reviews.
- We have seen an increase in the volume of connection applications, leading to an increase in signed connection contracts. We have improved our processes to handle this increased workload despite the challenges of COVID-19, and worked with Transmission Owners to save time for our customers.
- The low demands experienced during the COVID-19 pandemic gave rise to new operability challenges. We prioritised our work accordingly, distinguishing between those projects which were expected to deliver an economic benefit, and those which were essential for system security.

This section reports our performance against the deliverable descriptions and dates set out in the Forward Plan Addendum[64]. The Forward Plan Addendum set out our revised view (as of July 2020) of what we would deliver during 2020-21. During the period of regulatory flexibility, we shared with Ofgem a number of our deliverables where there were known impacts of COVID-19; these are clearly identified in the Addendum. However, we note that the impact of COVID-19 has been felt across many areas of the ESO's work.

C.3.2 Deliverables

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
Whole system operability			
Lead the of Loss of Mains Protection setting programme	Q2 2020-21 and ongoing	Ongoing	COVID-19 impacted on the programme's delivery assurance process. Activity has resumed with new safe working practices which means that programme milestones can now be met but with a risk to programme performance in 2021-22. The required review is now complete, and agreement has been reached on programme approach and actions required for the six months up to February 2021.

[64] https://www.nationalgrideso.com/document/173131/download

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
Address actions raised in the E3C report into the GB Power Disruption Event of 9 August 2019	Q1 2020-21	Target date met	We progressed and completed ESO actions identified by the Ofgem and E3C reports following the power outage of 9 August 2019, including completing an internal audit, conducting a review of the current Limited Operational Notification (LON) and Grid Code derogation processes, and implementing the improvements identified by these reviews. As agreed, we have raised Grid Code modification GC0141 which is now under industry process, and SQSS modification GSR027 on frequency standards, for which the SQSS Panel's recommendation will be submitted to the Authority in November
Implement approach for efficient reactive power flows between networks	Q4 2020-21	Paused	This work was indirectly impacted by changes in working arrangements brought about by COVID-19 and has since been de-prioritised relative to other deliverables where workload has ramped up. The scope of the work is under review with a view to identifying high value and/ or low cost changes and re-planning before the end of Q3 2020-21.
Defining roles and responsibility for voltage management across the transmission-distribution interface.	Q3 2020-21	Paused	This work was indirectly impacted by changes in working arrangements brought about by COVID-19 and has since been de-prioritised relative to other deliverables where workload has ramped up. The scope of the work is under review is with a view to identifying high value and/ or low cost changes and re-planning before the end of Q3 2020-21.
NOA Pathfinder projects			
Stability pathfinder	Q2 2021-22	On track	We launched the Stability Pathfinder Phase 2 RFI[65] on 17 June 2020. We held an RFI webinar on 25 June 2020. A webinar recording and FAQ document are available on our website. We published RFI summary feedback and next steps on 19 August 2020 which included a timeline for Phase 2 tender process. Expression of Interest was published on 30 September 2020 seeking short circuit level and inertia services up to 2030.which will be followed by a series of webinars. Milestones for phase 2 of the Stability Pathfinder are as follows: • Q2 Invitation for Expressions of Interest which was published in September • Q3 Publish draft commercial terms • Q3 Commence technical feasibility studies • Q4 Publish final commercial terms The NOA methodology was updated in July 2020, in line with our licence obligation. However, Stability Pathfinder Phase 1 was not complete at this stage, and therefore we were unable to incorporate the learning from this pathfinder into the NOA methodology. We will publish a further update to the NOA methodology next year, incorporating learning from Stability Pathfinder phase 1.
Mersey Voltage pathfinder: Project recommendations	Q1 2020-21	Target date met	On 22 May 2020 the ESO awarded 9-year contracts[66] for static voltage support in the Mersey region to PeakGen (200 MVAr Reactor) and Zenobe (40 MVAr of reactive capability from battery storage). These contracts are worth a total of £8.67m and are due to commence from April 2022. This pathfinder is the first time that we have directly compared market solutions to

[65] https://www.nationalgrideso.com/research-publications/network-options-assessment-noa/network-development-roadmap

