nationalgridESO

2019-20 End of Year Report Evidence Chapters

7 May 2020

Introduction

These evidence chapters set out in more detail, how the Electricity System Operator has performed in this 2019-20 performance year. Our evidence chapters provide information for each of our roles, and each section relates to one of the evidence criteria which are assessed by the Performance Panel. We therefore explain the benefits our activities delivered for consumers, provide an update on plan delivery, discuss our interactions with stakeholders and feedback from them on their experience, and our performance against our metrics.

Contents

Role 1

Managing System Balance and Operability

Role 1: Managing System Balance & Operability

Delivered benefits in 2019-20

- The new ESO Data Portal is saving time for our customers, resulting in a saving of £600k per year, and in the future should promote a better functioning electricity market.
- Removing barriers to entry for European Interconnector Trading, saving £22.3m on balancing costs

Future benefits and long term initiatives

- We note that role 1 will mainly deliver consumer benefit within the current year, due to the nature of the activities within this role area
- We are co-ordinating changes to Loss of Mains Protection settings which will save more than £170m per year from 2022-23

Plan delivery and new ways of working

- Upgraded IT systems including Ancillary Services Dispatch Platform and preparations for European Network Codes
- New ESO data portal improved information access for stakeholders
- Published insights documents including Operability Strategy Report and FES: Bridging the Gap to Net Zero
- We have undertaken extensive optimisation of balancing costs via trading and operational decision making

Stakeholder

- Engaged with 109 new organisations when developing this year's Future Energy Scenarios
- Held over 20 external engagement sessions for the Data Portal, receiving positive feedback at each one
- Stakeholder satisfaction scores for the Operational Forum improved from 5.9/10 in July to 8.5/10 in October
- Stakeholders found our monthly ENCC visits to be informative
- Weekly webinars kept the industry updated on our COVID-19 response

Performance metrics

Metric	Performance	Status	Justifications
1. Balancing cost scorecard	£1268.4m outturn against £1101.1m end of year benchmark	●	During 2019-20, the ESO has managed the power system through changing conditions. Although we have taken action within the year to resolve these issues in the short term, many of them require more strategic long-term actions to address the root cause of the issue, which we are also progressing.
2. Information Provision scorecard	The majority of publications and reports within our control were published in full and on time, with the exception of one report.	●	We consistently demonstrated green for all reports other than the Fast Reserve (FR) Market Information Report (MIR). There were two errors identified, which we rectified in time for March 2020
3. Energy Forecasting Accuracy	Demand forecast target met in eight months of the year, wind forecast target met in six months of the year	●	We note that Demand and Wind forecasting are becoming more difficult due to the changing mix of generation on the system. 2019-20 also saw unexpected challenges in wind forecasting due to multiple storms, and demand forecasting in March due to COVID-19.

A.1 Evidence of consumer benefits for Role 1

For each role area, we present our consumer benefit information in two sections, corresponding to Ofgem's evaluation criteria: evidence of delivered benefits, and evidence of future benefits/ progress against long term initiatives.

To evidence the consumer benefits which result from our activities, we present tables of our high-level deliverables, 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 area.

We would expect some role areas, such as 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 two case studies relating to activities which are expected to benefit today's consumers: the ESO Data Portal and Removing barriers to entry for European Interconnector Trading.

Role 1 also includes some activities which will deliver benefit for future consumers. An example of this is the Loss of Mains Protection work, which is part of our evidence of future benefits.

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. Readers can also refer to the Role 1 consumer benefit map produced as part of the Mid Year Report[1].

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

2019-20 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
Uninterrupted, safe, secure system operation	A reliable energy supply is essential for society and for everyday life as well as businesses and industry.	Having confidence in the security of our future energy supplies encourages businesses to invest in the UK, and benefits society as a whole.
Transparency of data used by our ENCC in our close-to-real-time decision making	In publishing operational planning data, as asked for by stakeholders to increase transparency, we are allowing stakeholders to make better informed decisions. This is contributing to lower consumer bills than would otherwise be the case, and a better functioning market.	More transparency supports a better functioning market. This in turn will encourage new entrants and drive more competition thereby ultimately lowering consumer costs.
Operational Insights	As requested by stakeholders, we have increased the transparency of the balancing	Providing more insights into the ESO's activities allows our stakeholders to be

[1] https://www.nationalgrideso.com/document/128421/download page 5

2019-20 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
	actions we have taken. We have done this by improving the reports and data which we publish on our website. This enables increased visibility of our operations. This also makes it possible for more providers to be able offer services to the ESO, increasing competition and thus reducing balancing costs below the level than would otherwise be the case.	better informed, which supports a more efficient market. This increased understanding should mean that more providers will be able to offer services to the ESO, thereby increasing competition and reducing balancing costs for future consumers.
Electricity Operational Forum and stakeholder engagement	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. This has enabled stakeholders to provide prompt and precise information to the end consumer.	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.
Upgrade of information systems	We have upgraded our IT infrastructure, for example improving our systems to prepare for European Network Codes, and moving dispatch of Short-term Operating Reserve (STOR) to the Ancillary Services Dispatch Platform (ASDP). These changes are ensuring we can continue to operate the system adeptly and effectively, thereby benefitting the end consumer.	In making IT systems more readily available, this encourages non-traditional participants to enter the market, leading to increased competition for balancing services. Widening access to the Application Programming Interface (API) system and streamlining the process for Balancing Mechanism (BM) registration has lowered barriers to entry for providers in the BM, leading to increased competition which will place downwards pressure on prices, leading to future consumers experiencing lower bills than would otherwise be the case.
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.
Forecasting	Increasing the number of forecasts published contributes to the short-term decision making of market participants, which delivers better functioning markets. These forecasts are also essential to enable the ENCC to plan and operate the system securely and economically. Less uncertainty for the ENCC leads to lower consumer bills, due to an increased level of confidence which we would expect to result in lower balancing spend than would otherwise be the case.	Increased confidence in energy forecasting will enable the ENCC to hold less response and reserve: this reduction in balancing services spend will contribute to lower consumer bills than would otherwise be the case. An improved ability to forecast the output of wind generation will make it possible to operate the system securely with an ever-increasing proportion of renewables, contributing to reduced environmental damage
Information access	After engaging with industry, we have created a data portal on our website. This increases visibility and convenience for our	Through the Data Portal, consumers of our data will be able to reduce costs associated with ingesting and manipulating our data,

2019-20 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
	stakeholders, as data can be found in one location and in a consistent format. This can increase the efficiency of processes, stakeholders' decision making and transactions between parties. This increased efficiency will ultimately benefit consumers by leading to lower bills than would otherwise be the case.	whilst an improved understanding of our data will support better informed decision making. This also has the potential to support innovation leading to new services and cost efficiencies. By increasing transparency and encouraging more players to participate in the market, this then leads to better competition and a better functioning market, which will place downwards pressure on prices

A.2 Evidence of delivered benefits for Role 1

A.2.1 Current consumer benefit case studies

ESO Data Portal

Activity	A wide range of stakeholders including generators, service providers and suppliers told us that the location of the data we publish, and its aggregated nature, format and structure often made it difficult to reuse or manipulate. It was also felt that the published data was frequently insufficient and difficult to locate, leading to inefficiencies and frustration. Stakeholders have asked for 'one source of the truth' and a one-stop-shop to access all data published by the ESO. Through the Electricity System Operator Data Portal, we are transforming the experience of those who consume our data by: - Building a centralised repository for published ESO data - Offering intuitive and powerful ways to discover, search and query our data - Implementing data quality and metadata standards to datasets - Providing a channel for consumers of our data to engage with us Following an agile development approach, we have released an initial public beta using CKAN (Comprehensive Knowledge Archive Network), which is the world's leading open-source data management platform. Our initial focus has been on providing a clear and intuitive user interface, with much-improved navigation and search features and the capability to provide rich metadata with each dataset. The portal also offers a powerful Application Programming Interface (API) for all suitable datasets, as well as on-screen visualisation and data manipulation tools for external users, to support the understanding of our data. Initially, we have been running the Data Portal in parallel to existing publication sources, during which time we have been engaging with consumers of our data, to refine the features and structure of the Data Portal prior to fully migrating the existing data feeds. We have now started migrating data feeds from historic locations, so that these sets of data are now published directly to the Data Portal. Where the datasets we publish are not in a machine-readable format, we will work to provide this data in a format that can be consumed via the API. To date, we have undertaken around 20 engagement sessions and have received uniformly positive feedback from our stakeholders. Additionally, during these sessions we have captured suggestions as to how we could further improve the Data Portal, and have already acted on several of the most popular suggestions. We have also published new datasets on the portal including voltage management costs, day ahead constraint limits and flows, and thermal constraint costs.
Role	1. Managing system balance and operability
Key Forward Plan Deliverables	• Open Data Portal

Current benefit	• Lower bills than would otherwise be the case
	  ○ Our customers now spend less time understanding, looking for, and processing the data they need, and their costs are eventually paid for via consumer bills.
	  ○ There are currently approximately 2000 unique visitors to the site a month, if we assume a 30 minute saving per user per month due to the efficiencies of the data portal this would equate to:
	  2000 x 30min saved a month is 12,000 hours a year, which is ~6 Full Time Equivalent (FTE) at £100,000k = £600,000

	We would expect this number to increase as more users discover the site and when we migrate additional data feeds to the portal. • Improved quality of service ○ The ESO Data Portal has been well received by customers and stakeholders, allowing them to provide a better service to end consumers. This is described further in our Stakeholder section for Role 1.

Future benefit	• Lower bills than would otherwise be the case
	  ○ Easily accessible data encourages more market entrants and more competition, which places downwards pressure on wholesale and balancing services costs. During 2019-20, the ESO spent £1268.4m on actions to balance the system.
	  ○ Wholesale costs account for around 30% of a typical electricity bill[2], meaning that the average electricity consumer spends around £200 per year on wholesale costs.
	  ○ It is widely accepted that increasing competition places downwards pressure on prices, and therefore all else being equal we would expect the introduction of additional market participants to lower both wholesale costs and the cost of balancing the system. However, it is not possible to predict the cost saving which would directly result from the introduction of the data portal.
	• Benefits for society as a whole
	  ○ Our customers and stakeholders can optimise their business models, leading to a better functioning market.
	• Improved safety and reliability
	  ○ Data quality and validation tools will be introduced, which will improve the accuracy of the data published. This will give our customers confidence that they have accurate information to support their operational activities.
	• Reduced environmental damage
	  ○ The data portal will allow providers of new flexibility services to easily access the information they need, which supports new business models which will support the transition to net zero

Basis of expected benefit	• According to the strategy for a Modern Digitalised Energy System - Energy Data Taskforce (EDTF) report[3] ‘’*Data is key to unlocking system and consumer benefits and managing the fast-approaching challenges of flexibility. Data is fundamental to the future of our economy, which is why it is the focus of one of the Grand Challenges in our Modern Industrial Strategy. In the power sector, it is the key to unlocking system and consumer benefits and managing the fast-approaching challenges of flexibility, resilience and costs in the most efficient way. Effective storage, sharing and management of data will allow the markets to develop that will put consumers at the heart of this change while allowing networks to support the proliferation of new business models and technologies. Interoperability, the virtue that allows different organisations to share and understand information, is critical too if we are to solve the complex challenges of decarbonising energy, heat and transport*.” • The Data Portal is a key enabler for a number of the Energy Data Taskforce (EDTF) outputs, supporting “unlocking system and consumer benefits and managing the fast-approaching challenges of flexibility”. • Through the Data Portal, consumers of our data will be able to reduce costs associated with ingesting and manipulating our data, whilst an improved understanding of our data will support better informed decision making, which has the potential to lead to lower risk margins. • Providing both existing and new datasets under an open licence has the potential to support innovation, leading to new services and cost efficiencies. We are already

[2] https://www.ofgem.gov.uk/system/files/docs/2019/01/bills_prices_profits_-_january_0.pdf
[3] https://es.catapult.org.uk/wp-content/uploads/2019/06/Catapult-Energy-Data-Taskforce-Report-A4-v4AW-Digital.pdf

	seeing innovation based on the Data Portal API to further drive efficiencies for consumption and use of our data[4]. • Research by the McKinsey Global Institute suggests that open data can help create $3 trillion (£2.4 trillion) a year of value in seven areas of the global economy, with the potential to add between $340 billion (£276 billion) and $580 billion (£470 billion) of value annually across the electricity sector. Analysis carried out by Deloitte[5] also shows that by providing open data, TfL is improving journeys, saving people time, supporting innovation and creating jobs. This approach is also generating annual economic benefits and savings of up to £130 million a year. We note that this analysis was carried out after TfL had been making their data available for some time, and as such the ESO is not in a position to replicate this analysis. However, we would expect the benefits delivered by the ESO data portal to also be significant.
Assumptions	• For the benefits calculation, that an FTE has a total cost of £100k per annum, and that there are 8 working hours per day, and 200 working days per year.

[4] https://github.com/AyrtonB/NGDataPortal
[5] http://content.tfl.gov.uk/deloitte-report-tfl-open-data.pdf

Removing barriers to entry for European Interconnector Trading

Activity

Our trading on interconnectors is enacted to manage system security. The ESO trades with counterparties in order to change the flow of power on the interconnectors. This is done by paying a counterparty to flow energy in the opposite direction to the market (i.e. from the more expensive market to the cheaper market), reducing the net flow on the interconnector. Trading with counterparties is done on a competitive basis: the ESO notifies its requirements to counterparties, who submit volumes and prices for these time periods.

In 2019, the ESO introduced a new trading tool to automate the process of generating and notifying the requirements for these trades. This tool allows counterparties to profile their submissions on an hourly basis, automates the assessment process, and generates confirmations for successful participants and notifications for unsuccessful participants. The automation of the process allows the ESO to quickly assess hundreds of submissions and automatically select the best trades to meet requirements on an hour by hour basis. This has allowed the trading team to efficiently manage an increasing amount of interconnector trading, on more interconnectors with more counterparties. The team has been able to easily adapt processes to include new interconnectors and new access rules on existing interconnectors.

The trading team has been successfully embedding the use of this new tool throughout the 2019-20 performance year, which has delivered savings to the end consumer.

Prior to this new method of working, requirements for interconnector trades were notified to counterparties as a block requirement over a set period of hours. Responses were manually assessed, confirmed and executed. The process was time consuming and inflexible. The previous process limited market participation and potentially created barriers to counterparties, which would lead to sub-optimal costs.

Now that we have a full year's worth of data, we are able to analyse and report on the benefits of the tool in comparison to the previous year.

Role

1. Managing system balance and operability

Key Forward Plan Deliverables

- Balancing cost management
- Uninterrupted, safe, secure system operation
- Addressing operational issues

Current benefit

Reduction in the cost of interconnector trading

Since the introduction of the new trading tool in January 2019, the cost per MWh of trades enacted has reduced. We have compared our interconnector trade price to the day ahead and intra-day price in 2018 and 2019. In calendar year 2019, the ESO bought 965,000 MWh and sold 2.3 GWh on interconnectors. This reduction in traded prices equates to a saving of £22.3m on balancing costs. The table shows the reduction in cost during this period.

For "buy" trades, the ESO usually must pay above the market price, as counterparties cover the cost of capacity and flowing power from the more expensive market to the cheaper market. The average "uplift" paid has reduced by £8.30/MWh against the day ahead price, and by £9.04/MWh against the intra-day price.

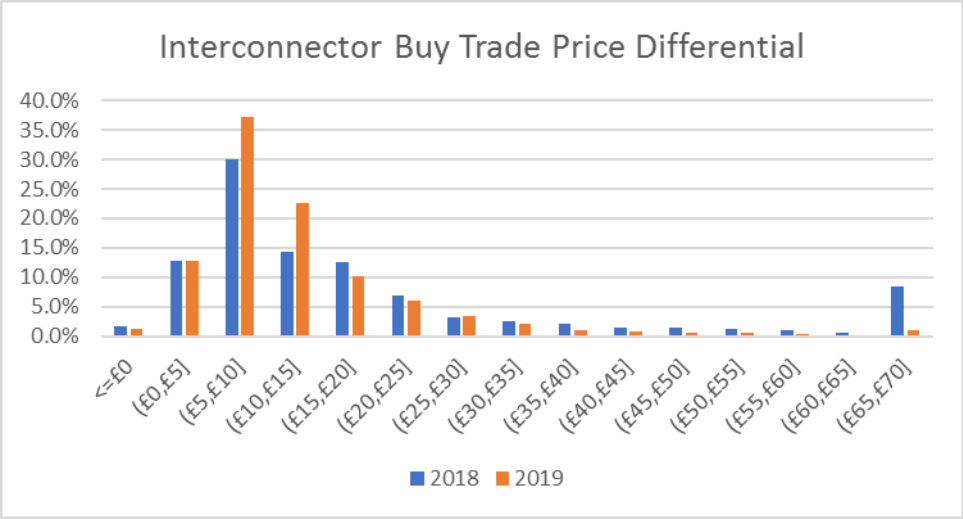
For "sell" trades, the cost of trading has reduced by £6.23/MWh against the day ahead price and £5.84/MWh against the intra-day price (P90).

£/MWh	Trade price v day ahead price				Trade price v intra-day price			
	Buy		Sell		Buy		Sell	
	P90	P80	P90	P80	P90	P80	P90	P80
2018	19.16	16.17	-19.48	-19.09	20.42	18.29	-18.31	-18.09
2019	10.86	10.38	-13.25	-12.77	11.38	11.08	-12.47	-12.18
Difference	8.30	5.79	6.23	6.32	9.04	7.21	5.84	5.91

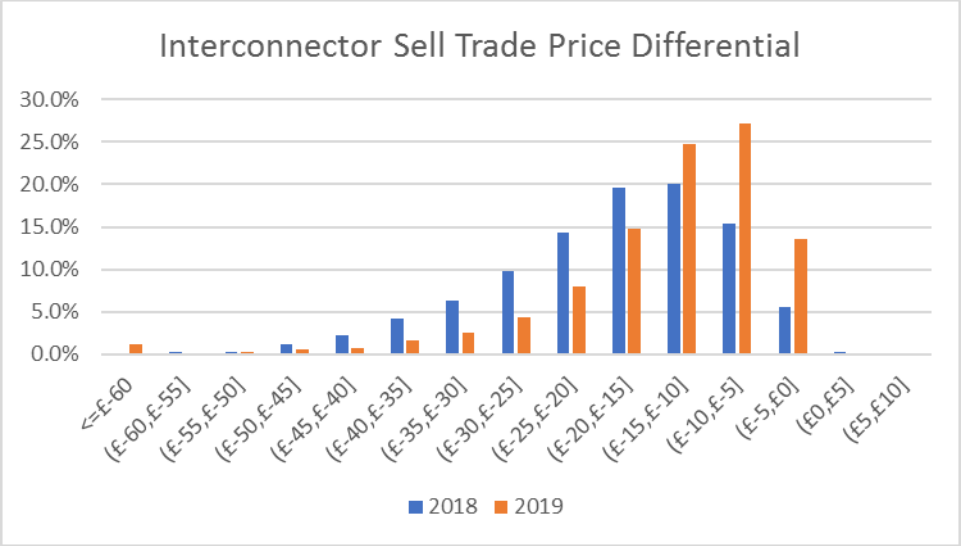
To remove the influence of market volatility, we have used a P90 measure, which removes (by volume) the 5% most expensive and 5% lowest cost actions. P80 removes (by volume) the 10% most expensive and 10% lowest cost actions for comparison.

We have also looked at the distribution of the size of the "uplift" paid compared to the day ahead and intra-day prices. The smaller the premium (i.e. closer to zero) the better. For both buys and sells in 2019 (orange bars) an increasing number of trades have been executed with a lower premium than in 2018 (blue bars).

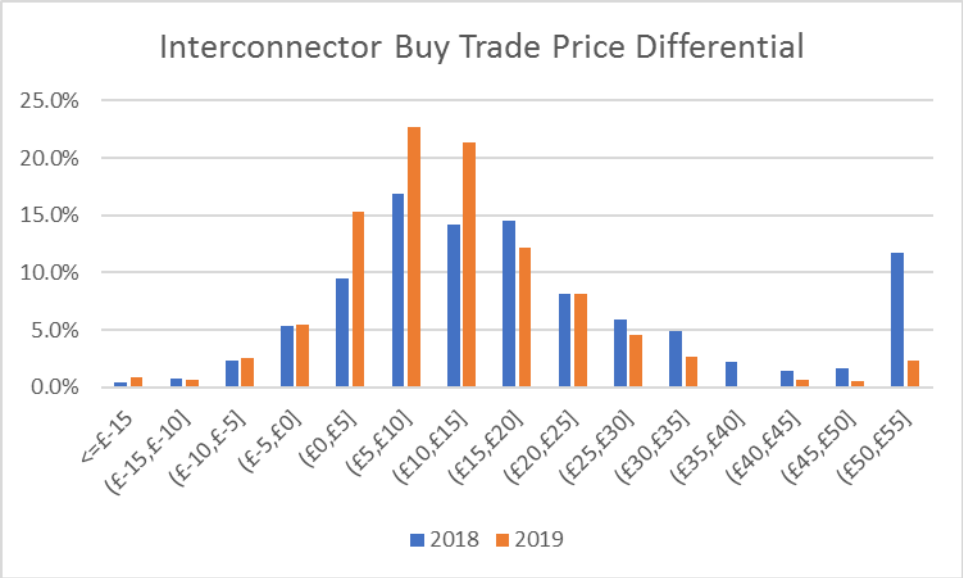
Trade Price v Day ahead Price – Buys



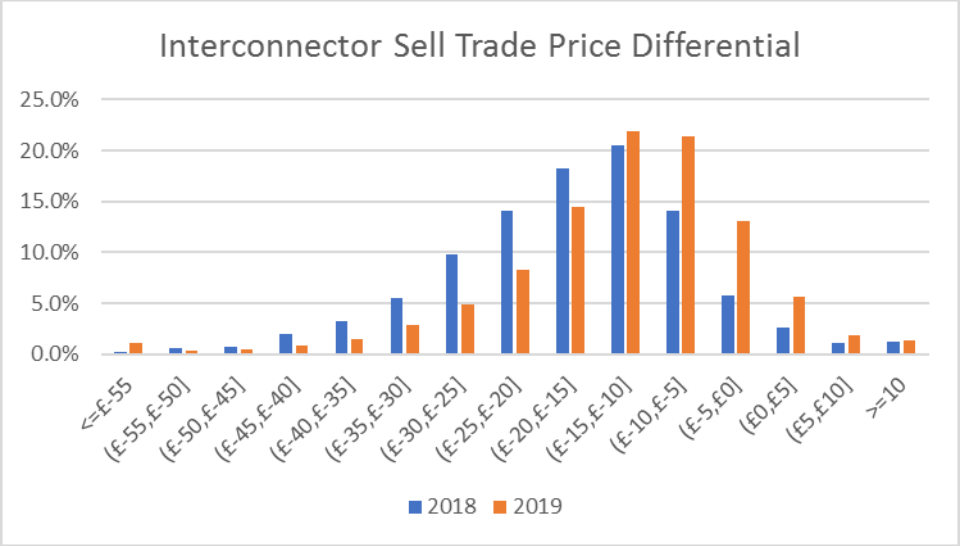
Trade Price v Day ahead Price – Sells



Trade Price v Intra-day Price – Buys



Trade Price v Intra-day Price – Sells



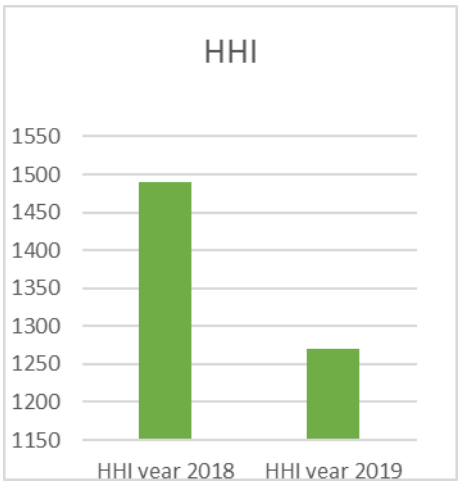
Market competitiveness

Herfindahl Hirschman Index (HHI) breakdown:

HHI can be used to analyse the competitiveness of a market. The Competition and Markets Authority (CMA) typically regards markets with a HHI below 1000 as unconcentrated, markets with HHI between 1000 and 2000 as concentrated, and markets with HHI above 2000 as highly concentrated.

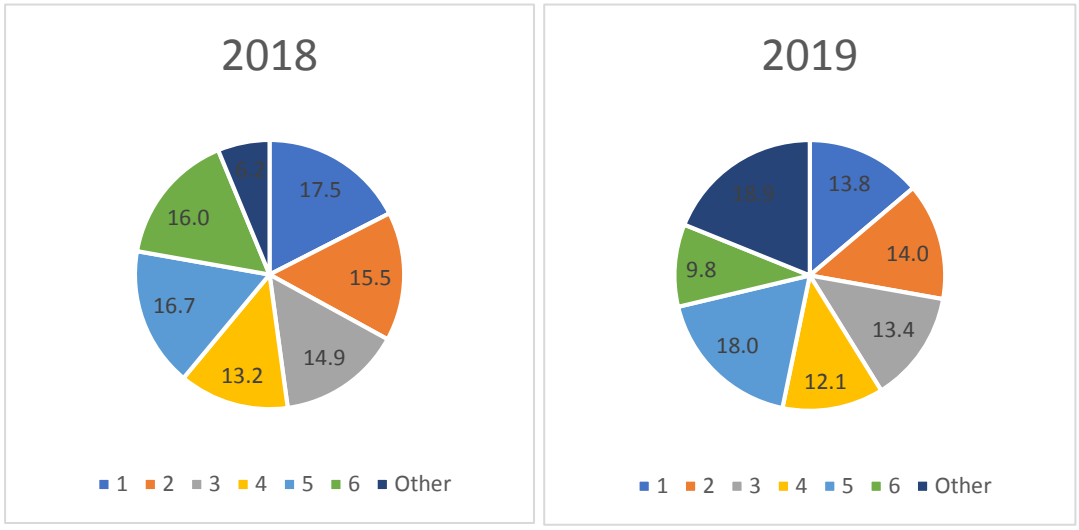
A comparison of the period July to December 2018 with the same period in 2019 shows a reduction in the HHI indicating the auctions have become more competitive. (The chart is based on the volume tendered in by counterparty. The period July to December has been used, as additional data capture functionality was added into the tool in July 2019.) Before the introduction of the auction tool, a counterparty would usually have to secure the full volume requirement for a specific duration (typically ranging from one hour to six hours). This meant that the process naturally favoured those counterparties that could fulfil the entire volume. The new process has reduced the minimum trade duration to one hour and can manage counterparty bids of any volume. This removes potential blockers for smaller counterparties who cannot meet the full requirement volume. The average trade duration has reduced from

three hours to one hour, and the average trade size has reduced from 428 MW in 2018 to 117 MW in 2019.



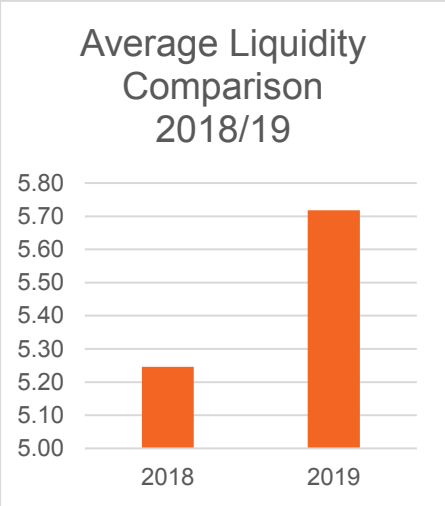
Market participation

In 2018, six large counterparties consistently participated in interconnector trading. “Other” counterparties made up 6%. In 2019, the number of “other” counterparties increased to just under 19%, as more smaller players had the ability to bid in any volume. Discussions are underway with a number of new counterparties who wish to enter this market. We expect this to have a positive effect on the HHI and on market participation.



Market Depth

The below chart shows the increase in market depth since the tool was introduced.



This represents the number of MWs that are tendered in for every MW of ESO requirement. Again, we can see the improvement between 2018 and 2019, in that there are more MWs offered to fulfil each requirement.

Future benefit	Increased competition will have a positive impact on the cost of interconnector trading, which will flow through into consumer bills as lower balancing costs will lead to lower BSUoS charges.
Basis of expected benefit	The ESO is in various stages of negotiation with a number of new interconnector trading counterparties. Increasing the number of active trading counterparties on existing and future interconnectors will continue to drive competition in the market and will have a positive influence on prices paid by the ESO.
How benefit is realised in the consumer bill	Trading on interconnectors is enacted to manage system security, which can displace the need to use more expensive conventional generation. The money spent on such actions, is levied on system users via the Balancing Services Use of System (BSUoS) charge, which is passed through to the end consumer. By finding more cost-effective ways of managing the system, and increasing competition to drive down the prices paid, the BSUoS charge will be lower than what it would otherwise have been.
Assumptions	Increased competition will lead to lower prices which will feed through to BSUoS. This saving will ultimately be passed onto end consumers by third parties.

A.3 Evidence of future benefits/ progress against longer term initiatives

A.3.1 Future consumer benefit case study

Loss of Mains Protection

Activity	We currently use commercial actions to manage a system operability issue caused by protection systems on some embedded 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 protection. We have taken the leading role in driving this change through the industry and since the case study for this work was published in the Mid Year Report in October 2019 the following activities have concluded: • A portal for generators to apply for payment to make Loss of Mains changes has been launched. • In the first and second application windows, 3194 applications have been approved totalling 6,457MW of volume. We are now in the third application window. If all approved applications are completed and proceed through the programme assurance process, there is the potential to save up to £10m in reduced operational spend in 2020-21 and in each subsequent year. We have factored the £10m into our balancing costs benchmark, where it manifests as a lower expected spend on actions to manage RoCoF. The value of further savings is dependant on applications in subsequent application windows. We have published a Window one report[6] and a Window two report[7] to update the industry on progress of the programme.
Role	1. Managing system balance and operability 3&4. Facilitating Whole System Outcomes and Supporting Competition in Networks
Key Forward Plan Deliverables	• Roll out of Loss of Mains protection settings
Future benefit	Once NGESO receives confirmation that relay settings have been changed, then operational processes can be updated, resulting in lower balancing cost spend than would otherwise be the case. Benefits will be more than £170m per year from 2022-23 in the form of balancing costs avoided once the programme is complete.
Basis of expected benefit	The projected short-term reduction in Vector Shift (VS) risk is expected to significantly reduce the occasions when NGESO needs to take an action to increase the system inertia 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 such actions prior to any change in VS relays is currently within the range of £10m per annum. The projected cost after the completion of all VS changes approved in Window one will drop to zero. The opportunity for savings from subsequent windows is over £170m per annum through a combination of further VS changes and the completion of Rate of Change of Frequency (RoCoF) changes. 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 £210m in 2019-20. We would expect costs, in

[6] https://www.nationalgrideso.com/document/161406/download
[7] https://www.nationalgrideso.com/document/167636/download

	the absence of the change programme, to be driven higher as the contribution from traditional synchronous forms of generation to electricity production decreases. We note that these cost savings could be significantly higher if demands and inertia levels are lower than anticipated. 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. We note that the restrictions imposed by COVID-19 are likely to impact on this programme, although Distribution Network Owners are still working to progress the changes as much as possible. At this stage, it is not possible to make a robust assessment of the magnitude of this impact.
How benefit is realised in the consumer bill	The Loss of Mains programme will lead to less costly balancing actions being needed to manage RoCoF issues. This has a direct impact on BSUoS prices, which leads to lower consumer bills.
Additional non-monetary benefit	The Loss of Mains programme will lead to reduced environmental damage, by reducing the number of operational interventions needed to increase inertia, and enabling the system to be operated with a greater proportion of renewable generation. It will also improve the safety and reliability of the network by increasing the ability of the network to respond to rapid changes in frequency.
Assumptions	We assume that the contractual framework we have developed with the DNOs is effective in delivering necessary programme performance, and dealing with risks and opportunities as they arise. We also assume that any reduction in BSUoS gets passed through to consumers.

A.4 Plan delivery

A.4.1 Highlights

- ✓ We have undertaken extensive optimisation of balancing costs via trading and operational decision making
- ✓ Hosted the Electricity Transmission Operational Forum
- ✓ Set up a portal for Loss of Mains Change Programme to receive applications
- ✓ Upgraded IT systems including Ancillary Services Dispatch Platform (which now includes Short Term Operating Reserve) and undertaking preparations for European Network Codes
- ✓ Published insights documents including Operability Strategy Report and FES: Bridging the Gap to Net Zero
- ✓ Implemented the latest multi-model blend forecast from the Met Office to improve forecasting accuracy
- ✓ New ESO data portal improved information access for stakeholders

During 2019-20, we introduced our Forward Plan Tracker, providing increased transparency to stakeholders who are now able to see a monthly update on our progress against the Forward Plan deliverables.

A.4.2 Deliverables

Deliverable	Target delivery date	Actual delivery date	Status
Uninterrupted, safe, secure system operation			
System security metrics	Q1 – Q4 2019-20	Target date met	Completed. This data is now published on our Data Portal: https://data.nationalgrideso.com/system/system-excursions System security metrics will also form part of our suite of metrics for 2020-21, as part of the Forward Plan or 2020-21.
Procurement Guidelines Process	Q3 – Q4 2019-20	Q4 2019-20	Target date met. Engaged with stakeholders and moved Short-term Operating Reserve (STOR) to the Ancillary Services Dispatch Platform (ASDP).
Transparency of data used by our ENCC in our close-to-real-time decision making			
Publication of operational planning data	Q3 2019-20	Q2 2020-21	A working group was put in place to ask for stakeholder feedback, meaning that this deliverable was pushed back to Q4 2019- 20 to give the ESO sufficient time to respond to this feedback. Work to create a version of the System Operation Plan was subsequently delayed into the first few weeks of Q1 2020-21 due to changes to Control Room ways of working as a result of COVID-19. A machine-readable version of the System Operation Plan is planned to be produced in Q2 2020-21.

Deliverable	Target delivery date	Actual delivery date	Status
Future of the ENCC	Q1 2019-20	Q3 2020-21	We now plan to include information on these operability challenges as part of the Operability Strategy Report
Operational Insights			
Insight on balancing decisions taken	Q3 2019-20	Target date met	Completed. More information can be found here: https://www.nationalgrideso.com/balancing-data/voltage-costs We began publishing within year costs for managing voltage levels per region in December 2019, and this is updated monthly on our website https://www.nationalgrideso.com/balancing-data/system-balancing-reports
Insight on constraint boundaries	Q2 2019-20	Target date met	Completed. We now publish on our website a map of outturn thermal constraint costs, as well as day ahead flows and limits of thermal constraints: https://www.nationalgrideso.com/balancing-data/system-constraints
Electricity Operational Forum and stakeholder engagement			
Electricity Operational Forum	Q2, Q3 and Q4 2019-20 and 2020-21.	Target date met	Complete to date. We held an Operational Forum on 1 July and another one on 23 October 2019. The next one was scheduled for March 2020, however it was cancelled due to the COVID-19 outbreak.
ENCC visit days	Q1, Q2, Q3, Q4 2019-20 and 2020-21	Target date met	Complete to date. This deliverable is now performed monthly rather than bi-monthly, although it is on hold during the COVID-19 outbreak.
Addressing operational issues			
Roll out of Loss of Mains protection settings	Q4 2019-20	Q4 2020-21	Delivery date has been changed from Q4 2019-20 to Q4 2020-21 as part of the Forward Plan for 2020-21, due to the delay for the Distribution-Code 0079 agreement and approval. We will publish programme performance measures, including the number of sites where protection setting changes are made, in line with the programme's quarterly assessment cycle. The delivery date may be further delayed due to COVID-19 impacts. Please note Roles 3&4 contains a separate deliverable relating to loss of mains protection.
Upgrade of information systems			
ASDP	Q2 2019-20	Target date met	Completed. Through the Platform for Ancillary Service (PAS) project we have moved non-BM (typically smaller-scale)

Deliverable	Target delivery date	Actual delivery date	Status
			STOR providers from historic systems into the new Ancillary Service Dispatch Platform (ASDP), which was integrated with ENCC systems.
Significant upgrading of IT systems to prepare for European Network Codes	Q1 2019-20	Q3 2020-21	The target date for project TERRE was changed in the period following receipt of an Official derogation from Ofgem, the project was delayed because RTE could not go live in December 2019. The impact of COVID-19 has now delayed the forecast go-live to Q3 2020-21 at the earliest, and discussions are ongoing with Ofgem to update the derogation.
Frequency and time equipment FATE-3	Q4 2019-20	Q4 2020-21	This has been reprioritised against other work, and has been delayed to Q4 2020-21 as part of the Forward Plan for 2020-21.
Pi gateway refresh	Q4 2019-20	Q1 2020-21	This project has faced challenges aligning suppliers' and stakeholders' availability, causing an initial delay from Q4 2019-20 to Q1 2020-21. This work has now been further impacted by our COVID-19 pandemic response. Additional risk to workforce can be avoided through amended delivery dates and hence the decision has been taken to delay this work. Revised delivery dates will be made available once we have completed a re-prioritisation review
Power Available (PA)	Q3 2019-20 Phase 1: integration of PA into energy calculations Q4 2019-20 Phase 2a: integration of PA into settlement and real-time response calculations Q3 2020-21 Phase 2b: blending PA with wind forecasts close to real-time	Phase 1 and phase 2a delayed to Q1 2020-21	Power Available integration phase 1 and phase 2a has been pushed back to May 2020 due to two unexpected IT delays emerging during testing. In addition, testing of Power Available Integration Phase 2a has uncovered additional code development requirements. Reduced access to site caused by the pandemic response has further slowed progress, and these have combined to delay go-live to May 2020. Market participants have been kept informed of progress via the Wind Advisory Group and are supportive of the current delivery timescales.
Interconnector programmes	Ongoing	Q3 2019-20	Intraday changes were delivered on time and to budget. Nemo went live in November, and BritNed went live in December. Interconnector owners have requested further intraday changes, which are being assessed.

