nationalgridESO

2018-19 Forward Plan
End of Year Report
Evidence chapters

3 May 2019

Introduction

The purpose of this report is to provide evidence of our performance across each Principle against our 2018-19 Forward Plan. We present our performance against each evaluation criteria: outturn deliverables, metrics, evidence of delivered and future benefits and how we have engaged industry and acted on stakeholder feedback.

In response to performance panel feedback we have prepared an overview report with clear summaries of our performance for each of the principles

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Delivering consumer benefit

In all that we do, our mission is to deliver most benefit for consumers and while we don't have direct contact with consumers, they benefit from our activities in five ways:

Improved safety and reliability

The on-demand provision of electricity is a fundamental part of our modern life which must be continuously attended to with the utmost importance by the Electricity National Control Centre (ENCC) and supporting functions. We will continue our focus on system balancing and security at optimum cost in line with the expectations that Government, the regulator and the consumer have of us. We look further ahead, to ensure we can operate the system in the future, as it rapidly transforms with low-carbon, intermittent, non-synchronous and distributed generation sources.

Improved quality of service

Over recent years we have transformed our approach to engage deeply with all our stakeholders, listening to what they want from us, and delivering on that where we can, and where we cannot, explaining why. This rich stakeholder input has shaped how we do things and put much more of a focus for us on why and how we can improve our quality of service. Improved service quality ultimately benefits the consumer due to interactions in the value chains across the industry being more seamless, efficient and effective.

Lower bills than otherwise the case

We lower consumer bills by working to control, reduce, and optimise elements of the system charges which we can impact and influence. Theses charges are the Balancing Services Use of System and Transmission Network Use of System charges (BSUoS and TNUoS). These charges are levied on suppliers and transmission-connected generators, and passed through to end-consumers. We optimise across BSUoS and TNUoS linking our balancing decisions with our ***Network Options Assessments (NOA)*** so that in the long-term the economic and efficient outcomes are being driven when planning, developing and investing in the network. Nearer to real time we manage BSUoS by focusing on controlling, reducing, and optimising our spend on balancing and operating the system. These charges flow through to the consumer bill from suppliers, therefore any reduction of this cost (approximately £1 billion of BSUoS and £3 billion of TNUoS per annum) will benefit the consumer.

Reduced environmental damage

Great Britain has committed to reducing its CO2 emissions year on year, and as the ESO we are at the centre of the transition to a low-carbon electricity system.
We therefore support new providers and technologies to enter and compete in the existing and new markets basing our decisions on the technical capabilities of providers. We also work innovatively to design novel solutions which ensure the system can operate safely and securely both now and in the future with large levels of intermittent and non-synchronous generation running. We are committed to being 'technology neutral', as market participants already have environmental costs priced into their products and services, for example through carbon price levies. We will not choose to procure from providers based on the fuel they use to generate power.

Benefits for society as a whole

By 2050, energy system decarbonisation efforts could add 19 million jobs and $52 trillion of gross domestic product (GDP) to the global economy, increasing the GDP of Northern and Western Europe by 1.25% and 2.5%, respectively. It could also generate a 15% increase in global welfare and reduce negative health effects caused by local air pollution by 60%.

PRINCIPLE 1

Support market participants to make informed decisions by providing user friendly, comprehensive and accurate information

Role #1
Managing system balance and operability

Principle 1
Support market participants to make informed decisions by providing user friendly, comprehensive and accurate information

AMBITION
Transparent accurate information to help market participants make informed investment decisions

Delivered benefits in 2018-19

- Improved confidence in forecasting with 'right first time' leading to BSUoS risk premia saving for consumers
- Improved user experience with development of self-service platforms
- Developed machine learning forecasting models leading to a more than 30% improvement in solar forecasting
- Launched the Carbon Intensity Forecasting Platform which leads to lower carbon emissions resulting in consumer benefit of £6m/year

£6m

£180m

Future benefits and long term initiatives

- Improved BSUoS forecasting leading to saving of £80m over the next 10 years (risk premia reduced over time as confidence in our forecasts improve)
- Improved Day Ahead demand forecasts (DA) and DA Balancing Mechanism Unit (BMU) wind generation forecasts with future savings up to £100m/year by 2024

Plan delivery and new ways of working

- Launched the Carbon Intensity Forecasting Platform
- Published the Investor, Customer and Stakeholder Roadmap
- Initiated ENCC 'visit days' and roadshows
- Utilised advanced machine learning technology to forecast national PV generation

65% New

35% Improved

Forward Plan 2018-19 deliverables

- ✓ Publish Future Energy Scenarios 2018
- ✓ Publish Summer and Winter Outlook Reports
- ✓ Publish Regional Carbon Intensity Forecast
- ✓ Mobilisation of demand forecast modelling review
- ✓ Implementing new energy forecasting tools, machine learning forecasting models, and cloud based systems
- ✓ Increase frequency, granularity and provide underlying assumptions of our energy forecasts
- ✓ Provide all energy forecasting data in one location
- ✓ Improve monthly BSUoS forecast accuracy and publish new report
- ✓ Publish the half hourly BSUoS forecast
- ✓ Webinars on ancillary and balancing services tender results
- ✓ Publish a schedule of ancillary and balancing services events and results for 19/20
- ✓ Publish daily balancing cost and the MBSS
- ✓ Review MBSS and improve granularity and scope of data provided
- ✓ Improvements to MBSS and FFR Market Information Report (MIR)
- ✓ Increase granularity of constraint costs and volume data
- ✓ Publish trades data at near real time
- ✓ Develop new 'Market Efficiency' metric to track market competitiveness and intervention by the ESO
- ✓ Publish tables of the information provided
- ✓ Hosting Electricity Operational Forum quarterly
- ✓ Publish an 'investor, customer and stakeholder roadmap'
- ✓ Commit to providing an FAQ document
- ✓ ENCC visit days

Stakeholder

- Future Energy Scenarios event with over 400 attendees with 98% positive feedback including (out of 5): Transparency in process (3.6), Timely in delivery (3.9), Use expertise to guide (4.1), Make things simple (3.9), Easy to work with (3.9)
- Quarterly Electricity Operational Forum with 120 attendees with score of 75%
- Ancillary and balancing services tender webinars with 44+ attendees
- Monthly ENCC visit days with positive feedback

Performance metrics

Metric	Performance
Metric 1: Commercial assessment transparency	Performance against targets is generally good with green across the board except right first time in FFR
Metric 2: Daily BSUoS provision	100% On time
Metric 3: Trades data transparency	We exceeded our baseline performance target of 90%, hitting 99% over the year
Metric 4: Forecasting accuracy	Exceeding baseline and accuracy with improvement on the last 3 year average of 12% for demand forecast and 3% for wind forecast

1. Evidence of Delivered Benefits in 2018-19

- ✓ Improved confidence in forecasting with 'right first time' leading to BSUoS risk premia saving for consumers
- ✓ Improved user experience with development of self-service platforms
- ✓ Developed machine learning forecasting models leading to a more than 30% improvement in solar forecasting
- ✓ Launched the Carbon Intensity Forecasting Platform which leads to lower carbon emissions resulting in consumer benefit of £6m/year

More accessible and transparent information provision, and improved forecasting are the main areas we focus on within this principle. Better performance in these areas leads to:

- Increased investor confidence in ability to invest in assets, new technologies, and solutions for future market requirements
- New entrants and technologies entering markets, and
- Better functioning markets.

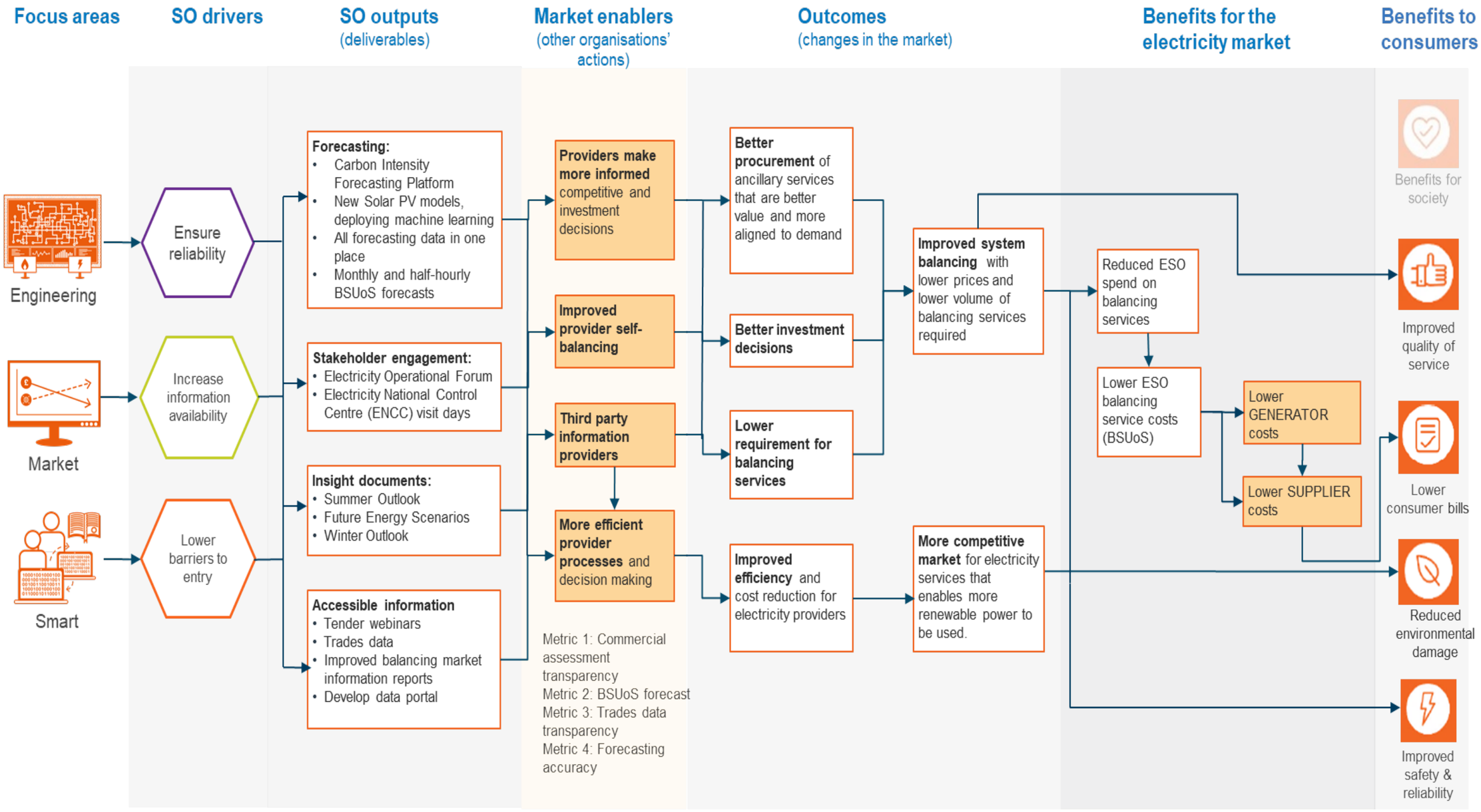
These outcomes deliver **lower bills** through enhanced competition in markets; **reduced environmental damage** as much new generation connecting is low-carbon; **increased system reliability and security** from a diverse base of new entrants and technologies; and **better quality of service to our customers** flowing through to the end consumer as our customers can reduce their effort dealing with our processes.

We are delivering these outcomes through:

- Energy forecasting – we delivered 9% year-on-year (YoY) reduction in day-ahead demand forecasting error (a 12% reduction when compared with the 3-year average); 2% YoY reduction in BMU wind forecasting error (3% compared with 3-year average); 5% YoY reduction in in-day demand forecasting error. We implemented a machine learning platform for solar PV forecasting which resulted in a more than 30% improvement in the modelling error and completed weather optimisation and solar radiation NIA projects.
- Reporting and forecasting – we listened to stakeholders, and are improving how we report balancing services data, trades and delivering new BSUoS forecasting based on their input.
- Carbon Intensity Forecasting – we launched a carbon intensity forecast platform, which allows end-consumers to adjust their electricity consumption behaviour based on how 'green' the generation is predicted to be.
- Industry-recognised flagship suite of informative publications – covering Future Energy Scenarios and Outlook Reports.
- Running stakeholder visits to the ENCC and hosting regular Operational Forums.

Figure 1 shows what drives us to prioritise our deliverables and activities within Principle 1, and how these deliverables ultimately provide benefit for the end consumer.

Figure 1: Principle 1 Consumer Benefit Map



Key examples of benefit we delivered this year are detailed in the following case studies.

Launched the Carbon Intensity Forecasting Platform

Consumer Benefit Outcome

Activity	The Carbon Intensity Forecasting Platform allows consumers to choose when to consume electrical energy based on the CO_2 emissions forecast from the generation mix, which can result in shifting consumer consumption patterns to optimise use of lower-CO_2 emitting generation, thereby reducing carbon emissions. E.g. a consumer could choose to charge their electric vehicle when there is a large volume of wind and/or solar energy forecast to be operating.
Delivered benefit	A conservative estimate in the reduction in CO_2 emissions is 0.5% or 0.36MtCO_2. Based on the UK Carbon Price Floor of £18/tCO_2, this would equate to a saving of **£6.5m.**
Basis of expected benefit	Currently a large volume of data requests are made through our website API, currently reaching **4.5m hits per month**. It is expected that consumers are changing their consumption behaviour due to access to this data telling them when is the most 'green' time to use electricity. The technology could also be integrated with 'smart' appliances/chargers, to automatically adjust consumption behaviour.

Deployed advanced machine learning for solar power forecasting

Consumer Benefit Outcome

Activity	In September, we successfully implemented an Advanced Machine Learning Technology to forecast National solar photovoltaic generation. This work is part of our deliverable: *Implementing new energy forecasting tools, machine learning forecasting models, and cloud-based systems.* This new AI solar model improves performance of National Demand Forecasts. Over the last summer our analysis shows that this state-of-the-art approach increases solar model accuracy by more than 30% on previous models. This new PV forecast is now published to the market daily via BM Reports. This is the 3pm forecast sent to BM daily at 5pm for the day-ahead. In our effort to deliver transformational innovation and tangible value to the market, we are committed to publishing these new PV forecasts hourly to the market. This is a key milestone in our path to deliver relevant innovations to the market to improve forecasting accuracy that would ultimately benefit consumers by lowering the cost of balancing the electricity network. This is the first of many forecast innovations we are delivering to enable a more efficient operation of a decarbonising electricity grid.
Delivered benefit	Over the last summer our analysis shows we increased the solar model accuracy (mean absolute error) by more than 30% on previous models. This new PV forecast is now published to the market daily via BM Reports.

	Lower forecast error leads to lower bills due to a lower BSUoS cost of ENCC acting as residual balancer, and the amount of reserve and response we need to operate the system. This step-change in capability also positions us to be able to operate a very low-carbon system in the future, enabling large amounts of renewable intermittent generation to be accommodated on the system.
Basis of expected benefit	More accurate forecasting of PV generation will help the market better self-balance, and also help the ENCC complete the residual balancing more efficiently. This will lead to lower costs for consumers, through a lower BSUoS charge. A good PV forecast will also help market participants position themselves in the market. This is of particular benefit to the increasing number of smaller organisations who may not have access to in-house forecasting capability, or the resources to pay for forecasts.

2. Evidence of Future Benefits /Long term Initiatives

- ✓ Increased competition in balancing service markets leading to savings of £350m over the next 10 years
- ✓ Improved BSUoS forecasting leading to saving of £80m over the next 10 years (risk premia reduced over time as confidence in our forecasts improve)
- ✓ Improved Day Ahead demand forecasts (DA) and DA Balancing Mechanism Unit (BMU) wind generation forecasts with future savings up to £100m/year by 2024.

Accessible and transparent information reduce barriers to entry in balancing markets which increases competition and lowers costs. Better information provision also facilitates better functioning existing markets, with participants better understanding our needs and how to offer services more competitively. Examples of the future benefit we are delivering are detailed in the following case studies:

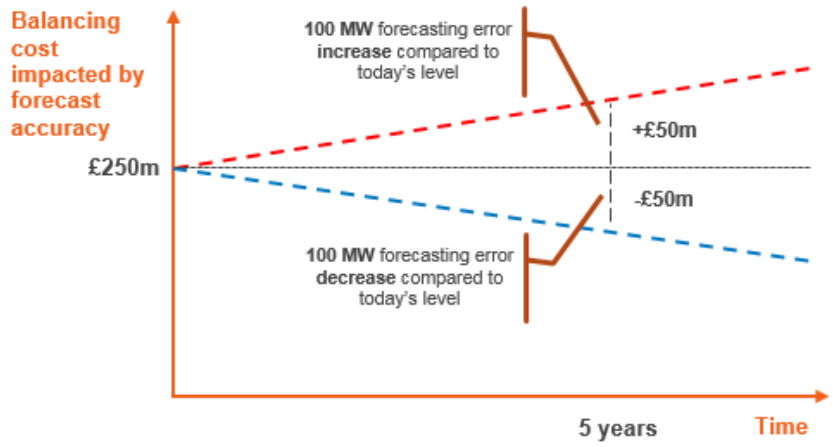
Consumer Benefit Outcome

Improved BSUoS forecasting

Activity	We are working to improve our BSUoS forecasts in all timescales. Suppliers can act on this better-quality information to reduce the level of risk premia that they add to the consumer bill to account for BSUoS volatility and uncertainty.
Key Principle 1 deliverables	• Improve monthly BSUoS forecast accuracy and publish new report • Deliver half hourly BSUoS forecast • Metric 2 – BSUoS Forecast Provision • Metric 20 (reported under principle 4) – Month ahead BSUoS forecast vs outturn
Delivered and future benefit	**Up to £80m over the next 10 years.** We deliver this benefit through lower bills due to a reduced risk premia component being held by system users.

Consumer Benefit Outcome

Improved accuracy of energy forecasting

Activity	Accurate Day Ahead (DA) demand forecasts and DA Balancing Mechanism Unit (BMU) wind generation forecasts are essential to support the market to balance its position ahead of real time. Accurate and timely forecasts are also essential to enable the ENCC to plan and operate the system securely and economically.
Key Principle 1 Deliverables	• Implementing new energy forecasting tools, machine learning forecasting models, and cloud-based systems • Increase frequency, granularity and provide underlying assumptions of our energy forecasts • Provide all energy forecasting data in one location
Delivered and future benefit	Accurate Day Ahead demand forecasts (DA) and DA Balancing Mechanism Unit (BMU) wind generation forecasts with future savings of **up to £100m per year by 2024.**
Basis of expected benefit	We estimate that an improvement in the accuracy of our demand forecasts by 100MW could result in £50m reduction in the annual cost incurred to balance the system compared to today's levels. We estimate that if we do nothing to improve our forecasts then the accuracy of the demand forecast is likely to decrease by 100MW over 5 years due to the increasing amounts of intermittent generation, DER, and changing consumer behaviour, which would lead to an increase in costs of £50m. As such, within five year, the difference between doing nothing and improving our forecasting could lead to a potential saving of £100m. As illustrated in Figure 2 if we do not react to address the increasing complexity of forecasting the electricity system, the annual cost of balancing the network related to the forecasting error is likely to increase (red dotted line); however, by improving our forecasting accuracy, this balancing cost can be reduced (blue dotted line). *Figure 2: Impact of forecasting accuracy on balancing cost* 
How benefit is realised in the consumer bill	System users pay for the cost of system operation through the BSUoS charge. Any change in this will directly affect consumers as it is a pass-through cost to them.

3. Plan Delivery and New Ways of Working

- ✓ Launched the Carbon Intensity Forecasting Platform
- ✓ Published the Investor, Customer and Stakeholder Roadmap
- ✓ Developed the Customer Data Portal Platform
- ✓ Initiated ENCC 'visit days' and roadshows
- ✓ Utilised advanced machine learning technology to forecast national PV generation

Across Principle 1, we have developed new ways of working that are beyond what is expected of a competent and efficient system operator. Over 50% of the deliverables are exceeding. Further, 65% of the deliverables are new ways of working, with 35% an improvement on baseline activities.

Outcome	2018-19 Deliverable	Target	Actual	Status
Improve confidence in our forecasts	Deliver Future Energy Scenarios 2018	Q2	Q2	Delivered
	Publish our Summer Outlook Report	Q1	Q1	Delivered
	Publish our Winter Outlook Report	Q3	Q3	Delivered
	Develop and publish Regional Carbon Intensity Forecast	Q1	Q1	Delivered
	Mobilisation of demand forecast modelling review	Q4	--	Superseded by the following three additional specific energy forecasting deliverables.
	Implementing new energy forecasting tools, machine learning forecasting models, and cloud-based systems	Q2	Q2	Delivered
	Increase frequency, granularity and provide underlying assumptions of our energy forecasts	Q4	Q2 2019/20	Delayed from original deadline due to refocus of our priorities to get ready to comply with upcoming European Network Codes.
	Provide all energy forecasting data in one location	Q4	Q4	All forecasts and historic demand data are now published in one place.
	Improve monthly BSUoS forecast	Q1-Q4	Q1-Q4	Delivered

	accuracy and publish new report			
	Half hourly BSUoS forecast	Q3	Q3	Delivered
Transparency of balancing costs	Webinars on ancillary service tender results	Q1-Q2	Q1-Q4	Delivered
	Publish a schedule of Ancillary and Balancing Services events and results for 19/20	Q4	Ongoing	We are currently seeking feedback on the usefulness of these webinars to assess whether to continue or whether a different channel would be more appropriate.
	Publish daily balancing cost and the Monthly Balancing Service Summary (MBSS)	Q2	Q1	Delivered
	Review MBSS improve granularity and scope of data provided	Q1	Q1	Delivered
	Improvements to MBSS and FFR Market Information Report (MIR) from customer feedback	Q4	Q4	We have improved the granularity of the MBSS and expanded it to include demand side actions, trading and BM. We have split out Rate of Change of Frequency (RoCoF) voltage and transmission constraints (previously they were all just constraints). We have also split out ancillary services and its component parts.
	Increase granularity of constraint costs and volume data	Q4	Q4	
	Publish trades data at near real time	Q1	Q1	Delivered – continually published on platform.
	Develop new 'Market Efficiency' metric to track market competitiveness and intervention by the ESO.	Q4	--	Metric 5 in the 2019-21 Forward Plan will measure the direction of travel away from bilateral arrangements, towards open and accessible market opportunities.
	Publish tables of the information we publish, with the frequency, granularity, accuracy and avenue of provision.	Q4	Q4	This has been incorporated into the investor, customer and stakeholder roadmap.

Channels for providing information to stakeholders	Hosting of our Electricity Operational Forum quarterly	Q1-4	Q1-4	Delivered – 4 sessions held with over 120 attendees
	Publish an 'investor, customer and stakeholder roadmap' to help customers navigate the information we publish	Q4	Apr 2019	This has been created and shared as a PDF. During the next quarter, we aim to embed this into the website to make a more user-friendly interface as a precursor to the data portal.
	Commit to providing an FAQ document following each new information item	Q4	Q4	During this year, we have shared a new FAQ document for tender round webinars.
	Develop a customer data portal for balancing cost data	Q3	Ongoing 19-20	Will be delivered in 2019-20. This has been delayed as we are considering what is the best enduring solution for providing this data. More detail on this can be found in our 2019-21 Forward Plan.
	Trial new ENCC visit days once every two months alongside Principle 2	Q4	Q4	The first one of these took place on the 12 March 2019. These have now been booked on a monthly basis due to high demand.

4. Stakeholder Evidence

- ✓ Future Energy Scenarios event with over 400 attendees with positive feedback including: transparency in process (3.7/5), timely in delivery (3.9/5), use expertise to guide (4/5), make things simple (3.9/5), easy to work with (3.9/5)
- ✓ Quarterly Electricity Operational Forum with 120 attendees at each session with a positive feedback score of 75%
- ✓ Ancillary and balancing services tender webinars with 44+ attendees
- ✓ Monthly ENCC visit days with positive feedback

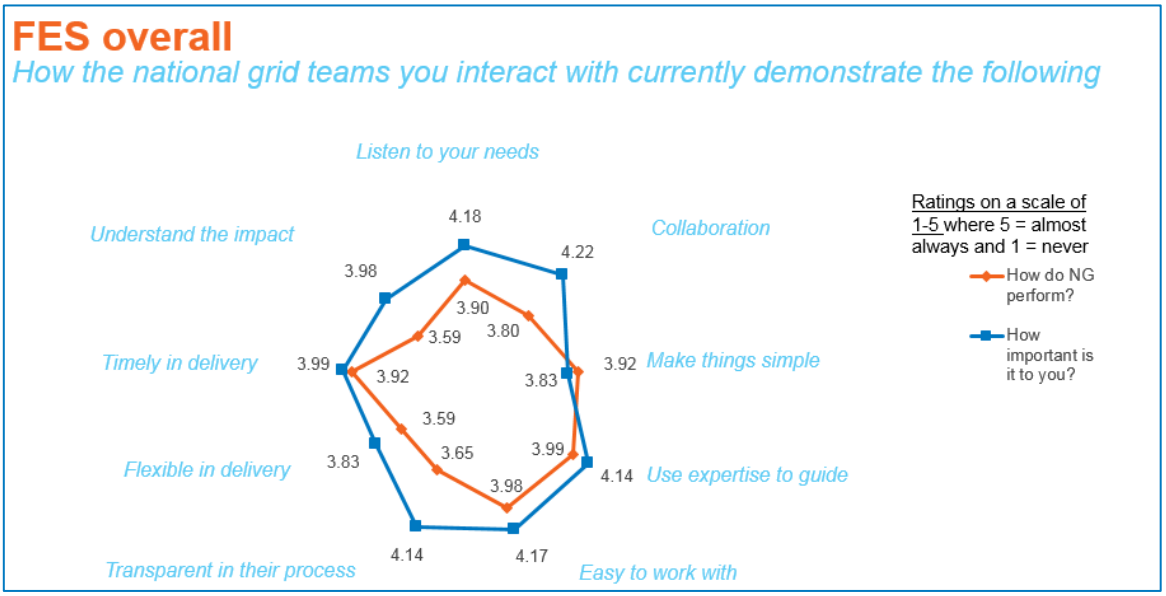
During this year, we have continued to use our established channels for communicating with our stakeholders as well creating new channels for more targeted interactions. We have

- Engaged with stakeholders on our FES using a consultation, six workshops, bi-laterals and webinars;
- Hosted the Electricity Operational Forum to around 120 attendees;
- Given tailored webinars on the ancillary services tender results;
- Started ENCC visits;
- Engaged with suppliers about our BSUoS forecasts.

Future Energy Scenarios (FES)

We publish our FES annually, which contains 4 credible scenarios for the future out to 2050. Our stakeholders tell us that the FES is a leading contribution to the debate around the future of energy. We published FES 2018 in July and hosted a launch event in London with over 400 stakeholders and viewed via a live-stream by 200 more. Stakeholders rated the conference at 8.7 out 10. This was followed up with a webinar. During September and October, we ran a call for evidence consultation for stakeholders to feed into the FES 2019. Which was followed by workshops, tailored workshops for heat and electric vehicles, webinars and bilateral meetings. Survey results showed feedback of: 'transparency in process' (3.7/5), 'timely in delivery' (3.9/5), 'use expertise to guide' (3.9/5), 'make things simple' (3.9/5), 'easy to work with' (3.9/5).

Figure 3: Results of FES 2018 stakeholder satisfaction survey



FES stakeholders told us they would like:	What will we do:
Early sight of the FES documents before the launch events and a data workbook that is easier to use	Make improvements to the data workbook and review how we share the FES suite, so stakeholders get the maximum benefit from the launch event.
More frequent updates throughout the year	Continue to give updates through our communication channels. We have already started to address this by publishing summaries of feedback from our call for evidence and the autumn workshops.
More detail on modelling and assumptions	We will look to provide more details on the assumptions and modelling by improving our data workbook and providing a detailed analyst session.
To see the changes from FES 2018 to FES 2019	As we did for the FES 2018 scenarios, we will provide a high-level summary of the changes from the 2018 to the 2019 scenarios at the time of FES 2019 launch.
Smooth process for webinar log in	Will complete full testing of the webinar functions before hosting the next webinar
Workshops to be included in the FES conference and flexibility in what to attend and more time to interact with FES team and delegates	We will explore different approaches to the launch for 2019 to reflect the varying needs and interests of our audience. We will consider holding a smaller briefing event for executives and senior leaders. This will be followed by a more detailed session for those that want more detail which will be held once stakeholders have had time to digest the FES information.

Electricity Operational Forum

The Operational Forum is an open industry forum run quarterly. This involves both a look back at performance and look ahead to what issues we are looking to address.

Feedback has been positive on the topics we have covered, and the event is well attended, usually with around 120 attendees at each session. The average score given is 7.5 out of 10 for the usefulness. We have focused the event around operational issues as this has always been the feedback received. We do provide networking opportunities as well as the come and see sessions over the lunch break, both of which have been put in place following feedback received. Following feedback from stakeholders that they want to learn in more detail what we do we have organised the ENCC visits with all the sessions being fully booked within one hour.

Ancillary services webinars

During this year, we have held monthly FFR tender feedback webinars which have had various levels of provider attendance. The majority of providers who gave feedback shared that they found the webinars useful especially when there was a special section in the webinar such as assessment process, tender proforma walk through.