[66] https://www.nationalgrideso.com/document/169751/download

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
			a TO network asset build approach for a long-term transmission level requirement. Since the publication of the results of the long-term Mersey voltage tender, we have been reflecting on the learnings from that event with a view to enhancing the upcoming Pennine voltage tender process. We have also engaged with the tender participants to conduct a lessons learned review and have been working through specific challenges associated with the involvement of 0MW assets in the pathfinder process, and the consequences to establishing a level playing field with counterfactual options that are not exposed to costs such as Final Consumption Levies. These discussions have taken place through the summer with tender participants as well as government and regulator and have progressed to a point where ESO are able to now create a tender assessment and contractual framework to reflect the uncertainty that exists and move forward with the long term Pennine voltage tender. The Pennine tender process will be launched during Q3 2020-21 with results published in Q2 2021-22; this is consistent with our compliance requirements of solutions to be delivered by Q1 2024-25.
Pennines Voltage pathfinder	Q2-Q4 2020-21	On track	The Pennine tender process will be launched during Q3 2020-21 with results published in Q2 2021-22; this is consistent with our compliance requirements of solutions to be delivered by Q1 2024-25.
Constraint Management Pathfinder	Q1-Q2 2020-21	Target date met	We intend to tender for the Constraint Management Pathfinder following the Request for Information (RFI) we conducted in February 2020. We have identified a wide range of different ways participants could provide this solution and determined that the best course of action for the first tender is to focus on short term issues. We will do this by looking at participants that are already connected to the transmission system and apply the results of the RFI in a different approach to resolve network constraints. The design of the service that we intend to tender for will differ from what we proposed in the RFI in that it will be a generator turn down/demand turn up service from transmission connected solutions within the constraint boundary north of B6 (Scotland England border). We intend to run annual tenders for this service where we will aim to expand the range of providers and technologies that could offer this service. Over the coming weeks, we will provide further details on the service design, how participants will be able to take part, and a timeline of the overall process.
Early Competition			
Early Competition plan setting out implementation for models.	Q1-Q4 2020-21	On track	Stakeholder feedback on the Phase 2 consultation has been broadly positive (summary published on our website[67]). Some TOs do not agree with TOs competing as other bidders and one stakeholder believes they should not compete at all. Suggestion of no value threshold also not favoured by TOs. Otherwise general support for direction of travel, though noting stakeholders need more detail in some areas to be able to comment. We have been running further stakeholder workshops throughout September and early October to further develop the model, picking up some of the points raised in consultation responses and developing further detail in areas identified in our Phase 2 consultation. These workshops will help evolve our thinking ahead of our Phase 3 consultation.

[67] https://www.nationalgrideso.com/future-energy/projects/early-competition-plan/get-involved

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
NOA: Enhanced communication			
Improve accessibility of Electricity Ten Year Statement (ETYS) and Network Options Assessment (NOA) publications	Ongoing	Ongoing	As a result of feedback we have received, this year we intend to make it clearer how the content of both of these publications applies to our stakeholders. We are also intending to reach new stakeholders and make the publication accessible and relevant to them by trying to answer the "so what?" question. We are also looking into how we present the document including elements such as interactivity and exploring using more web based content to engage audiences, for example how our maps are presented.
Regional Development Programmes (RDPs)			
Development of commercial arrangements for Transmission Constraint Management (TCM) service from DER	Q2-Q4 2020-21	On track	High level commercial arrangements are now scoped with both WPD and UKPN, and an external publication is being drafted. These arrangements are consistent with the work of Open Networks and we will continue to build on the work of this project. To support this, we have recently made internal organisational changes to more closely link RDPs with Open Networks. We have reassessed the timeline for operational need of both WPD and UKPN RDPs and, based on the current rate of connection applications, remain confident of delivery ahead of need.
Co-ordinated DER inter-tripping functionality for transmission fault management. Including completion of work with WPD and UKPN	Q2-Q4 2020-21	Ongoing	In our work with UKPN, much of the testing is now complete and the project is forecast to go-live in mid-November 2020. Due to the outstanding tasks required to complete on-site wiring and commissioning of the South West Operational Tripping Scheme, it is unlikely that the N-3 project with WPD will be in a position to meet the WPD go-live date in April 2021. This work will need outages of the primary transmission system by NGET who are looking to reschedule their work over summer 2021. The project is now targeting a go-live date of October 2021 for WPD, which also aligns with the existing completion date of SSE-N works. We have confirmed with WPD that this will cause no operational or customer issues. To help track delivery against this date, the ESO is now holding regular update sessions with the NGET project team.
Develop the Generation Export Management Scheme (GEMS) in South West Scotland to manage transmission constraints	Q2-Q4 2020-21	On track	The project is currently holding in-depth requirements workshops with SPD to capture integration requirements with the DNO Active Network Management (ANM) system prior to overall sign-off of the Technical Specification. Stakeholder feedback has now been incorporated into the Technical Specification in preparation for final agreement and sign-off.
Whole System thought leadership			
Support BEIS and industry in developing a strategy for clean heat.	Q1-Q4 2020-21 and ongoing	On track	We met BEIS in September 2020 and plan to meet again in November 2020. We continue to discuss whole energy system matters with the system operation teams in National Grid Gas Transmission (GSO) in the context of our ongoing stakeholder engagement on energy policy. No formal project will be taken forward in 2020-2021 as our teams are focused on understanding the longer term direction of the ESO in the context of the Ofgem review of system operation and the anticipated Energy White Paper.