Deliverable	Target delivery date	Actual delivery date	Status
Insights documents			
Summer Outlook	Q1 2019-20 & 2020-21	Q1 2019-20 & 2020-21	Complete to date. The Summer Outlook report presents our view of the gas and electricity systems for the summer ahead: https://www.nationalgrideso.com/document/140411/download
Future Energy Scenarios (FES)	Q2-Q4 2019-20 & 2020-21	Publication: Q2 2019-20 & 2020-21 Conference Q2 2019-20 & 2020-21 Call for evidence: Q2 2019-20 & 2020-21 Workshops Q3 2019-20 & 2020-21 & FES Bridging the Gap: Q4 2019-2020	Complete to date. The FES 2020 Framework has been built collaboratively with stakeholders and is currently being finalised. This is to be shared via the Stakeholder Feedback Document and takes into account how stakeholder views were sought and considered in developing the framework. In addition, our FES: Bridging the gap to net zero report was published on 26 March and can be read in full here: https://www.nationalgrideso.com/document/166306/download
Winter Outlook and Winter Review and consultation	Q3 2019-20 & 2020-21	Q1 2019-20 & 2020-21 Winter Outlook: Q3 2019-20 & 2020-21	Complete to date. Our 2019-20 Winter Outlook Report was published on 10 October. The Winter Outlook is one of our suite of insights documents designed to support the industry by providing useful data and inform future industry planning. The interactive document is supported by a data workbook and can be found on the ESO website here: https://www.nationalgrideso.com/publications/winter-outlook
Operability Strategy Report	Q1 and Q3 2019-20 & 2020-21	Target date met	Complete to date. We published our Operability Strategy Report 2019 Summer Update in summer 2019 and Operability Strategy Report 2020 in December. The reports can be found here: https://www.nationalgrideso.com/document/146506/download https://www.nationalgrideso.com/document/159726/download Our Operability Strategy is framed around the ESO's 2025 net zero carbon ambition. Key messages from the report include that the ESO will split its new frequency response products between pre and post-fault to allow a more transparent assessment of procured volume against operational requirements.
Forecasting			
Publish Forecasting Strategy Project Roadmap	Q1 2019-20	Target date met	Completed. The Energy Forecasting Strategic Project Roadmap outlines our plan to replace our existing forecasting system with a new advanced Platform for Energy Forecasting, redesign current processes,

Deliverable	Target delivery date	Actual delivery date	Status
			and apply advanced machine and deep learning modelling techniques and automation to drive efficiency. The document was published in June: https://www.nationalgrideso.com/document/145941/download
Publish half-hourly photovoltaic (PV) forecasts to market, 24 times a day	Q1 2019-20	Target date met	Completed. We have delivered improved and more frequent embedded forecasts to the market. Since June, we have been publishing data 24 times a day here: http://cdsasharedprod.uk.corporg.net/efs_demand_forecast/faces/%20DataExplorer
Publish four additional wind forecasts to the market	Q2 2019-20	Target date met	Completed. We have doubled the number of wind forecasts published to the market, providing more up-to-date information which the market can use to balance its position. The forecast can be found here: https://www.bmreports.com/bmrs/?q=generation/windforcast/out-turn.
Publish an additional Day-Ahead demand update at 12:00pm every day	Q2 2019-20	Target date met	Completed. We now publish an additional day ahead demand update to provide an updated demand forecast which incorporates the latest weather forecast, which can be found here: http://cdsasharedprod.uk.corporg.net/efs_demand_forecast/faces/%20DataExplorer
Make energy forecasts more accessible via a dedicated website and Application Programming Interface (APIs)	Q3 2019-20	Target date met	Completed. All market participants are now able to obtain our half hourly embedded renewable generation forecasting data; Photovoltaics (PV) and wind, through an Application Programming Interface (API), supplementing the current e-mail and website services. Using the API, market participants will be able to select the 24 most recent forecasts and obtain them as a JSON or CSV file.
Information access			
Open Data (ESO Data Portal)	Q3 2019-20	Target date met Data explorer page on website: Q1 2019-20, New data portal: Q3 2019-20	Completed. The ESO Data Portal beta version is now live and can be accessed here: https://data.nationalgrideso.com/

A.5 Stakeholder views

- ✓ Engaged with 109 new organisations when developing this year's Future Energy Scenarios
- ✓ We held over 20 external engagement sessions for the Data Portal, receiving positive feedback at each one
- ✓ Stakeholder satisfaction scores for the Operational Forum improved from 5.9/10 in July to 8.5/10 in October
- ✓ Stakeholders found our monthly ENCC visits to be informative
- ✓ Established weekly customer and stakeholder webinars to keep the industry up to date on our business continuity plans on COVID-19
- ✓ Stakeholders noted improvements to Loss of Mains application process

Uninterrupted, safe, secure system operation

Stakeholder engagement for 9 August Incident

On 9 August 2019 approximately one million customers lost power as a result of a series of events on the electricity system. These events caused significant disruption to many people in their homes and businesses, and to rail services in and around London.

On 6 September 2019, the ESO published a technical report[8] on the events of 9 August 2019. This was the result of comprehensive internal analysis, together with input and analysis from key stakeholders such as NGET, Orsted, RWE and Govia Thameslink Railway. This report was well received by stakeholders, and has formed the basis of wider reviews by the industry.

Ofgem[9] and the Energy Emergencies Executive Committee[10] (E3C) also investigated the events and produced reports. The Ofgem report stated that *"The ESO performed well in restoring the system given the amount of generation that was lost."*

We continue to keep industry informed on our website[11].

Stakeholder engagement under COVID-19

The COVID-19 pandemic has had a significant impact on all of society, and that the whole energy industry currently finds itself operating in a different environment than would have been anticipated only a few months ago. This includes the ESO, whose activities have been impacted not only by social distancing requirements, but the impact of changing demand patterns on real-time operation and system operability.

We have started a weekly customer and stakeholder webinar to keep the industry up to date on our business continuity plans during this difficult time, discussing the impact of the pandemic on demand and operability and seeking feedback on how we met operating challenges. In those webinars we have been talking about the need for flexibility and the importance of providers telling us what they can offer – we have also talked explicitly about super Stable Export Limit (SEL) contracts.

The webinars have been well attended, with participation from BM players and service providers, industry associations and network companies. The question and answer sessions have featured

[8] https://www.nationalgrideso.com/document/152346/download
[9] https://www.ofgem.gov.uk/system/files/docs/2020/01/9_august_2019_power_outage_report.pdf
[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/855767/e3c-gb-power-disruption-9-august-2019-final-report.pdf
[11] https://www.nationalgrideso.com/information-about-great-britains-energy-system-and-electricity-system-operator-eso

numerous questions about downward flexibility services, which is a priority area of work for us at the moment. We have made the slides and recordings from these webinars available on the ESO data portal[12].

Our market participants contacted us to understand some of our operability issues under the COVID-19 situation. We explained that we are experiencing low demand, with high volumes of solar and wind energy which makes balancing the system more challenging. Transparency of real-time decision-making information, and hence a better understanding of real time operational issues allows market participants to review and submit their operational data appropriately to better meet system needs and facilitate more efficient and cost-effective operation.

We have received some great feedback from these webinars, showing that our increased transparency around decision making has been valued by our stakeholders:

- *"This has been very useful." – generator*
- *"Thanks guys - these are well received" – generator*
- *"Super useful - thanks!" – generator*
- *"Very useful to put the recording of the webinar up on your website. Now catching up after discovering them when looking at the Optional Downward Flexibility docs… especially liked the waterfall chart and the associated breakdown into market and NG despatch/redespatch." – generator/supplier*

Transparency of data used in ENCC and close-to-real-time decision making, and Information access

We asked our stakeholders what we can do to improve the transparency of the information we provide on BSUoS. We received responses as follows:

- *"Perhaps a little more narrative by month on the key influences on the exceptional events and £ consequences." July 2019*
- *"Deeper analysis of drivers to BSUoS costs and key areas of investigation, key issues and where NG would like feedback and input from stakeholders." July 2019*
- *"In the MBSS, provide the total spend of all products separately and together, e.g. publishing the total costs of all bids and offers separately without netting the costs. This will help to increase transparency and help users to understand the actions taken by the ESO." July 2019*
- *"The monthly reports to be published sooner. Daily cost reports are published a few days later and are used to review previous month's costs; by the time the monthly reports come out business focus has moved on and they're of limited use." October 2019*
- *"I think you did a grand job. Well done to you all." October 2019*

We have been paying close attention to our stakeholder feedback and understanding their requirements via operational forums. We have improved our narrative to include the analysis on key events that had a large commercial impact in the BSUoS and Monthly Report outputs[13]. We have also added more data to the Monthly Balancing Service Summary (MBSS)[14] following various feedback we received on this and other occasions. We have considered the suggestion to publish the monthly report sooner, however this is not possible due to the timescales required to obtain the data. We will continue to work closely with our stakeholders to improve our data transparency.

Electricity operational forum and stakeholder engagement

[12] https://data.nationalgrideso.com/plans-reports-analysis/covid-19-preparedness-materials
[13] https://www.nationalgrideso.com/balancing-data/system-balancing-reports
[14] https://data.nationalgrideso.com/balancing/mbss

The ESO held a successful Electricity Operational (Ops) Forum at Faraday House in Warwick on 23 October 2019. The Ops Forum focuses on operational and commercial issues associated with the operation of the electricity transmission system. Over 150 delegates from across the industry attended, and particularly welcomed the sessions giving an overview of the 9 August incident and an update on our Pathfinder projects. An IT Change Forum also ran throughout the day where attendees could learn about the ESO's work to enable future changes to markets. Feedback and engagement from delegates have been very positive, with a current score of 8.4 out of 10 (compared with 5.9 out of 10 in July 2019) on the feedback survey and over one hundred questions on a wide range of topics.

We had moved the venue from central London to Warwick in order to make it more accessible for those based in the north of the country. Holding the event in Warwick also meant that we were able to run many more stands during the lunch break, as members of the wider team could facilitate these. Feedback from our stakeholders told us:

- *"Good overview and answers to tabled questions" October 2019*
- *"Good location at Warwick and scope of material / subjects were very helpful" October 2019*

We have invited industry stakeholders to visit our Electricity National Control Centre (ENCC), where we introduce our operational activities and challenges to help them better understand how we make real time decisions and how the electricity market operates. We have received positive feedback and some suggestions:

- *"Good. It would be good to present a sample day of trading, balancing and ancillary services."*
- *"Was interesting to see how complex the decisions can be and I found out that a lot of the decisions are not just energy based as there are more constraints than I realised."*
- *"Very insightful. Hopefully be able to send another nBS cohort."*
- *"It was interesting. I would've liked it to be more interactive and for there have been a tour of the facility. Perhaps consider having a separate tour for current National Grid employees from NGET."*
- *"[We want to see] information on forecasting methodology and a high-level overview slide on how NGESO is split into its difference departments, i.e. commercial, operations, etc."*
- *"[We want to see] the information about Inertia, voltage/reactive power, thermal, margin, and the reasons why you choose a plant in the BM."*

We took these suggestions on board, and worked not only on improving our ENCC visitors' experience, but also published more operational data on thermal constraints and voltage costs in our data portal[15] to increase transparency around our real time operations. We have been working on these comments and improving our visitors' experience on the ENCC visit days.

Addressing operational issues

We have developed the Loss of Mains (LoM) programme to implement distribution code modification DC0079 to decrease the risk of distributed generator shutdown and reduce the balancing costs incurred in securing system faults. The LoM programme is structured with four work streams reporting to a steering group, which gives affected stakeholders the opportunity to observe and challenge programme performance and to set direction.

The first application window for Loss of Mains closed in November 2019. Over 2,000 applications were submitted successfully prior to being assessed and, where acceptance criteria were met, accepted for payment in return for changing Loss of Mains settings. The project has made good progress and has approved 1993 applications for a capacity of 4352MW at a cost of approximately £6m. There is the

[15] https://data.nationalgrideso.com/data-groups

potential to save up to £10m in 2020-21, assuming that a high proportion of the applications deliver successfully.

The Window One report[16] has been published on various websites. Window Two is now closed, it addresses known issues from Window One. Results from Window Two report[17], and an early view of conversion rates from Window One, is now available.

We carried out a survey of embedded generators that applied for funding to implement Loss of Mains protection changes through the Accelerated Loss of Mains Change Programme. Around 88% of respondents felt that the application process was either straightforward or better.

Operational insights

The ESO Data Portal beta version went live on 31 December 2019. In addition to be a key deliverable under Role 1 of our current Forward Plan, the portal will also support delivery of the RIIO 2 Business Plan, and will be central to meeting the evolving data best practice guidance from the Energy Data Taskforce. Via the portal we intend to address the feedback our stakeholders have provided regarding the discovery, understanding and consumption of our data, whilst also providing a purpose-built platform to support sharing new datasets.

In response to stakeholder feedback on the transparency of data relating to our balancing actions, we now provide data through a Data Portal. This allows access to considerably more of data, much closer to real time. This has been well received by generators and suppliers. We have now done around 20 external engagement sessions, and without exception, we have had positive feedback on all occasions. Some of the quotes captured:

- *"Overall I'm excited by the portal and what it can offer" – service provider*
- *"There is a surprising level of detail on the API already which is good." The portal "looks fantastic and is a huge step progression" - utility*
- *"What [NGESO] has done with the data portal is really good" – utility*
- *"Well described data is critically important" – generator*
- *"It's good to have all the data in one place!" – energy company*
- *"Looks fantastic and is a huge step progression!" – anonymous*
- *"The portal has also received endorsement from the Energy Data Task Force." – anonymous*

Upgrade of information systems

We have developed a new Ancillary Services Dispatch Platform (ASDP) system, and have now migrated the Short Term Operating Reserve (STOR) service over to this platform. The new ancillary services platform forms the second part of our Platform for Ancillary Services (PAS) programme, which includes updating the Service Provider and Contracts Management platform, ASDP and the Settlements platform. For providers, we have been supporting them on the development of their platforms and migrated them over from the old Standing Reserve Dispatch (SRD) system since October. The support the project team has given to providers has been well received, as they have had a technical contact to support them throughout.

The deployment of the new ASDP system will ensure that we are compliant with relevant EU codes, whilst improving the flexibility of the STOR service. We also engaged with service providers, providing support for their technical issues and sharing our best practice. We have received some good feedback from our providers:

[16] https://www.energynetworks.org/assets/files/ALoMCP%20-%20Window%20One%20Report%20v22Jan2020.pdf
[17] https://www.nationalgrideso.com/document/167636/download

- *"I've already been talking to [technical contact] a lot and he's been very helpful!" – provider*
- *"Nice to see NG taking care of small players." – provider*
- *"Helps us when we go on conference calls knowing who we are speaking with." – provider*
- *"Can we continue this collaboration throughout the project?" – provider*
- *"It's good to have single point of contact for technical queries." – provider*
- *"Your visit has prompted us to start the ball rolling. Thank you for taking time to visit us" – provider*

We are continuing to integrate the new and existing interconnectors into our operational systems, both for agreed changes to operational processes or in preparation for the connection of a new interconnector, e.g. changes to intraday schedules on Nemo link and the connection of new interconnectors: IFA2, Eleclink and North Sea Link. This has involved working closely with the interconnector owners as well as the connecting Transmission System Operators (TSOs) through regular bilateral and trilateral meetings.

Insight 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, 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. Although this work is a licence obligation, it is something we seek to continually improve based on feedback from our stakeholders.

We work with stakeholders to gather information and test our thinking, as well as to share the conclusions of our analysis. During the year of 2019 we engaged widely with our stakeholders to listen and discuss with them, calling on their expertise. We have reached out to 224 unique organisations from nine main different stakeholder categories including 'energy industry', 'innovators' and 'regulators'. Across all our activities we have engaged with 590 stakeholders in total. During 2019 we engaged with 109 new organisations compared to 2018.

Our *Shaping FES 2020* online Call for Evidence was shared with the breadth of our stakeholder community of nearly 6,500 people providing the opportunity for all to provide us with evidence and insight on specific subjects. Our bilateral engagement has been a key focus for *FES 2020*. For this coming year's scenarios, we have reached out to 67 different organisations and spoken to a range of new organisations, including some beyond the GB energy industry such as RTE, the electricity transmission system operator of France. The experience and insight gathered from these meetings is an integral part of our engagement programme.

We have held several collaborative engagement events with stakeholders for *FES 2020* as part of the autumn engagement programme, specifically to focus on the Scenario Framework and Scenarios. This engagement provided early input into our thinking and was definitive in shaping the new framework. We also commenced the *FES: Bridging the Gap to net zero* programme during autumn and held the first workshop focusing on the use of bioresources in the context of a net zero emissions target.

Stakeholder feedback last year highlighted that stakeholders wanted us to collaborate with them more and we have sought to address this in the following ways:

- We have taken a different approach to our engagement, tailoring it to our stakeholders' needs and providing more bespoke sessions. This included a change in our events for the *FES 2019* launch programme. We undertook a briefing for Ofgem and BEIS (Department for Business, Energy and Industrial Strategy) to discuss our analysis and key messages prior to publication. On the day of FES publication, we hosted a morning briefing where we shared the *FES 2019* key messages and spoke with industry leaders about their views of the *Future Energy Scenarios*.
- Our conference was then held a week after publication which enabled attendees to fully review the document beforehand. This meant that discussion was more focussed on the data and analysis of the document, providing much more meaningful engagement for us and for our stakeholders.
- In our autumn engagement, we sought a broad range of industry opinion in using our *Shaping FES 2020* Call for Evidence and FES newsletter. This was done alongside a renewed focus on who we are engaging with and why, to ensure we get the necessary expert opinion whilst also considering a broader range of stakeholders.
- We have tailored further engagement to seek collaborative opportunities to engage with industry experts on specific topics, including the revised Scenario Framework, and the use of bioresources as part of the *FES: Bridging the gap to net zero* programme. This engagement has enabled us to deepen our understanding and provide challenge to our early FES design and Scenario Framework.

We received the following feedback from the stakeholder FES 2019 launch events:

FES 2019 launch executive briefing – Thursday 11 July 2019, County Hall, London, 52 delegates

- *"The change to this year's structure is having the launch first then conference a week later. Having a week in between to think about it all is a good idea." – Energy Industry Trade Association.*
- *"I think it's the access to documents early. Now there is a two-stage process which I support fully. Also, the briefing was extremely good and pitched at the right level" – Gas Distribution Network.*

- *“Their interaction within the industry with us, they reach out with everyone which is fantastic. I feel like they listen to my point of views and they are also reacting to what's going on from a regular basis.” – Renewable energy company.*
- *“They listened to all of our views and the one to one engagement with them have been positive throughout the organisation.” – Gas Distribution Network Owner*.

FES 2019 launch conference – Thursday 18 July 2019, NEC, Birmingham, 188 delegates

- *(FES 2019) “The most 'listening' and 'open to ideas' that I've ever seen” – anonymous*
- *“Very thorough and rigorous analysis” – anonymous*
- *“Timed allowed for Q&A for good discussions to develop” – anonymous*
- *“Networking and discussion. Opportunities to discuss with NG FES analysts” – anonymous*
- *“Printing the conference slides and putting them in the arrival hall for discussion was a great idea – anonymous*

Outlook Reports

We published the Winter Review and Consultation document in June 2019. This document looks back at last winter and compares the outturn data what happened with that year’s Winter Outlook forecast. The consultation included in this report sought to gather stakeholder insight to inform our analysis for the 2019-20 Winter Outlook report. Feedback received as part of this consultation showed further that stakeholders supported the new report format.

We published the 2019-20 Winter Outlook report in October 2019. The report demonstrated our work and showed that for the coming winter we had the right products and strategies in place to balance the system. We took on board feedback we received on the Summer Outlook Report and implemented the changes when we were writing the Winter Outlook Report. The report also evolved to reflect our stakeholders’ feedback from the consultations. As Fintan Slye, Director of National Grid ESO, commented, “Looking at electricity specifically, it’s our ambition to be able to operation the GB electricity system carbon free by 2025, and it’s only through listening to stakeholders, and sharing our insight in reports such as this, that we can move forward toward our goals”.

Our stakeholders commented positively on the Winter Outlook report:

- *“The format of the report is now easily digestible for consumers. The new format and layout make the report more ‘user-friendly’.” – energy company*
- *“We find these reports useful to assess how the past winter went according to predictions.” – energy company*
- *“I’d just like to say I like the presentation of this, including the prominence of whole systems. I think the clicks to enlarge graphs and for more information are really good too.” – trade association*
- *“We find National Grid’s (NG) review of how the previous winter compared to expectations useful, particularly where it focuses on the reasons for the differences between forecast and actuals.” – energy company*

Operability Strategy Report

We published the Operability Strategy Report 2020 in December 2019. It summarised our work towards meeting the future operability challenges, the link to zero carbon operation, and how stakeholders can engage to help achieve this. We have been continuously working with industry to create new ways of managing thermal constraints by increasing the visibility and control of embedded units, and by exploring new post-fault constraint management services. This increases network capacity, which benefits providers by increasing system access. It is also important for us to ensure our technical topics are explained properly and clearly to reach a wider audience in future.

One stakeholder described it as *"This is a very useful overview. There is a lot of work being taken forward here, which chimes with the need to commoditise flexibility services."* They also stated that *"The document provides a clear and transparent view for stakeholders on the work the ESO is undertaking and on how they can get involved in the process."* At the operational forum the overall feedback regarding the report was ''Good'' with many attendees saying it is useful and informative.

Forecasting

The Platform for Energy Forecasting (PEF) project is expected to deliver core forecasting capability for ESO by Q4 2020-21, and we anticipate that the full benefits of the project will be realised by summer 2022. At the mid-year panel event, the ESO was asked to provide "evidence of what positive impacts improving forecasting accuracy has had on its operations, to the benefit of the consumer". We listened to feedback from our stakeholders and we are planning to update our PEF roadmap in Q1 2020-21 with further information on how this feedback will be addressed in the PEF project. More accurate forecasts will naturally allow market participants to reduce their exposure to imbalance charges and it is expected that this will be the main customer benefit resulting from completion of the project. This project has been progressed using the agile methodology which means that it will be built and tested in a modular fashion. This allows some of the benefits of PEF to be realised before the project is complete. As part of this project we have facilitated an Application Programming Interface (API) with our half hourly embedded renewable generation forecasting data, photovoltaics (PV) and wind for all market participants supplementing the current e-mail and website services. This will be of benefit to customers who want to access forecasting data more easily.

Our stakeholders said:

- *"Thanks for this, I've been hoping NG would transition datasets on Data Explorer to APIs - I'll start using this immediately." – university*
- *"Having this data available through an API is a real improvement over the use of email" – utility*

A.6 Outturn performance metrics and justifications

Metric	Performance	Status	Justifications
Metric 1: Balancing Cost Scorecard	£1268.4m outturn against £1101.1m end of year benchmark	●	During 2019-20, the ESO has managed the power system through changing conditions. Although we have taken action within the year to resolve these issues in the short term, many of them require more strategic long-term actions to address the root cause of the issue, which we are also progressing.
Metric 2: Information Provision Scorecard	The majority of publications and reports within our control were published in full and on time, with the exception of one report.	●	We consistently demonstrated green for all reports other than the Fast Reserve (FR) Market Information Report (MIR). There were two errors identified, which we rectified in time for March 2020.
Metric 3: Energy Forecasting Accuracy	Demand forecast target met in eight months of the year, wind forecast target met in six months of the year	●	We note that Demand and Wind forecasting are becoming more difficult due to the changing mix of generation on the system. 2019-20 also saw unexpected challenges in wind forecasting due to multiple storms, and demand forecasting in March due to COVID-19.

Figure 1: Summary of metrics for Role 1

- ● **Exceeds benchmark**
- ● **In line with benchmark**
- ● **Below benchmark**

Metric 1 – Balancing cost management

For a monthly breakdown of costs, please refer to our balancing costs webpages[18].

Month	Benchmark cost (£m)	Additional cost forecast due to WHVDC fault (£m)	Benchmark adjusted for WHVDC (£m)	Outturn cost (£m)
April	83.2	11.3	94.5	80.1
May	97.5	11.2	108.7	60.8
June	75.3	1.0	76.3	85.8
July	85.6	0	85.6	67.2
August	87.4	0.5	87.9	105.2
September	96.6	1.0	97.6	107.4
October	103.3	0	103.3	130.3
November	98.4	1.5	99.9	86.5
December	91.0	0	91.0	130
January	82.6	8.1	90.7	144.8
February	81.9	2.6	84.5	148.9
March	81.1	0	81.1	121.4
Total	**1063.9**	**37.2**	**1101.1**	**1268.4**

Figure 2: Monthly balancing cost benchmark and outturn.

Note that we are including an adjusted benchmark figure due to the unplanned unavailability of the Western HVDC link during several months of the year.

Supporting information

For the whole 2019-20 year, outturn balancing costs have been higher than expected, meaning that our performance was **below the benchmark.**

The ESO is operating in an increasingly challenging environment, as decarbonisation, decentralisation and digitalisation drive significant change across the electricity network. This impacts on the costs of securing the system. These challenges, which we set out in our Operability Strategy Report[19], can be summarised as follows:

- **Frequency:** Frequency control encompasses response, reserve, balancing markets and services and the wholesale energy market structure. National Grid ESO will facilitate zero carbon operation by 2025. We will enable the participation of new sources of flexibility, and open and simplify our range of balancing services. In 2019-20 we spent £488.3m on managing frequency issues, compared to £380.8m in 2018-19.
- **Voltage**: As our requirement for reactive power grows and its provision from traditional sources of large synchronous generation becomes less certain, we must find new sources of voltage control and enable wider participation in reactive power commercial services. In 2019-20 we spent £64.8m on managing voltage issues, compared to £83.1m in 2018-19.

[18] https://www.nationalgrideso.com/balancing-data
[19] https://www.nationalgrideso.com/document/159726/download

- **Restoration (Black Start):** In the unlikely event of a partial or total system shutdown, we need the capability to restore the system. In the past, this capability has been provided by large synchronous transmission connected generation. The future energy mix will be more diverse, and generation is becoming less centralised. These changes provide an opportunity and a necessity to develop new approaches to restoration. In 2019-20 we spent £45.8m on restoration services, compared to £48.9m in 2018-19. Please note that spend associated with restoration services does not feed into the overall calculation of balancing spend.
- **Stability:** We have relied on the inherent qualities of synchronous generators to help maintain a stable system. However, the availability of these traditional sources is declining. To deliver zero carbon capability by 2025 it is essential to find additional sources for these stabilising qualities and develop transparent procurement methods. In 2019-20 we spent £209.9m on managing stability issues, compared to £143.7m in 2018-19.
- **Thermal**: The electricity network has physical limitations on how much power can be transmitted through every piece of equipment. To keep within these limits and operate a zero carbon network, we must deliver new tools, enhance current systems and create whole-system efficiencies to manage these constraints and reduce consumer costs. In 2019-20 we spent £505.4m on managing thermal constraints, compared to £533.6m in 2018-19.

These operability challenges manifest as the different categories of costs incurred in securing the system, which are shown in the graph below.

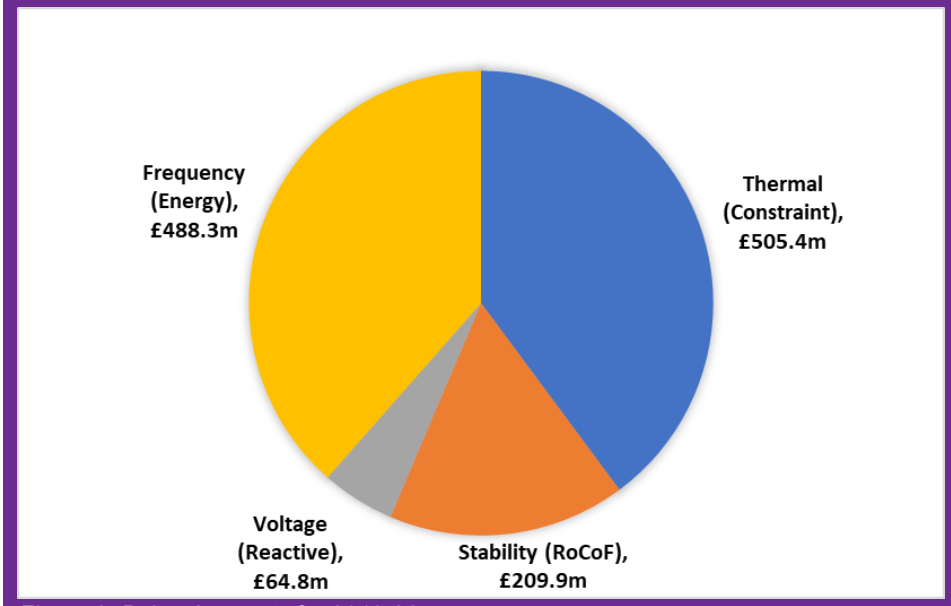


Figure 3: Balancing costs for 2019-20

During 2019-20, the ESO has managed the power system through changing conditions, which are outlined below. Although the ESO has taken action within the year to resolve these issues in the short term, many of them require more strategic long-term actions to address the root cause of the issue. We set out how we are acting to resolve each issue, both in the short term and in the long term. However, it is important to note that these operability challenges are closely related and cannot be addressed in isolation. Any action taken will have subsequent impacts on other areas of system operation and therefore need to be tackled holistically.

<u>Increasing wind generation:</u>

- 2019-20 saw high wind speeds in comparison to previous years, as well as the connection of over 2GW of new wind generation. Much of this wind generation is located in Scotland, whereas the majority of energy demand is in England.
- It can be difficult to export the power generated by these wind farms from Scotland to England, due to the limited capacity of the circuits which cross the border. This issue is made worse when the Western HVDC link is not fully available, which has been the case for significant portions of 2019-20.

- When this power cannot be exported from Scotland to England, the ESO can incur two types of costs: paying the wind farms in Scotland to reduce their generation (to compensate them for lost renewable subsidies), and paying generation in England to increase its output (to make up for the lost generation in Scotland). These costs are referred to as constraint costs.
- **In the short term**, the ESO manages this issue in several ways: agreeing trades with counterparties ahead of Balancing Mechanism timescales (where this is expected to result in lower prices), competitive procurement of balancing services, and real-time optimisation where the ENCC continually re-assesses the balancing instructions which are currently active.
- **In the long term**, the ESO runs the Network Options Assessment process, which optimises between balancing and infrastructure costs, recommending the solution which is expected to be most beneficial for consumers in the long term. The ESO is also progressing the Constraint Management Pathfinder, which aims to provide a long term commercial product to manage network constraints.

Generation sources which do not help to stabilise the system:

- A large amount of the UK's energy now comes from wind farms (a record of over 17GW was recorded on 2 January 2020), solar panels (a record of 9.6GW was recorded on 20 April 2020) and interconnectors. These are "non-synchronous" generation, whereas coal and gas plant are "synchronous" generation.
- The more synchronous generation on the system, the higher the system inertia, meaning that it is easier[20] to keep the frequency within its normal range of variation. Inertia typically comes from large spinning plant, such as coal and gas-fired power stations.
- Certain types of renewable generation have relay settings which mean that they incorrectly disconnect from the system in the event of a sudden change in frequency, which can compound the system issue if the frequency is falling.
- Very low levels of inertia make it difficult to operate the system at a stable frequency. To avoid this, we can change the generation mix, or avoid the possibility of sudden large changes in generation- but these actions come at a cost. This category of cost is known as RoCoF: Rate of Change of Frequency.
- **In the short term**, the ESO can take action to change the mix of generation on the system at a given time, or limit the size of the potential loss of generation due to a single event. This can be done by trading with counterparties ahead of Balancing Mechanism timescales, which can include trades with parties who have purchased capacity on interconnectors (to reduce the flow on the interconnector). We are also co-ordinating the Loss of Mains Protection programme, which is changing relay settings so that these types of generation do not disconnect from the system so easily.
- **In the long term**, we are progressing the Stability Pathfinder to explore alternative sources of inertia. We are also developing a tool to measure inertia, and progressing changes to industry codes to accommodate new types of technology which could assist with this issue.

Changes to the generation mix have increased the volume of balancing services required by the ESO:

- The increasing proportion of renewable generation connected has caused greater uncertainty, as renewable generation is less predictable and controllable than conventional fossil fuel generation.
- This increased uncertainty means that, in order to ensure that electricity demand can be matched by generation and maintain the frequency at 50Hz, the ESO must pay other market participants to react to any unanticipated changes in generation or demand. This can take two forms:
    - Response- frequency response services ensure that deviations in system frequency are mitigated within seconds
    - Reserve- reserve services provide additional sources of power over longer timescales, in the form of either increased generation or reduced demand

[20] Corrected on 11 May 2020

- Increased uncertainty has led to an increased requirement for both response and reserve services, leading to higher balancing costs for the ESO.
- **In the short term**, the ESO trades with counterparties ahead of Balancing Mechanism timescales, where this is more cost-effective than taking actions within the Balancing Mechanism. The ESO agrees competitive contracts with service providers, and is investing in the Platform for Energy Forecasting to obtain improved demand and generation forecasts.
- **In the long term**, the ESO has developed the Response and Reserve Roadmap, which sets out our plans to reform the design of these services to ensure they can support carbon-free operation by 2025. This will result in a new suite of frequency response and reserve products, as well as new response providers. This will increase competition in the market, placing downwards pressure on prices.

<u>COVID-19</u>

- The COVID-19 pandemic has resulted in changes to demand patterns, with overall demand reducing due to a lack of industrial and commercial demand.
- These unprecedented events led to considerable demand uncertainty in the second half of March, this has led the ESO to take more action in securing the system against the five operability challenges which has increased the costs of managing the system.
- **In the short term**, the ESO has enacted its Business Continuity arrangements, involving remote working and social distancing within the Control Room. The ESO has analysed the evolving patterns in electricity usage, and taken additional actions to secure the system.
- **In the long term,** the ESO continues to analyse summer operability requirements, procuring new balancing services to be used in periods of low demand (such as bank holidays). The ESO continues to assess generator and network resilience as part of its long-term planning activities. The ESO has also re-prioritised its suite of projects, ensuring that those trained to work in the Control Room are able to do so, and that key expertise is focussed on the challenges of operating the system during periods of low demand over the summer.

<u>Comparison to 2019-20 benchmark</u>

Taking into account all of the effects above, it is not possible to put together a straightforward model to accurately forecast the costs of securing the system. A benchmark figure exists for each month, which is derived from balancing costs in previous years with a number of adjustments for known issues such as HVDC availability, South East reinforcement work, RoCoF and Vector Shift, as described in the 2019-21 Forward Plan.