Providers have told us that they would like a forward look at longer term requirements and improvements to the tender proforma. We have acted on this feedback sharing our longer-term requirements and improved our tender proforma which has resulted in a reduction in non-compliant bids on a monthly basis. Providers have also shared that they find the published slide pack very useful so this will continue with this along with a podcast of similar media.

For STOR we have held one webinar during this year following the tender which was well received. Providers shared some useful feedback about increasing transparency which has been acted on in the recent contract changes. Following questions about STOR usage at the Electricity Operational Forum we shared an update for market participants to clarify on this.

ENCC visits

Stakeholders told us at Electricity Operational Forum that they want to learn in more detail what we do, so we can work together more efficiently and effectively. We have scheduled monthly ENCC visits for stakeholders to come to our ENCC and engage with us around what we are currently doing and what we can do to improve the services we offer. These sessions were fully booked within one hour of the invitation going out and the first visit took place in March. During our first event we gathered feedback about how to improve these sessions and will include this for the future events.

BSUoS forecasts

Customers and stakeholders have asked for more transparency around BSUoS charges as these are becoming more unpredictable and making up a greater proportion of the cost of generation. In response, we have made a number of changes to the MBSS around BSUoS forecasts with more detail on these changes in the plan delivery section. We have not formally sought feedback on this specifically, but we have received positive feedback from industry about the Daily Balancing Costs report and Monthly BSUoS forecast, at the Operational forum and ENCC visits.

5. Outturn Performance Metrics and Justifications

Metric	Performance	Justifications
Metric 1: Commercial assessment transparency	Performance against targets is generally good with green across the board except right first time in FFR.	This right first time metric for FFR has delivered green for the final three months of the performance year despite the end result of red being unchangeable after two instances of the results not being published right first time prior to this.
Metric 2: Daily BSUOS provision	100% On time	The performance exceeds baseline as we have implemented new models and processes to provide this forecast to stakeholders. We have provided this 100% of the time since implementation.
Metric 3: Trades data transparency	We exceeded our baseline performance target of 90%, hitting 99% over the year.	This is a new system and process, implemented based on stakeholder feedback. Because the system and process are new, and because we did not build-in 99.9% IS uptime for economic reasons, we set the baseline target that we would publish 80-90% of trades information published within one hour.
Metric 4: Forecasting accuracy	Exceeding baseline performance. Day-ahead forecasts were above expectation 12/12 months. BMU wind forecasts were above expectations 10/12 months.	Day-ahead demand forecasting had a year-on-year reduction in error of 9%, and a 12% reduction compared with the last 3 year's average. BMU wind forecasting had a 2% year-on-year error reduction, and a 3% reduction compared with the 3-year average. In-day demand forecasts had a 5% year-on-year error reduction.

Metric 1 – Commercial Assessment Transparency

Table 1: Metric 1 Commercial Assessment Transparency Performance

Month	FFR		Fast Reserve		STOR	
	On time	Right first time	On time	Right first time	On time	Right first time
April	●	●	●	●	n/a	n/a
May	●	●	●	●	n/a	n/a
June	●	●	●	●	●	●
July	●	●	●	●	n/a	n/a
August	●	●	●	●	n/a	n/a
September	●	●	●	●	●	●
October	●	●	●	●	n/a	n/a
November	●	●	●	●	n/a	n/a
December	●	●	●	●	n/a	n/a
January	●	●	●	●	n/a	n/a
February	●	●	●	●	●	●
March	●	●	●	●	n/a	n/a
YTD	●	●	●	●	●	●

●	Published on-time	●	Published right first time
●	Not published on-time	●	Not published right first time

Performance against targets is generally good with green across the board except right first time in FFR. This right first time metric for FFR has delivered green for the final three months of the performance year despite the end result of red being unchangeable after two instances of the results not being published right first time prior to this.

This metric has renewed our focus on delivering results right first time, on time, in full. Process improvements have been made to mitigate against errors experienced during the year within FFR, and continued focus on delivering results right first time has prompted a deep dive into the FFR assessment process to identify and resolve any potential for non-compliance.

This metric delivers benefit 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 2 – BSUoS Forecast Provision

Table 2: Metric 2 BSUoS Forecast Provision Performance

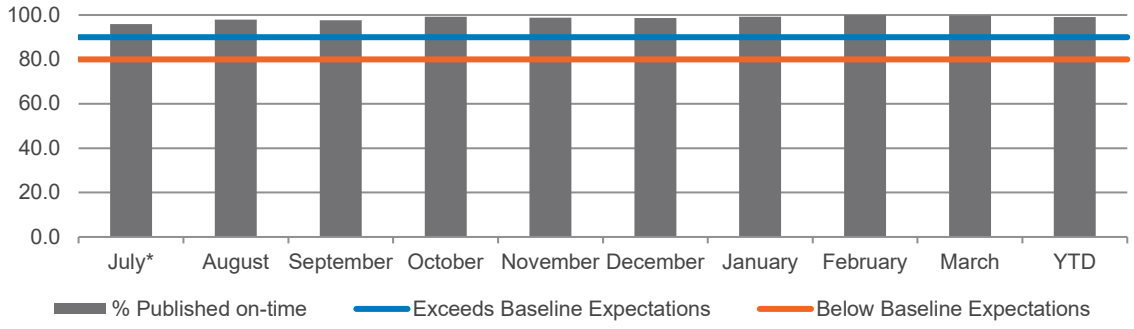
Month	Percentage on time delivery of half hourly BSUoS forecast	Performance
December	100%	●
January	100%	●
February	100%	●
March	100%	●
YTD	100%	●

100% on time delivery of half hourly BSUoS forecast. We are now publishing our half hourly BSUoS forecast on our website. We published this on time every working day in February ahead of the deadline of 08.00 of the day before for Tuesday to Friday and 17:00 Friday for the weekend forecast.

Full details of all metrics are here.

Metric 3 – Trades Data Transparency

Figure 4: Metric 3 Trades Data Transparency performance



**indicates that July performance only shows performance from 16th-31st July*

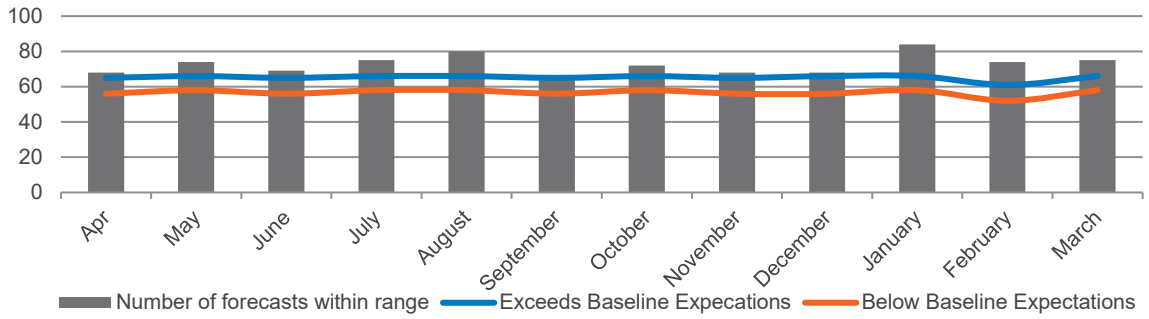
We have been publishing information about our trades on our new web portal since April. Since July we have been able to time stamp the trade allowing us to measure the elapsed time following the trade to its publication.

Our YTD performance is 99% of trades successfully published within 10 minutes of capture.

Metric 4 – Forecasting Accuracy

This metric covers the accuracy of our published DA Demand and Balancing Mechanism Unit (BMU) wind generation forecasts. To access the data that sits behind these metrics please click here.

Figure 5: Metric 4 Demand Forecasting performance



Day-ahead demand forecasts exceeded expectations against the metric target 12/12 months.

We delivered a 9% year-on-year reduction in forecasting error; a 12% reduction in error against the three-year average; a 12% reduction in large (>1GW) errors year-on-year; and a 6% reduction in large error against the three-year average.

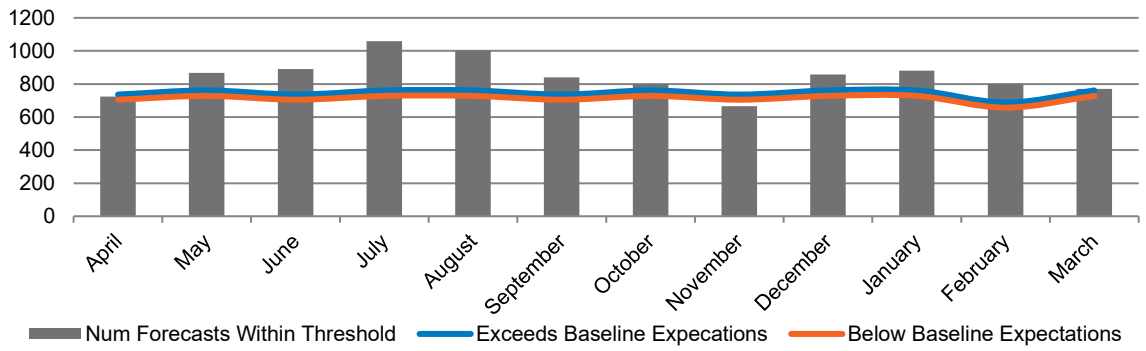
We published our forecasts on time 100%.

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

Our performance leads to:

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

Figure 6: Metric 4 Wind Forecasting performance



Wind generator BMU forecasts exceeded expectations 10/12 months, met them 1/12 months, and fell below standard 1/12 months.

We delivered a 2% year-on-year reduction in error; a 3% error reduction against the three-year average; a 39% reduction in large (> 20%) error year-on-year; a 55% reduction in large error against the three-year average.

We published on time 99.5% of the time. We have achieved a good performance in this area, particularly considering the ever increasing amount of wind generation connecting to the system.

PRINCIPLE 2

Drive overall efficiency and transparency in balancing, taking into account impacts of ESO actions across time horizons

Role #1
Managing system balance and operability

Principle 2
Drive overall efficiency and transparency in balancing, taking into account impact of ESO actions across time horizons

AMBITION
Delivery of secure supply while controlling balancing costs

Delivered benefits in 2018-19

- In performing our role to manage balancing costs we have delivered trading benefit through the balancing mechanism resulting in £490m of avoided costs
- We have reduced balancing spend by a further £129m due to our commercial and strategic actions including embedded protection systems change programme to leading to Vector Shift savings
- Control room optimisation leading to avoided cost of £42m

£660m

£670m

Future benefits and long term initiatives

- Addressing Future Operability Challenges leading to saving of £500m/year by 2029
- Changing embedded generator protection system with an accelerated change programme leading to £170m/year from 2022
- Better choice for consumers by enhancing competition and reducing barriers to entry

- Reduce time to connect to the grid from six months to <7 days for Fast Reserve
- Implementation of Ancillary Service Dispatch Platform (ASDP) in ENCC

Stakeholder

- Launched the IS Change Forum with 77% positive feedback
- Completed our Procurement Guidelines engagements and formal consultation
- Engaged with stakeholders on our innovation projects and completed formal consultation including a SO Open Innovation Day with 130 organisations in attendance with 100% positive feedback
- Shared our first Operability Strategy Report
- Developed the ancillary services dispatch platform (ASDP) for Fast Reserve

Plan delivery and new ways of working

- Enabled wider access to the balancing mechanism through product updates, innovative funding and procurement models
- Launched the IS Change Forum and TERRE industry days
- Developed the self service Platform for Ancillary Services (PAS)
- Worked collaboratively with European TSOs and preparation for EU network codes (TERRE Solution)

60% New

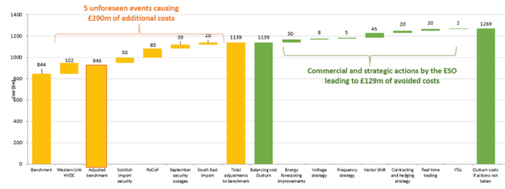
40% Improved

Forward Plan 2018-19 deliverables

- ✓ Balancing cost management
- ✓ Publication of improved Procurement Guidelines, and report, with a framework on our current approach to the procurement of ancillary and balancing services
- × Publication of the Future of ENCC Study, recommendations and scope of future work
- ✓ Successful hosting of the Operability Forum events and expansion of our channels to share
- ✓ Initiation and delivery of the IS Change Forum with terms of reference based on feedback from customers and stakeholders
- ✓ Consultation on innovation priorities and publication of the 2019-20 ESO Innovation Strategy
- ✓ Publish Operability Report on challenges, planned activity and stakeholder engagement
- ✓ Future GB system security planning
- × Embedding of enhanced inertia modelling tools and new inertia measurement capability
- ✓ Deliver new systems capability to enable participation of distributed resources within our balancing markets
- ✓ Deliver new systems capability within the ENCC, specifically PAS (Platform for Ancillary Services)
- ✓ Significant upgrading of IT systems to prepare for implementation of European Network Codes

Performance metrics

Metric	Performance
Metric 5: Balancing cost management	• Commercial and strategic actions leading to £129m of avoided costs • Trading benefit via balancing mechanism leading to £490m of savings



1. Evidence of Delivered Benefits

- ✓ In performing our role to manage balancing costs we have delivered trading benefit through the balancing mechanism resulting in £490m of avoided costs
- ✓ We have reduced balancing spend by a further £129m due to commercial and strategic actions including embedded protection systems change programme to leading to Vector Shift savings
- ✓ Control room optimisation leading to avoided cost of £42m
- ✓ Reduced time to connect to the grid from six months to <7 days for Fast Reserve
- ✓ Implemented Ancillary Service Dispatch Platform (ASDP) in ENCC

Our work in Principle 2 focuses on reducing the growth in balancing costs as the system, and user behaviour change. The costs we incur in maintaining a secure and operable network are passed through to the end-consumer through the BSUoS charges on system users.

Operating a complex, highly interactive and rapidly changing network is challenging. A significant amount of work relating to Principle 2 is focused on reducing the balancing costs through increasing competition, increasing liquidity in the markets we procure services through and driving down costs through optimisation.

We can influence the costs outcomes in a number of ways:

- Complex analysis to drive changes in the requirement for balancing services.
- Making changes to our markets to enable better procurement of our services which enables services to be provided at lower costs.
- Improving the efficiency of procurement to enable services to be provided at lower costs.

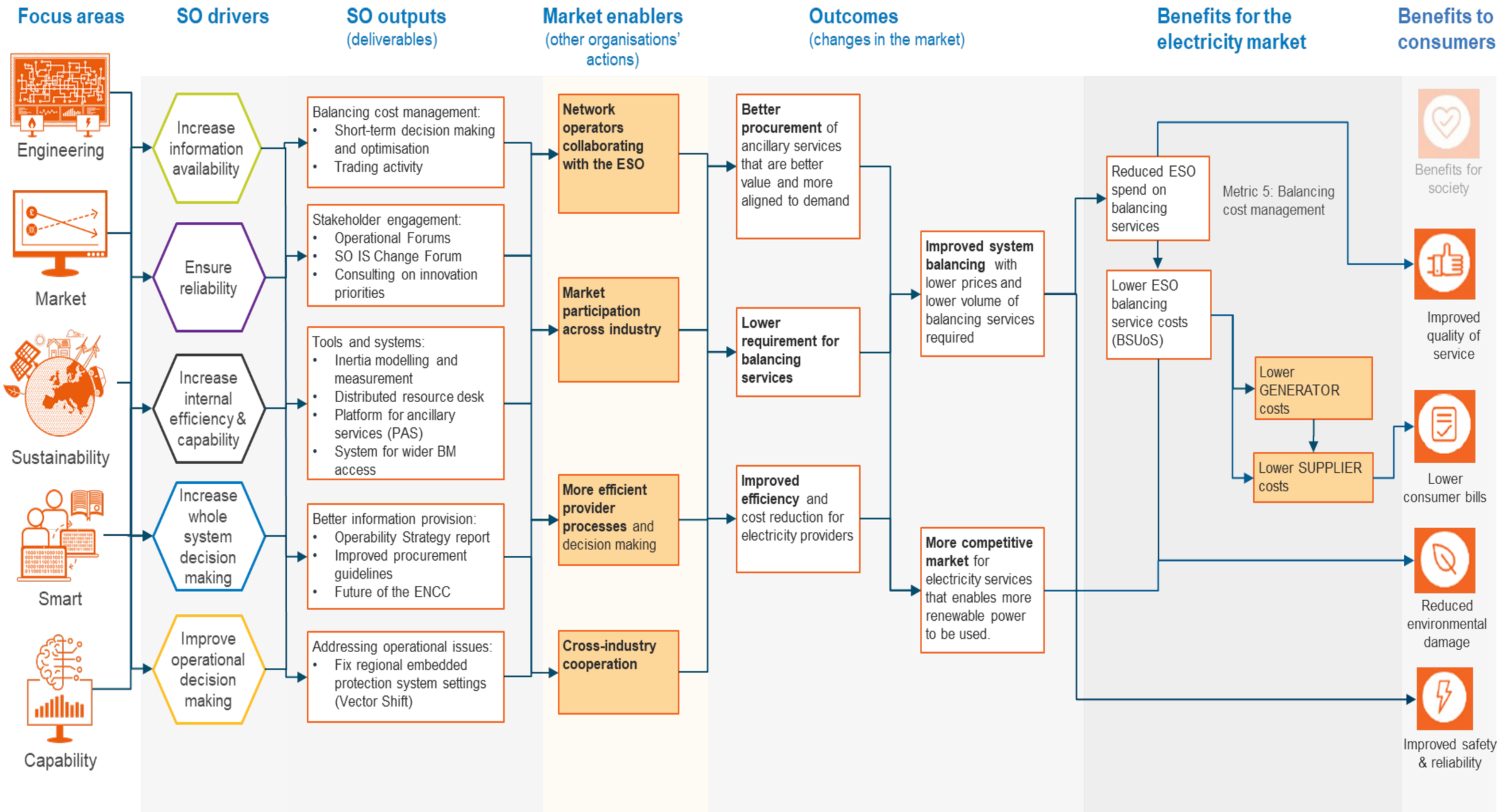
With the correct options available to us we are then able to optimise across a number of different spaces to reduce costs through effective short-term decision making, commercial options and trading.

A key area of development this year has been in improving our ENCC systems to enable us to access and dispatch new and additional generation and DER, delivering a Distributed Resource Desk and the first phases of the Platform for Ancillary Services (PAS). We have also done significant work to prepare for the implementation of TERRE, which will also enable wider access to the BM, all of which will contribute to managing costs.

We delivered improved service to our stakeholders this year, through delivering four Operational Forum events and initiation of the new ESO IS Change Forum. We also consulted on our Innovation Strategy and published reports on our Operability Strategy. These stakeholder-focussed activities enable our customers and stakeholders to better understand what we are doing and why, which can help the efficiency of the end-to-end process of electricity generation, supply, and transportation to the end-consumer. Efficiencies in this value-chain should hopefully be seen by the end-consumer through the service they ultimately receive, and the price they pay.

Figure 7 shows what drives us to prioritise our deliverables and activities within Principle 2, and how these deliverables ultimately provide benefit for the end consumer.

Figure 7: Principle 2 Consumer Benefit Map



We present some of the key ways we have delivered benefit this year in the following case studies.

Consumer Benefit Outcome

Trading benefit through balancing mechanism (as part of our role to manage balancing costs)

Activity	Trading actions are one of the key tools we use to manage system operation. We can use the Balancing Mechanism (BM) close to real-time to pay participants to flow additional power onto the network, reduce output, or take power from the network. Using our forecasts and models we are able to effectively take decisions at an earlier point than the balancing mechanism. When we can see clear benefit, we will use trades ahead of real-time where providers are able to offer us lower prices and avoid costly real-time instructions.
Delivered benefit	Over the last year, we completed over 9,000 trades. The counterfactual saving we made, versus taking actions in the BM or issuing emergency instructions, was £490m.
Basis of expected benefit	We calculate the benefit by comparing the price of each trade with the price of the alternative action. We sum this benefit for all the trades over the year to produce the overall saving of £490m. We only choose to enact a trade if our forward view shows that the trade will bring benefit, otherwise we will leave the action to be taken in the BM.
How benefit is realised in the consumer bill	We enact trades to make a saving over what we estimate the alternative cost would be in the BM, or through emergency actions. Therefore savings we make through a trade are reducing the amount we would have spent in the BM. That spend is levied on system users through the BSUoS charge, which is passed through to the end-consumer bill.
Additional non-monetary benefit	Many of the commercial actions result in reduced wind generation output on the system, for example when managing RoCoF, Response, and Headroom/Footroom operational issues.

Consumer Benefit Outcome

Control room optimisation

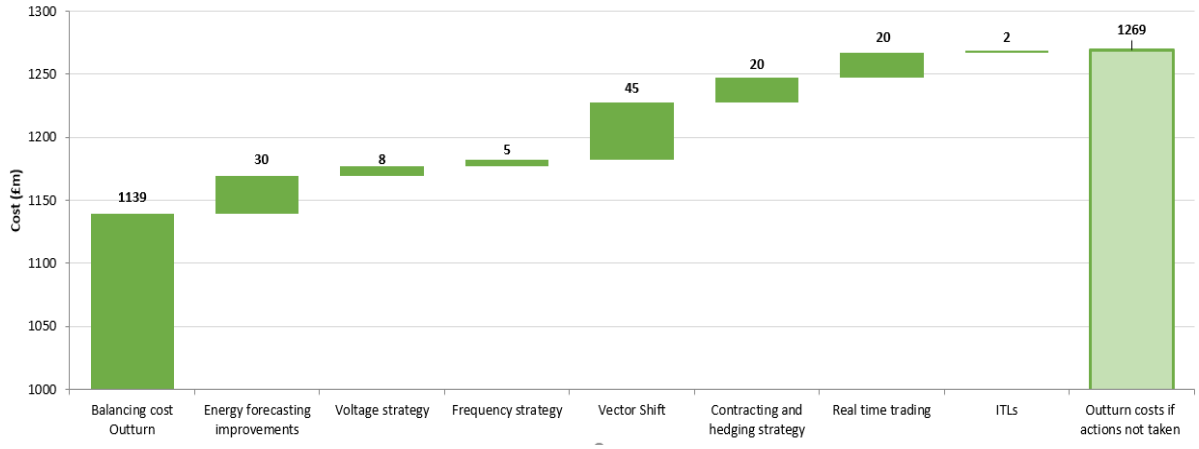
Activity	Our control room (ENCC) and associated supporting commercial and planning teams are making decisions on optimising the economic operation of the system on a daily and within-day basis.
Delivered benefit	**Up to £42m savings per year**
Basis of expected benefit	Our monthly performance reporting[1] includes detail on savings from short-term decision making. Based on savings achieved during late 2018 we noted avoided costs due to our actions of up to £3.5m per month (or £42m per year). There are many opportunities for the SO to create benefit by reducing the spend on operating the system by taking pro-active problem solving approaches including: • Continuing to refine operational analysis to reduce the required services to operate the network with in security standards – Savings this year in management of reactive power and frequency response services. • Relaxing operational limits where significant costs saving and minimal security impact can be identified. • Changes to our policies on restoration where we can still achieve the required technical capability but at lower costs. • Procurement of contracts to enable generators to run at lower levels during low demand periods reducing our negative reserve costs. • Continued Reassessment of constraint limits closer to real-time to reduce the number of constraint actions required. Re-configuring substation arrangements to optimise network flows and decrease congestion problems.
How benefit is realised in the consumer bill	We spend money to balance and operate the system which is levied on system users via the BSUoS charge. This is paid by system users who pass it through to end consumer via the bill. Any cost avoidance, reduction, or savings we make to this spend will directly benefit the consumer.

[1] https://www.nationalgrideso.com/about-us/business-plans/how-we-are-performing

Commercial and strategic actions to reduce balancing spend

In 2018-19, outturn balancing costs were £1,139m. As system operator we undertook a series of commercial and strategic actions which avoided a further £129m of costs as presented in Figure 8 below.

Figure 8: Commercial actions taken during 2018-19 that reduced balancing spend



If throughout 2018-19 we had not undertaken these seven actions, balancing spend would have been £1,268m or £129m higher. In particular:

1. Energy forecasting improvements, avoiding £30m of costs

   Changes to systems, processes and data have resulted in 5% improvement in demand forecasting accuracy across the year in and 8% reduction in large forecast errors. Our energy forecasting improvements have added £30m balancing cost savings.

2. Generate voltage strategies, avoiding £8m of costs

   Using complex power system analysis we generate voltage strategies to manage challenging periods. Across operational teams we increased the focus on voltage costs by implementing metrics to drive out performance saving £8m. We created a target for efficient voltage spend from the benchmark previous voltage cost.

3. Frequency strategies, avoiding £5m of costs

   Operating the network requires sharp focus on system frequency limits. We have operational and statutory frequency limits to provide confidence that we are able to manage the unexpected. Through increased focus on costs and further analysis we have implemented metrics to drive out performance saving £5m in 2018-19.

4. Vector shift programme, leading to £45m of savings

   Certain DER have a protection setting which at times, without effective management, can provide us with unacceptable system conditions. The costs of this management is significant as it requires a large number of costly actions. In May 2018, we spent £200k to reset relays on some embedded generators to mitigate the system stability risks that would otherwise have to be managed through other commercial actions. This resulted in a savings of £45m during the year.

5. Contracting and hedging strategy, avoiding £20m of costs

   Through effective forecasting and analysis, we are able to make decisions ahead of time where we are able to source services at a lower cost than in real time. Each year we implement contacts and procure services along our hedging strategy.

6. Real time trading, avoiding £19m of costs

   Through effective forecasting and analysis, we are able to make decisions ahead of time where we are able to trade services at a lower cost than in real time. We trade with various counterparties when there is financial benefit to doing this versus taking the commercial action in the BM. The value of the trades we have taken when there was a comparable action available in 2018-19 was £19m.

7. Interconnector Transfer Limits, savings £2m

   Interconnector Transfer Limits (ITLs) are an insurance policy against our trades on the interconnector being undone. An ITL is a safeguard to ensure our trades are effective. We have used ITLs in a targeted way in 2018-19 to reduce costs by £2m

Detailed case study of a commercial and strategic action: Resolution of system operation problems due to DER

Consumer Benefit Outcome

Activity	In Spring 2018 we identified a risk (vector shift loss) to the network that protection settings on some DER could results in an unacceptable security situation. During sunny weekend periods when the risk was highest the commercial actions to mitigate this risk were up to £1.5m. We identified a strategy to reduce the risk and hence avoid the costs. We worked with relevant DNOs to modify the protection systems of the at-risk DER, to deliver direct benefit to consumers through reduced system operation spend via BSUoS by removing the need to take commercial actions.
Delivered and future benefit	Up to **£45m in 2018-19**, and at least this amount every year into the future due to the specific problem being eliminated by our actions.
Basis of expected benefit	To calculate the benefit, we looked at the reduction in balancing costs due to avoided actions to manage the Vector Shift risk from transmission faults. Data used includes: • What the expected Vector Shift loss would have been, had no relays had been changed. • The outturn RoCoF (Rate of Change of frequency) trigger level. • A calculation of the cost of actions required to manage each event where the Vector Shift loss would have exceeded the RoCoF trigger level. We performed analysis from 1 June 2018 to 31 March 2019, the start date being once the majority of relays had been changed. This analysis was conducted on the price of synchronising additional units (offers) and the replacement price to balance those actions (bids).
How benefit is realised in the consumer bill	The benefit to the consumer from this work was immediate, in terms of the reduction to the BSUoS charge which should flow through to bills in the short term. BSUoS is levied on system users and passed through to the end-consumer bill.
Additional non-monetary benefit	An alternative solution would be to restrict the access of solar photovoltaic (PV) generation to the system at times of risk, and by not pursing this potential option, we contributed to increased environmental benefit due to solar PV contributing to the generation mix and displacing higher-carbon output generation.

Implementation of Ancillary Service Dispatch Platform (ASDP) in ENCC

Consumer Benefit Outcome

Activity	Ancillary Service Dispatch Platform (ASDP) is now live for non-BM Fast Reserve and non-BM Optional Fast Reserve. Historically the Fast Reserve market was dominated by Hydro Units as they were the only fuel types which could respond within the two minutes required for the service. As technology has evolved non-BM participants were eager to come to the market. However prior to ASDP implementation we did not have an mechanism of dispatching non-BM participants. The first two non-BM providers had their own discrete dispatch platforms which were owned by the market participants. This meant the Fast Reserve desk were at capacity of their dispatch platforms and created a barrier to entry.
Delivered and future benefit	£450k reduction in balancing costs and £80k reduction in removing the discrete dispatch platforms.
Basis of expected benefit	We will see a reduction in balancing costs as we enable more providers to participate in balancing services markets, increasing competition and ensuring we have full access to all market participants.
How benefit is realised in the consumer bill	Any reduction in balancing costs will result in a lower BSUoS charge, paid by system users, and ultimately passed through to the end consumer bill.
Additional non-monetary benefit	Once a provider has connected to the ASDP they are able to connect again for additional contracts or services i.e. STOR. Currently it would take a provider months to connect to ESO systems using Standing Reserve Dispatch (SRD) technology. We envisage that they will be able to connect to ASDP in a week. We are striving to reduce this to two days.

2. Evidence of Future Benefits / Long term Initiatives

- ✓ Addressing Future Operability Challenges leading to saving of £500m/year by 2029
- ✓ Changing embedded generator protection system with an accelerated change programme leading to £170m/year from 2022
- ✓ Better choice for consumers by enhancing competition and reducing barriers to entry

We continue to develop our ENCC systems to ensure they are able to accommodate new generation sources, DER and TERRE requirements. We are developing PAS to manage more of the balancing services we utilise. These IS platforms and processes will allow us to manage the system at optimum cost as we rapidly transform to a low-carbon economy, ensuring the end-consumer is not exposed to significant cost increases from the ESO.