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
			We are drafting a thought piece about clean heat pathways that we plan to publish before the end of 2020.
Active engagement in the development of DSO and co-ordinated flexibility markets including cross-sector considerations	Q3 2020-21	On track	ESO has provided significant input into the Open Networks DSO implementation plan[68], which was published on 1 July 2020, and were actively involved in the drafting of the Open Networks 2020 flexibility consultation[69] published on 31 July 2020. In response to feedback we have increased our input into the Open Networks flexibility workstream with a dedicated Markets resource. This includes the ESO now leading product 2 (Procurement) of this workstream. This added input has revealed additional work to be undertaken to align DSO and ESO service contracts which could affect the timeline. We have continued to lead the Open Networks Whole Energy System workstream and are also leading a major deliverable in this workstream, the whole system CBA. The ESO is represented on Ofgem's RIIO-ED2 overarching workgroup and has actively contributed to its work on DSO.
Network value assessment tools			
Voltage needs identification tools/ processes.	Q4 2020-21 and ongoing	On track	Developed Historical Data Mining Tool and completed initial view on potential next priority regions for high voltage assessment. Initial outcome of voltage needs identification process was published at the end of June 2020[70].
Enhanced customer experience			
Continue to work with Customers and Network Owners to understand the requirements and scope of a system wide single platform to provide online account management and connection application functionality	Ongoing, due to be completed in 2022	On track	Discussions with customers and stakeholders regarding scope of portal completed in January 2020. We did intend to engage on further discussions to identify functionality, but the TOs have accelerated their portals and have now physically launched them. From the products the TOs have launched and the work we did with industry last year, we now know what is required from the ESO portal. The next phase of the ESO portal development will now be after the start of RIIO-2, subject to funding.
Insights documents			
Operability Strategy Report	Q3 2020-21	On track	The frequency of this report has changed to annual (rather than every six months) to align with our other publications.

[68] https://www.energynetworks.org/electricity/futures/open-networks-project/dso-implementation-plan.html

[69] https://www.energynetworks.org/industry-hub/resource-library/open-networks-2020-prj-flexibility-consultation-paper-2020.pdf

[70] https://www.nationalgrideso.com/research-publications/network-options-assessment-noa/network-development-roadmap

Deliverable	Target delivery date (from Forward Plan Addendum)	Actual delivery date	Status
FES: Bridging the gap to net zero	Q3-Q4 2020-21	On track	On track to work with stakeholders through Q3 2020-21. External stakeholder engagement has begun and content is being developed in advance of the workshop planned for 21 October 2020.
Summer Outlook	Q1 2020-21	Target date met	Completed. Report[71] published April 2020.
Winter Outlook	Q3 2020-21	On track	On track for publishing in October 2020.
Winter Review and consultation	Q1 2020-21	Target date met	Completed. Report[72] published 24 June 2020.
Future Energy Scenarios (FES)	Q2-Q3 2020-21	Target date met	Completed. Report[73] published July 2020. The Launch conference for stakeholders was shifted to a virtual event online. This year we have designed the FES report to be digital first, reducing our environmental footprint and making the overall length of the document 25% shorter, whilst including broader analysis and new sections on whole system flexibility not previously covered by FES.

