nationalgridESO

2019/20 Mid Year Report
Evidence Chapters

October 2019

Introduction

These evidence chapters set out in more detail, how the Electricity System Operator has performed in this six-month period. 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 deliver for consumers (both in this six-month period and looking ahead into the future), 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

Managing System Balance and Operability: Executive Summary

Our aim under Role 1 is to operate the system safely and securely, whilst driving overall efficiency and transparency in balancing strategies across time horizons.

Further, we support market participants to make informed decisions by providing user friendly, comprehensive and accurate information.

Under this Role we find the optimum way of carrying out balancing and operability actions in a low-carbon, decentralised and digitised world. We act as residual balancer, taking actions needed to balance and operate the system efficiently, ensuring stable balancing costs amongst a world of change.

Our achievements so far

Our role of providing safe, reliable energy was brought into sharp focus on the 9 August when a series of events on the electricity system caused approximately one million customers to lose power. You can find out more about the event in our technical reports[1], In this mid year performance report we explain how a strong focus on the commitments set out in our Forward Plan is delivering good progress and benefits to consumers.

"Thank you very much for the visit last Tuesday. It was very informative, and I think the day was very well structured. I particularly enjoyed having the opportunity to see the Control Centre in action."

– Smart Technology Provider

Managing balancing costs will always be important to us and we are pleased to have outperformed the benchmark cost by 9%, yielding a net benefit of £47m lower costs to consumers. We have achieved this by maintaining a keen daily focus on cost management and our balancing actions despite upward pressures during the summer months which featured some particularly high cost days with high wind and solar output coincident with lower demand periods. We are aware that, although our consistent downward pressure on balancing costs is in the overall interests of consumers through lower bills, it also represents a consistent downward pressure on a revenue stream for our balancing service providers. Our work to continuously improve our forecasts and transparency is important in that context, so that providers can have the best possible understanding of the market in which they are operating.

We have continued our programme of investment to improve our energy forecasting; our rolling 12 month monthly mean absolute error for electricity demand forecasting was lower by 3.3% compared to last year, and in August we delivered the best monthly performance for five years. We have implemented the latest multi-model blend forecast from the Met Office; receive weather forecasts eight times a day (up from four at the beginning of last year) and we have added forecasts for additional weather locations to improve forecast accuracy for large new off-shore wind farms. We are seeing benefits from this in our new national demand forecasting tool which provides hourly demand forecast updates into the control room. This has enabled us to outperform our forecasting target in five months of the past six months for electricity demand forecasting and four months out of the past six for wind power forecasting. Our improvement helps us drive consumer benefit through better balancing cost management, but we have also increased our transparency by publishing our embedded forecasts more frequently, increasing the number of published photovoltaic (PV) forecasts from two to 24 times daily. This enables market participants to adjust their positions based on more up-to-date data, which should enable more efficient markets and greater value for consumers.

[1] https://www.nationalgrideso.com/information-about-great-britains-energy-system-and-electricity-system-operator-eso

With the development of the Ancillary Services Dispatch Platform (ASDP), the ESO has a scalable solution which has already created competition within the Fast Reserve market and we have migrated the Short Term Operating Reserve (STOR) service over to this platform. Service Providers can connect to the platform quickly and once connected can play in multiple markets, reducing cost and effort for all stakeholders. The deployment of the new ASDP system will ensure we are compliant with relevant EU codes, while improving flexibility of the STOR service.

Our provision of indicative trend of regional and national carbon intensity of the electricity system via the Carbon Intensity Application Program Interface (API)[2] continues and is increasingly popular. The average of 4.7 million hits per month is trending upwards, building on the success we saw last year with uptake from suppliers such as Bulb who use the data to improve the service they provide for consumers.

"[The Future Energy Scenarios team] listened to all of our views and the one to one engagements with them have been positive throughout the organisation."

– Gas Distribution Network Owner

Our theme of increasing transparency has continued, with our ever-popular National Control visit days[3] and our daily GB Electricity System Operator Daily Reports[4] publication. Within the period we also published several key insight documents:

- The Winter Review and Consultation, presenting our view of the supply and demand of both electricity and gas last winter compared to our 2018 Winter Outlook Report; and seeking stakeholder views on the electricity and gas supply and demand for the winter ahead.
- The Operability Strategy Report, summarising our work on the future operability challenges and how they relate to our ambition for zero carbon operation in 2025.
- Our 2019 Future Energy Scenarios (FES), providing transparent, holistic paths through future, uncertain energy landscapes. We have also launched 'Shaping FES 2020', which is an opportunity for stakeholders to help us develop the 2020 Future Energy Scenarios.

As we publish more data and insight on our operation, it can become increasingly difficult to navigate, and so to improve the user experience, we have added a "Data explorer" page[5] to our website to improve access.

Overall, we are pleased with the progress we have made in this first half of the year. What we have achieved and learned (including taking lessons from the 9 August events) will continue to inform our delivery in the second half of the year to ensure we provide value for consumers through our management of system balance and operability.

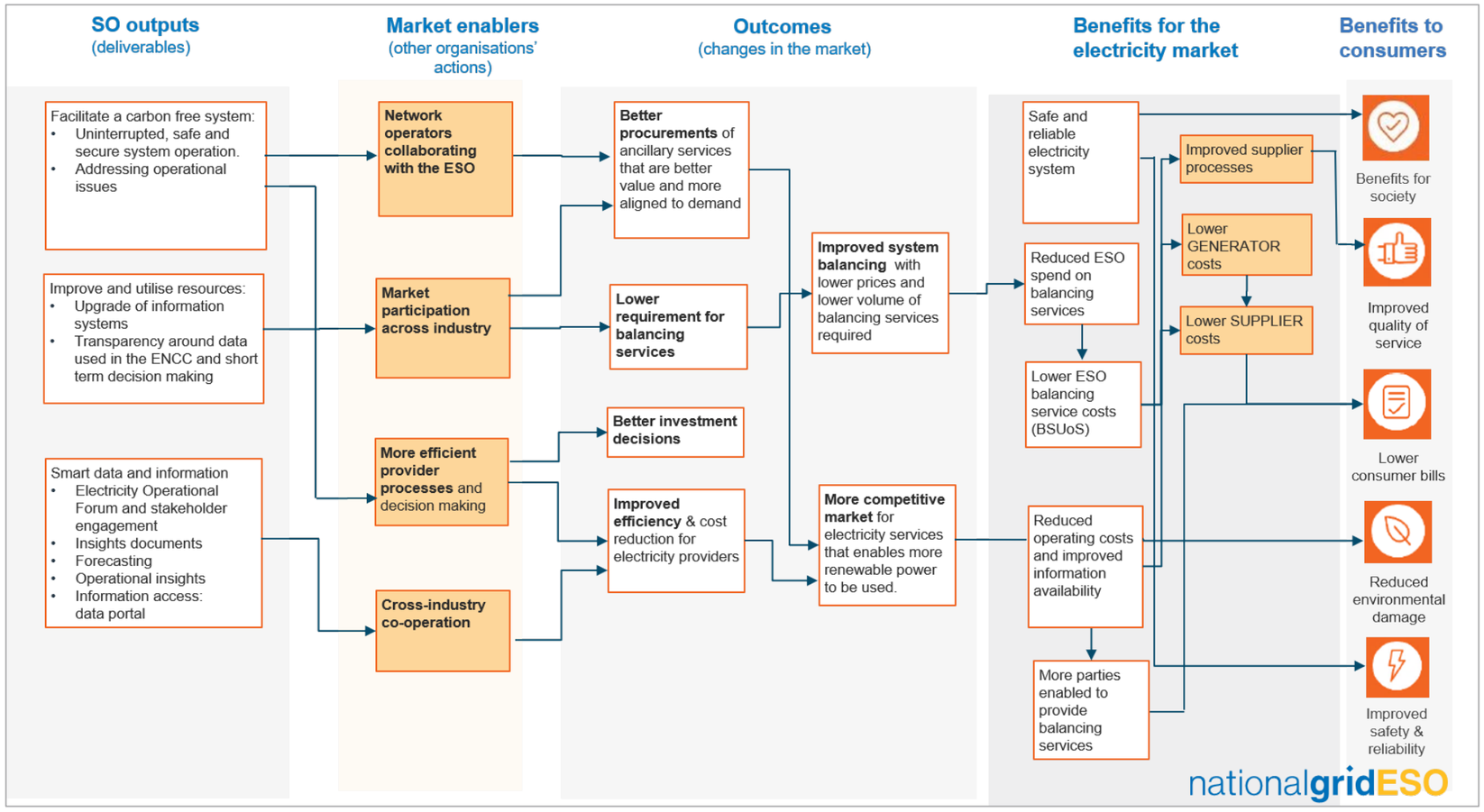
"The [Operability Strategy Report] document provides a clear and transparent view for stakeholders on the work the ESO is undertaking and on how they can get involved in the process"

– Industry publication

[2] https://carbonintensity.org.uk/
[3] All attendees at the Operational Forum were invited to the ENCC visit days
[4] https://www.nationalgrideso.com/balancing-data/gb-electricity-system-operator-daily-reports
[5] https://www.nationalgrideso.com/balancing-data/data-finder-and-explorer

Role 1 Consumer Benefit Map

Our role of Managing System Balance and Operability has a significant impact on consumers both now and into the future and this benefit map sets out the interactions between our role and other market participants to lead to benefits for consumers. In planning and operating the system, the ESO seeks to ensure that the system operates safely and reliably. We deliver long-term projects to address operational issues, particularly those which have arisen as a result of the increased penetration of renewables. We focus on delivering a high-quality service to our stakeholders, upgrading our information systems to make more data available in real time, and increasing transparency around our activities to better inform market participants' decision making. New developments and business-as-usual activities, contribute to lower bills than would otherwise be the case. Programmes such as Loss of Mains protection are also making it easier to operate the system with a higher proportion of renewables, leading to reduced environmental damage. In providing a secure energy supply at an economic cost, we are providing an important service to society as a whole



1. Evidence of Delivered Benefits in 2019-20

- ✓ With the development of the Ancillary Services Dispatch Platform (ASDP), the ESO has a scalable solution which has already created competition within the Fast Reserve market. Service Providers can connect to the platform quickly and once connected can play in multiple markets, reducing cost and effort for all stakeholders
- ✓ We have introduced new forecasting tools, resulting in a significant improvement in accuracy for wind and demand forecasts – in August we delivered the best monthly performance for five years
- ✓ We have reduced the effort needed to access our information, and published additional information which is useful to stakeholders, for example the data explorer page, outturn costs of Thermal Constraints, and Day Ahead Thermal Constraint limits and flows
- ✓ We have outperformed the benchmark cost for balancing by 9%, yielding a net benefit of £47m lower costs to consumers.

Case Study:

Removing barriers to entry for European Interconnector Trading

Consumer Benefit Outcome

Activity

We have reduced to the cost to consumers of interconnector trades by developing and implementing a new Interconnector (IC) auction trading tool which allows the ESO to utilise European interconnection to meet system security requirements with more agility, accuracy and market participation. The introduction of this new tool has removed barriers to trading with the ESO over European Interconnectors and maintains system security.

- Forward trades are carried out on interconnectors to manage system security and reduce costs to the consumer. ESO makes requests for the necessary volumes from the market, who then offer trade prices over the interconnectors. Via an auction based process the ESO agrees the most cost-effective trades to meet system requirements.
- Prior to this new method of working, requirements for IC 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 which limited market participation and potentially created barriers to counterparties thereby producing sub-optimal costs. It was also liable to human error in acceptance and communication of trades.
- The new trading tool has automated the process of generating and notifying requirements, it 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. Once confirmed, trades are then automatically uploaded into our trade capture system, removing the potential for human error. The time to run an “auction”, end to end, has been reduced from over two hours to under 45 minutes.
- The automation of the process allows the ESO to quickly assess hundreds of submissions and automatically select the best trades to meet our requirements on an hour by hour basis. We can trade large volumes, swiftly, therefore

	securing the system whilst minimising the cost to the consumer. By increasing participation in the auctions as shown by the graphs in Figure 2, liquidity in the auctions is increasing and allows the ESO to access better prices for managing the system. • We are continuing to improve this process: further detail on this will be provided for the end of year report.
Role	1. Managing system balance and operability
Key Forward Plan Deliverables	• Uninterrupted, safe, secure system operation • Balancing cost management
Current benefit	• The introduction of this tool has resulted in time savings and increased accuracy. Our trade publication performance metric (part of metric 2) clearly shows this improvement; since the introduction of the auction tool in Q1, which enabled us to significantly increase the numbers of trades conducted, we have also been able to reduce the absolute number (and %) of errors reported: this can be seen in Figure 1: Trade reporting errors graph • The introduction of this tool has reduced barriers to entry, the impact of this on participation and market share is shown in Figure 1 and Figure 2. The impact of increased participation on prices is being analysed and will be reported on in the End of Year report. • The introduction of the new tool has saved time every day for the ESO (reducing processing time for each “auction” from over two hours to 45 minutes), which will either result in reduced BSUoS charges due to reduced internal costs, or free up time for the ESO to focus on activities which add more value. Trading counterparties have also seen an improvement in the way the ESO manages this activity. If trading parties are able to operate more efficiently, this should flow through into lower wholesale prices.
Future benefit	• The auction tool can process multiple, and simultaneous, requirements for multiple interconnectors and a large number of independent bids, paving the way for future levels of greater interconnection and more participants.
Basis of expected benefit	• By allowing participants to bid dynamically; in hourly (vertical) blocks rather than longer horizontal blocks, multiple steps per period and whatever step size or volume they prefer or have capacity for, it removes barriers to entry, either for smaller players to participate or for capacity holders to bid for what they have available rather than ‘everything or nothing’. • This increased competition and market liquidity has helped to deliver value for money through our trades despite needing to access larger volumes more frequently on an increasingly complex system. • The reduction in the end to end processing time (from over two hours to under 45 minutes) for each IC requirement means we can run auctions more frequently if necessary and manage the timing of them to coincide with IC capacity auctions. This allows our counterparties to bid for capacity with the needs of the ESO in mind. • A Quarterly total number of auction winners shows an increase over time of participation by market parties in our IC auction. Additionally, by measuring participation by bid volume, our counterparties have access to a relatively even share of our requirement.

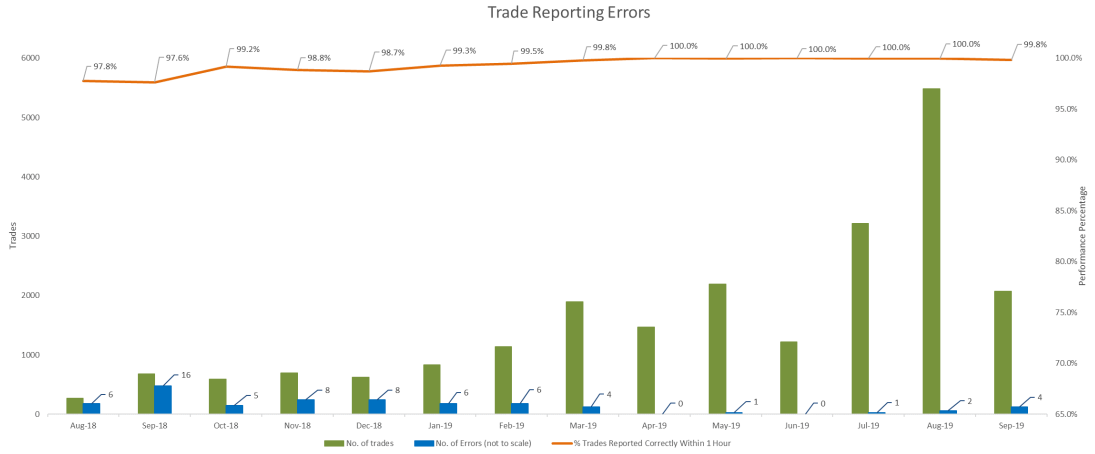


Figure 1: Trade reporting errors

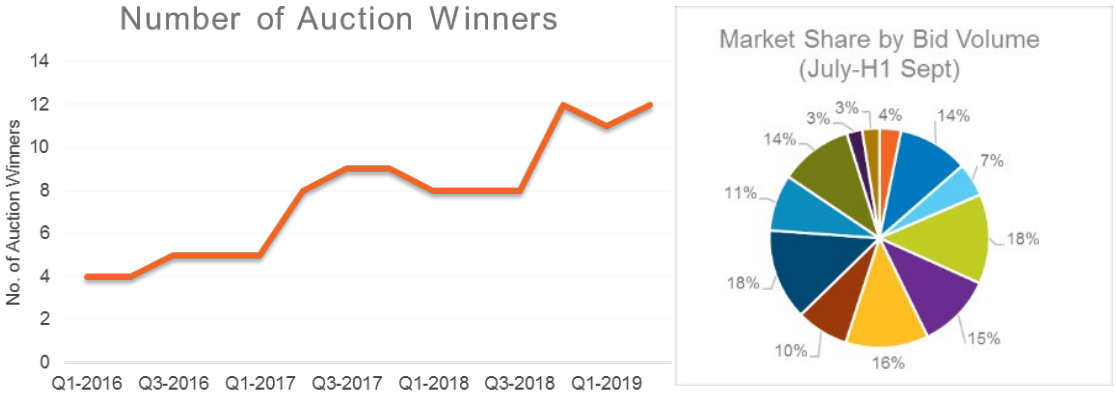


Figure 2: Number of Auction Winners

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, as well as on the ESO's activities, 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, we will reduce the BSUoS charge below what it would otherwise have been. We will present further evidence for this in our End of Year report. Where trading counterparties can operate more efficiently, this is expected to flow through into lower wholesale costs than would otherwise be the case.
Additional non-monetary benefit	By increasing the number of parties who can participate in interconnector trading, we are increasing security of supply as there is more likely to be a larger number of counterparties to trade with in any given situation.
Assumptions	We are assuming increased liquidity will lead to lower prices which will feed through to BSUoS. We are then assuming this saving will be passed onto end consumers by third parties.

2. Evidence of Future Benefits and Long Term Initiatives

- ✓ We are working closely with distribution licensees to implement the Loss of Mains Programme, which will allow us to reduce balancing spend and support system resilience
- ✓ We are publishing our forecasting data more frequently, which will allow market participants to make use of the latest data to enable more efficient market operation and greater value for consumers
- ✓ We making our publications more accessible to stakeholders by adding a Data Explorer page to our website. This will give a full picture of the ESO's activities, giving opportunities for stakeholders to work with us to solve operational challenges.

Case Study:

Consumer Benefit Outcome

Improvements in Forecasting

Activity

The Energy Forecasting team continuously identifies opportunities for improving the accuracy of our demand, wind and solar forecasts, whilst ensuring that our investments are assessed against the improvements they will deliver. This year we have increased the frequency of key forecast publications[6], allowing the industry to benefit from more up-to-date data and information.

Our demand forecasting team provides Transmission System Demand Forecasts and Balancing Mechanism Unit (BMU) wind generation forecasts at the day-ahead stage. Providing the most accurate forecasts in a timely way is essential to support the market to balance its position ahead of real time. These forecasts are also essential to enable the ENCC to plan and operate the system securely and economically.

In this six month period, we have delivered all of our Forward Plan commitments, which have mainly focussed on more frequent forecasts. Beyond this, we identified an opportunity to improve the accuracy of each forecast.

The demand forecasting models and processes have been completely rebuilt; using parts of the old process that performed well, and a newly developed mathematical model. In addition, an interactive tool has been built to implement the new model and existing methods. This tool allows for automated forecasts to be produced, even when the forecasters are not on duty, allowing new forecasts from any changes to be provided to the ENCC automatically.

There is still a need for forecasters to monitor the new systems. Computer models require datasets of previous days to create accurate forecasts. Days with limited data such as bank holidays, Christmas, Easter or any other special days require input from forecasters. The introduction of the new process gives the forecasters more time to focus on these special days and to design further improvements to the system.

The introduction of the new processes and tools has, to date, also led to notable improvements in forecasting accuracy, as well as significant time

[6] http://cdsasharedprod.uk.corporg.net/efs_demand_forecast/faces/%20DataExplorer

savings. The improved forecasting performance can clearly be seen in

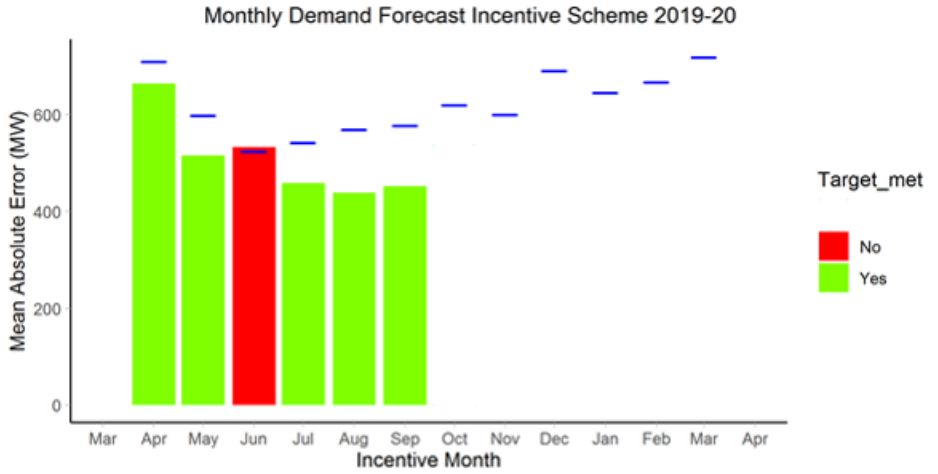


Figure 3 and Figure 4.

Role	1. Managing system balance and operability
Key Forward Plan Deliverables	• Publish Forecasting Strategy Project Roadmap • Publish half-hourly photovoltaic (PV) forecasts to market, 24 times a day • Publish four additional wind forecasts to the market • Publish an additional Day-Ahead demand update at 12:00pm every day
Future benefit	The forecasting team has two main customers: the ENCC and market participants. Market participants make use of our demand forecasts to balance their position, and where these forecasts are more accurate then this will ensure a better match between generation and demand. The provision of more frequent and more accurate forecasts should help to ensure that market participants' positions can be balanced ahead of time, resulting in less market intervention and residual balancing by the ESO which reduces the costs to consumers. However, we would not expect to see an instantaneous improvement: it will take time for participants to change their processes to make use of the more frequent forecasts. Once the new processes have been embedded, it should result in lower volumes of energy being traded by the ENCC after gate closure, which should translate to lower balancing costs. The ENCC makes use of our forecasts of renewable generation and demand to ensure that generation and demand are balanced in real time. At any given time, the ENCC holds a particular volume of reserve and response. One of the factors which contributes to the volumes of response held is the risk of forecasting errors in generation or demand levels. We are working towards embedding the new forecasting tools and processes in the ENCC; once the ENCC's level of confidence in our forecasts has increased, then the volume of reserve and response held for this purpose can be reduced. We would expect this to result in lower balancing spend than would otherwise be the case. The availability of additional and more accurate forecasting information will make it easier to operate the system securely with a higher percentage of renewables, consistent with our ambition to be able to operate carbon-free by 2025. In making it easier for market participants to balance their position, we are establishing a more efficient market. Smaller market participants may not have their own in-house forecasting capability, and may particularly benefit from our improved information. As such, improved forecasting will potentially remove a barrier to entry. and contribute to our ambition to achieve competition everywhere.