The ESO meets with Ofgem on a monthly basis, and the costs of securing the system in the previous month are a standing item on the agenda. The comparison of costs to the monthly benchmark is a starting point for the discussion, where the ESO highlights any trends that it has observed, as well as describing some of the short-term actions it has taken to secure the system.

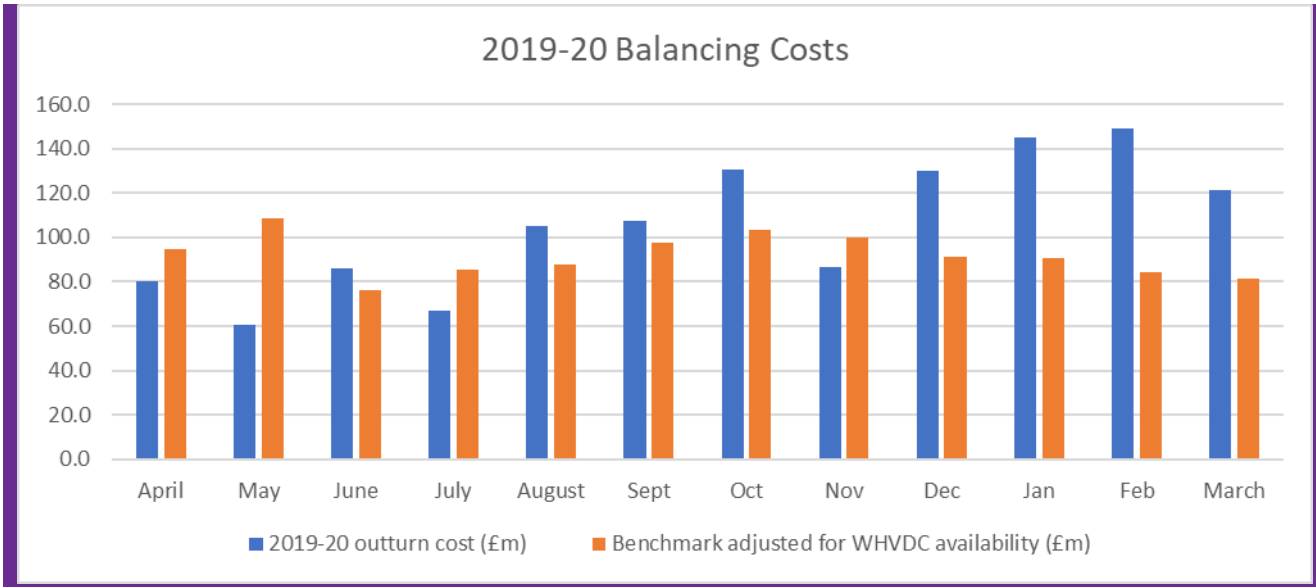


Figure 4: 2019-20 Balancing Costs

The graph above shows a general trend of outturn costs being higher than the benchmark, which can be explained by the trends described above. Note that the benchmark figures are adjusted to take into account the availability of the Western HVDC link, which was not fully available for significant periods during 2019-20: this figure is calculated based on the assumed benefit of the Western Link. We describe in more detail below the four months where the outturn cost was most different from the benchmark.

- May 2019: outturn £60.8m, benchmark £108.7m
  - Constraint costs were the lowest of the year (£13m) due to low levels of wind.
  - Scottish Wind output for the month was the lowest of the year at 0.9TWh
  - Western HVDC link was unavailable for the whole of May, resulting in an upward adjustment to the benchmark
- January 2020: outturn £144.8m, benchmark £90.7m
  - The Western HVDC Link was unavailable from 10 January onwards, making it challenging to operate the system on days with high wind levels. This led to power flow restrictions on the Scotland-England boundary, requiring large volumes of Balancing Mechanism actions as described above.
  - There were several days of sustained high winds, with wind generation in excess of 10 GW and Scottish Wind output was the highest of the year at 2.5TWh
- February 2020: outturn £148.9m, benchmark £84.5m
  - February 2020 was an especially windy month, with storms Ciara and Dennis on consecutive weekends and the Western Link unavailable for the early part of the month.
  - Sustained high wind levels at times of low demand (at the weekend) mean that large volumes of Balancing Mechanism actions were required to manage the power flow restrictions in place in Scotland, and on the Scotland-England boundary.
  - Later in the month, a combination of planned outages on the transmission system, and network faults, resulted in further restrictions on the network, which led to additional constraint costs being incurred.
  - The combination of high levels of wind, and low demand due to mild temperatures, meant that the proportion of non-synchronous generation was higher than usual, meaning that levels of inertia were low, and high RoCoF costs were incurred.
- March 2020: outturn £121.4m, benchmark £81.1m
  - The COVID-19 pandemic and associated lockdown led to a significant change in electricity usage.
  - In the early days of the lockdown, demand forecasting was extremely difficult, as there was no reliable historic data with which to predict demand patterns. This meant

that increased volumes of reserve and response were required, to ensure that the system frequency remained within limits even if demand patterns were different from expected. This resulted in increased costs being incurred to secure the system. However, our analysis of demand patterns, and rapid response to this analysis, kept these costs lower than they otherwise would have been.
    - Reduced demand has led to an increased proportion of renewable generation on the system, which has led to lower levels of system inertia. This has resulted in record high RoCoF costs being incurred than would have been anticipated.

Additional detail on the costs incurred to secure the system can be found in our monthly and quarterly reports[21] published on our website throughout 2019-20.

For full details of this monthly metric, see page 21-23 of our Forward Plan

[21] https://www.nationalgrideso.com/our-strategy/how-were-performing

Metric 2 – Information Provision Scorecard

This metric demonstrates our performance in publishing a large range of information in full and on-time.

April 2019 to September 2019 performance

Information Provision	Frequency	Deadline and Target	Apr	May	Jun	Jul	Aug	Sep
MBSS	Monthly	Each monthly report published by the end of the following month	●	●	●	●	●	●
Daily Cost Summaries	Daily	85% of reports produced within 2 working days	●	●	●	●	●	●
Trades	Daily	97% of trades published within 1 hour	●	●	●	●	●	●
BSUoS Reports	Monthly	Monthly BSUoS report published by the 10th working day	●	●	●	●	●	●
Market Information Reports	Monthly	FFR Monthly report published on time (as per schedule) and right first time 100% of the time	●	●	●	●	●	●
Market Information Reports	Monthly	FR Monthly report published on time (as per schedule) and right first time 100% of the time	●	●	●	●	●	●
Market Information Reports	3x/year	STOR market report published on time (as per schedule) and right first time 100% of the time	N/A	N/A	N/A	●	N/A	N/A
Daily BSUoS Forecast	Daily	100% of forecasts published by 08:00 at day ahead stage for Tues-Sat and 17:00 on Fri for Sun & Mon	●	●	●	●	●	●
Demand Forecasts	Daily	100% of forecasts published on time. Forecasts published every day no later than 9:15am	●	●	●	●	●	●
Wind forecasts	Daily	100% of forecasts published on time. Forecasts published every day no later than 9:15am	●	●	●	●	●	●
Trades	Daily	97% of trades published within 1 hour	●	●	●	●	●	●

October 2019 to March 2020 performance

Information Provision	Frequency	Deadline and Target	Oct	Nov	Dec	Jan	Feb	Mar	Overall status
MBSS	Monthly	Each monthly report published by the end of the following month	●	●	●	●	●	●	●
Daily Cost Summaries	Daily	85% of reports produced within 2 working days	●	●	●	●	●	●	●
Trades	Daily	97% of trades published within 1 hour	●	●	●	●	●	●	●
BSUoS Reports	Monthly	Monthly BSUoS report published by the 10th working day	●	●	●	●	●	●	●
Market Information Reports	Monthly	FFR Monthly report published on time (as per schedule) and right first time 100% of the time	●	●	●	●	●	●	●
Market Information Reports	Monthly	FR Monthly report published on time (as per schedule) and right first time 100% of the time	●	●	●	●	●	●	●
Market Information Reports	3x/year	STOR market report published on time (as per schedule) and right first time 100% of the time	●	N/A	N/A	N/A	●	N/A	●
Daily BSUoS Forecast	Daily	100% of forecasts published by 08:00 at day ahead stage for Tues-Sat and 17:00 on Fri for Sun & Mon	●	●	●	●	●	●	●
Demand Forecasts	Daily	100% of forecasts published on time. Forecasts published every day no later than 9:15am	●	●	●	●	●	●	●
Wind forecasts	Daily	100% of forecasts published on time. Forecasts published every day no later than 9:15am	●	●	●	●	●	●	●
Trades	Daily	97% of trades published within 1 hour	●	●	●	●	●	●	●

Figure 5: Information Provision Scorecard

Supporting information

Most of our reports have consistently delivered green for the whole of the 2019-20 performance year. The majority of publications and reports within our control were published in full and on time. The exception was the Fast Reserve (FR) Market Information Report (MIR). There were two errors in the fast reserve utilisation analysis spreadsheet which lead to three of the five tabs in the MIR data file, which gets published on the National Grid ESO website[22], being incorrect over a period of time and these were:

- An incorrect formula to calculate the total monthly utilisation for settlement period 48 in the "2.1 Utilisation Monthly Data" tab and to calculate the total monthly utilisation above a utilisation price of £200 per MWh in the "2.2 Utilisation volume by price" tab. When the Platform for Ancillary Services (PAS) system came on line, this data was omitted from the data tabs in the data file. These tabs were incorrect in the December 2018 (published in October 2018) to September 2019 (published in July 2019) inclusive data files. The formula has now been corrected and these tabs have now been correct since the MIR October 2019 (published in August 2019) data file.

- One particular provider's data being overwritten and then truncated to cover only the previous 12 months led to an error in the "2.3 Utilisation by time" tab in that it omitted some or all of the fast reserve instructions to this provider between December 2016 and October 2019. These tabs were incorrect in the May 2019 (published in March 2019) to February 2020 (published in December 2019) inclusive data files. The formula has now been corrected and this tab has now been correct since the FR MIR March 2020 (published in April 2020) data file.

For full details of this quarterly metric, see page 24 of our Forward Plan

[22] https://www.nationalgrideso.com/balancing-services/reserve-services/fast-reserve?market-information

Metric 3 – Energy Forecasting accuracy

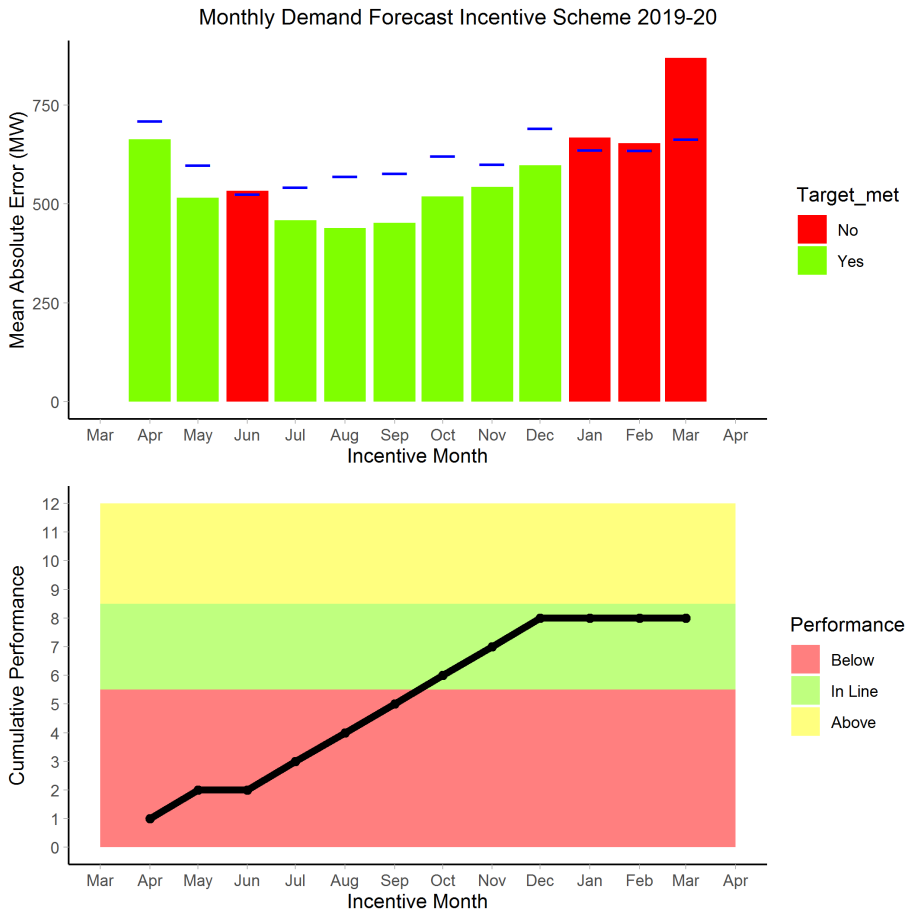


Figure 6: Demand Forecasting Performance, First graph shows our performance as green or red histograms against the blue target lines. Second graph shows our cumulative performance across the year.

Supporting information

Annual performance for Day Ahead demand forecasting was "**in line with expectations**" according to the benchmarks defined in the 2019-21 Forward Plan.

Since the introduction of a new forecasting system in July 2019, the ESO's demand forecasting performance has noticeably improved. There were 8 months where monthly targets were comfortably outperformed, and 4 occasions when the target was missed. In the months where the target was not met, with the exception of March 2020 the target was narrowly missed: by 9MW in June, 18.7MW in February and 30.4MW in January 2020. Additional detail can be found in our monthly and quarterly reports[23] published on our website throughout 2019-20.

March 2020 and COVID-19 performance impact:
The Monthly Mean Absolute Error (MMAE) performance target for March 2020 was 664MW. At the end of the month the outturn error was 868.9MW. For the first part of the month, the performance was on track to achieve another successful outcome. From Monday 16 March, demand levels started to drop in response to COVID-19 mitigation measures. This drop accelerated after the introduction of the lockdown on Tuesday 24 March. In this second half of March, the mean absolute error started to decrease. All absolute errors above 2.5GW were observed in the first week after the lockdown. The highest absolute error, 4.8GW occurred on Wednesday 25 March, 2 days after the lockdown was announced. This is in

[23] https://www.nationalgrideso.com/our-strategy/how-were-performing

line with the experience of other European system operators. French and German system operators observed significant day ahead errors, 10.9GW and 8.9GW respectively within the first week of the lockdown being introduced in their countries.

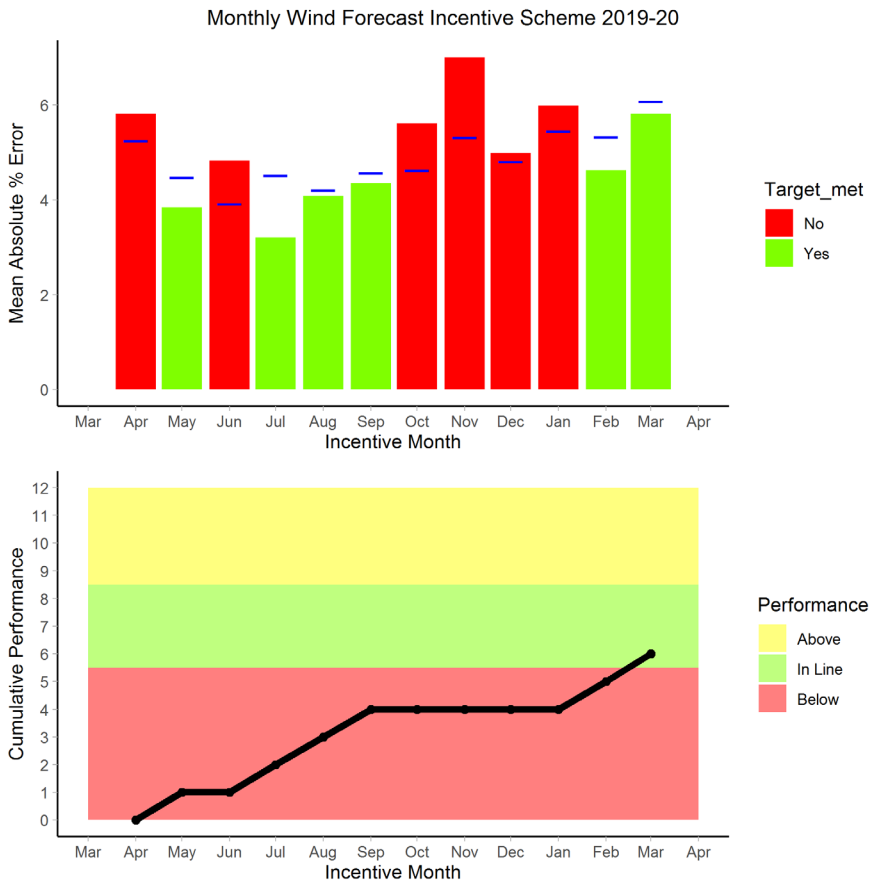


Figure 7: Wind Forecasting Performance, First graph shows our performance as green or red histograms against the blue target lines. Second graph shows our cumulative performance across the year.

Supporting information

In March 2020, our day ahead wind forecasts were better than the target of 6.08%. March's Mean Monthly Absolute Percentage Error (MMAPE) was 5.82%. This brings our annual performance for the day ahead BMU wind forecasting "**in line with expectations**" according to the benchmarks defined in the 2019-21 Forward Plan. There were 6 months where monthly targets were outperformed and 6 occasions when the target was missed. Additional detail can be found in our monthly and quarterly reports[24] published on our website throughout 2019-20.

The months when the target was missed were characterised by unusually strong weather conditions which present challenges especially in relation to the timing of weather fronts, the magnitude of wind speed, and the effect of wind gusts. On these occasions, even a small delay or earlier than expected arrival of wind conditions translates to a forecast error. This error is proportional to the size of the capacity of a wind generator affected by it. The ESO implemented a number of initiatives to improve performance, such as purchasing of more weather station forecast and outturn information for those

[24] https://www.nationalgrideso.com/our-strategy/how-were-performing

sites that would yield the greatest forecast improvement, and engaging with the Met Office in the event of large weather forecasting errors.

We are continually working to improve our wind forecasting performance, however our research shows that in order to make significant advances in wind forecasting accuracy, we would need to obtain much more specific turbine level data from the wind farms themselves.

Performance for Demand and Wind Forecasting

At the end of the year, we count how many months we have met our targets and apply the benchmarks.

- **Exceeds benchmark:** 9-12 months
- **In line with benchmark:** 6-8 months
- **Below benchmark:** 0-5 months

For full details of this monthly metric, see page 24-27 of our Forward Plan

Role 2

Facilitating Competitive Markets

Role 2: Facilitating Competitive Markets

Delivered benefits in 2019-20

- We note that role 2 will mainly deliver consumer benefit in future years, due to the nature of the activities within this role area
- We are transforming the customer experience for network charging. Our customers pay around £4.5bn in transmission charges a year, and helping them better understand the charges they face, helps them to be more effective players in the market

Future benefits and long term initiatives

- We are implementing network charging reforms, which will save £3.8-5.7 bn for consumers
- We are enabling wider access to the Balancing Mechanism, which is anticipated to bring consumer benefits of £110-500m per year from 2020-21

Plan delivery and new ways of working

- Took a leading role in charging reforms such as the Balancing Services Charges Task Force and Targeted Charging Review
- Balancing Mechanism Wider Access went live
- Delivered weekly Frequency Response auction trial
- Hosted forums for Charging Futures, Power Responsive, Flexibility and Balancing and Charging, as well as Power Responsive annual event
- ESO Code Administration website refresh made information more accessible

Stakeholder

- Positive stakeholder feedback from Flexibility forum and Power Responsive summer reception
- New long term reactive power service developed based on stakeholder feedback
- Collaborated with Wind Advisory Group for Power Available work
- Worked with our tenderers to improve data access, simplify tender spreadsheets and improve their procurement experience
- Our response to stakeholder feedback on Dynamic Containment work was well received by industry

Performance metrics

Metric	Performance	Status	Justifications
4. Provider Journey Feedback	3.7/5 score on Tendering survey	●	The feedback we have received shows have made improvements over 2019-20 and we are in line with benchmark.
5. Reform of Balancing Services Markets	Deliverables to remove barriers to entry on track, and tracking movement away from bilateral arrangements	●	Deliverables relating to balancing products and markets gives a performance of 76% which exceeds benchmark
6. Code Admin Stakeholder Satisfaction[25]	1) CACoP survey scores was below benchmark	●	1) Performance in all three of our codes scores have decreased from previous years. The results only cover the first half of the performance year as they are published in the previous October.
	2) Deliverables delivered on time	●	2) All deliverables were delivered by year end, but there were some delays within year, including the website improvements.
	3) ESO customer survey was above benchmark	●	3) For customer survey feedback at the commencement of modifications, we outperformed the previous year's baseline.
7. Charging Futures	Average webinar and workshop score of 7.7 against a baseline of 7.3	●	We continue to work with various content providers to produce the webinars and seek out new ways of collaborating. Our workshop feedback was largely positive.
8. Year ahead forecast vs outturn annual BSUoS	Annual BSUoS forecast was £3.07/MWh and outturn was £3.44/MWh[26] giving an Absolute Percentage Error (APE) of 10.8%[26]	●	Annual BSUoS forecasting was higher than 10% APE and lower than 20% APE.
9. Month ahead forecast vs outturn monthly BSUoS	15% average forecasting error across whole of 2019-20 performance year	●	Forecasting error has been less than 10% APE for five months and above 20% APE for four months.

[26] Corrected on 14 May 2020

[25] Corrected on 10 June 2020

B.1 Evidence of consumer benefits for Role 2

For each role area, we present our consumer benefit information in two sections, corresponding to Ofgem's evaluation criteria: evidence of delivered benefits, and evidence of future benefits/ progress against long term initiatives.

To evidence the consumer benefits which result from our activities, we present tables of our high-level deliverables, 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 area.

We would expect some role areas, 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: Network charging implementation and Enabling wider access to the Balancing Mechanism.

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 work to transform the customer experience for network charging, which is part of our evidence of current-year benefits.

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 to meet the evidence criteria for the incentives scheme. Readers can also refer to the Role 2 consumer benefit map produced as part of the Mid Year Report[27].

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

2019-20 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
Product roadmaps for response and reserve, product roadmaps for reactive implementation	This year we have published the roadmaps and delivered the frequency response auction trial, providing a high-quality service to our stakeholders and reducing barriers to entry through increased transparency. The auction trial has driven increased competition, putting downwards pressure on consumer bills.	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.

[27] https://www.nationalgrideso.com/document/128421/download page 31

2019-20 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
Product Roadmap for Restoration implementation	Having worked closely with our stakeholders, we have provided visibility of the opportunities which are available and have developed new approaches to system restoration.	In developing and delivering competitively tendered Black Start contracts, we are increasing competition which should lower prices. It will also encourage non-traditional providers to offer Black Start services, contributing to improved system security. This in turn enables us to securely operate a carbon free network and leads to reduced environmental damage.
Power Responsive	By engaging with our stakeholders, we are identifying the best way of providing them with an improved quality of service, and enabling them to access the information they need.	To progress projects to unlock demand flexibility, we have increased our engagement with the demand side of the industry to ensure 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.
Wider Access to Balancing Mechanism Roadmap implementation	The ESO's activities to enable greater participation in the Balancing Mechanism (BM) have promoted competition within the market, removing barriers to entry for smaller players. It has also provided the ENCC with greater access to tools it can use to manage the system, promoting improved safety and reliability and providing more options for balancing actions.	By removing barriers to entry in the BM, we are allowing the widest possible participation in the ultimate flexibility market in GB, encouraging competition and delivering benefit to consumers. Where the new participants are renewable generation, this work also contributes towards reduced environmental damage.
Intermittent Generation	The work we have done to integrate intermittent generation to participate more effectively in market frameworks lowers barrier to entry and increases competition. This in turn drives down costs to consumers and improves quality of service.	Developing tools which integrate intermittent generation into our systems will allow these types of generation to participate more effectively in the market, which will lead to increased competition and allow the ESO to more efficiently balance the system. This will also make it possible for the ESO to operate the system with a higher proportion of renewable generation, resulting in reduced environmental damage.
Provider experience	With our new survey framework, we are able to frequently engage with stakeholders to ensure we are delivering better interactions as well as ensuring we are procuring the most suitable products at the right times in the most competitive and efficient way. This feeds into BSUoS costs, which are ultimately funded by consumers.	By improving our online resources and regular stakeholder engagement, our work on provider experience enables a more effective, transparent and easier experience for current and future providers.
Facilitating code change	By taking an active role as code administrator, updating our governance process, supporting pre-modification proposals and refreshing our website we are ensuring that stakeholders receive the information they need to understand electricity codes.	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, and ensure that charges are aimed at the most suitable parties. This in turn leads to

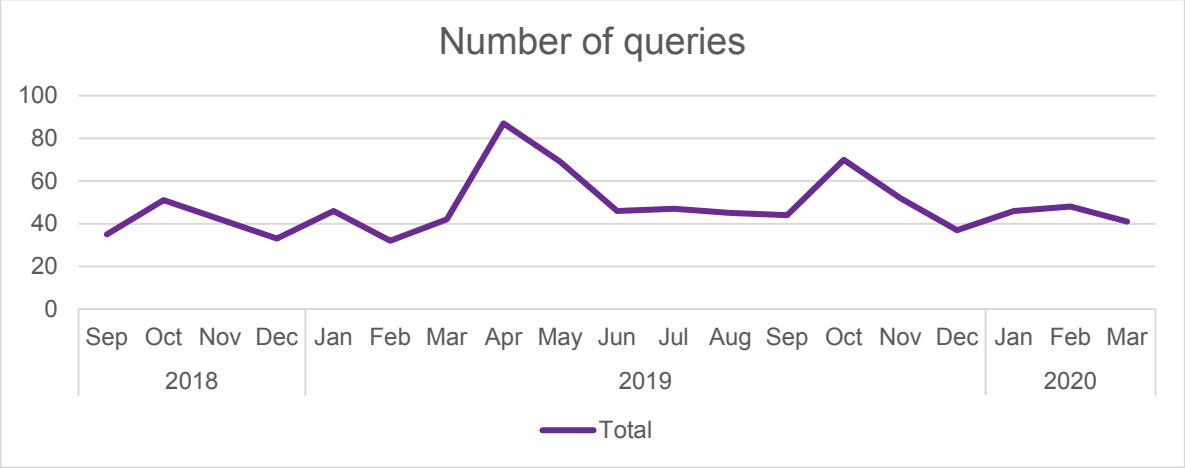
2019-20 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
		better outcomes across the wider community.
Transform industry frameworks to enable decentralised, decarbonised and digitised energy markets	We have published materials such as the Balancing Services Charges Task Force report which have provided our stakeholders with a clearer understanding of market developments. We have also provided a service to industry in running workshops, making best use of industry time and providing our stakeholders with the information they need.	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.
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.	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.

B.2 Evidence of delivered benefits for Role 2

B.2.1 Current consumer benefit case study

Transform the customer experience for network charging

Activity	We recognise that network charges represent significant costs to market participants, and knowing how and when they are going to be charged is a key part of running their business. Overall, around £4.5bn of network charges are recovered each year by the ESO on behalf of transmission owners. How charges are levied to generators and suppliers is governed by the methodology in the CUSC. These methodologies are complex, and the charging regimes can be bewildering for non-experts and new entrants. We want to make sure that our customers have information about the network charges they face that is accurate, timely and relevant. This is as true for existing parties making business decisions, and it is for new entrants looking to join the market. By facilitating the effective passing on of charges to our customers, we can enable them to operate efficiently in competitive markets. This effective operation in a competitive market will deliver longer term benefits to consumers, through a sustainable market with a large number of competitive participants. This year we have made some significant improvements in how we provide information to customers about network charges and how we interact with our customers. We have launched a series of tailored information guides and webinars, and reformed our website content to be more focussed on our customers' needs. We have reworked our query management processes to focus on a Service Level Agreement (SLA) of 5 days for responding to customer queries. In the future, we are looking to work more closely with other industry parties to further improve the onboarding process tailored for different types of customers.
Role	2. Facilitating Competitive Markets
Key Forward Plan Deliverables	• Improve our ESO charging query processes • Improve understanding of our onboarding processes and streamline to meet our customer needs • New data reports for BSUoS • Reform of website content into a user centric knowledge base • Introduce new 'new entrant' e-learning on charging
Current benefit	In the short-term the costs of building and maintaining the transmission network, and the operational costs of balancing and securing the network are fixed. This means that the revenue to be recovered for network companies is not affected by how effectively we engage with our customers on network charging. However, the benefits of improved engagement with network charging are typically felt indirectly through more competitive markets, and more effective long-term investments in the networks. By providing better information to market parties about the network charges they face, we believe they can be better informed players in a market, which should create more effective liquid markets to the benefit of consumers. This also allows smaller and newer entrants to fully understand their charges, and creates a more level playing field of information with the bigger more established parties. An increasingly competitive market should continue to increase downward pressure on wholesale prices, leading to better outcomes for consumers. There is also a saving in industry time resulting from having better and more detailed information. This is likely to result in tangible benefits to consumers as money is not required to be spent on servicing regulatory processes and can be spent on more 'value add' activities elsewhere, or result in a genuine cost reduction. However, these benefits are very difficult to quantify. The total market size for electricity is around £50bn per year, and less than a one percent efficiency increase in this market would result in multi-million pound savings to consumers.

Future benefits	We would expect the benefits accrued in early years to continue to be realised in later years. The benefits of competitive markets and increased market depth should be felt on an enduring basis.
Basis of expected benefit	Benefits are realised through competitive markets. From economic theory, two features of a perfectly competitive market are i) lower barriers to market entry, and ii) perfect information. The steps we have taken have been implemented to directly support new entrants to markets for example, through our 'new supplier' guidance[28]. Moreover, we have worked to make the information we provided clearer and more complete, and hence allow all parties to have better information. 2019-20 saw an increase of 14 new suppliers, and taking into consideration the amount of change and uncertainty for customers around the Targeted Charging Review (TCR) and RIIO-2 over the past 12 months, in addition to several phases of billing issues, we would have expected to receive an unmanageable volume of queries. However, as a result of the improvements we have made, the total number of queries has remained relatively constant over this time. This supports the hypothesis that the quality of the information we provide has improved, and customers are able to easily access and self-serve the information they need.  We also expect that better information about charges should lead to lower risk premia being applied by market parties, which leads to lower costs to consumers. By lowering the barriers to entry, we are also able to support continued diversification of both the generation and supply markets. This increases the number of small suppliers in a market – another feature of a perfectly competitive market.
How benefit is realised in the consumer bill	Benefits to consumers have been realised through reduced industry overhead in time spent on processes associated with network charges. This leads to either a reduction in industry costs, or reallocation of resources to further value-adding activities. This will flow through to consumers' bills as lower charges set by generators and suppliers. Similarly, an approach to enabling participation of small market parties is removing a barrier to entry, which should have knock on effects on liquidity and efficiency of markets, driving further benefits for consumers. During the past year, 14 new suppliers have registered with us and only five suppliers have gone into administration.
Additional non-monetary benefit	Facilitating new connections to the network has in recent years has overwhelmingly brought an increased capacity of low carbon generation on to the system, helping society to meet our environmental obligations. Connecting new and diverse generation to the system also helps to ensure longer time capacity and security of supply. By providing improved information, we are improving the quality of service we provide to our stakeholders.

[28] https://www.nationalgrideso.com/document/135056/download

Assumptions	There is a risk premium applied to our network charges by suppliers and/or generators that is passed on to consumers. Suppliers and others were previously unhappy with the timeliness and quality of the information we provided (feedback and surveys have suggested this is the case), and that better quality and timely information from us would enable them to run their businesses more efficiently. The wholesale markets are sufficiently liquid that savings are passed on to consumers, through downward price pressure, rather than kept by other market participants in the chain.

B.3 Evidence of future benefits/ progress against longer term initiatives

B.3.1 Future consumer benefit case studies

Network charging implementation

Activity	It is essential that charges for using the transmission system are equitable and proportionate for users. Ofgem's Targeted Charging Review (TCR) is making significant reforms to charges, which will deliver benefits to consumers. The ESO's role in this has been significant from 2016, with the specific activities in this financial year being summarised in the two phases below: 1) Policy Development Support Through early and mid-2019, we have engaged with Ofgem and industry on the TCR as the policy was being developed. This was through responding to consultations, engagement around the cost benefit analysis, and ensuring through Charging Futures, ESO webinars and the Transmission Charging Methodologies Forum that users were aware of the reforms being proposed. 2) TCR Implementation Following the publication of Ofgem's TCR decision in November 2019, we initiated discussions with our partners at the Distribution Network Operators (DNOs) and the Energy Networks Association (ENA) to create a joint plan for delivery of the TCR. We worked collaboratively across all parties, to deliver a detailed plan in a short timescale. Using this as a basis we raised five Connection Use of System Code (CUSC) and one Balancing and Settlement Code (BSC) modification proposals to implement the TCR at transmission level. This involved us re-prioritising workload to ensure that we could create and raise the modifications quickly, whilst ensuring alignment with industry colleagues and stakeholders including the DNOs. Through this period, we have engaged across industry, with generators, suppliers, demand users, BEIS and Ofgem on our proposals and the impacts these would have on consumers. This included the Demand Residual reforms, where we would charge demand users the "residual charge" on a banded basis, rather than according to their usage over triads today. This would make the charge unavoidable. Through this engagement, it became clear that delivering the Demand Residual reforms in April 2021 would actually come at a dis-benefit to consumers. The justification for this was that as suppliers would not know the detail of their charges until late in 2020, and as they fix contracts in advance, the impact of the Demand Residual reforms was unlikely to have been factored into these. The result of this is that either suppliers would have incurred losses, or that re-opener clauses would have been triggered, resulting in disruption for non-domestic customers, subsequent disputes and potential financial strain for suppliers. We therefore requested that we should withdraw the associated modification and delay implementation of this element. We have also stood up a cross-functional project team internally to ensure that we are able to deliver the TCR changes for April 2021, this is due to the complexity of the TCR and the significant changes required to tariff setting processes and billing systems.
Role	2. Facilitating Competitive Markets
Key Forward Plan Deliverables	• Facilitate electricity network charging reform through Charging Futures
Current benefit	The benefit of implementing the TCR will be realised in future years. This is due to some of the reforms (setting Transmission Generation Residual (TGR) to zero and charging BSUoS to suppliers on a gross basis) being implemented in April 2021 and the demand residual being implemented in April 2022.

Future benefit	Ofgem set out in their cost benefit analysis supporting their TCR decision that the benefits of implementing TGR to zero and BSUoS being charged to suppliers on gross to be between £3.3bn and £4.1bn from April 2021. For the demand residual, the expected consumer benefits of implementing in April 2022 are £0.5bn - £1.6bn in consumer benefits and £1bn to £3.2bn in system benefits. These benefits can only be realised via the ESO implementing the reforms, and we are fully responsible for 100% of transmission related implementation.
Basis of expected benefit	Ofgem's view of the benefits is set out in their TCR decision[29], however these significant benefits can only be realised via the ESO working with industry to ensure the timely and successful implementation of the changes. This is due to the ESO's central role for setting and billing charges to users - Balancing Use of System (BSUoS) and Transmission Network Use of System (TNUoS). We regularly engage with industry through existing forums on TCR progress, with a webinar being held in March 2020 which received a score from participants of 7.6 out of 10.
How benefit is realised in the consumer bill	Ofgem note that most domestic consumers will make a saving on their energy bills as a result of the reform to fixed charges, with a typical household seeing a £5/year reduction in their bill
Additional non-monetary benefit	Supports competition by creating a more level playing field between users
Assumptions	Ofgem's TCR decision and view of the consumer benefits associated with this are set out in their Targeted Charging Review: Decision and Impact Assessment document[30]. We have assumed that the benefits will not be realised for the transmission related elements of the TCR without the ESO implementing the transmission reforms.

[29] https://www.ofgem.gov.uk/publications-and-updates/targeted-charging-review-decision-and-impact-assessment
[30] https://www.ofgem.gov.uk/publications-and-updates/targeted-charging-review-decision-and-impact-assessment

Enabling wider access to the Balancing Mechanism

Activity

The Balancing Mechanism (BM) is a core tool that enables the ESO to manage the GB electricity system and to ensure that electricity supply and demand is balanced on a second by second basis. The BM also allows the ESO to manage constraints on the transmission system as BM Units (BMUs) can be instructed to vary their generation or consumption to change power flows on the network.