[71] https://www.nationalgrideso.com/document/167541/download

[72] https://www.nationalgrid.com/uk/gas-transmission/document/131756/download

[73] https://www.nationalgrideso.com/document/173821/download

NOA Pathfinder Timetable

	Description	Q1 20/21	Q2 20/21	Q3 20/21	Q4 20/21	Q1 21/22	Q2 21/22	H2 21/22	Size / Volume	Eligibility	Status
Stability Phase 1	Procurement of stability contracts which can be delivered in shorter timescales to support national inertia	Contracts start between April 2020 and April 2021, but there may be delays due to COVID							12.5GVAs £328m for up to 6yr contracts	• GB wide stability tender open to anyone available from April 2020 to April 2021 • Limited to mature technology only (TRL=9)	• Tender closed and contracts awarded
Stability Phase 2	Procurement of stability contracts to meet our short circuit requirement in Scotland. Comparison of commercial and asset solutions.	RFI	EOI	Feasibility		Publish tender	Contract Award Tender	Contracts start between April 2022 and April 2024	Up to 8.4GVA up to 8yr contracts	• Available to solutions connected in Scotland • Open to anyone transmission connected (132kV and above) • Targeting short circuit levels (SCL), dynamic voltage and inertia at regional level	• Open to wider set of technologies than Phase 1 • Solutions to be delivered from Apr 2022 • Open to service providers and network owners
LT Mersey Voltage	Procurement of reactive power in Mersey region to meet SQSS compliance. Comparison of commercial providers and regulated asset.	Commercial Assessment	Contract Award 22 May					Contracts Start April 2022	230 MVAr ~£10m for 9yr contract	• Enduring solution for Mersey high voltage need • Open to service providers and network owners • Open to both distribution and transmission levels – solving a transmission system need • Solution from April 2022	• Tender closed – contracts awarded 22 May • Service delivery could be delayed – • short-term tender from April 2021 aims to cover the uncertainty
LT Pennines Voltage	Procurement of reactive power in North East to meet SQSS compliance and economic benefit. Commercial providers and NGET included.			Publish tender	Tender process		Contract Award	Contracts Start April 2024	800+ MVAr (400 compliance +400 economic) 10yr contracts	• Enduring solution for North East high voltage need • Open to service providers and network owners • Open to both distribution and transmission levels – solving a transmission system need • Solution from April 2024	• Tender publication before Dec 2020 to ensure new build delivery by Apr 2024
Constraint Mngt	Procurement of post-fault constraint service in Scotland and Northern England to deliver economic benefit until delivery of Eastern HVDC		Sep '20 Publish decision to tender			Publish EOI then tender EOI	Contract Award Tender process	Contracts could start April 2022	Min. 200MW Annual contracts	• Thermal constraint management service open to anyone who can deliver the service in ~18 months time • Creating a post-fault intertrip market • Post-fault service for at least 200MW	• No longer a dual location service • Service from 2022 • Annual tender

This timeline shows the status of our NOA Pathfinder projects, which are an important part of meeting our Competition Everywhere ambition.

C.4 Outturn performance metrics and justifications

Metric /Performance Indicator	Performance	Status	Justifications
3A. Right first-time connection offers	For the first six months of this performance year we have been meeting expectations.	●	Despite receiving a high volume of connection applications, we have consistently been 95%[74] and above for right first-time connection offers.
3C. Customer connections- customer satisfaction	The SATs were paused in the first half of this year due to the impact of COVID-19. We have now re-started the SATs part of our insights programme.	N/A	We have not received any scores yet for SATs. However, we have been sending bespoke surveys to customers to gather feedback throughout the last six months.
3D. Whole system unlocking cross boundary solutions	155MW of Distributed Energy Resource (DER) within WPD network and 207.2MW within UKPN network accepted for the first half of this year.	N/A	DER has remained largely static across the first half of the 2020-21 performance year.
3E. Future balancing costs saved by operability solutions	We successfully released commercial service contracts under Stability Pathfinder phase 1 and the Mersey Voltage Pathfinder over 2020-21, where we expect to save £21.3m in future balancing costs.	N/A	The saving was estimated based on the counterfactual spend forecast if no new operability solution was brought in, we then annualise the figure through the contract length based on the assumption that all contracts will be delivered on their contractual dates.
3F. Capacity saved through operability solutions	For 2020-21, the ESO will deliver N-3 intertripping capability with UKPN and will continue to monitor contracted DER volumes in the respective RDP areas against the delivery timelines for the other projects.	N/A	Whilst overall DER contracted connections have increased marginally; actual rates of connection have been slower than expected. The UKPN N-3 project is on-track to deliver in Q3 2020-21 and work is ongoing for WPD and UKPN MW Dispatch. The overall contracted connections remain largely the same for GEMS and are still in line with the target delivery date.