Basis of expected benefit

Market participants and ESO teams have asked for more accurate forecasts so that they can act more efficiently and economically. Energy Forecasting has delivered on several strategic areas to deliver tangible benefits to consumers:

- **Accuracy** of our forecasts. More accurate forecasts will allow market participants to better adjust their generation/consumption positions ahead of real time. This will result in fewer actions taken by the ENCC – and therefore less consumers' money spent – to balance the electricity system.
- **Frequency** of our forecasts. More frequent forecasts allow market participants to better adjust their positions closer to real time. This helps organisations to optimise their balancing decisions and therefore reducing the number of actions that we need to take to balance the system.
- **Transparency and accessibility** of our forecasts. Easy to understand and more accessible forecasting data leads to more efficient markets and potentially remove barriers to entry.

Since implementing our new tools and processes in June 2019, we have performed better than our target for both demand forecasting (see

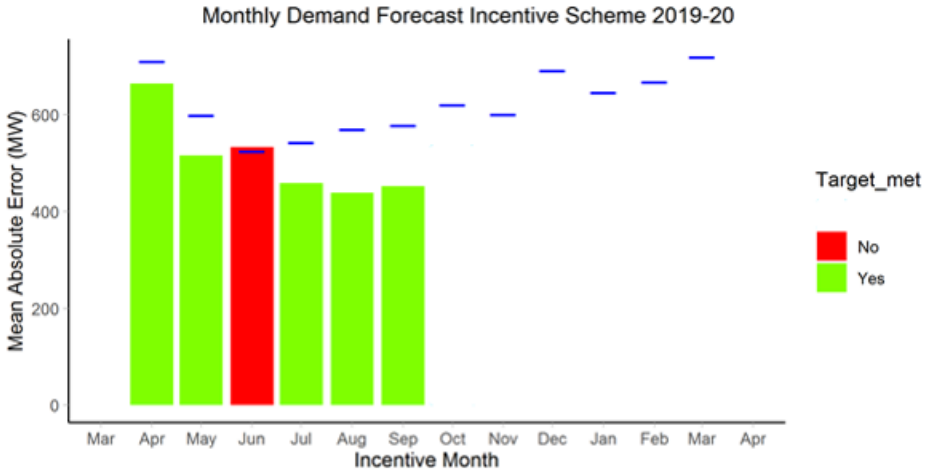


Figure 3 and wind forecasting (see Figure 4)

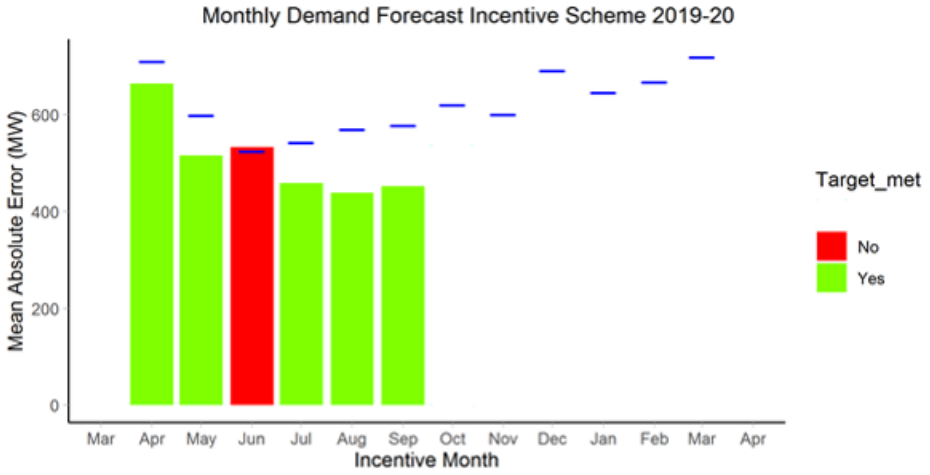


Figure 3: Monthly demand forecasting performance

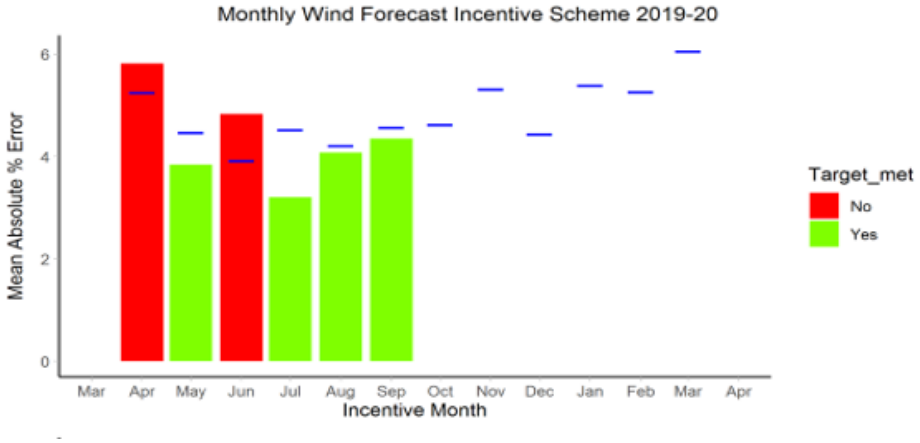


Figure 4: Monthly wind forecasting performance

The ENCC typically holds 1000-1500 MW of reserve to account for forecasting errors, and last year we spent £252m on reserve. Any improvements in forecasting, once established, should lead to this spend being lower than would otherwise be the case.

How benefit is realised in the consumer bill	System users pay for the cost of system operation through the BSUoS charge. Any increase in this directly affects consumers, as generators and suppliers will pass it on to them. Without any improvements in forecasting, increasing amounts of renewables would make it more difficult and therefore more expensive for the ESO to balance the system. Our improved forecasts will lead to lower costs being incurred than would otherwise be the case, as the ENCC could reduce the volumes of reserve it holds to account for forecasting errors, and market participants could balance their own positions leading to fewer balancing actions being taken by the ESO. These lower balancing costs would result in a lower BSUoS charge than would otherwise be the case.
Additional non-monetary benefit	Better service for users of our forecasts outside of the ESO, e.g. smaller participants in the wholesale and balancing services markets who do not have their own in-house forecasting capabilities. Providing services such as good forecasting can lead to more market participation due to being an enabler for small participants. Where new market participants are renewable generation, there is an environmental benefit associated with enabling these parties to participate in the market.
Assumptions	Increasing amounts of non-metered embedded wind and solar generation, alongside Distributed Energy Resources (DER), will make it more difficult to accurately forecast transmission demand, which could lead to higher costs. More accurate energy forecasts will allow the ENCC to hold less reserve, and take fewer balancing actions.

Case Study:

Loss of Mains Protection

Consumer Benefit Outcome

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 pass-through cost to the end consumer. The issue is referred to in the industry as Loss of Mains programme (LoM), and includes Rate of Change of Frequency (RoCoF) and Vector Shift protection. Since highlighting the case study in March in our Forward Plan document: • The modification to update LoM protection obligations in the Distribution Code has been approved by Ofgem • We have worked with the distribution network licensees and the Energy Networks Association (ENA) to implement a payment process to accelerate the protection changes. This work included: – Taking on board stakeholder feedback in development of the scheme – Developing a portal for embedded generators to apply to have their settings changed – Developing and agreeing commercial terms between the network operators to deliver the programme
Role	1. Managing system balance and operability 3. Facilitating whole system outcomes
Key Forward Plan Deliverables	Addressing Operational Issues- Roll out of Loss of Mains programme protection settings
Future benefit	Benefits will be more than £170m per year from 2022-23 in the form of Loss of Mains programme related balancing costs avoided once the programme is complete. Between 2019 and 2022, we will run a three-year programme to change the protection settings on affected embedded generators. The forecast cost is £100m. The cost of the programme will be charged through BSUoS over the relevant timeframe and is included within our BSUoS forecasts alongside the ongoing Loss of Mains programme related balancing cost. Once the programme is complete, the commercial cost of managing the issue will be removed.
Basis of expected benefit	We are creating benefit by working with all the DNOs in an accelerated change programme to reduce the costs of managing the Loss of Mains programme risks earlier, by proactively modifying affected generator protection systems, ahead of the deadline imposed by industry codes, and adapting operational polices in line with programme performance. The benefit to consumers will be delivered in a reduction in Balancing Services expenditure from current levels. We spent £170m in 2018/19 managing Loss of Mains programme risks and would expect costs, in the absence of the change programme, to be driven higher as the contribution from traditional synchronous forms of generation to electricity production decreases.
How benefit is realised in the consumer bill	The issue is managed through commercial actions paid for through BSUoS. The cost of the programme to resolve will also be levied through BSUoS. BSUoS is levied on system users and passed through to the end consumer as part of their electricity bill. Therefore, there will be an increase in total cost during the programme period, but as we move through the programme, the

	commercial cost of managing the issue will reduce, and upon successful completion of the programme will reduce to zero.
Additional non-monetary benefit	There is potential environmental benefit because we will not have to explore other options for RoCoF management which could include curtailment of non-synchronous generation, which are usually low-carbon sources. There is also a system security benefit, as once these changes are made generation should no longer disconnect unnecessarily due to fault conditions.
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.

3. Plan Delivery and New Ways of Working

- ✓ Shared insight on our balancing actions, publishing details of thermal constraints and actions taken
- ✓ ENCC visit days have enabled stakeholders to learn about real-time system operation
- ✓ Future Energy Scenarios, Winter Outlook and Operability Strategy Report published
- ✓ Data Explorer page added to ESO website to improve navigability, working towards creating data portal
- ✓ Improved planning process for Bank Holidays and significant events
- ✓ Improvements in Demand and Wind Forecasting accuracy due to new processes and tools
- ✓ Reviewed events of 9 August to inform future operational planning
- ✓ Worked closely with distribution licensees to implement Loss of Mains Programme
- ✓ Improved management of balancing costs through daily reviews, strategy meetings and greater interaction between control room and commercial departments.

Prioritisation Activities

Contained within this Role are the activities focussed on the operability of the network. The understanding and analysis of the future operability challenges, as published in our Operability Strategy Report, has been key in supporting the prioritisation across the other roles on focussing on the deliverables that will ensure the network remains operable.

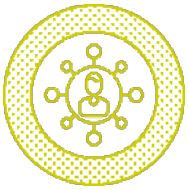
We have delayed the Future of the ENCC reports to ensure that we have are able to articulate the operability challenges clearly and expand on how these challenges shape our operational decisions. Getting this report right is key to ensuring that we are able to help stakeholders understand clearly the reasoning behind our decisions which may impact their businesses.

Deliverable	Target delivery date	Actual delivery date	Status
Uninterrupted, safe, secure system operation			
System security metrics	Q1 – Q4 2019-20	On track	As part of our C16 licence obligation we publish metrics that demonstrate our compliance with the Security and Quality of Supply Standards. We are continuing to develop more real time metrics to give insight into our operational performance. https://www.nationalgrideso.com/document/153121/download
Transparency of data used by our ENCC in our close-to-real-time decision making			
Future of the ENCC	Ongoing	On track	In July we published the first part of a report into the future of the ENCC, offering an insight into our activities and how we are evolving to enable a low carbon future:

Deliverable	Target delivery date	Actual delivery date	Status
			https://www.nationalgrideso.com/document/149711/download
Operational insights			
Insight on constraint boundaries	Q2 2019-20	Target date met	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.	On track	We held an Operational Forum in July, and the next one is scheduled in October- see our Stakeholder Evidence section for more detail
ENCC visit days	Q1-Q4 2019-20 and 2020-21.	On track	We have held monthly ENCC visit days, where stakeholders came to the ENCC for a series of topical presentations and a viewing gallery tour. The events have been very popular, attracting over 60 attendees to date, and received positive feedback from attendees. Further visit days are planned for November and December
Upgrade of information systems			
ASDP	Q2 2019-20	Target date met	Dispatch of Non-Balancing Mechanism Short Term Operating Reserve has now moved to the Ancillary Services Dispatch Platform (ASDP)
Interconnector programmes	Ongoing	On track	We are on track with all interconnector projects described in the Forward Plan. Any delays to implementation dates are due to changes in the interconnector commissioning dates, which is not something the ESO can control.
Insights documents			
Summer Outlook	Q1 2019-20 & 2020-21	Target date met	The Summer Outlook report, published in March, presents our view of the gas and electricity systems for the summer ahead: https://www.nationalgrideso.com/document/140411/download
Future Energy Scenarios	Q2 2019-20 & 2020-21	Target date met	Our Future Energy Scenarios document, published in July 2019, provides thought leadership and insights and reflect the year-round feedback from stakeholders across the energy industry and beyond: https://www.nationalgrideso.com/insights/future-energy-scenarios-fes
Operability Strategy Report	Q1 and Q3 2019-20 & 2020-21	Target date met	In June we published an update to our Operability Strategy Report, outlining the future challenges we face in maintaining an operable electricity system and how we are addressing these challenges:

Deliverable	Target delivery date	Actual delivery date	Status
			https://www.nationalgrideso.com/document/146506/download
Forecasting			
Publish Forecasting Strategy Project roadmap	Q1 2019-20	Target date met	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, 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 PV forecasts to market, 24 times a day	Q1 2019-20	Target date met	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	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	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
Information access			
Data explorer page on website	Q1 2019-20	Target date met	In response to stakeholder feedback, a data explorer page has been added to the website to improve navigability: https://www.nationalgrideso.com/balancing-data/data-finder-and-explorer
Whole system operability			
Roll out of Loss of Mains programme Protection setting	Commencing Q1 2019-20	Target date met	The programme is now live and the portal for DERs to apply for Loss of Mains programme change payment is open. The first formal programme steering group will meet in November and the results of the first assessment window will be available in the New Year.

4. Stakeholder Evidence



- ✓ Regular visits to the ENCC have received an overwhelmingly positive reception from stakeholders
- ✓ We have published information on our constraint boundaries in response to stakeholder feedback
- ✓ The Electricity Transmission Operational Forum we held in July 2019 gave stakeholders an opportunity to learn about and discuss our ongoing activities and flagship projects
- ✓ We are working collaboratively with DNOs and generators to roll out changes to Loss of Mains programme Protection
- ✓ Stakeholders found the Future Energy Scenarios documents and launch events useful, and welcomed the new format we have introduced for the Outlooks reports
- ✓ In response to stakeholder feedback we have published a Data Explorer page on our website.

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

Since April, we have been hosting regular visits to the ENCC, where stakeholders are given several topical presentations and a tour of the viewing gallery. These visits have been very popular, leading us to increase the frequency of the tours from every other month to every month. So far we have hosted over 60 attendees, from a range of companies, and received an overwhelmingly positive reception:

- "Thank you very much for the visit last Tuesday. It was very informative, and I think the day was very well structured. I particularly enjoyed having the opportunity to see the Control Centre in action." – Generator/ Provider.
- "Thanks for having us along, much appreciated. I think you had a mixed bag of an audience, and the content of the day touched on a wide variety of issues and interests which suited well. It gave us the opportunity to pick up on anything specific we might have been interested in. I wouldn't suggest you change any content at all if you are catering for such an audience in future, well done!" – Generator/ Provider.
- "I think that the most useful content, for me, was in listening to you and your colleagues talk about NGESO's ways of working and priorities. For an outsider, your organisation can be a bit mysterious. The opportunity to understand a little about, as it were, what makes you tick, was very enlightening." – Supplier.

We have also published the Future of the ENCC document, which articulates to stakeholders the types of real-time operational challenges the ENCC faces, and how these are likely to change in the future. Through this process we are inviting stakeholder feedback on their ideas on how we can solve these challenges, which will inform the development of the roadmap and future-proof our operations.

Operational insights

Stakeholders attending the Operational Forum told us that they would like to better understand our constraint boundaries and have better insight on balancing decisions made by the ESO. In response to this, we created a page on our website where stakeholders can download data showing outturn system costs for thermal constraints across a number of significant constraint boundaries. We also provide a snapshot of these limits and flows at the day ahead stage.

In Q3, we will start to publish a map of outturn system costs for voltage constraints per region.

Electricity Operational Forum and stakeholder engagement

In July we hosted the Electricity Transmission Operational Forum, where attendees heard presentations about BSUoS, a "difficult day" scenario for the ENCC, the Operability Strategy Report, and the Platform for Ancillary Services. We used the Slido tool to survey attendees on the day.

Stakeholders rated BSUoS forecasting 6/10 for usefulness, and the information provided regarding drivers of balancing costs as 6.4/10. When asked how we could shape improvements, the transparency and the usefulness of the information we provide on BSUoS, stakeholders asked for more granular cost data, with deeper analysis of the drivers of BSUoS costs. There was also specific feedback regarding the layout of the Monthly Balancing Services Summary (MBSS) document, where stakeholders were keen to see additional narrative regarding the key drivers of BSUoS and their cost implications.

The "Control Room Difficult Day Analysis" presentation was rated 5.9/10 by attendees, who felt that the presenter was knowledgeable and the presentation insightful. However, we received feedback saying that more detail would be useful, particularly regarding the requirements from Balancing Mechanism Units (BMUs) to support the network, system requirements in an extreme weather scenario, and emergency staffing. We will take this feedback on board for future presentations of this type; stakeholders were keen to see a similar session in future operational forums.

The Operability Strategy Report presentation was scored 7.4/10 by stakeholders. Although the majority of stakeholders were not previously aware of the report, all of those who had not already read the report were intending to do so. Stakeholders felt that the content was good, but requested more specific details about the challenges, severity and timeframes for implementing changes. For our next report we are increasing our engagement around the publication to ensure that stakeholders have visibility and understanding of the contents.

The update on the Platform for Ancillary Services was rated 6.7/10 for usefulness, with stakeholders feeding back that additional context and background material would be useful. There has since been regular dialogue with providers to ensure that they are ready for migration.

The next Electricity Operational Forum is scheduled for 23 October 2019. The comments received will help shape this event, and we will again seek feedback following this event to continually improve.

Addressing operational issues

We are working with stakeholders across the industry to roll out the Loss of Mains programme Protection work. We have taken several steps to ensure that those stakeholders whose settings are being changed understand the process. For example, we worked with Distribution Network Operators (DNOs) and Independent Distribution Network Operators (IDNOs) to produce dedicated communications and briefing material, which is being rolled out by the DNOs and IDNOs as they engage with their individual customers. We have specifically engaged with those stakeholders who manage a large portfolio of generation, agreeing an approach to make their protection setting changes more efficient. We also held two stakeholder engagement events, in London and Glasgow, which were attended by over 200 people in total. We received feedback that

- "this event is very useful to us to understand the scope of the programme and how we will be impacted" – Generator.

Upgrade of information systems

We have developed the new Ancillary Services Dispatch Platform (ASDP) system, and have now migrated the Short Term Operating Reserve (STOR) service over to this platform. For providers, we have been supporting them on the development of their platforms and are looking to migrate them over from the old Standing Reserve Dispatch (SRD) system from the middle of 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. An example of feedback:

- "I've already been talking to [technical contact] a lot and he's been very helpful!" – Provider.

The deployment of the new ASDP system will ensure we are compliant with relevant EU codes, while improving flexibility of the STOR service.

We are also continuing to integrate the new and existing interconnectors into our operational systems for both agreed changes to operational processes or in preparation of a new connection. For example, changes to intraday schedules, the connection of new interconnectors (i.e. Nemo Link, IFA2, Eleclink and NGNSL). This involves working closely with the interconnector owners as well as the connecting Transmission System Operators (TSOs) throughout regular bilateral and trilateral meetings.

Insights documents

Over the last six months, we have published a range of insight documents which we have developed in collaboration with our stakeholders.

Outlooks reports

We published the Summer Outlook report in March 2019. This year, we trialled a new format for the document in response to stakeholder feedback, to ensure that the report is clear and succinct without losing the detailed data which underpins our analysis. The publication therefore now consists of a concise executive summary briefing pack, accompanied by an in-depth data workbook containing additional analysis which we know is valued by some stakeholders. Verbal feedback, for example at the Operational Forum, told us that stakeholders like the new approach to the documents, which we will also use for the Winter Outlook.

We published the Winter Review and Consultation document[7] in June. 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, which will be published in October.
Feedback received as part of this consultation showed further that stakeholders supported the new report format.

Future Energy Scenarios

The development and creation of the Future Energy Scenarios (FES) is an annual process that starts and ends with the publication of FES, usually in July. The process includes 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 plausible and credible scenarios are delivered.

Stakeholders told us that they would like to have early sight of the FES document to prepare for the event. Stakeholders also said they would like us to make revisions to the Data Workbook to make it easier to use and easier to create their own analysis.

We published FES on 11 July this year and held our conference a week later. This allowed stakeholders the opportunity to fully digest the documents before joining the conference on 18 July and were in a better position to ask questions and take part in discussions.

We made changes to the data workbook following feedback that data was hard to find, there were too many tabs and more data was required. For this year, we rationalised demand data into fewer tables and included more data overall. Feedback to date has been positive.

[7] https://www.nationalgrideso.com/document/145396/download

The FES launch events had attendance of 250, and had a Net Promoter Score (NPS) of +41, with 93% of responses saying the format of the conference meet expectations, 94% of responses said the content of the conference meet expectations. In a follow up survey for Shaping FES 2020 53% of respondents said they found the FES document extremely useful, with 56% of respondents finding the Data Workbook extremely useful. FES in 5, a summary version of our FES documentation, received 93% positive feedback.

Stakeholders gave us the following feedback:

- "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 owner.
- "Their interaction within the industry with ourselves, 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 engagements with them have been positive throughout the organisation." – Gas Distribution Network owner.

In June 2019 we published an update to our Operability Strategy Report[8]. The updated report is more stakeholder focussed, helping stakeholders to understand the challenges faced by the ESO, what we are doing about them, where to look for further information, and how they can get involved. We also made the report more interactive, to make it easier for stakeholders to navigate. Industry awareness of the report is gradually increasing, with coverage in Cornwall Insight and Network. Cornwall Insight said 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." The report was discussed further at the Operational Forum.

Information Access

We have taken on board industry feedback that, as we publish more data and insight on our operation, the material on our website can become increasingly difficult to navigate. We have therefore published a Data Explorer page[9], which allows stakeholders to quickly and easily locate the data they are looking for. We are also working towards creating a data portal, which is due for delivery in Q3. Users have told us that they have found it easier to access data since these changes have been made.

For the European Codes changes, we have developed a new prequalification portal, that has been live since the end of February 2019 and it has been used to allow market participants to register for their chosen markets; currently the Balancing Mechanism (BM) and Trans European Replacement Reserves Exchange (TERRE). We are finalising enhancements to the portal to allow participants to also register for STOR along with improving user experience. The PreQual portal facilitates a single platform for market participants to manage the balancing services that they can provide to NGESO. We believe this is a vast improvement over the current set-up of numerous applications in different places. We have held external engagement events (IS Forum & joint session with Elexon) and feedback has been positive and we have seen healthy interest in use of the portal.