For all generation BMUs directly connected to the transmission system, BM participation is mandatory while embedded generation units are also able to participate in the BM when they have a Bilateral Connection Agreement or a Bilateral Embedded Generation Agreement. Licensed electricity suppliers are also able to participate in the BM by registering additional BMUs that can be a collection of meters across a Grid Supply Point Group.

Prior to the Wider Access project, the existing BM participation routes did not allow Aggregators who were not licensed suppliers to participate in the BM. The Wider Access project has provided a route to the BM for aggregators and enables the aggregation of multiple smaller units to create BMUs over 1MW capacity to participate in the BM.

Widening access to the Balancing Mechanism makes this market more accessible for small balancing services providers and aggregators. This will help the ESO to manage operability challenges, and will consequently lead to more cost-effective balancing actions through increased competition. The goal is to ensure that the BM is open to all technologies and providers with no significant barriers to entry.

A Virtual Lead Party (VLP) is a new type of party to the Balancing and Settlement Code (BSC) that only participates in settlement by offering balancing energy. A supplier aggregator is an energy service provider which can increase or moderate the electricity consumption of a group of consumers according to total electricity demand on the grid. A licensed supplier is authorised to supply electricity.

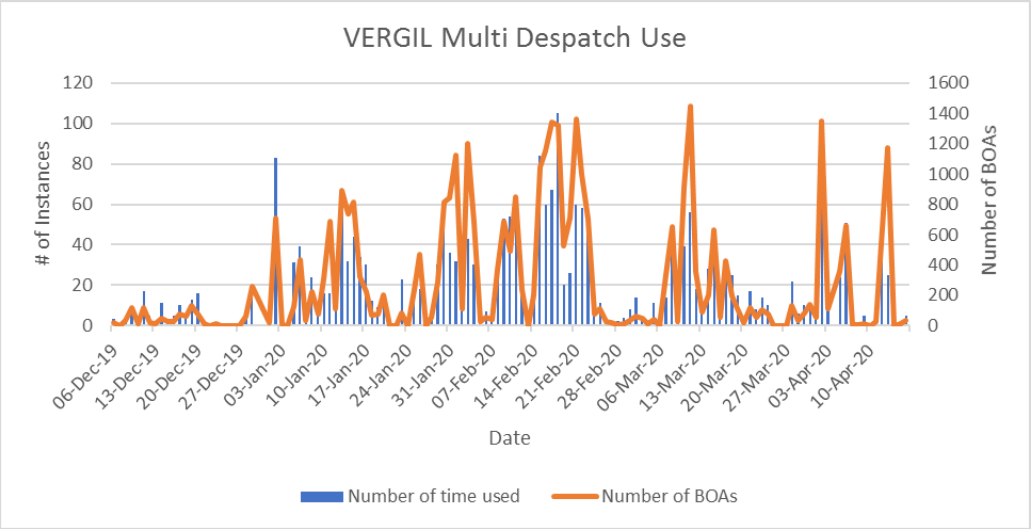
The project has been reducing barriers to entry for small and aggregated units in three ways:

1. Improving existing routes to market to ensure the participation of supplier aggregators in the BM. To date there are 58 live small BMUs participating in the BM from 8 providers/aggregators that have entered the BM through the licensed supplier route, with a total capacity of 485MW.

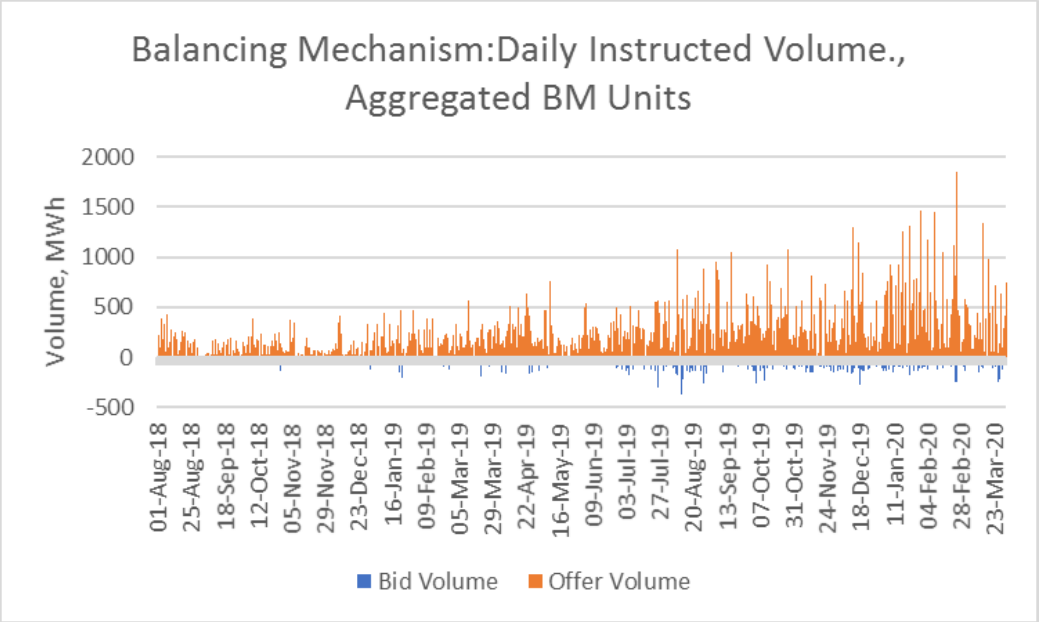
2. Developing new routes to market through framework changes to the Grid Code (GC), the Balancing and Settlements Code (BSC) and the Connection and Use of System Code (CUSC). BSC modification P344 created VLPs, and CUSC modifications 295, 296 and 297 defined the concept of a VLP in the CUSC and ensured that aggregated BMUs are obligated to fulfil similar technical requirements for similar types of units whether they are a supplier or an independent aggregator. All the code modifications required to enable wider access by smaller and aggregated BMUs have been approved and are implemented. There are several providers going through the pre-qualification and application process for the VLP route, we saw the first participant go live in April 2020.

3. Enhancing IT systems to improve data flows between the Electricity National Control Centre (ENCC) and market participants so that they are more efficient and cost-effective for smaller and aggregated units. We are testing a new web-based Application Programming Interface (API) as an alternative to Electronic Dispatch and Logging (EDL)/ Electronic Data Transfer (EDT) communications and to facilitate a growing number of market participants. We have delivered capability to enable multi-dispatch of market participants. This capability was implemented in December 2019, and its use is being embedded into the ENCC processes. We will understand from the feedback received how to develop the maturity and required complexity of this capability going forward as part of our ongoing planned works.

The graph below shows on a daily basis the instances where the multi-dispatch facility has been used. There are two sets of information, the number of times a set of collective instructions has been issued, and the number of individual Bid Offer Acceptances (BOA) that have been issued. For example, we may have issued a set of BOAs 10 times where the number of individual BOAs is 100.



Role	2. Facilitating Competitive Markets
Key Forward Plan Deliverables	• Clearer accession requirements for BM participation and enable aggregated BMU participation in balancing services • Use better technology/systems to improve efficiency of installing communications with BM providers and optimising BMU dispatch
Current benefit	The graph below shows the growth of accepted Bid Offer Acceptances (BOAs) from aggregated units through two routes, market supplier and virtual lead party (Wider access). This shows an increase in BM participants, which creates a more competitive market which drives down costs and benefits the end consumer.



Future benefit	Wider access to the Balancing Mechanism will facilitate competitive balancing markets that drive down costs for consumers and enable the ESO to manage the system in the most cost-effective way. The BM is the ultimate flexibility market in GB, so increasing participation in this market will encourage competition and deliver benefits to consumers. Several studies[31] have investigated the economic benefits of increasing participation in the BM. While these studies vary widely in the consumer benefits they report (£110-500m per annum by 2020-21), they all nonetheless point to significant benefits resulting from increased liquidity and competition in the BM.
Basis of expected benefit	Flexibility in the energy system, from technologies such as demand side response (DSR), storage and interconnectors, is generally understood to provide three key sources of value: 1. It reduces the capacity of low carbon generation needed to achieve carbon reduction targets by improving the utilisation of intermittent low carbon generation 2. It enables system balancing at a lower cost by displacing more expensive flexibility options such as peaking plant 3. It improves the utilisation of existing conventional generation, and defers investments in transmission and distribution network reinforcement After engaging with industry, we found that the net benefits of deploying flexibility technologies, inclusive of their costs, are expected to be in the range of £1.4-2.4 bn/year in 2030, assuming an electricity carbon emissions intensity target of 100 g/kWh in 2030. The UK could save £17-40 bn across the electricity system from now to 2050 by deploying flexibility technologies. This report[32] was conducted by Carbon Trust and Imperial College of London. For comparison, a Committee on Climate Change[33] found a gross benefit from deploying flexibility technologies of £3-3.8 bn/year in 2030, the additional benefit being largely explained by this being a gross saving, i.e. not including the cost of the additional flexibility technologies deployed. Similarly, a report[34] by the National Infrastructure Commission states that gross benefits could range from £2.9- 8.1 bn/year in 2030. In this case the difference is largely explained by these again being gross rather than net benefits, and by this analysis assuming an emissions intensity target of 50 g/kWh in 2030 for the high end of the range. We already have 485MW of small BMU participating in the BM via the licensed supplier route who would not otherwise be able to participate in the BM. This is against a typical BM list of 65GW, so we have added 0.75% to the market. If you take the theory that competition is linked to prices, we would expect 0.75% cost reduction. With £1billion balancing costs per year, this would give around £7.5 million in savings.
How benefit is realised in the consumer bill	Increased competition in the BM should reduce BM costs and result in lower BSUoS charges than would otherwise be the case. BSUoS charges are levied on system users and passed through to the end consumer as part of their electricity bill.
Additional non−monetary benefit	Increasing access to the BM by distribution connected capacity will improve system operability, as an increasing proportion of system flexibility can be accessed, in addition to working towards a net zero carbon future at lower cost.
Assumptions	Due to uncertainties in how the future energy system will evolve, and the projected cost and availability of different flexibility options, quantifying these benefits is very complex. Yet, despite these uncertainties, key investment decisions need to be made in the short-term, which will have a lasting impact on Great Britain's future energy system. This is primarily

[31] https://www.ofgem.gov.uk/system/files/docs/2017/07/an_assessment_of_the_economic_value_of_demand-side_participation_in_the_balancing_mechanism_and_an_evaluation_of_options_to_improve_access.pdf
[32] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/568982/An_analysis_of_electricity_flexibility_for_Great_Britain.pdf
[33] https://www.theccc.org.uk/wp-content/uploads/2015/10/CCC_Externalities_report_Imperial_Final_21Oct20151.pdf
[34] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/505218/IC_Energy_Report_web.pdf

because generation and network assets have long lead times between the investment decisions and the start of operation, in addition to even longer lifetimes once installed, so choices made now will affect the design and cost of the electricity system for decades ahead.

Additional flexibility can also provide ‘option value’, whereby small investments in flexibility can postpone decision-making on larger investments until there is better information, hence reducing the need to make potentially high regret decisions.

The number of additional generation units is obviously restricted by system capability, however we look at the underlying level of energy resources coming through the pipeline and look to scale the capability accordingly so in theory there should never be a restriction.

B.4 Plan delivery

B.4.1 Highlights

- ✓ Delivered weekly Frequency Response auction trial, moving our procurement of balancing services closer to real time
- ✓ Balancing Mechanism Wider Access went live, removing barriers to entry for small participants
- ✓ The ESO took a leading role in charging reforms such as the Balancing Services Charges Task Force and Targeted Charging Review
- ✓ Hosted forums for Charging Futures, Power Responsive, Flexibility and Balancing and Charging, as well as Power Responsive annual event
- ✓ ESO code administration website refresh made information more accessible, empowering stakeholders to find the information they need

During 2019-20, we introduced our Forward Plan Tracker, providing increased transparency to stakeholders who are now able to see a monthly update on our progress against the Forward Plan deliverables.

B.4.2 Deliverables

Deliverable	Target delivery date	Actual delivery date	Status
Product Roadmaps for Response and Reserve implementation			
Rollout of full functionality in frequency response auction trial	Q3 2019-20	Target date met	Completed. We delivered the second phase of the auction trial with our partners European Power Exchange (EPEXSPOT) on 29 November 2019 and have had seven successful auctions to date. An upward trend in total volume has been seen for Dynamic Low High (DLH), (from ~8,000MW in December to around 11,000MW for 10 January) and stable volumes for Low Frequency Static (LFS), (around 5,000MW). We continue to see the 100MW cap met in many Electricity Forward Agreement (EFA) blocks, and higher prices than in Firm Frequency Response (FFR), as expected in a new market. Analysis and a review of the first six months, along with a review of the 20MW cap, will be shared externally in Q2 2020-21.
Report on development of new frequency response product suite	Q3 2019-20	Target date met	Completed. The Response and Reserve Roadmap was published on 3 December 2019 and can be found here: https://www.nationalgrideso.com/document/157791/download
Market design and implementation plan for reformed reserve products	H1 2019-20	Q4 2020-21	This work is now expected to be delivered in Q4 2020-21, rather than H1 2019-20. We are also considering the reserve design in light of how the new pan-European Standard product Trans European Replacement Reserve Exchange (TERRE) will be used, and what the impact of wider access will be on the makeup of the Balancing Mechanism. We will be progressing

Deliverable	Target delivery date	Actual delivery date	Status
			reformed reserve products once we have more clarity on these areas.
Report on our plan for retaining specific products	Q1 2019-20	Ongoing	We have made a request under A26 of Electricity Balancing Guideline (EBGL) to retain Short-Term Operating Reserve (STOR) and the Balancing Mechanism (BM) as Specific products and are in ongoing discussions with Ofgem on this, as it relates to matters in the Clean Energy Package. We may consider adding other services to this list such as the new downward flexibility product. As and when further Standard products are due to be implemented, e.g. manually-activated Frequency Restoration Reserve (mFRR) under Project Manually Activated Reserves Initiative (MARI), we will revisit our list of balancing services to determine whether more should be retained as Specific.
Migration of non-BM Short-Term Operating Reserve (STOR) providers to Ancillary Services Dispatch Platform (ASDP)	Q2-4 2019-20	Target date met	Completed. The Platform for Ancillary Services (PAS) programme went live with Non-BM STOR on the Ancillary Services Dispatch Platform (ASDP)in October. The migration of providers commenced in October 2019 and completed by end of March 2020.
Implementation of pan European replacement reserve standard products	Q1–Q4 2019-20	Q2 2020-21	A number of Transmission System Operators (TSOs), including NGESO, were granted a derogation against the original target implementation date. The implementation date has subsequently been delayed again from June to October 2020 given the disruption caused by the COVID-19 pandemic. This may impact local implementation of the Manually Activated Reserves Initiative (MARI) which is due to go live in 2022, as this is dependent on other parties in Europe.
Product Roadmap for Reactive implementation			
Communicate reactive power requirements & historic spend	Q2 2019-20	Target date met	Completed. Further transparency on Reactive Power synchronisation and utilisation costs have now been provided. This data has been consolidated into the National Grid ESO Data Portal: https://data.nationalgrideso.com/constraint-management/outturn-voltage-costs
Power Potential trial with UK Power Networks (UKPN)	Q2-Q4 2019-20	Q4 2020-21	We have moved this project to Q4 2020-21 from Q4 2019-20 as part of the Forward Plan for 2020-21. We are continuing to identify whether Distributed Energy Resource (DER) providers embedded within the Distribution network can provide dynamic voltage support to the Transmission network. As there is no precedent for this world class project, this has been a more gradual process to ensure a fit for purpose scheme. We have delayed the "optional" and "market" trials and expect to start in Q3 2020-21 as

Deliverable	Target delivery date	Actual delivery date	Status
			a result of COVID-19 challenges. The trials will then run into Q4 2020-21.
Review learning from Power Potential	Q4 2019-20	Q4 2020-21	This deliverable has been moved to Q4 2020-21 from Q4 2019-20 as part of the Forward Plan for 2020-21. This is since both NGESO and UK Power Networks (UKPN) are focused on the development of essential systems and readiness of Distributed Energy Resource (DER) participants. We have delayed the "optional" and "market" trials to start in Q3 2020-21 as a result of COVID-19 challenges. The trials will then run into Q4 2020-21.
Product Roadmap for Restoration implementation			
Alternative Approaches to Restoration	Q1 2019-20	Target date met	Completed. The Distributed ReStart project is a three-year collaboration between NGESO, SPD and SP Manweb which will explore how Distributed Energy Resource (DER) can be used to restore power in the event of a blackout. The aim is to resolve how to bring the organisational coordination, the commercial and regulatory frameworks, and the power engineering solutions together to achieve Black Start from DER. The project published three Network Innovation Allowance (NIA) reports in June 2019 and its first technical milestone report in July. Stakeholder engagement events have included Utility Week Live and Power Responsive conferences. The Competitive Procurement events ("Tenders") launched in 2019-20 for the existing Black Start market provided an opportunity for various alternative technologies to participate, including as combined services. Greater participation is encouraged by evolving the contractual framework, technical requirements and removing barriers to entry. During the tender submissions, as well as submissions from alternative technologies there were various good examples of combined services e.g. conventional (thermal) + storage; wind + storage. These examples demonstrate the appetite and viability of the combined services for Black Start. We expect to see more examples of combined services as a result of the Distributed ReStart project.
Develop and evolve a market approach for the procurement of Black Start services	Q4 2019-20	Target date met	Completed. We trialled this approach in the South West and Midlands, and are running a tender for restoration services from assets in these areas, subsequently we took learning from this process and launched a further tender in the Northern Region in August 2019. We have also identified an opportunity to run a tender in the South East and plan to launch an Expression of Interest in Q2 2020-21. Our experience throughout these processes will continue to evolve and allow us to develop and improve the approach and identify

Deliverable	Target delivery date	Actual delivery date	Status
			other areas where we could run more competitive procurement of restoration services going forwards.
Power Responsive			
Deliver innovation projects to unlock demand flexibility	Q1-Q4 2019-20	Q1 2020-21	We have been working with United Utilities through the Network Innovation Allowance (NIA) project 'Enhancing Energy Flexibility from Wastewater Catchments through a Whole System Approach'. The project has been exploring how coordination of a single wastewater catchment area could unlock additional flexibility compared to considering these assets on their own. The project is at an advanced modelling stage, and is due to publish results in Q1 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. The project team recently presented the work and initial findings at the ENA Innovation Forum in February 2020; the project is due to conclude in Q1 2020-21. NIA is providing full funding for internal spend for this project.
Power Responsive Stakeholder Engagement	Q1 2019-20 – Q4 2020-21	Q4 2020-21	On track. Power Responsive sponsored the Flexible Power Zone at the two-day Energy Management Exhibition (EMEX) conference in London, hosting a number of Demand Side Response (DSR), DNO and new-technology companies. We also hosted the Flexibility Forum in January, which was attended by over 200 people, and featured presentations on local flexibility developments from five of the six DNOs.
Wider Access to Balancing Mechanism Roadmap implementation			
Clearer accession requirements for BM participation and enable aggregated BMU participation in balancing services	Q1 2019-20	Target date met	Completed. More information can be found here: https://www.nationalgrideso.com/document/150276/download
Use better technology/systems to improve efficiency of installing communications with BM providers and optimising BMU dispatch	Q4 2019-20	Target date met	Completed. As part of implementation preparations, NGESO and ELEXON have successfully completed a course of testing with an initial group of market participants, who will create their own web-based Application Programming Interfaces (APIs) to provide Electronic Data Transfer (EDT) and Electronic Despatch and Logging (EDL) to NGESO.
Support industry work on providing and delivering against Physical	Q3 2019-20	Target date met	Modifications P375 and P376 are still at Workgroup stage with industry, however they have now been combined by Elexon with P379 (Multiple Suppliers

Deliverable	Target delivery date	Actual delivery date	Status
Notifications (ELEXON led) and also support on work on accurate settlement for behind the meter			through Meter Splitting) as a result of identified interdependencies between all three modifications.
Intermittent Generation			
Raise code modification to apply Power Available Consistently across technical commercial codes	Q1 2019-20	Target date met	Completed. We raised CUSC Modification Proposal (CMP) 314 to align the CUSC with the Grid Code definition of Power Available for Power Park Modules on 1 April 2019. The Final Modification Report was submitted to Ofgem on 12 July, and was approved by Ofgem on 22 August.
Publish Power Park Module signal best practice guide	Q2 2019-20	Target date met	Completed. In conjunction with Renewable UK and renewable generators through the Wind Advisory Group, we held a Power Available industry workshop on 16 April, with 36 attendees, to seek views on data accuracy and monitoring policy. The feedback and views provided through this workshop allowed us to develop and publish a "Power Park Module Signal Best Practice Guide", which offers guidance for Power Park Modules (PPMs) on how to send accurate and timely signals to the Electricity National Control Centre (ENCC) and how the ENCC will make use of this data. This was published on 25 July and further updated in March 2020 to reflect the new Quality Standard for Power Available developed in conjunction with Strathclyde University and the Wind Advisory Group: https://www.nationalgrideso.com/document/149181/download
Deliver Power Available integration phase 1	Q3 2019-20	Q1 2020-21	Power Available integration phase 1 delivery has been pushed back to May 2020 due to two unexpected IT delays emerging during testing.
Publish wider strategy on flexibility from intermittent generation	Q4 2019-20	Target Date Met	As published at the link below, stakeholder feedback was sought via the Wind Advisory Group, a stakeholder group set up with Renewable UK. https://www.nationalgrideso.com/research-publications/future-balancing-services
Deliver Power Available integration phase 2a	Q4 2019-20	Q1 2020-21	The Power Available Integration Phase 2a delivery has been pushed back to May 2020 due to two unexpected IT delays emerging during testing. Note that Phase 1 and Phase 2a are being delivered together to ensure consistency between the changes made to the three affected IT systems. Phase 2a specifically refers to changes to the NGESO settlement system (ASB) to ensure that Power Available is used in the settlement of Mandatory Frequency Response for Intermittent Generators (MFR).

Deliverable	Target delivery date	Actual delivery date	Status
Provider Experience			
Feedback approach	Q1 2019-20	Target date met	Completed. We have developed a survey framework to obtain feedback from our providers at key points in their journey including onboarding, tendering, contracting and query management. This will enable us to improve the provider experience. On a quarterly basis, surveys for feedback on Onboarding are sent directly to new providers who we've had contact with; and for Tendering to those who are currently on the invitation to tender for Short Term Operating Reserve (STOR), Firm Frequency Response (FFR), Fast Reserve and Constraints; Query surveys are being sent as and when we resolve queries that Providers raise with us.
Improved online resources	Q1 2019-20	Target date met	Completed. The ESO Balancing Services Guidance Document has been published on our website https://www.nationalgrideso.com/document/142726/download As the document was drafted, we sought feedback from Providers on what content they would like to see and how the document could be improved. In response to this we added more detail to the Electricity Market Overview section, and included a service and revenue stacking table. A further guidance document has been developed to support providers looking to enter the Balancing Mechanism (BM): https://www.nationalgrideso.com/document/150276/download We have also created a new dedicated webpage for Wider Access: https://www.nationalgrideso.com/balancing-services/wider-access
Facilitating code change			
Meeting calendar & transparency of workgroups	Q1 2019-20	Target date met	Completed. All meetings held are now available on our code modifications calendar. Summary notes are now published following every workgroup meeting, sharing key progress and outputs.
Governance process FAQs, improved guidance material and critical friend review	Q1 2019-20	Target date met	Completed. We have updated our governance process FAQs on the website https://www.nationalgrideso.com/industry-information/codes/help-and-support, consolidated guidance material and provided a clear guide on how stakeholders can get involved in the modification process on our website. This is all as a direct response to stakeholder feedback. We have published a document outlining the "critical friend" role that code administrators are obligated to follow during the modification process.

Deliverable	Target delivery date	Actual delivery date	Status
			This provides a benchmark for quality and service levels provided by code administration teams to all stakeholders involved in the modification process.
Facilitation of pre-modification discussions	Q3 2019-20	Target date met	Completed. The Code Administration team now supports pre-modification proposals with subject matter expertise, ensuring that cross code implications are being considered to ensure that scope and defects are correctly identified.
Incorporation of all 14 Code Administrator Code of Practice (CACoP) Principles	Q3 2019-20	Ongoing	A Modification was raised in March 2020 to facilitate the 14th CACoP principle; sandboxing. The modification was reprioritised due to congestion from high priority modifications delivering the Targeted Charging Review, therefore this deliverable is ongoing.
Engage all parties to understand information requirements for code modifications and provide executive summaries on modifications	Q1 2019-20	Target date met	Completed. During Q1 2019-20 we conducted bilateral discussions and industry surveys to build a full view of how stakeholders want us to target further improvements. We have used this to build a plan of activities across the next 18 months. We have shared key messages from this to industry via our improvement newsletter and have incorporated changes into the 2020-21 Forward Plan.
Code administrator website	Q3 2019-20	Q4 2019-20	Completed. Significant updates to code website have now been delivered, improving the navigation and content available to users. This is in addition to previous minor updates including ordering of modifications, availability of meeting documents and maintenance of a live cross-code calendar.
Raising potential impact of modifications	Q3 2019-20	Target date met	Completed. The Code Administration team has sought feedback internally and externally and presented the final version of the Initial Written Assessment to Panel. Feedback has suggested that this document may not be required once the report template has been updated. We are committed to offering an enhanced experience to our stakeholders, so we will continue to trial this method to see if it is fit for purpose.
Governance surgeries	Q2 2019-20	Target date met	Completed. We have held webinars, available to watch on our website, that help set out the governance process and support available to industry parties. Alongside these webinars we have produced videos to give an overview of the codes we manage. We have introduced new governance surgeries including webinars and bite size videos to show and guide industry parties through the process.
Historical timelines & horizon scanning: cross-code	Q2 2019-20	Target date met	Completed. A cross-code horizon scanning document incorporates anticipated changes across the energy industry that could affect any of the codes within the Code Administrator Code of Practice (CACoP). This can be found on our codes

Deliverable	Target delivery date	Actual delivery date	Status
			section of the ESO Website: https://www.nationalgrideso.com/codes All modifications from the last two years are available on our website and further historic modifications are being added from the last 10 years. We have updated our website to showcase all historical modifications and outcomes across Grid Code, Connection and Use of System Code (CUSC) and System Operator Transmission Owner Code (STC) over the last two years. We have introduced of a new holistic view of all cross-code changes which impact codes we manage.
Horizon scanning: strategic	Q3 2019-20	Target date met	Completed. We circulated the horizon scan document at the November Panels. This can be found on our website here: https://www.nationalgrideso.com/codes
Transform industry frameworks to enable decentralised, decarbonised and digitised energy markets			
Leadership in the successful transformation of electricity access and charging regime	Ongoing	Ongoing	Ofgem have published their first working paper, and the ESO has been attending all sub-group meetings to assist them to get to this position. We will continue to shape the future of Access & Forward Looking Charges through these sub-groups
Leadership in the successful transformation of electricity access and charging – Publication of ESO-led Balancing Services Charges Task Force final report	Q1 2019-20	Target date met	Completed. In Q1 2019-20 the Balancing Services Charges Task Force published their draft report, held a final webinar and a published a consultation, with positive feedback received. The task force then published their final report (including consultation feedback from industry stakeholders) and this final report and other task force documentation can be found as follows: http://www.chargingfutures.com/charging-reforms/task-forces/balancing-services-charges-task-force/resources/
Leadership in the successful transformation of electricity access and charging – Leadership in network access and forward-looking charges review	Ongoing	Ongoing	We are continuing to shape the future of Access & Forward Looking Charges through Ofgem's Access and Connection Boundary sub-groups. In the Access subgroup we are leading on a few thought pieces. We are also providing modelling and policy support for Transmission Network Use of System (TNUoS) elements of the reform, which have been significant pieces of work.
Leadership in the Energy Codes Review – Publish ESO thought piece	Q1 2019-20	Target date met	Completed. In Q1 2019-20 our Thought Piece was published as planned and can be found as follows: https://www.nationalgrideso.com/codes/energy-codes-review We have since started to engage with stakeholders on our thought piece, and our thinking also contributed to our recent Energy Codes Review consultation response:

Deliverable	Target delivery date	Actual delivery date	Status
			https://www.nationalgrideso.com/about-us/our-consultation-responses
Working for you on European matters	Q2 2019-20	Target date met	Completed. In late September we published our high-level impact assessment on the Electricity Market Design elements of the Clean Energy Package. https://www.nationalgrideso.com/document/153571/download
Unlocking whole system network development opportunities – Continue to review potential options under the SQSS review.	Q1 2019-20	On hold	Deliverable N/A – The Engineering Standards Review was launched by the Department for Business, Energy and Industrial Strategy (BEIS) in the first half of the year, and supersedes our planned deliverable – we now expect to engage with the Engineering Standards Review: https://www.gov.uk/government/publications/electrical-engineering-standards-independent-review
Developing and driving targeted market improvements – Continue our review of new commercial security arrangements for long lead time high value transmission schemes	Q1 2019-20	Target date met	Completed. We continue to develop our internal thinking on this specific targeted market improvement i.e. long lead time high value transmission schemes. We have also continued to support, consider and/or develop other targeted market improvements such as supporting CMP285 (which was approved by Ofgem in July 2019 and improved the CUSC Panel election process), or raising CMP316, which explores Transmission Network Use of System (TNUoS) arrangements for co-located sites, and CMP311 which explores whether the balance of risk between suppliers and consumers is appropriate in respect of credit arrangements.
Facilitate electricity network charging reform through Charging Futures			
Facilitate electricity network charging reform through Charging Futures 1. Targeted Charging Review 2. Access and Forward Looking Charges SCR 3. Reform of the Balancing Services Charges	Ongoing	Ongoing	The year began with the finalisation of the Balancing Services Charges Taskforce Report in May, with webinars covering this taskforce and wider progression of reform to network charging. In July we hosted a Charging Futures Forum to bring a wider group of stakeholders up to speed with reform, and held another Forum in September where network users shared their views on the first working paper on Access and Forward Looking Charges. The latest Charging Futures Forum received a high score of 8.1 for satisfaction. We will continue to work with Ofgem to provide updates on network charging reform. Please see the Charging Futures website: http://www.chargingfutures.com/
Transform the customer experience for network charging			
Improve our ESO charging query processes – Communicate clear routes of contact for all charging queries and publish	Q1 2019-20	Target date met	Completed. We now manage charging queries through our customer relationship management system. Our contact details are clearly displayed on our website and we include them in any materials we produce. We aim to acknowledge all

Deliverable	Target delivery date	Actual delivery date	Status
updated query management standards			charging queries within 24 hours, we have made great improvements to meet this target during H1 for the vast majority of queries but still continue our strong focus to meet this expectation fully. In August 2019 we made further improvements to the query process, by publishing a new charging query online form as part of our website: https://www.nationalgrideso.com/charging/submit-charging-query In August we also started asking those submitting queries to rate how well we have responded to their query: our close-out email now includes a link to an optional survey which consists of one Net Promoter Score style question.
Improve understanding of our onboarding processes and streamline to meet our customer needs	Q4 2019-20	Target date met	Completed. Our approach to customer onboarding has been simplified by creating updates to guidance documentation on the newly updated charging section of the ESO website which can be found here: https://www.nationalgrideso.com/charging/charging-guidance This is in conjunction with our deliverable for redefining our processes to make them more customer centric. This will provide greater clarity and ease for new customers accessing key information during the onboarding process. The wider onboarding piece with Ofgem, Elexon and wider industry will begin next year as per our deliverable to establish a 'cross party' approach to onboarding and mapping out whole industry requirements. We published guidance documents, webinars and tools to our website to help customers and stakeholders to be better informed on our charges. They are: "TNUoS tariffs for suppliers", "BSUoS data sources", "What are Transmission Losses?", "TNUoS charges for generators", "A guide to Termination Amounts", and "Connections charges – annual charge and app fee calculator". The implementation of multiple contact emails for customer invoicing through the Charging and Billing (CAB) system has been completed, addressing a key issue highlighted by customers. The Variable Direct Debit process has been updated and any issues arising from the process have been minimised.
New data reports for BSUoS	Q1 2019-20	Target date met	Completed. We published a new version of the Balancing Services Charging report, which shows more granular costs by settlement period. The new report enables customers to see different cost components and model future prices. We publish the new version of the report to our website daily, to benefit those wider than our customers.

Deliverable	Target delivery date	Actual delivery date	Status
Reform of website content into a user-centric knowledge base	Q2 2019-20	Target date met	Completed. We re-structured the Charging section of our ESO website to make it easier for users to navigate. We received feedback from customers who appreciate the new layout.
Publications and guidance of the impact of charging reform to our customers	Q2 2019-20	Target date met	Completed. The TNUoS Tariffs report provides guidance on how the code modifications will affect TNUoS charges for different system users.
Introduce new 'new entrant' e-learning on charging	Q4 2019-20	Target date met	Completed with the new and updated guidance documents and billing tools outlined in the our engagement plan available on the charging section of the ESO website: https://www.nationalgrideso.com/charging/charging-guidance Additional tools have also been added to help give greater clarity to customers around the impact of the TCR and RIIO-2, and what potential effects they could have on TNUoS tariffs 2021-22 and onwards. The Charging forums in October provided a great stage for sharing of some of this information and providing new and existing customers with a better understanding and more clarity of our charges. The presentations and workshops from the forum have now also been added to the charging section of the ESO website and contribute towards our suite of training materials.
Making Electricity Market Reform (EMR) easier for participants			
Capacity Market Modelling – facilitating broader participation in the CM to provide security of supply at best value for consumers	Q4 2019-20	Q4 2020-21	This deliverable has moved from Q4 2019-20 to Q4 2020-21. In order to fully meet this deliverable, a new register of embedded assets is required as sufficient consolidated data points are not available. To date, a Distribution Connection and Use of System Agreement (DCUSA) modification has been raised seeking to create the necessary register of embedded assets. We are supporting this modification and are involved in the working group. The modification was due to be approved in Q4 2019-20, but this has been delayed as the working group had to resolve legal concerns regarding the provision of the data. The modification is now open for consultation with approval currently scheduled for May 2020. The Capacity Market analysis used to produce the Electricity Capacity Report (ECR) works on an annual cycle. As the analysis for the 2020 ECR will already be complete by the time the new embedded data is available, full implementation will not be possible until the next annual cycle in the 2021 ECR.

B.5 Stakeholder views

- ✓ New long-term reactive power service developed based on stakeholder feedback
- ✓ Positive stakeholder feedback from Flexibility Forum and Power Responsive summer reception
- ✓ Collaborated with Wind Advisory Group for Power Available work
- ✓ Worked with our tenderers to improve data access, simplify tender spreadsheets and improve their procurement experience
- ✓ Dynamic Containment work well received by industry, with 90% of survey respondents interested in participating

Product roadmaps for response and reserve implementation

Platform for Ancillary Services

Frequency Response and Reserve are essential balancing services which the ESO procures from industry providers to support the secure operation of the National Electricity Transmission System. It is our priority to reform the design of these services to ensure that they are capable of supporting carbon-free operation of the electricity system by 2025. Through the Platform for Ancillary Service (PAS) project we have moved non-BM (typically smaller-scale) STOR providers from historic systems into the new Ancillary Services Despatch Platform (ASDP), which is integrated with ENCC systems. Our stakeholders highly recommended the PAS project:

"We've been really pleased in the main with the implementation and the support and effort NGESO has given to the project:

- *PAS provides an opportunity to further automate processes, in line with [our internal] tools and the services we deliver to NGESO.*
- *The ability to affect our own front-end interface has allowed for more efficient use of the system by our Operations team." – provider*

"Pas has had an incredible beneficial impact on the ability of [our company] to provide reserve to National Grid

- *Cloud based – transitioning to the PAS system for STOR came at perfect time for the Covid lockdown as the Standing Reserve Dispatch (SRD) previous system was held solely in the now quarantined office meaning our commercial were unable to access this on a regular basis. For future use we are exploring mobile and other more advantageous uses of the software so we can maximise our flexibility and ability to respond to Grids needs.*
- *Variable MW for optional STOR contracts – we can now vary the size of our STOR contracts to match our available capacity, allowing us to demonstrate to the control room our actual expected dispatch rather than capacity agreed 6 months previously.*
- *Variable pricing – incredibly valuable from a commercial standpoint to allow us to respond to market variances and ensure our capacity is not priced out of the market or unduly exposed to movements in fuel cost.*
- *Central system – [we] previously operated from a number of individual SRD pcs, this made it both time consuming and in some cases practically impossible to adequately monitor all in service STOR contracts, the new central interface allows a single point of overview and control for the entire STOR and soon to be FR fleets.*
- *Great level of support from a dedicated Grid support team (particular thanks to [technical contact]) has helped us get through a lot of the teething problems swiftly and without major incident." – utility*

Dynamic Containment

For the new frequency response service, Dynamic Containment (DC), we have engaged with industry on the design of the product and the timeline for delivery. Due to the operability need for DC and learnings from the Auction Trial on the onboarding process, we have had tight timescales for engagement. Therefore, we made sure we engaged with the market in the most effective way, making sure to set and manage expectations. We shared our initial thoughts for the product proposal, making it clear to our stakeholders that this was an initial draft and we were also seeking alternative proposals to solve our operability challenge. We focused on working with ADE and Energy UK in the first instance, enabling us to meet with a large number of market providers in a single meeting.