Over the past few years we have seen operability challenges emerging on the system which did not exist before. Some of these challenges are costing significant amounts of money to manage through commercial actions, such as RoCoF. On the other hand, we have been able to rapidly address an operability related to Vector Shift protection systems as detailed previously.

In order to reduce the risk of being exposed to future system issue which threaten the safety, security, or economical operation of the system, we report on future potential issues through our Operability Strategy work, detailed in the case study following.

Consumer Benefit Outcome

Addressing future operability challenges

Activity	We use our engineering expertise to identify future operability challenges well in advance and communicate this to industry via our Operability Strategy reports. We will accompany this with proposals for how to address challenges from both technical and market perspectives. This will give advance signals to potential solution providers, so that we can be well placed to secure the system at optimum cost, avoiding expensive resolutions to operational scenarios which could have been foreseen.
Delivered and future benefit	Savings of £500m per year by 2029. The consumer will benefit directly from any savings, reductions, or cost avoidance we make in this area. If we do not focus on controlling system operation and balancing costs, industry views are that they could double or more over 10 years. We estimate we should be able to impact up to 50% of this projection, thereby avoiding spend of up to £500m per year in 2029. Benefits from work coming from our operability reports are already being seen, as reported elsewhere here, such as through our RDPs. We will see benefits arising from our focus on operability materialising over the next 10 years as we develop solutions to the operability challenges.
Basis of expected benefit	• External reports and academics have modelled that the costs of operating and balancing the system will rise significantly over the next 10 years: in some analysis, more than doubling.[2] • If BSUoS costs were to double in ten years compared to today's costs, as predicted by some observers, we are centrally placed to intervene to put mitigations in place. Our actions should be able to impact up to 50% of those additional costs due to operability challenges. That could result in consumer benefit of up to £500m per year by 2029. • We must take action, otherwise it is likely that the costs forecasted by these models and reports would materialise. • For example, the report 'Delivering future-proof energy infrastructure' states: "Analysis demonstrates that the value of ancillary services market, if supplied by conventional plant only, would increase about 10 times, which should provide strong incentives for non-traditional technologies and solutions to compete".[3]
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 will directly affect consumers as it is a pass-through cost to them.
Additional non-monetary benefit	Our focus on future operability will ensure the electricity system is secure and resilient in the future, enabling uninterrupted supply of power to consumers at optimum cost.

[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/568982/An_analysis_of_electricity_flexibility_for_Great_Britain.pdf
https://www.nic.org.uk/wp-content/uploads/Delivering-future-proof-energy-infrastructure-Goran-Strbac-et-al.pdf

[3] https://spiral.imperial.ac.uk/bitstream/10044/1/33703/6/TengStrbac_IEEE_V4_Revised_V15.pdf

3. Plan Delivery and New Ways of Working

- ✓ Enabled wider access to the balancing mechanism through product updates, innovative funding and procurement models
- ✓ Launched the IS Change Forum and TERRE industry days
- ✓ Developed the self-service Platform for Ancillary Services (PAS)
- ✓ Worked collaboratively with European TSOs and preparation for EU network codes (TERRE Solution)

Across Principle 2 all our deliverables were completed with 60% of the activities being a new way of working, and 40% a significant improvement on the current ways of working. This has led to the majority of deliverables exceeding the expectations of a competent and efficient system operator.

Outcome	2018-19 Deliverable	Target	Actual	Status
Transparency of our requirements and balancing activities	Balancing cost management	2018-19	2018-19	2018-19 outturn: £1,139.3m 2018-19 benchmark adjusted for unavailability of HVDC: £946.1m Please see further details under section 5, Principle 2.
	Publication of improved Procurement Guidelines, and report, with a framework on our current approach to the procurement of Ancillary and Balancing Services.	Q4	Q4	Following stakeholder support of proposed changes to C16 to provide additional clarity and transparency to market participants Ofgem will not be using their power of discretion to veto the proposed changes
	Publication of the Future of ENCC Study, recommendations and scope of future work.	Q2/Q3	Q2-19	The scope of this work package has increased, and as such we are delaying the publication of the study until we are sure we have gather all the input we need.
Engage with our stakeholders	Successful hosting of our 'Ops Forum' events and expansion of our channels to share information to support wider engagement of market participants and service providers.	Q1-4	Q1-4	Four Operational Forums run in 2018-19. Feedback has remained positive with over 120 attendees at each event.
	Initiation and delivery of the SO IS Change Forum with terms of reference based on feedback from	Q1	Q1-Q3	We held two SO IS Change forum as trade stand events. Feedback was positive for both events.

	customers and stakeholders.			
	Consultation on innovation priorities and publication of the 2019-20 SO Innovation Strategy.	Q2/Q4	Q2	Webinar held on 26 October 2018 to consult industry on current innovation strategy and request feedback for 2019-20. Approx. 40 attendees with 66% rating the webinar excellent and 33% good. We published our new SO Innovation strategy on the 5 April 2019.
Solve operability challenges and prepare for the future	Publish Operability Report on challenges, planned activity and stakeholder engagement.	Q3	Q3	Operability report published on 30 November 2018.
	Future GB system security planning.	2018-19	2018-19	Plan in place for delivery of RoCoF and Vector Shift relay retrospective change programme.
	Embedding of enhanced inertia modelling tools and new inertia measurement capability.	Q4	Q4	Tenders received and contract negotiations are underway to deliver solutions. Delivery of a new monitoring service now expected for January 2020.
Implement new systems	Deliver new systems capability to enable participation of distributed resources within our balancing markets.	2018-19	Q3	In January 2019, a new Distributed Resource Desk was implemented in the ENCC. This allows us to optimise small BM units, so they can compete on a level footing with other players. We have completed analysis to understand any potential capacity constraints with any of our operational systems as a result of growth in BM activity. We are also looking to address IT-related barriers to entry
	Deliver new systems capability within the ENCC, specifically Platform for Ancillary Services (PAS).	Q2	Q2	On track. STOR providers will start to be moved across to PAS during Q2 2019
	Significant upgrading of IT systems to prepare for implementation of European Network Codes.	2019/20	Ongoing	On track for TERRE prequalification and registration in February 2019.

4. Stakeholder Evidence

- ✓ Launched the IS Change Forum with 77% positive feedback
- ✓ Completed our Procurement Guidelines engagements and formal consultation
- ✓ Engaged with stakeholders on our Innovation projects and completed formal consultation including a SO Open Innovation Day with 130 organisations in attendance with 100% positive feedback
- ✓ Shared our first Operability Strategy Report
- ✓ Developed the ancillary services dispatch platform (ASDP) for Fast Reserve

During this year, across Principle 2 activities we have engaged with our stakeholders using new channels as well as existing formal consultations.

IS Change Forum

This year we have hosted two forum events with another held on 30 April 2019. The purpose of these events was to communicate the change landscape within the electricity industry and share with stakeholders about projects that will impact them as well as to seek feedback to ensure two-way conversation. We received positive feedback about these events with 77% of attendees telling us that the content was useful or very useful

Stakeholders have told us	What have
They would like a greater range of subjects and more in depth technical details	• Covered additional topics • Shared technical design details for the Balancing programme and Wider access
They would like to know what will be covered at each stand	Shared this detail at the stands and in the invitations to this event.

Procurement Guidelines

Annually we share with our stakeholders the balancing services that we may be interested in buying along with the mechanisms by which these could be bought in our Procurement Guidelines. To be update these this year we have engaged with stakeholders at a workshop and a formal consultation. For the workshop, we had 14 attendees and for the consultation we had 11 responses with a total of 39 questions. This is a large increase in the engagement we've received previously. We responded to the questions with changes and responses in the document published.

Innovation Strategy

During this year, we have been working to raise the profile of SO Innovation Strategy and the projects that are being run. To do this we have hosted a webinar for 40 industry attendees with 66% rating this as 'excellent' and 33% rating this as 'good'. Attendees thought it gave an 'in depth explanation' and a 'good introduction and clear explanation of process and rationale'. Other feedback included that there are 'too many priorities', and that we need to "distinguish between whole system for electricity, gas and energy", and that 'some priorities are too specific'. We incorporated all feedback into our refreshed strategy, published March 2019.

We received feedback that the SO's innovation needs to be more visible so we have increased attendance at events and are building a stakeholder engagement strategy. As such, we have:

- Presented to the Power Responsive conference where we received excellent feedback with 'audience understanding' from 28% to 85% of the 'audience understood' the SO innovation process.
- Held the SO Innovation workshops at the Electricity Operational Forum and attended the Low Carbon Networks Innovation conference.
- Attended many other events including Future Energy Scenarios events, the Power Potential dissemination event, Utility Week Live, ENA Energy Innovation Forums and the ENTSO-E meetings.

Operability Strategy Report

Our first Operability Strategy Report has been well received in the industry press and described as 'a very useful overview'. We have engaged with industry through the Electricity Operational Forum. More than 80% of responses were positive about the report when polled. Going forward, we will increase stakeholder engagement to raise awareness of the report as it meets a stakeholder need by giving an overview of our operability work.

5. Outturn Performance Metrics and Justifications

Metric	Performance	Justifications
Metric 5: Balancing cost management	£660m of avoided costs due to baseline and exceeding actions to reduce balancing spend	Actions to reduce balancing costs including: • Trading benefit via balancing mechanism (£490m) • Commercial and strategic actions (£129m) • Control room optimisation (£42m)

Metric 5 – Balancing cost management

Benchmark, adjusted benchmark and outturn performance

The benchmark of £844m is based on the rolling average of the past 5 years. This provides a trend line which helps create a statistical reference for the purposes of evaluating performance. As this is a statistical construct, the benchmark only indicates the potential costs on the basis of what has previously be seen. Table 2 highlights the areas where additional cost has been incurred above the expectations of the data trend of previous year. The benchmark also had an adjuster to allow for the benefit of the Western Link High Voltage Direct Current (WLHVDC). For large parts of this year this has been out of service so we have removed the benefit that we would expect from WLHVDC for those months.

Table 2 below shows the original benchmark cost, and the adjusted benchmark, as compared to the outturn costs (actual). For monthly breakdown of costs, please refer to the hotspots and the accompanying data tables found here.

Table 3: Metric 5 Balancing Cost Management performance by month

Month	Benchmark cost (£m)	Adjusted Benchmark (£m)	Outturn cost (£m)
Apr-18	56.9	62.6	**56.3**
May-18	68.3	72.9	**59.4**
Jun-18	90.7	102.9	**84.6**
Jul-18	65.2	74.3	**78.3**
Aug-18	72.4	86.5	**72.8**
Sep-18	57.5	71.4	**140.2**
Oct-18	99.6	129.1	**145.6**
Nov-18	70	70.0*	**107.9**
Dec-18	79	79.0*	**96**
Jan-19	65.8	65.8*	**78**
Feb-19	52	56	**80.2**
Mar-19	67.1	75.6	**140.1**
YTD	844.3	946.1	**1139.3**

**no adjustment needed as WHVDC was in service*

Figure 9 shows the original benchmark set for balancing costs, and the additional costs which we have incurred which were not accounted for. Across these **five** activities, there have been **£294m of unforeseen costs** across 2018-19. We explore each of these events further in Table 4.

Figure 9: Adjustments to 2018-19 benchmark

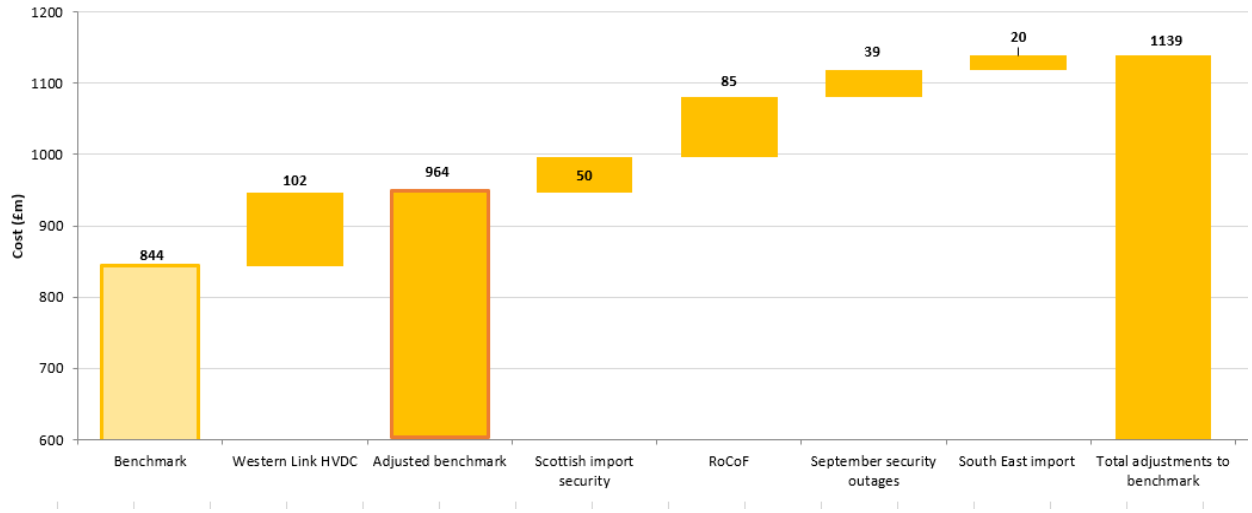


Table 4: Impacts on Cost Benchmark

Name	What it is	Unforeseen impacts on 2018-19 outturn	Size of Impact
Scottish import security	A number of unforeseen extended generation outages affected our operating plans and required significant management to ensure Scottish import security	£50m was the cost of contracts required to maintain Scottish import security which would not have been seen in the trend line data.	**£50m**
Western Link HVDC	The WLHVDC increases the export capability of energy from Scotland to England. When in service this link is able to export more wind energy from Scotland to England and hence requires less ESO actions to manage the overall network.	The WLHVDC was out of service for large parts of the year and has reduced capacity due to local system issues, so the benefit provided by the WLHVDC has been removed for the months it was unavailable. Total cost savings of the WLHVDC is £102m less than forecast. The increased cost was also driven by much higher wind outputs across 2018-19 compared with previous years (30.8TWh in 2018-19 vs 25.8TWh in 2017-18).	**£102m**
RoCoF	A number of DER have a protection setting that provides us with an additional operational constraint. The actions to manage this constraint increase as non-synchronous generation increases, low system demand periods and an increase in certain units load factors.	2018-19 saw a number of units running at higher load factors than during previous years. Combined with a larger number of lower demand periods during the summer, a windier autumn winter and an increase in Solar PV outputs led to a larger than expected increase in RoCoF costs for 2018-19.	**£84m**

September security outages	With the unplanned station shutdown at Hunterston, we needed to accelerate transmission outages, and bring some forward into September and October so we could maintain system security into October and across the winter. Outages that would normally be planned consecutively needed to happen concurrently.	During this time the wind output was also higher than in previous years so this drove the costs up further, combined with the WLHVDC being out of service. We estimate an additional £38m to manage these outages compared with the trend line.	**£38m**
South East import	Managing transmission constraints is vital activity to ensure security and ensure safe operation of the transmission network.	Management of the South East part of the network is highly dependent upon interconnector flows. Additional requirements combined with increased flows on the network led to higher than previous trend spend in the area of £20m	**£20m**
TOTAL IMPACT TO BENCHMARK			**£294m**

In conclusion, when accounting for the impacts of these unforeseen costs including those incurred due to outages of the WLHVDC we believe that balancing cost management has met its full objective of demonstrating strong performance of an efficient and competent system operator. We discuss our performance below in respect of additional actions we have taken to proactively manage balancing spend.

Commercial and strategic actions which led to further reductions in balancing spend

Figure 10 shows the outturn balancing cost (actual), and the additional costs which would have been incurred had we not taken commercial and strategic actions. These commercial actions are explored further in Table 5.

Figure 10: Commercial and strategic actions taken during 2018-19 that reduced balancing spend

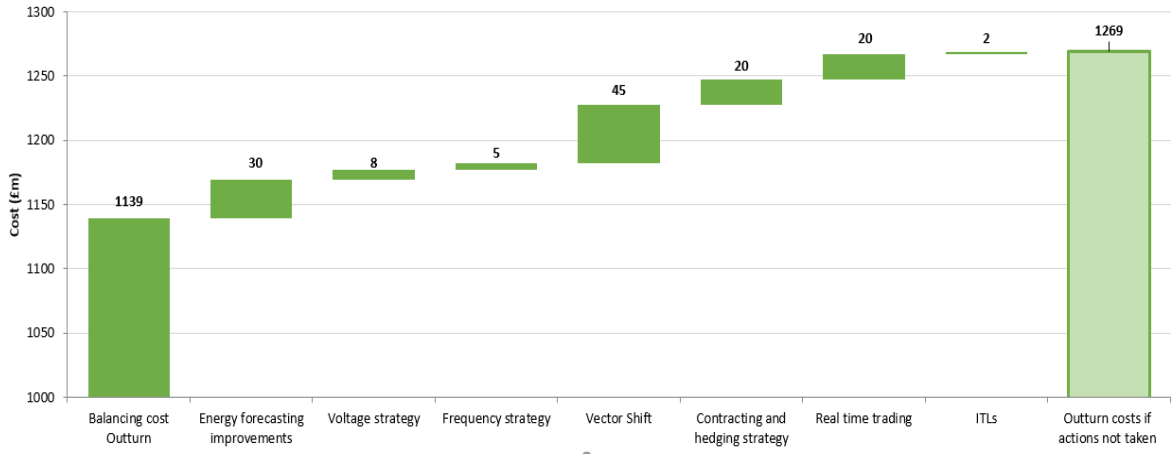


Table 5: Specific reductions to balancing spend in 2018-19

Name	What it is	Unforeseen impacts on 2018-19 outturn	Size of Impact
Energy forecasting improvements	Ensuring that the market at the ESO have accurate energy forecasts reduces uncertainty and means optimising across a	Changes to systems, processes and data have resulted in 5% improvement in demand forecasting accuracy across the year in and 8%	**£30m**

	narrower space resulting in lower operational costs	reduction in large forecast errors. Our energy forecasting improvements have reduced balancing costs by £30m.	
Voltage strategy	Maintaining the networks with the voltage standards is a key security requirement for the ESO. Using complex power system analysis we generate voltage strategies to manage challenging periods.	Across operational teams we have increased the focus on voltage costs by implementing metrics to drive our performance, saving £8m this year. We created a target for efficient voltage spend from the benchmark previous voltage cost.	**£8m**
Frequency strategy	Operating the network requires sharp focus on system frequency limits. We have operational and statutory frequency limits to provide confidence that we are able to manage the unexpected.	Through increased focus on costs and further analysis we have implemented metrics to drive out performance saving £5m.	**£5m**
Vector shift	Certain DER have a protection setting which at times, without effective management, can provide us with unacceptable system conditions. The costs of this management is significant as it requires a large number of costly actions.	In May, we spent £200k to reset relays on some embedded generators to mitigate the system stability risks that would otherwise have to be managed through other commercial actions. This saved up to £45m. See case study for more details.	**£45m**
Contracting and hedging strategy	Through effective forecasting and analysis, we are able to make decisions ahead of time where we are able to source services at a lower cost than in real time.	Each year we implement contacts and procure services along our hedging strategy.	**£20m**
Real time trading	Through effective forecasting and analysis, we are able to make decisions ahead of time where we are able to trade services at a lower cost than in real time.	We trade with various counterparties when there is financial benefit to doing this versus taking the commercial action in the BM. The value of the trades we have taken when there was a comparable action available in the BM was £19m.	**£19m**
Interconnector Transfer Limits (ITLs)	ITLs are an insurance policy against our trades on the interconnector being undone. An ITL is a safeguard to ensure our trades are effective.	We have used ITLs in a targeted way in 2018-19 to reduce costs by £2m.	**£2m**
TOTAL AVOIDED COSTS			**£129m**

PRINCIPLE 3

Ensure the rules and processes for procuring balancing services maximise competition where possible and are simple, fair and transparent

Role #2
Facilitating competitive markets

Principle 3
Ensure rules and processes for procuring balancing services maximise competition where possible and are simple, fair and transparent

AMBITION
Facilitate new business models and technology for balancing services market

Delivered benefits in 2018-19

- Reduced barriers to entry with 350+ market participants (increase from 20 in 2016)
  - Introduced standard procurement windows and long term seasonal procurement
  - Simplified and standardised Response and Reserve contracts
- Developed an auction trial for FFR with shadow auction in March 2019
- Standardised FRR products with 50% reduction of FFR Static price and 60% reduction of FFR dynamic price in 2018-19
- Streamlined the new provider onboarding process including interactive guidance documents and webinars. Published an improved testing process for participation in our services
- Enabled wider access to BM programme with updated procurement processes so new aggregators and batteries can participate in FFR and BM

£24m

£350m

Future benefits and long term initiatives

- Developed the Frequency response auction platform with shadow auction undertaken by market participants. This will lead to closer to real time procurement enabling more DSR and intermittent generation to participate in our markets, increasing competition, reducing costs and carbon emissions
- Increased competition in ancillary and balancing services markets leading to further cost reductions of £350m over the next 10 years
- Enabled Black Start capabilities from non-traditional technologies including interconnectors and began the process with DER

Plan delivery and new ways of working

- Power Responsive Programme
- Updated onboarding process for providers
- Developed auction trial for Frequency Response market
- Enabled Black Start capabilities from non-traditional technologies
- Accelerated access for early adopters entering the balancing mechanism
- Standardised and simplified contracts for ancillary and balancing services

60% New

40% Improved

Forward Plan 2018-19 deliverables

- ✓ Standardise the FFR market with simplified contracts
- ✓ Publish Restoration Roadmap and Publish Reactive Roadmap
- ✓ Understand the journey that potential counterparties go through
- ✓ Explore restoration service provision from interconnectors
- ✓ Deliver Roadmap for Restoration service
- ✓ Publish Thermal Constraints Management information note
- ✓ Publish Wider Access to the Balancing Mechanism Roadmap
- ✓ Detailed auction trial publication and launched a weekly auction trial for response
- ✓ Deliver a new, highly scalable and flexible dispatch solution for reserve – Phase 1 roll out for Fast Reserve providers
- ✓ Deliver new standardised products for reserve together with simplified contracts
- ✓ Publish and consult industry on exclusivity clauses to improve the ability to stack products
- ✓ Publish new testing and compliance/performance monitoring policy for response and reserve providers
- ✓ Build and implement a measurement framework that will track the success of ESO in helping potential and existing providers progress through the journey
- ✓ Raise a CUSC modification for removal of Enhanced Reactive Power Service
- ✓ Raise Obligatory Reactive Power Service concerns with CUSC issues standing group
- ✓ Develop an integrated approach to buying standard and faster-acting frequency response
- ✓ Publish an invitation for Expressions of Interest for provision of reactive power services in South Wales
- ✓ Accelerated access for early adopters entering the balancing mechanism
- ✓ Grow Power Responsive including annual conference

Stakeholder

- Hosted annual Power Responsive Conference with 220 attendees allowing interested parties to find out the latest information on market and product developments, access subject matter experts directly, and feedback directly on a range of topics, as well as giving the opportunity to network with other industry parties.
- Auction trial webinar for development of new frequency response products with 180 attendees and feedback score of 4.2/5
- Power Responsive Local Authority Workshop with 47 attendees and feedback score of 8.7/10
- Wider access – Virtual Lead Parties can register secondary BMUs which facilitates participation in both TERRE and the BM with positive feedback score of 3.3/5

Performance metrics

Metric	Performance
Metric 6: Reform of Balancing Services markets	Exceeding baseline
Metric 7: Facilitate new provider on-boarding	Exceeding baseline. We engaged with providers across a cross-section of our supplier base to gain insights on their journey and areas for improvement
Metric 8: Market diversity	On target – increased liquidity in relevant markets

1. Evidence of Delivered Benefits

- ✓ Reduced barriers to entry with 350+ market participants (an increase from 20 in 2016)
  - Introduced standard procurement windows and long-term seasonal procurement
  - Simplified and standardised Response and Reserve contracts
- ✓ Developed auction trial for FFR with shadow auction in March
- ✓ Standardised FRR products with 50% reduction of FFR Static price and 60% reduction of FFR dynamic price in 2018-19
- ✓ Streamlined the new provider onboarding process including interactive guidance documents and webinars
- ✓ Enabled wider access to BM programme with updated procurement processes so new aggregators and batteries can participate in FFR and BM. This was done well ahead of schedule with at least two aggregators joining in early 2019 (12 month ahead of schedule).

Our work to reduce barriers to entry and facilitate increased competition in balancing services markets has resulted in:

- Falling prices for the ancillary services we procure, leading to lower consumer costs through lower BSUoS charges
- More market participants and clear paths for introducing competition into areas where we have traditionally used bi-lateral agreements, such as Black Start.

Our actions have resulted in the Static FFR average accepted tender price reducing from £3.17/MWh in 2017-18 to £1.61/MWh in 2018-19, (a 49% decrease); and the Dynamic FFR average accepted tender price reducing from £6.11/MWh to £2.49/MWh, (a 59% decrease). This resulted in **£24m of benefit**, delivered through the BSUoS levy.

We have delivered benefits through greater clarity of our procurement requirements in all timescales; better service to the market participants; and rationalised and standardised products.

We have enabled new routes for access to the balancing mechanism for non-traditional providers ahead of our commitment to deliver Wider Access and the Project TERRE (Trans European Replacement Reserves) market in December 2019.We delivered strong stakeholder engagement, through consulting on our Product Roadmaps and our Power Responsive programme.

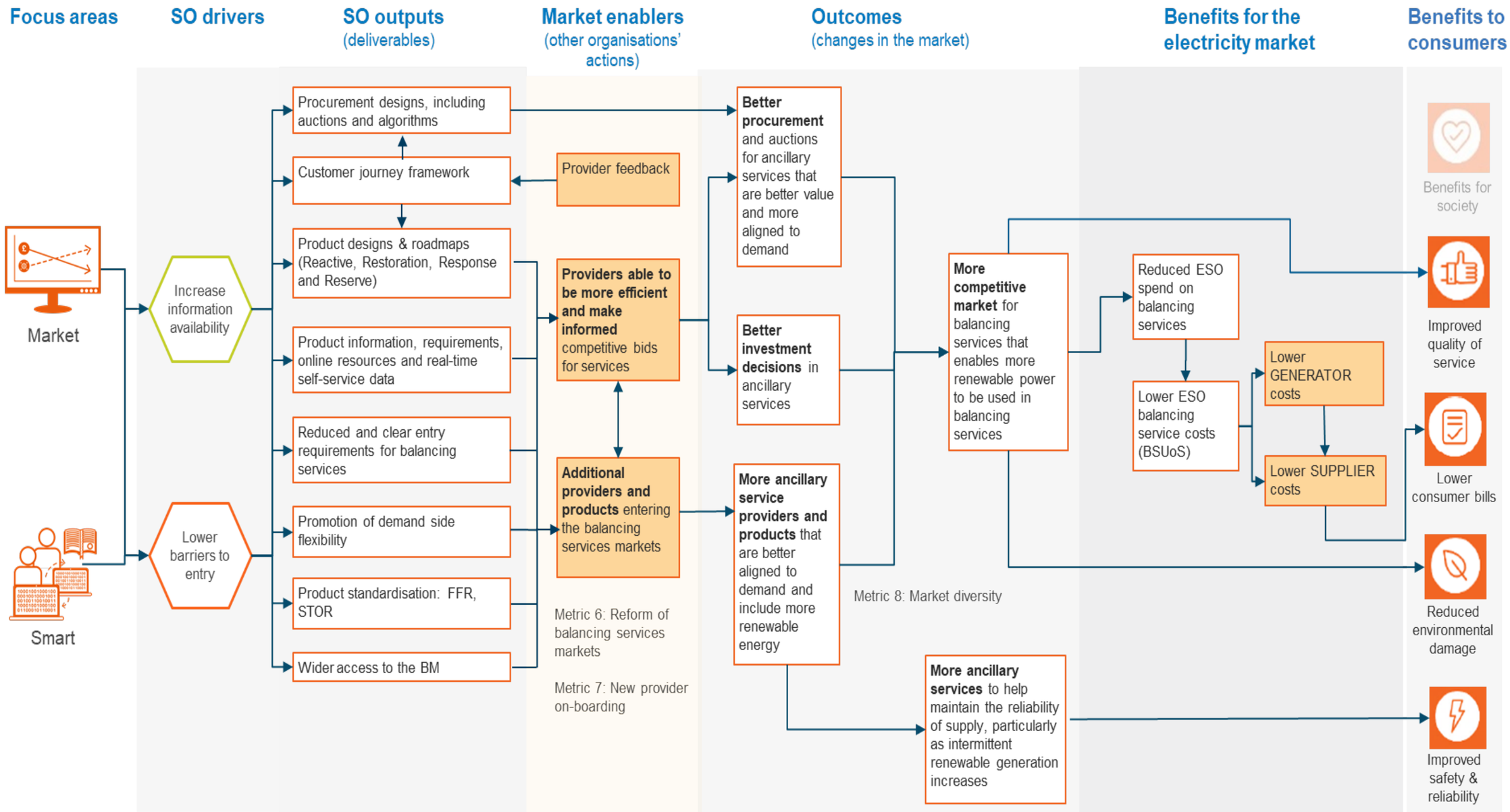
We took the first steps to introducing an auction platform to procure frequency response services and took the first steps to create a restoration (black start) market by publishing extensive guidance materials and issuing a request for expressions of interest to provide this service.