[8] https://www.nationalgrideso.com/document/146506/download
[9] https://www.nationalgrideso.com/document/144006/download

5. Outturn Performance Metrics and Justifications

Metric	Performance	Status	Justifications
Metric 1: Balancing Cost Scorecard	£503m year to date outturn against £1089m end of year benchmark	●	We have focussed heavily on balancing costs, reviewing daily across teams and promoting best practice
Metric 2: Information Provision Scorecard	All publications and reports within our control published in full and on time	●	This metric has consistently delivered green for the first half of the 2019/20 performance year.
Metric 3: Energy Forecasting Accuracy	Demand forecast error target not met; Wind forecast error target not met.	●	Over this six-month period, we have seen a significant improvement in our forecasting performance, and we are on track to achieve our performance target at the end of the year. However, over the first half of the year, our performance is slightly below where we had hoped it to be

Figure 5: Summary of monthly metrics for Role 1

- ● **Exceeding expectations**
- ● **Meeting expectations**
- ● **Below expectation**

Metric 1 – Balancing cost management

April – September 2019 Performance

For monthly breakdown of costs, please refer to our balancing costs webpages[10].

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	78.7
May	97.5	11.2	108.7	60.5
June	75.3	1	76.3	85.3
July	85.6	0	85.6	65.5
August	87.4	0.5	87.9	105.3
September	96.6	1	97.6	108
October	103.3	0	103.3	
November	98.4	0	98.4	
December	91.0	0	91.0	
January	82.6	0	82.6	
February	81.9	0	81.9	
March	81.1	0	81.1	
Total	**1064**	**25**	**1089**	**503**

Figure 6: 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 April, May and June.

Supporting Commentary

We have outperformed our benchmark costs by £47m for the first half of the year, and the benefit of lower costs is passed on to consumers through BSUoS. With the system becoming increasingly complex with higher levels of wind, solar, embedded generation and interconnectors on the system, we have focussed heavily on balancing costs. We are working more closely across departments with daily reviews and improved feedback loops to promote best practice and reduce costs.

[10] https://www.nationalgrideso.com/balancing-data

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 projected 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							●

Figure 7: Information Provision Scorecard

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

Supporting information

Performance against targets is good with green across the board. During the first half of this financial year, we have published the information which is important to our customers and stakeholders on time and in full. New processes have been put in place and trade updates are checked weekly. We have improved the processes to have greater resilience and additional training of staff has been completed.

This metric focusses on delivering results right first time, on time and in full, it delivers benefits for the end consumer through minimising market impact as results are delivered correctly at the earliest time. This allows providers to give timely information to their investors and stakeholders.

Metric 3 – Energy Forecasting accuracy

April – Sept 2019 Demand Forecasting Performance

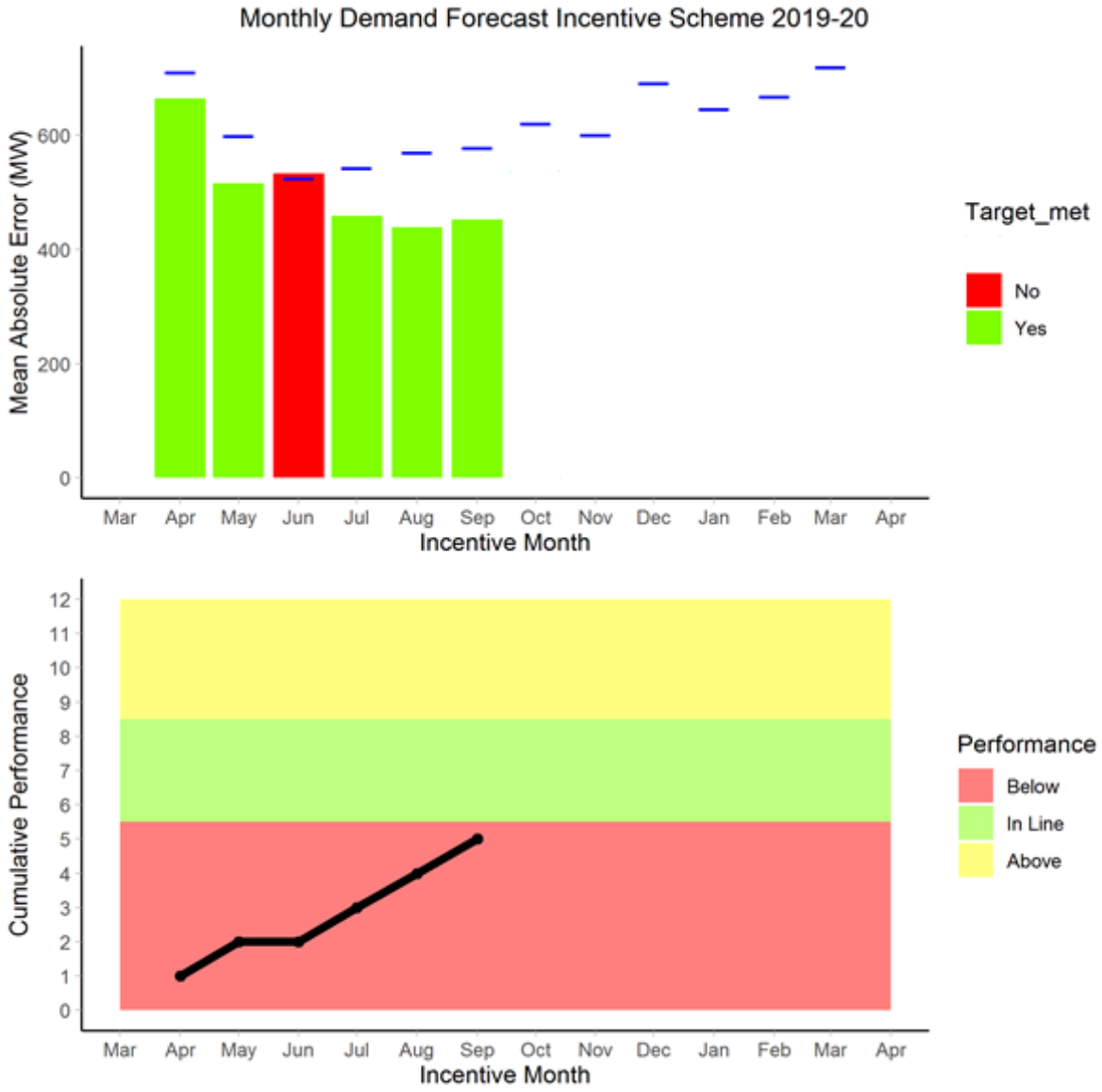


Figure 9: Demand Forecasting Performance, First graph shows our performance as green or red histograms against the blue target lines. Second graph shows our cumulative performance across the year.

Supporting information

The performance across the year has been very good and has demonstrated the benefit that has been achieved from the initiatives mentioned in earlier sections, **Improvements in Forecasting.**

This metric makes us focus on the day ahead forecast performance. Many of the operational decisions made by market participants and the Electricity National Control Centre are taken 24 hours ahead of real time. It is for this reason that it is important that forecasts produced for that timescale are as accurate as they can be.

Accurate forecasts benefit the end consumer because they enable the electricity industry to make efficient operational decisions and only hold the operating margin that is necessary. This reduces costs overall.

April – Sept 2019 Demand Forecasting Performance

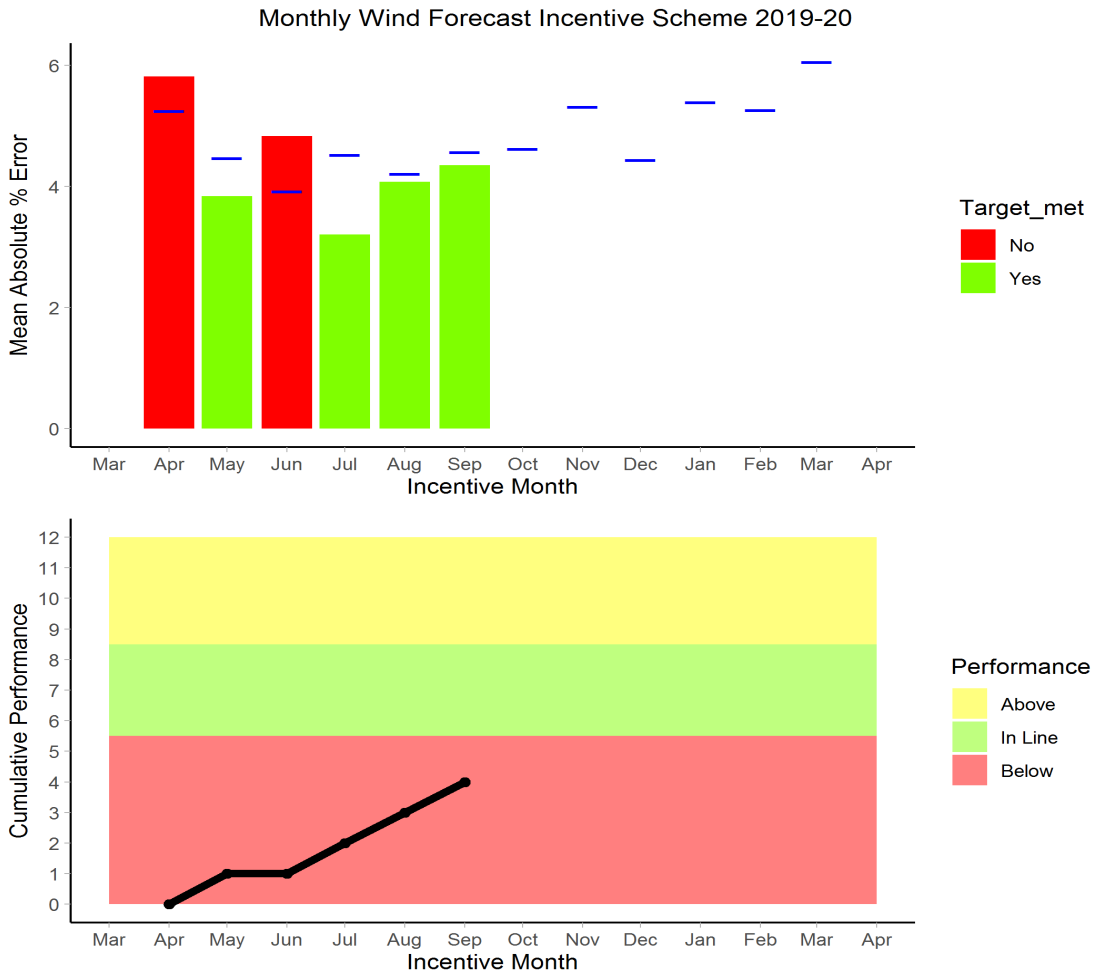


Figure 10: Wind Forecasting Performance, First graph shows our performance as green or red histograms against the blue target lines. Second graph shows our cumulative performance across the year.

Supporting information

The forecasting performance has been very good in recent months and has shown the benefit achieved in obtaining specific forecasts for 4 of the new large offshore wind farms including Hornsea. This benefit began to be realised after June 2019 after the new weather locations had been providing forecasts for a month and the wind power forecasting models had been revised.

Solar PV modelling error reduced by more than 30% due to the deployment of our new machine-learning model.

Our performance leads to:

- More accurate balancing decisions
- Fewer actions taken by the ESO to balance the electricity network
- Removal of barriers to entry for small businesses.

Performance benchmarks

At the end of the year, we will 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

ROLE 2

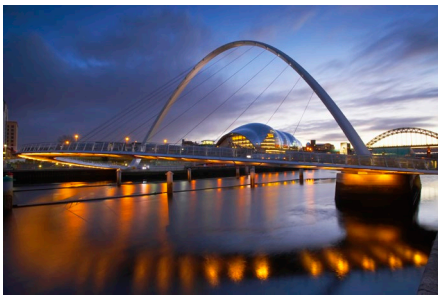
Facilitating Competitive Markets

Facilitating Competitive Markets: Executive Summary

Within Role 2, we aim to ensure that the rules and processes for procuring balancing services

maximise competition where possible, and are simple, fair and transparent. Further, we promote competition in wholesale and capacity markets.

To deliver economic security of supply in the low-carbon world of the future and to facilitate the transition to this new world, we need to have the appropriate markets, codes and governance in place. This presents a considerable challenge, as the current markets and code regime were designed for a world of large centralised generation, whereas the volumes of distributed generation, renewables (particularly solar) and demand side response far exceed levels anticipated just five years ago. Our deliverables against the Forward Plan in the first six months of this year have helped take us forward to meet this challenge.



"I was at the webinar last week on your proposals for the FFR auction trial. I was really positively surprised on your proposal to run a "double blind" process where you make your buy order without seeing any of the tenders' sell orders. I also welcome your proposal to ultimately use an independent market operator. Thanks for taking onboard the feedback!"

– FFR provider

Our Achievements so far

We are driven by delivering efficient outcomes for consumers, and are always cognisant of the impact of our activities on consumers' energy bills, whether that is today or in the future. We know that maximising consumer benefit and ensuring economic security of supply in the low-carbon world of the future will be facilitated through competitive markets.

In the past six months, we have taken steps towards our goal of competition everywhere by starting to move our procurement of balancing services closer to real time by delivering the first phase of our frequency response auction trial. By working with key industry stakeholders and Renewable UK to deliver the 'Power Park Module Signal Best Practice Guide', we aim to deliver improved utilisation of variable generation sources. We also improved participation in our markets and removed barriers to entry by working closely with the Association of Decentralised Energy (ADE) and their members to develop revised Firm Frequency Response (FFR) Testing guidance.

We also recognise that markets that deliver efficient outcomes for consumers are underpinned by effective industry frameworks. We took a stronger thought leadership role in this space over the last six months, working with industry to deliver the Balancing Services Charges Task Force final report and through the publication of our thoughts on the future direction of energy codes. We have also demonstrated leadership in significant pieces of industry change aimed at facilitating the transition to a low carbon society, including our work with stakeholders and regulators on the on-going Significant Code Reviews, and European market integration through the continuing implementation of the European Network Codes and impact assessment on the Clean Energy package.

Distribution connected generation and demand side flexibility already plays a key role in how the ESO operates the system, and will be critical to future flexibility needs. In the past six months, we have continued to investigate ways to model distributed connected generators including supporting the proposal of a Distribution Connection and Use of System Agreement (DCUSA) modification to create a register of embedded assets driving improved transparency of data.

We are acutely aware of the impacts our actions in this role can have on both stakeholders' bottom lines and consumer bills. In our role of collecting use of system charges transparent, accurate and timely information is critical. Therefore, we have made improvements to our charging query processes by implementing a better relationship management system. We are further improving our engagement through guidance documents, webinars, reporting and enhancements

to our webpages to help customers and stakeholders to be better informed on our charges and to make the change process more accessible.

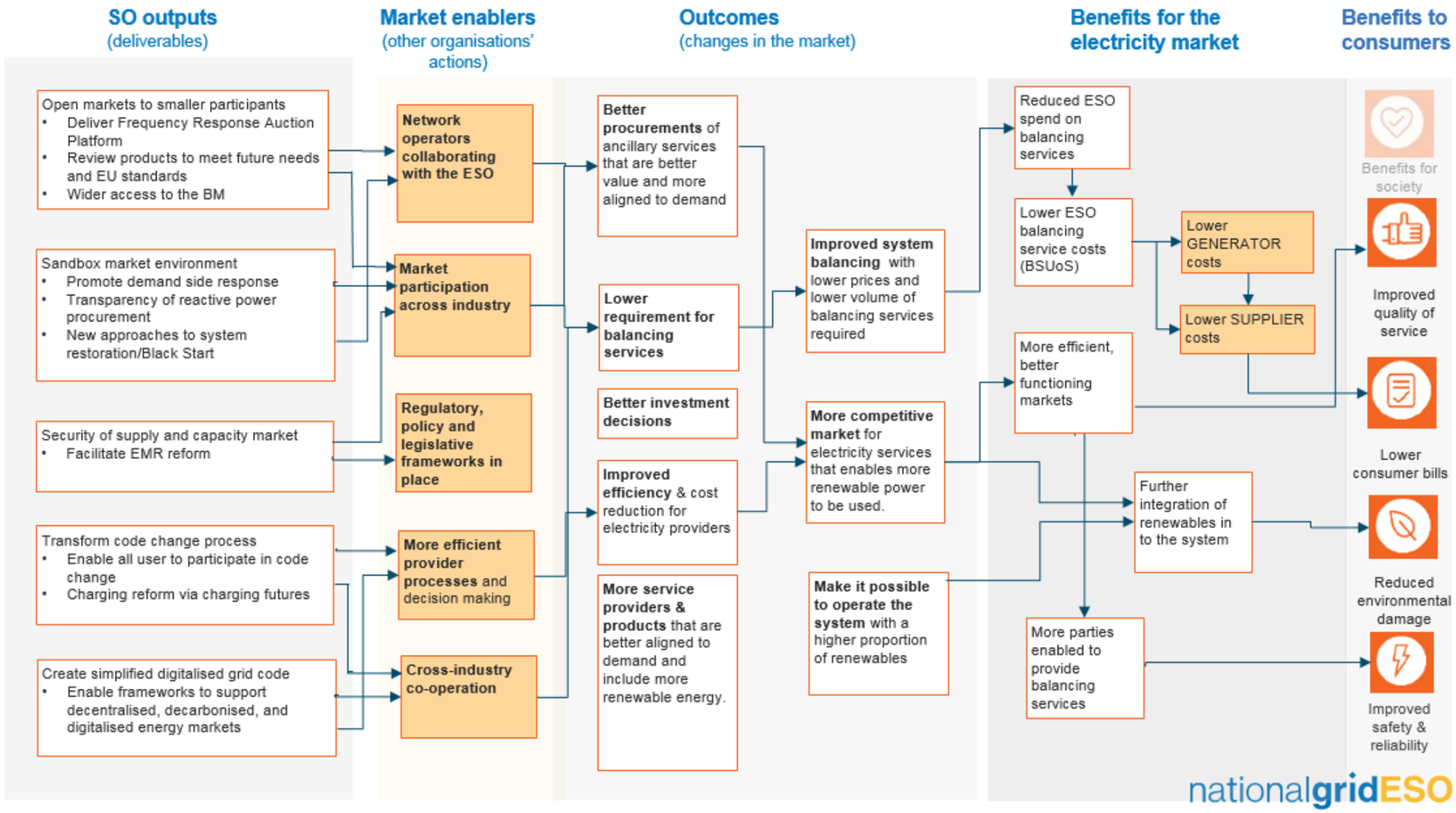
We recognise that the ESO alone cannot create the future, it will be co-created with our stakeholders. All of our work in this role is underpinned by a drive to improve on the feedback we have received, engage more, listen better and communicate more clearly. Flagship examples of how we have transformed our industry engagement in the last 6 months include delivering the 5th annual Power Responsive Summer Reception that focussed on 'Delivering Zero Carbon Ambitions' and hosting Charging Futures Forums in July and September.

"Congratulations on your whole [power responsive summer reception] event. I enjoyed the networking too and the work being progressed is very much in line what [our] members wish to see ... You can count on me to support your initiatives!"

– Trade association director

Role 2 Consumer Benefit Map

Our role of Facilitating Competitive Markets brings benefits to consumers both now and into the future, and this benefit map sets out the interactions between our role and other market participants to lead to benefits for consumers. Our RIIO-2 activities in transforming code change processes and creating a digitalised grid code are making our industry frameworks more accessible, giving our customers the data they need to provide an improved quality of service to the end consumer. We are working hard to open markets to smaller participants, and find improved market solutions using our sandbox market environment: in the long run, this will lead to increased competition for balancing services which should contribute to lower consumer bills than would otherwise be the case. These new markets make it possible to operate the system with a higher proportion of renewables, contributing to reduced environmental damage. Our work on Electricity Market Reform and system restoration contributes to improved safety and reliability, which brings benefits to society as a whole.



1. Evidence of Delivered Benefits in 2019-20

- ✓ Improved our charging query process and produced guidance material, saving time for our customers
- ✓ Delivered phase 1 of the frequency response auction trial, with phase 2 to be delivered in the second half of the year, moving the procurement of balancing services closer to real time. This lowers barriers to entry for greater volumes of Demand Side Response (DSR) to participate in our frequency response markets, resulting in greater competition, and lower costs to consumers through reduced BSUoS charges
- ✓ Chaired the Code Administrator Code of Practice, driving efficiencies in code management as well as supporting the publication of a forward work plan to give a clear direction of travel
- ✓ Improved tariff publications and meetings, meaning our customers are better informed about the network charges they face and able to make better informed decisions for the consumer
- ✓ By raising a code modification relating to unsecured credit, we are reducing the risk of consumers facing additional costs due to supplier failures.

Case Study:

Changing our approach to customer engagement on market frameworks

Consumer Benefit Outcome

Activity

As ESO we are the code administrators for a number of electricity codes – Connection and Use of System Code (CUSC), Grid Code, Security and Quality Supply Standards (SQSS) and System Operator Transmission Owner Code (STC). In addition, following our appointment as lead secretariat to the Charging Futures programme, Ofgem also requested that the ESO lead a taskforce on Balancing Services Charges, to consider issues associated with Balancing Services Use of System (BSUoS) charges ahead of any code modification process.

This period we have made new advances in how we engage with our customers, and continued to enhance existing approaches to market frameworks by continuing to improve our code administration processes, delivering a new approach to industry engagement, and delivering the Charging Futures secretariat.

These advances have led to continual improvement in the customer experience in how customers interact, learn about and contribute to the development and operation of market frameworks in GB. Together, this has saved customers time, and allowed them to be more active participants in the market. Both of these outcomes drive benefits for consumers.