We published an information pack outlining the problem (i.e. our operability need) with our proposal of the product and asked for providers' views via a feedback survey. Following feedback from industry, we extended the survey window from two to four weeks to allow providers more time to analyse the proposal. We had 36 responses to the survey, with 90% saying that they were interested in participating in DC. We met with ADE and Energy UK in January to take them through our proposal of the product to get their initial feedback. We then presented the document to industry via a webinar where they also had the chance to ask questions. 163 providers joined the webinar. We published the recording of the webinar presentation and the questions and answers in a document from the session. We have kept providers updated with the progress of the project via weekly communications and updates to the new DC page on the website[35].

Auction Trial

Since the go-live of the Auction Trial in November 2019, we have been reviewing what we can learn from this process. Providers have asked us to remove the unit caps, and we are assessing our internal processes against this feedback. We are also looking at how we can simplify the algorithm, helping our providers to better understand how the auction works. We aim to publish guidance and case studies to help educate the market and to encourage participation in the auction trial.

- *"Constant forward motion, transforming a complex system and opening markets to new capacity" - supplier*

Product roadmaps for reactive implementation

Our focus on delivering the Mersey voltage pathfinder in Roles 3&4 has been managed through cross functional working across all role areas. We invited industry to attend a webinar and respond to a request for information on a new long-term reactive power service. We used the feedback and responses to develop and tender for a nine-year service. We had over 30 solutions submitted from 15 providers. Throughout the project we have had many valuable conversations with participants – helping them to understand the service, contract terms and process. Other conversations have helped us understand the risk and uncertainty for commercial providers and develop the service, contract terms, and tender process and assessment.

During the tender some changes were required, and we informed all participants at the earliest opportunity – even where the change was not finalised.

- *"[We] were talking yesterday about the rapid rate of progress that NGESO have made this year with your pathfinder projects and greater procurement of grid services from distributed resources. We wanted to write to say congratulations – we think you've done fantastically to have 3 live pathfinder tenders and an RFI out. It must be hard work, but I hope it's also rewarding – you're doing an important job.*" *- pathfinder participant*

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

We worked very closely with SP Manweb for both Mersey tenders to assess whether distribution connections were technically feasible, effective and economical. The close partnership has, for the first time, allowed a distribution connection to provide a reactive power service to the transmission system. Lessons from the Mersey 2020 tender were applied to the Mersey 2022 tender, enabling high quality outputs which could be confidently shared with tender participants. Both tenders have delivered significant learning for us to take to other DNOs as we develop further tenders for other areas of the network.

We have continued to collaborate with DNOs to investigate management of reactive power transfers between networks. DNOs have recognised the problems we experience, and are willing to take a pragmatic approach in times of system stress on the transmission system.

We remain part of the CUSC working group seeking to review reactive power market arrangements. We intend to publish our strategy for market review by Q3 2020-21 following industry engagement events.

Product roadmaps for restoration implementation

Black Start Strategy and Procurement Methodology

In February 2020 we launched the consultation for the new Black Start Strategy and Procurement Methodology. There was a good response to the consultation, and this has helped us shape the Methodology which is now with Ofgem for approval. Some examples of consultation feedback were:

- *"We are fully supportive of greater transparency regarding the reporting of Black Starts costs and the principles of procurement."*
- *"We welcome the fact that Interconnectors are included and will be included in future open and competitive tenders."*
- *"This consultation is a good example of allowing all potential participants to existing and new products the opportunity to share their thoughts and concerns."*
- *"In general, the additions you have included this year provided greater insights and understanding on the ESO's approach to black start and associated procurement."*
- *"The consultation document has a strong focus on the use of competition and new approaches in black start provision. We agree that these principles should be applied, where appropriate, and they should inform the development of the long-term strategy for delivering effective and value-for-money black start across all regions of GB."*

Black Start Training

In Autumn 2019 the ESO's Black Start training was extended to include external parties such as TOs and DNOs.

The ESO was approached by a consultancy currently working with the German government in a project developing market-based alternatives to non-frequency ancillary services. This consultancy is developing a model for procurement of black-start capability for Germany. The consultancy said in relation to Black Start in the UK:

- *"In doing so, we were researching the UK Black Start Strategy, which to us seems to be an international best-practice example."*

We moved from buying Black Start through bilateral contracts to running competitive tenders which are open to all. This is a significant change and one that has had significant challenges, but the early outcome looks very positive with a large number of new participants and a great response from the market.

Competitive Events for procurement

Following on from the Expression of Interest (EOI) which we published in February 2019 for Restoration services in the South West and Midlands, feedback has helped the ESO shape the requirements for a second procurement event in the Northern region, which we launched in August 2019. Both competitive events are on track for delivery of services in 2021 and 2022. In the Methodology, we have announced that the next procurement event will be launched in 2021 for services in the South East.

Distributed Re-start

Distributed ReStart explores how Distributed Energy Resources (DER) in Great Britain can be used to restore power in the highly unlikely event of a total or partial blackout of the National Electricity Transmission System. The project is a partnership between National Grid Electricity System Operator (ESO), SP Energy Networks (SPEN) and TNEI. This project was partly funded by NGESO TOTEX (as a compulsory network licensee contribution), in combination with £10.3 million of Network Innovation Competition (NIC) funding. ESO's bid for innovation funding was approved by Ofgem in November 2018, and webinar sessions were held in March 2019, August 2019 and January 2020. The project also reached out to the industry via various workshops and teleconferences, with the first annual conference was held on 30 January 2020.

Network Code on Electricity Emergency and Restoration (NCER)

In 2019-20, the ESO has progressed the implementation of the Network Code on Electricity Emergency and Restoration (NCER). This has been completed by progressing changes to the Grid Code, namely GC0108[36], GC0125[37] and GC0127[38]/GC0128[39]. These changes have been proposed in collaboration with industry working groups, and were approved by Ofgem in February 2020[40].

In accordance with NCER, ESO have prepared and consulted on the following documents with the Industry and Ofgem.

- System Restoration Plan
- System Defence Plan
- Market Suspension
- Test Plan.

There has been strong engagement from the industry through a series of consultations. This feedback, which is published on our website, led to several amendments being made to the document, which have now been submitted to Ofgem for approval.

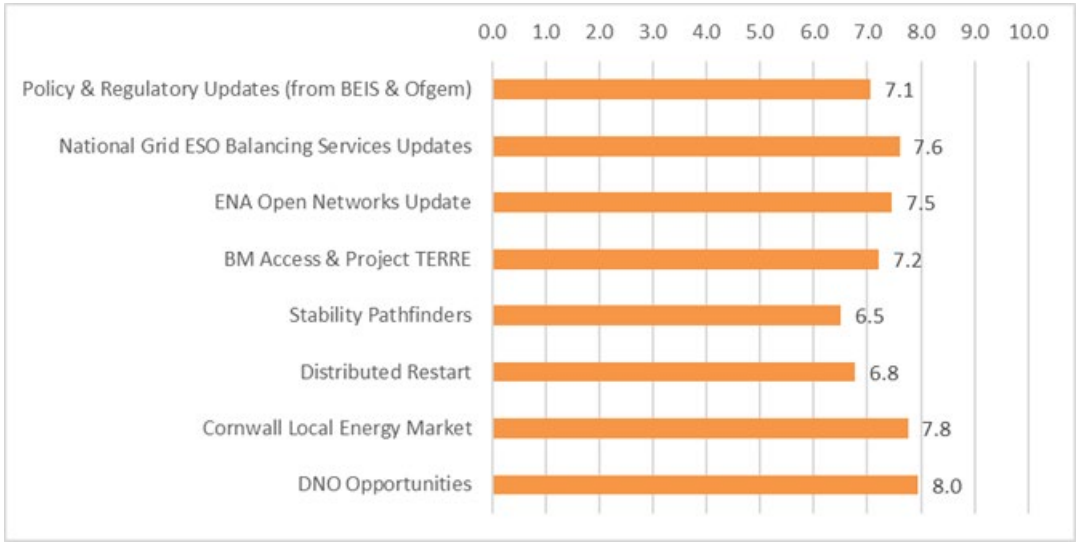
Power responsive

Flexibility Forum Survey

We held the Flexibility Forum on 15 January, where we welcomed 160 industry parties to the ETC Venue in London. The day covered policy updates from BEIS and Ofgem, current developments in flexibility markets from the ESO and ENA, and future opportunities from Centrica, ESO and DNOs. We received 45 responses to our feedback survey after the event, with an average score across the day of 7.3/10 on the question "How useful did you find each session?", as shown in the chart below.

How useful did you find the sessions? Scored out of 10

[36] https://www.nationalgrideso.com/industry-information/codes/grid-code/modifications/gc0108-eu-code-emergency-restoration-black-start
[37] https://www.nationalgrideso.com/codes/grid-code/modifications/gc0125-eu-code-emergency-restoration-black-start-testing-requirements
[38] https://www.nationalgrideso.com/codes/grid-code/modifications/gc0127-eu-code-emergency-restoration-requirements-resulting-system
[39] https://www.nationalgrideso.com/codes/grid-code/modifications/gc0128-eu-code-emergency-restoration-requirements-resulting-system
[40] https://www.ofgem.gov.uk/system/files/docs/2020/02/gc_125_127_128_d.pdf



As part of the survey we received feedback from participants on what went well and what we should change for the next event, which we will be addressing for future events.

- *"I think the main thing for there is a lot of the info was pitched as if people already knew quite a lot, rather than keeping people up to speed."*
- *"It was very useful that it brings together a wide range of players. It allows us to keep up date with what's happening."*
- *"Arranged excellent speakers to present."*
- *"[The event should] omit some of the very technical presentations describing development of new services"*
- *"The events fall in the same pattern, as time goes on the same area is being discussed so they could update the format as that would be valuable."*

Summer Reception Survey

This survey followed the Power Responsive Summer Reception in June 2019. The reception is aimed specifically at the demand side flexibility community and takes place annually to inform the industry of demand side flexibility success in previous years, policy and regulatory, and market developments, and future opportunities and direction of travel. The survey seeks to capture how relevant and useful attendees found the content, and how confident attendees are that developments will deliver flexibility objectives. It is worth noting that the content is not solely ESO focused: BEIS, Ofgem, DNOs and other industry players are invited to deliver content.

How useful did you find the following sessions at the Summer Reception? (0 = not very useful / 10 = extremely useful)

- Flexibility Trends & Direction of Travel
  - Average of 8 out of 10
- National Grid ESO Balancing Reforms and Wider Opportunities
  - Average of 7.88 out of 10
- Network Charging Reforms
  - Average of 6.75 out of 10
- Emerging DNO & Whole System Opportunities
  - Average of 7.43 out of 10
- The Future of Flexibility
  - Average of 7.14 out of 10

On average, reception attendees scored the event content as 75% useful to themselves/their organisations. Our participants found it useful to understand the ESO view as a guidance to the market. Participants provided the below feedback on this event:

- *"Good to see a general stance that flex will become more important."*
- *"[NGESO views on] future pricing for DSR [is useful]. I understand the economic of driving down price but without investment future ideas in this space will only provide shorter term fixes, which are not practical solutions for delivery to a wider space."*
- *"I come from a mobile and IT background, so very new to this area. More forums and step by step guidance for new entrants etc would be useful."*
- *"A pleasure as always- as you say, lots of good engagement which made my job a lot easier! Well done to you for excellent organisation- it felt seamless."*
- *"Thanks again for the chance to share our experience at yesterday's Reception. I thought the keynote by Chris Rapley set a committed tone and the event featured a broad range of interesting perspectives."*

Wider access to BM roadmap implementation

We are introducing the Application Programming Interface (API) as a way for smaller parties without Bilateral Connection Agreements (BCAs) or Bilateral Embedded Generation Agreements (BEGAs) to communicate with the control room in a more cost-effective and faster way than the traditional Electronic Dispatch Logging (EDL) and Electronic Data Transfer (EDT) communication route. We received some feedback from one party who wanted to access the BM as a BEGA party but was concerned around the requirement to use EDL/EDT. We responded to this feedback by changing our processes to allow BEGA parties to use the wider access API instead of EDL/EDT, and received positive feedback from the party involved:

- *"I'm pleased to report that we have received advice from the relevant teams that small generators entering the market via the BEGA route will be able to access the Wider Access API instead of traditional EDT/EDL solutions. The team has also been in touch to facilitate access to the test environment for our software engineers so that they can get to work to make sure our systems integrate with NG ESO's in time for the connection of the first Autobidder site… It is really good to see the NG ESO teams aligning and being able to revisit internal decisions to check that they align with the goal of operating the system with net-zero emissions." – service provider*

Despite having over 400MW of wider access flexibility in the BM now, some VLP parties have been reporting that they are not being instructed by the control room as much as they feel they should be, based solely on the price order in the BM (this has become known as "skipping"). We are listening to the feedback and have been holding regular calls with concerned parties to provide clarity on individual decisions. We are also in the process of developing a 'skip rate' tool so we can get a better understanding of who is being skipped and when, which will help us understand the drivers behind the issue.

Intermittent generation

We have continued to regularly engage with the intermittent generation community through the Wind Advisory Group (WAG), facilitated by RenewableUK. This has been positively received by the industry, and has helped us to write a report detailing the wider strategy for flexibility from intermittent generation, which has been sent to the group and published on our website. This report sets out the issues and barriers around flexibility that have been communicated to us, and details the work we have set in motion to address these concerns.

We have been working with the WAG to keep them updated with the progress of the Power Available (PA) signal implementation, which is one of our deliverables. To help wind operators to improve their PA signalling in advance of go live, we have also shared a snapshot of their operational signal accuracy with

them. We have received interest from 10 different companies in receiving this data snapshot covering 53 wind Balancing Mechanism Units (BMUs). Each respondent has received the data and then been able to query their results directly with a control room engineer. Initial feedback from one company suggests that the data has been useful in improving their signalling, and helped them to understand how the data they send to the control room is used with practical examples from their own portfolio. We hope that this exercise will enable the PA project to have an impact immediately upon go-live. We have received the following feedback from one of the WAG members on the work we are doing on PA implementation:

- *"Thank you and all the NGESO team that has worked hard for this to happen. We know that the effort that has been put on this and hope we can keep supporting you in the future to allow for more confidence and flexibility from wind."*

However, there are still barriers to intermittent generation participating fully in our markets, particularly the lack of a dynamic high-only product for frequency response. One party told us:

- *"…it's frustrating to be blocked by what appear to be regulatory barriers rather than technical ones … Weekly auctions for Dynamic High Response FFR would be ideal for distributed wind at this time and would give us the chance to develop our understanding of frequency response from real experience. I'm surprised that the move to weekly auction trials hasn't already incorporated this type of product, I had thought the purpose of weekly auctions was to help access the GWs of intermittent distributed generation for FR?"*

We are very conscious of this issue, and are looking to address this through developments to our IT and processes for scheduling, dispatch and settlement systems, as well as designing some of our future frequency response products to be able to be delivered as either high or low. We will be continuing to engage with the intermittent generation community through the WAG as well as dedicated sessions on the new product suite.

Facilitating code change

Following the 2019 CACoP survey, we have made extensive improvements for our industry stakeholders who need help to make code changes.

It was apparent that there were frustrations with interacting with our codes, but also some wider industry issues such as lack of resourcing and knowledge were particularly reported for our codes. Given that our team was processing over 70 modifications (which resulted in approximately 121 workgroups that we administered) and the additional burden already on industry, this ultimately meant that we not only needed to improve our existing service, but also think more holistically about how we could make code change easier for everyone whether they were newly interacting with us or very familiar with the governance process.

This resulted in some extensive process and cultural changes for our team internally, including upskilling, training, and better tracking of our key performance indicators. We felt this cultural shift was essential, not only to be able to embed the wider external changes that our stakeholders expected to see, but also to ensure that they were all sustainable and consistent in the future.

We chose our improvement areas very carefully in accordance with what our stakeholders told us they wanted to see. We shared these in an open letter[41] to industry and have detailed key focus areas below (the full list of ongoing focus areas can be found in our 2020-21 Forward Plan):

[41] https://www.nationalgrideso.com/document/156551/download

Case Study: Code administrator website

In March, we started implementing major changes to improve the experience of users visiting the Codes pages on the ESO website. We delivered a large-scale review and redesign of the Industry Codes section of the ESO website. We took on board feedback that said the website was difficult to navigate, and the information was sometimes out of date or missing. In order to see the significant changes that our stakeholders wanted within a reasonable time scale, we made an investment to employ an external agency. The agency has re-written, streamlined and consolidated all of our pages to be more intuitive, as well as make everything look and feel more current. Not only have we made these changes, but internally, we have reviewed all the information on each page (such as guidance to new industry parties for example) to ensure it is helpful and accurate.

The project saw a total of 23 pages reviewed, redesigned, rewritten and pushed live on the ESO domain[42] on 31 March 2020. Since the project, we have seen an improvement to key usability metrics such Bounce rate, Pages per session and the number of Page views which all indicate that our pages are being well-received.

We've seen a 12%* reduction in Bounce Rate when comparing the immediate period prior to deployment. Bounce rate is a widely used digital metric and a significant drop such as this indicates that the redesigned pages are far more intuitive for our website users. It also indicates that fewer people are leaving the ESO Codes website immediately without taking further action. This is a significant drop by digital standards.

Since the review, we have also seen an increase in visitors to the pages (an 11%* increase in Pageviews, 14,052 vs 12,576). Pageviews indicates that the information on our new pages is useful to those in industry and more people are able to find our pages through search engines, due to our search engine optimisation activity.

Users appear to be visiting more pages on our website since we redesigned the pages to make navigating them easier and we've seen a 10% increase in Pages per session.

The newly redesigned Codes homepage[43] has been performing particularly well – by redesigning the page to be more intuitive, we've reduced the Bounce rate of this primary page by 45%*.

*Data sourced from Google Analytics (date range: 31/03/20 – 21/04/20 vs 9/03/20 – 30/03/20). A small margin of error may need to be accounted for when reviewing this data.

Modification reports

Stakeholders told us that our reports were too long, difficult to navigate and could sometimes be repetitive. We have redesigned our workgroup consultation document to better explain the change being consulted upon and made it more digestible for multiple readers. This new format is now being rolled out across all of the documents we publish during the modification process. We conducted a webinar to show industry the new look document, to ensure that it was in line with what they expected to see. The webinar itself received a high score of 8.75 and some feedback received was:

- *"I like the fact that the questions you are asking as part of the consultation are throughout the document"*
- *"It is much easier to digest the information you require"*
- *"I have sent it on internally to look at any best practice we can use within our company"*
- *"Thank you for addressing our concerns with the reports"*

[42] www.nationalgrideso.com
[43] www.nationalgrideso.com/industry-information/codes

- *"This should help our members, thanks for taking the time to talk us through this improvement"*

Executive summaries

Our new consultation and report format all include an executive summary for those short of time, wanting a brief overview. We have also introduced a proposal summary document to help stakeholders to understand complex modifications when they are first being proposed. We have received positive feedback on the implementation of these new supplements from the February Grid Code Panel, noting that they were useful and that the Panel would like the Code Administrator to continue to produce these.

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

We continuously engage with our customers and stakeholders through various forums, this provides industry with an opportunity to understand the reforms which are ongoing, and for them to be able to input and shape these. These include: Transmission Charging Methodology Forum (TCMF), Connection and Use of System Code (CUSC) Issues Steering Group, and Charging Futures Forum.

Below we have called out the scores from recent events where we had a large number of participants. The event score relates to the content and presentation of the material, with the secretariat score relating to the organisation of the event. The ESO is accountable for both of these scores in the table below.

Event	Event Score	Secretariat Score
Targeted Charging Review (TCR) Webinar (March 2020)	7.6	8.4
ESO Targeted Charging Review (TCR) Webinar (December 2019)	7.6	N/A
BSUoS Transmission Forum Final Webinar (October 2019)	8.1	N/A

We received feedback from our stakeholders:

- *"I have flagged the work of the BSUoS Transmission Forum (TF) to Ofgem in the scope of the System Operation review that it is in the process of launching as a good example of the value I see in a more assertive and independent system operator – in helping to tackle the complex policy issues that we will continue to face." -- provider*
- *"It has been greatly beneficial to have had consistent support during the Access SCR project. Previous experience of working with [National Grid] has been negatively impacted by continually changing personal contact points" – provider*

Facilitate electricity network charging reform through Charging Futures

We have continued to deliver regular Charging Futures Forums throughout the year to facilitate debate between network users and policy makers. Alongside this we have kept network users informed of charging reform through webinars, podcasts, emails, summary notes and our website.

Feedback from our forums include:

- *"Excellent Forum: Insightful conversations"*
- *"Very useful and comprehensive information"*
- *"Opportunity to ask Questions. Networking"*
- *"Pre homework is helpfully laid out"*

- *"An excellent forum, sincere thanks"*
- *"Open communication"*

Transform the Customer Experience for Network Charging

We have continued to focus on the better provision of data and information, and removing unnecessary barriers to market entry through improved onboarding processes. Our stakeholders told us that we need to improve our customer experience:

- *"Be as transparent as possible in requirements. Engage early with industry on product. Try and act like you also trust us." – provider*
- *"More transparency around tender exercises including timelines and feedback post tender." - generator*

In response to feedback we have received, a number of improvements have been implemented, including:

- Better access to data: We now publish the post tender results data for our monthly tendered services in excel format to enable providers to more easily carry out their own analysis
- Tender spreadsheets have been simplified to include drop-down menu choices where possible to try and prevent non-compliant bids being received
- We acknowledge that the move from our Ariba e-tender system to Coupa was not easy. We are working with our Procurement colleagues to improve functionality to confirm receipt of tenders, and send automated emails on tender closing.

We received the following feedback from our stakeholders:

- *"Maintain strong links across NGESO so that questions can be swiftly directed to the relevant person, as it was in this case." – supplier*
- *"Our account manager is very responsive and keeps us informed on progress." – provider*
- *"My question was answered quickly - the next morning - so I see no need for improvement." – provider*
- *"The assistance provided by our Account Manager was exceptional and much appreciated." – provider*
- *"Very prompt and informative response. Query was answered in full and with no delay." - provider*

Making Electricity Market Reform (EMR) easier for market participants

Our engagement on capacity market modelling is predominantly with BEIS, Ofgem and BEIS' independent Panel of Technical Experts (PTE). The PTE perform a critical role in scrutinising our work, which helps to inform the decisions taken by the Secretary of State following National Grid ESO's recommendations in the Electricity Capacity Report (ECR). The PTE produce an annual report on our ECR modelling, which also includes recommendations for future developments. The feedback in the 2019 PTE Report described our work as: "a thorough and carefully executed analysis." The PTE also endorsed the improvements made to assess interconnector de-rating factors and overall, were "pleased with the process of engagement."

One of the recommendations in the 2019 PTE Report was to create a register of embedded assets. This led to us supporting a Distribution Connection and Use of System Agreement (DCUSA) Change Proposal, referred to as DCP350[44]. National Grid ESO took an active role in the Working Group, working

[44] https://www.dcusa.co.uk/group/dcp-350-working-group/

collaboratively with DNOs to develop the Change Proposal. This is currently scheduled for approval in May 2020, and if approved, will help to improve our modelling of embedded generation in the capacity market to benefit energy consumers in Great Britain.

While we haven't carried out any modelling changes that required a formal industry consultation this year, we have engaged with industry stakeholders to discuss our modelling at a capacity market launch event in July, an interconnector briefing hosted by BEIS in September and bilateral meetings throughout the year.

B.6 Outturn performance metrics and justifications

Metric	Performance	Status	Justifications
4. Provider Journey Feedback	3.7/5 score on Tendering survey	🟡	The feedback we have received shows we have made improvements over 2019-20 and we are in line with benchmark.
5. Reform of Balancing Services Markets	Deliverables to remove barriers to entry on track, and tracking movement away from bilateral arrangements	🟢	Deliverables relating to balancing products and markets gives a performance of 76% which exceeds benchmark
6. Code Admin Stakeholder Satisfaction[45]	(1) CACoP survey performance was below benchmark.	🔴	(1) Performance in all three of our codes scores have decreased from previous years. The results only cover the first half of the performance year as they are published in the previous October.
	(2) Deliverables delivered on time	🟡	(2) All deliverables were delivered by year end, but there were some delays within year including the website improvements.
	(3) ESO customer survey was above benchmark	🟢	(3) For customer survey feedback at the commencement of modifications, we outperformed the previous year's baseline.
7. Charging Futures	Average webinar and workshop score of 7.7 against a baseline of 7.3	🟢	We continue to work with various content providers to produce the webinars and seek out new ways of collaborating. Our workshop feedback was largely positive.
8. Year ahead forecast vs outturn annual BSUoS	Annual BSUoS forecast was £3.07/MWh, and outturn was £3.44/MWh[46], giving an APE of 10.8%[46]	🟡	Annual BSUoS forecasting was higher than 10% APE and lower than 20% APE.
9. Month ahead forecast vs outturn monthly BSUoS	15% average forecasting error across whole of 2019-20 performance year	🟢	Forecasting error has been less than 10% APE for five months and above 20% APE for four months.

Figure 8: Summary of metrics for Role 2

- 🟢 **Exceeds benchmark**
- 🟡 **In line with benchmark**
- 🔴 **Below benchmark**

[45] Corrected 10 June 2020

[46] Corrected 14 May 2020

Metric 4 – Provider Journey Feedback

This metric measures feedback from four areas.

Onboarding Survey Benchmark Data – Performance Against Targets

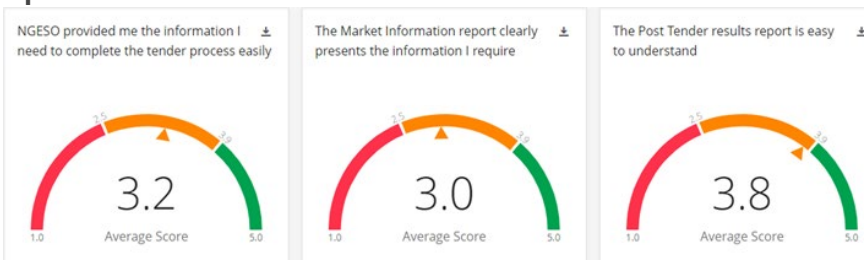
Through our discussions with Providers during the onboarding process we frequently seek verbal feedback on the documentation we publish and where we can make improvements. This includes ensuring the Balancing Services Guidance Document is kept up-to-date along with other website material.

Tendering Survey Benchmark Data – Performance Against Targets

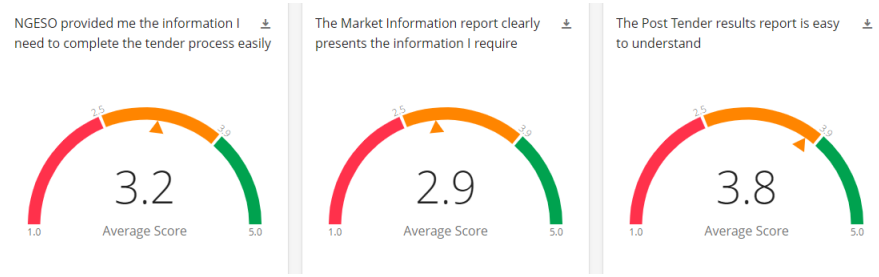
Scores across the tendering survey have consistently improved throughout the year. In response to feedback we have received, improvements have been implemented, including:

- Better access to data: We now publish the post tender results data for our monthly tendered services in excel format to enable Providers to more easily carry out their own analysis
- Tender spreadsheets have been simplified to include drop-down menu choices where possible to try and prevent non-compliant bids being received

April 2020 Data:



January 2020 Data:



December 2019 Data:

September 2019 Data:

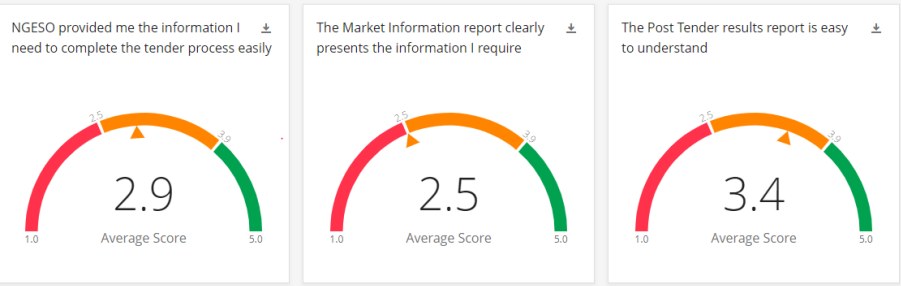


Figure 9: Average tendering scores

Contracting

To minimise survey fatigue, seeking this feedback took the form of a check-in with Providers prior to their Contract Start to make sure all of the required arrangements were in place.

Query Management Survey Benchmark Data – Performance Against Targets

Surveys are being sent as part of our Query Closure process with a summary of responses received to date below. A key area of improvement has been to ensure Providers are kept up-dated with the status of their query and one we will continue to focus on.

Colour category for 'Were you updated regularly with the status of your query':

- Strongly disagree
- Somewhat disagree
- Neither
- Somewhat agree
- Strongly agree

April 2020

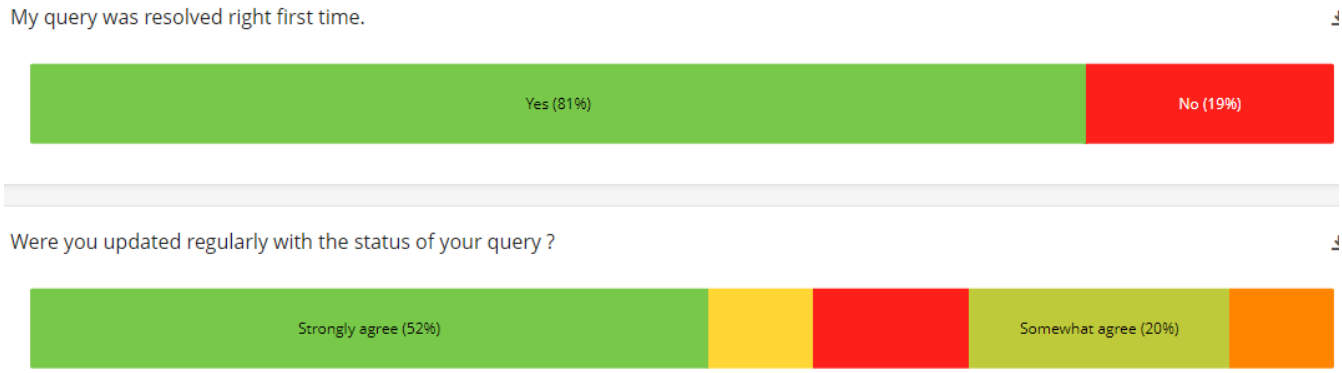


Figure 10: Average query management scores

Supporting information

Our annual performance is in **line with the benchmark**. The average feedback score we received in 2019-20 is 3.7.

There has been no feedback from the Onboarding survey, however the Balancing Services Guidance Document is under constant review and the document is updated regularly. We refer new providers to this document in the first instance.

Feedback on our Tendering Process has shown steady improvement throughout the year, with feedback being responded to and improvements made.

Query Management feedback has seen an improvement in queries being resolved first time, as well as providers being kept up to date on progress with their query. This remains a continued area of focus going forwards.

Performance benchmarks

- **Exceeds benchmark**: average of 4.5 or above
- **In line with benchmark:** average of 2.5-4.5 or above
- **Below benchmark:** average of less than 2.5/5

For full details of this quarterly metric, including the survey questions, see page 46 of our Forward Plan

Metric 5 – Reform of Balancing Services Markets

In response to stakeholder feedback at the mid-year ESO performance panel in November 2018, we developed a metric that covers the removal of barriers to entry for different technologies in different services. This is supplemented by tracking the distribution of balancing services spend across bilateral and open procurement approaches (competitive tenders and auctions) in order to tell the full story. We use this metric to communicate progress against a fundamental element of Role 2 deliverables. Where the status has changed, the background colour represents the original forecast status.

Metric Part 1

Where the status has changed, the background colour represents the original forecast status.

- significant barriers to entry with no solution implemented
- interim solution implemented
- enduring solution implemented to enable commercial access

Deliverable in 2019-20	BM Wind through 2019-20					Embedded wind through 2019-20				
	Current	Q1	Q2	Q3	Q4	Current	Q1	Q2	Q3	Q4
Mandatory Frequency Response (MFR)	●	●	●	●	●	●	●	●	●	●
Commercial Frequency Response (FFR/auction trial)	●	●	●	●	●	●	●	●	●	●
Obligatory Reactive Power Service (ORPS)	●	●	●	●	●	●	●	●	●	●
Reserve Products	Consultations and developments carried out in 2019-20 for delivery in future years									
Black Start services	Consultations and developments carried out in 2019-20 for delivery in future years									
Balancing Mechanism	●	●	●	●	●	●	●	●	●	●

Deliverable in 2019-20	Solar through 2019-20					DSR through 2019-20				
	Current	Q1	Q2	Q3	Q4	Current	Q1	Q2	Q3	Q4
Mandatory Frequency Response (MFR)	●	●	●	●	●	●	●	●	●	●
Commercial Frequency Response (FFR/auction trial)	●	●	●	●	●	●	●	●	●	●
Obligatory Reactive Power Service (ORPS)	●	●	●	●	●	●	●	●	●	●
Reserve Products	Consultations and developments carried out in 2019-20 for delivery in future years									

Black Start services	Consultations and developments carried out in 2019-20 for delivery in future years									
Balancing Mechanism	●	●	●	●	●	●	●	●	●	●

Figure 11: Relationship between deliverables and barriers to market participation

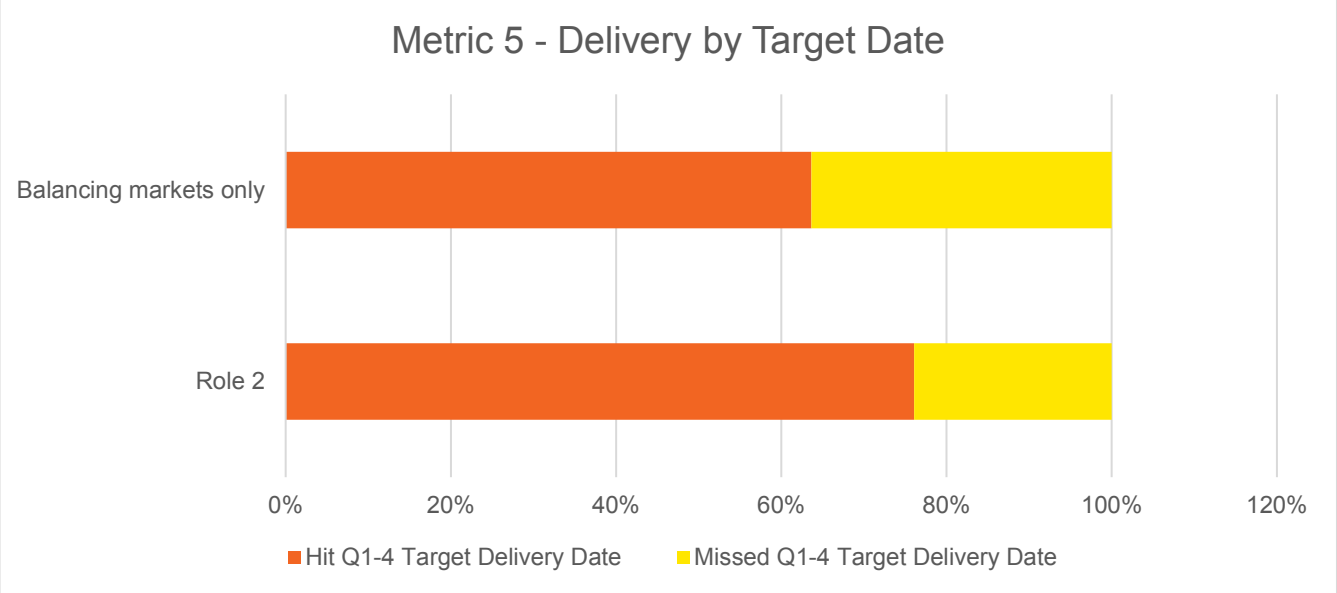


Figure 12: Target delivery performance

Supporting information

Over the 2019-20 period, 76% of our Role 2 deliverables were achieved on time, which equates to a score of **Exceeds benchmark**. Looking at just those Role 2 deliverables that relate to balancing services, a slightly lower figure of 64% were achieved on time, which equates to a score of In Line with Benchmark. The delayed deliverables were mainly due to the reprioritisation of reactive power work to focus on the Voltage Pathfinder; unforeseen issues on the Power Potential innovation project; and unexpected IT issues being found during testing of the Power Available signal implementation. These delays affected access to the mandatory market for wind and solar in Q4, as illustrated in the first table.