Table 14: Summary of metrics and performance indicators for Role 3

● **Exceeding expectations**

● **Meeting expectations**

● **Below expectations**

[74] The number was revised on 20 November 2020.

3A Right First Time connection offers

April - September 2020 Performance

This metric measures whether the ESO aspects of connection offers were correct the first time they were sent out to customers.

Connections Offers	Results
Year to date number of connections offers	166
Year to date ESO related reoffers	8
Year to date percentage of Right First Time connections offers determined from ESO related reoffers	95%[75]

Table 15: Connections re-offers data

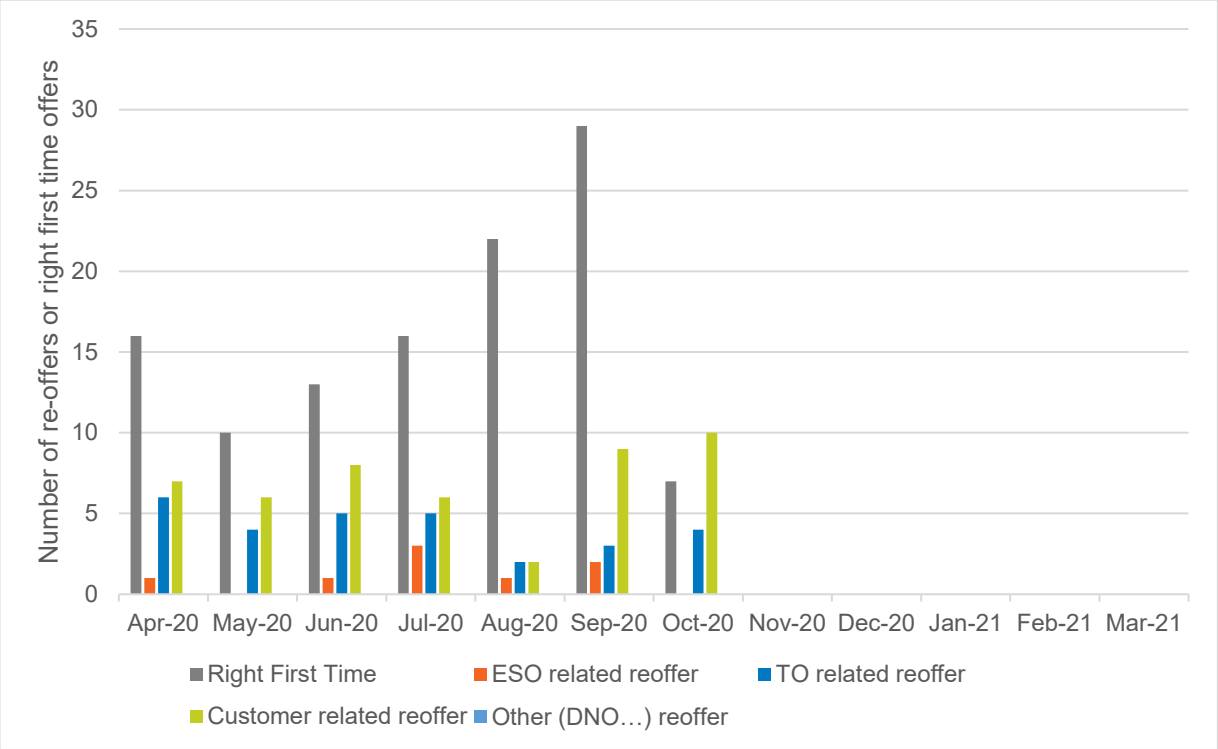


Figure 7: Connections offers monthly performance

Supporting information

We have been meeting expectations throughout the first half of 2020-21. We saw a total of 166 offers returned over the last six months with 60 re-offers, eight of which had ESO related drivers. It is noted that an offer can be subject to multiple re-offers.