Three specific examples, which we focus on are:

- **Balancing Services Charges Task Force.** We led the industry task force in considering the future of balancing services charges. The task force Final

	Report[11] concluded that, in its current construction as a cost recovery mechanism, it neither provides nor can provide useful forward looking signals to the market. The focussed industry engagement delivered to stakeholder expectations, in a shorter time-period than we have historically worked to. This delivered efficiencies and more certainty in this important future area of charging reform. The outcome of this work marks a major milestone in the future reform of balancing services charges. • **Charging Futures**: We are the lead secretariat for Charging Futures. We are responsible for ensuring all network users can actively engage in the ongoing reform of network charging. We have continued to improve the tailoring of our engagement, specifically for smaller parties. We are operating across transmission and distribution, engaging with many parties who are traditionally not directly involved with the ESO, and finding new ways to engage with parties such as podcasts, webinars and forums. • **Code Administration processes**: We continue to drive efficiencies and improvements in our code administration processes, making them better and more user friendly for market parties to access, understand and engage, for example, by improving our documents, using more podcasts and webinars, and improving our website. We are responding to industry's feedback that they feel constrained on their ability to engage on industry change.
Role	2. Facilitating Competitive Markets
Key Forward Plan Deliverables	• Facilitating Code Change • Transform industry frameworks to enable decentralised, decarbonised and digitised energy markets • Facilitate electricity network charging reform through Charging Futures • Transform the customer experience for network charging
Current benefit	The benefits which we have delivered are in two parts; non-quantifiable benefits already realised and potential future benefits. **Current benefits** By providing routes to engagement particularly for smaller parties through Charging Futures, we have enabled parties to be better informed about current and future regulatory direction. Better informed parties, can be more effective players in markets, which overall delivers benefits to consumers. We continue to see diversification and innovation in the supply market, including parties such as Octopus bringing new consumer tariffs to the market[12] that reflect features of our charging arrangements. Secondly, a saving in industry time has resulted from more effective and efficient customer engagement on code modifications. This results 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.
Future benefit	**Potential future benefits which have been enabled** The current benefit described above (as well as further planned improvements) will accrue over time and result in tangible and quantifiable consumer benefits. In addition, the Balancing Services Charges Taskforce has potentially unlocked further value through confirming that the charge should be a cost recovery charge. If this view is supported, it could add weight to arguments for some

[11] http://www.chargingfutures.com/media/1348/balancing-services-charges-task-force-final-report.pdf
[12] https://octopus.energy/agile/

	form of fixed BSUoS product in future. BSUoS charges currently cost consumers £1.2bn per year, but are viewed as volatile, unpredictable and causing additional cost in the industry. As ESO we have signalled our intent to consider the merits of moving to a fixed product for balancing service charges, to reduce volatility, and deliver consumer value through lower risk premia being applied by market parties. We are proposing considering the options for fixing BSUoS under Role 2 in our RIIO-2 submission, which has the potential to unlock consumer benefit of £280m over RIIO-2, see the ESO RIIO-2 draft Business Plan for details on this benefit[13].
Basis of expected future benefit	For example, we estimate that through our customer improvements, we could reduce (i) the number of workgroups needed per modification, and (ii) the time taken by each market party to respond to our consultations. Broadly, if we have 40 modifications per year, and if we reduce the number of workgroups by 1 for each modification, and there are 10 industry attendees for each workgroup, then we estimate that we could save 400 days of effort per annum. Using an illustrative cost of £100k per employee, the following approximation can be made: 40 modifications x 1 workgroup x 10 people= 400 days effort. 400 days is approximately 2 Full Time Equivalent (FTE), so 2 x £100k= £200k. **This initiative could therefore save consumers around £200k per year.**
How benefit is realised in the consumer bill	Benefits to consumers have been realised through reduced industry overhead in time spent on modification processes. This allows either reduction in industry costs, or reallocation of resources to further value added activities. This will flow through to consumers' bills by 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.
Additional non-monetary benefit	There are also *environmental benefits* to be derived from a reduction in the number of meetings, the use of video- and tele-conferencing reducing the need for travel, and the associated carbon emission. Saving one return flight from Edinburgh to a meeting in London, saves 0.14 metric tons of CO2e.
Assumptions	• Each of the 40 modifications per year, can have their workgroups shortened by one day affecting ten attendees. • We assume that any time-savings provided to industry parties, are passed on to consumers through direct cost reduction or through increased value-added activities. • 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.

2. Evidence of Future Benefits and Long Term Initiatives

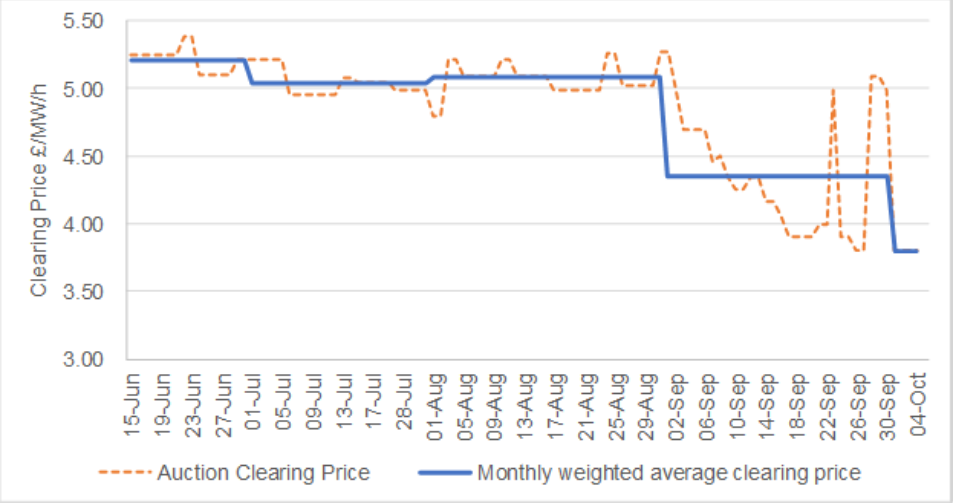
- ✓ Successfully demonstrated a new market approach to Black Start in the Midlands and South West, with over half of the expressions of interest originating from non-traditional technologies. Introducing new providers of Black Start services will not only increase competition in this market, which should lead to lower prices, but will also contribute to increased security of supply
- ✓ Led the Balancing Services Charges Taskforce, producing a final report in Q1. The task force assessed whether there is value in seeking to improve cost-reflective signals through BSUoS, or whether it should be treated as a cost recovery charge. This ensures that going forward, BSUoS charging will be carried out fairly and efficiently, minimising market distortions and contributing to lower consumer bills than would otherwise be the case
- ✓ We are providing ongoing leadership in the Targeted Charging Review, redesigning electricity network residual charges to reduce distortions and increase fairness. This should promote more efficient use of the networks, leading to lower overall costs, as well as being fairer for society as a whole
- ✓ We have facilitated and enabled network charging reform through delivery of two Charging Futures Forums held in July and September, promoting increased market participation and discussion
- ✓ We have started procurement of Frequency Reserve through a new auction platform. This has demonstrated the possibility of this technology for procurement of balancing services. This will enable future markets which are closer to real-time and available to more parties, which should lead to increased market participation and competition.

Case Study:

Frequency Response auction trial

Consumer Benefit Outcome

Activity	As ESO we procure Frequency Response products to enable the secure operation of the system by the Control Room in real-time. Frequency Response products respond automatically to significant deviations in system frequency to contain and secure the system from disturbances. We have a licence obligation to control system frequency at 50Hz plus or minus 1%. We make sure there is sufficient generation and demand held in readiness to manage all credible circumstances that might result in frequency variations. The auction trial is developing a new customer-friendly way of procuring Frequency Response products for the ESO. The trial, running since June, has successfully delivered Frequency Response products from various parties.

	In our 2018-19 end of year report[14], we referenced the early stages of this auction trial. The auction trial went live in Summer 2019, and is now producing results procuring up to 100MW of frequency response. We are analysing the output from the initial stages of the auctions to understand the actual and potential abilities of the market. The auction trial is an enabling step in our longer-term ambition, to move more procurement to open platforms, closer to real-time and encourage a broader range of participants.
Role	2. Facilitating Competitive Markets
Key Forward Plan Deliverables	• Product Roadmaps for Response and Reserve implementation • Wider Access to Balancing Mechanism Roadmap implementation
Future benefit	We have demonstrated through the auction trial the ability of an auction to deliver our requirements. As the volume procured through the auction (compared to the traditional route) increases, the market will become more liquid and we expect the price to fall. **A total cost of around £130m per annum is currently spent on Frequency Response products. As this is currently a trial, we do not have the evidence at present to quantify the size of the likely reduction in this cost, but we have seen a significant fall in the costs of the up to 100MW of reserve purchased through the auction. For example, for Electricity Forward Agreement (EFA) block 1 the average in June was £5.21/MW/h and in September this was £4.35/MW/h – a reduction of 16%. This is illustrated in** Figure 11**.**  Figure 11: Trends in clearing price **It would not be appropriate to extrapolate that saving to the whole market, however, for illustration, if we see a 5% reduction in the cost through a better market, this will equate to an enduring consumer saving of £6.5m per annum.** Moreover, as an enabler to the principle of procurement through auctions closer to real time, this project is unlocking further value through other balancing service contracts when the work is extended to other products.

[14] https://www.nationalgrideso.com/document/128421/download

Basis of expected benefit	We delivered the first phase of the weekly frequency response auction trial in June. This was successfully rolled out with four participants, all of whom secured some capacity across the week. We have seen the number of providers rise from four in the first week to seven by the end of August, and the volume cleared rising from a daily average of 25MW to 60MW of cleared volume. Even with small trial volumes, and a small number of parties, prices have been relatively stable, around £5/MW/h overnight and £3/MW/h during the day, which is comparable to static Firm Frequency Response (FFR) prices but for a service which delivers better value for consumers through faster delivery. We can expect as the liquidity of the market is increased, these benefits will increase further.
How benefit is realised in the consumer bill	The benefit is realised by direct reduction in the cost of balancing services required to be held by the ESO. This is passed through to generators and suppliers by lower BSUoS charges. These lower BSUoS charges should flow through the wholesale market (generators) and retail prices (suppliers) to result in lower bills to consumers.
Additional non-monetary benefit	Moving procurement closer to real time removes barriers to entry for providers with variable demand and generation. This increases competition, and provides additional sources of reserve to be accessed. This should (i) further reduce the price in the long run *reducing consumer bills*, and (ii) provide further cost effective options for ESO leading to *improved safety and reliability*, and (iii) enable participation of non-traditional providers including renewable providers which will lead to *reduced environmental damage.*
Assumptions	We have assumed that 5% of the current market value of Frequency Response products can be saved through increased market liquidity. This is commensurate with economic theory, and of the scale seen in other markets.

Case Study:

Future restoration services “Black Start”

Consumer Benefit Outcome

Activity

- As ESO we procure Black Start Services to be available to the Control Room for real-time system operation, to restore the system in the event of a full or partial black-out. Black Start providers must be able to start power production without the need for external power, and respond to the technical needs of ESO under such a situation.
- Traditionally, Black Start has been provided by large thermal power stations. As the number of these stations reduce there is a need to secure additional black start capability. Similarly, we need to consider how Distributed Energy Resource (DER- those generators on the distribution networks) could be used for system restoration.
- As part our improving our standard business processes, we have progressed twenty Black Start Service offers through to the next stage of the South West and Midlands Black Start Tender in May 2019 for services delivering from April 2022. This was the first trial of a market-based mechanism for procuring black start, and was very successful, with a wide range of provider technologies submitted.
- We received 31 Expressions of Interest, around half of which were from or include ‘non-traditional’ black start technologies or fuel types. We are following this with an Expressions of Interest for three further zones, North West, North East and Scotland.

As part of the innovation funding, the Distributed ReStart project, which explores how DER can be used to restore power, published its first technical

	milestone report in July and three Network Innovation Allowance (NIA) reports in June 2019.
Role	2. Facilitating Competitive Markets
Key Forward Plan Deliverables	• Product Roadmap for Restoration implementation
Future benefit	We have demonstrated two benefits already – firstly, that there is interest in a market-based approach to the provision of Black Start Services, and secondly, that Distributed Energy Resources can be used in system restoration. This has demonstrated that services can be procured from beyond the small number of traditional providers. More providers, competitively tendered, leads to a more competitive market where there is downward pressure on the price, resulting in better outcomes for consumers. **A total cost of around £50m per annum is currently spent on Black Start Services. We do not have the evidence at present to quantify the size of the likely reduction in this cost. However, for illustration, if we see a 5% reduction in the cost through a better market, this will equate to an enduring consumer saving of £2.5m per annum.** Under RIIO-2 we have investigated Restoration further, where it is estimated that £115 million of net consumer benefits are delivered between 2025 and 2050, see the ESO RIIO-2 draft Business Plan for details on this benefit[15].
Basis of expected benefit	Through expressions of interest from market parties, and a technical milestone report through the Distributed ReStart Project, we know that we have the market interest and the technical ability to make such a change happen.
How benefit is realised in the consumer bill	Moving to a tendered procurement, and allowing additional parties to participate reduces barriers to entry, and results in more liquid markets. This increases competition, and allows additional sources of Black Start to be accessed. The benefit is realised by direct reduction in the cost of Black Start services required to be procured by the ESO. This is passed through to generators and suppliers by lower BSUoS charges. These lower BSUoS charges should flow through the wholesale market (generators) and retail prices (suppliers) to result in lower bills to consumers.
Additional non-monetary benefit	Additional sources of Black Start provide further options for the ESO leading to *improved safety and reliability*, and enables participation of non-traditional providers including renewable providers which will lead to *reduced environmental damage.*
Assumptions	• We have assumed that the level of interest seen in the 'expression of interest' translates in to valid products in the actual market. • Further, we have assumed that the distributed parties are able to meet the required technical requirement, and hence participate in the market. We have assumed that 5% of the current market value of Black Start can be saved through increased market liquidity. This is commensurate with economic theory, and of the scale seen in other markets.

[15] https://www.nationalgrideso.com/document/153616/download see section 4.4

3. Plan Delivery and New Ways of Working

- ✓ Delivered Phase 1 of frequency response auction trial
- ✓ Demonstrated new market approach to Black Start in Midlands and South West, receiving 31 expressions of interest
- ✓ Chaired Code Administrator Code of Practice, developing first Forward Work Plan and holding industry event in July
- ✓ Providing ongoing thought leadership in the two significant code reviews: Targeted Charging Review, and Electricity Network Access and Forward-Looking Charging
- ✓ Led on European matters, publishing a high-level impact assessment of Clean Energy Package and engaging with stakeholders
- ✓ Led Balancing Service Charges Task Force and published a final report with great stakeholder feedback throughout the process
- ✓ Held two Charging Futures Forums
- ✓ Published a thought piece on the future of energy codes
- ✓ Improved charging query processes, and produced guidance material to make code change process more accessible to industry.

Prioritisation activities

In this role NGESO committed to delivering a wide range of market reforms to reduce barriers to entry and maximise competition in our ancillary and balancing services markets in the 2019-21 Forward Plan. While, much good work has been delivered and is on-going in this space, the reality is that we have fallen behind in two key areas; the design of more competitive markets for both our Reserve and Reactive Power requirements.

We decided to give priority to those areas of work which would unlock consumer benefits within the year. These include:

- Wider Access to the Balancing Mechanism, which will improve existing routes and develop new routes for non-traditional providers and aggregators and distributed energy resources (DER) to offer their flexibility to the Electricity National Control Centre (ENCC).
- Project TERRE (Trans European Re, which will create a new pan-European market for intraday flexibility for providers and aggregated portfolios above 1MW.
- Power Potential, which aims to create a world-first reactive power market for DER and generate additional capacity on the network in the South East.
- Virtual Synchronous Machines (VSM) expert group, which has been engaging with the wider industry to deliver a specification for how converter-based plant, such as wind and batteries, could be operated in a new way to add stability to the grid. This will be a key enabler for achieving zero carbon operation from 2025.

All of the projects we have focussed on enable and inform future market design through a learning by doing approach. Projects such as Wider Access to the Balancing Mechanism will also open up markets, and projects such as the Mersey Voltage tenders will provide commercial opportunities to address system service requirements.

However, we recognise that this is less than we committed to our stakeholders, but we have made these decisions based on the operability requirements of the system and delivered value to the

end consumer by prioritising these projects and our ongoing work in our Frequency Response market.

In addition, we have also re-prioritised a couple of further deliverables as set out below:

Transform industry frameworks to enable decentralised, decarbonised and digitised energy markets – As part of our Forward Plan we committed to review the SQSS and this was to be specifically targeted at the emergence of alternatives to transmission system investment (including through the NOA process) to potentially support delivery of consumer value by facilitating better value alternatives to transmission system investment within the SQSS where appropriate. The Engineering Standards Review launched by BEIS in H1 overlaps significantly with our planned deliverable. Therefore, this specific deliverable has now been superseded and we expect to engage with the Engineering Standards Review in future as and where we can add value.

Transform the customer experience for network charging – we committed to simplify our approach for onboarding customers by Q2. Significant work has been undertaken during H1 to publish improved guidance and webinars on the website, the team has also spent significantly more time with new customers to ensure that they fully understand their obligations and processes. All of these activities have considerably improved customers' onboarding and overall experience of network charging. However, we are still undertaking work to improve this further by reaching out to other key industry stakeholders e.g. Elexon, in order to further enhance customers' experience by providing a more joined up process map and onboarding documentation. This is now envisaged to be completed in Q3.

Deliverable	Target delivery date	Actual delivery date	Status
Product Roadmaps for Response and Reserve implementation			
Market design for reformed reserve products	H1 2019-20	Target date will not be met Q2 2020-21	This deliverable is currently off track. Market design for reformed reserve products has not yet started. Priority has been given to recovering delivery of our new suite of frequency response products. Reserve reform will be progressed once we have more clarity on interdependencies including response reform, Wider Access to the Balancing Mechanism and Project TERRE, all of which impact on our reserve requirements. In the interim we will continue to make tactical improvements to our reserve markets to address market participant feedback on topics such as optional Fast Reserve. More information will be provided through the Product Update for Frequency Response and Reserve which will be published in October.
Report on our plan for retaining specific products	Q1 2019-20	Target date met	Delivered on time on 18 June and submitted to the Authority, who now have six months to decide on our recommendations. https://www.nationalgrideso.com/codes/european-network-codes/meetings/consultation-ebgl-article-26-requirements-specific-products
Migration of non-BM STOR providers to ASDP	Q2-4 2019-20	On track	This deliverable is on track for planned completion during December. The Platform for Ancillary Services (PAS) programme is in the final stages of work prior to commencing the migration of providers, and we are working closely with market participants.
Implementation of Pan-European replacement	2019-21	Delayed	TERRE: A number of TSOs, including NGESO, have applied for a derogation against the original target implementation date of December 2019. Ofgem has

reserve standard products			indicated that it will publish a decision on our derogation request in November. We are continuing work to be ready for December, but without the ability to link through France to the wider continental market there is no benefit to introducing the product.
Product Roadmap for Reactive implementation			
Communicate reactive power requirements & historic spend	Q2 2019-20	Target date not met Q4 2019-20	This deliverable is late: it was deprioritised to focus on the delivery of the voltage work. Further transparency on Reactive Power requirements and historic spend is only useful if parties have the opportunity to react to that information. With the reprioritisation of the work to design new competitive reactive power markets (see below), we consider it to be more efficient to focus our resource on other deliverables. The information is now planned to be delivered within Q4 2019-20, which will be in advance of any subsequent work on designing new markets for a reactive product. However, locational requirements will be shared on a discrete basis for any specific market opportunity such as the NOA pathfinders.
Implement approach for efficient reactive power flows between networks	Q2 2020-21	On track	Two workshops with Transmission Owners (TOs) and Distribution Network Operators (DNOs) to discuss reactive transfer at the Transmission-Distribution interface have already been held. We have extracted historical reactive transfer data for each Grid Supply Point (GSP) and are now organising a third workshop to try to agree a methodology for defining a reactive envelope of operation for the DNOs.
Work with industry to determine future role for reactive power and design more competitive reactive power services	Q4 2018-19 – Q2 2020-21	On track / At risk Ongoing	We are prioritising work already underway through projects such as Power Potential, the Network Options Assessment (NOA) Pathfinders for Voltage and Stability, Project Phoenix and the Virtual Synchronous Machine (VSM) working group. We believe that it is appropriate to focus on these areas of work before considering any significant change to the core Obligatory Reactive Power Service (ORPS) market structure to develop new Reactive Power markets. We are currently reviewing our delivery plan for introducing more competition in reactive power services.
Power Potential trial with UKPN	Q2 – Q4 2019-20	On track / At risk Ongoing	Both NGESO and UK Power Networks (UKPN) are focussed on the development of essential systems and readiness of Distributed Energy Resource (DER) participants. This project, which is a world-first project to identify whether DER providers embedded within the distribution network can provide dynamic voltage support to the transmission network, has proven to be more challenging than initially expected. As a result, the commercial go-live of the project has been delayed and is currently scheduled to commence in January 2020.
Product Roadmap for Restoration implementation			
Alternative Approaches to Restoration	2019-20	Target date met	The Distributed ReStart project is a three-year collaboration between NGESO, SPD and SP Manweb which will explore how 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 its first technical milestone report in July and three NIA reports in June 2019. Stakeholder engagement events have included Utility Week Live and Power Responsive conferences.
Power Responsive			
Deliver innovation projects to unlock demand flexibility	Q1-Q4 2019-20	On track	On 24 June 2019, the Innovate UK-funded project "Vehicle 2 Grid Britain" published a desktop study on the feasibility and potential revenue streams for Vehicle to Grid (V2G) services to ESO and DNOs. The "Residential Response" Network Innovation Allowance (NIA) project is investigating how we can lower barriers to market entry for domestic assets. The "Enhancing Energy Flexibility from Wastewater Catchments through a Whole System Approach" NIA project is a partnership with United Utilities to see if we can use the assets across a whole wastewater system to provide cost-effective flexibility.
Power Responsive Stakeholder Engagement	Q1 2019-20 – Q4 2020-21	On track	The Power Responsive Summer Event was held on 26 June 2019, with around 250 attendees. Surveys sent out to attendees after the event rated it as 7.5 / 10 on average on the question "How useful did you find the sessions?".
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 not met	Clearer accession requirements ensure that clear and proportionate arrangements are in place to tie parties into the relevant GB codes and BM obligations for BM participation. This needs to be delivered in advance of Wider BM Access being delivered so that parties have time to meet their obligations. CUSC modifications 296 and 297 were implemented on 1 April 2019, while CUSC Modification Proposal 295 (creation of a contract under CUSC for Virtual Lead Parties) has been slow to progress due to problems achieving sufficient workgroup members to meet the CUSC quoracy requirements. The workgroup report recommendation was supported by the CUSC Panel in July, and the proposal is now with Ofgem for decision.
Use better technology/systems to improve efficiency of installing communications with BM providers and optimising BMU dispatch	Delivery throughout 2019-20	On track	Draft IT specs for the alternative to Electronic Despatch and Logging (EDL) / Electronic Data Transfer (EDT) were made available to market participants on 2 July. This will be a cost-effective way to enable Electronic Data Transfer (EDT) and Electronic Despatch and Logging (EDL) for smaller market participants. The Operational Metering system development is ongoing and trials with providers have been undertaken in preparation for "go-live". Full specifications have been released through a secure portal. We have now enhanced one of our existing systems to be able to multi-dispatch several units with greater ease and the system is ready for test. We are looking

			to implement this new functionality by the end of October 2019.
Intermittent Generation			
Raise code modification to apply Power Available consistently across technical & commercial codes	Q1 2019-20	Target date met	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	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: https://www.nationalgrideso.com/document/149181/download
Provider experience			
Feedback approach	Q1 2019-20	Target date met	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 STOR, 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	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 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			

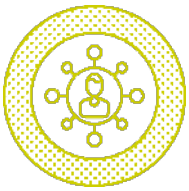
Meeting calendar & transparency of workgroups – Targeted website improvements to ensure all meetings are available within our code modification calendar with meeting outcomes available and transparent	Q1 2019-20	Target date met	Complete – All meetings held are now available on our code modifications calendar. Summary notes are now published following every workgroup meeting, sharing the key progress and outputs.
Governance process FAQs, improved guidance material and critical friend review	Q2 2019-20	Target date met	We have updated our governance process FAQs on the website, consolidated the guidance material and further website improvements such as a clear guide on how stakeholders can get involved in the modification process is now available. 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. This provides a benchmark for quality and service levels provided by code administration teams to all stakeholders involved in the modification process.
Engage all parties to understand information requirements for code modifications and provide executive summaries on modifications – Work with stakeholders to understand how they want to better access information on code modifications and implement solutions in a timely manner.	Q1 2019-20	Target date met	During Q1 2019-20 we have 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 will incorporate changes into the next iteration of the Forward Plan.
Historical timelines & horizon scanning: cross-code	Q2 2019-20	Target date met	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 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.
Governance surgeries	Q2 2019-20	Target date met	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.