All of these benefits lead to **lower bills for consumers** than would otherwise have been the case. The benefits lead to lower BSUoS charge than would have been the case without our intervention, which will feed through to lower consumer bills, as BSUoS is passed through to consumers from the system users it is levied upon.

This has also resulted in **reduced environmental damage**, as many of the new providers entering the balancing services markets are low-carbon generators, DSR, or distributed embedded resources. When we **improve our service for our customers** this also benefits end consumers: as we make it easier for our customers to do business, this increases their efficiency and effectiveness, which should flow through the value chain to the end consumer.

Figure 11 shows what drives us to prioritise our deliverables and activities within Principle 3, and how these deliverables ultimately provide benefit for the end consumer.

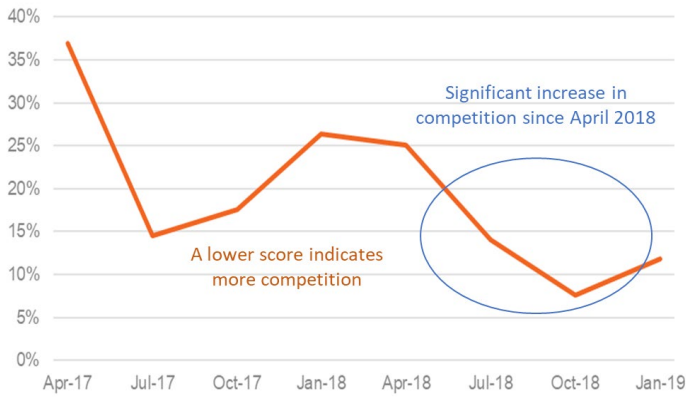
Figure 11: Principle 3 Consumer Benefits Map



We present the following case studies of our delivered benefit under Principle 3 for 2018-19:

Consumer Benefit Outcome

Increasing competition in the Firm Frequency Response (FFR) market

Activity	We delivered a number of actions designed to increase the competition within the FFR market: • Tender number limitation – to encourage more targeted tendering strategies. • Rationalisation of services – retiring a number of services including Firm Frequency Response (FFR) Bridging. • Standardised windows for procurement – standardised windows for FFR, we now procure the product in 4-hourly Electricity Forward Agreement (EFA) blocks which makes it easier for providers to analyse pricing. • Testing and compliance policy – was reviewed and refreshed to make the testing clearer and provide pass criteria which has helped to reduce barriers to entry for new providers. • Termination provisions – to limit exposure experienced by providers. • Simplified Standard Contract Terms and a cap on liability to standardise and reduce exposure to providers.
Delivered benefit	Total value creation across FFR market is **£24m** due to increased competition in the market: • Static FFR market: the average accepted tender price dropped from £3.17/MWh in 2017-18 to £1.61/MWh in 2018-19, a 49% decrease in price or a drop of £1.56/MWh in real terms. Multiplying this price differential by the total volume (MWh) procured in 2018-19 represents value creation of £4m. • Dynamic FFR market: the average accepted tender price dropped from £6.11/MWh to £2.49/MWh, a 59% decrease and a drop of £3.62/MWh in real terms. Multiplying this price differential by the total volume (MWh) procured in 2018-19 represents value creation of **£20m.**
Basis of expected benefit	A Herfindahl – Hirschman Index (HHI) has been calculated in 2018-19 based on the accepted tenders. *Figure 12: HHI for FFR 2017 to 2019* There is a clear downwards trend in the index which indicates an increase in competition in the market over this time. Peaks and troughs on the journey are to be expected due to the cyclical tendering process. 

2. Evidence of Future Benefits/ Long term Initiatives

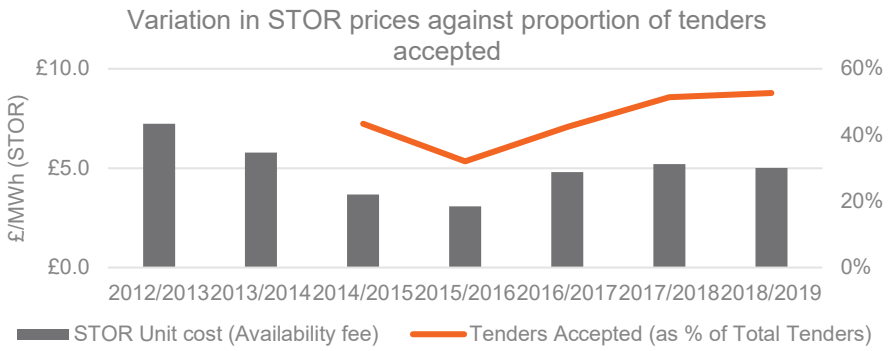
- ✓ Developed the Frequency response auction platform with shadow auction undertaken by market participants. This will lead to closer to real time procurement enabling more DSR and intermittent generation to better participate in our markets, increasing competition, reducing costs and carbon
- ✓ Increased competition in ancillary and balancing services markets leading to cost reductions of £350m over ten years
- ✓ Enabled black start capabilities from non-traditional technologies including interconnectors and began the process with DER

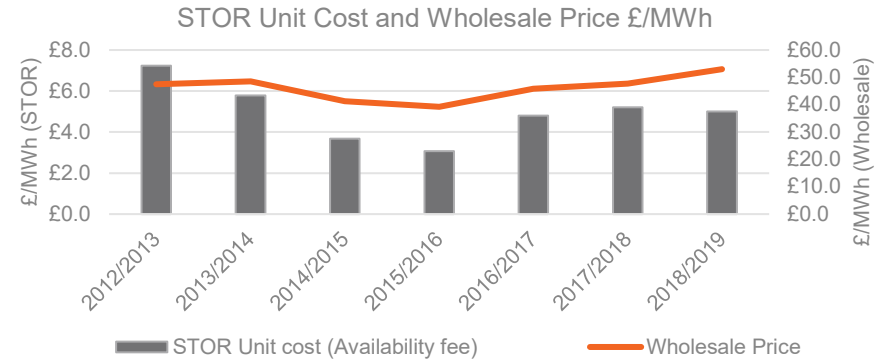
Principle 3 is already delivering benefits, with more market participants driving greater competition, delivering lower prices for our balancing services and therefore lower costs for consumers. As we continue to develop and facilitate our markets, there will be further benefit released in the future, as detailed in the following case studies:

Consumer Benefit Outcome

Increased competition in balancing service markets

Activity	We will continue to increase competition in existing balancing service markets, and where ever possible introduce competition where none exists. We will do this through a wide range of deliverables and activities, from providing more information to facilitate markets, through to simplifying and rationalising our product requirements through our roadmaps. We are a fundamental driver of this reduction in costs due to increased competition, as we are the sole purchaser of balancing and ancillary services, and as such must act proactively to develop and facilitate the markets
Future benefit	Increasing competition will bring additional flexibility into the market will be critical in hitting our Towards 2030 ambitions and ability for Carbon Free operational capabilities by 2025. Over the next 10 years as our deliverables increase market competition, there are benefits of £350m to be gained in both the balancing and ancillary markets. There will be a lead time of several years as the changes we put in place feed through into tangible market behaviour which result in lower balancing costs for us.
Basis of expected benefit	By increasing competition in already competitive markets, and where ever possible introducing competition where none currently exists, we can drive down the spend in these areas.
	Increasing competition has driven down STOR market prices. Variations in the STOR prices between 2014 and 2019 correspond to variations in competition. We measure competition in this period by looking at the ratio of tenders accepted as a percentage of total tenders received.





	STOR unit cost (availability fee) decreased by 58% between 2012 and 2016. Some of this is likely related to wholesale price, which reduced by 17% over this period. STOR unit price decreased at a faster rate than wholesale price between 2012 and 2016, indicating competition was a major factor. Factors including increased competition in the STOR market between 2012 to 2016 corresponded to a reduction in STOR unit cost of around 40%. A conservative estimate is that our actions will contribute to generating 50% of the savings from increasing competition. Looking at the total value of the competitive and non-competitive markets, we believe there is value to be unlocked in the order of £350m over 10 years.
How benefit is realised in the consumer bill	The money we spend on commercial actions to balance and operate the system is levied on system users via the BSUoS charge, which is a pass-through cost to the end-consumer. We will increase competition to drive down the prices we pay in these markets, which will reduce the BSUoS cost when compared to a counterfactual of us not working to increase competition.
Additional non-monetary benefit	There are environmental and security benefits which arise from increased competition. Specifically, many new suppliers tend to be low-carbon, and a greater range of diverse providers and technologies can add to system resilience.

Consumer Benefit Outcome

Frequency response auction platform trial

Activity	We currently procure the balancing service product frequency response through monthly tenders. Stakeholders have told us that they want to see us moving toward more transparent procurement closer to real-time. Closer to real time procurement enables intermittent generation and demand side to participate more fully in the market – increasing competition and unlocking more sources of flexibility.
Delivered and future benefit	Potential for £6m/year savings in balancing services costs after the end of the 2-year trial period. These savings will be due to lower prices realised through the platform, giving a consumer benefit of up to £6m/year after the trial as we move to more frequent closer to real-time procurement of services. Note that this figure is the maximum we could achieve if all our procurement was moved to the auction platform. If we still procure some volume from longer-term monthly auctions and the intra-day mandatory market, we may not achieve this maximum.
Basis of expected benefit	The auction trial will lower BSUoS costs through increasing competition in the market, and increasing liquidity, as new and existing providers will find it easier to participate in the market via the new platform. The platform should open up the market to more renewable, embedded and demand-side flexibility participants. We currently buy our tendered products up to 24 months in advance. By moving to a more frequent procurement closer to real-time, participants should get better price signals and we will not be locked in to longer term contracts. The NIA Project Registration Document for the auction platform trial estimates a 5% cost reduction in price as a successful outcome of the trial. In 2017-18.[4] Commercial Frequency and Mandatory Frequency costs were £99m and £21m respectively. If these costs remain static by the end of the trial period, then we should see savings of 5% of £120m = £6m if we were able to move all procurement into the auction platform. We expect further commercial benefits from the trial, as we transform how DSR and intermittent generation participate in the ancillary services markets, such as Reserve. This trial will be a proof of concept enabling activity leading us towards the potential for day-ahead response and reserve auctions in the RIIO2 period.
How benefit is realised in the consumer bill	The balancing services products we use are paid for via the BSUoS levy on system users, which ultimately gets passed through to the end consumer. By driving down prices in the markets we procure products and services, we will drive down the pass-through BSUoS costs for consumers.
Additional non-monetary benefit	There will be environmental benefit due to more low-carbon and demand-side providers being able to participate in the market via the new platform.

[4] http://www.smarternetworks.org/cdn/pdf/niaregistration/d2638a2f-3891-45c2-b729-a9ac00b10915

Consumer Benefit Outcome

Enhanced diversity in balancing service markets

Activity	Encouraging and facilitating new providers and new technologies to enter balancing services markets through our new-provider on-boarding activities
Delivered and future benefit	**Up to £4m savings per day** on days where we see price spikes and extreme market behaviour. Savings are based on an estimated 25% reduction in cost of balancing services on unusual days where prices across all markets are abnormally high.
Basis of expected benefit	The daily balancing costs for the UK in the first quarter of 2018, fluctuated between £0.5m and £6m. However, there was a sharp spike in the daily price, up to £16m, during a period of extreme winter weather. This led to multiple system challenges such as a short market, a Gas Deficit Warning and a number of additional technical issues with certain unit types. There was a significant increase in the cash-out price which led to balancing costs reaching approximately £16 million on one day. While demand spikes are beyond the control of the ESO, an increasingly diverse portfolio of balancing service providers could help to mitigate unpredictable challenges like these across a number of our balancing services. This should both enhance reliability of the system and dampen the effects on price resulting from challenging events. For example, a diverse portfolio which dampened the short-term increase of balancing costs in this period by even 25% could save consumers around £2.5m – £4m over just a few days.
How benefit is realised in the consumer bill	Any reduction in BSUoS spend is assumed to be passed through to the end consumer, as BSUoS is a levy paid by system users and ultimately added to the end consumer bill.
Additional non-monetary benefit	New providers are likely to be low carbon, and as such will deliver environmental benefit.

3. Plan Delivery and New Ways of Working

- ✓ Power Responsive Programme
- ✓ Updated onboarding process for providers
- ✓ Developed an auction trial for the Frequency Response market
- ✓ Developed Black Start capabilities from non-traditional technologies including Distributed Energy Resources
- ✓ Accelerated access for early adopters entering the balancing mechanism
- ✓ Standardised and simplified contracts for ancillary and balancing services

Outcome	2018-19 Deliverable	Target	Actual	Status
Promote competition and develop new markets in balancing markets	Standardise the FFR market	Q1	Q1	Standardised seasons and four-hourly EFA blocks were introduced for the May tender
	New simplified contract	Q1	Q1	The simplified contract was published as part of the FFR OCP consultation in June.
	Publish Restoration Roadmap	Q1	Q1	Published in June
	Publish Reactive Roadmap	Q1	Q1	Published in June
	Understand the journey that potential counterparties go through from first showing interest in the Balancing Services market, through to signing a framework agreement	Q2	Q2	Based on Provider feedback we have developed a Balancing Services Guide. This aims to make things simple and more transparent and is published on the Balancing Services overview page of our website.
Grow participation and promote fair access in provision of balancing services	Explore restoration service provision from interconnectors	Q2	Q2	Workshop held on 2 July 2018 to begin process of exploring service provision from interconnectors.
	Deliver Roadmap for Restoration service including: • Assessing the merits of different procurement models, and agree timeframes in our	Q4	Q3	We launched a consultation on how to competitively procure Black Start Ancillary Services. This included: • Guidance on how to take part in the tender • Technical requirements

	procurement methodology Improve metrics to provide more transparency on costs and capacity requirements			• Assessment criteria • Revised Black Start service terms • Cost and capacity transparency delivered in updated market report. The NIA and NIC projects to explore alternative approaches to Black Start were awarded funding from Ofgem on 30 November 2018. **Trial a market approach for black start procurement in one region** During 2018 we developed a proposal for a market approach for competitive black start procurement and published this to gather stakeholder feedback to shape our approach. We have published our Request for Expressions of Interest on the 1 February 2019. This will gather stakeholder feedback to shape our approach. Our request for EOIs produced: • 31 submitted EOIs • 16GW asset volume • 11 technology types • 9 combined approaches In the Roadmap, we promised to commence a trial of a competitive procurement approach in Q3 2020, but delivering against our current plan, by Q3 2020 we expect to have awarded contracts. **Develop a combined services methodology and contract structure.** We have proposed methodology for parties offering a combined service to participate and have invited combined service proposals through the recent launch of our competitive procurement event.
Publish Thermal Constraints Management	Q1	Q2	Published 26 July	

information note				
Publish Wider Access to the Balancing Mechanism (BM) Roadmap		Q2	Q2	Published 9 August
Detailed auction trial publication		Q1	Q2	Summary published 31 Aug, webinar held on 27 September and published online with Q&A.
	Deliver a new, highly scalable and flexible dispatch solution for reserve – Phase 1 roll out for Fast Reserve providers	Q2	Q2	Phase 1 complete. The Platform for Ancillary Services (PAS) is an agile programme aiming to deliver integrated solutions to automate the business processes for the operation of ancillary service. Once completed, the project is expected to deliver the following outcomes: • Reduce the time to connect to National Grid from six months to less than a week from being awarded a contract • Have one access point to all Non-BM ancillary services with one set of web services allowing providers to move within services quickly • Reducing the amount of manual work i.e. faxes to the ENCC • Enable changes to ancillary services quickly to reflect market conditions. Phase 1 of the project provided an online system for distribution-connected providers of Fast Reserve to communicate with our Electricity National Control Centre (ENCC), increasing competition and reducing barriers with one new non-traditional unit winning a Fast Reserve contract. Significantly this is the first battery unit to be accepted and takes the number of non-traditional parties in the Fast

				Reserve market from two to three.
	Deliver new standardised products for reserve together with simplified contracts	Q2	Q2-Q3	The new simplified standard contract terms for STOR are in use from 21 December 2018. The new simplified contract terms for STOR and Fast Reserve where shared in the outline change proposal in July and September 2018.
	Publish and consult industry on exclusivity clauses to improve the ability to stack products	Q2	Q2	We have now published our ESO Balancing Services guidance document.
	Publish new testing and compliance/performance monitoring policy for response and reserve providers	Q2	Q2	Published on the 30 September which streamlined the process and made it more accessible.
	Build and implement a measurement framework that will track the success of ESO in helping potential and existing providers progress through the journey	Q3	Q2	Metric proposal published as part of six-month report, phased implementation and related improvement activities are ongoing.
	Raise a Connection and Use of System Code (CUSC) modification for removal of Enhanced Reactive Power Service (ERPS)	Q3	Q3	We raised the CUSC modification (CMP305) it is in process and if approved will support wider reactive power market reform.
	Raise Obligatory Reactive Power Service concerns with CUSC issues standing group	Q3	Q3	Action delivered at CUSC Issues Standing Group (CISG) in December 2018. Highlighted general concerns with the service and our ambition to develop markets that better reflect how the network has developed. Industry workshops planned to open the debate about the future role of reactive power and develop more competitive commercial services.
	Develop an integrated approach to buying standard and faster-acting frequency response	Q3	Q4	Our plan for the start of a new frequency response product suite was delayed to Q4 to ensure the document had the full context of the work and next steps. Our plan for the start of a new frequency response product

				suite was published on 28 February 2019 on our website. The document brings together our latest work on the reform of frequency response markets to explain the journey so far, our rationale for change, what's been achieved to date, how these deliverables interact and how stakeholder feedback has shaped our work.
	Publish an invitation for Expressions of Interest for provision of reactive power services in South Wales	Q3	Q3	We published two Requests for Information (RFI) in October 2018. These asked for expressions of interest in providing reactive power services in Mersey and South. We received 19 responses across the two requests.
	Launch a weekly auction trial for response	Q3	Q4	Mock auction to test ESO processes and systems was held week commencing 25 March 2019. This gave providers the opportunity to see how their own data contributed to the results and to understand the drivers behind certain outcomes. Learning from this will be used to finalise the Phase 1 auction which will commence 25 April 2019 for a fast-low frequency static product i.e. a frequency response product that delivers when system frequency falls to 49.6 Hz. Additional functionality and products will be introduced from Q2 2019-20 onwards as part of the Phase 2 rollout.
	Accelerated access for early adopters entering the balancing mechanism	Q2	Q2	In August 2018, a demand side aggregator entered the Balancing Mechanism as the first Virtual Power Plant. October 2018 saw the successful go live for our second aggregated BM provider via the improvements made to enable accelerated wider access. Our work under Principle 3 facilitated the ability for these units and

				batteries to participant in both the BM and FFR markets.
	Grow Power Responsive including annual conference.	Q3	Q3	We hosted our fourth annual Power Responsive conference in June 2018. From 80 delegates at the first annual Power Responsive event in 2015 with 220 attendees in 2018. Unique non-traditional units that tendered into the FFR/STOR/Fast Reserve markets doubled between December 2017 and December 2018. The Flexibility Forum allows interested parties to find out the latest information from the ESO on market and product developments, access ESO subject matter experts directly, and provides the opportunity to feedback directly to the ESO on a range of topics, as well as giving the opportunity to network with other industry parties.

4. Stakeholder Evidence

- ✓ Hosted the annual Power Responsive Conference with 220 attendees, allowing interested parties to find out the latest information on market and product developments, access subject matter experts directly, and feedback directly on a range of topics, as well as giving the opportunity to network with other industry parties.
- ✓ Auction trial webinar for development of new Frequency Response products with 180 attendees and feedback score of 4.2/5
- ✓ Power Responsive Local Authority Workshop with 47 attendees and feedback score of 8.7/10
- ✓ Wider access – Virtual Lead Parties can register secondary BMUs which facilitates participation in both TERRE and the BM with positive feedback of 3.3/5

During this year, stakeholders have told us that we are doing very good work in transforming markets for balancing services and how we are engaging with them on this topic. Whilst acknowledging that this is very complex and that we need to engage broadly and deeply some stakeholders have told us that we need to move faster.

There is strong evidence that we are helping a wide range of parties to understand and engage with the balancing services markets. We have also heard that we need to provide more detail in some areas, such as wider access to the Balancing Mechanism (BM).

We have engaged with stakeholders through

- Hosting the Power Responsive reception, workshops, mailing lists and main forum event
- Hosting webinars on the development of the auction trial and wider access to the BM
- Interviews with providers.

Power Responsive

The Power Responsive programme promotes participation in demand side flexibility. Our aim this year has been to grow Power Responsive by broadening engagement to target harder to reach stakeholder groups and evolving the scope to incorporate emerging forms of demand side flexibility. We have hosted our annual Power Responsive Conference in June 2018 with 250 attending. We had positive feedback from stakeholders and the survey questions we asked before and after the event to understand attendees' knowledge of several topics including ESO Product Roadmaps, Wider Access to the Balancing Mechanism and Whole Electricity System approaches to flexibility had an average score of 5.9/10 before and 7/10 after. Stakeholders shared that facilitating whole system outcomes is a priority area and network operators can improve confidence for parties looking to deliver flexibility services by providing an early view of what these services may look like. In response, we're working more closely with DNOs to present a coherent picture of market opportunities to our stakeholders through our regular mailing list updates and events. For example, at the Power Responsive Summer Reception, UKPN and WPD exhibited on their flexibility procurement, and at our Local Authorities workshop, WPD presented and exhibited on their Flexible Power brand and DSR requirements. The DNO representatives then shared that they took great value from attending the event, and had some great conversations, including with those they aren't always able to reach.

We have hosted local authority workshops to broaden our audience. This was attended by 40 delegates and was attended by external speakers from demand side aggregators, suppliers, DNOs

and other parties. There was a very high level of satisfaction (8.7/10) with the event, and knowledge has increased significantly. We regularly share information with our stakeholders using a mailing list for which we have 2,500 subscribers from 1,000 organisations.

The Power Responsive Flexibility Forum took place in October 2018 to over 125 demand side stakeholders providing flexibility updates from BEIS (including Smart Appliances Consultation, Domestic DSR Competition, Industrial Strategy Challenge Fund and Road to Zero), Ofgem (on the Storage Consultation and RIIO2 Framework), the ESO (Reform of Balancing Services, Wider Access to the BM, Charging Futures SO/DSO interactions, & Project TERRE), and the Association for Decentralised Energy on the publication of their code of conduct for aggregators. On average we improved stakeholder knowledge across all subject areas by 52%.

Stakeholders have told us	What we have done
Speed of delivery: Whilst providers are generally satisfied with the scale of the changes we are proposing and delivering, we have received feedback from some stakeholders around the pace of change.	We recognise the need to work at pace to ensure periods of uncertainty are minimised for our stakeholders and deliver changes more quickly. Regular and clear communication is key to maintaining pace and ensuring no stakeholders are left behind.
The need to signpost changes: Stakeholders told us that we need to provide a better forward view of all the changes that are coming into the balancing markets.	In response to this feedback we have been publishing a monthly newsletter to provide updates via the Future of Balancing Services webpages to increase transparency and provide timely progress updates.
Effective engagement methods: Stakeholders have told us they value a range of engagement methods. We have learnt that webinars are an effective and accessible way to share new material with a large audience. We have also learnt that small, targeted workshops enable us to tailor the content to the audience, so they receive maximum value from attending and we are able to seek insightful inputs to shape particular deliverables.	We will continue to utilise these routes of engaging for Principle 3, as well as exploring additional methods of communicating with our stakeholders, and we welcome views on this.
New provider onboarding (Metric 7): Through the provider interviews we conducted we learnt that we can become a better buyer of services through addressing not only the new provider onboarding process but designing solutions to overcome pain-points across the end to end provider experience.	This has driven our desire to broaden the focus of Metric 7 to cover the key points across the whole provider journey.
Challenges facing our stakeholders: Through our Power Responsive events our stakeholders have helped us to identify challenges they face when pursuing routes to markets for our balancing services and other flexibility opportunities. With a number of revenue streams under review, uncertainty is a wide-reaching barrier.	These insights will inform how we continue to work with our stakeholders to address barriers to entry, to ultimately create accessible and competitive markets.

Auction trial

On 27 September 2018, we shared a summary of the auction design with our stakeholders and sought views on progress through a webinar with 179 participants (some of whom dialled in as a group of colleagues). This received positive feedback with a score of 4.2/5 for the content. Stakeholders shared that they are unsatisfied with the speed of the ESO's work as go-live has been delayed from 2018-19 into 2019-20. In response, we invested resource to try and bring this in sooner. Our mock auction to test ESO processes and systems was held week commencing 25 March 2019.

Webinars for Wider Access to the Balancing Mechanism

During this year, we shared our roadmap to clarify the current routes for entering the balancing mechanism. Following this we hosted webinars to support market participants. This was attended by 125 attendees and with a score of 3.6/5 for the content in the Roadmap.

We also hosted webinars on 'Virtual Lead Party' requirements, this is a new way to participate in both the Balancing Mechanism (wider access) and TERRE markets. It was attended by 147 and received a lot of positive feedback as most found it very informative and the Q&A was useful in providing clarity. 19 responses out 46 rated the usefulness of the webinar as 'very good'; the majority found it good and overall score for usefulness was 3.3/5. 10 responses out of 46 rated the overall delivery as 'very good'; the majority found it 'good' and the overall score for the presentation was 3.2/5.

Provider Journey

This year we have been developing our work with market participants who sell us services, who we call providers. We currently have 56 contracted providers and have 20 potential providers who are in the early stages of becoming providers. We want to understand how the journey is for our providers and if there are any issues/areas we can improve based on their feedback. As part of this work we have held 10 provider interviews and gathered their insight.

Our Provider Journey work has been focussed around our desire to become a better buyer. Through our engagement with providers and potential providers we gained valuable insights into what the provider journey is like for them and how we could improve. An area of focus based on feedback was to make our information more accessible, we have done this through producing the ESO Balancing Services Guidance Document and making improvements to the website. We continue to ask for feedback to identify further ways we can make the experience even better. Through our engagement, we have summarised what stakeholders have said into themes:

- **Pace and dynamism –** there is a tension between the dynamism of the market and innovation and the need for us to stabilise the product which changes facilitated through the change proposal process. This helps to ensure a level playing field for all providers.
- **Power imbalance –** smaller providers feel vulnerable due to market volatility risks and what they see as last-minute changes to our requirements. We have provided clear visibility through the market information reports for each service, ensuring that there are not last-minute changes and providing clear visibility of our needs.
- **Horizon scanning –** providers feel things are changing quickly and what a better view of what is coming so they can plan especially for IT changes. We have established the IS Change Forum to share our approach to the future delivery of IS change.
- **Time constraints –** newer providers struggle with workload and capacity as they often work extremely hard to secure funds, a contract etc. leaving them little time to build and set up. We have made changes to the FFR Market which enabled providers to determine the length of their build and set up programme of works.
- **High effort** – effort on all sides can be high to get things up and running. Information doesn't always flow between teams and manual data entry is common. We have reviewed our internal processes to ensure data flows between teams. Further work is required in this area to ensure that systems do this work.

- **Reactive, not proactive –** too much time is spent reacting to issues and dealing with system faults rather than proactively creating future opportunities. Our roadmaps have been published to provide detail externally on what the future will look like.
- **Individual relationships –** account management is seen to be good. Providers rely heavily on account managers and notice the effects of high staff turnover. This has been noted and wherever possible multi-skilling is taking place to try to minimise impacts on Providers.
- **In transparency, we trust –** providers are looking for transparency. Providers want to understand the decision-making processes behind the scenes, for example, across payments and dispatch. We have made improvements to the MBSS to provide more detail on the balancing actions we take.

5. Outturn Performance Metrics and Justifications

Metric	Performance	Justifications
Metric 6: Reform of Balancing Services markets	Exceeding baseline	We believe that we have exceeded baseline expectations through delivery of all objectives, including the trial of our auction process in March 2019.
Metric 7: Facilitate new provider on-boarding	Exceeding baseline. We engaged with providers across a cross-section of our supplier base to gain insights on their journey and areas for improvement	We delivered: Provider self-serve; an open innovation environment; in-line smart support; a feedback collection process; keeping providers 'in the know' via the ESO calendar. The feedback received has been taken on board and addressed through the ESO Balancing Services Guidance Document.
Metric 8: Market diversity	On target – increased liquidity in relevant markets	This year 48 new units entered FFR, 3 units entered Fast Reserve, 4 units entered the STOR market and 11 units entered demand turn up. We met our baseline target with this performance.

Metric 6 – Reform of Balancing Services markets

This metric tracks the progress of the SO in achieving commitments made in the Future Balancing Services Roadmap.