Performance benchmarks

The timing of the deliverables is achievable but challenging, particularly for those classed as Exceeding Baseline', and therefore a target of >75% for being above the benchmark was chosen:

- **Exceeds benchmark**: Completing >75% of deliverables.
- **In line with benchmark:** Completing 50-75%.
- **Below benchmark:** Completing <50% of deliverables.

Metric Part 2

Part 2 of this metric measures the direction of travel away from bilateral arrangements, towards open and accessible market opportunities. We have attributed balancing spend to three categories that describe the openness of the procurement approach: Commercial (bilateral contract); Mandatory; Tendered. On a quarterly basis, information is presented in a chart for each service that shows cumulative spend broken down into the three categories of procurement approach to provide supporting narrative on our progress.

Data for 2019-20 is shown in Figure 13.

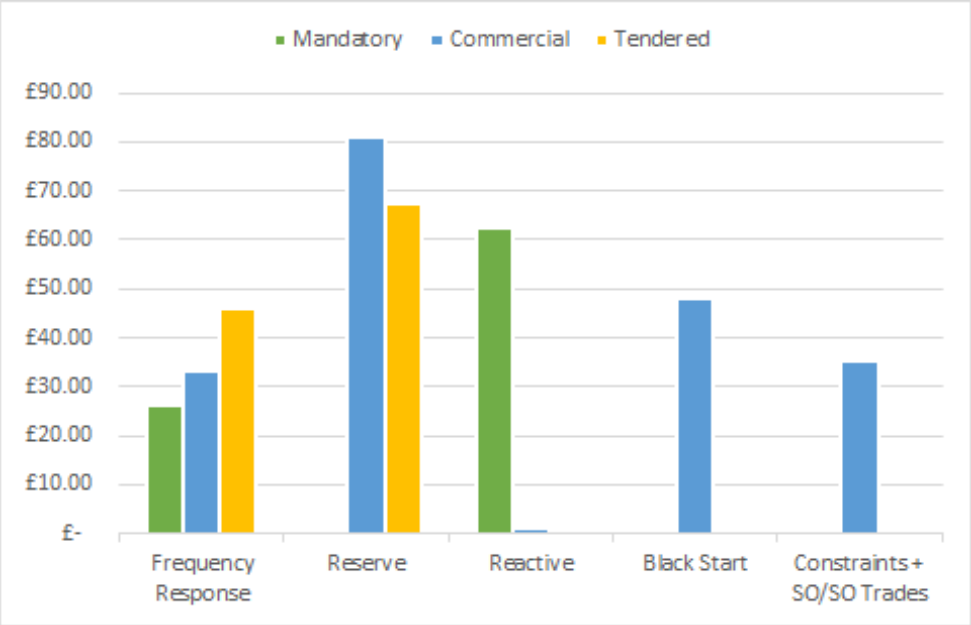


Figure 13: Cumulative spend on services per procurement category in £millions[47]

Performance benchmarks

There are no performance benchmarks set here, as none were set in the 2019-21 Forward Plan. However, we believe that reporting the information in a regular and transparent way will allow for more open conversations around balancing services procurement and the effect Forward Plan deliverables have on the markets. In response to stakeholder feedback, in our 2020-21 Forward Plan we have now set benchmarks for next year's reporting.

Supporting information

Frequency Response has seen an increase in tendered spend during Q3 and Q4 compared to Q1 and Q2. This is as a result of the introduction of the frequency response auction trial in November, which has seen a slightly higher market price paid, as well as the ESO moving some of the response requirement from the mandatory market to the Firm Frequency Response tender, increasing capacity bought from 1400MW to 1719MW. Relative proportions of reserve spend have remained broadly the same each quarter in 2019-20.

For full details of this quarterly metric, including the survey questions, see page 47 – 49 of our Forward Plan.

[47] Corrected on 10 June 2020

Metric 6 – Code Admin Stakeholder Satisfaction

Code Administration Code of Practice (CACoP) – stakeholder satisfaction survey results

Year	CUSC	Grid Code	STC
2019	43	46	44
2018	65	66	58
2017	47	59	45

Figure 14: CACoP stakeholder satisfaction survey

ESO Code Administrator Stakeholder Survey Performance

Workgroup	Month surveyed	Average rating
CMP285	April 2019	7.6
CMP303	April 2019	8
GC0096	April 2019	7
GC0111	April 2019	7.3
GC0114	April 2019	5
CMP292	August 2019	5
CMP295	August 2019	7
CMP306	August 2019	6
GC0123	August 2019	9
GC0125	August 2019	8
GC0105	October 2019	6.5
CMP320	February 2019	10
CMP333	April 2019	9
2019-20 Average rating		**7.34**
2018-19 Baseline rating		**6.93**

Figure 15: Workgroup Satisfaction Performance

Supporting information

CACoP survey:

We are **below benchmark** due to the decrease in scores received through the CACoP survey, conducted May to August 2019. These were disappointing, however they set out clear areas for improvement that we have been able to focus on to better meet our stakeholders' expectations. We have clearly outlined the activities that we have undergone as a team, to improve, moving forward.

Improvement activities according to plan:

We have remained **in line with the benchmark** for improvement activities. We have delivered everything that we promised to achieve, but with some deliverables slightly delayed beyond the originally anticipated dates. Areas such as the website upgrade have demonstrated that by taking the

time and investment to make sustainable and future-proof changes, we can ensure stakeholders will see real benefits for the long term.

Stakeholder Satisfaction:

Stakeholder satisfaction surveys conducted throughout the year following the conclusion of a modifications workgroup have shown an average score of 7.3 an increase on the baseline score of 6.9. We have therefore **exceeded the benchmark**. We will continue to work hard to ensure this high standard continues.

Performance benchmarks

- **Exceeds benchmark**:
  1. Increased overall performance across all our three codes (STC/CUSC/Grid Code) in the 2020- 21 CACoP survey due to be carried out in spring 2020; benchmarked with our previous scores.
  2. All exceeding baseline deliverables achieved to plan.
  3. Stakeholder survey taken periodically throughout the year – increased overall performance across all our three codes (STC/CUSC/Grid Code); benchmarked with our previous scores.
- **In line with benchmark:**
  1. Increased overall performance across all our three codes (STC/CUSC/Grid Code) in the 2020-21 CACoP survey due to be carried out in spring 2020; benchmarked with our previous scores.
  2. All exceeding baseline deliverables achieved to plan.
  3. Stakeholder survey taken periodically throughout the year – increased overall performance across all our three codes (STC/CUSC/Grid Code); benchmarked with our previous scores.
- **Below benchmark:**
  1. Maintained performance across all our three codes (STC/CUSC/Grid Code) in the 2020-21 CACoP survey due to be carried out in spring 2020; benchmarked with our previous scores.
  2. All baseline deliverables delivered to plan.
  3. Stakeholder survey taken periodically throughout the year – maintained performance across all our three codes (STC/CUSC/Grid Code); benchmarked with our previous scores.

For full details of this quarterly metric see page 50 of our Forward Plan.

Metric 7 – Charging Futures

Our role as lead secretariat for Charging Futures allows us to exhibit our proactive stance in helping the industry to best engage with charging reform. Our performance should be judged on how well we can enable the industry change process.

18/19 Baseline	Active Network Management Webinar – May 19	Access Webinar – May 19	DUoS and Locational Granularity Webinar – May 19	Balancing Services Charges Taskforce Webinar – May 19	Final TCR Decision Webinar – December 19	ENA Non-SCR Webinar – December 19	ESO TCR Webinar – December 19
7.3	6.2	6.2	6.6	8.1	5.0	6.8	7.6

Figure 16: Charging Futures Webinar Satisfaction

18/19 Baseline	Charging Futures Forum - July 19	Charging Futures Forum - September 19	Charging Futures Forum - December 19	Charging Futures Forum - March 20*
7.3	6.9	7.6	8.1	7.6 & 8.3

Figure 17: Charging Futures Forums Satisfaction
**The Charging Futures Forum in March 2020 was delivered as two webinars as a precaution due to the outbreak of COVID-19*

Supporting information

Charging Futures average satisfaction this year was 7.7, which **exceeds benchmark** on the baseline of 7.3. We have taken on board previous feedback and ensured that topics covered in the agenda are in line with what industry will want to know about, working closely with the Ofgem team.

Charging Futures webinars scored an average of 6.5 which is a decrease on the baseline of 7.3. However, when only ESO webinars are considered, the score is an increase on the baseline from 7.3 to 7.9 which exceeds benchmark. Webinars that are not ESO led this year have included presentations from Ofgem, DNOs and the ENA. For the webinars that the ESO have led, we have **exceeded the benchmark.**

Performance benchmarks

- **Exceeds benchmark**: Average scores from surveys undertaken throughout the year are higher than the baseline score.
- **In line with benchmark:** Average scores from surveys undertaken throughout the year equal the baseline score.
- **Below benchmark:** Engagement scores achieved throughout the year fall below the baseline score.

For full details of this quarterly metric see pages 51 – 53 of our Forward Plan.

Metric 8 – Year ahead forecast vs outturn annual BSUoS

This metric compares the BSUoS forecast made at the start of the financial year against outturn using the concept of an Absolute Percentage Error (APE).

APE = abs((Actual – forecast)/ actual). APE calculates the difference between actual and forecast divided by the actual to give a percentage error, the absolute value is taken to account for positive and negative errors.

	Year ahead forecast	Outturn	Absolute Percentage Error (APE)
2019-20	3.07	3.44[48]	10.8%[48]

Figure 18: Year ahead forecast vs. outturn BSUoS (£/MWh) 2019-20 Performance

Supporting information

We are **in line with the benchmark** for 2019-20 year ahead BSUoS Absolute Percentage Error (APE), and the error has decreased to 10.8%[48] from 23% last year. We introduced a new forecasting process mid-way through last year, so this was the first year the annual forecast was made using the new process. The outturn BSUoS charge was higher than forecast due to higher costs through the later part of the year driven by the low demands, high winds and the changing energy mix.

Performance benchmarks

- **Exceeds benchmark**: Exceeding target is under 10% APE.
- **In line with benchmark:** Proposed baseline target is less than 20% APE.
- **Below benchmark**: Underperforming greater than 20% APE.

For full details of this annual metric see pages 53 – 54 of our Forward Plan.

[48] Corrected on 14 May 2020

Metric 9 – Month ahead forecast vs outturn monthly BSUoS

The metric will count the occurrences outside of a 10% and 20% band of absolute percentage error (APE) for our monthly forecast with outturn data available at month end.

Month	Actual	Month-ahead Forecast	Absolute Percentage Error (APE)	APE>20%	APE<10%
April-19	2.86	3.02	0.05	0	1
May-19	2.48	3.12	0.26	1	0
June-19	3.35	3.07	0.08	0	1
July-19	2.73	3.23	0.18	0	0
Aug-19	3.94	3.34	0.15	0	0
Sept-19	3.94	3.71	0.06	0	1
Oct-19	3.86	4.02	0.04	0	1
Nov-19	2.56	3.52	0.38	1	0
Dec-19	3.58	3.18	0.11	0	0
Jan-20	3.86	2.98	0.23	1	0
Feb-20	4.31	3.43	0.20	1	0
Mar-20	3.71	3.63	0.02	0	1

Figure 19: Month ahead forecast vs. outturn BSUoS (£/MWh) 2019-20 Performance

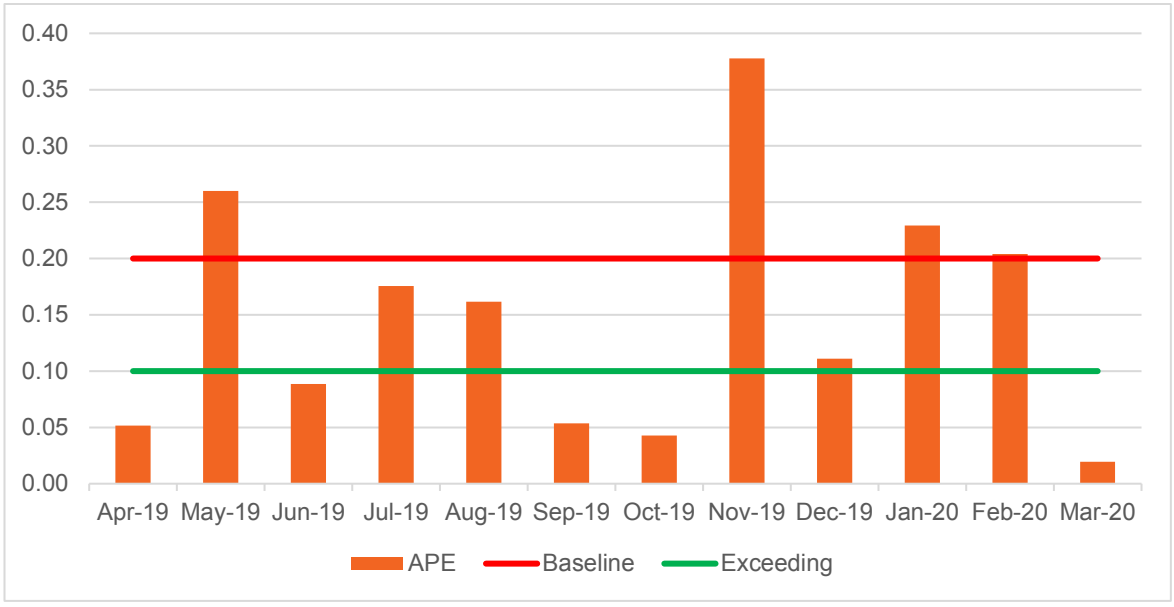


Figure 20: Monthly BSUoS forecasting 2019-20 Performance

Supporting information

We **exceeded our benchmark** for monthly BSUoS forecasting performance. The Absolute Percentage Error (APE) was <10% for March 2020, which means that for the 2019-20 performance year we have had less than five months with APE>20% and five months with APE<10%.

We have reviewed a sample of the most and least accurate months in more detail:

- The forecast error for June was 8%, the BSUoS figures came back into line with expectations following very low wind levels in May and therefore Western Link unavailability had a smaller impact than expected.
- The cost of balancing the system in October was higher based on an increase in Constraint Costs and Energy Imbalance. However, the BSUoS charge was lower due to the volume being significantly higher. The forecast accuracy was good with an APE of 4% in October.
- BSUoS charges were much lower in November, we forecasted Constraint Costs to be more consistent with October, but a reduction of Thermal Constraint Costs was lower than expected. Coupled with a higher-than-forecast increase in BSUoS volume, our forecast accuracy fell outside the 20% level.
- Balancing costs were high in March but were lower than February due to lower Constraint Costs driven by less extreme weather and the availability of Western Link HVDC for the entire month having returned in February. Demand was lower than forecast due to the lockdown caused by Covid-19, however these measures weren't introduced until late March so the impact over the whole month was less pronounced.

Performance benchmarks

- **Exceeds benchmark**: Meeting baseline performance and five or more forecasts less than 10% APE.
- **In line with benchmark:** Of the 12 forecasts over a financial year, baseline performance is less than five forecasts above 20% APE.
- **Below benchmark**: Five or more forecasts above 20% APE.

For full details of this monthly metric see page 54 of our Forward Plan.

Roles 3 & 4

Facilitating Whole System Outcomes and Supporting Competition in Networks

Roles 3 & 4: Facilitating Whole System Outcomes and Supporting Competition in Networks

Delivered benefits in 2019-20

- We note that roles 3&4 will mainly deliver consumer benefit in future years, due to the nature of the activities within this role area
- Our new outage planning processes have saved our customers over £30m to date, releasing around 11,000,000 MWh of renewable energy

Future benefits and long term initiatives

- Stability Pathfinder phase 1 will save consumers £52m-£128m[49] between 2021 and 2026
- Our improvements to the Network Options Assessment (NOA) publication[45] are estimated to deliver around £1.9m of additional value for future consumers

Plan delivery and new ways of working

- Progressed Stability, Mersey and Constraint Management pathfinders
- Began work on Early Competition
- Generation Export Management Scheme commenced in collaboration with Scottish Power Energy Networks
- Appendix G process continues to accelerate the connection of embedded generation

Stakeholder

- Worked collaboratively with Distribution Network Operators (DNOs) and Transmission Owners (TOs) on Regional Development Programmes
- Led the Whole Energy System workstream as part of Open Networks
- Improved our market dispatch model based on stakeholder feedback
- Extensive stakeholder engagement as part of Pathfinder projects

Performance metrics

Metric	Performance	Status	Justifications
10. Whole system unlocking cross boundary solutions	1094.7 MW of Distributed Energy Resources (DER) within WPD network and 48.3 MW within UKPN network accepted in 2019-20	●	New DER continued to increase across the first half of the 2019-20 performance year with gradual decline due to system restrictions in the second half.
11. System access management	2.92 cancellations per 1000 outages	●	There has been a significant reduction in outage cancellations due to our improved software tool
12. Customer value opportunities	10,453.0 GWh of direct savings and 1,065.5 GWh of indirect savings delivered	●	New innovative ways of working have added value
13. Connections agreement management	100% of agreements updated	●	Connection agreements updated on time within nine months of notification.
14. Right first-time connection offers	As there were 17 ESO-related reoffers, this means that 93% of connection offers to date this year were Right First Time, against a benchmark of 95%.	●	Despite experiencing challenges with embedding new processes and ways of working with the TO post legal separation, and a high volume of connection applications, we have seen significant progress over the past six months
15. NOA consumer benefit	Conducted four ad-hoc Cost Benefit Analysis (CBA) and calculated the consumer benefit of ESO options to be 3.5%.	●	To calculate the consumer benefit generated from ESO options, we compare the consumer benefit specifically of ESO options as a percentage of the overall consumer benefit of the NOA.
16. NOA: Enhancing Communications	Positive stakeholder feedback on changes made to the documents.	●	Hosted engagement events, webinars and published videos gaining positive qualitative feedback and giving us improvement areas to focus on.

[49] Corrected on 11 May 2020

C.1 Evidence of consumer benefits for Roles 3 & 4

For each role area, we present our consumer benefit information in two sections, corresponding to Ofgem's evaluation criteria: evidence of delivered benefits, and evidence of future benefits/ progress against long term initiatives.

To evidence the consumer benefits which result from our activities, we present tables of our high-level deliverables, 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 area.

We would expect some role areas, such as Roles 3&4, to deliver consumer benefits mainly in future years: Roles 3&4 are focussed on long-term projects which will mainly benefit tomorrow's consumers. As such, for Roles 3&4 we have included two case studies relating to activities which are expected to benefit future consumers: Stability Pathfinder and Improvements to the Network Options Assessment (NOA) publication.

Although Roles 3&4 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 work to improve the outage planning process, which is described in a case study.

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. Readers can also refer to the Roles 3&4 consumer benefit map produced as part of the Mid Year Report[50].

The table below illustrates how our high-level deliverables in Roles 3&4 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

2019-20 deliverable	Benefit to energy consumers this year	Benefit to energy consumers in the future
Whole electricity 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, in the 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.
Development of a proactive RDP	We have identified that the ENA Open Networks project is the best place for this	We will collaborate with DNOs and TOs to design a process which ensures that the

[50] https://www.nationalgrideso.com/document/128421/download page 68

identification process	discussion, as it provides a forum for us to collaborate with key stakeholders and ensure that a co-ordinated approach is taken.	Regional Development Programmes which are progressed are those which add the most value for the end consumer, taking into account their impact on consumer bills, environmental outcomes, and system security.
Ongoing Regional Development Programmes	We have worked collaboratively with network stakeholders as these projects have progressed, helping to design a workable solution for consumers and stakeholders.	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 system without requiring network investment, contributing to reduced environmental damage and increased competition and facilitating the transition to net zero.
Pathfinder projects	We have actively engaged with Pathfinders stakeholders, ensuring that those participating in the tender receive the information they need in order to generate a fairer process. We recognise that these projects are the first of a kind anywhere in the world and we are learning as to what information is required for participants.	The 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
Study tools	We have improved our processes and tools for system studies, providing a more complete picture of system operation, which improves safety and reliability. It has also contributed to the provision of improved information to our stakeholders within the Electricity Ten Year Statement (ETYS) document.	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
NOA: Enhanced communication	We have published more accessible information relating to the Network Options Assessment (NOA), Electricity Ten Year Statement (ETYS), and associated processes, allowing our stakeholders to more efficiently access the information they need.	By improving the accessibility of the NOA style process, we will provide those submitting options with a better understanding of the system need we are trying to address. As a wider range of system issues are considered as part of the NOA process, this will become increasingly important. Making the process accessible to more participants is expected to increase competition, leading to lower bills than would otherwise be the case. Through enhanced communication we expect to engage with more participants who can potentially offer solutions to meet transmission needs, and in so doing drive competition.
Whole system data exchange	We have collaborated with Distribution Network Operators (DNOs) to exchange data to improve their network studies, allowing them to be more confident that they are operating safely and reliably. We have also shared data to collaborate with Transmission Owners to release capacity for renewable generation under outage conditions, reducing environmental damage and contributing to lower consumer bills than would otherwise be the case.	The improvements to data exchange we have implemented this year will allow for greater optimisation across different voltage levels, in both operational and planning timescales. This is expected to result in improved system security, and reduced costs for the end consumer as it will inform decision making.

Whole system operability	We have continued to progress the Loss of Mains work, working closely with our stakeholders to ensure the smooth running of the process. The first two phases have identified nearly 6GW of embedded generation that will change their protection settings – hence reducing the system operation risk.	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.
Deeper system access planning	The Network Access Planning team has rolled out a process to identify and deliver opportunities for adding consumer value, by reducing the extent to which the network is constrained during outage conditions. This has delivered an improved service to our stakeholders, as well as lower balancing costs than would otherwise be the case, and reduced environmental damage where we have avoided restricting the output of renewable generation.	The process to identify customer value opportunities will allow the Network Access Planning team to reduce the extent to which network capacity is constrained during outage conditions. Not only does this lead to lower balancing costs than would otherwise be the case, but our new ways of working have been welcomed by our stakeholders
Enhanced customer experience	We have engaged with customers and stakeholders, including the Transmission Owners, to develop an online portal for connections. Feedback suggested that a single co-ordinated solution covering all parts of the GB network would be preferred, and so we will continue to develop this to enable build during RIIO-2.	Having engaged with our customers and stakeholders this year, we have learned that there is a preference for a co-ordinated solution. We will take this 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.

C.2 Evidence of delivered benefits

C2.1 Current consumer benefit case study

Outage Planning

Activity	NGESO Network Access Planners add value by using their engineering expertise and judgment to propose innovative ways of planning system access. Managing access to the transmission system, and facilitating the commercial arrangements necessary for customer connections, are both business-as-usual activities for the ESO. However, there has recently been a significant increase in collaboration between the Network Access Planning and Customer Connections teams, who have worked together in a range of different situations to find a better way for our customers. The ESO, working in partnership with our stakeholders, the Transmission Owners (TOs) and Distribution Network Owners (DNOs), can add value to the outage planning process in the following ways: • Creating savings to the end consumer from the Network Access Policy paper process. (The Policy is a planning approach designed to improve communication between TOs and ESO in relation to outage planning. The paperwork is used in balancing operational ESO costs and TO costs to give the best value for the end consumer). • Identifying and facilitating opportunity outages • Optimising outage plan to reduce constraint costs • Proposing and facilitating alternative solutions for long outages that impact customers • Re-evaluating system capacity to release additional generation capacity. • Sharing of network capacity below certain wind output levels to maximise revenue and low carbon generation • Outage duration reduction for customers • Aligning outages with customer maintenance • Aligning outages with generator shutdowns
Role	3&4. Facilitating whole system outcomes and supporting competition in networks
Key Forward Plan Deliverables	• Deeper outage planning • Customer journey mapping – outage planning
Current benefit	Our innovative ways of working have saved our customers over £30m over the 2019-20 performance year, whilst facilitating the ESO ambition to transition to a low carbon network by releasing around 11,000,000 MWh of renewable energy (enough to supply about 2 million homes for a year).
Basis of current benefit	During the 2019-20 performance year, the Network Access Planning team noted 72 instances where its actions directly resulted in a reduction in BSUoS costs. This represents a total of 10,453,000MWh of extra generation capacity, which would have otherwise been constrained at a cost to the consumer. The Network Access Planning team also noted 55 distinct occasions where its innovative ways of working indirectly facilitated increased generation capacity. This resulted in an additional 1,065,500MWh of generation capacity across the year, resulting in increased wholesale competition, less renewable generation being restricted, and a better service being provided to our customers. Some examples of direct and indirect savings are: • The initial outage plan to deliver a new substation would have restricted two wind generators to 0MW for approximately 4 months. After extensive system analysis, NGESO determined that it was possible to release a limited amount of capacity to each wind generator during the outages.

This resulted in the release of around 200,000MWh of renewable energy: enough to supply 50,000 homes for a year.

- Working with the TO, NGESO facilitated the bypass of a quad booster transformer (rated at 89MVA) by using materials from one isolator to fix the other. The bypass increased the thermal export capability limit of the circuit from 90MVA to 115MVA in a 350MW generation group of Hydro and Wind. This will release about 92,000MWh of renewable generation to the market for the next three years.
- NGESO facilitated a network modification application, that reduced the duration of an outage affecting a generator from a 25-week outage to 8 weeks (saving 17 weeks of outage on the wind farm). This resulted in the release of around 354,000MWh of renewable energy.
- A planned outage originally had a forecast exposure cost of £14m due to a thermal constraint limit on a boundary. NGESO in collaboration with the TO optimised the plan (moving dates, reducing return to service time and obtaining enhanced ratings) with the current system conditions and caused an increase in the thermal export capability limit of the group which resulted to a reduction of exposure cost to £500k. This represents approximately £13.5m of savings and released 173,000MWh of clean energy to the market.

The current benefit described above (as well as further planned improvements) will accrue over time and result in tangible and quantifiable consumer benefits.

The capacity and cost savings are calculated as follows:

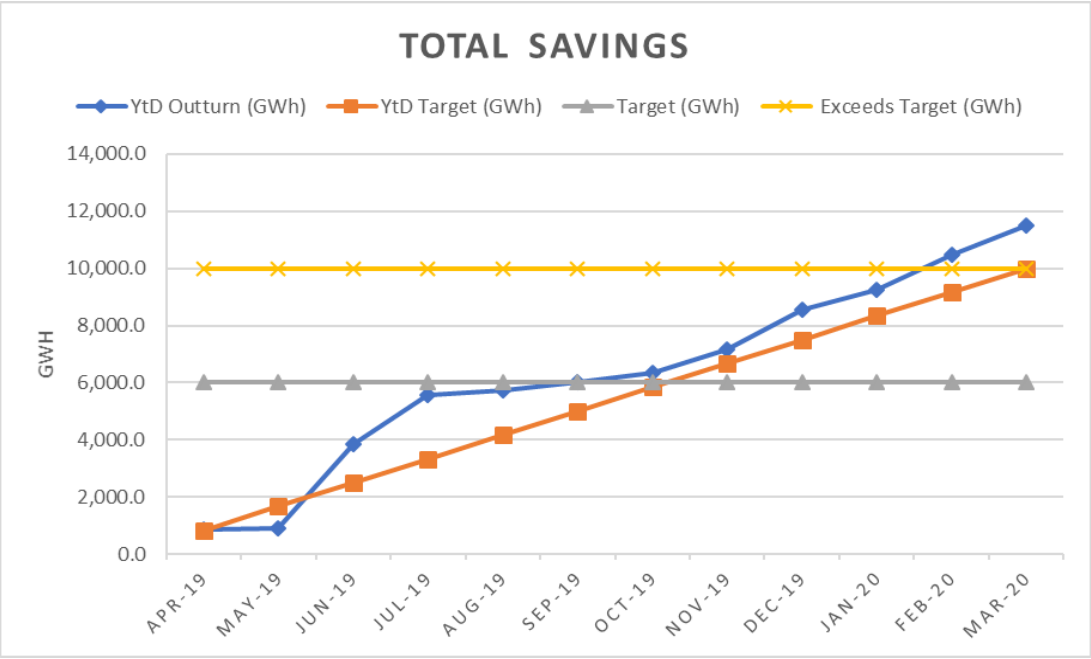
Cost savings = energy saved (MWh) x Cost of energy (£/MWh)

where the cost of energy: Wind - £78.7/ MWh & Other - £55/ MWh. These average values were chosen for simplicity using a range of wind values for certain times of the year taken from the energy trading team. When more accurate figures are available, they are then used.

An example of this calculation is where NGESO granted a wind farm an additional 14MW of capacity on top of its connection agreement for 36 days, this was achieved by re-evaluating system capacity:

Energy saved = 14MW x 36Days x 24Hours = 12,096MWh

Cost savings = 12,096MWh x 78.1£/MWh = £944,700



How benefit is realised in the consumer bill	Improvements in network access planning have delivered two main types of savings to the consumer bill: • Direct Balancing Services Use of System (BSUoS) savings due to reduced balancing costs (e.g. by minimising constraint costs) • Savings for our customers, which will appear elsewhere in the consumer bill. Savings to generators should flow through into reduced wholesale or balancing service costs, savings to TOs should result in lower Transmission Network Use of System (TNUoS) charges, and savings to DNOs should result in lower Distribution Use of SysteDUoS charges.
Additional non-monetary benefit	Improvements to network access planning have also resulted in some non-monetary benefit: • Improved safety and reliability results from allowing maintenance outages to take place in a timely manner • Reduced environmental damage results from preventing wind generation from being constrained • Our customers experience an improved quality of service as a result of our new ways of working
Assumptions	• We have assumed that both direct savings (to BSUoS costs) and indirect savings (to customers' costs) are eventually passed on to the end consumer. • We have assumed that the optimisation of the outage plan would not have taken place without NGESO's contribution.

C.3 Evidence of future benefits/ progress against longer term initiatives

C3.1 Future consumer benefit case studies

Stability pathfinder phase 1

Activity	Stability is the ability of the system to withstand a network disturbance and continue to operate normally. Traditionally conventional synchronous power plants (typically gas or coal) inherently provide stability when they generate electricity. However the changing generation mix means new providers are needed. We have just concluded a tender round for stability (phase 1). This is a world first and an important step in the development of a stability market. We looked for proven technologies such as synchronous plant (including the repurposing of existing, end of life generators). We developed the service in an expedited manner and asked for service delivery from April 2021 to help reduce the immediate operational costs. We secured 12.5GVAs of additional 'inertia' from a combination of new & existing assets & sites in phase 1. We awarded contracts to five providers for services commencing throughout FY20-21, ending March 2026. These contracts will reduce the need for costly mitigation actions in the Balancing Mechanism (BM) such as paying non-synchronous generators to reduce their output and paying 'out-of-merit' carbon-intensive synchronous generators to increase their output.
Role	3&4. Facilitating Whole System Outcomes and Supporting Competition in Networks
Key Forward Plan Deliverables	• Pathfinder projects
Future benefit	NGESO spent £210m on managing 'Rate of Change of Frequency' (RoCoF) over the 2019-20 performance year. This figure has increased significantly over the last few years as an increasing amount of renewable generation has connected. The inertia provided by the five stability contracts awarded is estimated to reduce the cost of mitigation actions by £52m-£128m[51] between 2021-2026. This is forecast by comparing tender prices against the alternative operational actions available.
Basis of expected benefit	The assessment compared the cost of available alternative actions to provide the capability offered by each tender. A conservative view of utilisation (from the standpoint of this service) was assumed. Our assessment principles[52] aim to ensure that end consumers realise cost savings across all scenarios.
How benefit is realised in the consumer bill	The Stability Pathfinder will lead to savings in BSUoS charges, due to reduced balancing costs that otherwise would have been incurred as a result of control room mitigating actions.
Additional non-monetary benefit	In addition to its contribution to lower consumer bills, Phase 1 procurement supports our 2025 ambition to have an electricity system that can operate carbon free by reducing the need to pay carbon-intensive synchronous generation to come on in place of renewable non-synchronous generation- thereby contributing to reduced environmental damage. In total Phase 1 is procuring the equivalent inertia as that provided by approximately 5 coal fired power stations. Phase 1 procurement is an initial step towards the development of a fully functioning stability market and the learning from phase 1 will be critical in the development of this

[51] Corrected on 11 May 2020

[52] https://www.nationalgrideso.com/document/154921/download

	stability market. This will lead to increased competition in the provision of stability, by asking the market to provide potential solutions. This will increase competition and drive down prices and lead to lower consumer bills. Examples from elsewhere in the market support the hypothesis that increased competition leads to lower prices, for example the Contracts for Difference auctions where strike prices have fallen significantly over the years. The Stability Pathfinder work also increases market transparency by publishing results of the tender indicating how much we are willing to pay for service providers to supply inertia and stability services. This will facilitate future investment from a wider range of service providers. We note that the restrictions imposed by COVID-19 are likely to impact on the progress of this programme. However, at this stage, it is not possible to make a robust assessment of the magnitude of this impact.
Assumptions	The benefit assessment is baselined against current market arrangements and does not include future developments such as the creation of a stability market and the potential impact of other pathfinders, due to the significant uncertainty associated with this work.

Improvements to the Network Options Assessment (NOA) publication

Activity

The NOA publication[53] makes recommendations to onshore Transmission Owners across Britain as to which projects to proceed with to meet the future network requirements as defined in the Electricity Ten Year Statement (ETYS).

On 1 April 2019, the ESO became a legally separate business within the National Grid Group. We set an ambition for the ESO to have its own identity and ensure that our stakeholders knew who we are and what we do. We took this opportunity to review the NOA publication and give the document a new look and feel.

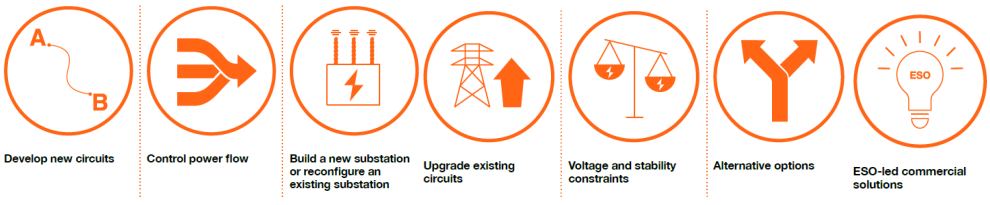
The recommendations made within the NOA deliver consumer benefit by ensuring that the most beneficial projects are delivered at the most beneficial time. The recommendations in the NOA optimise between infrastructure costs and balancing costs, to deliver the least worst regret solution for consumers.

The ability of the NOA to deliver consumer benefit depends on a sufficient number of high-quality options being submitted to the process, enabling the ESO to optimise across a range of scenarios. It is also dependent on our stakeholders' ability to interpret and act on the information we provide. As such, the accessibility of the NOA process and publication is fundamental to its role in delivering consumer benefit.

After listening to stakeholder feedback, the first step we took was to condense and streamline the content of the report. We did this by removing Chapter 3 which previously had a detailed summary of the "Boundary descriptions". The majority of this information could be found in the Electricity Ten Year Statement (ETYS). We took the approach of giving our stakeholders the opportunity to find the details they were looking for in other ESO publications through direct URL links within the NOA. The same approach was taken with Chapter 2 – Methodology. This chapter now contains a brief summary of the NOA methodology, where further details are signposted to our separate publication of NOA methodology report. The streamlined report was well received by our stakeholders.