Transform industry frameworks to enable decentralised, decarbonised and digitised energy markets			
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	Complete – In Q1 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 have led transmission input into the Access significant code review, by representing transmission across each subgroup, providing expertise on the transport model and teach ins on user commitment. We have also taken the pen on various access papers such as the impact of access options on a user's ability to participate in balancing services.
Leadership in the Energy Codes Review – Publish ESO thought piece	Q1 2019-20	Target date met	Complete – In Q1 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 fed into our recent Energy Codes Review consultation response as follows:https://www.nationalgrideso.com/about-us/our-consultation-responses
Working for you on European matters	Q2 2019-20	Target date met	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 H1, 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	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 supplier 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	Throughout the year	Ongoing	The year began with the finalisation of the Balancing Services Charges Taskforce Report in May, with webinars covering this taskforce and also 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.
Transform the customer experience for network charging			
Improve our ESO charging query processes – Communicate clear routes of contact for all charging queries and publish updated query management standards	Q1 2019-20	Target date met	We now manage charging queries through our customer relationship management system. Our contact details are clearly displayed on our website and we include them any materials we produce. We aim to acknowledge all 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 this year 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 – Publish guidance to help and support new suppliers in understanding our charges, our obligations, and what they need to do.	Q1 2019-20	Target date met	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”. https://www.nationalgrideso.com/charging/charging-guidance
Improve understanding of our onboarding processes and streamline to meet our customer needs – Simplify our approach for onboarding customers	Q2 2019-20	Target date not met	We committed to simplify our approach for onboarding customers by Q2. Significant work has been undertaken during H1 to publish improved guidance and webinars on the website, the team has also spent significantly more time with new customers to ensure that they fully understand their obligations and processes. All of these activities have considerably improved customers’ onboarding and overall experience of network charging. However, we are still undertaking work to improve this further by reaching out to other key industry stakeholders e.g. Elexon, in order to further enhance customers, experience by providing a more joined up process-map and onboarding documentations. This is now envisaged to be completed in Q3.

New data reports for BSUoS – Publish new Balancing Services Charging report to show more granular costs by settlement period to enable customers to see different cost components and model future prices	Q1 2019-20	Target date met	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.
Reform of website content into a user-centric knowledge base	Q2 2019-20	Target date met	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	Ongoing from Q2 2019-20	On track	The TNUoS Tariffs report provides guidance on how the code modifications will affect TNUoS charges for different system users.

4. Stakeholder Evidence



- ✓ Power Available industry workshop sought views from renewable generators, leading to publication of Power Park Module Signal Best Practice Guide
- ✓ Webinars and mock auctions held in preparation for frequency response auction trial, ensuring a smooth roll out. Ongoing engagement allowed for stakeholders' suggestions to be taken on board
- ✓ Information Systems Change Forum continued industry dialogue regarding changes to support wider Balancing Mechanism (BM) access and the Trans European Replacement Reserve Exchange project (TERRE)
- ✓ Webinar and tool for Firm Frequency Response (FFR) testing allowed us to seek stakeholder feedback, leading to publication of guidance document and streamlined process, both of which were well received by the industry
- ✓ After proactively engaging with stakeholders throughout the process and receiving strong support, the Balancing Services Charges Taskforce published its final report
- ✓ Throughout the first quarter, ESO has been represented across all of the Significant Code Review (SCR) sub-groups, leading on various areas to support Ofgem with their option development
- ✓ The September Charging Futures Forum enabled network users to share their views on the first working paper on Access and Forward Looking Charges.

Product Roadmaps for Response and Reserve Implementation

In advance of the frequency response auction trial phase1, we ran a number of webinars and mock auctions to get feedback on all aspects of the trial, test our processes and providers' processes, and ensure that the roll out was as smooth as possible for all parties. Once the auction trial went live, we continued discussions with participants to address concerns and take on views, which resulted in well-received changes such as the removal of the locational requirement for aggregated portfolios. We sought feedback on our proposal to run a double-blind process until the independent market operator goes live in phase 2. We received one piece of feedback:

- "I was at the webinar last week on your proposals for the FFR auction trial. I was really positively surprised on your proposal to run a "double blind" process where you make your buy order without seeing any of the tenders' sell orders. I also welcome your proposal to ultimately use an independent market operator. Thanks for taking onboard the feedback!" – FFR provider

One requirement as part of phase 1 was that all assets making up a portfolio had to be within a single Grid Supply Point (GSP). We received a lot of feedback from participants that this was unnecessarily restrictive and inhibited their ability to actively manage their portfolios to deliver the service. After discussion, we removed this requirement from phase 1. We received positive feedback on this action:

- "Thanks for the confirmation around the removal of locational requirements [in the frequency response auction trial phase 1]. It's a good example of taking on board industry feedback." – FFR aggregator.

Some parties have raised concerns that the move to weekly auctions is insufficiently ambitious, and that we should follow the example of some other European TSOs in moving directly to day ahead auctions. Whilst we still believe that starting with weekly auctions is the right approach, we are ensuring that we take every opportunity to fast-track the move to day ahead procurement.

We have also received complaints from parties relating to the lack of transparency of our optional fast reserve services such as 'spin gen', along with a perceived lack of urgency in working to move these bilateral products to a more open and competitive procurement approach. Whilst there is a limit to how much information we can publish on bilateral contracts due to confidentiality clauses, we are investigating potential options for addressing this such as increasing procurement in existing fast reserve markets, or breaking out reporting data in the Monthly Balancing Services Summary.

Product Roadmap for Reactive Implementation

We engaged with industry parties at the CUSC Issues Standing Group (CISG) on 10 April and the Operational Forum on 12 July to explain that we were going to take an operability-led approach to prioritising reactive power developments, and that this may affect Forward Plan target dates. In general this approach was supported by attendees, and we have received no specific feedback to date.

Power Responsive

The fifth Power Responsive Summer Reception was held in London on 26 June focussing on 'Delivering Zero-Carbon Ambitions'. The event brought together 250 demand side stakeholders, including industrial and commercial (I&C) energy users, storage developers, small-scale generators, suppliers and aggregators, financiers, energy experts and policy makers. Results of a word cloud at the start of the day showed that stakeholders consider uncertainty, the Targeted Charging Review, revenues, and market design as the most significant challenges to overcome in order to increase DER participation. General feedback from delegates based on electronic surveys was as below:

- "How useful did you find the sessions?": average **7.5 / 10**
- "How confident do you feel that actions you heard about at the Summer Reception will contribute towards the delivery of a more flexible, zero-carbon energy system?": average **6.8 / 10.**

We also received positive feedback from participants around the content and organisation:

- "It [the Power Responsive Summer Reception] was noticeably not an ESO roadshow, which could have been an accusation a couple of years ago." – FFR provider.
- "It was a pity I could not stay beyond the break as the presentations and discussions were very interesting." – External event speaker.
- "Well done to you for excellent organisation- it felt seamless" – Event attendee
- "Congratulations on your whole event. I enjoyed the networking too and the work being progressed is very much in line what [our] members wish to see ... You can count on me to support your initiatives!" – Trade association director.

Wider Access to the Balancing Mechanism Roadmap Implementation

We held the third Information Systems (IS) Change Forum on 30th April. This forum continues the dialogue with the industry on the IT changes and developments that are being progressed to support wider BM access and Project TERRE.

We have also received formal complaints from two providers that they have not been dispatched in the Balancing Mechanism as much as anticipated, and at times when their prices are in merit. We

have engaged with these parties to understand the issues, and are addressing them through the introduction of additional measures in the Control Room, as well as developing a multi-dispatch tool.

Intermittent Generation

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. Typically, the Wind Advisory Group consists of around 10-15 parties attending the regular meetings. 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 explains how the ENCC will make use of this data. The guidance has been downloaded 31 times since it was published at the end of August.

We have received complaints from several parties who are concerned that BM wind generation is not being utilised for mandatory frequency response by the ESO Control Room despite appearing to be in merit. This has been raised by those parties with Ofgem, who have sent two information requests to NGESO. We are working with providers and Ofgem to understand the reasons behind the issues raised. We are in the process of integrating the Power Available signal into our scheduling, settlement and control systems which, along with the Signal Best Practice Guide mentioned above, will make it easier for wind generators to access frequency response markets.

We have also received negative feedback from wind generators on the changes to the product design in phase 2 of the frequency response auction trial. Originally we intended to procure low and high frequency response separately, which would suit wind parties as they could provide high only at a low cost by reducing output. We have changed to a combined low and high dynamic product for go-live, due to issues with our internal scheduling and settlement systems. These systems are currently in the process of being upgraded or replaced, and therefore we are confident that we will be able to move to separate procurement during the trial period.

Provider Experience

Following on from the publication of the FFR testing guidance consultation in June, we ran a webinar to demonstrate how we use our testing tool and published a version for providers to use themselves. We further developed the document and published the final version (with supporting documents) in July, taking into account many areas of stakeholder feedback to make the process more streamlined and painless for providers. We have worked closely with the Association of Decentralised Energy (ADE) throughout the development of the guidance, and have had positive feedback from many industry parties both on the resulting document and the process we took in working with the industry. We received the following feedback on our approach to its development:

- "[Industry Trade Association] … would like to record its thanks to NGESO for their continued engagement on [the FFR Testing Guidance] over the past few months … the revised guidance is more comprehensive and logical than the current regime and is likely to be more suitable for smaller assets."
- "We acknowledge National Grid [ESO]'s significant positive engagement with industry providers. We are happy that National Grid [ESO] has listened to and taken on board the concerns from the original [FFR Testing] guidance consultation from September 2018. We feel the new proposed FFR testing guidance provides a much improved and less discriminatory testing process, particularly for the Dynamic FFR service toward multi-site aggregated units. We feel the new processes provide a more balanced testing process for different types of providing units, while also ensuring a sufficient standard of testing to prove operational compliance." – FFR aggregator.
- "We would like to thank you for the hard work you [ESO] have put in as it is clear a lot of asks [on the FFR Testing Guidance document] have been accommodated." – FFR aggregator.

Facilitating code change

Workgroup Satisfaction Survey Scores

The code administrator baseline score for workgroup satisfaction scores in April 2019 was 6.93/10. As of September 2019, our average score was 6.95/10. We note that we are just above baseline for our scores in this quarter, and will embed the valuable feedback from our stakeholders attending these workgroups, to provide a process that is straightforward and accessible for attendees to navigate. One of the changes we will be implementing as a result of the feedback we have received is to refine the modification proposal forms, to allow for ease of use and clarity on what information the proposer needs to provide. Combined with a personal and direct link to the code administrator for guidance, we hope that this will make the process simple and clear.

All stakeholders involved in the process were asked a series of questions relating to their overall experience of the process.

The results showed that there was a broad range of scores but we received some helpful feedback that will allow us to continue to build a more user friendly experience around the modification process. Some of the anonymous comments received from a variety of stakeholders were as follows:

- ‘Generally well organised, thank you.’
- ‘All the discussions were very well organised with everyone able to raise items.’
- ‘I think the code administrator is doing a good job given the various complexities of managing grid code change.’
- ‘Can you get better speakers into meeting rooms if you are holding meetings were people are dialling in?’

While the feedback was largely positive, we recognise that there was only a small percentage of stakeholders who provided free text to support their scores. As part of our continued commitment as code administrator, we will take a consultative approach with our stakeholders and seek more verbatim feedback in between surveys.

Code Administrator Code of Practice (CACoP) Survey Results

We are disappointed that the CACoP survey scores for the codes that we administer have decreased this year.

We continue to focus on improving the Code Administration service that we provide to industry. Through our Customer Journey work, we have developed a programme of improvement activities. These centre on getting the basics right through website improvements, better guidance documentation, focus on quality and improved communications by taking the lessons from the team’s lead secretariat role for Charging Futures.

We note the overall industry trend of reduced resource to engage and support the modification process. As highlighted in our response to the Energy Codes Review we believe a review of the codes which govern our energy system is required. The review gives fresh impetus to code governance reform at a critical time when current codes and code processes are no longer fit for purpose, against the backdrop of an unprecedented volume of change.

It is our ambition under RIIO-2 that by 2025 our codes and code governance will no longer be perceived as a barrier to change and will instead facilitate the rapid change required to deliver the energy transformation efficiently while enabling greater accessibility for all participants and delivering consumer benefits in both the short and long term.

As a leading industry voice, the ESO has an active role to play in shaping and helping to create the wider industry governance framework needed to deliver the energy transformation.

Code Administrator Code of Practice – stakeholder satisfaction survey

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

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

Balancing Services Charges Task Force webinar

In Q1 the Balancing Services Charges Task Force held a final webinar updating industry stakeholders with the draft report conclusions. The webinar received very good stakeholder feedback. The satisfaction score was 8.1/10, complementing the score of 8/10 from the previous webinar held in March 2019. The majority of participants concluded that they would recommend the webinar and that their understanding had increased significantly as a result.

Balancing Services Charges Task Force consultation

The Balancing Services Charges Task Force produced a final consultation after extensive stakeholder engagement, such as the webinar noted above. Over 90% of consultation respondents supported the draft conclusions of the task force. This statistic reflects the extensive communication and engagement that the task force had with wider industry throughout the process, under the Charging Futures arrangements. The final report, along with the consultation feedback from industry stakeholders, can be found on the Charging Futures website.[16]

Balancing Services Charges Task Force- task force feedback

The respondents were asked if they agreed with the overall conclusion of the draft report:

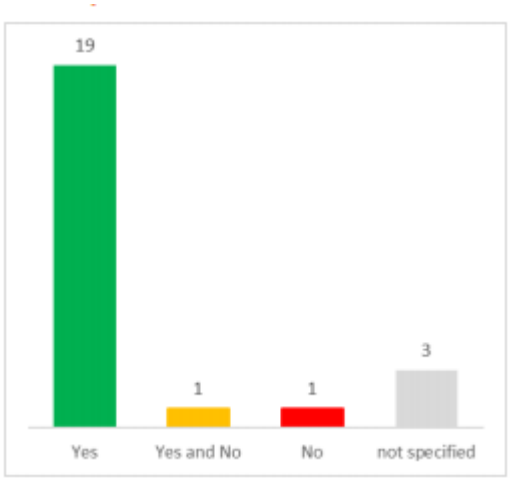


Figure 12: agreement with Balancing Services Charges Task Force report conclusion

Figure shows that the majority of respondents asked, were in agreement with the findings of the draft report.

The ESO received an average satisfaction score of 9/10 from our stakeholders on the Balancing Services Charges Task Force who responded to our survey on our leadership of the task force across each of the roles we performed. This was noted as a positive outcome and again reflected the level of engagement and collaboration throughout the process. We are also taking the constructive feedback on board for any similar exercise in future.

[16] http://www.chargingfutures.com/charging-reforms/task-forces/balancing-services-charges-task-force/resources/

Thought Piece feedback from industry

In June 2019, the ESO published its thought piece on 'Reforming energy code content: the case to rationalise and simplify codes'. We used an illustrative case study from the CUSC to show the impact and benefit of harmonisation, rationalisation and simplification of content in three related generation access products in Section 6. BEIS welcomed our proactive approach and demonstration of thought leadership in providing a tangible example of how reform of code content can be achieved. The recent BEIS/Ofgem consultation on reforming energy industry codes included evidence from our case study to help demonstrate the potential benefits of rationalising and simplifying code content. Industry stakeholders at CUSC, Grid Code and STC panels gave positive support for the underlying principles and objective of our approach, and following publication the thought piece was featured in Cornwall Insight publication, with the ESO noted as being 'on the front foot'.

Facilitate electricity network charging reform through Charging Futures

Charging Futures Forum – July 2019

On 4 July we hosted a Charging Futures Forum for electricity network users. The forum gave an overview of the latest developments in strategic reform of electricity network charging and focussed on building the understanding of new parties that had not previously been actively involved in charging reform and giving them the tools to engage going forwards. 20% of attendees hadn't attended a forum previously. The forum was organised at short notice following a request from the Chair of Charging Futures (Ofgem) and received an average rating from attendees of 7.1/10; slightly below our baseline set last year of 7.3/10.

- 'Kept on schedule' (Industry body)
- 'Opportunity to ask questions. Networking.' (Network User Transmission)
- 'Good representation from Ofgem with the ability to ask questions' (Network User Transmission).

Charging Futures Forum – September 2019

The September forum offered better opportunities for attendees to contribute towards the reforms that they have come to expect from Charging Futures, and this was reflected in the uplifted scores of 7.5/10 overall and the much improved score of 7.6/10 for the Secretariat. Both scores are above the baseline, and whilst there is room for further improvement, we are pleased to note that our focus on thorough planning and listening to what our stakeholders expect have contributed to the overall satisfaction with the forum.

We are pleased with the improved scores and will continue to develop the Forums in line with what stakeholders want and need in order to facilitate effective industry debate.

We received the following feedback from stakeholders:

- 'Well focussed content and plenty of chance to comment or question'.
- 'Much more detail in this one, far more actual discussion and focus' (Network User Distribution)
- 'Breakout sessions on the table are good' (Network User Transmission)
- 'Right people to talk to' (Network Supplier)
- We have adopted the use of webinars as an additional route to engage with our stakeholders. This channel helps us to inform stakeholders on progress in the energy network charging reform.

Webinars held across May received the following scores, against a baseline of **7.3 / 10**:

- Active Network Management – **6.2 / 10**
- Granularity – **6.6 / 10**
- Access – **6.2 / 10**

We are considering how we can work with other content providers and presenters to try to make the webinars more useful to attendees.

Transform the customer experience for network charging

We are committed to improving our customer experience for transmission network charges, in particular, the onboarding processes for new suppliers.

We have published guidance documents, webinars and tools on our improved website to help customers and stakeholders to be better informed on the charging regimes, e.g. how they are forecasted, calculated, billed and reconciled and why and how credit requirements are calculated. Working with customer account managers, we have produced an onboarding document which helps new and potential customers understand obligations under the CUSC.

We continue to host a webinar every time we publish a new TNUoS tariffs publication, to explain the key points in the document.

During the first half of this year we made major improvements to our charging query processes. We now manage all charging queries through our customer relationship management system and we have a new charging query online form[17] as part of our website. In August we also started asking query owners to rate how well we have responded to their query through an optional anonymous survey. So far, we have received very positive responses. Some feedback examples are as follows:

- '...extremely quick response, despite my request for a large amount of data! Thanks very much for your help.'
- 'Very quick response, helpful information, thank you.'
- 'Helpful team'

We acknowledge that over the last six months some customers have had an unsatisfactory experience with us as a result of the new ERP (Enterprise Resource Planning) system implementation. Since the system went live on 1 April, we have experienced some unexpected technical issues; on a number of occasions some invoices had missing or incorrect information and the varied direct debit process was not working smoothly. We are sorry for the inconvenience this has caused to the customers and endeavour to avoid any technical issues in the future.

[17] https://www.nationalgrideso.com/charging/submit-charging-query

5. Outturn Performance Metrics and Justifications

Metric	Performance	Status	Justifications
4. Provider Journey Feedback	3.2/5 score on Tendering survey	●	The feedback we have received shows we are within the tolerance for the set benchmark of 2.5
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 57%
6. Code Admin Stakeholder Satisfaction	(1) CACoP survey scores below benchmark	●	(1) Performance in all 3 codes are below our previous CACoP scores
	(2) Average ESO code administration survey score of 8 against baseline of 6.93	●	(2) Our average ESO code administrations survey scores are currently exceeding the benchmark, although we recognise this is a small data set
	(3) All H1 deliverables implemented	●	(3) All commitments delivered in H1
7. Charging Futures	Average webinar and workshop score of 6.97 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.
9. Month ahead forecast vs outturn monthly BSUoS	7.8% Average forecasting error across first half of 2019-20 performance year	●	Forecasting has been less than 10% APE for three months and above 20% APE for only one month.

Figure 13: Summary of monthly metrics

● **Exceeding expectations**

● **Meeting expectations**

● **Below expectations**

Metric 4 – Provider Journey Feedback

Apr – Sept 2019 Performance

This metric measures feedback from four areas.

Onboarding Survey Benchmark Data – Performance Against Targets

Surveys were sent to 10 providers, but to date no responses have been received. Three reminder triggers have been incorporated to encourage providers to give feedback, and we are highlighting the survey through our discussions with them.

Tendering Survey Benchmark Data – Performance Against Targets

Headline: We have received 21 responses to the survey so far. The feedback has been reviewed, and in response to feedback we are making improvements to make the information we publish easier to understand. Scores have improved slightly for all three question areas since Q1.

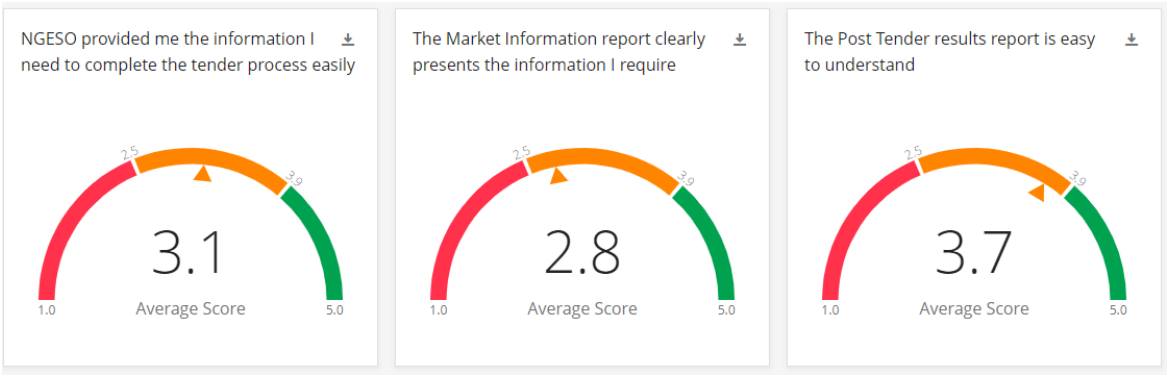


Figure 14: Average tendering scores

Contracting

To minimise survey fatigue, this now takes the form of a check-in with Providers prior to their Contract Start to make sure all of the required arrangements are in place.

Query Management Survey Benchmark Data – Performance Against Targets

Surveys are being sent as part of our Query Closure process, but only one response has been received to date.

Performance benchmarks

A benchmark of 2.5 has been chosen as it is the mid-point of the 1-5 rating. The feedback we have received shows we are within the tolerance for the set benchmark.

- **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

Supporting information

We have developed a survey framework for getting feedback from our providers at key points in the journey including onboarding, tendering, contracting and query management. Feedback will be used to inform process improvements, and this will help us to better understand our Providers and improve their experience, making NGESO a better buyer of Balancing Services. This will enable our Balancing Services market to function better, leading to more liquid markets and lower prices.