We saw 11 offers returned in September. There were two ESO related re-offers in September 2020 which means that we are still meeting our target at 95% Right First Time.

Over the last six months the issues we experienced leading to ESO related re-offers were:

- Transmission Owner Reinforcement Instructions (TORIs) was incorrectly included in Attributable Works.
- The initial offer was made out in the name of one of the customer's other project companies.

[75] The data and supporting information were revised on 20 November 2020.

- Re-offer updated the Appendix F around ‘Chapter 11 Voltage Regulation at the Grid Supply Point’ and ‘Chapter 12 Emergency Instructions for the generators on Appendix G’.
- Contract provisions relating to restrictions on availability and a related agreement were missed in the customer’s original offer.
- Re-offer was due to an update required on the Construction Agreement Appendix H. The works were categorized as attributable based on an out of date Transmission Owner Connection Offer (TOCO), when in fact they are non-attributable.
- Re-offer issued to amend the User Works (Appendix I) to include works the DNO are required to undertake in order to interface with specified TORIs
- Re-offer to correct Appendix E part 2 Outage Condition A and B which incorrectly referred to 0MW and amended "The Value for the purposes of the clause to 85MW"

We review all reasons for re-offers and share learning across the teams to ensure we continue to maintain good standards and improve on the customer experience.

Performance benchmarks

- **Exceeding expectations:** 100% of connection offers Right First Time (excluding those where the error was not due to the ESO)

- **Meeting expectations:** 95-99.9% of connection offers Right First Time (excluding those where the error was not due to the ESO)

- **Below expectations:** Less than 95% of connection offers Right First Time (excluding those where the error was not due to the ESO)

3C Customer Connections- Customer Satisfaction

April – September 2020 Performance

Supporting information

Having paused our Satisfaction surveys (SATs) for the first half of this year due to the impact of COVID-19 on our customers and stakeholders, we have now re-started the SATs part of our insights programme for the second half of this year. As these surveys were put on hold, we have not received any scores yet. The SAT survey focusses on the ESO's overall performance and how well we are doing at meeting our ESO Ambition of becoming a Trusted Partner by improving the service we provide. We are planning SATs surveys for customers, stakeholders and balancing service providers from across the business which will go out in the next six months. The first one from the ESO connections team will be going out in October 2020. We currently send out a bespoke survey to the customer after each contract offer has been completed requesting feedback on what they found helpful and areas we can improve on.

All other insights continue to be gathered and acted on as usual over the last six months, through our bespoke surveys capturing improvement ideas on operational process, events and programmes of work. This is supported by utilising our Customer Relationship Management system to capture the day-to-day queries from our customers and stakeholders.

Our philosophy across all insights is to ensure we are acting on feedback and communicating back to customers and stakeholders on what improvements we've made using a "you said, we did/we considered" approach.

Performance benchmarks

- **Exceeding expectations:** Score out of 10 of 8.2 or more
- **Meeting expectations:** Score out of 10 between 7.8 and 8.2
- **Below expectations:** Score out of 10 of 7.8 or below

3D Whole System, Unlocking Cross Boundary Solutions

April – September 2020 Performance

This Performance Indicator is an assessment of the effectiveness of our whole system actions, measured in terms of their outputs. This indicator measures the changes to contracted Distributed Energy Resources (DER) in each of the Regional Development Programmes (RDP) regions, as a result of the UKPN/ESO collaboration in the South East Coast region and the WPD/ESO collaboration in the South West region.

Q1-Q2 2020 Performance (UKPN)

Grid Supply Point (GSP)	MW	Commentary on DER technology types
Bolney	76.9	No new DER in Q1. Multiple new acceptances of 76.9MW for a mixture of Battery storage, Solar and Waste in Q2.
Canterbury	-5	No new DER in Q1. One DER moved to Sellindge in Q2.
Ninfield	124.3	New acceptance for 5MW of battery storage in Q1. Multiple new acceptances of 119.3MW for a mixture of Battery storage and Solar in Q2.
Sellindge	11	New acceptances for 16MW of Gas in Q1. 5MW of DER terminated in Q2.
Total	**207.2**	

Table 16: Change to contracted MW capacity of UKPN DER connections

Q1-Q2 2020 Performance (WPD)