Table 6: Metric 6 Reform of balancing services markets performance

Key: ● Complete ● On-track ● Behind but recoverable ● Missed target

2018-19 deliverables	Detail	Status
Standardise the FFR market	Standardised seasons and four-hourly EFA blocks were introduced for the May 2018 tender.	●
New simplified contract	The simplified contract was published as part of the FFR OCP consultation in June 2018.	●
Publish Restoration Roadmap	Published in June 2018.	●
Publish Reactive Roadmap	Published in June 2018.	●
Understand the journey that potential counterparties go through from first showing interest in the Balancing Services market, through to signing a framework agreement	Immersion interviews completed	●
Explore restoration service provision from interconnectors	Workshop held on 2 July 2018.	●
Publish Thermal Constraints Management information note	Published 26 July 2018.	●

Publish Wider Access to the BM Roadmap (additional deliverable to the Forward Plan)	Published 9 August 2018.	●
Detailed auction trial publication	Summary published 31 August 2018, webinar held on 27 September 2018 and published online with Q&A. More detail communicated on Phase 1 of the auction trial throughout February and March 2019 via the Future of Frequency Response document and webinars.	●
Deliver a new, highly scalable and flexible dispatch solution for reserve – Phase 1 roll out for Fast Reserve providers	Phase 1 complete.	●
Deliver new standardised products for reserve together with simplified contracts	Simplified contract terms have been published in the STOR and Fast Reserve OCPs in July and September 2018; details of standardisation of Fast Reserve is included in the September OCP.	●
Publish and consult industry on exclusivity clauses to improve the ability to stack products	Published consultation on 28 September 2018.	●
Publish new testing and compliance/performance monitoring policy for response and reserve providers	Published on 30 September 2018.	●
Build and implement a measurement framework that will track the success of ESO in helping potential service providers progress through this journey	Framework delivered on time. Currently being implemented, please see metric 7 – new provider on-boarding for further information.	●
Grow the Power Responsive campaign, including the annual conference	All commitments delivered for 2018-19.	●
Deliver a new, highly scalable and flexible dispatch solution for reserve – Phase 2 roll out for STOR Providers	Delivery date of Q3 2018 was an early estimate prior to project start; implementing the platform for Fast Reserve during 2018 has allowed us to revise that date with actual experience. Development of dispatch solution for STOR is progressing, rollout is anticipated from Q2 2019-20	●
Develop an integrated approach to buying standard and faster-acting frequency response	The Future of Frequency Response document published in February 2019 shared information on the new frequency response products. A roll-out plan will be informed by further network analysis of the new products and stakeholder engagement. We will procure faster acting response as part of the auction trial phase 1 and have gone further by providing details of a potential new suite of Frequency Response products.	●
Launch a weekly auction trial for response	Mock auction run in March 2019 to test the auction algorithm for Phase 1 of the auction trial which go live in June 2019. Phase 2, with	●

	more complex functionality will go live in Q2 2019-20.	
Raise a CUSC modification for removal of ERPS	Delivered on time.	●
Raise ORPS concerns with CUSC issues standing group	On track.	●
Publish an invitation for Expressions of Interest for provision of reactive power services in South Wales	Delivered on time.	●

Metric 7 – New provider on-boarding

Table 7: Metric 7 New provider on-boarding performance

Performance	Justification
We engaged with providers across a cross-section of our supplier base to gain insights on their journey and areas for improvement	We want to become a better buyer and understand areas we can improve to grow our provider base. This enables more providers to participate, resulting in liquid markets, lower balancing costs and lowering costs to the end consumer. The feedback received has been taken on board and addressed through the ESO Balancing Services Guidance Document.
We delivered: • Provider self-serve	This is implemented for TERRE and functionality will be extended to other services
• Open innovation environment	We created this via our website[5]
• Inline smart support	We published the ESO Balancing Services Guidance Document[6] in January as a one-stop shop for new providers
• A feedback collection process	We developed a survey framework for gathering feedback at the key points of the provider journey: onboarding; tendering; contracting; and query management
• Commitment to providers to "Keeping you in the know"	This is captured in the SO calendar[7]
Feedback Summary	
100% of surveys sent to new potential providers at start of each month. Responses are limited and number returned is fairly low.	Comments so far for onboarding: 'A one stop shop is required' 'As the norms are evolving almost daily, some of the information used to take a decision become unreliable'. 'Once the changes stabilize, I will be ready to take the best decision possible. Thanks a lot for all the help'.
Future Development	

[5]https://www.nationalgrideso.com/innovation

[6] https://www.nationalgrideso.com/sites/eso/files/documents/ESO%20Balancing%20Services%20Guidance%20Document%20V1.pdf

[7] https://www.nationalgrideso.com/events

Contract start survey	To be developed during Q1 of 2019-20
Query management survey	To be developed during Q1 of 2019-20

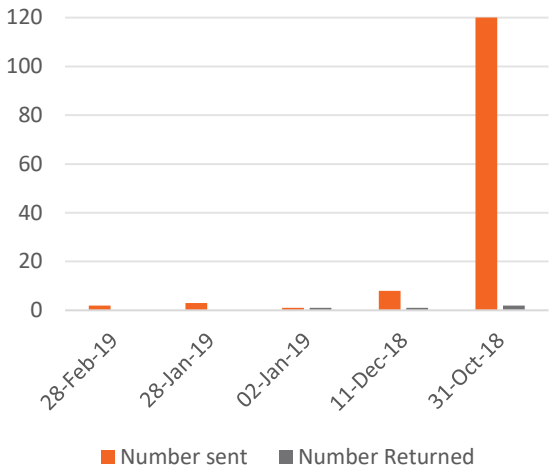
Figure 14: Onboarding surveys sent vs completed

Figure 14 shows the numbers of surveys we have sent to collect feedback regarding our on-boarding process vs. the number returned. So far, the number of responses is too low to draw general conclusions from.

The survey questions used (rated on a 5-point scales: strongly agree to strongly disagree) are:

On-boarding

- I found it easy to find the information I needed
- I was provided with information of sufficient quality to enable me to make an informed decision
- What can we do to improve the accessibility of our information? (Free comments box)

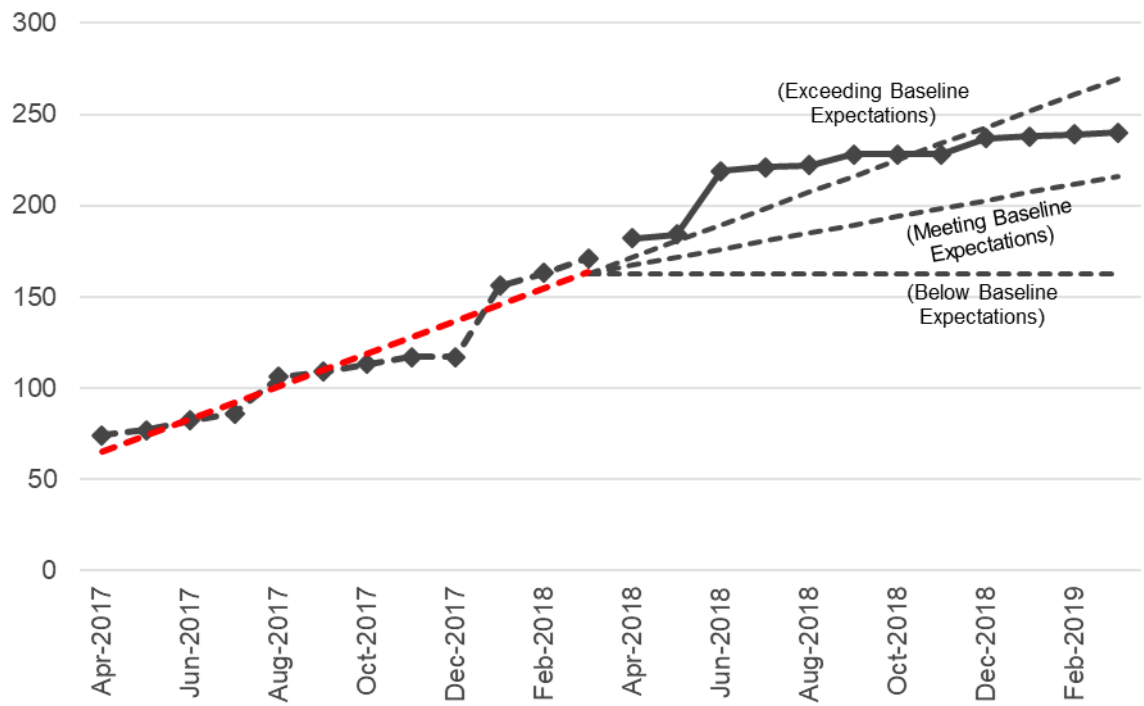


Tendering

- What type of participant are you?
- I have the information I need to understand the service tender results.
- What can we do to improve transparency of the service tender results? (Free comments box)

Metric 8 – Market diversity

Figure 15: Metric 8 Market Diversity Performance



This year 48 new units entered FFR, 3 units entered Fast Reserve, 4 units entered the STOR market and 11 units entered demand turn up.

PRINCIPLE 4

Promote competition in the wholesale and capacity markets

Role #2
Facilitating competitive markets

Principle 4
Promote competition in wholesale and capacity market

AMBITION
Transform access to the capacity market and develop codes and charging arrangements that are fit for the future

Delivered benefits in 2018-19

- Delivered the Charging Futures programme which coordinates significant charging reform, in a way where every stakeholder can equally contribute to change. It helps network users to plan, manage and shape future reform together by providing one place to: learn, ask, and contribute
- Implemented scheduled code improvements including horizon scanning documents and FAQ guides
- Developed capacity market modelling providing more information to market participants
- Improved validation of demand forecasting by establishing a dialogue with new customers at an early stage, reducing the risk of underpayments which result in an unexpected reconciliation bill
- Improved accuracy of tariff forecasts and transparency of charges, providing more certainty to market participants
- Successful implementation of the European Network Codes programme
- Developed improvement action plans through our customer journey workstreams for both charging information and code administration

Future benefits and long term initiatives

- Provided thought leadership and industry support to understand market impacts of Code changes, charging arrangements and the Capacity Market
- Delivered necessary electricity market changes including code changes
- Enabled better functioning and more efficient markets

Plan delivery and new ways of working

- Refined the five year view of TNUoS tariffs report and webinars
- Published an improvement action plan for charging information and Code administration activities
- Led the Charging Futures programme and BSUoS Charging Task Force
- Advised BEIS on the EU Exit strategy including energy adequacy and operability updates
- Worked with BEIS to fulfil security of supply obligations following the suspension of the Capacity Market

80% New
20% Improved

Forward Plan 2018-19 deliverables

- ✓ Charging data – Phase 1: Customer access to information
- ✓ Charging data – Phase 2: Better forecasting and outturn information and material
- ✓ Joint Charging and Settlement Forum
- ✓ Publish Improvement Action Plan for Code Administration
- ✓ Targeted interventions that enhance our customers' experience of our charging processes
- ✓ Improve TNUoS billing reconciliation, forecast and final tariff setting processes
- ✓ Implement a new charging customer on-boarding process
- ✓ Publish Improvement Action Plan for Charging
- ✓ Improve access to modification working groups
- ✓ Engagement on regulatory horizon project
- ✓ Publish energy adequacy and operability updates in the context of EU Exit
- ✓ Comprehensive review of BSUoS
- ✓ Initiate consideration of changes to the SQSS (developing)
- ✓ Update on our thinking on security arrangements for transmission schemes
- ✓ Consult on our renewables derating method and results
- ✓ Consult on our distributed generation derating method and results
- ✓ Deliver Charging Futures Forums that are open to all network users
- ✓ Deliver webinars, podcasts and plain English publications under the Charging Futures (CF) Brand
- ✓ Publish a report on Charging Futures (in progress)

Stakeholder

- Positive feedback on network charging training sessions and webinars including Transport and Tariff model training
- Charging Futures Forum, webinars and podcasts with combined annual feedback score of 7.9/10
  Facilitated several webinars providing accessible information including: the targeted charging review, access and forward looking task forces and settlement reform project
- Developing code changes including publishing guidance material for market participants to improve understanding of the process, facilitating greater involvement across the whole market
- Proactive engagement with the proposer of CMP286/7 to develop understanding of consumer benefit including running a first of its kind RFI to develop the case for change
- Improved customer experience with charging, coaching new suppliers, providing a suite of guidance documents and the Charging and Settlements forum
- Delivered the joint charging and settlement forums for BSUoS and TNUoS customers, recasting our forums around our customers
- Tightened the process for onboarding new suppliers by contacting them when they apply for CUSC accession, introducing ourselves as the charging team and offering advice on their CUSC obligations

Performance metrics

Metric	Performance
Metric 9: BSUoS billing	Exceeding baseline
Metric 10: Code administrator- stakeholder satisfaction	Survey results show a significant increase from last year in overall satisfaction from our customers and stakeholders across CUSC, Grid Code & STC. + 18% improvement in CUSC (from 47% to 65%) +7% improvement in Grid Code (from 59% to 66%) +1% improvement in STC (from 57% to 58%)
Metric 11: Charging Futures	Exceeding baseline with score above 7.3/10 (baseline of 6.5)
Metric 20: Month ahead BSUoS forecast vs outturn	Exceeding baseline
Metric 19: Year ahead BSUoS forecast vs outturn	Below baseline

1. Evidence of Delivered Benefits

- ✓ Delivered the Charging Futures programme which coordinates significant charging reform, in a way where every stakeholder can equally contribute to change. It helps network users to plan, manage and shape future reform together by providing one place to: learn, ask, and contribute
- ✓ Implemented scheduled code improvements including horizon scanning and FAQ guides
- ✓ Developed capacity market modelling providing more information to market participants
- ✓ Improved validation of demand forecasting by establishing a dialogue with new customers at an early stage, reducing the risk of underpayments which result in an unexpected reconciliation bill
- ✓ Improved accuracy of tariff forecasts and transparency of charges, providing more certainty to market participants
- ✓ Successful implementation of the European Network Codes programme
- ✓ Developed improvement action plans through our customer journey workstreams for both charging information and code administration

Through our main focus areas of Facilitating and Delivering Code Change; Capacity Market Modelling; Charging Futures; and helping our customers manage their profitability we are delivering:

- Better functioning markets, competition, and new entrants which results in lower bills for consumers.
- Better quality of service through focus on our stakeholders, suppliers, providers and customers, which should in turn benefit the customer of those organisations, who in the case of suppliers is the end consumer.
- Benefits for society as a whole, through ensuring that we avoid inadvertently disadvantaging vulnerable customers or other classes of user when designing network reforms.

In support of the above, this year we delivered:

- New BSUoS forecasting and reports.
- Educational webinars.
- Multiple stakeholder forums and workshops.
- Many new guidance documents.
- Energy adequacy and operability updates in the context of EU Exit.
- Continued the development of a methodology to allow wind and solar derived generation to participate in the capacity market.
- Lead secretariat of the Charging Futures and Balancing Services Charging Task Force programmes.
- Leadership or support of a selection of targeted market improvements that are expected to be in the interests of the consumer.

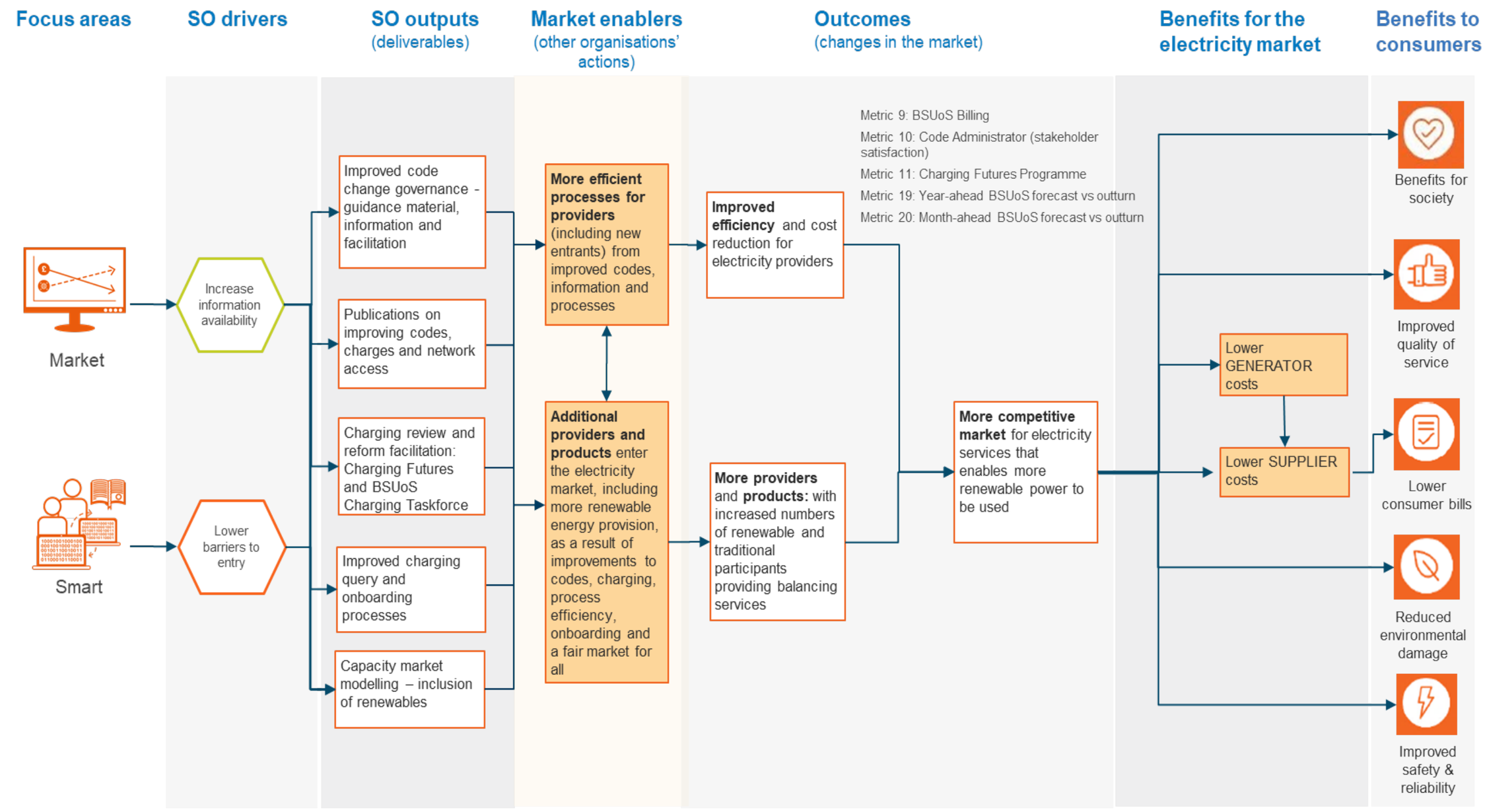
We made significant progress in achieving compliance with European Network Codes (ENCs). Across the 8 network codes more than 30 proposals and methodologies have been finalised and submitted to the regulator for approval and many of these have also now been approved and implemented. Many of these changes have required modifications to our national codes. Some key modifications crucial to the implementation of ENCs that have now been approved include;

- GC0097 and P344 implements project TERRE (a key implementation project for the Electricity Balancing Guideline)
- GC108 implements European requirements for Black Start.
- GC106 implements European requirements for data exchange.
- GC104 implements requirements from the Demand Connection Code.

These are all important steps towards compliance with the European rules, which are facilitating harmonisation, integration and efficiency of the European electricity market. Balancing platforms such as project TERRE are projected to save approximately €14 million on GB balancing costs per year, as well as support the security of supply across Europe.

Figure 16 shows what drives us to prioritise our deliverables and activities within Principle 4, and how these deliverables ultimately provide benefit for the end consumer.

Figure 36: Principle 4 Consumer Benefits Map



2. Evidence of Future Benefits/ Long term Initiatives

- ✓ Provided thought leadership and industry support to understand market impacts of Code changes, charging arrangements and the Capacity Market
- ✓ Delivered necessary electricity market changes including code changes
- ✓ Enabled better functioning and more efficient markets

The work we do is fundamental to ensuring the capacity market, codes, and charging arrangements can support the transition to the low-carbon economy.

We are a key contributor to setting the foundation of the economic and secure system of the future as discussed in industry reports such as The National Infrastructure Commission's (NIC) 'Smart Power'[8], which indicate if all players act together in the consumer interest there are savings of up to £8bn[9] to be unlocked.

Having the right charging arrangements in place facilitates and underpins future market functioning, which needs to be efficient and effective to deliver benefits such as increased participation, increased competition, and facilitation of new technologies.

Putting these measures in place will deliver **lower bills for consumers** through well-functioning markets; **environmental benefit** as we support Great Britain to drastically reduce its carbon output, and **societal benefit** as we move towards a world where consumers are enabled to become active market participants. An efficient capacity market will also ensure the most economical route to guaranteeing adequate **security of supply**.

The following case study illustrates how we can contribute to the industry unlocking significant value for the end consumer over a number of years.

[8] https://www.gov.uk/government/publications/smart-power-a-national-infrastructure-commission-report
[9] https://www.nic.org.uk/wp-content/uploads/Delivering-future-proof-energy-infrastructure-Goran-Strbac-et-al.pdf

Facilitating code changes

Consumer Benefit Outcome

Activity	We want our codes to facilitate the rapid change required to deliver the UK's 2050 carbon reduction target. By 2025, our codes and code governance will no longer be perceived as a barrier to change. Code modification will work for hundreds of market participants, rather than the tens of participants for which the current process was devised. We will work with industry to ensure codes keep pace with the rapidly changing energy generation and supply landscape so that the industry can operate efficiently and effectively for the benefit of the consumer. We will help stakeholders access information in a clear and transparent way, to enable informed and value-adding debate. We will work to implement code change in a timely manner, to deliver benefit to the consumer as early as possible.
Delivered and future benefit	Will work with industry to deliver code changes which maximise consumer benefit We are not solely responsible for the significant savings which are realised through code change. We work with industry and the regulator to facilitate robust framework development and expedient delivery of changes. The sooner changes are delivered, the sooner the consumer starts to see benefit through their bill. An example is from recent work under CUSC modifications CMP286/7, which indicated (from a formal request for information issued by NGESO) that the risk premia added by suppliers to domestic bills for the uncertainty in TNUoS could be increasing costs to consumers. This is a clear example of where the ESO can assist in identifying potential benefits through working with industry as a trusted partner, providing impartial support on issues that otherwise are difficult for market participants to collaborate over. In addition, we supported the development of P354 which will contribute to enabling Wider Access to the Balancing Mechanism. This was alongside our work in raising and progressing with ELEXON and industry one of the most complex changes to the Balancing and Settlement Code (P344 Project TERRE) to deliver the benefits of cross European reserves and allow a mechanism for robust access to the Balancing Mechanism in the GB market. However, many code changes deliver small benefit, therefore it is difficult to estimate the value of benefit which could materialise in the code-change pipeline. Nevertheless, in the context of recent changes which have delivered significant benefit, and the transformational change facing the industry as we move to a low-carbon decentralised system> There is no doubt that we can contribute to maximising benefit for consumers.
How benefit is realised in the consumer bill	Each code varies in which element of the bill they affect from direct BSUoS changes to wider industry change seen through the wholesale market. By enabling better functioning markets and supporting new entrants which stimulates competition, well facilitated code change reduces the end-consumer bill.

Basis of expected benefit	We are currently a Code Administrator for the following codes: CUSC, STC and the Grid Code. Benefits to the consumer will result from earlier implementation of code changes and modification, than current BAU activities. The benefits arise from us working as Code Administrator together with our Market Development and Market Change delivery teams to target market improvements which also span outside the three codes we administer. The increase in transparency and simplicity will open this market to new and innovative players, increasing competition and facilitating more efficient codes for all players. Benefits would be linked to each individual code. For the speed of code modifications and changes the benefits are for the additional period they will be implemented. We will deliver improved quality of service benefits through focus on our stakeholders, suppliers, providers and customers, which should in turn, benefit the customers of those organisations, and their end consumers.
Additional non-monetary benefit	We will deliver better service to industry participants to make navigation through the codes processes easier.

3. Plan Delivery and New Ways of Working

- ✓ Refined the Five-year view of TNUoS tariffs report and webinars
- ✓ Published an Improvement Action Plan for charging information and Code administration activities
- ✓ Led the Charging Futures programme and the BSUoS Charging Task Force
- ✓ Advised BEIS on the EU exit strategy including energy adequacy and operability updates
- ✓ Worked with BEIS to fulfil security of supply obligations following the suspension of the Capacity Market

Outcome	2018-19 Deliverable	Target	Actual	Status
Managing customer profitability	Improved transparency and publication of charging data – Phase 1: Customer access to information.	Q1	Q1	Phase 1 completed.
	Improved transparency and publication of charging data – Phase 2: Better forecasting and outturn information and material.	Q3	Q3	• Half Hourly BSUoS forecast for day+2 to give customers a 48 hour ahead forecast of the BSUoS price. • Daily balancing costs report that breaks down the different categories of costs into sub-categories to give customers a more granular view of the costs that make up BSUoS charges.
	Joint Charging and Settlement Forum	Q3	Q3	Helping our customers understand our charges held in October 2018.
	Publish Improvement Action Plan	Q3	Q3	Published in October 2018
	Targeted interventions that enhance our customers' experience of our charging processes on the 'hot spots' they have told us matter to them.	Q3	Q3	The feedback we had in our 'Managing customer profitability' journey identified three key areas of focus, which helped us to build customer focussed action plans. The areas were: • I need to understand information and data • I need better access to information and data • I need to understand the onboarding and exit process

	Improve TNUoS billing reconciliation, forecast and final tariff setting processes	Q3	Q3	We improved TNUoS billing reconciliation by making additional metering data available. We improved validation of demand forecasting by establishing a dialogue with new customers at an early stage, reducing the risk of underpayments which result in an unexpected reconciliation bill.
	Implement a new charging customer on-boarding process	Q3	Q3	We tightened the process for onboarding new suppliers by contacting them when they apply for CUSC accession, introducing ourselves as the charging team and offering advice on their CUSC obligations. We developed a guide to TNUoS for new suppliers.
	I need to understand information and data: Provide charging seminars and documents	Q3	Q3	Joint Charging and Settlement Forum held in October 2018. Publication of a suite of webinars and guidance documents on our website guidance page
	Update guidance documents	Q4	Q4	We have updated existing guidance documents and created new guidance on the top things' customers ask us about.
	I need to better access to information and data: Rollout single contact details for ESO Charging	Q4	Q4	We now have consistent email addresses for each ESO charging team. Our email addresses and phone numbers are clearly communicated on our web pages, emails, and on our published documents.
	I need to better access to information and data: Publish information map on ESO reporting	Q4	June 2019	We are aiming to publish a one-pager on BSUoS data and reporting information by June 2019.
	I need to understand the onboarding and exit process	Q4	Q4	We have tightened the process for onboarding new suppliers by contacting them when they apply for CUSC accession, introducing ourselves as the charging team and offering advice on their CUSC obligations.
Facilitating Code Change	Publish Improvement Action Plan	Q3	Q3	Published in October 2018
	Improve access to modification working groups with varying locations and technology to enable easier participation	Nov 18	Nov 18	Trialled changing the location of working groups based on where our stakeholders are located. We have had a good response and will continue this method which will

				promote greater participation, aiding industry resource requirements.
	Provide transparent, easily accessible information to track modification proposals	Q4	Q4	We have published a new modification tracker here.
	New FAQ guides to improve understanding of the process, facilitating greater involvement across the whole market	Q4	Q4	We have published a new FAQ guide here.
	Cross code working, including forward planning, to increase convergence and reduce congestion and complexity	Q4	Q4	We have introduced horizon scanning documents for Grid Code, CUSC & STC.
	Introduce a range of communication methods (i.e. podcasts, webinars) to provide timely and meaningful updates tailored to industry needs	Q4	Q4	We piloted hosting an industry webinar upon receiving a new modification to educate, update and improve future industry engagement on modifications. The webinar was well received by industry and we intend to roll this out for new modifications which merit further pre-explanation ahead of first work group discussions.
	Engage on Code Change project plan	Q4	Ongoing into 19-20	We have identified a number of focus areas via our forward plan to provide a better code administration service. We have engaged industry via our March 2019 ESO customer seminars and a survey monkey to identify the best communication methods to update industry with our developments. This has concluded that we will publish industry updates by emails and newsletters. We look to publish our first newsletter during April 2019.
	Engagement on regulatory horizon project	Q4	Q4	• We had discussions with the Grid Code and CUSC panels on a future approach to a Code Manager role and key funding and governance principles. • A webinar (under our RIIO-2 engagement) to ask for feedback on our initial thinking with this work to date. • We have been involved in (and will continue to be) the Energy Codes Review to provide collaborative thought leadership to help shape the future of codes.