On a quarterly basis, surveys for feedback on Onboarding are being sent directly to new providers who we have had contact with. Surveys for Tendering are sent to those who are currently on the invitation to tender for STOR, FFR, Fast Reserve and Constraints. Query surveys are sent as and when we resolve queries that Providers raise with us.

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 have 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. Our intention is to use this metric to communicate progress against a fundamental element of Role 2 deliverables. Where the forecast status has changed, the background colour represents the original forecast status. We would value stakeholders' views on how to articulate this and benchmark progress in the simplest and most transparent manner.

Apr – Sept 2019 Performance

Metric Part 1

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 are in progress for 2019-20 for delivery in future years									
Black Start services	Consultations and developments are in progress for 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 will be made throughout 2019-20 for delivery in future years									
Black Start services	Consultations and developments will be made throughout 2019-20 for delivery in future years									
Balancing Mechanism	●	●	●	●	●	●	●	●	●	●

Figure 15: Relationship between deliverables and barriers to market participation

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

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

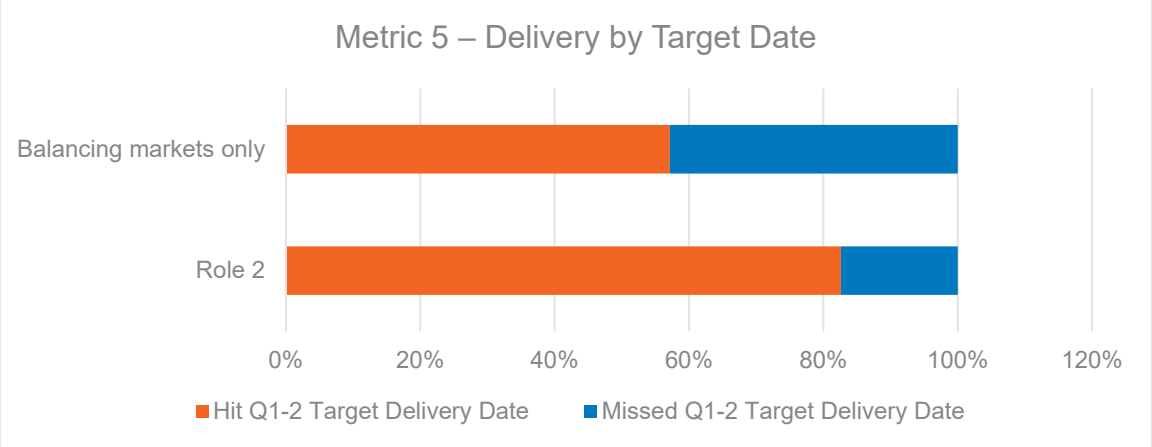


Figure 16: Target delivery performance

Supporting information

Our performance in meeting the target delivery dates across Role 2 during Q1 and Q2 of 2019/20 has been 83% (19 of 23 hit), which equates to a result of Exceeds Benchmark. Restricting the results to only those Role 2 deliverables relating to balancing products and markets gives a performance of 57% (4 of 7 target dates met), which equates to a result of In Line with Benchmark.

The change of status between 'current' and 'end Q4 2019-20' is driven by the expected changes from completing relevant role 2 deliverables. These deliverables have been identified as addressing identified barriers to market participation, however there may not be a direct and immediate effect on the market associated with each one. This is because changes in product design or market structures take time to filter through into changes in participant behaviour, and cannot easily be unpicked from natural variations or the impact of external factors such as regulatory changes.

In Q2, there has been a change to the Obligatory Reactive Power Service (ORPS) deliverable. The delivery of improved access to reactive power from non-BM assets has been delayed as a result of the IT challenges experienced by our partners in the Power Potential project, specifically the Distributed Energy Resources Management System (DERMS) in UKPN's control centre. These challenges have delayed the Wave 1 optional trial start to January 2020, and the delivery plan for the Wave 2 full commercial trial is in the process of being reviewed.

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 has been chosen.

- **Exceeds benchmark**: Completing >75% of deliverables.
- **In line with benchmark:** Completing 50-75%.
- **Below benchmark:** Completing <50% 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 will be 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 Q1 and Q2 is shown in Figure 17. Final figures for balancing services spend are produced at M+1, so these are final figures for April to August 2019, with provisional data for September 2019.

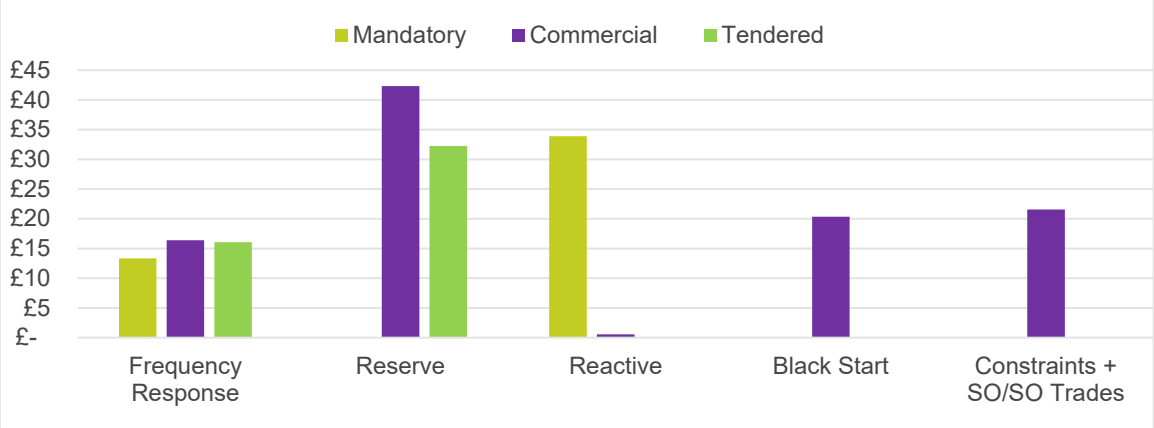


Figure 17: Cumulative spend on services per procurement category in £millions

- Frequency Response:

The majority of the costs of commercial frequency response are for Enhanced Frequency Response availability payments, with a small remainder for legacy Frequency Control by Demand Management (FCDM) contracts (up to July), and interconnectors.

- Reserve:

Tendered Reserve covers Short Term Operating Reserve (STOR) and Fast Reserve tenders, with the commercial reserve being made up of non-tendered reserve payments.

- Reactive:

This is almost entirely mandatory, with a small amount being commercial payments for synchronous compensation operation by BMUs. Development of market approaches through the Pathfinder projects are progressing.

- Black Start:

Entirely through commercial arrangements at present. Development of market approaches to restoration continue to move forward.

- Constraints & SO/SO trades:

Entirely through commercial arrangements at present. Development of markets through the Pathfinder projects are progressing.

Performance benchmarks

There are no performance benchmarks set here, as creating an incentive on ESO to procure in a certain way would limit our ability to deliver our balancing services at the lowest cost to consumers. 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.

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

Metric 6 – Code Admin Stakeholder Satisfaction

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

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

Figure 18: CACoP stakeholder satisfaction survey

Apr -Sept 2019 ESO Code Administrator Stakeholder Survey Performance

18/19 Baseline	GC0125 August 2019 Workgroup	GC0123 August 2019 August 2019 Workgroup	CMP295 August 2019 Workgroup
6.93	8	9	7

Figure 19: Workgroup Satisfaction Performance

Supporting information

Our performance is currently exceeding the benchmark across all our three code workgroups. This metric has allowed us to focus on what matters to our workgroup members in order to continuously improve. This benefits the end consumer by offering workgroup meetings that are focussed and time effective to members as well as other stakeholders involved in the overall process. Surveys are sent out during the year and the performance for all three workgroups have exceeded our baseline score.

- In relation to figure 18, we note that the CACoP satisfaction scores have decreased for this year but are comparable to the previous year. We are disappointed that the CACoP survey scores for the codes that we administer have decreased.
- We continue to focus on improving the Code Administration service that we provide to industry. Through our Customer Journey work, we have developed a programme of improvement activities. These improvement activities centre on getting the basics right through website improvements, better guidance documentation, focus on quality and improved communications by taking the lessons from the team's lead secretariat role for Charging Futures.

In relation to figure 19, we note that the performance on average is above baseline. This metric has allowed us to focus on what matters to our workgroup members in order to continuously improve. This benefits the end consumer by offering workgroup meetings that are focussed and time effective to members as well as other stakeholders involved in the overall process.

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. 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.

- **Below benchmark:**
  1. Decreased 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. Not all baseline deliverables delivered to plan.
  3. Stakeholder survey taken periodically throughout the year – decreased performance across all our three codes (STC/CUSC/Grid Code); benchmarked with our previous scores.

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

Metric 7 – Charging Futures

Apr – Sept 2019 Performance

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
7.3	6.2	6.2	6.6	8.1

Figure 19: Charging Futures Webinar Satisfaction

Apr – Sept 2019 Performance

18/19 Baseline	Charging Futures Workshop July 19	Charging Futures Workshop - September 19
7.3	7	7.5

Figure 20: Charging Futures Workshop Satisfaction

Supporting information

We note that the scores for the webinars are lower than our baseline. We work in conjunction with various content providers to produce the webinars. We will continue to seek out ways to work in collaboration with the other content providers to give our stakeholders the best possible experience.

We note that the most recent Charging Futures Workshop score exceeds the baseline. The feedback for this workshop was largely positive, noting that the content provided on the day was useful and that the opportunity for Q&A at the end was an effective use of time. This feedback is vital to ensure that we inform our stakeholders appropriately at future workshops.

This metric has made us focus on different channels of communication with our stakeholders and also how we work with Ofgem at the workshops, to relay key messages to industry on the energy network charging reform.

This metric benefits the end consumer as we are constantly striving to improve content and delivery to better inform industry, resulting in a more efficient use of industry time.

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 metric see pages 51 – 53 of our Forward Plan.

Metric 9 – Month ahead forecast vs outturn monthly BSUoS

Apr – Sept 2019 Performance

Month	Actual	Month-ahead Forecast	Average 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
August-19	3.94	3.34	0.15	0	0
September-19	3.94	3.71	0.06	0	1

Figure 21: Month ahead forecast vs. outturn BSUoS (£/MWh) Mid-year 2019 Performance

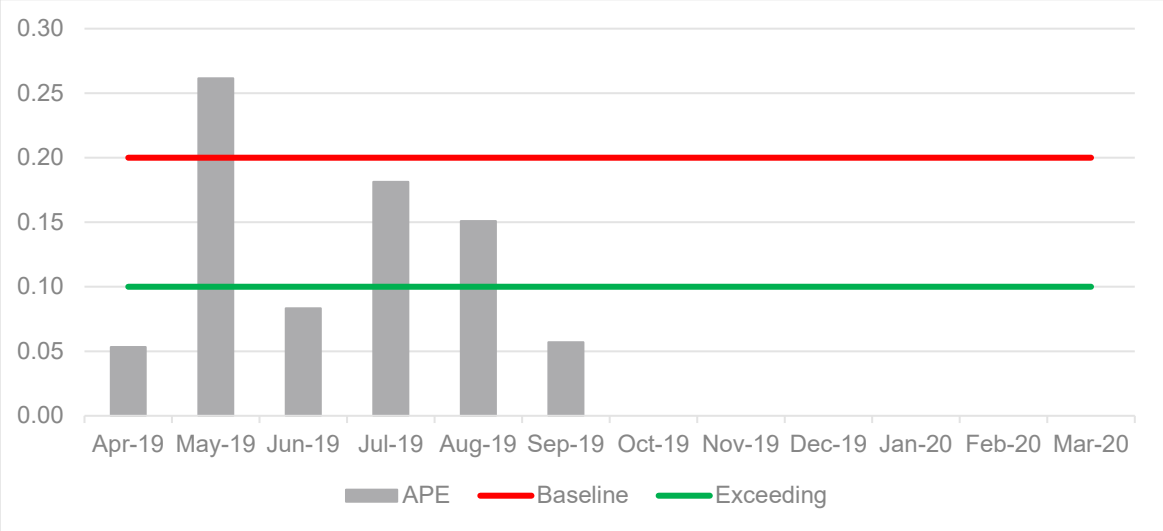


Figure 22: Monthly BSUoS forecasting performance

Supporting information

Performance has been in line with benchmark this first half of the 2019/20 performance year, with forecasting less than 10% APE for three months and above 20% APE for only one month.

The biggest variable in Balancing costs and therefore BSUoS charges is constraints driven by system outages and weather. As weather is unknown at month ahead timescales we take into account known outages and past performance to produce forecast costs for consumers. As this charge is applied to all users of the system, it is built into wholesale prices and passed on to consumers in their bills. An accurate forecast can lead to a reduction in the risk premia applied by generators and suppliers leading to a reduced overall cost to the end consumer.

Performance benchmarks

- **Exceeds benchmark**: Exceeding is 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.

ROLES 3 & 4

Facilitating Whole System Outcomes and Supporting Competition in Networks

Facilitating Whole System Outcomes and Supporting Competition in Networks: Executive Summary

Within Roles 3 & 4, we strive to ensure that all investment and operability decisions are taken from a whole system perspective, and that we use competitive markets to resolve network operability issues where this brings value for the end consumer.

Our achievements so far

There has been a big step forward in addressing future operability issues in the first six months of this performance year, with the release of the voltage and stability pathfinder work and associated requests for information to the market[18]. This gives us a more complete picture of the range of options and technologies that the market has to offer. Market tenders will be running later this year, allowing us to contract with existing and new technology providers to provide services in the short term and possibly for the next ten years. This is an exciting development, helping us to identify how we can manage a zero-carbon electricity system by 2025 and do this at a lower cost than would be the case without our intervention.

> ***"[We] welcome and support initiatives from National Grid ESO to maintain and improve resilience and operability, including the network development roadmap approach, and in particular, this stability pathfinder"***
>
> *– Supplier/generator*

Recognising that operability concepts are more difficult to understand for many participants, we have engaged extensively to provide education and support. Across the pathfinder projects we have engaged with many potential market providers directly and held webinars with over 100 people attending. Attendees were keen to understand more and find out how they could get involved. This level of engagement has surpassed anything that we had expected, and we are looking forward to working closely with stakeholders as the projects develop further in the coming months.

One of the key aspects to delivering connection capacity and understanding the future operational challenges of the network is understanding the connection activity that is being undertaken by the DNOs. We recently introduced the 'Appendix G' process (relating to Appendix G of customers' Bilateral Connection Agreements), a trial we have been running to try and speed up the process for the connection of generators which are embedded within the DNO network. This has saved nine months and several thousands of pounds per DNO application for those DNOs that participated. In two regions alone, this new process has brought forward 4GW of embedded generation more quickly than under previous methods, and has saved almost £1m in application fees. We have continued to engage with the DNOs on the benefits of introducing this process, and over the last six months Northern Power Grid and Electricity North West have both adopted this way of working which is driving greater transparency across the north of England.

> **"It was really refreshing for the ESO teams to have the same entrepreneurial approach that we have at [supplier]. Their customer focus really help us get to a positive solution where all parties were happy with the outcome"**

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

To manage the system more effectively as we move towards decarbonisation, one of the key elements that we need to be able to monitor is system inertia. In the first six months of this year we have signed first of a kind contracts for the implementation of inertia monitoring systems, that will come on line in spring 2020. These tools will be the first in the world to be installed, and will provide essential data to manage a secure system and to reduce consumer bills as we will better understand and have confidence in the operating envelope available in real time operation and hence can optimise the quantity and location of synchronous generation.

"We thank National Grid ESO's flexibility to go the extra the mile to get (commercial flexibility around operational connections) working"

– Generator

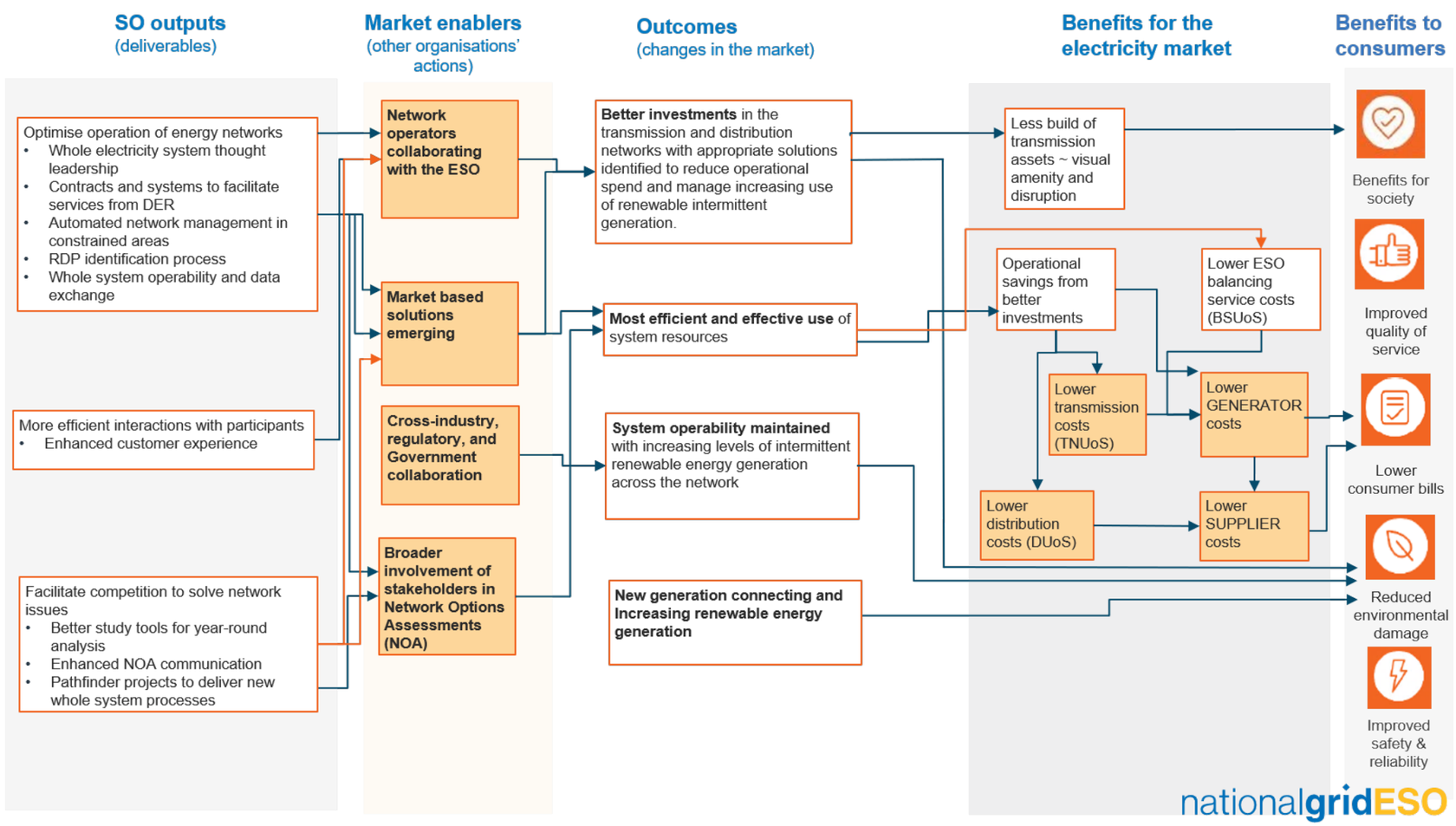
We have also made improvements to the NOA process and methodology, such as holding stakeholder events and introducing probabilistic assessments. In addition to the activities set out in our Forward Plan, we are developing proposals for the potential introduction of early model competition in onshore transmission. This aims to drive innovation and consumer value through the introduction of competition to the design, construction, ownership and operation of transmission assets.

In the coming six-month period, we look forward to going live with the tenders and projects described above. We expect all of these activities to drive considerable consumer benefit, not necessarily in this performance year but in the years to come.

Role 3 & 4 Consumer Benefit Map

Our roles of facilitating whole system outcomes and supporting competition in networks impact positively on the end consumer, both today and in years to come, and this benefit map sets out the interactions between our role and other market participants to lead to benefits for consumers. We focus on those outcomes which deliver the most value for consumers, such as avoiding the need to build new overhead lines, and allowing renewables to connect earlier.

We undertake a range of activities to optimise the operation of energy networks, such as putting in place contracts and systems to facilitate services from DER, and putting in place automated network management in constrained areas. We also facilitate competition to solve network issues, running pathfinder processes in addition to the existing Network Options Assessment process, which we are always seeking to refine and improve. Our endeavours to increase competition for network services should reduce the cost of running a secure network, which will flow through into **lower consumer bills** than would otherwise be the case. Where alternatives to conventional network build can be found, this contributes to **reduced environmental damage**, as well as improving visual amenity which brings **benefits to society as a whole**. In seeking to identify future operational issues before they arise, we are contributing to **improved safety and reliability** in future years. In our interactions with networks and potential service providers, we seek to provide information in a timely and accurate manner, taking on board feedback in order to provide a better service. Providing our stakeholders with the information they need allows them to communicate effectively with the end consumer, providing an **improved quality of service**.



1. Evidence of Delivered Benefits in 2019-20

- ✓ We have improved our information provision for the Network Options Assessment (NOA), Electricity Ten Year Statement (ETYS) and Pathfinder processes, improving the quality of information exchanged and making the best use of our interaction with industry stakeholders This provides customers with information allowing them to participate in providing transmission solutions increasing competition, driving down consumer costs
- ✓ We have used customer journey mapping to improve our customers' experience of working with us, contributing to time savings and better-quality information exchange across the industry
- ✓ The Appendix G arrangements, a trial we have been running to speed up the process for the connection of generators which are embedded within the DNO network, has helped us to connect 4GW of embedded generation more quickly, and saved almost £1m in application fees, in two regions of the country
- ✓ Developed solutions that prevented two 100MW generators from being switched out of service for almost 6 months, saving approximately £20m
- ✓ We have found opportunities to allow some customers with connection restrictions related to outages to generate more than their contracted entitlement. This will allow more renewable generation on the network which should result in lower wholesale electricity prices and lower consumer bills.