Grid Supply Point (GSP)	MW	Commentary on DER technology types
Abham	0	No new DER.
Alverdiscott	27	A new acceptance for 28MW Solar and 37MW Solar terminated in Q1. A new acceptance for 32MW Solar in Q2.
Axminster	0	No new DER.
Bridgwater	85	New acceptances for 130MW Mixed technology and 45MW Mixed technology terminated in Q1.
Exeter	38	New acceptance for 47MW of PV and 9MW of Gas terminated in Q1.
Indian Queens	-30	30MW of PV terminated in Q1.
Landulph	35	New acceptances for 29MW Mixed technology in Q1. A new acceptance for 6MW Solar in Q2.
Taunton	0	No new DER.
Total	**155**	

Table 17: Change to contracted MW capacity of WPD DER connections

Supporting information

Levels of new embedded generation connections in the South West have become extremely static as a result of limited capacity available on both the Distribution and Transmission Systems. In addition, many in-flight schemes connecting during 2020 have also been delayed mainly due to COVID-19 impacts on build and procurement timelines. We have received several applications from WPD for GSPs in the South West to start to developing options and solutions to increase capacity in this region.

DER has been added at certain GSPs in the South East, however these have not been large volumes. There have been several applications received from UKPN for three of the four GSPs seeking additional capacity.

3E Future balancing costs saved by operability solutions

April – September 2020 Performance

This is a Performance Indicator to demonstrate the consumer benefit of implementing new operability tools such as Stability, Frequency, Constraint Management Services and Loss of Mains.

Operability Solution projects	Annualised cost saving through RIIO 2
Counterfactual Spend (£m)	76.9
Contract cost for Stability Pathfinder phase 1 (£m)	54.7
Savings due to Stability Pathfinder phase 1 (£m)	8.7
Contract cost for Mersey Voltage Pathfinder (£m)	1.0
Savings due to Mersey Voltage Pathfinder (£m)	12.6
Total savings (£m)	21.3

Table 18: Future balancing costs saved by operability solutions

Supporting information

We successfully released commercial service contracts under Stability Pathfinder phase 1 and the Mersey Voltage Pathfinder, and as a result, we expect future balancing costs savings in the next few years. The saving was estimated based on the counterfactual spend forecast if no new operability solution was brought in, we then annualise the figure through the contract length based on the assumption that all contracts will be delivered on their contractual dates. However, if there is any delay to those dates, we may need to update those annual figures.

In our 2019-20 Forward Plan publication in March 2020, we included a balancing cost saving forecast from the Loss of Mains protection change programme. COVID-19 has impacted the programme's delivery assurance process in the first quarter. Activity has resumed with new safe working practices, so far 4,892 applications have been approved from electricity generation sites, for a total of 9.7GW of generation capacity. We are working out the impact on balancing cost saving following those operational changes and will provide an update in the end of year incentives report.

For the above three projects (Stability Pathfinder, Voltage Pathfinder, Loss of Mains), the counterfactual spend is the forecast cost of balancing the system based on the forecast of future system conditions such as those contained within the Future Energy Scenarios (FES) and other relevant market intelligence information, if no new commercial solution were implemented. After introducing the new commercial solutions through an open market tender, that counterfactual spend would disappear, but there would be additional contract costs relating to the payment for the service providers who deliver those new commercial solutions, so the savings are calculated as the difference between the counterfactual spend and the contract cost.

3F Capacity saved through operability solutions

April – September 2020 Performance

The Regional Development Programmes (RDPs) are taking a whole system view of the required transmission network capacity. As such, we monitor the progress of both transmission and distribution connections to ensure the RDP is delivered and capacity released when needed. Changes in the total Forecast Connected DER Capacity will be monitored and reported through this indicator to ensure current RDPs are being progressed in line with the system need. This indicator will also report on new RDP areas where work has been progressed throughout each quarter to provide new whole system solutions.

The required network capacity needs to be sufficient to cover a range of credible system backgrounds accounting for the operations of both transmission and distribution connected parties. In some areas of the network, where there are multiple transmission connected parties, there may be a much higher capacity required than just that needed to manage DER volumes.

WPD N-3 Intertripping

Year	2020-21	2021-22	2022-23
Forecast Connected DER Capacity (MW)*	1900	2100	2300
Baseline Transmission Capacity (MW)**	1700	2300	2300
Additional Capacity Released (MW)	N/A	600	N/A

*This figure is based on 100% connection of Forecast DER Connected Capacity, with no load factors applied.