Delivering Code Change	Publish energy adequacy and operability updates in the context of EU exit	Q3	Ongoing due to EU Exit process	Throughout 2018-19 we continued to have active engagement with BEIS, Ofgem and wider industry in preparation for EU Exit, including regular engagement with key stakeholders, preparatory code modifications and relevant updates in key ESO publications e.g. Summer Outlook. In Q3 we also published: • Open letters in November and in December on potential code change related to EU Exit; and • A short update on EU Exit via our Operability Strategy Report. Throughout Q4 we continued to engage bilaterally and through other forums on EU Exit (such as through a workshop with current and future interconnectors) either alongside BEIS and Ofgem or independently e.g. through the code modification process with Panels. We had planned to provide a further broader published update related to EU Exit in Q4 however this was not undertaken due to the inclusion of updates in other relevant ESO documentation and via other communication channels such as attending the Energy UK Brexit Working Group or providing an update at our Operational Forum.
	Comprehensive review of BSUoS	Q3	Ongoing 19-20	We held two BSUoS workshops and a webinar in October 2018 reaching a total of 77 individuals. We had positive feedback from customers with an average of 88% finding the workshops useful with an average satisfaction rating of 8/10. In November 2018 Ofgem asked us to start and lead a Balancing Services Charges Task Force under the Charging Futures Programme to consider how network users are charged for balancing services. After a successful launch of the ESO-led Balancing Services Charges Task Force at the Charging Futures Forum in January 2019 we are on track to deliver against the Terms of Reference. We selected and announced task force members and held the first task force on 29 January 2019. In February 2019, we held a webinar to test emerging views and this webinar received an average satisfaction score of 8/10

				from those who responded. At end of March 2019 we had held a further four task forces and we have kept industry updated throughout by being transparent and publishing data, information and podcasts, etc. Updates are available on the Charging Futures website.
	Initiate consideration of changes to the SQSS	Q4	Ongoing 19-20	Whilst there have been some changes to the SQSS throughout the year we have re-prioritised our broader development work in this area in anticipation of an Engineering Standards Review announced in Q3 2018-19. We expect to be involved with this review in the future to shape the future evolution of the SQSS.
	Update on our thinking on security arrangements for transmission schemes	Q4	Completed April 2019	We have developed our thoughts and published a thought piece in early April 2019. Industry engagement will continue to take place to further develop our thoughts and next steps which could include a targeted code modification.
Capacity Market Modelling	Consult on our renewables derating method and results	Q4	On track, dependent on BEIS timescales	In Q3, we developed a methodology for calculating de-rating factors for wind and solar if they are allowed to participate in the Capacity Market auctions. We: • Benchmarked our approach with other capacity markets around the world. • Received the endorsement of BEIS' independent Panel of Technical Experts. • Started an industry consultation. • Launched consultation with supporting event. In Q4, we ran an industry consultation on the method for calculating de-rating factors for wind and solar if they were allowed to participate in the Capacity Market auctions. We: • Held an industry workshop to present and answer questions relating to the method and indicative de-rating factors. • Reviewed consultation responses and produced additional analysis to address issues raised. • Published our final conclusion document.
	Consult on our distributed generation derating method and results	Q4		

				We completed the analysis of distributed connected generation with a view to calculating de-rating factors for each technology type. However, while reliable output data could be obtained by technology no reliable capacity figures associated with the output could be obtained. Consequently, we have outlined what would be required to enable this for the next phase of the analysis and are currently investigating sources of potential capacity data by technology and site.
Facilitate and deliver code change under Charging Futures (CF)	Deliver CF Forums that are open to all network users.	Q1, Q2 & Q4	Ongoing 19-21	Charging Futures has supported Ofgem's: • Launch of the Targeted Charging Review minded to decision. • Request for the ESO to lead the Balancing Services Charges Task Force. • Significant Code Review launch into access and forward-looking charges. • Communications via emails, podcasts and organisation of an industry webinar. Delivered the Charging Futures Forum during January 2019 which gave a focus to the Targeted Charging Review's minded-to position and the launch of the Balancing Services Task Force. The task force has since had its first meeting. We have also supported the launch of the Access and Forward-Looking Charges SCR by facilitating a webinar.
	Deliver webinars, podcasts and plain English publications under the CF Brand. Adapt the content and format in response to the ongoing requirements and preferences of all CF members.	Q1-4	Ongoing 19-21	
	Publish a report on Charging Futures. Identify the lessons learned from cross-industry and code engagement.	Q4	Ongoing 19-21	We have periodically reviewed the success of Charging Futures since its inception in 2018. Sharing lessons with Ofgem to continually improve content. We aim to share these learnings through the Code Administrators Code of Practise (CACoP) in May 2019.

A key feature of this year has been the backdrop of political uncertainty driven by the EU Exit and the legal challenge to the Capacity Market which has required us to divert resources from planned activities to emerging issues. Listed below are additional noteworthy deliverables from 2018-19 under Principle 4 that were not included in our 2018-19 Forward Plan.

Targeted Market Improvements

- Proactive engagement on the evolution of the statement of works process with a subsequent code modification to facilitate the connection of new embedded generation and to streamline processes.
- Proactive involvement in the development of P362 with support for the introduction of an electricity market sandbox in the BSC when proposed by ELEXON, including supporting an alternative (and subsequently approved) proposal which allows ESO participation.
- Support for the new Principle 14 of the CACoP and proactive engagement on code sandbox development for CUSC and Grid Code subsequent to Ofgem approval of above referenced BSC sandbox proposals.
- Proactive engagement on co-location development with the publication of a guidance note and engagement on and plans for targeted charging changes to remove a potential future market distortion.

Working for you on European matters

- Proactive engagement (and influencing) in relation to the Clean Energy Package: we worked closely with key stakeholders to protect consumer interests and add value e.g. in relation to ISP changes, including via leadership on Working Groups within ENTSO-E.
- Proactive engagement with ENTSO-E through participation in the Assembly and our elected position on the Board, as well as through regular attendance at and contribution to and number of ENTSO-E committees and working groups.
- Ongoing implementation of the European Network Codes, with several key code modifications and methodologies approved and others under development in collaboration with wider industry; this includes engagement with stakeholders such as via a recent webinar including TERRE.

Capacity Market Suspension

Since the suspension of the Capacity Market (CM) in November 2018, the ESO delivery body have been working collaboratively with BEIS, Ofgem and our other delivery partners to deliver successful restoration of the scheme.

We continue to believe that the CM is the right mechanism to deliver security of supply. Our objectives following suspension, have been to;

- Ensure any amended rules and regulations align with original policy intent and our wider ESO strategy.
- Ensure process and/or system change are deliverable within in the timescales by all delivery partners.
- Represent feedback from the industry appropriately in any change.

Restoration has required significant change to policy, regulation and rules in increasingly tight timescales. We have been continuously driving discussions with our delivery partners to ensure that any changes are deliverable and align with policy intent.

4. Stakeholder Evidence

- ✓ Positive feedback on network charging training sessions and webinars including Transport and Tariff model training
- ✓ Led the Charging Futures Forum, webinars and podcasts with combined annual feedback score of 7.9/10
- ✓ Facilitated several webinars providing accessible information including the targeted charging review, access and forward-looking task forces and settlement reform project
- ✓ Developed code changes including publishing guidance material for market participants to improve understanding of the process, facilitating greater involvement across the whole market
- ✓ Proactive engagement with the proposer of CMP286/7 (npower ltd) to develop understanding of consumer benefit including running a first of its kind RFI to develop the cost for consumers and the case for change
- ✓ Improved customer experience with charging, coaching new suppliers, providing a suite of guidance documents and the Charging and Settlements forum
- ✓ Delivered the joint charging and settlement forums for BSUoS and TNUoS customers, recasting our forums around our customers
- ✓ Tightened the process for onboarding new suppliers by contacting them when they apply for CUSC accession, introducing ourselves as the charging team and offering advice on their CUSC obligations

During this year, we have engaged with stakeholders in the following main areas:

- Managing profitability customer journey: covering our administration of BSUoS and TNUoS charging.
- Facilitating code change: as code administrator for System Operator Transmission Owner Code (STC), Connection and Use of System Code (CUSC) and the Grid Code. And, though our engagement on the implementation of the European Network Codes.
- Delivering code change.
- EMR modelling engagement.

Managing profitability customer journey

We engage with our BSUoS and TNUoS customers regularly and this year have updated our processes to address their feedback.

Customers told us through the feedback process that there are three key areas in which we can improve to drive value for consumers by supporting our customers to manage their profitability.

The Action Plan that we have developed based on feedback addresses each of these three areas specifically:

Stakeholders have told us	What we have done
I need to understand relevant information and data • **Content to give information on what charges we will face, with relevant updates.** • **Content to explain how charges are calculated.** • **Forecasting data that is transparent and clearer on accuracy.** • **Experts who can support with finding relevant information.**	• Refined the Five-year view of TNUoS tariffs report and webinars in response to stakeholder feedback. We have provided specific scenarios that would help customers who are new to the industry to better manage their risk. The scenarios are related to current and potential CUSC modifications which give an indication on the direction of travel. These scenarios have been based on feedback that we received from customers on what scenarios they wanted us to model for them. This enables customers to better forecast their costs and in turn drives better value for consumers. We have also developed the structure, language and explanations we use in our report and webinars to be more customer friendly. • Improved customer learning experience with charging for generation, supply, and offshore generation, and also a guide on Triads; providing a suite of guidance documents for all charge payers and a Charging and Settlements forum. • When customers send in their monthly TNUoS forecasts, we now have a new monthly process, to identify demand customers who are under-forecasting. We now alert them to the potential consequences and encourage them to provide additional credit cover which protects them and also end consumers in the event of the supplier experiencing financial difficulties. • Improved accuracy of tariff forecasts and transparency of charges, providing more certainty to market participants. We have a new demand forecasting model which helps us to better forecast chargeable demand volumes. For offshore, we now use the most recent data to model future OFTO (Offshore Transmission Owner) revenues. We have also asked the onshore TOs to provide a consistent breakdown of their revenues, which helps customers to understand where changes in revenue have come from. • Regular newsletter updates including timely information and guidance on our charges, which also include our contact details, links to our pages and feedback routes to our teams.
I need better access to relevant information and data • **Improvements to digital access to information** • **Improvements to how we can interact with data** • **Access to relevant experts and knowledge of how to reach the right people.**	For BSUoS: • We now publish the initial invoice settlement data on the website. • We have made improvements to the BCR report; the new report will be available from the end of April 2019. • Improved forecasting, outturn information and material for BSUoS. For TNUoS: • Improved TNUoS billing reconciliation by making additional metering data available. • Improved validation of demand forecasting by establishing a dialogue with new customers at an early stage, reducing the risk of underpayments which result in an unexpected reconciliation bill.

	• Improved communications when there have been problems, by sending out email circulars to ensure customers are informed.
The onboarding process is not clear • **Knowledge of who to contact and what to know for new entrants.**	• Tightened the process for onboarding new suppliers by contacting them when they apply for CUSC accession, introducing ourselves as the charging team and offering advice on their CUSC obligations. • Developed a guide to TNUoS for new suppliers.

Charging and Settlement Forum

In 2017 we held two separate forums on BSUoS and TNUoS. In response to customer feedback, in 2018 we brought our network charging forums together. This meant customers only needed to attend on one day to understand everything for their business. By recasting our forums around our customers, rather than our charges, our customers get higher value for less time away from the office. We hosted one day for generators and the other for suppliers. We sought feedback from our customers asking, 'How likely is it that you would recommend the Charging and Settlement Forum to a friend or colleague?' receiving a score of 8.1/10 from 27 stakeholders on day 1 and 8/10 from 20 stakeholders on day 2.

Direct quotes from stakeholders:

- Good overview of charging formulas and recent developments. Generally clear presentation. Good event for industry.
- Information about different charges was really well-delivered and simple to digest.
- It has provided me insight in how the entire system works, regulations, cost and progress/ what next.
- Nice to hear how you are proving more transparency on BSUoS.
- Topic information was very thorough, time management allowed enough time to allow clarifications and questions, speakers were very informative.
- The terminology was kept simple and the explanations clear. I particularly benefited from the agenda item on RIIO2/Forward Looking/SCR which I did not have a clear understanding of before today.
- Opportunity to ask quite specific questions both during the presentations and particularly in the breaks.
- Good overview of many aspects of network charging and the ESO's role in charging.

Facilitating 2016-17 code change: Code administration

In the 2016 CACOP survey respondents told us that our performance in this area wasn't what they expected. Following this we made improvements and the overall satisfaction feedback in the 2017-18 CACOP survey[10] improved.

[10] https://www.ofgem.gov.uk/system/files/docs/2018/10/code_administrators_survey_2018_-_report_final.pdf

Table 8: CACOP Survey Results: Overall Satisfaction

Code	2017 (%)	2018 (%)	% change
CUSC	47%	65%	+18%
Grid Code	59%	66%	+7%
STC	57%	58%	+1%

During this year, we have carried out a "manage a code change" customer journey. We have gathered feedback from our customers in this and have developed an action plan in response to this.

Stakeholders said	We did/ We are doing
That they are looking for more support and facilitation from us as code administrator.	• We have updated our website to make it easier to find the documents needed. • We have increased the team working in this area. • Prioritisation process for modifications. • Attended other industry events to share the what key modifications are taking place. • Improving the ability for stakeholders to join the webinars. • Varying the location of meetings.
That it is difficult for them to understand what changes mean for them	• We will give more high-level information. • Remove jargon. • Signposting to the full report. • We will target industry at key stages with who it impacts, when and why. • Provide a horizon scan of potential modifications for the next 6-12 months.

We run and chair a monthly industry meeting, the transmission charging methodology forum, where we can discuss and raise topics before parties decide to raise CUSC modifications. This is a good opportunity for us to share our early thinking and support stakeholders before modifications are raised. We regularly have around 20 attendees. Alongside this we have shared about code changes for Emergency and Restoration implementation. We have presented to industry groups and circulated slides via our distribution list and incorporated into an Energy UK newsletter.

Facilitating code change: European Network Codes

During 2018-19 we have been implementing the regulations that have been brought about by the European Network Codes. This year we are working in System Operation Guidelines (SOGL), Electricity Balancing Guidelines (EBGL), Project TERRE and Project MARI. We are aiming to reach and help any parties that are affected by these topics with what is required by them and by when. To support this, we are trying to simplify content and use webinars, fact sheets, meeting documents, LinkedIn and our website to communicate with stakeholders.

We have regularly engaged with stakeholders on these changes. Through code modification workgroups we have been able to take a collaborative approach to shaping how the requirements are implemented. We have also consistently held webinars on European proposals which we used to share information, encourage responses to consultation and challenge our proposals. In December 2018, we held two consecutive conferences titled "Project TERRE, what it does it mean for you?" which allowed us to go through the details of how the balancing platform will work with 200 stakeholders, and we continue to update the industry on the progress of this project via the quarterly IS forums. During our engagement for TERRE, stakeholders have given positive feedback. They have told us that it would be useful to include wider details on TERRE, not just about the IT aspects. We have followed up by sharing additional information on how the bidding and instructions will work.

We have also held webinars on EBGL article 18 for stakeholders to share details on our February 2019 consultation. Before this was published, we shared our thinking with stakeholders with industry parties. The feedback we have received has been responded to as part of the consultation.

Delivering code change

Charging Futures is a programme designed to give all networks users the opportunity to learn more about the reform of electricity network charging, with the opportunity to ask questions and contribute. Our role as lead secretariat for Charging Futures allows us to facilitate industry in engaging with charging reform. The Charging Futures Forum was held in May 2018, September 2018 and January 2019 with stakeholders giving an overall score of 7.3/10. In our role, we have also produced podcasts with 4,321 listens throughout this year and hosted five webinars with an overall score for all of these of 7.3/10. For full details of our Charging Futures performance please see Metric 11: Charging Futures.

When we launched the ESO-led Balancing Services Charges Task Force at the Charging Futures Forum in January 2019 we committed to wider industry that as a task force, we would be transparent and engage/communicate periodically throughout the process leading up to the final report being sent to Ofgem in May 2019. To date we have published the task force agendas, presentations and minutes on the Charging Futures website, alongside podcasts with task force members. We also held a well-received webinar in March 2019 to provide updates and invite input on task force progress, as well as discussing our progress and views bilaterally with interested parties where requested and engaging multilaterally through industry events such as TCMF or our Operational Forum.

EMR modelling engagement

During 2018-19 we undertook a range of stakeholder engagements via formal consultations, industry workshops and face-to-face meetings. In addition, we have consulted academic experts to validate our approaches to modelling and also benchmarked these approaches against similar markets around the world. This has ensured that we can present our modelling methodologies to industry giving them confidence that they are fit for purpose and at the forefront of this type of modelling work.

In January 2018, we ran an industry workshop and consultation on the method for calculating wind and solar de-rating factors if these technologies were to be allowed to participate in the Capacity Market. This was then followed by a formal consultation with a final conclusions document published at the end of February 2018. While the final de-rating factors may have been lower than some industry stakeholders hoped we still had positive feedback on the thorough approach and consultation process and in particular the industry workshop.

We have also presented our analysis behind the Electricity Capacity Report recommendations on the amount of capacity to secure through the various Capacity Market auctions at the CM industry event in July 2018. This presentation was then followed by a Q&A session giving stakeholders every opportunity to ask questions and challenge our modelling work. This event also gave us the opportunity to carry out an industry consultation on Capacity Market de-rating factor methodologies for all eligible generation technologies.

We ran an interconnector modelling industry workshop in September 2018 where we discussed with stakeholders our pan-European modelling approach and how our de-rating factor ranges for each connected country are calculated. This gave stakeholders the opportunity to challenge and provide suggestions for enhancing our approach. We also work closely with the model owner/developer (Poyry) to improve the modelling of stress events across Europe as they are increasingly becoming linked to wind generation.

Finally, we have undertaken a number of bilateral meetings during 2018-19 with trade associations e.g. Energy UK as well as with individual companies to explain our modelling and conclusions and giving them opportunity to provide feedback on future enhancements.

5. Outturn Performance Metrics and Justifications

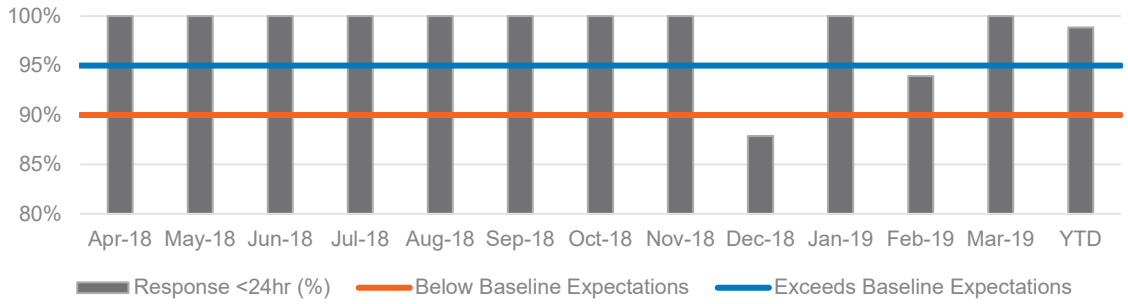
Metric	Performance	Justifications
Metric 9: BSUoS billing queries and process	Exceeding baseline	We improved our billing performance to 99% and query response time to 99% within 24 hours and our query resolution time to less than 2 weeks to 87%.
Metric 10: Code administrator-stakeholder satisfaction	Exceeding	Survey results show a significant increase from last year in overall satisfaction from our customers and stakeholders across CUSC, Grid Code & STC. + 18% improvement in CUSC (from 47% to 65%) +7% improvement in Grid Code (from 59% to 66%) +1% improvement in STC (from 57% to 58%)
Metric 11: Charging Futures Engagement Objectives	Exceeding baseline with score above 7.3/10 (baseline of 6.5)	Charging Futures podcasts have been listened to over 4,321 times, webinars were attended by 358 people and have been watched 1581 times during the year on demand. Charging Futures have helped network users understand the reform happening to electricity network charging and contribute to its development.
Metric 20: Month ahead BSUoS forecast vs outturn	Exceeding baseline	We delivered a month ahead BSUoS forecast that exceeds baseline performance because our forecast error is below 10% for 5 months in the year.
Metric 19: Year ahead BSUoS forecast vs outturn	Below baseline	Our year ahead BSUoS forecast error is 22.6% for this year. The performance is better than the last two years but is below expectations for the target set for this metric. Constraint costs have been higher this year because of unforeseen outages of the HVDC and a step change in RoCoF costs. Further details on outturn costs can be found in Metric 5.

Metric 9 – BSUoS Billing

Table 9: Metric 9 performance

Code	%	Performance
BSUoS query response time less than 24hrs	99%	●
BSUoS query resolution time less than 2 weeks	87%	●
BSUoS timeliness	99%	●

Figure 17: Metric 9 BSUoS query response time



We closed 36 queries during the month. We received 42 new queries in March. We received 3 customer survey results following query closure, 3 x excellent (Ratings available are: - Very Poor / Poor / Good / Excellent)

We published the payment calendar for BSUoS Settlement in March so that customers were aware of the invoice and settlement dates for the 2019/20 financial year.

To improve billing timeliness, we have invested a lot of time and effort in our billing system over the last couple of years so despite using the same system and having the same inputs we have been able to dramatically improve the performance against our billing metric. Over 20 different improvement activities have resulted in now us been able to bill 99%+ of runs on time across the whole year.

For query management, we have benefitted greatly from a new CRM system and custom dashboards that allow us to better service the needs of our BSUoS customers and view our own performance. We still have some improvements that we can make in this area and have plans to further improve our customer service for the coming year.

Billing BSUoS on time is important to our customers as the BSUoS costs feed directly into their costs and without this information they are forced to add a risk premia onto the end consumers that ultimately end up paying the BSUoS charge. Our BSUoS customers need to be able to challenge and ask questions about the BSUoS charges they are paying and by good query management we can service those needs.

Communication and engagement with our BSUoS customers is an area that we are particularly focused on. From 2014 to the start of 2017 we issued just 3 circulars/communications to our BSUoS customers, this is in stark contrast to the 45+ communications we have issued to them since 2017.

Figure 18: BSUoS query resolution time

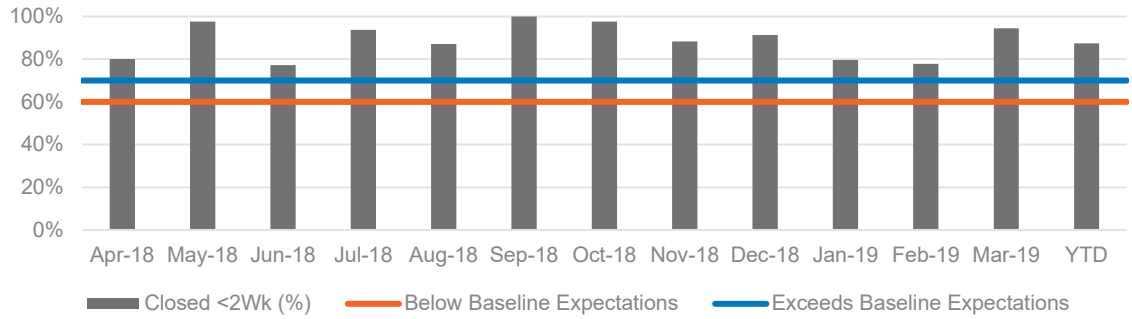
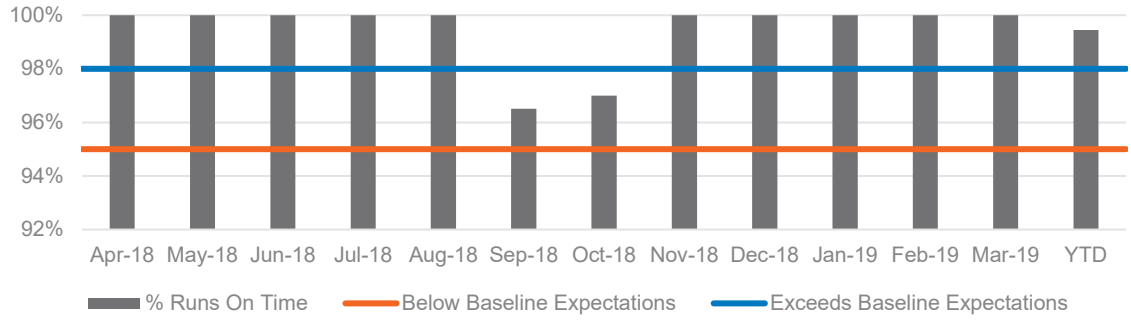


Figure 19: BSUoS bills timeliness



Metric 10 – Code administrator-stakeholder satisfaction

Our performance against this metric requires the output from the 2019-20 Code Administrators Code of Practice which as yet are not available.

The results from 2017-18's survey was published in October 2018. These results show a significant increase from last year (2016-17) in overall satisfaction from our customers and stakeholders across CUSC, Grid Code & STC.

Table 10: Metric 10 Code administration stakeholder satisfaction

Code	2017 (%)	2018 (%)	% change
CUSC	47%	65%	+18%
Grid Code	59%	66%	+7%
STC	57%	58%	+1%

During this year, we have developed and implemented our code improvement plan. This has been driven by stakeholder feedback, we are placing increased focus on talking to users of the code modification change process.
During this year we have seen an increase in the level of change in our codes.

These codes are crucial in facilitating competitive markets. By offering an improved service in their administration allows benefits to flow through the change process and be delivered in an efficient manner.

Metric 11 – Charging Futures

Table 11: Metric 11 Charging Futures Forum

Forum Date	Attendance	On a scale of 1-10 (10 being highly-recommend) how much would you recommend this event to a friend or colleague?	Number of responses
May-18	72	6.5/10	31
Sep-18	70	7.9/10	30
Jan-19	88	7.7/10	38

Quality of delivery improved significantly during the year. The year's first forum in May 2018 scored 6.5/10 and we have developed how Forums worked significantly since then.

Charging Futures have helped network users understand the reform happening to electricity network charging and contribute to its development.

Table 12: Metric 11 Charging Futures - Webinars recorded in 2018-19

Webinar	Live attendees	On-demand views	"A good overview but a few gaps/ comfortable* (pre webinar) "	"very comfortable /I'm on top of it *(post webinar)"	Would you recommend the webinar to a colleague or a friend
Access and Forward-Looking Charging Consultation	102	255	43%	80%	7.7/10
Targeted Charging Review: Significant Code Review	133	335	67%	96%	6.9/10
TCR Minded to position	78	236	64%	83%	6.8/10
Access Reform SCR Launch	45	153	41%	73%	7.1/10
BSUoS Task Force	--	23	--	--	8/10

Webinars recorded this year were attended by 358 people and have been watched 1002 times during the year on demand.

Four webinars recorded prior to 2018 have been watched 579 times this year.

The level of interest in these podcasts and webinars show how valuable network users have found them in supporting their understanding and enabling them to contribute to reform.

Table 13: Metric 14 Charging Futures- Podcasts

Quarter	Number of podcasts added	Podcast listens (to all podcasts available)
Q1	3	688
Q2	9	1,586
Q3	2	1,107
Q4	6	4,321

Twenty podcasts were added to the Charging Futures library since April 2018 which have enabled network users to develop their understanding of reforms being discussed in industry. These are used by network users that attend the Forum but are also publicly available so that all stakeholders interested in network charging and access arrangements can engage with the reform.

Metric 19 – Year ahead BSUoS forecast vs outturn

Our year ahead BSUoS forecast error is 22.6% for this year. The performance is better than the last two years where our performance was 34% in 2016-17 and 25% in 2017-18 but is below expectations for the target set for this metric. The average absolute percentage error over the last three years was 25%, and we set ourselves a challenging targets of: baseline target is <20% APE and exceeding target is <10% APE.

Metric 20 – Month ahead BSUoS forecast vs outturn

Table 14: Metric 20 Month ahead BSUoS forecast vs outturn

Month	APE below 10%	APE above 20%
April	●	
May	●	
June		
July	●	
August		
September		●
October		●
November		
December	●	
January		
February	●	
March		●
YTD	5	2
Target	5 or more green months	Less than 5 red months

Our error has been less than 10% for 5 months this year, so our performance exceeds baseline. Our BSUoS forecast for March 2019 was below target because the HVDC tripped and was out of service for 23 days in that month. This could not have been reasonably foreseen and incorporated within this forecast.

PRINCIPLE 5

Coordinate across system boundaries to deliver efficient network planning and development

Role #3
Facilitating whole system outcomes

Principle 5
Coordinate across system boundaries to deliver efficient network planning and development

AMBITION
Whole system approach to developing electricity networks

Delivered benefits in 2018-19

- Published and delivered against plans for three Regional Development Programmes (RDPs), which are ground-breaking collaborations with DNOs that take a whole-system approach to planning and operating electricity networks
  - the SP Energy Networks RDP optimises costs of network constraints, additional generation connections, and network development
  - the WPD RDP looks at potential options for treatment of storage at three GSPs, and how to use flexible resources to facilitate connections in constrained areas
  - the ENWL RDP assesses operability options to manage constraints versus deploying assets
- Implemented innovative contracts for DER connections in both UKPN and WPD areas
- Standardised templates for the submission of data for week 24 data exchange
- Created consumer value through earlier and cheaper connections in UKPN's South-East Coast network and WPD's South West network

£520m

Future benefits and long term initiatives

- Developed whole system approaches to networks and unlocking of further DER connections
- Supported long term network investment decisions and operational strategies across the system
- Enhanced ability of DER to resolve network constraints / issues in the South West Scotland network area
- Changing embedded generator protection systems leading to more than £170m/year saving from 2022
- Developed whole system approach to cross boundary working leading to saving of £350m over the next 40 years from the South West Scotland RDP

Plan delivery and new ways of working

- Improved and developed new tools and processes to enable DER connections
- Joint RDP with UKPN takes a whole-system approach to optimising network capacity in the South East
- Joint RDP with WPD for the South West region, to facilitate the connection of additional DER
- Launched the Accelerated Loss of Mains Protection Change programme

70% New
20% Improved

Forward Plan 2018-19 deliverables

- ✓ Publication of the WPD and UKPN Regional Development Programme Learnings
- ✓ Begin two new RDPs by publishing a bespoke work plan for each region
- ✓ Facilitate unlocking of further DER connections through:
  - Implementation of innovative connections contracts that support the roll-out of revised Statement of Works processes on a national basis and the ability for DER to provide transmission constraint management services in our in-flight RDP areas
  - Implementation of new commercial contracts to allow DER to participate in the provision of transmission constraint management services in our in-flight RDP areas (developing)
  - Implementation of enhanced systems and ways of working between T&D to support provision of transmission services by DER (developing)
- ✓ Wk24 data exchanges that help establish whether the system is compliant with the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS or SQSS) and trigger remedial works if not

Stakeholder

- Our engagement with DNO stakeholders includes monthly face to face meetings with DNO and iDNO representatives to deliver RDP outcomes and develop the Accelerated Loss of Mains Change Programme. The Accelerated Loss of Mains Change programme is unprecedented in what it will achieve and how it will be achieved, necessitating the design of new ways of encouraging compliance with mandatory requirements as well as new commercial arrangements and ways of working between the ESO, the DNOs and iDNOs
- The RDPs single-stage connection offer process has created a level playing field for both transmission and distribution customers, and maximised competition by enabling both to participate in the same flexibility markets. This should increase competition in provision of services, and lower costs consumers
- The RDPs recommend technical and commercial joint-actions. Ultimately these will provide better use of local network capacity for DER connections and reduces time to connect

Performance metrics

Metric	Performance
Metric 13: Whole system – unlocking cross-boundary solutions	Exceeding baseline – 278MW of DER – capacity enabled to connect.