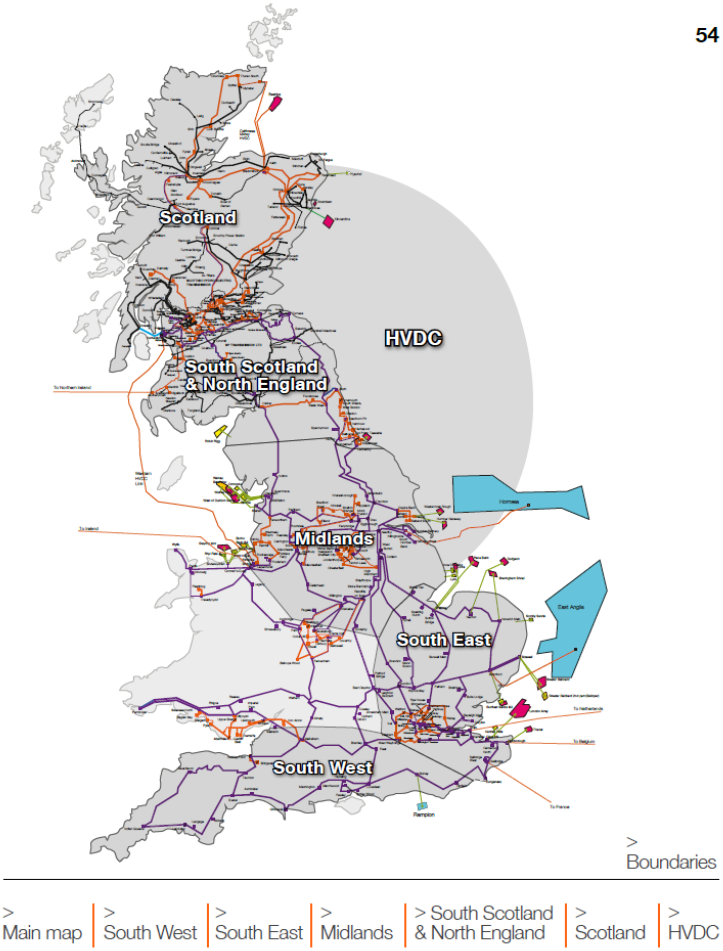
The NOA 2019-20 report became a fully interactive document focusing on improved navigation across all chapters and encouraging the reader to engage with the report. This gave our stakeholders the opportunity to more easily find the information they were looking for. "Hover over" texts became a key feature of the publication, where further information was available or terms could be defined. Purple text was used to indicate additional information was available by hovering the cursor to reveal a text box. We gave our stakeholders this feature to reduce the requirement to navigate between the main document and the Glossary.

With an increase in the number of options submitted for economic analysis, which we anticipate will grow year on year, we created seven unique icons to represent each of the option categories. In the report, we assign four letter codes to each of the options in order to identify and reference them throughout. By designing new icons, we provided our stakeholders the opportunity to find the options they were interested in quickly and effectively.



For the first time ever, we developed and published an interactive map of the GB transmission system as part of 'Chapter 4 – Investment recommendations' to represent the options and recommendations made in NOA 2019-20.

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



The country was segmented to provide a detailed regional view of the options. Within each of these we included an outline of the NOA recommendations.

Stakeholders are now able to see a visual representation of the recommendations and understand using the legend provided which category they belonged to. We also provided information in table format to include their optimal delivery date and which scenarios are driving each recommendation. This was also positively received by our stakeholders.

Our licence obligation is to publish the results and recommendations of the NOA. We are able to choose how these are best represented in the report and use stakeholder feedback. We set high ambitions by recreating the NOA report, by condensing the report for concise messaging and including many interactive features. Since the NOA was published on 31 January we have already seen 1138 downloads from our NOA webpage as of 31 March 2020.

Role	3&4. Facilitating whole system outcomes and supporting competition in networks
Key Forward Plan Deliverables	• Improve accessibility of the ETYS and NOA publications
Current benefit	The NOA report is published in January of every year and is available to the public through our website[54]. We have made extensive changes to the publication this year including new features such as an interactive reinforcement map. The NOA has recently featured in local news articles, such as the East Anglian Daily Times and Current–News.co.uk, being used as a reference to explain various options

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

	recommended by the NOA. This showcases the value stakeholders have found by having visual and detailed explanations of the options considered in our analysis. By demonstrating that we are implementing the feedback we receive, we hope this will continue to encourage our stakeholders to provide us with new ideas on how we can make the publication better year on year.
Future benefit	The improvements we have made to the NOA this year have made it easier for our stakeholders to understand the NOA, including submitting options to the process and acting on the recommendations it provides. Currently the NOA uses single year least-worst regret (LWR) to determine the investment strategy for the next year based for TOs and/or relevant parties. To calculate the overall consumer benefit, we use the concept of 'anti-regrets'. This means that the recommendations made on critical options, in each of the optimal paths, using LWR, are reversed. The 'anti regret' is the single year regret of doing the opposite of what NOA recommended and serves as a benchmark for comparing the 'best' and 'worst' investment strategies possible. Using this method, we have calculated that the recommendations made in NOA 2019-20 provided ~£1.9 billion of consumer benefit, based on the Two Degrees scenario. This benefit can only be realised by way of a well-functioning NOA process, which is dependent on high-quality communication. The improvements to the NOA publication can therefore be deemed an enabler to this consumer benefit. Even a slight increase to the quality of options as a result of an improved publication could generate millions of pounds of benefit for consumers. We estimate an improvement in options submitted for the next cycle of just one tenth of a 1% would still account for £1.9 million of additional consumer value. We believe it is important to continue improving the NOA every year for the benefit of our stakeholders, helping them better understand our recommendations and the reasons behind them.
Basis of expected benefit	There is significant value to the consumer in the ESO improving the NOA process. Running the NOA process is a business as usual deliverable, but the extent to which we seek new ways of reporting goes beyond core expectations. The ability of the NOA to deliver consumer benefit depends on a sufficient number of high-quality options being submitted to the process, enabling the ESO to optimise across a range of scenarios. It is also dependent on our stakeholders' ability to interpret and act on the information we provide. As such, the accessibility of the NOA process and publication is fundamental to its role in delivering consumer benefit.
Additional non-monetary benefit	The aim was to allow stakeholders to use the document with ease, facilitating navigation so that they could find the information they needed quickly and effectively. In turn, by including an interactive map, this provided a greater opportunity to visualise and explain the reasons behind our recommendations.
Assumptions	Based on stakeholder feedback, we can assume that stakeholders find our improvements useful and saves time and money.

C.4 Plan delivery

C4.1 Highlights

- ✓ Progressed Stability, Mersey and Constraint Management pathfinders: for the Stability Pathfinder we Published an RFI and a tender for phase 1, for Mersey we published a tender for a nine-year reactive power service contract, and we published an RFI for a Constraint Management Pathfinder. All of these projects will save money for consumers in the long term.
- ✓ We began work on Early Competition, publishing our Phase 1 Update and engaging extensively with stakeholders. This is additional to the activities set out in the 2019-21 Forward Plan.
- ✓ The Appendix G process is a trial we have been running to accelerate the connection of generators which are embedded within the DNO network. We have facilitated the connection of an increasing volume of embedded generation, progressing the necessary Connection and Use of System Code (CUSC) changes and continuing to add to the number of participating Grid Supply Points (GSPs). Seven DNOs are now participating, up from the original number of two.
- ✓ Through the Generation Export Management Scheme (GEMS) solution we are collaborating with Scottish Power Energy Networks, looking at new ways to use technology and operational methods to provide cost efficient outcomes for renewable developments.

During 2019-20, we introduced our Forward Plan Tracker, providing increased transparency to stakeholders who are now able to see a monthly update on our progress against the Forward Plan deliverables.

C.4.2 Deliverables

Deliverable	Target delivery date	Actual delivery date	Status
Whole electricity system thought leadership			
ESO thought leadership – how our role will evolve	Q1 2019-20	Target date met	Completed. We have provided context on our role through both our 2030 Ambition and RIIO-2 business plan publications. We have also produced a high level video (https://www.nationalgrideso.com/insights/whole-electricity-system) to highlight the importance of whole electricity thinking for a broad audience. We will further facilitate whole electricity thinking through insights into Ofgem's work on Distribution System Operation (DSO). In addition we have produced a Discussion Paper (https://www.nationalgrideso.com/document/151716/download) to facilitate industry debate on how we develop new and coordinated ways of working to ensure efficient use of services from Distributed Energy Resources (DER) to support operation of transmission and distribution networks.
Whole electricity system learnings	Q3 2019-20	Target date met	Completed. This work has now been published https://www.nationalgrideso.com/document/163026/download

Deliverable	Target delivery date	Actual delivery date	Status
ENA Open Networks project 2019 ESO input – play a proactive role in the ENA Open Networks Project including leading the development of a number of products	Q3 2019-20	Target date met	Completed. Our involvement is described in the Open Networks End of Year report which is published here: http://www.energynetworks.EYR
ENA Open Networks project 2019 ESO input - Lead the development of the whole energy system workstream of the Open Networks project.	Q3 2019-20	Target date met	Completed. Our involvement is described in the Open Networks End of Year report which is published here: http://www.energynetworks.EYR
Development of a proactive RDP identification process			
RDP identification process	Q3 2019-20	Q4 2020-21	We have discussed potential approaches for this deliverable at the ENA Open Networks Steering Group. General feedback from DNOs and TOs is of support for the deliverable but favouring an approach of collaborative development potentially through the Open Networks project. Ofgem indicated that this deliverable's intent is completely in alignment with Ofgem's intended whole systems approach. The deliverable will be further developed with Open Networks in 2020-21.
Pathfinder projects			
Stability pathfinder	Q4 2019-20	Target date met	Completed. We published a technical Request for Information (RFI) pack on 19 July, and the feedback closed on 13 September with 28 responses. We published the summary feedback on 21 October including our next steps. All contracts were signed for phase 1 by 1 April. For the Stability pathfinder, feedback from the RFI has given us more information on potential providers' time constraints.
Mersey Voltage pathfinder	Q4 2019-20	Q1 2020-21	Having successfully completed the Request for Information (RFI) in May 2019, we announced in June that we will be running a commercial tender to contract for long term reactive services in the Mersey region. This project has been delayed to Q1 2020-21 as short term requirements have been given priority as these are required to maintain network compliance. The long-term pathfinder tender was issued on 25 November 2019. The final tender has closed on 9 April, this is an extension to the 27 March date primarily due to arising commercial impacts allowing participants time to re-evaluate their bids. We will award contracts by 22 May.

Deliverable	Target delivery date	Actual delivery date	Status
Pennines Voltage pathfinder - Run RFI and then decision to tender market solutions	Q1 2019-20	Q1 2020-21	The notification of Fiddlers Ferry generation closure forced a reprioritisation of resources for voltage assessments from the Pennines to the Mersey area. Hence as part of the Forward Plan for 2020-21, we have delayed the Pennines project from Q1 2019-20 to Q1 2020-21. This has also given us the opportunity to take learnings from the Mersey pathfinder and apply this to the Pennine region.
Pennines Voltage pathfinder - Project recommendations	Q3 2019-20	Q3 2020-21	As part of the Forward Plan for 2020-21, we have delayed this action to Q3 2020-21 as part of a reprioritisation process. This will follow on from the Mersey pathfinder, so we can take on board and adapt to stakeholder feedback and any further learning from Mersey.
Constraint Management Pathfinder	Q2 2019-20	Target date met	Completed. The RFI stage of the Constraint Management pathfinder is now complete. We are now evaluating responses. Taking into account the results received from the RFI, we will make a decision as to whether it is cost-effective to run a tender process, and if a tender is deemed to be cost-effective then its design will depend on the feedback received as part of the RFI process.
Study Tools			
Voltage needs identification tools/ processes	Ongoing	Q4 2020-21	We have created new processes to identify future voltage needs and placed the detail of this process in our NOA methodology which is consulted upon annually. To enhance these processes and make them more efficient we have begun a Network Innovation Allowance (NIA) project investigating a proof of concept for year-round voltage needs, identification and optimisation tool with Strathclyde university. Although it is still in the early stages the project is progressing well, and its final output is expected Q4 2020-21. This tool will improve our ability to quickly assess GB voltage needs in future years. We are investigating a number of ways to improve our voltage needs and identification tools & processes: • Historical Data Mining Tool to be developed and tested in Q1 2020-21 • Initial view on potential next priority region(s) for high voltage assessment planned for Q1 2020-21 (dependent on delivery of Data Mining Tool) We are continually building on the deliverable of documenting and testing voltage needs identification tools/ processes for inclusion in the NOA methodology.
Thermal probabilistic assessment tool / process-	Q3 2019-20	Target date met	Completed. Proof of concept and initial boundary capability results including the development pathway for our probabilistic pathfinder, are

Deliverable	Target delivery date	Actual delivery date	Status
Initial boundary capability results available			reported upon within our Electricity Ten Year Statement (ETYS) 2019 publication which can be found here: https://www.nationalgrideso.com/document/157451/download
NOA: Enhanced communication			
Improve accessibility of the ETYS and NOA publications - Enhancements to information in ETYS	Ongoing	Target date met	Completed. Whilst this is an ongoing action, the deliverables for 2019-20 are complete. These included the submission of System Requirements Form (SRF) information on the ESO website as part of the Electricity Ten Year Statement (ETYS) / Network Options. Assessment (NOA) process to encourage third party participation in the process. We have reported on probabilistic modelling developments and the improvements made on presenting system needs and we have also shared additional information on system fault levels as part of our ETYS 2019 publication.
Improve accessibility of the ETYS and NOA publications - Provide regular updates and continue engagement	Ongoing	Target date met	Completed. Whilst this is an ongoing action the deliverables for 2019-20 are complete. We have published a series of videos explaining the long-term Network Planning process, the role of ETYS and NOA and the changes we are making to the NOA and why. These are hosted on our YouTube channel: https://www.youtube.com/channel/UCh7g68ZFu8W2zaSUdAHNs7Q. These aim to engage stakeholders not familiar with our processes, in an easy way. They have already been viewed over 100 times each. NG ESO publish a monthly newsletter to industry participants on network development including details on ETYS, NOA and pathfinders.
Whole system data exchange			
Extended roll out of enhanced whole system data exchange	Q2 2019-20	Target date met	Completed. We have worked with DNOs to improve data exchange in planning timescales to enable DNOs to make a better all year-round assessment of the impact of transmission flows on their network. A proposal to consider a Common Information Model (CIM) is also under development. All DNOs have signed up to the concept of Appendix G in their Bilateral Connection Agreements.
Commercial flexibility around operational connections	Q3 2019-20	Target date met	Completed. ESO have been working together with Scottish TOs to find ways to release capacity for renewable generation during transmission circuit outages, when they would normally have been restricted to zero output under their connection agreement. An innovative way of operating the network by optimising transmission

Deliverable	Target delivery date	Actual delivery date	Status
			outages and operational conditions is where we use short term rating enhancements for some transmission circuits to release capacity before reinforcements are completed, and modify the generator inter-trip scheme to provide further capacity in certain operational scenarios. We have successfully released capacity and saved consumers over £20m.
Whole system operability			
Roll out of Loss of Mains Protection setting	Commencing Q1 2019-20	Target date met	This deliverable, which contributes towards the Loss of Mains Protection setting project by engaging other network operators to implement Loss of Mains changes more widely, has been completed. The programme is now live in Window 2 and the portal for Distributed Energy Resources (DER) to apply for Loss of Mains programme change payment is open. The Window 1 performance report was published in January 2020 with 933 applications accepted for 4352MW of generation. https://www.nationalgrideso.com/document/161406/download. The Window 2 report was published in March with results from Window 2 and more information on the successful conversion rates from Window 1 https://www.nationalgrideso.com/document/167636/download Please note Role 1 contains a separate deliverable relating to Loss of Mains protection.
Defining roles and responsibility for voltage management across the transmission distribution interface	Q1 2019-20	Q3 2020-21	Proposals have been developed for additional information exchange and action in the planning process. Agreement on some issues is outstanding meaning conclusions are likely to be delayed until 2020-21.
Deeper system access planning			
Deeper access coordination of 1-2 major infrastructure projects to commence in the RIIOT1 period	Q3 2019-20	Target date met	Completed. A process has been implemented across the ESO's Network Access Planning team with customer value being reported quarterly in Metric 12. The target was under continuous review throughout 2019-20 as we increased our understanding of how much value could be delivered. A new stretching target for 2020-21 has been agreed based on 2019-20 outturn.
Enhanced customer experience			
Transmission Outages, Generation Availability (TOGA) replacement	Q4 2019-20	Q3 2020-21	The project is delivering in an agile way, therefore the substantial details of the low level discussions and requirements are more difficult to validate at a higher level. The requirements can expand in complexity when the design phase and detailed

Deliverable	Target delivery date	Actual delivery date	Status
			analysis for each release and sprint are completed. We are incorporating requests from the external stakeholders and there may be more changes and feedback through the continued demonstrations through our engagement activity. There is also the desire to include 'regional/ national diagrammatical outage representation'. In addition to this, we have been progressing an OC2 code change to support Generator Outage And Maintenance Planning (GOAMP) replacement - GC0130. Go-Live has been delayed to align with internal and external views around operational commitments and the desire to avoid peak outage season. 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. This project has therefore been delayed to Q3 2020-21
Customer journey mapping – outage planning	Q1 2019-20	Target date met	Completed. This was a deliverable owned by National Grid Electricity Transmission (NGET) which the ESO was contributing to. The actions from the journey mapping sessions are now being delivered by NGET and we are working with them to manage the negative impact of changes to Transmission Owner (TO) outage plans on Distribution Network Owners (DNOs).
Connections customer portal	TBC	Q3 2021-22	During the 2019-20 Forward Plan delivery year, we engaged with customers, stakeholders and the Transmission Owners to understand their thoughts and develop ideas for the design of an online portal for connections. Feedback suggested that a single coordinated solution covering applications in all parts of the GB network would provide the greatest value. We will continue to develop the specification and design for this tool to enable build during RIIO-2, due to be completed in Q3 2021-22

C.5 Stakeholder views

- ✓ Provided input to the development of the Distribution System Operator (DSO) model through our work on Whole Electricity System
- ✓ Led the Whole Energy Workstream as part of the Open Networks programme
- ✓ Worked closely with DNOs and TOs on the Regional Development Programmes, tailoring our approach to meet our stakeholders' requirements
- ✓ Engaged extensively with stakeholders as part of our Pathfinder projects
- ✓ Made several improvements to our market dispatch modelling tool based on our stakeholders' feedback
- ✓ Improved the accessibility of the Network Options Assessment (NOA) document
- ✓ Worked proactively with DNOs to improve the current data exchange process and saved consumers £20m by releasing additional capacity

Whole electricity system thought leadership

The Whole Electricity System Development document[55] which was published earlier this year has been of benefit to industry already. It has informed one of the major deliverables in 2020 for the ENA Open Networks project; the development of a DSO implementation plan. The DSO implementation plan will be a published, interactive guide to the activities being undertaken by network organisations to develop Distribution System Operation (DSO) capabilities.

The ESO's input to DSO is through our work on Whole Electricity System, looking at how any DSO model needs to consider transmission and distribution impacts. This is a broad area affecting many of the ESO's activities. These have been collated and summarised in the Whole Electricity System Development document. As a result, this document has been used by DNV, the consultants delivering the DSO implementation plan, as the basis for the ESO's input. DNV have fed back that "*this has been a very useful summary of the forward plan and the RIIO 2 business plan, highlighting only steps relevant for the DSO*."

Open networks

The ENA Open Networks project is the collaboration vehicle for network organisations to develop a co-ordinated approach to both DSO and transmission – distribution harmonisation. The ESO has been actively involved in the 2019 work programme for Open Networks, most notably in leading the Whole Energy Workstream (WS4). The ENA have commented on the role of the ESO in Open Networks:

- "*ESO input has been essential in providing Whole Electricity System thinking and input to Open Networks development work, products and outcomes. Alongside the DNOs, TOs and GTC [service provider] in Great Britain under Open Networks, ESO has:*
  - *signed up to flexibility commitments that are underpinning the development and transparency of flexibility markets in GB*
  - *committed to the pathway to Distribution System Operation and associated implementation planning*
  - *enhanced the FES process with improved whole systems input*
  - *continued to participate in initiatives to deliver open data*
  - *There is ongoing development work that continues to require ESO involvement across the Open Networks project in 2020 (e.g. alignment of service contracts).*"

[55] https://www.nationalgrideso.com/document/163026/download

- *"Our Whole Energy Systems Workstream (WS4) in Open Networks has been chaired by National Grid ESO and this has been the first of its kind to consider efficiencies across electricity and gas networks, as well as other parts of the energy industry. Aligning such a broad range of stakeholders has had its challenges, but real progress has been made in progressing initiatives to take a wider Whole Energy Systems view on delivering benefits to networks and consumers."*

Ongoing 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. In 2019-20 this development has happened in two main areas. In both areas, DNOs can have differing technologies and approaches, and we have tailored our approach to meet each DNO's requirements as well as the needs for that particular RDP;

- IT and communications – Our N-3 intertrip project will deliver a co-ordinated protection solution across the south coast area facilitating a distribution system response to problems on the transmission network. In 2019-20 we moved this project to the delivery phase, which means understanding and agreeing project methodologies and technical solutions across 5 different network organisations. This has received good traction with other network organisations and is now in the process of being implemented.
- Commercial arrangements – This has been a more difficult area to make progress in and our initial approach to suggest a potential way forward has struggled. We have listened to our DNO partners and adopted a more consultative approach since early in 2020. This appears to be gaining traction and we are hopeful that high level principles will be agreed in the near future allowing detailed development work to be started.

One DNO commented:

"The working relationships fostered between DNO and ESO continue to improve, and work especially well where there is a shared interest in seeking the best outcome for the whole electricity system, regardless of where the costs, benefits or effort rests. The technical solutions of many of the thorny issues resulting from our changing energy system are usually more straightforward to agree a mutual pathway. More effort is required by the ESO to address the commercial barriers, but I continue to be hopeful that these are being addressed, albeit slowly. A more symmetrical approach to making energy data available between ESO and DSO should also be accelerated as this too feels one sided in favour of the ESO"

Development of a proactive Regional Development Programme (RDP) identification process

Regional Development Programmes (RDPs) consider efficient ways of working across the whole electricity system. The ESO needs to collaborate with other network organisations to develop a process to proactively identify new RDPs. We have found through the RDP process that providing strawmen for comment by other network organisations has not led to efficient progression of RDPs, and are increasingly adopting a more consultative approach, listening to DNO views and using these to shape the RDPs (see above).

Whilst this deliverable was originally envisaged as a proposed strawman process to be discussed with DNOs and TOs, we have reflected on our approach to RDP development generally, and taken a step back to consider the best way to collaboratively deliver this work. As such, we presented initial outline thoughts to the Open Networks Steering Group's March meeting, inviting views both on the need for this deliverable and its method of development. There was good support for the deliverable, and potential to develop it further through Open Networks. Further context will now be circulated around the Steering Group to invite more detailed discussion. In summary, the Ofgem representative to the Steering Group indicated that this was a good thing to do, aligning with Ofgem's intended whole systems approach.

Pathfinder projects

We have made significant progress on our Pathfinder projects during 2019-20.

Within the “Voltage” space we progressed our short-term Mersey tender, that saw us contract with an embedded provider for the first time, with an additional 9-year long-term tender opportunity for the same area. Participation levels in the long-term tender have been high and we look forward to publishing the results in May.

As part of the short-term and long-term tenders for the Mersey area, we have worked very closely with SP Manweb to assess whether it was technically feasible, effective and economical for solutions connected to the distribution network to provide reactive power support to the transmission network. As a result of the close partnership with the DNO, we were able, for the first time ever, to offer a commercial contract to a distribution-connected provider to support the voltage on the transmission network. At the end of the short-term tender, we had a productive session with the DNO to understand the areas which could be improved upon for the long- term tender. This resulted in much better collaboration, more effective communication and more efficient exchange of information between NGESO and SP Manweb in the long-term tender, enabling all the required analysis to be completed on time and with high quality outputs that we could confidently share with the tender participants. Overall, the partnership with SPEN on both the short term and long-term tender has been very productive, and the two projects have delivered significant learning for us apply to other DNOs as we develop further tenders for other areas of the network.

Within the “Stability” space we ran a national tender which represented a world first for the procurement of a product of this type. This “phase 1” service was tendered following positive response to our RFI that identified that the capability existed to deliver solutions during the 20-21 year. This event represented a genuine world first tender for a product of this type and resulted in the award of £328m of contracts offered to 5 companies out to 2026. We are currently working up the service design and process that will be followed for “phase 2” which is expected to be more complex as it seeks to attract greater levels of innovation and new technologies. We were able to take on board stakeholder feedback during this process, publishing tender results for Stability Phase 1 ahead of the Capacity Market auction. One tender participant reflected that the process had been run very well overall, with great engagement along the way, and only noted a small number of modest issues particular to their situation.

Finally, we have issued an RFI for a residual Constraint Management service that has recently closed and has had a strong level of responses. We are currently reflecting on the feedback and evaluating the value of a service that may be tendered later this year should we view that there is consumer benefit in doing so.

In line with our “learning by doing” approach we have taken many lessons from our experiences to date that will help us to refine future events. We faced a number of challenges as part of the pathfinders, such as, including determining how solutions and their development should be funded, the limitations in distribution networks’ ability to facilitate reactive power services, transparency of costs, and the connection of zero MW solutions. We are continuing to work through these challenges in collaboration with TOs, DNOs and Ofgem, many of which are triggering wider industry conversations (such as how to promote and define zero MW participants, and how solutions should be funded).

We have received positive feedback from service providers in relation to our Pathfinder projects, for example one provider commented on:

“…rapid rate of progress that NGESO have made this year with your pathfinder projects and greater procurement of grid services from distributed resources. We wanted to write to say congratulations – we think you’ve done fantastically to have 3 live pathfinder tenders and an RFI out. It must be hard work, but I hope it’s also rewarding – you’re doing an important job.” – service provider

The Pathfinders are the route to enabling non-TO participation in the NOA process, through a fair and transparent tender process. In addition, our Early Competition Plan explores how to enable further participation in network development through competition to design, build and own transmission assets once the necessary legislation is in place to facilitate this.

Study tools

We have made several improvements to our market dispatch modelling tool, Bid3. We can now model dynamic boundaries, allowing us to change the capability of a given boundary, on an hour by hour basis, depending on chosen generator/interconnector outputs. We have also improved our modelling to more accurately model both the redispatch of plants with a Contact for Difference (CfD) and voltage constraints on the network. We have developed a cloud-based solution which allows us to ramp up our processing power during periods of high workload (e.g. NOA/NOA for interconnectors). This solution also allows us to use the model remotely. The ORACLE tool has been released, which aims to inform stakeholders of the NOA process where network constraints are forecast to occur in the network and what potential benefit there is in resolving them. One of the benefits realised from ORACLE this year is fewer long-term conceptualised reinforcement options submitted by the TOs. The tool helped the TOs better understand the system needs between 2030 and 2040, and TOs were therefore able to provide real options for NOA 19-20. This has in turn provided a clearer picture of how the future transmission network needs to be developed over the full 20-year detailed assessment period.

During the Q1 2019-20 period we developed an automated data mining tool. This was tested on a single boundary which followed a “NOA type” assessment to undertake the high volume of data analysis required. We engaged with the three TOs throughout to show the different types of network needs we can identify, thereby giving a more holistic understanding of network requirements. We also worked with them to agree information to be presented in ETYS 2020. We completed this activity at the end of Q1 2019-20, and we were working on the next steps toward the ETYS 2020 probabilistic publication chapter.

In Q2 2019-20 and Q3 2019-20, we had a number of engagement meetings with the modelling experts at ENTSO-E to showcase what the year-round analyser can do and collect their feedback. We finalised and tested our new probabilistic tool in Python and successfully carried out year 1 probabilistic analysis for all boundaries across the whole year. The new tool has a year-round losses calculation module which enables us to complete our analysis for the Ten Year Network Development Programme (TYNDP) 2020 process in much shorter time and meet ENTSO-E’s requirements of 8760 snapshots in a more efficient way.

In Q4 2019-20, we published a new probabilistic year-round chapter in the 2019 Electricity Ten Year Statement (ETYS). Following this, we held a webinar in Q1 2019-20 to explain our work and better engage with our stakeholders through a real-time interactive platform. Considering the level of interest generated, attended by over 50 participants, we intend to continue with this form of engagement following future publications. We also presented at the EPSRC Supergen Energy Networks Hub Risk Day event in Glasgow to increase our engagement with stakeholders from academia.

NOA: enhanced communication

We have published the NOA report annually since 2016 and building on the improvements we’ve made year on year, we’ve gone for a full refresh for the 2019-20 report. We aimed to make it more concise, more easily understood, in short, more accessible. We have reviewed the content to shorten the document, make references to other ESO publications where possible and making each word count. In order to best represent the results, we have included more interactivity, diagrams and charts to improve the overall reader experience. We have also, for the first time since NOA was published, included an interactive map that gives a visual representation of the options recommended by the NOA across the whole of Great Britain.

In the ETYS, we have added summer minimum fault level data in a spreadsheet format, which can be used to review protection settings and assist with stability assessment. Both are hot topics due to declining amounts of synchronous generation depressing fault levels.

Interactions with our stakeholders helped us improve the service we provide in relation to assessment options, publication quality, and customer experience. We have received some feedback from our TO stakeholders:

- *"Good working level engagement and quick resolution of challenges/updates"*
- *"I like the interactive published document. It's more visual. Well done!"*
- *"I prefer the shortened NOA report. Good use of interactivity in the shortened chapters"*
- *"NOA better streamlines with ETYS i.e. no replication of boundary requirements discussion"*
- *"Additional sensitivity analysis following main NOA CBA - good support by ESO"*

The ESO is actively seeking to facilitate non-TO participation in the NOA. For this to be possible, a fair and transparent tender process must be developed- this is taking place through the Pathfinders work.

Whole system data exchange

Extended roll out of enhanced whole system data exchange

We have worked proactively with DNOs to improve the current data exchange process between ESO, TO and DNOs. We have engaged proactively with all DNOs and completed a review of the Week 24 data exchange template and Week 42 data exchange content. Both pieces of work have addressed DNOs and other industry feedback, making improvements to enable network modelling in planning timescales to achieve a new level of granularity and robustness, resulting in increased confidence in our system models and studies.

In order to cover a wider range of additional scenarios at different points throughout the year, we have acted on network companies' feedback to review the mechanism for data exchange, and formed an industry working group to work on the development and implementation of a Common Information Model (CIM), which will be a new standard for a more appropriate format for the exchange of planning data.

We continued the trial of the new Appendix G arrangements. Appendix G is a new part of a DNO's connection agreement which informs the DNO of the transmission impact of a fixed amount of capacity, and creates rules which allow the DNO to manage applications within that fixed amount of capacity. This was well received by our stakeholders, and we acknowledge further steps need to be taken.

The ENA Open Network Working Group told us:

"The Appendix G trial was successful but still lots of lessons learnt, industry should formalise this with best practice guidance in place".

Commercial flexibility around operational connections

We have worked with the Transmission Owners in Scotland to revise their programme of work to better account for the effect on customers and consumers, and after a detailed project review alternative ways of working were identified which reduced the duration of some outages from approximately six months to four months. This initiative has reduced the impact of transmission outages on renewable generation, and means that the number of transmission system outages which could restrict those windfarms' output have now been reduced by 75% in those particular cases. We have saved consumers £20m by removing restrictions in order to release capacity, meaning that those windfarms can now generate and avoid revenue loss. Stakeholders were delighted with the outcome, and recognised that we had gone the extra mile to get this initiative working:

- *" We are also very grateful for your assistance in this matter as it will save the project significant revenue."– Generator*

- *" I wanted to thank you for your work on our outage plan, this is a real example of working together on a practical solution for the benefit of your customer."– Generator*
- *‘’We thank National Grid ESO’s flexibility to go the extra the mile to get this [commercial flexibility around operational connections] working" – Generator*

Whole system operability

On the Accelerated Loss of Mains Change Programme (ALoMCP), we have worked closely with DNOs and the ENA to engage distributed generators on the need for Loss of Mains protection changes and to encourage their early participation in a nationwide initiative to deliver these improvements. We engaged extensively with stakeholders alongside DNOs in the context of this work, holding two stakeholder events and three webinars. Over 200 people attended the events, and we received feedback from that the events were “very useful to us to understand the scope of the programme and how we will be impacted”. Another added that “the benefit of the programme is really clear” and that they were keen to progress the works. We also engaged with generator and supplier representatives at transmission charging forums to provide information on the costs and benefits of the programme, with a focus on how and when costs would be passed through to them and savings delivered.

This resulted in 3,194 successful applications in the first two rounds of assessment for sites with a combined capacity of 6,457MW. Stakeholders have also been engaged through the development of an online portal that is receiving over 2,000 visitors per month and includes regularly updated technical guidance responding to frequently asked questions. 40 participants joined a webinar in March, providing guidance on participating in the programme and an opportunity to raise questions and hear answers from the delivery team. 88% of respondents to a customer survey of participants in the first round of assessments found the overall process for participating straightforward or better.

Deeper system access planning

Engagement has been sought from a number of DNOs with, in some cases, a very positive response to being invited to future stakeholder events. One DNO in particular was enthusiastic about becoming involved when this was discussed with operational planners and managers.

In February we issued a survey seeking stakeholder feedback on our transmission outage planning. We received 50 responses from our customers and stakeholders, with an average score of 7.6. We are assessing the qualitative feedback that has been provided and will be developing quick wins or longer-term solutions to address their concerns.

Enhanced customer experience

As reported in the mid-year report, we have engaged widely with stakeholders to gauge interest for a connections portal and develop a high-level view of what such a portal should provide. We have also worked with the TOs in the development of their portals, to ensure they will be compatible with the ESO portal when we invest further in its development during RIIO2.

Early Competition

An Early Competition webinar was held on 12 September and workshops on 26 September, 22 October and 12 November. We also held various early competition bilateral meetings with potential participants and TOs. Early competition awareness sessions were held at Customer Seminars on 1 October and 5 November. We introduced a separate early competition newsletter in August and circulated this to our newly established distribution list.

C.6 Outturn performance metrics and justifications

Metric	Performance	Status	Justifications
10. Whole system unlocking cross boundary solutions	1094.7 MW of Distributed Energy Resource (DER) within WPD network and 48.3 MW within UKPN network accepted in 2019-20	●	New DER continued to increase across the first half of the 2019-20 performance year with gradual decline due to system restrictions in the second half.
11. System access management	2.92 cancellations per 1000 outages	●	There has been a significant reduction in outage cancellations due to our improved software tool
12. Customer value opportunities	10,453.0 GWh of direct savings and 1,065.5 GWh of indirect savings delivered	●	New innovative ways of working have added value
13. Connections agreement management	100% of agreements updated	●	Connection agreements updated on time within nine months of notification.
14. Right first-time connection offers	As there were 17 ESO-related reoffers, this means that 93% of connection offers to date this year were Right First Time, against a benchmark of 95%.	●	Despite experiencing challenges with embedding new processes and ways of working with the TO post legal separation, and a high volume of connection applications, we have seen significant progress over the past six months
15. NOA consumer benefit	Conducted four ad-hoc Cost Benefit Analysis (CBA) and calculated the consumer benefit of ESO options to be 3.5%.	●	To calculate the consumer benefit generated from ESO options, we compare the consumer benefit specifically of ESO options as a percentage of the overall consumer benefit of the NOA.
16. NOA: Enhancing Communications	Positive stakeholder feedback on changes made to the documents.	●	Hosted engagement events, webinars and published videos gaining positive qualitative feedback and giving us improvement areas to focus on.

Figure 21: Summary of metrics for Roles 3&4

- ● **Exceeds benchmark**
- ● **In line with benchmark**
- ● **Below benchmark**

Metric 10 – Whole system- unlocking cross boundary solutions

This metric is an assessment of the effectiveness of our whole system actions, measured in terms of their consequences. The measure is the contracted MW capacity of Distributed Energy Resources (DER) connections as a result of the UKPN/ESO RDP collaboration in the South-East Coast region and the WPD/ESO RDP collaboration in the South West region. The WPD/ESO collaboration only began in Q2.