Case Study:

Appendix G process: accelerating the connection of embedded generation

Consumer Benefit Outcome

Activity	The Appendix G process is a trial we have been running to try and speed up the process for the connection of generators which are embedded within the DNO network. The existing Statement of Works Process is outdated and does not satisfy the requirements for making quick connection offers to DNOs for many small embedded customers. The Appendix G trial is designed to improve this level of service. This allows us to manage the connection of Distributed Energy Resources more quickly, by releasing available capacity at Grid Supply Points to allow DNOs to offer connections. This involves a monthly exchange of data so the DNO has visibility of the transmission constraints and customers connecting to the DNO do not have to wait so long for a connection offer.
Role	3&4. Facilitating whole system outcomes and supporting competition in networks
Key Forward Plan Deliverables	• Extended roll out of enhanced whole system data exchange

Current benefit	The introduction of the Appendix G process benefits DNOs by allowing them to connect embedded generators much quicker than under the existing Statement of Works (SoW) process. This saves money for the embedded generators, as they do not have to pay the £2700 Statement of Works application fee for each connection application, The Appendix G process also saves time for the ESO, TO and DNO, as it avoids the Statement of Works process which takes approximately 2 weeks of Full Time Equivalent (FTE) resource per application, In the South West area we started the Appendix G process in 2015, and since that time we have brought forward connections for 2.469GW of embedded generation through 193 individual generators saving £521,000.00 in SoW application fees. In the East Midlands Appendix G was started in 2016 and has resulted in connection of 1.565GW of embedded generation through 143 individual generators, which has saved £386,000.00 in SoW application fees. In these two areas alone this process has brought forward a total of 4GW of embedded generation much quicker than under previous methods and has saved almost £1m in application fees. As 336 applications were avoided in these two areas, we can assume that 672 weeks (equal to 3360 days or 16.8 years) of FTE resource have been saved in processing this application. Assuming that an FTE has a total cost of £100k per annum, this translates into a time saving worth £1.68m as a result of introducing the Appendix G process in the South West and East Midlands. The Appendix G process has also been used in other regions of the country, so the benefits stated above are only illustrative, and therefore will be higher in reality. We note that our figures relate to a period lasting several years: as a result of the duration of the connection process it is difficult to directly associate a benefit with a particular period of time. The embedded generators will no longer need to recover the cost of this application fee in their wholesale energy prices, or in the prices they charge for ancillary services. The Appendix G process makes the connection process quicker and cheaper for embedded generators, which removes a barrier to entry. The new simpler process, combined with DNOs having visibility of the connection capacity they can release, should increase levels of competition in the market.
Future benefit	Prior to the introduction of the Appendix G process, generators wishing to connect to the distribution network had to apply to the DNO, and then wait for the DNO to apply to the ESO through the Statement of Works process. If network reinforcement works were required, then further application processes between the DNO and ESO would need to take place before the connection could be offered. This process takes time to complete, and makes the investment case for new market entrants more difficult. The Appendix G process makes this much simpler, by allocating capacity headroom to DNOs at specific Grid Supply Points, so that DNOs can make connection offers without applying to the ESO. This will therefore facilitate more connections to the network, increasing wholesale competition which should result in lower wholesale prices than would otherwise be the case. The Appendix G process also allows for the implementation of new technology such as Active Network Management, which allows greater visibility and control of embedded generation. This will make it possible for the ESO to operate the system with a higher proportion of renewable generation, without compromising system security. The Appendix G process will also facilitate greater use of Distributed Energy Resources (DER) to manage system constraints, as it will make it easier for embedded generation to connect. This increase in competition should result in a lower spend on thermal constraints than would otherwise be the case. We

	currently spend approximately £250m per year on thermal constraints. The Appendix G process will also facilitate greater use of Distributed Energy Resources (DER) to manage system constraints, as it will make it easier for embedded generation to connect. This increase in competition should result in a lower spend on thermal constraints than would otherwise be the case. We currently spend approximately £250m per year on thermal constraints.
Basis of expected benefit	The Appendix G process reduces the requirement for DNOs and embedded generators to go through lengthy and costly connection processes. This reduces a barrier to entry for distribution-connected generation.
How benefit is realised in the consumer bill	The embedded generators will no longer need to recover the cost of this application fee in their wholesale energy prices, or in the prices they charge for ancillary services. The Appendix G process will mean that distribution-connected generation customers will no longer need to pay application fees. The embedded generators will no longer need to recover the cost of this application fee in their wholesale energy prices, or in the prices they charge for ancillary services. The ESO, TOs and DNOs will also spend less time processing connection applications. Any savings to DNO, TO and ESO costs will either be passed through to consumers via lower DUoS, TNUoS and BSUoS charges, or will release resource to focus on additional value-add activities. Greater visibility of DER which can provide ancillary services will increase the competition for ancillary services, which will drive down BSUoS costs. BSUoS costs are passed through to end consumers by suppliers (directly) and generators (via their wholesale energy charges). This reduces a barrier to entry for embedded generation, which increases wholesale competition which should lead to lower wholesale prices.
Additional non-monetary benefit	This work provides the DNOs with a more transparent view of what capacity is available on the transmission network. This allows them to know what level of embedded generation they can connect to their network ahead of requiring transmission reinforcement. This allows them to provide better customer experience as the customer can receive a connection offer in shorter timescales. This initiative will reduce the time it takes for low carbon generation to be connected to the network, allowing it to come online more quickly, leading to an environmental benefit of reduced carbon emissions. It also brings an economic benefit to society as a whole, by giving more certainty to small projects which will have better visibility of whether there is space on the transmission network for them to connect. It will give a better experience to our customers and those connecting to the distribution network, as customers will pay a lower connection fee and save time during the connection process.
Assumptions	• It is assumed that the Appendix G Process will be implemented into the CUSC as Business As Usual: the code change is currently under development. • We also assume that some DNOs will be willing to try the process ahead of its implementation in CUSC: our discussions to date have shown this to be the case. • We assume that savings made by generators, the ESO, TOs and DNOs are passed through to consumers. • For the benefits calculation, we assume 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.

- We also assume that the Statement of Works fee would have been £2700 per application, although it has recently increased as a result of Legal Separation. We assume that the embedded generation in the regions considered has connected or contracted to connect via the Appendix G process, and would have otherwise had to follow the Statement of Works process. We assume that the embedded generators had not triggered works or paid a Modification Application Fee.

2. Evidence of Future Benefits and Long Term Initiatives

- ✓ We have worked with the TOs to develop and share the ORACLE (Optimal Reinforcement And Constraint Level Estimator) tool. This economic assessment tool allows the user to understand the forecast level of system constraints on the network and evaluate the economic value of potential reinforcement options
- ✓ We have progressed the Appendix G arrangements, which will allow more customers to connect, increasing competition in the generation market and facilitating the connection of more renewable generation
- ✓ We have progressed the Mersey voltage pathfinder, which will enable us to find the right solution to a voltage issue which currently costs around £1.5m per month to manage. This work will result in lower consumer bills than would otherwise be the case
- ✓ Our Stability pathfinder will improve network safety and reliability, and optimise the solution so that bills are lower than would otherwise be the case
- ✓ Our Constraint management pathfinder will reduce the costs incurred due to network constraints, resulting in lower bills. It will also allow more renewable generation to connect, and will result in less renewable generation being constrained off
- ✓ Our Network Options Assessment work will make recommendations about which options to progress to resolve system issues, making trade-offs between network and non-network solutions. This will result in lower consumer bills, and is likely to recommend reduced infrastructure build which will have a positive impact on society and the environment.

Consumer Benefit Outcome

Case Study:

Improved Information Provision

Activity	Developing and sharing the ORACLE (Optimal Reinforcement And Constraint Level Estimator) tool with the TOs. This economic assessment tool allows the user to understand the forecast level of system constraints on the network and evaluate the economic value of potential reinforcement options. This is a sandbox Network Options Assessment (NOA) environment for users to better understand the network constraints
Role	3&4. Facilitating whole system outcomes and supporting competition in networks
Key Forward Plan Deliverables	• Improve accessibility of the ETYS and NOA publications • Pathfinder projects
Current benefit	The TOs have clearer visibility of the level of economic network reinforcement required. They can see whether their proposed options are sufficient to alleviate

	all constraints or whether further options are required. The tool also provides insight as to the ideal time to implement options, whether something should be built earlier, or whether there is an 'in-fill' option (that is, a smaller solution which provides benefit ahead of a large reinforcement being delivered) or a staggered approach. By providing this tool and additional level of insight, we have received more higher quality reinforcement options from the TOs this year. This means that we do not need to employ the use of notional reinforcements (which we have used in the past to be able to perform the economic analysis and indicate to the TOs that further reinforcement is required). This additional information allows a better quality optimal path of network reinforcements and potentially more recommendations to maximise the reduction in network constraints. It also means that any options with significant lead times have more opportunity to be delivered at the optimal time to provide maximum consumer benefit. This allows our planning processes to run more smoothly and for TOs to be better engaged and able to support the process.
Future Benefit	As network reinforcements can be identified in earlier timescales, there is more time and greater ability for them to be delivered with optimal timing to maximise consumer benefit. This means that consumer bills can be lower than would otherwise be the case, by ensuring that the optimal level of TNUoS and BSUoS costs are incurred. There are also wider societal benefits through earlier identification of network reinforcements which allows development of the most optimal solution. This approach also has environmental benefits, as optimal network reinforcement will allow for greater levels of renewable generation to operate.
Basis of expected benefit	TOs have a better understanding of the economic benefit of their proposed options and can better tailor their solutions. The need for reinforcement is identified earlier, so there is more time to develop projects, and more opportunity to deliver them in the optimal timescales. Through the NOA process we should be able to identify the present value of the additional options which have been submitted this year for inclusion in the assessment.
How benefit is realised in the consumer bill	Benefits in the consumer bill will come from an optimal trade-off between TNUoS and BSUoS costs. Earlier identification of reinforcement options provides TOs with more opportunity to deliver projects within optimal timescales, and to better tailor solutions to the system need. There should also be further benefit from allowing more renewable energy onto the system, which should feed through to result in lower consumer bills than would otherwise be the case.
Additional non-monetary benefit	Better optimisation of options and facilitating more renewable generation could also deliver both environmental and wider societal benefits. Environmental benefits can be achieved through renewable generation displacing fossil-based generation and optimised reinforcements which could either be a reduced build solution or a single asset solution rather than smaller solutions. There are also potential wider societal benefits from having optimised reinforcements, as there is a lower risk of asset stranding or community disruption from delivery of multiple sequential options.
Assumptions	We assume that the additional information provided is valued by our stakeholders. Further, we assume that improved information provision results in

an increased number of high-quality submissions to processes such as the NOA.

We assume that having a better understanding of the economic value of options allows the TO to identify options earlier, allowing them to be delivered in the optimal timeframe and for the “right” solution to be chosen rather than one which can be delivered as early as possible.

When considering the benefit of running a more efficient process, we assume that any efficiency savings realised by the ESO and our stakeholders would ultimately result in a consumer benefit.

3. Plan Delivery and New Ways of Working

- ✓ Contracted with suppliers to develop real time inertia measurement capability (planned commissioning in 2020)
- ✓ Working with industry to improve data exchange, including DNOs signing up to Appendix G arrangements to identify available capacity
- ✓ Systems and contracts being designed to facilitate balancing services from Distributed Energy Resources
- ✓ Working with TOs and generation customers, we have identified commercial arrangements to reduce system constraints and outage time for renewable generation
- ✓ Progressed Stability Pathfinder work, issuing Request for Information (RFI) and hosting webinars
- ✓ Committed to short-term and long-term reactive provision in the Mersey area, following analysis of impending network changes
- ✓ Improvements to the NOA process: methodology consultation, stakeholder event, webinars, introduction of probabilistic assessments, publication of System Requirement Form Part A documents to give visibility of future network needs
- ✓ Constraint management pathfinder webinar held, discussing management of residual constraints in constrained areas ahead of the intent to publish an RFI later this year
- ✓ Agreed and implemented the contractual framework for funding, delivery and performance assurance of the Accelerated Loss of Mains Programme with the DNOs (also part of Role 1).

Prioritisation activities

We committed to a number of pathfinder projects, which identify solutions to transmission operation challenges and promote a wider range of commercial solutions to meet these challenges. As we have learned from the work we have done so far, we have revised the timings of some of our activities:

- We have delayed the next stage of the Mersey pathfinder process to avoid running two tenders at the same time. Short term requirements have been given priority as these are required to maintain network compliance. The long-term pathfinder tender will follow.
- Based on the valuable feedback we received as part of the Mersey Voltage pathfinder, we will refine and improve the process for future voltage pathfinder projects. Therefore, we have delayed the Pennine region RFI to Q1 2020-21.
- For the Stability Pathfinder, feedback from the RFI has given us more information on potential providers' time constraints. We have therefore extended our timescales to allow more time to run the tender process, for providers to participate and evaluate the options.

Commercial and contractual development with DNOs has been focussed on the Loss of Mains programme because of its operational impact and value to consumers of over £100m per year. The arrangements put in place are the first of a kind.

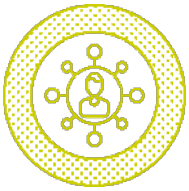
We are re-planning our Regional Development Plan (RDP) roll-out to ensure that activities are aligned with developments in Open Networks and the pace of change within the DNOs, and to ensure that the NGESO role and how it might develop is understood by all parties involved.

Deliverable	Target delivery date	Actual delivery date	Status
ESO thought leadership – how our role will evolve	Q1 2019-20	Target date met	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 DER to support operation of transmission and distribution networks.
Whole electricity system learnings	Q2 2019-20, update Q2 2020-21	Target date will not be met	Delayed. We have delayed this work to better align with relevant deliverables in Open Networks as well as Ofgem's work on DSO.
Pathfinder projects			
Stability pathfinder	Q1 2020-21	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 will publish summary feedback in October including our next steps.
Mersey Voltage pathfinder: decision to tender market solutions	Q1 2019-20	Target date met	Completed 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. Based on stakeholder feedback, we are working on the design of the tendering process and documents. We have also made the decision to run a short-term tender for the Mersey area for the period from April 2020 to March 2021 in the light of the recent announcement from Fiddlers Ferry to consult on their closure. This will be run in parallel with the above long-term tender and satisfy the more urgent system needs.

Deliverable	Target delivery date	Actual delivery date	Status
Pennines Voltage pathfinder	Q1 2019-20	Delayed: planned for Q1 2020-21	Delayed Based on the valuable feedback we had in the Mersey Voltage pathfinder, we would like to refine and improve the process for future voltage pathfinder projects. Therefore, we have delayed the Pennine region RFI to Q1 2020-21.
NOA: Enhanced communication			
Improve accessibility of ETYS and NOA publications	Ongoing	Ongoing	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 You Tube 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.
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	Q1 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 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.

Deliverable	Target delivery date	Actual delivery date	Status
Whole system operability			
Roll out of Loss of Mains programme Protection setting	Commencing Q1 2019-20	Target date met	The programme is now live and the portal for DERs to apply for Loss of Mains programme change payment is open. The first formal programme steering group will meet in November and the results of the first assessment window will be available in the New Year.
Enhanced customer experience			
Customer journey mapping – outage planning	Q1 2019-20	Target date met	The customer journey mapping has been completed – this was a deliverable owned by 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 TO outage plans on DNOs.
Connections customer portal	N/A	N/A	This is an ongoing piece of work to help us understand the design requirements for a customer application portal. During 2019/20 we have been engaging with connection customers, DNOs and Transmission owners to understand their needs and inform our design which will be taken forward during RIIO-2.

4. Stakeholder Evidence



- ✓ Whole system data exchange – we have proactively worked with the DNOs to improve the current data exchange process
- ✓ Whole system operability – we have engaged extensively with stakeholders on the Accelerated Loss of Mains programme; over 200 stakeholders provided their views on this programme which has resulted in increased support for affected generators
- ✓ Enhanced customer experience – we are proactively working with NGET TO on an outage planning process
- ✓ Whole electricity system thought leadership – through discussions with stakeholders we have developed our 'Commercial Interfaces with DER paper', and continue to be actively involved in Open Networks including hosting a Whole Energy System workgroup meeting at our Wokingham office
- ✓ Pathfinder projects – We have held webinars for both Voltage and Stability RFIs and for the constraint management pathfinder with over 100 stakeholders attending the constraint and stability webinars. We have answered over 100 stakeholder queries on the Stability RFI
- ✓ NOA: Enhanced communication – We have held a workshop and webinars as well as providing monthly newsletters and video information.

Whole system data exchange

Extended roll out of enhanced whole system data exchange

Having received feedback that "the current data exchange between ESO, TO and DNOs are not very efficient", we have worked proactively with DNOs to improve the current data exchange process. In addition to participating in the Energy Networks Association (ENA) Open Networks working group, we have engaged proactively with all DNOs. This has resulted in a review of the Week 24 data exchange template, which now reflects the total aggregated generating capacity for all embedded power stations less than 1MW, with the ability to split the data by primary energy source. This will enable network modelling in planning timescales to achieve a new level of granularity, resulting in increased confidence in our system models and studies.

Looking longer term, in a world with increased levels of DER, stakeholders have told us that additional data submissions will be required to cover a range of additional scenarios at different points throughout the year. As a result we are acting on network companies' feedback to review the mechanism for data exchange, and considering the development of a Common Information Model (CIM).

Additionally, we trialled the new Appendix G arrangement. 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 outage durations 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 the 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 releasing capacity and because there is less restriction. 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:

- "It was really refreshing for the ESO teams to have the same entrepreneurial approach that we have at [supplier]. Their customer focus really help us get to a positive solution where all parties were happy with the outcome".
- ''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

We have worked proactively with DNOs on developing the Accelerated Loss of Mains programme, agreeing an implementation plan and developing a portal for distributed energy resources to apply for a change in their protection settings.

For NGESO, this has involved extensive work with DNOs and IDNOs, whom we provided with dedicated communications material and briefing. We have now finalised contractual arrangements with the DNOs and IDNOs, who will manage customers' individual protection setting changes. The contractual framework includes customer facing terms and conditions, delivery assurance policy, processes for assessment and payment, and terms covering service delivery by the DNOs. Data privacy and cyber-security risks have also been captured and will be managed proactively throughout the programme.

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.

We addressed a number of specific queries from distributed generation owners, for example a stakeholder who managed a large portfolio of generation. We met with this stakeholder and the relevant DNOs, and agreed an approach to make the process more efficient for this type of application. We also produced a guidance document to help generation owners to find out what protection equipment they already had fitted, and informed generators how they could participate in the programme and the implications of the changes which would be made. We also published a list of contractors who were willing to do the work via the ENA to help stakeholders who had no previous relevant experience see that that they could get access to the required expertise.

Pathfinder projects

As part of our Network Development Roadmap work, we are going beyond the traditional approach of only looking at transmission based solutions, and we are also working with TOs, DNOs and service providers to identify distribution and market based solutions. Our Pathfinder projects allow us to collaborate with these stakeholders to identify the most cost effective approach to addressing network issues.

Stability Pathfinder

The Stability Pathfinder explores new processes and solutions to operate the system safely, securely and economically in the future, which will be needed due to increasing levels of non-synchronous generation. We published a Request for Information (RFI) for this Stability pathfinder on 19 July and the feedback closed on 13 September.

- "[we] welcome the opportunity to respond to a Request for Information in relation to the proposed procurement of future system stability products'' – supplier/ generator.
- ''[we] welcome and support initiatives from National Grid ESO to maintain and improve resilience and operability, including the network development roadmap approach and, in particular this stability pathfinder" – Supplier/ generator.

Other parties would like to have seen us engage with the industry earlier and some would like to see us devote more attention to existing generators.

Our first webinar was on the overview of RFI, this was held on 6 August 2019 with around 180 attendees. At the webinar, stakeholders were keen to further understand the technical requirements, so we held a second webinar focussing on the specific technical requirements to allow stakeholders to contribute more meaningfully to the RFI. This was presented on 14 August 2019, and attracted over 100 attendees.

We have answered and published over 100 questions as part of this process. There has been a lot of interest from manufacturers, current and new developers, TOs and existing generators who have wanted to understand our technical requirements. The feedback has been positive and it acknowledges that we have defined technical requirements that could potentially be demonstrated by any technology, and we are thinking ahead and taking practical steps to accommodate more renewables on the system.

Voltage pathfinders

Changes in the energy system over the last decade have resulted in managing system voltages becoming an area of increasing challenge for the ESO. We have seen a continual decrease in both minimum demand and reactive power consumption on distribution networks, resulting in an increasing need to absorb more reactive power on the transmission network. This has resulted in us setting up a pathfinder project, where we are developing a regional options assessment process for voltage requirements, for example in the Mersey region (the Mersey voltage pathfinder).

Having successfully completed the Request for Information (RFI) for the Mersey Voltage pathfinder 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. Based on stakeholders' feedback, we are working on the design of the tendering process and the tendering documents, to improve the stakeholder experience for future pathfinder projects. "Overall, a well-thought out, clear and concise document. In particular, the effectiveness map is highly useful and I would urge NGESO to utilise this to illustrate future balancing services requirements." – Supplier/ generator

We held a webinar for the Mersey RFI, with over 40 people dialling in and had 17 responses to the RFI, with 16 of these solutions meeting the minimum technical requirements. We have published all FAQ documents from all our pathfinder webinars to answer the questions stakeholders have raised.

Incorporating stakeholder feedback on pathfinder projects

We have received feedback that in the past we have been too specific in our technical requirements, which have tended to favour a particular technology type. For the Mersey and Stability RFIs we have therefore stipulated less specific technical requirements to allow for a range of different technology solutions.

Stakeholders have also asked about the electrical effectiveness of network locations for the Mersey RFI, so we conducted further analysis and enhanced the information provided to the market as part of the RFI process.

Due to the valuable feedback we received relating to the Mersey Voltage pathfinder, we will refine and improve the process for future voltage pathfinder projects. This along with prioritisation of other system needs pathfinders means that we have delayed the Pennine region RFI to Q1 2020-21, in order to be able to provide additional information on location effectiveness for prospective solutions and take any further learning from Mersey to allow for a better customer experience.

We have also received feedback from stakeholders that they would like to be kept informed on the pathfinder developments and queries when we have not kept information on our website up to date. To address this, we have introduced a monthly newsletter providing updates on all our projects and ensure that the website is updated in line with this.

NOA Enhanced communication

We hosted a Network Development workshop, "Commercial solutions to Network challenges". which was attended by 30 stakeholders. At our event stakeholders were interested in seeing the requirements which are sent to the TOs, and so we published the System Requirement Forms (SRF) in the summer to get feedback whether this would be a workable template for other stakeholders or whether additional information would also be required. Although 92 stakeholders have viewed these forms, we have yet to receive any feedback.

We have hosted webinars for Stability RFI (180 listeners), Stability Technical Requirements (100 listeners), and Constraints Management (70 listeners), and have been sending out monthly newsletters since March 2019.

We have also 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 along with the rationale for these changes. These are hosted on our YouTube channel[19]. These aim to engage stakeholders not familiar with our processes in an easy to understand way. They already have had over 130 views per video.

Whole electricity system thought leadership

We have continued to progress our thought leadership on the whole electricity system. Recognising the variety of stakeholders interested in this subject we have produced a high-level video[20] explaining our future role and the benefits of taking a whole system approach to the changing energy landscape. This has been viewed more than 140 times.

At a more technical level, following challenge on how we can co-ordinate service provision from Decentralised Energy Resources (DER) for transmission and distribution system needs we have worked with others to develop a discussion paper[21]. The 'Commercial Interfaces with DER' paper considers how DER can efficiently provide services for transmission and distribution network needs in a coordinated manner. To date, we have used the paper to inform DSO discussions with stakeholders including DNOs, Ofgem and BEIS.

Ofgem sees the paper as a useful articulation of the issues presented by the need to better coordinate Transmission and Demand use of services from DER. BEIS have given positive feedback on the intent of the paper and its contents, they see it as a useful contribution to the debate. ENA Open Networks see it as a good catalyst to focus coordination discussions in the context of WS3 (DSO Transition). UKPN and SPEN appreciate the setting out of principles; used to inform their approach to coordination through RDPs (Regional Development Plans). WPD welcomed the intent of the paper but were keen that it should not force a particular solution and instead recognise the need to keep future options open.