1. Evidence of Delivered Benefits

- ✓ Published and delivered against plans for three Regional Development Programmes, which are ground-breaking collaborations with DNOs that take a whole-system approach to planning and operating electricity networks
  - the SP Energy Networks RDP optimises costs of network constraints, additional generation connections, and network development.
  - the WPD RDP looks at potential options for treatment of storage at three GSPs, and how to use flexible resources to facilitate connections in constrained areas.
  - the ENWL RDP assesses operability options to manage constraints versus deploying assets.
- ✓ Implemented innovative contracts for DER connections in both UKPN and WPD areas
- ✓ Standardised templates for the submission of data for week 24 data exchange
- ✓ Created consumer value through earlier and cheaper connections in UKPN's South-East Coast network and WPD's South-West network

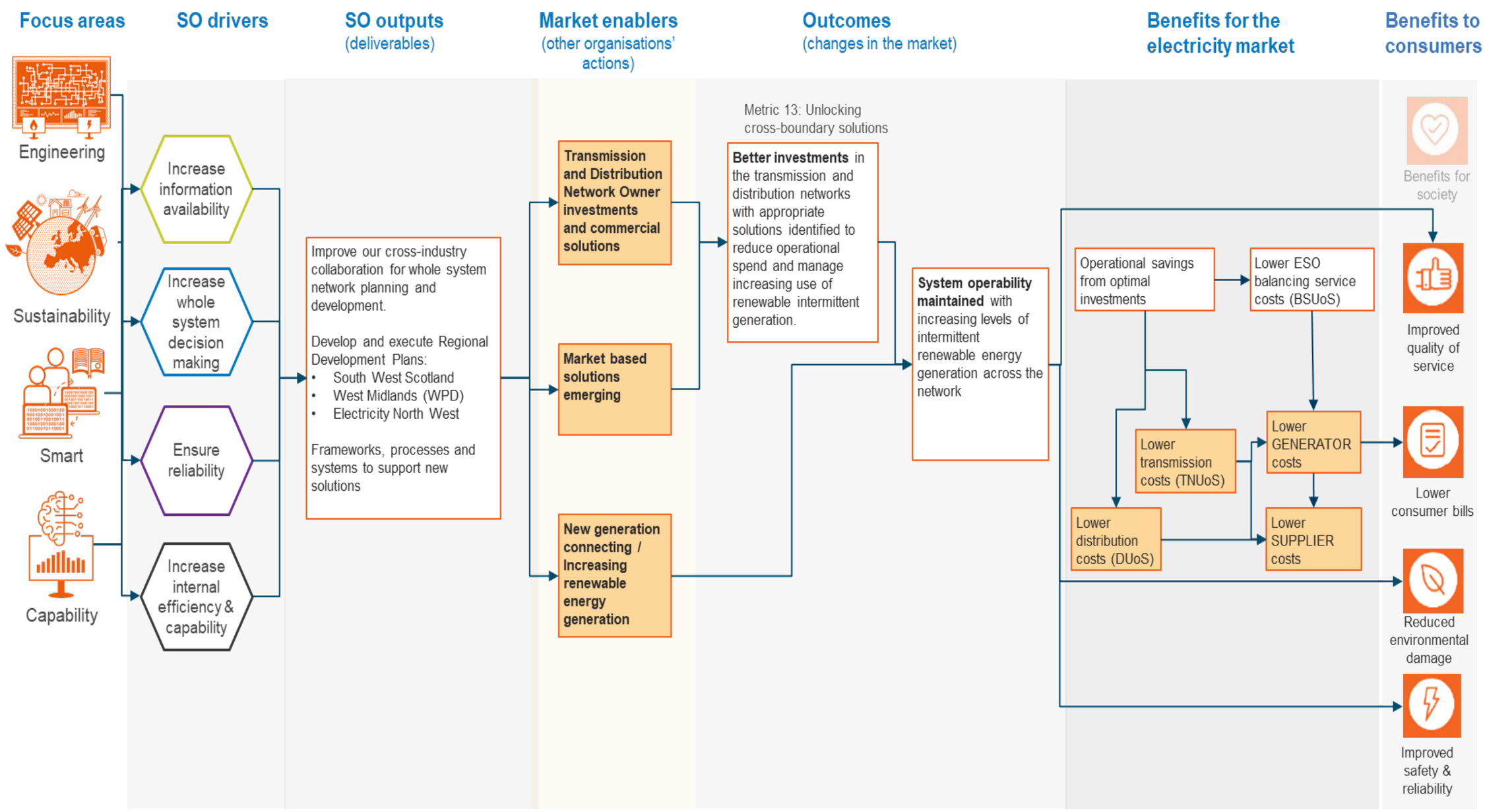
The benefits created by Principle 5 are derived through unlocking value from working across transmission and distribution boundaries, to find optimised solutions to network development and operation challenges. We look for the best solution whether it be asset-based or service-based, irrespective of its location or source across all networks.

We delivered improved customer service to the DNOs by creating these RDPs, and the RDPs will then go on to create future tangible end-consumer benefit of lower bills as the recommendations and plans are executed. Lower bills will be realised through optimum spend across BSUoS, TNUoS and DUoS charges. Additionally, there are opportunities for the ENCC to utilise new resources to manage the system, giving us more 'tools in our box' which has the potential to lower what we spend to operate the system.

As described in Metric 13, we enabled the connection of an additional 212MW of new DER in the UKPN distribution network. This delivers end-consumer benefit through lower bills realised by having more generation able to participate in markets earlier, and environmental benefit from 190MW of this additional DER being low-carbon.

Figure 20 shows what drives us to prioritise our deliverables and activities within Principle 5, and how these deliverables ultimately provide benefit for the end consumer.

Figure 20: Principle 5 Consumer Benefit Map



2. Evidence of Future Benefits / Long term Initiatives

- ✓ Developed whole system approaches to networks and unlocking of further DER connections
- ✓ Supported long term network investment decisions and operational strategies across the system
- ✓ Enhanced ability of DER to resolve network constraints / issues in the South West Scotland network area
- ✓ Changing Embedded Generator Protection Systems leading to more than £170m/year savings from 2022
- ✓ Developed whole system approach to cross boundary working leading to saving of £350m over the next 40 years from the South West Scotland RDP

Much of our work under Principle 5 spans multiple years, and delivers benefits for end consumers in future years. It is vitally important that we focus on longer-term initiatives and avoid short-term thinking, in order to optimise the value for the consumer when looking across the whole system. We present two case studies illustrating work we undertook in 2018-19 that will generate future benefits for consumers.

Consumer Benefit Outcome

Whole system approach to cross boundary working

Activity	We are finding the right balance between operational cost and network costs in developing our solutions to future requirements. Previously network licensees would only have looked as far as their system boundary when looking at options. We are now looking across system boundaries to find the most efficient solution.
Delivered and future benefit	Up to £350m over the next 40 years from the South West Scotland RDP
	For the South West Scotland area we have undertaken a cost-benefit analysis which showed around £500m of consumer value in not building transmission assets. This will be a TNUoS saving. This is balanced against an additional projected BSUoS spend to constrain generation of £150m, giving a net consumer benefit of £350m. As we work through other Pathfinders, RDPs, and cross-boundary options we will perform further cost benefit analysis to assess their value.

Basis of expected benefit	• We are the central coordinator. We drive and lead the options analysis delivering the optimum cost solution from a range of options.
	• We scan the system for opportunities, inviting relevant parties, such as DNOs, to work with us to drive overall system cost down. When these parties on board, we partner with them to deliver the agreed solutions. Examples are described below.
	  ○ Recently we have seen examples of generation that has connected to the UKPN network before they would have previously been able to. There would have needed to be transmission investment first, now this is not the case as contractual solutions have been put in place which provide the facilities needed to avoid the network investment.
	  ○ We have previously released capacity in the Dumfries and Galloway region, deferring transmission investment. The cost benefit analysis for South West Scotland shows in the region of £500m of consumer value in not building network infrastructure, and now we need to develop the Generation Export Management Scheme to support this saving and develop an effective and competitive local solution in a whole system context. We estimate we will spend £150m in additional constraint costs due to the deferred transmission investment, giving a net consumer benefit of £350m.
	  ○ We are delivering a Regional Development Programme with WPD focusing on storage, the benefits of which are up to £10m in avoided investment.
	  ○ We are working with Electricity North West to determine the most efficient site for reactor deployment, the benefit is up to £5m realised by highlighting the optimal network infrastructure solution.

How benefit is realised in the consumer bill	• Various charges on system users are passed through to the end-consumer. These can be for use of the distribution system (DUoS); the costs incurred by the system operator in running the system (BSUoS); and the cost of building and maintaining the system levied by the TOs (TNUoS). • Choosing solutions which have an optimum cost across all these charges will maximise savings for the end-consumer.
Additional non-monetary benefit	There are potential additional benefits, such as environmental, both when we allow generation to connect earlier (if it is low-carbon, which is likely), and if we defer or avoid physical asset build.

Changing Embedded Generator Protection Systems

Consumer Benefit Outcome

Activity	We currently use commercial actions to manage a system operability problem 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 problem is referred to in the industry as Loss of Mains protection, RoCoF and Vector Shift. We will create benefit by working with all the DNOs to agree an accelerated change programme to curtail these costs earlier, by modifying effected generator protection systems.
	More than **£170m per year** from 2022.

Delivered and future benefit	Between 2019 and 2022, we will run a 3-year programme to change the protection settings on affected embedded generators. The programme of change is currently forecast to cost £60m. This cost will be charged through BSUoS over the relevant timeframe. Once the programme is complete, there will be no commercial cost of managing the problem. The table below shows how we forecast the cost of the problem will increase if we do nothing; the costs of implementing the change programme; and the impact of the change programme on costs.

Table 15: RoCoF forecast costs and change programme costs

£m		19-20	20-21	21-22	22-23	23-24	24-25
Do Nothing	Forecast Balancing Costs	130	150	150	170	190	290
	Cumulative	130	280	430	600	790	**1080**
Implement Change Programme	Forecast Balancing Costs	130	150	40			
	Forecast Change Costs	20	30	10			
	Total Balancing Costs	150	180	50			
	Cumulative	150	330	**380**			

Basis of expected benefit	We will create benefit by working with all the DNOs to agree an accelerated change programme to curtail these costs earlier, by modifying effected generator protection systems. This would not be possible without us working closely with the DNOs and Ofgem to agree an accelerated plan to solve the problem at the generator protection systems. We are also progressing a code modification to ensure this can happen. We believe this is adding additional value, as there is no direct impetus on industry to solve this via a code modification without our intervention.
How benefit is realised in the consumer bill	The problem is managed through commercial actions paid for through BSUoS. The cost of the programme to resolve the problem will also be levied through BSUoS. Therefore, there will be additional cost over the 3-year programme period, but as we move through the programme into its third year, the commercial cost of managing the problem will reduce, and upon 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 benefit to system security due to the elimination of the situation where generation may disconnect unnecessarily due to fault conditions.

3. Plan Delivery and New Ways of Working

- ✓ Improved and developed new tools and processes to enable DER connections
- ✓ Joint RDP with UKPN takes a whole-system approach to optimising network capacity in the South East
- ✓ Joint RDP with WPD for the South West region, to facilitate the connection of additional DER
- ✓ Launched the Accelerated Loss of Mains Protection Change programme

Across Principle 5 all our deliverables are exceeding what is expected from a competent and efficient system operator. These deliverables are ongoing in 2019-20 as they are long term programmes of work.

Outcome	2018-19 Deliverable	Target	Actual	Status
Improve our cross-industry collaboration for whole system network planning and development	Publication of the Western Power Distribution and UK Power Networks Regional Development Programme Learnings	Q1	Q4	WPD: Published in June UKPN: Published in March 2019
	Begin two new RDPs by publishing a bespoke work plan for each region	Q3	Q4	Three RDPs underway: • Dumfries and Galloway (D&G) RDP ongoing. We have developed our IT delivery approach, and supported SPT to engage with their customers at regular stakeholder events. IT requirements are being progressed in a project structure, in the start-up phase. We published the Project plan in March 2019. • WPD RDP '4' was initiated in September 2018. We developed the datasets and ran modelling to understand potential options for treatment of storage at three GSPs. We discussed with WPD how to capture and present case studies on how flexibility could be contracted to facilitate further connections in constrained areas. We discussed how to ensure the proposed treatment of storage as flexible demand is consistent with the interpretation of Engineering Recommendation P2. We

			published the Project plan in March 2019. • ENWL RDP ongoing. We worked to assess whether operability options might represent a more appropriate way of managing constraints when compared with a traditional asset option (e.g. a new transformer). We published the Project plan in March 2019.
Facilitate unlocking of further DER connections through: • Implementation of innovative connections contracts that support the roll-out of revised Statement of Works processes on a national basis and the ability for DER to provide transmission constraint management services in our in-flight RDP areas	Q3	Q3	UKPN Bilateral Contract Agreement (BCAs) for relevant South Coast GSPs have contained the necessary provisions since June 2017, and DER connection agreements are being rolled out on that basis. All 8 RDP Offers for the South West were issued to WPD South West, and have since been returned signed.
Facilitate unlocking of further DER connections through: • Implementation of new commercial contracts to allow DER to participate in the provision of transmission constraint management services in our in-flight RDP areas.	Q3	Ongoing 19-21	We have experienced delays in the technical and commercial workstreams. This work will continue into 2019-2021 and our plans can be seen in our Forward Plan 2019-21. We are continuing our discussions with DNOs on contract structure and detail for transmission constraint management from DER.
Facilitate unlocking of further DER connections through: • Implementation of enhanced systems and ways of working between transmission and distribution to support provision of transmission services by DER.	Q3	Ongoing 19-21	We have experienced delays in the technical and commercial workstream. This work will continue into 2019-21 and our plans can be seen in our Forward Plan 2019-21. We continue to progress through the start-up phase of the IT project to deliver the necessary systems and processes.
Wk24 data exchanges that help establish whether the system is compliant with the National Electricity Transmission System Security and Quality of	Annual process	Competed in line with code obligations	Following submission of our network planning data to other network operators (by week 42), the formal week 24 data exchange processes have concluded for 2018. We are converting the data

	Supply Standard (NETS SQSS or SQSS) and trigger remedial works if not.	into a format suitable for modelling with. This year we introduced a new template-based approach for certain data items, to promote consistency of submissions. This was helpful as it made processing easier and allowed for year-on-year comparisons to be made.

4. Stakeholder Evidence

- ✓ Our engagement with DNO stakeholders includes monthly face to face meetings with DNO and iDNO representative to deliver RDP outcomes and develop the Accelerated Loss of Mains Change Programme. The Accelerated Loss of Mains Change programme is unprecedented in what it will achieve and how it will be achieved, necessitating the design of new ways of encouraging compliance with mandatory requirements as well as new commercial arrangements and ways of working between the ESO, the DNOs and iDNOs
- ✓ The RDPs single-stage connection offer process has created a level playing field for both transmission and distribution customers, and maximised competition by enabling both to participate in the same flexibility markets. This should increase competition in provision of services, and lower costs for customers and consumers
- ✓ The RDPs recommend technical and commercial joint-actions. Ultimately these will provide better use of local network capacity for DER connections and reduce the time for customers to connect

Regular meetings with DNO and independent distribution network operator (iDNO) representatives to deliver RDP outcomes and develop the Accelerated Loss of Mains Change Programme

Our main engagement with DNO stakeholders had been through working level meetings with our RDP partners and in the establishment of Accelerated Loss of Mains Change programme. For each of our RDPs there is some requirement for us to have visibility and control of distributed energy resources (DER), so we can manage the impact of further DER connections.

Stakeholders have told us	What we have done
DNOs and TOs want us to communicate earlier and more clearly on topics that are relevant to them such as regional approaches to managing reactive power and future plans for evolving the NOA process.	We produce and share a monthly table providing a forward view of our relevant pieces of work and when we were planning to engage externally on these topics. We also encouraged other network companies to reciprocate, ultimately driving enhanced transparency of activities across networks. We also sought DNO input into a letter on exclusivity of ancillary services contracts in advance of engaging with industry more broadly.
“The collaborative working has illustrated the benefits that can be found from harnessing the breadth of experience. And shows the benefits of working together to maximise the whole system efficiencies. With regard to vector shift work, whilst a great result was achieved for consumers, this work also provided significant learning around the need for transparency and sharing of data at an earlier stage. This has been further illustrated by National Grid’s	In response to this feedback, following receipt of the first application for supergrid transformer tertiary winding connections, we worked with NGET and the customer to gain a thorough understanding of the customer’s needs. This was a novel connection approach that had not been envisaged previously and it took time for us to understand how a licensed offer to this customer should be developed. The connection offer process requires us to provide an offer to the customer within three months, which combined with the confidential requirements of the customer did not allow for wider industry engagement prior to the

intention to use the tertiary windings of super grid transformers for customer connections. It was disappointing to hear that offers had already been made to customers prior to giving consideration to the impact on our networks or as to whether this presented the most cost effective solution. We saw this as a marked change from the effective whole system collaboration described earlier in this response. We would reiterate our concerns with the process that was followed in this instance, and would urge that any similar activities in the future be considered in the manner that befits whole system working and is in keeping with what has generally been a very productive, effective and collaborative relationship."	connection offer being made. Once we understood enough details to make an offer we included within the offer a requirement for engagement between the impacted DNO to allow us to fully understand the impact of the connection. This was made clear to the customer and engagement with the DNO took place once this was understood. We recognise that this approach has raised concerns with certain DNOs and since our initial conversations we have increased the level of engagement regarding these connections, holding bilateral meetings with DNOs and a workshop in March 2019. We have committed to continue increased levels of engagement with DNOs regarding these connections to ensure the final connection solution is delivered in the most economic, efficient and coordinated way.
"Engagement over the past year with the ESO has been good, with frequent contact but sometimes in unforeseen timescales. The pipeline of engagement is not clear and many times have been at short notice, leaving resourcing this very difficult. The level of engagement generated by the ESO is large due to its size and it is opaque as to whether these occasions are shared equally amongst all DNOs, or those that are more open or more aligned in thinking. Opportunities for discussion still feel one-sided and whilst some engagement has been very productive for both parties, these tend to be when the work is well aligned to the ESO's own position. Where our positions are misaligned, fruitful and collaborative discussions can be allusive."	In response to this feedback, we have taken steps to ensure greater coordination of DNO engagement within the ESO. In particular, we have established a process to consider the mutual impact of our work on DNOs, and vice-versa, so that we can drive greater awareness within the business.

5. Outturn Performance Metrics and Justifications

Metric	Performance	Justifications
Metric 13: Unlocking cross-boundary solutions	Exceeding baseline-278MW of DER - capacity enabled to connect.	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 on the South-East Coast. We have enabled 278MW of DER to connect, which would not have been possible otherwise.

Metric 13 – Whole system – unlocking cross-boundary solutions

Table 16: Metric 13 Whole system unlocking cross boundary solutions performance

Grid Supply Point (GSP)	MW	Commentary on DER technology types
Bolney	140	10MW of battery storage scheme added in October/December, 65.4MW of new battery storage schemes added in January/March
Canterbury	21.5	New Gas Turbine scheme added in October to December period.
Ninfield	51.2	All battery storage schemes
Sellindge	0	n/a
Total	**278.1**	

During January to March 2019 we contracted a further 65.4MW of new DER battery schemes with UKPN, bringing the year to date total of new DER contracted through the RDP Appendix G trials in South East England with UKPN to 278.1MW*. Since the introduction of the RDP Agreements in 2017 we have contracted 343.51MW* of new DER.

** All numbers account for any DER contracted under RDP that have subsequently terminated.*

WPD have now signed RDP Agreements at 9 GSPs South West England on the 29 March 2019 with their first Appendix G updates due in April 2019. RDP principles will now also roll out across all WPD regions for battery connections where there are known restriction as and when a new application triggers the need. Work is also ongoing with SP Energy Networks for RDP Appendix G trials across 11 GSPs in South West Scotland.

PRINCIPLE 6

Coordinate effectively to ensure efficient whole system operation and optimal use of resources

Role #3
Facilitating whole system outcomes

Principle 6
Coordinate effectively to ensure efficient whole system operations and optimal use of resources

AMBITION
Enable innovative connection solutions on a whole system basis, irrespective of ownership boundaries

Delivered benefits in 2018-19

£30m

- Launched the new fast track (Sprint) approach for connections which reduces the offer timescales by 30%. This has also increased the number of connection application to the transmission network by 40% from the previous year with 45 new (first time) market participants (up from 15 the previous year)
- Updated 10 connection agreements to reflect changes in network connections within 9-month target period

- Developed specifications for the replacement of the Transmission Outage and Generator Availability (TOGA) tool including bilateral meetings and stakeholder workshops on developing the new tool to ensure it meets stakeholder needs and expectations
- Delivered value through reduced application fees and processing time due to improved Appendix G process with all DNOs enabling quicker connection offers to connect distributed energy resources, typically reduced time scales by six months and a saving of 15k per application

Future benefits and long term initiatives

£600m

- Led a whole system approach to cross boundary working leading to benefits of £500m by 2030
- Published whole electricity system thought leadership leading to benefits of over £100m/ year by 2030
- Enabled a more diverse range of suppliers and technologies and increased liquidity in the market
- Enhanced asset optimisation and improved access to networks
- Reduced balancing and operability intervention by the ESO

Plan delivery and new ways of working

- Initiated changes to the commercial arrangements for connection charges
- Launched a pilot trial for the Appendix G process with DNOs
- Developed innovative connection solutions and connection arrangements using transformer's tertiaries
- Developed an alternative approach to enable increased boundary flows and automation of current network access planning process
- Developed the specifications of the new TOGA tool

50% New

50% Improved

Forward Plan 2018-19 deliverables

- ✓ Whole Electricity System Outcomes' paper
- ✓ ENA Open Networks Future Worlds consultation
- ✓ Extend Appendix G trial processes
- ✓ Supporting a new Tertiary connection product that the NGET TO has offered to the market
- ✓ Non-Firm and Restricted access connections
- ✓ Engage with TOs and DNOs to identify opportunities to achieve more efficient use of existing assets, making use of weather and loading related operational capabilities thereby reducing the need for investment and lowering the volume and cost of balancing actions taken
- ✓ Identify areas for process improvement under existing contracts between SO and TOs and lead change programmes to optimise consumer benefits
- ✓ Specifications for TOGA replacement
- ✓ TOGA Procurement Event
- ✓ Delivering increased volume and complexity
- ✓ Increased connection application volumes and 'Sprint' process
- ✓ Connection and Compliance customer engagement
- ✓ Customer Connection seminars
- ✓ Network user planning workshops to reduce outage 'churn'
- ✓ DNO Operational Liaison
- ✓ Identify and develop new market tools with all relevant parties to ensure efficient system solutions for operation
- ✓ Demonstrate system operability related challenges to a broader range of stakeholders identifying the scale of the impact we forecast on future operation and providing opportunity for whole system solutions to be developed
- ✓ Regular engagement with DNOs exists currently to share seasonal data and challenges encountered on networks. We will increase the volume of this engagement and include other network operators as well as large demand customers
- ✓ Build strong relationships with DNOs and review and develop contractual arrangements and processes to deliver efficient whole system focused outcomes
- ✓ Increasing our involvement and support of the ENA Open Networks Project
- ✓ Articulating our thought leadership on Whole Electricity System across a broad stakeholder base

Stakeholder

- Leadership role within the ENA Open Networks Project with broader representatives from across the ESO including the Energy Network Future Group
- Improvements in communication with all affected parties and outage management system including Network User Planning Workshops to reduce outage churn
- Hosted the Customer Connection Seminars to inform new and potential market participants with 200 attendees and positive feedback score of 4.3/5
- Published the 'Facilitating Whole Electricity System Outcomes' paper with positive feedback including that it was clear and well thought out
- Engaged on a replacement for the TOGA tool – worked closely with customers and stakeholders to listen to their views and take account of their requirements in the design of the new outage planning tool to ensure it delivers what they need

Performance metrics

Metric	Performance
Metric 14: Connections Agreement Management	Exceeding baseline
Metric 15: System Access Management	Exceeding baseline
Metric 16: Future GB electricity system security planning	Published with positive stakeholder feedback
Metric 21: Right First Time Connection Offers	On target

1. Evidence of Delivered Benefits

- ✓ Launched the new fast track (Sprint) approach for connections which reduces the offer timescales by 30%. This has also increased the number of connection application to the transmission network by 40% from the previous year with 45 new (first time) market participants (up from 15 the previous year).
- ✓ Updated 10 connection agreements to reflect changes in network connections within 9-month target period
- ✓ Developed specifications for the replacement of Transmission Outage and Generator Availability (TOGA) tool including bilateral meetings and stakeholder workshops on developing the new tool to ensure it meets stakeholder needs and expectations
- ✓ Delivered value through reduced application fees and processing time due to improved Appendix G process with all DNOs enabling quicker connection offers to connect distributed energy resources, typically reduced time scales by six months and a saving of 15k per application

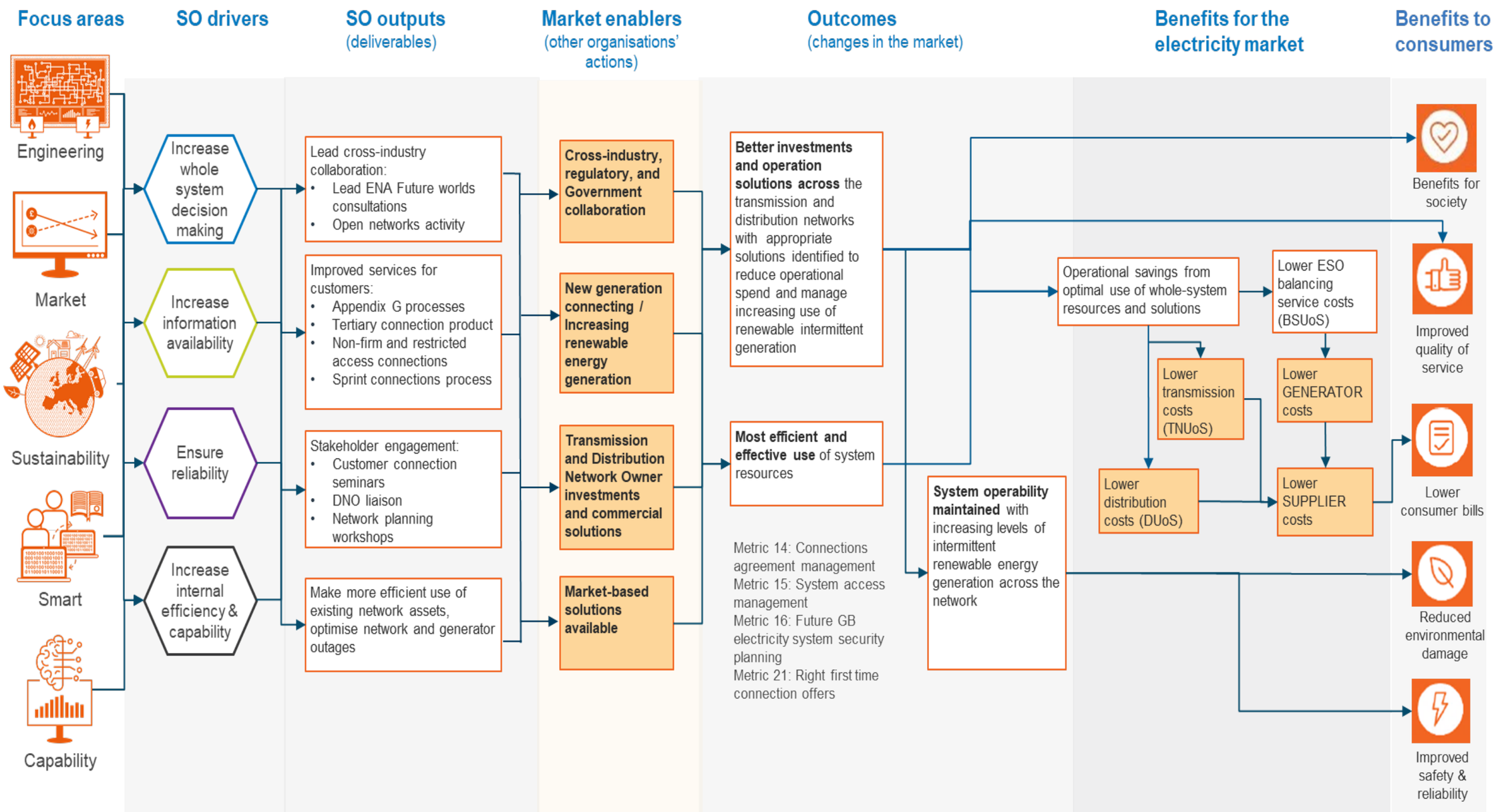
Under this principle we delivered a diverse range of benefits to our customers, which ultimately flow through to benefit the end consumer. We delivered improved service and reduced costs through the **Appendix G process**. This process allows quicker connection times and reduced costs. Previously DNOs applied to us each time they received a customer application to connect to their network, to identify any required transmission works. This trial process gives more transparency of the connection capacity available at particular Grid Supply Points, resulting in saving many individual statement of works and a reduction in application fees and processing time. Further, the streamlined Appendix G process is reducing the number of statement of works required and project progression applications.