Q1-4 2019 Performance (UKPN)

Grid Supply Point (GSP)	MW	Commentary on DER technology types
Bolney	-9	No new DER in Q1. Battery storage project moved to connect at Ninfield in Q2. No new DER in Q3. One cancellation (gas generation) in Q4
Canterbury	0	No new DER in Q1-4
Ninfield	57.3	A new acceptance for 49MW of battery storage in Q1. Battery storage project moved to connect at Ninfield in Q2. No new DER in Q3. One new DER (5MW gas synchronous generation) and one cancellation (2.2MW battery storage) in Q4
Sellindge	0	No new DER in Q1-Q4
Total	**48.3**	

Q2-4 2019 Performance (WPD)

Grid Supply Point (GSP)	MW	Commentary on DER technology types
Abham	29.5	Multiple technologies, primarily Energy Storage System (ESS) and renewables in Q2. No new DER in Q3. Terminations in Q4.
Alverdiscott	335.7	Multiple technologies, primarily Energy Storage System (ESS) and renewables in Q2. No new DER in Q3-Q4
Axminster	10.3	Multiple technologies, primarily ESS and renewables in Q2. 1.56MW PV in Q3. No new DER Q4
Bridgwater	119.3	Multiple technologies, primarily ESS and renewables in Q2-Q3. 5.25MW wind connections in Q4
Exeter	340.6	Multiple technologies, primarily ESS and renewables in Q2. No new DER Q3-Q4
Indian Queens	176.5	As above
Landulph	0	No new DER in Q2-Q4
Taunton	82.9	Multiple technologies, primarily ESS and renewables in Q2. No new DER Q3-Q4

Total	**1094.7**

Figure 22: DER Connections Released

Supporting information

Over the course of 2019-20 we have contracted 1094.7 MW of new DER schemes with WPD, most of which are Energy Storage Systems (ESS) or Renewables. Currently 8 of 11 of the Grid Supply Points (GSP) in the South West where WPD connect are operating under a Regional Development Programmes (RDP). RDP introduces the principles of Connect and Manage normally associated with Transmission connections. By applying these principles, DER has been able to connect to the DNO's network whilst avoiding the need for Transmission Reinforcement Works.

Levels of new Distributed Energy Resources (DER) in the South West region of Western Power Distribution's (WPD) network covered by the South West RDP slowed significantly over Q3 and Q4. Feedback from WPD indicates that this cannot be easily attributed to any particular trend, but it is apparent that the number of projects obtaining planning consent has declined, and the time taken for this consent to be obtained has increased. This, together with increased local constraints on the DNO network and the significant increase in zonal tariffs for Wider Works Cancellation Charges, have seen less viable schemes terminate their connections. We have considered this in the overall project timeline for this RDP.

For full details of this quarterly metric see pages 75 – 76 of our Forward Plan.

Metric 11 – System access management

This metric looks to drive down the number of planned outages that are delayed by more than an hour or cancelled by the ESO in the control phase due to process failure, investigating the reason for cancellations and putting in place changes into the process where appropriate to prevent a repeat. This measure is a count of the number of outages out of every 1,000 which are delayed by more than an hour or cancelled within day. However, it is important to note that the ESO seeks to optimise overall system costs, rather than focussing on minimising planned outages to meet a target.

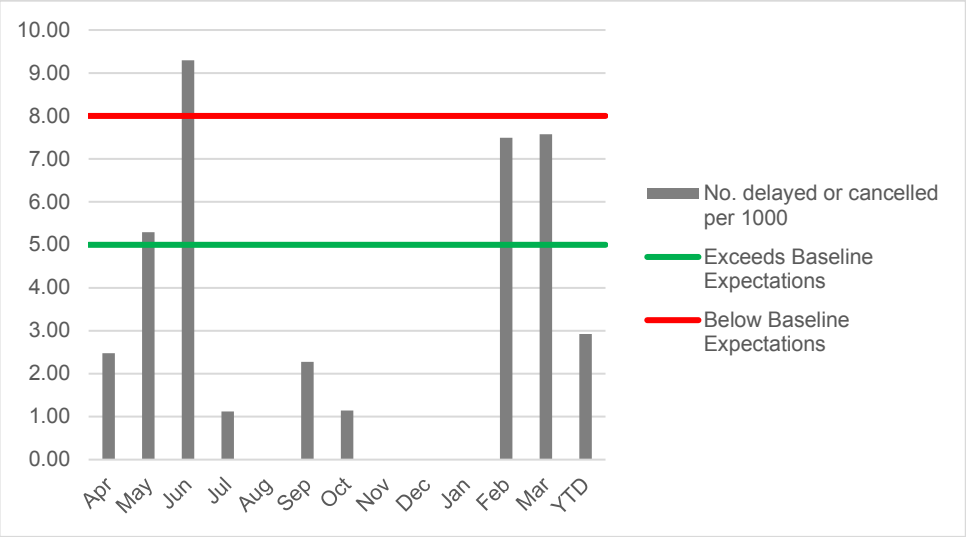


Figure 23: Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

	Number of outages	Outages delayed/cancelled
Apr	807	2
May	756	4
Jun	753	7
July	891	1
Aug	678	0
Sep	879	2
Oct	874	1
Nov	822	0
Dec	525	0
Jan	513	0
Feb	534	4
Mar	528	4
YTD	8560	25

Figure 24: Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

Supporting information

We **exceeded the benchmark** on our system access metric, achieving 2.92 outage delays per 1000 outages. In total we successfully released 8560 outages, of which NGESO was responsible for 25 delays to outages throughout 2019-20. The 25 delays can be broken down into the following:

- 5 delays due to a demand forecasting data error within our forecasting tool that meant when a fault was studied in planning timescales, the impact was different to what the control room saw on the day.
- 1 delay due to a modelling error between our real-time analysis software and our off-line transmission analysis software, which was resolved before releasing the outage.
- 16 delays related to the Network Access Planning department:
    - 2 delays as the cost exposure on two outages was not sanctioned correctly.
    - 3 Technical Limitations (known issues with equipment) within substations were missed during the planning process, and resulted in delays in switching the equipment out of service.
    - 4 outages delayed as there were communication issues with customers obtaining their agreement within planning timescales.
    - 4 outages where the “Demand At Risk” process had not been completed fully and communicated to the Transmission Owner (TO).
    - 1 outage was delayed as when it was handed over to the control room, they were unable to secure it within their overnight studies. As there were two issues which occurred with this outage. The first being an error with the demand forecasting data and the second, an incorrect rating applied to the planning study. Both results differed from what the control room saw in their overnight study.
    - 2 outages delayed as the proposed substation configuration had not secured for a switch fault.
- 3 delays related to the Electricity National Control Centre (ENCC):
    - 2 outages delayed as there was a high cost exposure. The outage was released the next day.
    - 1 outage delayed over the concern of a Distribution Network Owner (DNO) substation configuration submitted within planning timescales, which had been agreed with the DNO.

Overall, the effective communication and liaison with the many stakeholders across the ESO has led to exceeding expectations on this metric, with only 25 delays for 8560 outages in the whole year, or 2.92 delays per 1000 outages. This was an improved performance against 2018-19 where we finished the year with 4.47 per 1000 outages, or 37 delays for 8275 outages. This demonstrates how we have increased system access for our stakeholders and customers whilst improving our performance during 2019-20.

Performance benchmarks

- **Exceeds benchmark:** Less than or equal to 5 per 1,000 outages
- **In line with benchmark:** Between 5 and 8 per 1,000 outages
- **Below benchmark:** More than 8 per 1,000 outages

For full details of this monthly metric see pages 76 – 77 of our Forward Plan

Metric 12 – Customer Value Opportunities

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

We have looked 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 have measured 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 connection agreements). There are also indirect benefits to the end consumer, 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 the volume of generation that is constrained is that it reduces the impact on market liquidity and competition.

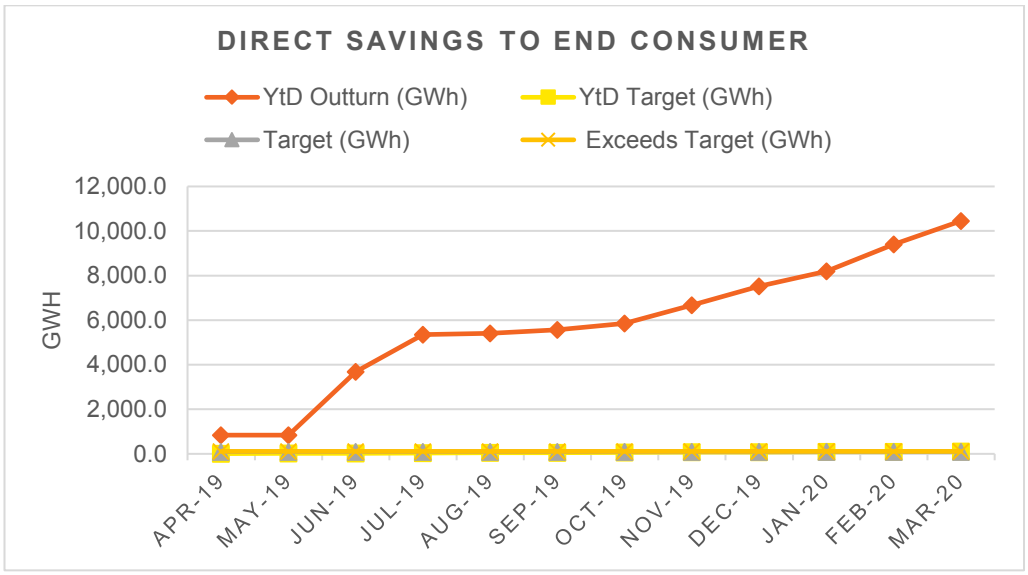


Figure 25: Customer Value Opportunities – direct savings

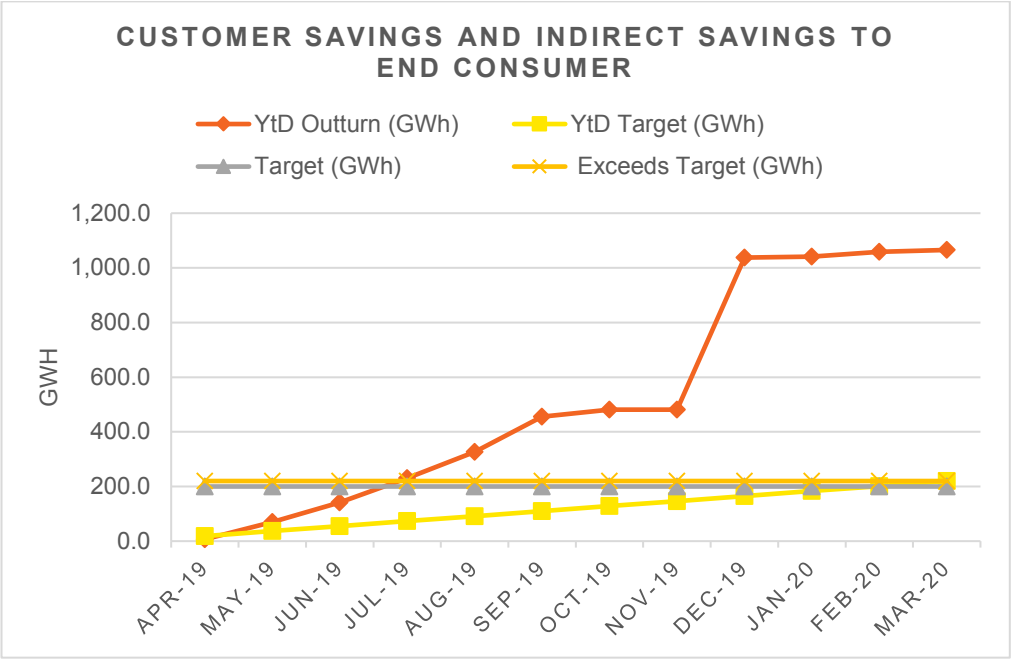


Figure 26: Customer Value Opportunities – indirect savings

Supporting information

During 2019-20 the Network Access Planning team **exceeded the benchmark** and made excellent progress to exceed metric targets for both direct savings to the end consumer (fig. 25) and indirect savings to the end consumer (fig. 26). Our outturn direct savings to the end consumer was **10,453,000 MWh**. Our outturn customer and indirect savings to the end consumer was **1,065,500 MWh**.

The Network Access Planning team, in collaboration with our stakeholders (TOs and DNOs) have identified and recorded more than 144 cases where we have used our engineering expertise and judgment to propose innovative ways of planning system access, and gone over and above our network access planning policies and procedures to add value to end consumers and connected customers.

Following the success of the metric results in Q3, in Q4 all teams in Network Access Planning (NAP) have continued to find better ways of doing their work, and we continue to challenge the plans to find savings to benefit the end consumer. This represents a total of **11,518,500 MWh** of extra generation capacity being released over the 2019-20 performance year, which would have otherwise been constrained at a cost to the consumer.

As stated in the Q1 report as part of our learnings from the metric development, we have continually revised the targets we use for these metrics internally, in order to continue to challenge ourselves. This has led to a much higher benchmark being used in the 2020-21 Forward Plan. The metric will continue to be challenging and drive strong performance for the next financial year.

Performance benchmarks

The target values for Scotland Outage Planning are set from historic measurements and performance. At the time of setting these targets, we did not have historical data for the Outage Planning teams who cover England and Wales. We therefore set the targets for the combined GB metric to be twice the original Scotland targets.

A. <u>Direct savings to end consumer:</u>

- **Exceeds benchmark:** Between 100,000 MWh and 110,000 MWh
- **In line with benchmark:** Between 100,000 MWh and 110,000 MWh

- **Below benchmark:** Less than 100,000 MWh

B. Customer savings and indirect savings to end consumer

- **Exceeds benchmark:** Greater than 220,000 MWh
- **In line with benchmark:** Between 200,000 MWh and 220,000 MWh
- **Below benchmark:** Less than 200,000 MWh

For full details of this quarterly metric see pages 77 – 78 of our Forward Plan.

Metric 13 – Connections agreement management

The requirement to update connection agreements arises from a situation where new generation connects, and the ESO needs to amend its arrangements with existing generators connected in that region to ensure that it does not incur unnecessary balancing costs for consumers as a result of restricting generation.

This metric will measure how long it takes from the point of notification for these agreements to be updated. This metric drives efficient and effective management of existing connections contracts by measuring the percentage of contracts which are updated within nine months of notification.

Number of agreements that need updating	Number of agreements that need updating identified nine months ago	Number of agreements updated within nine months	Percentage of agreements updated within nine months	Status
3	0	3	100%	●

Figure 27: Connections agreement management performance

Supporting information

We **exceeded the benchmark** for 2019-20 with 100% of agreements updated within the nine month timeframe.

Three agreements were identified in 2019-20:

- One was completed in April 2019.
- The second one was signed by customer in July 2019.
- The remaining one was signed in November 2019.
- In addition, one outstanding agreement from 2018-19 was agreed and signed by the customer on 31 March 2020

The requirement to update connection agreements arises from a situation where new generation connects, and the ESO needs to amend its arrangements with existing generators connected in that region to ensure that it does not incur unnecessary balancing costs for consumers as a result of restricting generation.

We have removed this metric for 2020-21, due to the low volume of eligible connection agreements it is no longer a meaningful measure.

Performance benchmarks

2018-19 performance: = 86%

- **Exceeds benchmark:** >90% of agreements to be updated within nine months of notification.
- **In line with benchmark:** 80-90% of agreements to be updated within nine months of notification.
- **Below benchmark:** < 80% of agreements to be updated within nine months of notification.

For full details of this monthly metric see pages 78 – 79 of our Forward Plan

Metric 14 – Right first-time connection offers

This right first time metric will report all connection offers signed within a calendar month and identify if a 'reoffer' has been made (i.e. the offer was not right first time and needed rework) and what the root cause for the rework was. Any reoffers directly attributable to the ESO will impact the performance of the metric. Any rework driven by a TO or driven by a customer change to requirements during the process will be excluded from the metric performance but reported for information only.

Connections Offers	Results
Year to date number of connections offers	217
Year to date ESO related reoffers	15
Year to date percentage of Right First-time connections offers determined from ESO related reoffers	93%

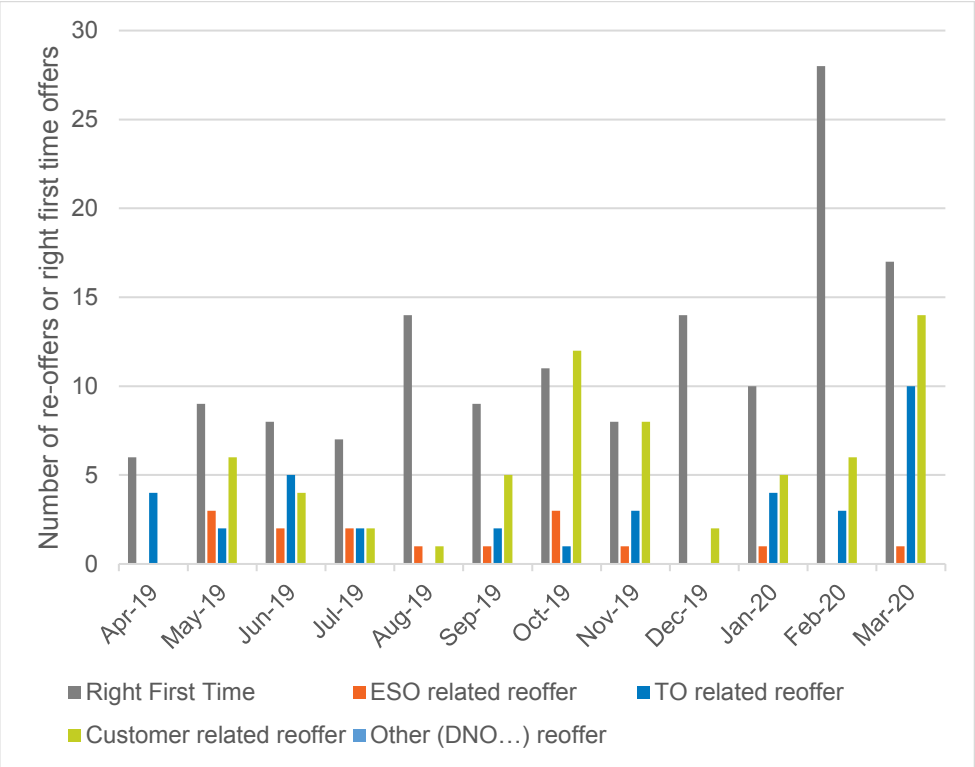


Figure 28: Connections offers monthly performance

Supporting information

Although our performance for Right First Time connection offers sits **below benchmark**, it has been steadily improving since July 2019. The high target means that a just a small number of ESO-related reoffers can have a significant impact on performance. There was a significant change to processes on 1 April 2019 as a result of legal separation, and those new processes are now becoming more established. The Connections Teams are working hard to ensure that ESO-related offers are minimised, by continuously reviewing the reasons for re-offers and feeding the learning back into the process.

Performance has been improving month on month since July. The number of offers requiring re-work over the last two months has doubled from earlier in the year, however ESO related re-offers have remaining low.

By reducing the number of ESO related re-offers our customers are able to proceed with their offer acceptance quicker, which improves the overall efficiency of the connections process.

Performance benchmarks

2018-19 performance: = 94%

- **Exceeds benchmark:** >95% of offers right first time.
- **In line with benchmark:** 95% of offers right first time.
- **Below benchmark:** < 95% of offers right first time.

For full details of this monthly metric see pages 79 – 80 of our Forward Plan

Metric 15 – NOA consumer benefit

This performance metric is measuring the outcomes of the Pathfinder projects, Study tools and NOA: enhanced communication deliverables.

Supporting information

The Network Options Assessment (NOA)'s purpose is to make recommendations to transmission owners across Britain as to which projects to proceed with, and delay, to meet the future network requirements as defined in the Electricity Ten Year Statement (ETYS). We are **in line with benchmark** for our performance this year as we conducted four ad-hoc Cost Benefit Analysis (CBA) and we calculated the consumer benefit of ESO options in the Two Degrees scenario to be 3.5%.

Options are defined as:

Optimal: The option is economically justified in at least one scenario.

Critical: The option is 'optimal' on its earliest in service date (EISD) in at least one scenario.

Earliest In Service Date (EISD): The earliest date when the project could be delivered and put into service, if investment in the project was started immediately.

Currently the NOA uses single year least-worst regret (LWR) to determine the investment strategy for the next year based for TOs and/or relevant parties. The method measures and compares the economic regret of delivering each critical option against the economic regret of delaying it by one year. In economic analysis, the regret of an investment strategy is the net benefit difference between that strategy and the best strategy for that scenario. The recommendations we make for each option, or combination of options, are based on minimising the levels of regret across all scenarios, which is in the best interest of consumers.

To calculate the overall consumer benefit, we use the concept of 'anti-regrets'. This means that the recommendations made on critical options, in each of the optimal paths, using LWR, are reversed. The 'anti regret' is the single year regret of doing the opposite of what NOA recommended and serves as a benchmark for comparing the 'best' and 'worst' investment strategies possible. We perform this analysis by calculating the single year regret, in each of the FES scenarios, by changing:

- Options that received a 'Proceed' recommendation to 'Delay'; and
- Options that received a 'Delay' recommendation to 'Proceed'

Delaying an option that was recommended to 'Proceed' results in additional constraint costs in some scenarios. Conversely, proceeding with an option that was recommended to 'Delay' results in inefficient first year spend since the reinforcement is delivered earlier than it is required. The difference in economic benefit between the NOA recommendations and the strategy of doing the opposite of the recommendation (anti-regret) is the quantifiable measure of consumer benefit.

Consumer benefit can be calculated for each of the four FES scenarios, however this would result in a range of values that may cross the performance scale as the NOA looks at a per scenario basis, which is why we calculate four consumer benefit values. Using the latest market intelligence and views from the wider industry, three out of the four FES 2020 scenarios will meet the 2050 net zero targets. Therefore, we believe that the FES 2019 Two Degrees scenario most accurately represents this updated view and is the most appropriate scenario for reporting consumer benefit for 2019-20.

To calculate the consumer benefit generated from ESO options, we compare the consumer benefit specifically of ESO options as a percentage of the overall consumer benefit of the NOA, where:

$$Consumer\ benefit\ of\ NOA = (Anti\ regret\ of\ \boldsymbol{ALL}\ critical\ options - Regret\ of\ NOA\ recommendations)$$

$$Consumer\ benefit\ of\ ESO\ Options = (Anti\ regret\ of\ critical\ \boldsymbol{ESO}\ options - Regret\ of\ NOA\ recommendations)$$

$$Consumer\ benefit\ of\ ESO\ Options\ \% = \frac{Consumer\ benefit\ of\ ESO\ Options}{Consumer\ benefit\ of\ NOA} \times 100$$

Using the above formula, we calculate the consumer benefit of ESO options in the Two Degrees scenario to be **3.5%, meeting the baseline target**. It should be noted that the value of two ESO collaborative options are not included in this value since they are optimal but not critical options, and hence not subject to regret analysis. In addition, the value of ESO commercial solution options this year has reduced following a revision of their expected earliest in service dates. The dates of our commercial solutions were pushed back from 2020 to 2023-2024 to reflect the challenges in going out to tender for such a service and the timescales involved. This has meant that some of the consumer benefit previously captured in early 2020 is no longer expected to be realised. This is because last year's NOA analysis showed that the benefit of the commercial solution was realised from 2020 onwards. This has meant that some of the consumer benefit previously reported for the early 2020s will no longer be captured.

For the alternative metric comparing the number of ESO options to the total number of options in the optimal paths, we calculate this to be 6.6%, tracking below the baseline target. This was calculated based on 6 ESO exclusive or collaborative options being optimal this year. The TOs submitted an additional 32 options into the NOA process and as a result the total number of options in the optimal paths increased by 16 to a total of 91 options. This led to a significant reduction in the percentage of options in the optimal path made up by ESO options. The ESO cannot control the number of options which are submitted by the TOs. We have revaluated this metric and believe that in order to capture consumer benefit more accurately the former metric should be used because it focuses on the value the ESO has created relative to the overall NOA value.

Consumer benefit of NOA pathfinder projects

Following our Network Development Roadmap publication, we are always looking for opportunities to develop the NOA to assess and recommend the most efficient ways of meeting transmission network needs.

These projects look to resolve compliance issues and we have found that these urgent requirements are not well suited to an annual cycle. We therefore decided to run our pathfinder projects separate to the annual NOA process, whilst ensuring they are subject to a NOA-type assessment. This year we have completed the initial tenders for two pathfinder projects, focusing on stability and voltage support.

Decoupling these projects from the annual NOA cycle ultimately means that their consumer benefit cannot be calculated using the metric originally presented. Instead we propose that the consumer benefit for pathfinder projects is calculated as the difference between our forecast constraint costs and the cost of the contract we award via competitive tender.

Stability Phase 1 tender

Over time we have seen declining levels of system inertia and we currently use the Balancing Mechanism (BM) to control the rate of change of frequency (RoCoF) risk. We do this to secure for the largest loss on the system or as a measure to increase system inertia. We explain more on how we do this in our System Operability Report on system inertia[56].

In November 2019, we approached the market to procure additional system inertia. This was phase 1 of the stability pathfinder, which aimed to reduce the RoCoF risk by awarding a number of six-year long-term contracts between 2021 and 2026. Our cost benefit analysis compared these

[56] https://www.nationalgrideso.com/document/164586/download

prospective contracts to the predicted future cost of managing RoCoF risks. Due to the high level of uncertainty involved, we used a range of costs to capture a wide spectrum of possible outcomes.

In January 2020, we concluded the stability pathfinder phase 1 tender and awarded contracts to five providers, worth £328 million, in a new, innovative and world first approach to managing the stability of the electricity system. Our cost benefit analysis has shown that this pathfinder project could lead to consumer savings between £52m-£128m between 2021-2026.

Mersey short-term voltage tender

Driven by the need to address high voltages in the Mersey area from April 2020, the voltage pathfinder set out to identify both existing and new whole system solutions which could provide a reactive power absorption service at competitive prices.

The short-term tender sought a reactive power absorption service from April 2020 - March 2021 and the long-term tender from April 2022 for nine years.

The short-term tender concluded on the 17 January, where for the first time, we have awarded a contract to a provider connected to the distribution network. In collaboration with SPEN, the reactive capability was successfully tested and delivered and since the beginning of April 2020, we have already enacted this contract to maintain voltages within limits on the transmission network.

We have evaluated that the contracts signed have the potential to save the end consumer up to £4 million by avoiding the need to procure this service in the Balancing Mechanism at higher costs.

Consumer benefit from SWW

In the last year we have progressed a number of Strategic Wider Works assessments, however this analysis is still ongoing and therefore we do not have a consumer benefit value to report at this stage. The projects in flight include:

- Orkney Islands
- Shetland Islands
- Western Isles
- East Coast of Scotland and North England

Consumer benefit from Connection and Infrastructure Options Note (CION)

During this financial year we have conducted a total of six CION assessments. The CION process is an optioneering process to identify the overall economic and efficient connection option. The total consumer benefit calculated from these assessments is approximately £4.3 billion. This figure shows that through our CION analysis, we have made strong recommendations in the best interest of consumers.

Consumer benefit from ad-hoc Cost Benefit Analysis (CBA)
During this financial year, we conducted a total of four ad-hoc CBAs **exceeding our benchmark target of three**. We carried out two CBAs for both SHE Transmission and NGET. These assessments ranged from asset replacement schemes to the evaluation of a TO's potential outage strategies, all to minimise cost to the GB consumer. We estimate that the ESO's recommendations across these projects will provide a total of £107 million of consumer benefit.

ESO Workstream	Consumer Benefit
Pathfinder projects	£56m - £132m between 2021-2026
SWWs	Projects ongoing
CIONs	£4300m

Ad Hoc CBAs	£107m
Total	**~£4500m**

Figure 29: Consumer benefits from ESO workstreams

Performance benchmarks

Consumer benefit

- **Exceeding benchmark**: The % of ESO exclusive and ESO collaborative options is >12% of the total number of options in the optimal path or the value is >4% of the overall consumer benefit.
- **In line with benchmark:** The % of ESO exclusive and ESO collaborative options is between 10% and 12% of the total number of options in the optimal paths and the value is between 3% and 4% of the overall consumer benefit.
- **Below benchmark:** The % of ESO exclusive and ESO collaborative options is below 10% of the total number of options and the value is below 3% of the overall consumer value.

Cost Benefit Analysis

Consumer benefit from SWW: Report the consumer benefit for the preferred option against the next best option.

Consumer benefit from CION: Report the consumer benefit for the offered connection location against the customer desired connection location.

Consumer benefit from Ad-hoc CBA

Consumer benefit: Report consumer benefit from all small-scale CBAs conducted.

Target: Conduct 3 small scale CBAs per year.

- **Exceeds benchmark:** The number of ad-hoc CBAs conducted is above target.
- **In line with benchmark:** The number of ad-hoc CBAs conducted is on target.
- **Below benchmark:** The number of ad-hoc CBAs conducted is below target.

For full details of this annual metric see pages 80 – 82 of our Forward Plan

Metric 16 – NOA Enhancing Communication

Engagement activities

The Network Options Assessment (NOA) process

- NOA for Interconnectors workshop held on 17 April.
- Webinars were held in April covering the NOA methodology and NOA for Interconnectors.
- We published three videos about our work for network planning, zero carbon and the NOA in July and August which by March had had over 1000 views. The videos can be found here.
- Electricity Ten Year Statement (ETYS) webinar held on 19 February
- Engagement meetings held with the TOs about the indicative NOA results on 28 November and 4-5 December.
- NOA report including NOA for Interconnectors published on 31 January.
- Network Development Roadmap Progress Update also published on 31 January.

Pathfinder projects

- Commercial Solutions for Network Challenges event held on 16 May.
- Webinars were held in May and August covering the Mersey high voltage pathfinder project, Constraint Management pathfinder and Stability pathfinder.
- Stability pathfinder RFI published on 19 July.
- Response to stability RFI published on 20 October.
- Tenders published on 5 November and 25 November for short term Mersey voltage and stability phase 1 respectively.
- Tender published for long-term Mersey voltage on 25 November.
- Requests for Information (RFI) published for Constraint Management pathfinder on 18 December.
- Constraint Management pathfinder webinar held on 22 January

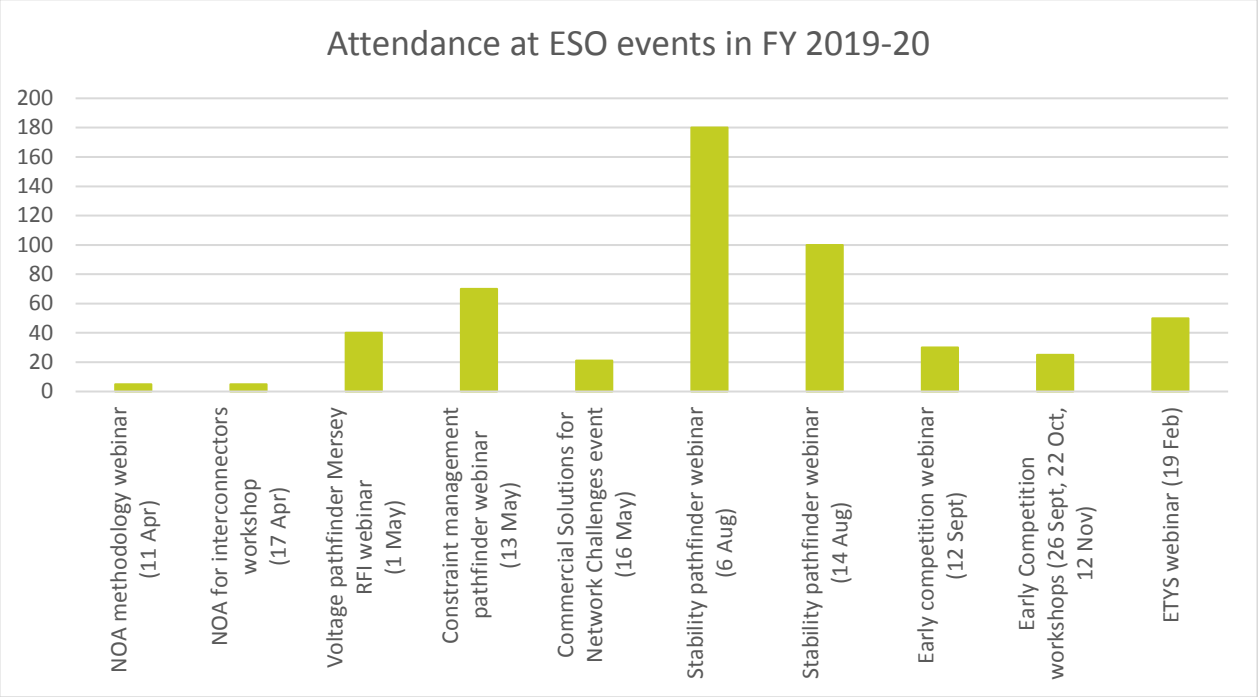


Figure 30: Event attendance

Supporting information

We have **exceeded our benchmark** as more people are participating in our events and providing positive qualitative feedback on our documents (which can be found in our Stakeholder section). Our average score for our publications is 7.6.

In the first half of the year, we strengthened relationships with customers and stakeholders by delivering a pipeline of engagement events. This fed into our NOA methodology and was used in the analysis which dominates our NOA work in the second half of the year. At the same time, we continued to engage with stakeholders as part of the Network Development Roadmap, pathfinder projects and early competition plan.

Our objective is providing sufficient information to parties interested in submitting options to meet system needs. This will allow them to effectively develop solutions to be assessed against traditional options. By providing the right information in suitable timeframes, we can facilitate more options being put forward into our options assessment processes. This will benefit the end consumer because we will be able to deploy the optimum cost-effective solution.

For the NOA and NOA for interconnectors

- We published the NOA methodology for public consultation on 9 May. The consultation closed on 20 June and attracted ten responses. Four of these were solely about the voltage pathfinder project. We took account of this feedback for the methodology that we submitted to Ofgem on 26 July and which Ofgem approved on 11 October.
- We published our System Requirement Forms on 31 July. These describe the needs that we identify that must be met to manage the electricity transmission system in the future. We published the forms as a step towards widening the NOA and allowing more parties to participate in the future in providing options to meet the transmission system's needs.
- NOA for Interconnectors: we held a workshop on 17 April to discuss and gain feedback on the proposed methodology for NOA for Interconnectors 2019-20. Five stakeholders attended the workshop. The feedback we received was used to shape the draft NOA for Interconnectors methodology. Three consultation responses were received regarding the NOA for Interconnectors consultation and one stakeholder requested a one to one meeting. Based on stakeholder feedback, the methodology for calculating the interconnection baseline level has been revised and a note detailing the revised

methodology was sent to stakeholders in late September. We engaged further with stakeholders in October about the baseline capacity calculation methodology. We outlined our proposed methodology including the reasons for change and recommendations.

- We published the Electricity Ten Year Statement (ETYS) on 29 November 2019 and announced it by email to 956 recipients registered for ETYS updates. The email had over 330 unique opens and the ETYS document has been downloaded 617 times since. We also arranged an ETYS webinar in February 2020 with 50 participants.
- We met with the TOs about the indicative NOA results in late November and early December. We timed these meetings to allow the TOs time to digest the indicative NOA results. We published the NOA report on 31 January and announced this by email, with the email being sent to over 1100 recipients who had registered for NOA updates. The email had over 340 unique opens and there have been 1138 downloads from our NOA webpage of the NOA report file.

Scoring

Publication	Survey question	Average
ETYS	**On a scale of 1 to 10, how satisfied are you with the current format of the ETYS Report? - ETYS Report**	**7.4**
NOA	**On a scale of 1 to 10, how satisfied are you with how the NOA publication was presented this year? - NOA Publication**	**8**
NOA	**On a scale of 1 to 10, how valuable did you find the interactive map in Chapter 4? - NOA Publication**	**7**
ND Roadmap	**On a scale of 1 to 10, how valuable did you find the ND Roadmap update? - Network Development Roadmap Update**	**8**

Performance benchmarks

- **Exceeds benchmark:** High scores and positive stakeholder feedback on the documents and changes we are making to them.

- **In line with benchmark:** Meets licence obligations. Average stakeholder feedback with clear areas for improvement.

For full details of this metric see pages 82 – 83 of our Forward Plan

nationalgridESO