**Network Capacity if no RDP solution in place.

Supporting information

The delivery of this capability with WPD is now likely to be complete by October 2021 as a result of the need to complete outstanding outages on the transmission network, hence the capacity released has been deferred into the 2021 financial year. Although the Forecast Connected DER Capacity volume remains largely similar, actual new connections into the DNO network have been slower than expected, therefore this delay is not expected to cause any operational challenges. We are monitoring the outage status regularly with NGET and we're also exploring any options available to deliver incremental capability increases ahead of the anticipated October 2021 delivery date.

UKPN N-3 Intertripping

Year	2020-21	2021-22	2022-23
Forecast Connected DER Capacity (MW)*	1500	1600	1750
Baseline Transmission Capacity (MW)**	1700	2300	2300
Additional Capacity released (MW)	600	N/A	N/A

*This figure is based on 100% connection of Forecast DER Connected Capacity, with no load factors applied.

** Network Capacity if no RDP solution in place.

Supporting information

The UKPN N-3 project is on-track to deliver in mid-November 2020 although Forecast Connected DER Capacity has not changed significantly since April 2020. The baseline capacity and additional capacity figures have also not changed.

WPD MW Dispatch

Year	2020-21	2021-22	2022-23
Forecast Connected DER Capacity (MW) *	1900	2100	2300
Baseline Transmission Capacity (MW)**	2600	2600	2600
Additional Capacity released (MW)***	N/A	N/A	1300

*This figure is based on 100% connection of Forecast DER Connected Capacity, with no load factors applied.

** Network Capacity if no RDP solution in place.

***Based on delivery of IT infrastructure by Q4 2022-23.

Supporting information

The MW Dispatch project with WPD is looking to deliver co-ordinated operational visibility and commercial controllability of DER for transmission constraint management purposes. Work is currently ongoing to deliver the necessary commercial frameworks to achieve this, with the IT development commencing once this is in place.

The Forecast Connected DER Capacity is taken from the latest connection information. The Baseline Network Capacity is taken from the technical study work and the Additional Capacity Released is noted as a notional number (against scenario planning) however, the Network Options Assessment process will determine whether it is economic to continue to allow connections in this manner.

UKPN MW Dispatch

Year	2020-21	2021-22	2022-23
Forecast Connected DER Capacity (MW) *	1500	1600	1750
Baseline Transmission Capacity (MW)**	5100	5100	5100
Additional Capacity released (MW)	N/A	N/A	1350

*This figure is based on 100% connection of Forecast DER Connected Capacity, with no load factors applied.

** Network Capacity if no RDP solution in place (this capacity is also shared by transmission-connected parties and is required to accommodate flows on the interconnectors).

***Based on delivery of IT infrastructure by Q4 2022-23.

Supporting information

The MW Dispatch project with UKPN is looking to deliver co-ordinated operational visibility and commercial controllability of DER for transmission constraint management purposes. Work is currently ongoing to deliver the necessary commercial frameworks to achieve this, with the IT development commencing once this is in place.

The Forecast Connected DER Capacity is taken from the latest connection information. The Baseline Network Capacity is taken from the technical study work and the Additional Capacity Released is noted as a notional number (against scenario planning) however, the Network Options Assessment process will determine whether it is economic to continue to allow connections in this manner.

SPT – Generation Export Management Scheme (GEMS)

Year	2020-21	2021-22	2022-23
Transmission & Distribution Forecast Connected Capacity (MW)*	1500	1600	2300
Baseline Transmission Capacity (MW)**	1800	1800	1800
Additional Capacity released (MW)	N/A	N/A	500+

*This figure is based on 100% connection of Forecast Connected Capacity on to the transmission and distribution networks, with no load factors applied.

** Pre-GEMS deployment. Baseline Transmission Capacity accounts for diversity in generation output.

Supporting information

The overall Forecast Connected Capacity remains largely the same as reported previously. GEMS is still targeting a delivery date of October 2022, in line with the relevant customer connection dates. GEMS will facilitate the 500+MW of capacity in 2022-23 and will provide additional capacity beyond this which will be monitored through a cost benefit analysis process (Strategic Wider Works) to ensure it remains the efficient solution.

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