In addition we have continued to play an active role in Open Networks including leading the new Whole Energy System workstream. This workstream takes a broader view, bringing together stakeholders from across both gas and electricity networks. We recently hosted a meeting of this group at our Wokingham office and received positive feedback from stakeholders:

- ''Just a quick thank you for coordinating and hosting our visit today. I'm sure the location and promise of a control room visit will have encouraged more people to attend during a bank-holiday week, and the very relevant explanation of how the ESO manage system balancing and use of flexible gas generation will hopefully have helped put the rest of our meeting into context. It's clearly quite a challenging work area given how early we are in considering whole system impacts across networks but hopefully we are making some progress, thanks for your support helping with context around Open Networks and general input too.'' – Gas Distribution Network owner.

[19] https://www.youtube.com/watch?v=go7fhi7Cek0
[20] https://www.youtube.com/watch?v=go7fhi7Cek0
[21] https://www.nationalgrideso.com/document/151716/download

5. Outturn Performance Metrics and Justifications

Metric	Performance	Status	Justifications
10. Whole system unlocking cross boundary solutions	1113.69 MW of DER with WPD and 54.5 MW at UKPN accepted in Q1&Q2	●	New DER has continued to increase across the first half of the 2019/20 performance year
11. System access management	3.36/1000 YTD cancellations	●	Software tool is under review and the replacement being utilised to improve process
12. Consumer value opportunities	2218GWh of direct savings and 166GWh of indirect savings delivered	●	New innovative ways of planning and processing of procedures has 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 nine ESO-related reoffers, this means that 89% of connection offers to date this year were Right First Time, against a benchmark of 95%.	●	We are experiencing challenges with embedding new processes and ways of working with the TO post legal separation, and have experienced a high volume of connection applications, particularly bespoke applications
16. NOA: Enhancing Communications	Positive stakeholder feedback on changes we are making to the documents.	●	Hosted four engagement events, seven webinars and published videos gaining positive qualitative feedback and giving us areas to focus improvement on.

Figure 23: Summary of monthly metrics

● **Exceeding expectations**

● **Meeting expectations**

● **Below expectations**

Metric 10 – Whole system- unlocking cross boundary solutions

Apr – Sept 2019 Performance

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 collaboration in the South-East Coast region and the WPD/ESO collaboration in the South West region.

Q1 2019 Performance (UKPN)

Grid Supply Point (GSP)	MW	Commentary on DER technology types
Bolney	0	No new DER in Q2
Canterbury	0	No new DER in Q2
Ninfield	49	A new acceptance for 49MW of battery storage
Sellindge	0	No new DER in Q2
Total	**49**	

Q2 2019 Performance (UKPN)

Grid Supply Point (GSP)	MW	Commentary on DER technology types
Bolney	-5.5	Battery storage project moved to connect at Ninfield
Canterbury	0	No new DER in Q2
Ninfield	5.5	Battery storage project moved from Bolney
Sellindge	0	No new DER in Q2
Total	**5.5**	

Q1 2019 Performance (WPD)

Grid Supply Point (GSP)	MW	Commentary on DER technology types
Abham	15.25	Multiple technologies, primarily ESS and renewables
Alverdiscott	98.8	As above
Axminster	7.22	As above
Bridgwater	47	As above
Exeter	146	As above
Indian Queens	49.9	As above
Landulph	0	No new DER
Taunton	3	Multiple technologies, primarily ESS and renewables
Total	**367.17**	

Q2 2019 Performance (WPD)

Grid Supply Point (GSP)	MW	Commentary on DER technology types
Abham	25.15	Multiple technologies, primarily ESS and renewables
Alverdiscott	199.39	As above
Axminster	28.78	As above
Bridgwater	57	As above
Exeter	232.8	As above
Indian Queens	118.2	As above
Landulph	0	No new DER
Taunton	85.2	Multiple technologies, primarily ESS and renewables
Total	**746.52**	

Figure 24: DER Connections Released

Supporting information

We have now contracted 1113.69 MW of new DER schemes with WPD, most of which are Energy Storage Systems (ESS) or Renewables. Currently 8 of their 11 GSPs in the South West are operating under the Regional Development Programs (RDP). RDPs were set up to provide detailed analysis of areas of the network which have large amounts of DER and known transmission and distribution network issues in accommodating that DER. The idea is to use this analysis to innovate and push the boundaries of current thinking with a “design by doing” approach to resolving the issues. We are supportive of a movement towards DSO type solutions and informing thinking for the DSO debate. WPD are also in discussions with the ESO to develop RDP4 across the Midlands region. RDP4 is specifically for WPD and only applicable to ESS at GSPs that are already reaching demand compliance limits. Its purpose is to introduce conditions into the DER contract with the DNO that prevents them charging the battery at times of peak demand, and so therefore excluding them from the compliance calculation and mitigating the need for new assets.

By introducing the concepts of RDP, visibility and control has enabled embedded generators to enter into ESO contracts and be paid for resolving certain system constraints. The local DNO also has the added benefit of additional time to make offers.

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

Metric 11 – System access management

Apr – Sept 2019 Performance

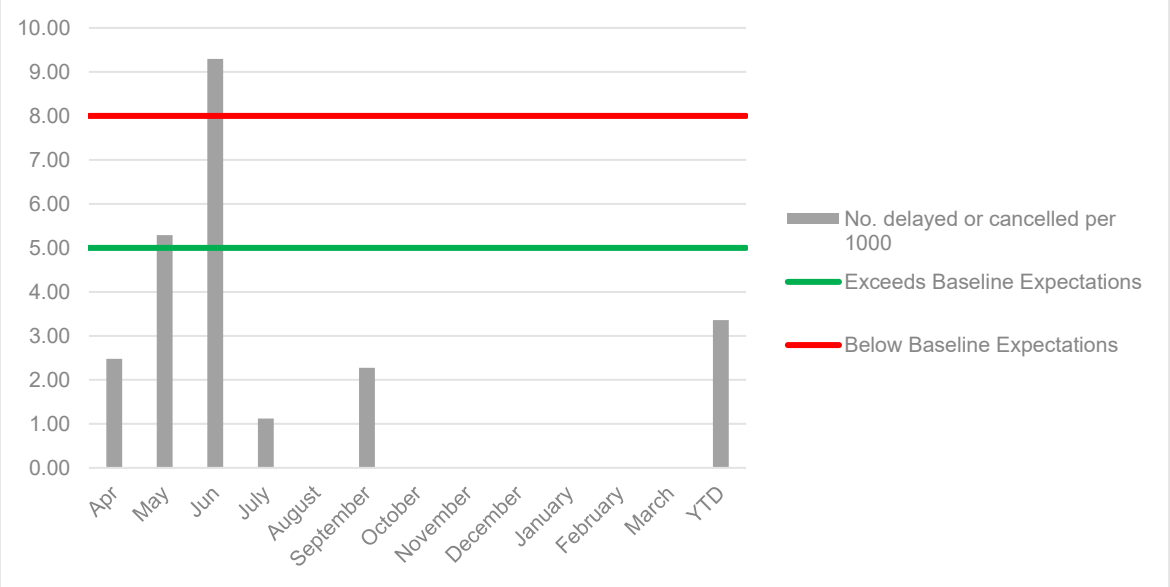


Figure 25: Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

Supporting information

The reason for the lower than expected Q1 performance was due to discrepancies in the power system modelling tool and the data fed into the model. The data feed from the Energy Forecasting System (EFS) which provides network demand data was identified as the root cause of the outages being delayed or cancelled. The system has been reviewed and the replacement is being worked on as described in the ESO Forward Plan. As a result, it will tell us when there is incorrect metering or discrepancies between the historic data which the forecast is based on. It will also provide a greater breakdown of demand forecasts throughout the day to increase the accuracy.

Within Network Access Planning, we have not had any significant issues with the demand predicted from EFS or if there has been an issue, it has been manually resolved by applying engineering judgement and cross checks in the weeks leading up to the outage. We have not had any outages where the demand has significantly differed from the forecasted value. This has resulted in us consistently exceeding the benchmark for Q2 performance.

We are continuing to focus on driving down process errors and in August we did not have any cancellations or delays.

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

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 encourages us to focus on creating and capturing added value for our customers and stakeholders as part of the network access process.

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

This work can benefit end consumers if we spend less managing system constraints, and can benefit connected customers (e.g. generators) if the volume of MW and/or duration they are constrained off is reduced (particularly if they have non-firm 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.

Apr – Sept 2019 Performance

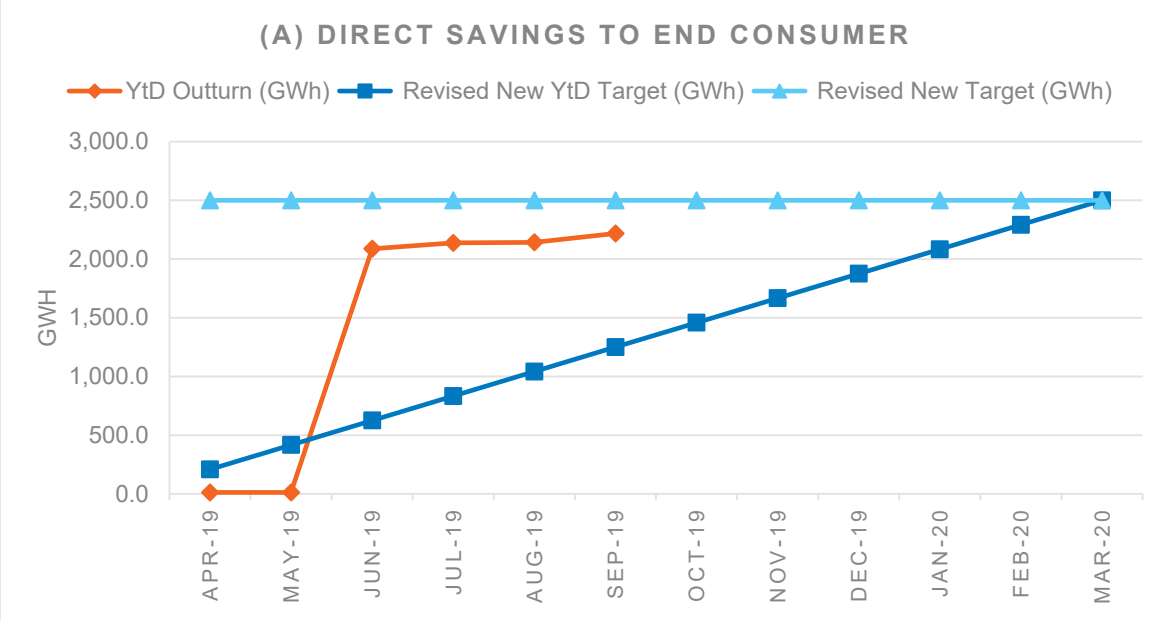


Figure 26: Customer Value Opportunities

Performance benchmarks

Direct savings to end consumer:

- **Exceeds benchmark:** Greater than 2,600,000 MWh
- **In line with benchmark:** Between 2,500,000 MWh and 2,600,000 MWh
- **Below benchmark:** Less than 2,500,000 MWh

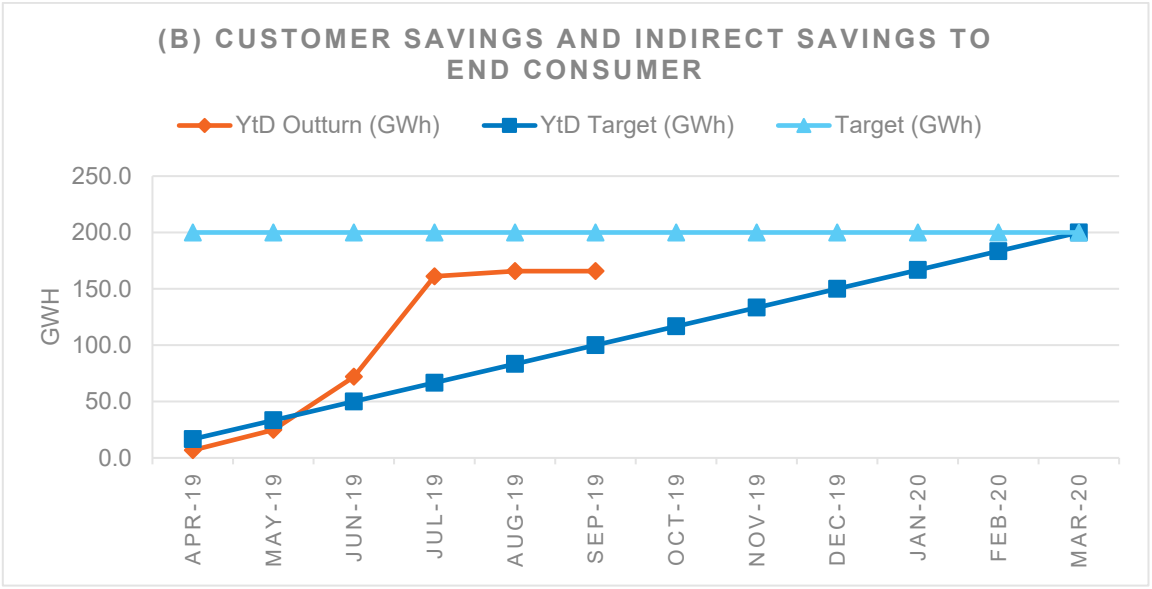


Figure 8: Customer Value Opportunities

Performance benchmarks

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

Supporting information

Following the success of the metric results last quarter, all teams in Network Access Planning (NAP) have continued to find better ways of doing their work. We continue to challenge the transmission outage plans requested by the three TOs (NGET, SHET and SPT) to find savings to benefit the end consumer.
NAP has continued to make excellent progress this first half of the 2019/20 performance year, we are currently exceeding our year to date targets for both direct (fig. 26) and indirect (fig. 27) savings to the end consumer.
Currently, NAP has identified and recorded more than 35 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.

As stated in the Q1 report as part of our learnings from the metric development, we have revised the metric targets for this quarterly reporting. This will ensure that the metric will continue to be challenging and drive strong performance in the coming months.

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

Metric 13 – Connections agreement management

Apr -Sept 2019 Performance

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	2	100%	●

Figure 28: Connections agreement management performance

Supporting information

We ensure that connection agreements correctly reflect any changes to the transmission system and benefit consumers by preventing unnecessary constraint costs.

This metric measures the number of connection agreements updated within nine months of notification.

So far three agreements have been identified

- One was completed in April 2019, within the nine-month timeframe.
- The second one was signed by the customer in July, within the nine-month timeframe
- The remaining one is with the customer.

Further agreements are being checked and will be added should a requirement to change the agreement be identified.

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.

Metric 14 – Right first-time connection offers

Apr – Sept 2019 Performance

Connections Offers	Results
Year to date number of connections offers	82
Year to date ESO related reoffers	9
Year to date percentage of Right First-time connections offers determined from ESO related reoffers	89%

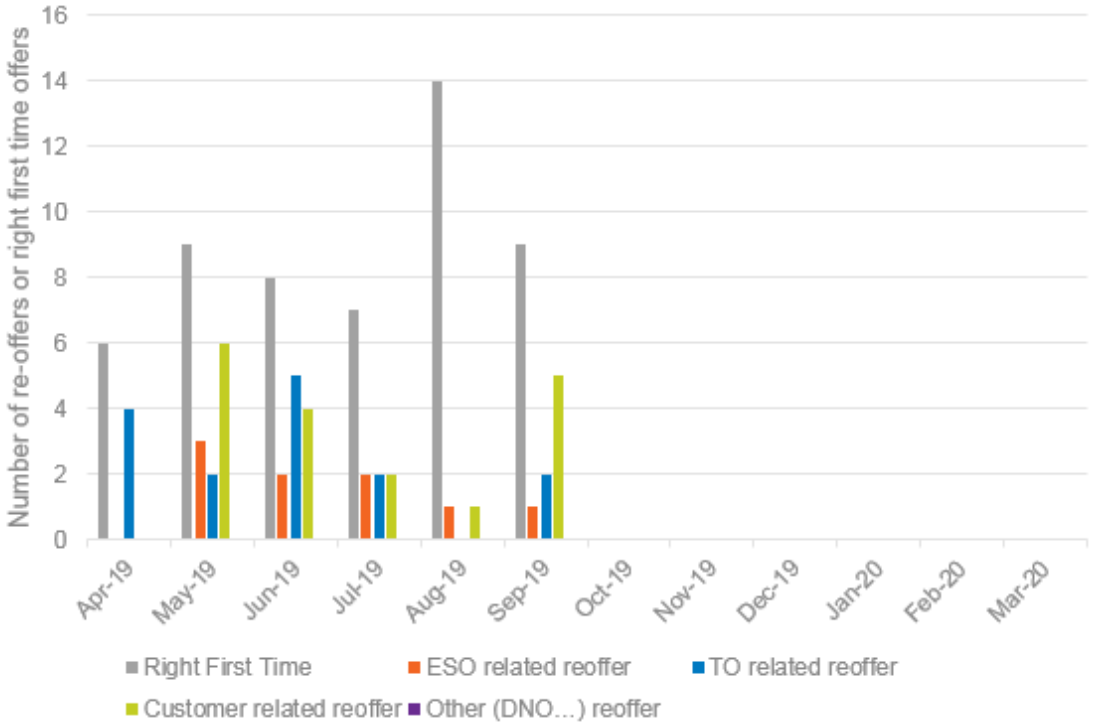


Figure 29: Connections offers monthly performance

Supporting information

We are aware of the continued underperformance relating to Right First Time (RFT) Connections for the 2019/20 year so far. From an England and Wales point of view, the issue having the biggest impact on this metric is the embedding of new processes and ways of working with the TO post legal separation, which is causing some issues in terms of quality and timeliness which we are working with the TO to address. NGESO are also experiencing an increased volume of applications, many of which are new types of connection that require bespoke agreements that differ from the standard, in particular tertiary connections which also tend to come through in bulk often resulting in multiple CUSC deadlines on the same day. This, coupled with the fact that legal separation coincided with the RFT target increasing from 90% to 95%, made the RFT metric particularly challenging this year.

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.

Metric 16 – NOA Enhancing Communication

Apr – Sept 2019 Performance

Engagement activities

- Commercial Solutions for Network Challenges event held on 16 May.
- NOA for Interconnectors workshop held on 17 April.
- Six webinars were held in April, May and July covering the NOA methodology, NOA for Interconnectors, Mersey high voltage pathfinder project, constraint management pathfinder and stability pathfinder.
- We published videos about the NOA on 4 July and 30 August.
- Stability pathfinder RFI published on 19 July.
- Early competition webinar held on 12 September and workshop on 26 September.

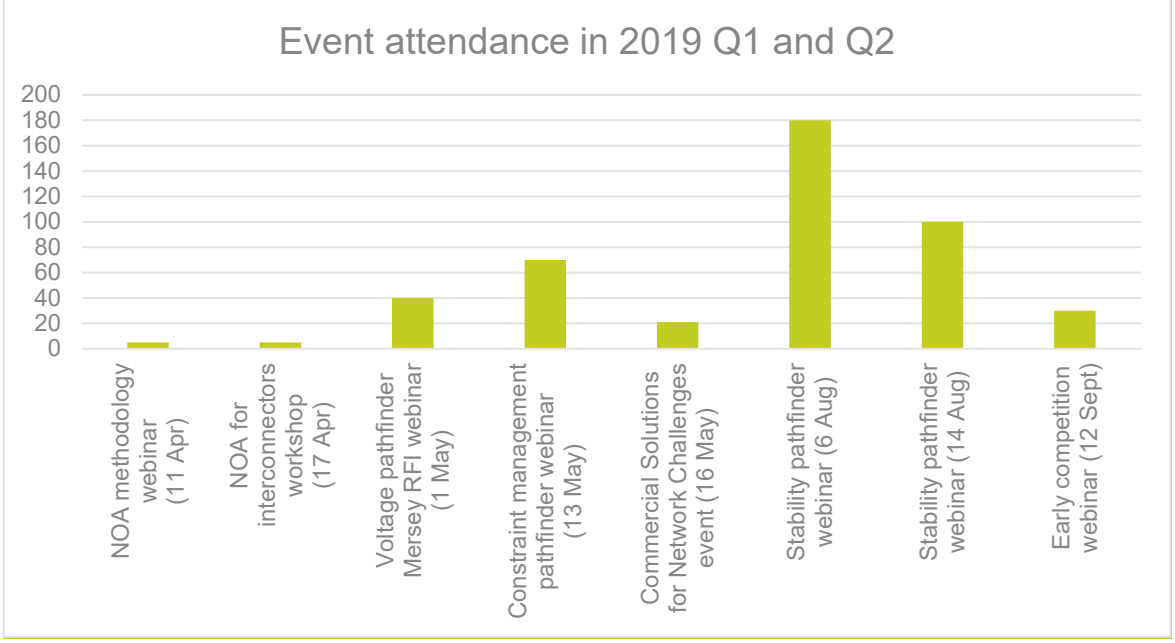


Figure 30: Event attendance

Supporting information

Across the first half of the year, we strengthened relationships with customers and stakeholders by delivering a pipeline of engagement events.

This metric made us focus on the importance of engaging with all stakeholders and 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 into any options assessment process. This will benefit the end consumer because we will be able to deploy the optimum cost effective solution. We have exceeded our benchmark because more people are participating in our events and giving positive qualitative feedback on our documents.

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.
- We published our System Requirement Forms on 31 July. These describe the needs that we identify that need to be met in order to manage the electricity transmission system in the future. We published the forms to widen the NOA and allow more parties to participate in providing options to meet the transmission system's needs. We want to refine the forms and are seeking stakeholders' views on how to make the forms more usable for them.
- NOA for Interconnectors: a workshop was held 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 was used to shape the draft NOA for Interconnectors methodology. Three consultation responses were received regarding the NOA for Interconnectors consultation. One stakeholder requested a one to one meeting regarding NOA for Interconnectors. 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.

For the Network Development roadmap and pathfinding projects

We have gained a large amount of input into our pathfinding projects from a wide range of stakeholders. Over 70 stakeholders attended our constraint management webinar, 17 responded to the Mersey voltage RFI, and over 20 attended at our Commercial Solutions event on 16 May. We held two webinars for the stability pathfinding project in August with 180 people joining the first one and 100 the second. From this, we published 100 questions in the Stability Pathfinder project Q and A pack. We have had 28 individual responses covering over 100 potential stability solutions. For our early competition project, we held a webinar on 12 September that 30 people joined and a workshop on model development on 26 September that 25 people joined.

National Grid ESO – Network Capability videos

We aim to make our network planning more accessible, and so we have published videos online to explain our work. They explain that we use the future energy scenarios to identify system needs and how the NOA process identifies solutions. The videos describe how the NOA process recommends when solutions should be delivered to achieve the best value for consumers, while maintaining system security and meeting environmental needs. The videos aim to encourage more participants to provide innovative and competitive potential solutions for the NOA process. The videos have had a total of over 300 views and they cover these areas:

- Network Planning for Zero Carbon
- National Grid ESO Network Planning Process
- The Future of the NOA Process

Click on link below to view video:

https://www.youtube.com/playlist?list=PLj-QmI1W1RfeoJts1TK5Ye7L554MXu5re

Performance benchmarks

- **Exceeds benchmark:** 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

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