We delivered **improved service** from our connections process for on-target right-first-time performance for new connection offers, against a background of an increasing number of connection applications: we delivered an increase of 63% from 109 to 178 applications this year compared with the previous year. We are able to deliver this performance through use of the 'Sprint' approach we have developed.

We delivered **improved customer service** by: supporting a new connection product (tertiary connection) to offer lower costs and quicker connection; holding customer connections seminars; running workshops to focus on outage optimisation to reduce outage planning 'churn'; workshops to gather customer-led design functionality for the replacement of our customer-facing TOGA IS system.

Figure 21 shows what drives us to prioritise our deliverables and activities within Principle 6, and how these deliverables ultimately provide benefit for the end consumer.

Figure 24: Principle 6 Consumer Benefit Map



A case study of where we have delivered tangible benefit for consumers of lower bills, through working with our customers in the area of system access follows:

Whole-system approach to network access and outage planning

Consumer Benefit Outcome

Activity	The Network Access Planning department works with the TOs and generators in order to plan and optimise outages more efficiently and economically. The planners add value to the end consumers and the connected customers by using their engineering expertise and judgment to propose innovative ways of planning outages, and by going over and above our network access planning policy and procedure requirements This results in BSUoS savings which leads to lower bills for the end consumer.
Delivered benefit	This approach delivers **£4.3m** of savings through BSUoS and **£15.4m** savings for connected customers (generators).
	We derived these numbers by determining the number of additional MWhs we have released onto the system, and multiplying this figure by an estimate of the cost of the MWhs. For generators whose connection agreements do not compensate them for being unable to export power during transmission system outages, savings are generated when our actions result in them being sterilised for shorter durations than anticipated in the original outage request.
Basis of expected benefit	As part of the network access process, we have created and captured added value for the customers and stakeholders by: • Coordinating with the TOs to calculate the cost benefit analysis of outage requests • Minimising the duration of outages requested by the TOs • Moving outages in coordination with the TOs using the System Operator-Transmission Owner Code Procedures (STCP) • Accepting and planning additional high value outages received within year and optimising outage placement including nesting of outages • Proposing alternative and innovative solutions to the TOs, like temporary connections for generators affected by long outages • Reassessing system capacity to release additional generation capacity This minimises the impact of outages on energy flow and reduces the length of time generation is unable to export power onto the network.
How benefit is realised in the consumer bill	The money we spend to manage system constraints is funded through the BSUoS levy, paid by system users and passed through to the end consumer bill. Any reductions, or cost-avoidance, we can make in this area will directly benefit the consumer as BSUoS would be lower than otherwise the case due to our actions. Any actions we have taken which result in generators being offline for less time than would otherwise have been the case, will also indirectly benefit the consumer, as this is more generation capacity released into the wholesale and balancing markets, adding to liquidity in those markets.
Additional non-monetary benefit	Often when we are able to re-work outages and system access requests, the affected generators are low-carbon. By enabling these generators to be offline for as short a time as possible, we are enabling environmental benefit, as the avoided curtailed output does not have to be replaced by carbon-intensive generation.

2. Evidence of Future Benefits / Long term Initiatives

- ✓ Led a whole system approach to cross boundary working leading to benefits of £500m by 2030
- ✓ Published whole electricity system thought leadership leading to benefits of over £100m/year by 2030
- ✓ Enabled a more diverse range of suppliers and technologies and increased liquidity in the market
- ✓ Enhanced asset optimisation and improved access to networks
- ✓ Reduced balancing and operability intervention by the ESO

Our work across the whole system is fundamental to setting us and industry up for success as we rapidly transition to a low-carbon future.

It is crucial that we give appropriate focus to future issues now, to avoid be in a position where we are struggling to operate the system securely and economically as it swiftly evolves. A case study of where we are adding that value is detailed following:

Consumer Benefit Outcome

Whole electricity system thought leadership

Activity	We play a key role in the ENA Open Networks project and are actively involved across all workstreams. Across the ENA Open Networks workstreams, we are engaged in over 30 working groups and/or product development groups.
Delivered and future benefit	As the ESO we contribute to £8bn per year of savings to be had for the end consumer by 2030 if the industry works together to intervene to resolve issues which are being created by the move to a low-carbon decentralised electricity system.
Basis of expected benefit	Work in this area is fundamental to the achievement of an economic and securely operable electricity system in the future. Current research[11] from Energy UK, ADE, Ovo Energy demonstrates that if industry works together to solve the challenges appearing on the system as a result of the transition to a low-carbon environment, there are immense benefits to be realised for the end consumer. For example:

[11] https://www.energy-uk.org.uk/publication.html?task=file.download&id=5722
https://www.theade.co.uk/assets/docs/resources/Industrial flexibility and competitiveness report_v10 web.pdf
https://www.ovoenergy.com/binaries/content/assets/documents/pdfs/newsroom/blueprint-for-a-post-carbon-society-how-residential-flexibility-is-key-to-decarbonising-power-heat-and-transport/blueprintforapostcarbonsocietypdf-compressed.pdf

	• The often-cited papers[12] for the National Infrastructure Commission puts the upper bound of consumer benefit in the region of £8bn/year in 2030. • The Roadmap For Flexibility Services To 2030 for the Committee on Climate Change states "that the coordinated (i.e. whole-system) approach may result in significant additional savings in system operation and investment costs, i.e. between £1.1bn/yr and £2.3bn/yr, relative to transmission or distribution network centric models."[13] We are a key player in the transition of the electricity system to its low-carbon decentralised future state, and as such will contribute significantly to deliver future consumer benefits in this area.
How benefit is realised in the consumer bill	Without intervention, the end consumer will face significant increases in the bill through: • System operational challenges via BSUoS. • More requirement for transmission system build via TNUoS. • More requirement for DNO assets via DUoS.
Additional non-monetary benefit	Working across industry to deliver a system fit for the future which is safe, reliable, and can be operated economically, will benefit society as we transition to a low-carbon economy.

12 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/505218/IC_Energy_Report_web.pdf

13 https://www.theccc.org.uk/wp-content/uploads/2017/06/Roadmap-for-flexibility-services-to-2030-Poyry-and-Imperial-College-London.pdf page 42

3. Plan Delivery and New Ways of Working

- ✓ Initiated changes to the commercial arrangements for connection charges
- ✓ Launched a pilot trial for the Appendix G process with DNOs
- ✓ Developed innovative connection solutions and connection arrangements using transformers tertiaries
- ✓ Developed an alternative approach to enable increased boundary flows and automation of current network access planning process
- ✓ Developed the specifications of the new Transmission Outage and Generator Availability (TOGA) tool

Outcome	2018-19 Deliverable	Target	Actual	Status
Improve our cross-industry collaboration on whole system	'Whole Electricity System Outcomes' paper	Q2	Published in Sept 2018	Link to Paper. Allows us and the industry to understand the areas that need to be considered as we move to a whole system approach.
	ENA Open Networks Future Worlds consultation	Q2	Q2	Received positive stakeholder feedback on the delivery of the consultation. We attended Future Worlds stakeholder events in Edinburgh and London events. With over 100 stakeholders present the feedback received suggested the consultation was well received.
	Extend Appendix G trial processes	Q4	Ongoing	The Appendix G trial started with UKPN and WPD to improve the application process for connection of embedded generation projects. It has now been rolled out with all remaining DNOs.
	Supporting a new Tertiary connection product that the NGET TO has offered to the market	Q4	Ongoing	Engagement has taken place with all DNOs bilaterally since September 2018. On 21 March 2019 we hosted a workshop to discuss these connections and the technical and commercial arrangements that were being developed. Changes to DNOs connection agreements that will result from these connections will be addressed through the Modification Notification process. This is a method for updating bilateral connection agreements. We will start engaging with individual DNOs regarding this process in April 2019.
Design new products for connections	Non-Firm and Restricted access connections	Q4	Q3	In certain congested areas of the network we continued to receive applications for connecting additional generation products. To provide these connections quickly and

				without triggering the requirement for significant transmission reinforcements, we developed new commercial products that provide access to the market but during restricted time windows. These products meet customers' needs but reduce the cost to the consumer of operating a constrained network.
Enhanced Asset Optimisation	Engage with TOs and DNOs to identify opportunities to achieve more efficient use of existing assets, making use of weather and loading related operational capabilities thereby reducing the need for investment and lowering the volume and cost of balancing actions taken	Q4	Ongoing	The first example of this approach was identified in January 2019 and has taken place with a transmission connected customer in SHETL's region of Scotland.
Cross TO system performance enhancements	Identify areas for process improvement under existing contracts between SO and TOs and lead change programmes to optimise consumer benefits.	Q4	Ongoing 19-20	This will be discussed with TOs at the next Working Together meeting where ESO and TOs review working practices on a 6-monthly basis. The next meeting will take place in May 2019.
Work with stakeholders to design new systems	TOGA replacement	Q3	Ongoing 19-20	Extensive stakeholder engagement, ensuring new functionality is customer-led through hosting three customer workshops during July and August 2018 to collect input.
	TOGA Procurement Event	Q4	Q4	TOGA Procurement event completed and the provider are going through the onboarding process. The first product development sprint is scheduled for May 2019.
Improve our services for connected customers	Delivering increased volume and complexity	Q4	Q4	Increased volume of applications at transmission and distribution voltage has continued throughout the 2018-19 year. The volume of connections to the transmission networks increased by 50% compared to 2017-18. These were delivered using sprint methodology adopted in 2018. The Appendix G trials adopted for DNO

				connections has expanded to include all but two DNOs. This has helped to process the increased volume of embedded connections.
	Increased connection application volumes and 'Sprint' process	Q4	Ongoing	We continue to use the 'Sprint' approach to the customer offer process to deliver double the volume of connection applications compared with the same period last year.
	Connection and Compliance customer engagement	Q4	Ongoing	In the connection offer and connection compliance areas we saw continued improvement in reported customer satisfaction, regularly receiving 8/10 and 9/10 survey responses. We have increased the level of engagement with customers throughout the connection journey and the compliance process.
	Customer Connection seminars	2018-19	2018-19	Delivered successful customer seminars in Glasgow and London, attracted over 80 participants at each event receiving excellent feedback. We hosted further events in March 2019.
Improve our cross-industry collaboration on whole system	Network user planning workshops to reduce outage 'churn'	Q2	Q2 and ongoing	We developed and delivered stakeholder events with TOs focusing on outage planning optimisation, addressing the levels of change and creating a more accurate plan to deliver system access for maintenance and connection works.
	DNO Operational Liaison	Q4	Ongoing	Quarterly operational engagement workshops with DNOs resulting in improved information sharing, seasonal operating challenges addressed and improved cross network collaboration.
Increase and improve our engagement activity across network users	Identify and develop new market tools with all relevant parties to ensure efficient system solutions for operation	Q4	Ongoing 19-20	Additional RDPs have been started in UKPN and WPD areas to identify further opportunities for operational solutions, information on these has been published for industry on our website. In March 2019, a Request for Information (RFI) for Voltage issues was published for the Mersey area.
	Demonstrate system operability related challenges to a broader range of stakeholders identifying the scale of the impact we forecast on future operation and providing	Q4	Ongoing 19-20	Provided at the DNO liaison meeting and customer seminars in October 2018 and March 2019. We provided information on system operability needs and future requirements for new market tools.

opportunity for whole system solutions to be developed.			
Regular engagement with DNOs exists currently to share seasonal data and challenges encountered on networks. We will increase the volume of this engagement and include other network operators as well as large demand customers.	2018-19	Ongoing	DNO engagement increased in connection with SGT Tertiary applications. We had a meeting with the Electricity Network Futures Groups to discuss applications to date. Commercial and charging arrangements for these connections have now been developed between ESO and NGET. We held a workshop on 21 March 2019 to discuss these connections with all DNOs.
Build strong relationships with DNOs and review and develop contractual arrangements and processes to deliver efficient whole system focused outcomes	2018-19	Ongoing	Successful discussions with SPD and SSEN in August 2018. Good progress made with ENWL and NPG.
Increase our involvement and support of the Open Networks Project	Q4	Ongoing	New projects from ENA identified. We will include more representation from ESO to facilitate discussions.
Articulate our thought leadership on Whole Electricity System across a broad stakeholder base	Q4	Ongoing	Bilateral discussions with ENWL, WPD, UKPN, NPG and SSE (Manweb) regarding tertiary connected generation.

4. Stakeholder Evidence

- ✓ Leadership role within the ENA Open Networks Project with broader representatives from across the ESO including Energy Network Future Group
- ✓ Improvements in communication with all affected parties and outage management system including Network User Planning Workshops to reduce outage churn
- ✓ Hosted the Customer Connection Seminars to inform new and potential market participants with 200 attendees and positive feedback of 4.3/5
- ✓ Published the 'Facilitating Whole Electricity System Outcomes' paper with positive feedback including that it was clear and well thought out
- ✓ Engaged on a replacement for the Transmission Outage and Generator Availability (TOGA) system – worked closely with customers and stakeholders to listen to their views and take account of their requirements in the design of the new outage planning tool to ensure it delivers what they need

During this year, we have continued to evolve how we communicate and engage with stakeholders on whole system operation and the best uses of resources.

Whole electricity system

In early 2018-19 we received feedback from Ofgem and other stakeholders that our position on whole electricity system issues was not clear, so we have shared a thought piece on Facilitating Whole Electricity System Outcomes. We've used feedback to the Open Networks Future Worlds consultation (see below) to further develop this thinking and in December 2018 published an informal consultation document for which we received seven responses. The feedback was positive with agreement of our direction which we are now incorporating into our RIIO-2 planning.

We are an active member of the ENA Open Networks project, a significant vehicle in the transition to the future energy landscape. In summer 2018 we led the major industry consultation on future DSO/ESO pathways; 'the Future Worlds'. We took an innovative stakeholder-centric approach to its development, involving key stakeholder groups in the tone of the document and description of actors within the document. Ultimately this work was delivered through a formal consultation (47 responses received), two stakeholder workshops with over 150 attendees and two webinars to 100 attendees. We received overwhelmingly positive feedback on the consultation approach, that it was 'clear and well thought out' and 'puts forward a coherent view of key considerations'.

Customer connection seminars

We hosted the customer connection seminars in London and Glasgow in October 2018 and in Warwick in March 2019. These seminars are for our connected customers to give an overview of our current focus, charging, whole system, the direction the ESO is heading and network development. Alongside this we listen to our customers' needs and how these areas affect their businesses. We received positive feedback for the event in October, and in March we received a score of 4.3/5 for the seminar overall. One stakeholder shared,

> *'the user seminar was also a great event – we find it is consistently the most useful networks related industry event each year'.*

Transmission Outage and Generator Availability (TOGA) system replacement

TOGA is a system that we currently use to view transmission outage information and generation availability. Many TOGA stakeholders need to use this system daily, so their needs for its replacement are important. As such, we are engaging with stakeholders using regular face-to-face

meetings in London, Glasgow, Warwick and Wokingham and through webinars. Stakeholders have shared their issues with the current system telling us:

- they need to do manual and inconsistent processes
- there is a poor change management processes
- there is poor communication and the user experience could be improved
- they want alignment between this submissions and REMIT.

We have listened to this feedback and included improvements in these areas in the requirements for the new system. Through continued engagement with stakeholders they can hold us to account against their expectations.

Customer and Stakeholder Satisfaction (CSAT / SSAT) surveys

Alongside this we have continued to gather feedback from our customers and stakeholders through our formal channel SSAT and CSAT for customer connections, generator compliance and network access planning. For customer connections, we have received positive feedback scores with an average of 8/10.

5. Outturn Performance Metrics and Justifications

Metric	Performance	Justifications
Metric 14: Connections Agreement Management	Exceeding baseline	We outperformed the 'exceeding' target of 70% by achieving performance of 83% of agreements updated within 9 months of notification.
Metric 15: System Access Management	Exceeding baseline	We have facilitated 8,275 outages throughout the year across the GB network. Only 37 outages were cancelled or delayed by an hour in the control phase due to an ESO process oversight resulting in an average of 4.47 per 1000 outages cancelled. All incidents were reviewed and operational learning notes circulated as lessons learnt.
Metric 16: Future GB electricity system security planning	Published with positive feedback	We have exceeded baseline by publishing the Operability Strategy report. With this, we are striving to understand the operability challenges to 2030 and driving cross industry solutions to these. We have delivered on the commitments in the plan and stakeholders have described it as a useful overview.
Metric 21: Right First Time Connection Offers	On target	We delivered on-target performance, with our measure of 'Year to date percentage of connections reoffers caused by ESO error' being 6.3%, within the on-target band of 5-15%.

Metric 14 – Connections Agreement Management

Table 17: Metric 14 Connections Agreement Management performance

Number of agreements that need updating	Number of agreements that need updating identified 9 months ago	Number of agreements updated within 9 months	Percentage of agreements updated within 9 months	Status
8	6	5	83%	●

This metric measures the number of connection agreements updated within 9 months of notification.

9 months has now passed on the timeline for some of these agreements. Five out of six agreements have now been updated.

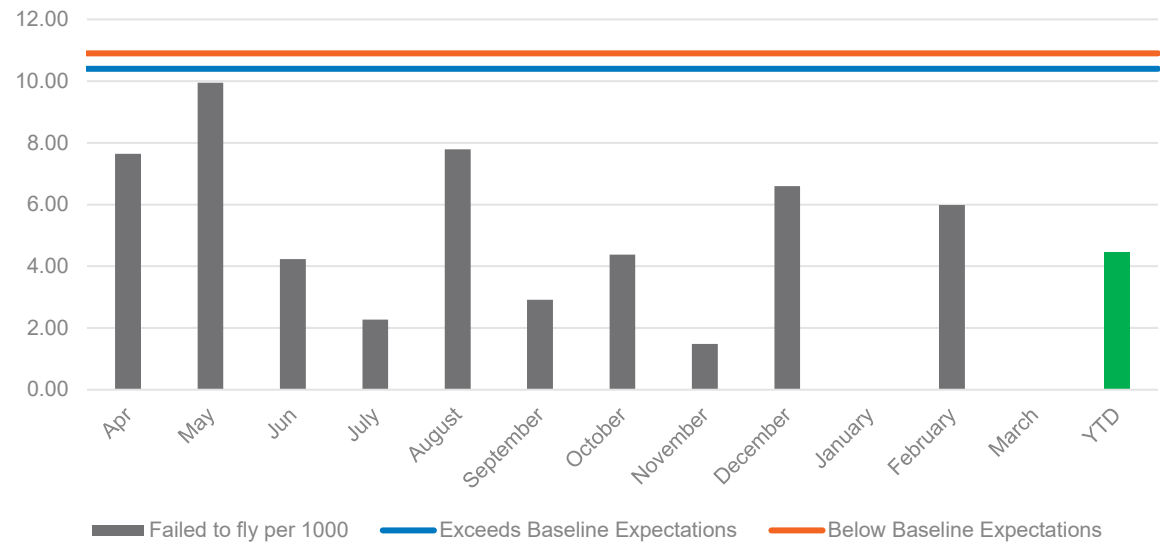
Progress is being made on the three remaining agreements:

- One has been sent to the customer
- One has been sent as a draft to the customer
- One of the agreements is still out of date after 9 months due to a complicated contract issue.

We outperformed the exceeding target of 70% by achieving performance of 83% of agreements updated within 9 months of notification.

Metric 15 – System Access Management

Figure 22: Metric 15 System Access Management performance



**no failures in January and March 2019*

This metric monitors the number of planned outages on assets per 1000 planned outages that were either cancelled or delayed by over an hour in the control phase due to an oversight in the ESO's processes.

When an outage is cancelled, a cost is incurred to stand down contractors and staff on-site and could have significant knock-on effects to projects or schemes.

Outages that do not go ahead on time have the potential to incur significant costs to the end consumer. By not allowing outages to proceed on time, the stand down costs of the 37 delayed/cancelled outages in 2018-19 amounted to approximately £235,000. This indicates the importance of getting the assessment right first time and ensuring robust business and engineering processes exist.

The focus on this metric has improved the behaviour of relevant teams across the ESO; there is a greater sense of ownership to resolve outstanding issues to allow outages to proceed on time and collaborate with the affected parties. This collaboration is over and above what had previously been taking place. This also resulted in process improvements across the relevant teams.

Note that in the February monthly report, we reported February performance as 9.98. After reviewing the data, this has been revised to 5.99 as reported here.

Metric 16 – Future GB electricity system security

The GB electricity system is changing rapidly. We have identified the emerging system operability challenges, put a plan in place to address the issues, and are executing it to time and quality. The plan increases system security by reducing system operability risk. It also reduces end consumer costs by optimising between the different solution types whether they are: market, code or asset based.

Six-monthly operability reporting performance

We published our first operability report in November 2018, ahead of the deadline of 14 December 2018. The report is transformational and has not been previously done by the ESO, as we strive to understand the operability challenges on the GB network out to 2030. Combined with understanding the challenges we face, we are developing and implementing roadmaps which deliver cross-industry

solutions to those challenges. As such this **exceeds the baseline expectation**. We are on track to publish our six-monthly update by 30 June 2019.

Stakeholder feedback on Six-Monthly Operability Reports

Our first Operability Strategy report has been well received in the industry press and described as 'a very useful overview'. We have engaged with industry through the Operational Forum and the feedback has been good. For example, **more than 80% of responses were positive about the report** when polled at a recent Operational Forum. Going forward, we will increase stakeholder engagement to raise awareness of the report as it meets a stakeholder need by giving an overview of all the operability work going on.

Delivery against plan

We are delivering against the ambitious plan that we committed to in the Operability Strategy report. Within the **frequency** control area, we have completed phase one of the response auction product design and platform development and the response trial is going ahead. In February 2019, we published the future of frequency response. We have also delivered the wider BM access actions by publishing a roadmap and driving forward industry code modifications.

We have issued commercial contracts for **voltage** support following successful tenders in both South Wales and Mersey

In the **restoration** area, we have taken forward a successful NIC bid to investigate how distributed energy resources can contribute to our black start requirement. Further we have improved transparency by publishing the technical assessment criteria and by developing interconnector standard contract terms.

Within **stability**, we have:

- published two reports examining the impact of changing system fault levels;
- published the findings of the Enhanced Frequency Control Capability innovation project;
- we are also driving forward the accelerated loss of mains protection change programme by working closely with the DNOs to ensure it delivers as soon as possible. The final Grid Code modification report and implementation plan has been submitted and we have been progressing preparations for implementation, through contract discussions, portal development and stakeholder events. This is a whole system deliverable that we are influencing and driving forward.

In the **thermal** work stream, we have

- Published a year-round assessment for the South East using probabilistic modelling.
- Completed the BM wider access actions which help constraint management.

The commercial solution RFI for North England has been delayed because of changing system need. It has become clear the boundary flow is increasingly stability limited which potentially removes the need for a thermal solution, and due to the interaction with the new pathfinder project. The new pathfinder project is not in the Operational Strategy report and is looking for alternative options to network build to manage constraints (one example may be storage providers).

Metric 21 – Right First Time Connection Offers

Figure 23: Metric 21 Right first time connections offers performance

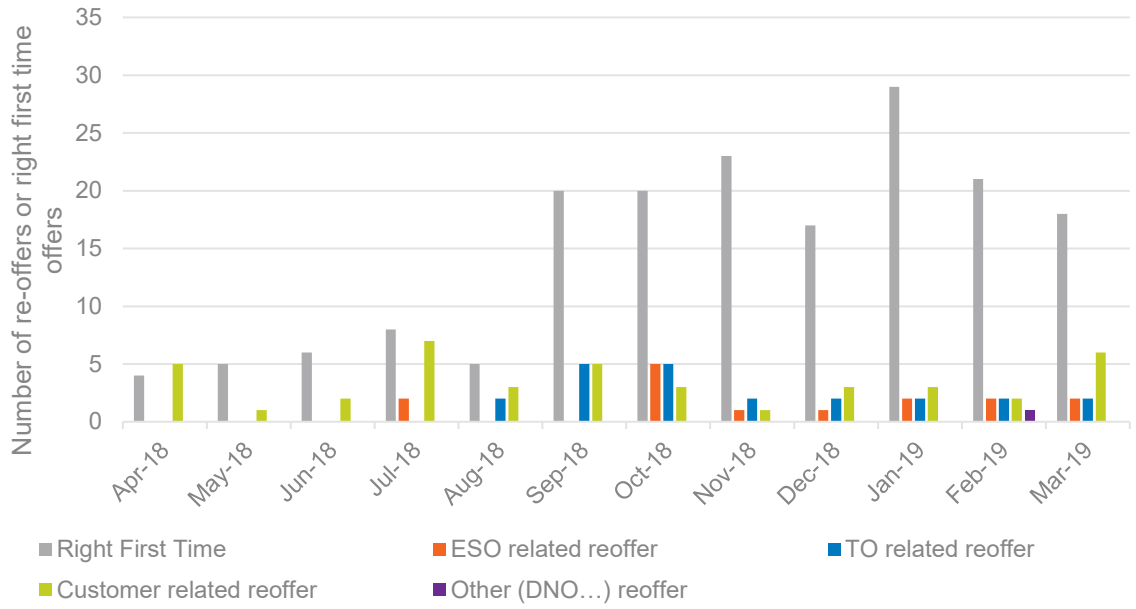


Table 18: Metric 21 Right first time connections offers year to date performance

Connections offers	Results
Year to date number of connections offers	240
Reoffer required due to ESO error	15
Year to date percentage of connections reoffers caused by ESO error	6.3%
Exceeds expectations; On target: Below expectations	0-5%; >5-15%; >15%

PRINCIPLE 7

Facilitate timely, efficient and competitive network investments

Role #4
Supporting competition in networks

Principle 7
Facilitate timely, effective and competitive network investments

AMBITION
Drive innovation and develop alternatives to asset solutions

Delivered benefits in 2018-19

- Reduced spend on commercial actions to manage future high voltage issues, leading to reduction in BSUoS and TNUoS charges
- Led changes to the NOA methodology to enact the upcoming changes to SLC C-27 which included the assessment of connections against the competition criteria
- Added commercial solutions to NOA process leading to up to £100m/year reduction in constraint costs
- Improved the Strategic Wider Works (SWW) process including cost benefit analysis which considers the network impacts of investments leading to savings of £400m
- Developed tools to enable a systematic approach to identifying future network issues

£504m

£6.3bn

Future benefits and long term initiatives

- Initiated low carbon generation options including reduced environmental damage of non-build options
- Developed Connection and Infrastructure Options Notes (CION) assessment with up to £2bn of consumer value over 25 years
- Initiated economic network development leading to lower costs for consumers by expanding the NOA process to consider wider range of system needs
- Improved the SWW process resulting in savings up to £400m, with the benefits realised over 40 years
- Added Commercial Solutions to the NOA Process, with benefit of up to £1.1bn over the next 10 years
- Following this year's NOA recommendations leads to avoided costs for consumers of up to £2.6bn over the next 10 years
  - Developed the High Voltage Pathfinder leading to benefit of up to £36m/year, post 2021

Plan delivery and new ways of working

- Reactive power / voltage Pathfinder projects – 'learning by doing' approach
- Explored market and DNO solutions as alternatives to transmission assets
- Published Network Development Roadmap providing a clear roadmap of enhancements to the NOA process
- Developed thermal probabilistic assessment case studies
- improved interconnector methodology and modelling

60% New

40% Improved

Forward Plan 2018-19 deliverables

- ✓ Publication of the NOA methodology and report
- ✓ Publication of the 2019 NOA recommendations
- ✓ Publication of the Network Development Roadmap consultation and the final Roadmap
- ✓ Progress delivery of the pathfinder projects to implement the Network Development Roadmap
- ✓ Agree a route to fund DNO solutions in RIIO-1 and RIIO-2
- ✓ Publication of the Electricity Ten Year Statement
- ✓ Publication of the ENA Open Networks approach to whole system investment and operability options across transmission and distribution networks
- ✓ Increase the scope of the NOA methodology to include non-network solutions
- ✓ Improve and develop our modelling capability, further embedding the interconnector modelling and our analysis of offshore networks
- ✓ Progressing probabilistic year-round assessment to understand how often the network boundaries are exceeded.
- ✓ Integrate changes in our models and methodology to include analysis of generator connections
- ✓ Design developments to the NOA to support the introduction of competition in delivery of the onshore transmission network.
- ✓ Progressing with the process and methodology development for the high voltage regional network options assessment process

Stakeholder

- DNOs involved in the development of processes including industry forums
- TO workshops with feedback score of 7.3/10
- ESO 2030 Ambition workshop and customer seminars in October 2018 and March 2019 with positive feedback
- A number of bilateral conversations with a range of interested parties, eg Citizens Advice, Scottish and Welsh governments, BEIS, project developers, ADE, Renewable UK and Energy UK

Performance metrics

Metric	Performance
Metric 12: Whole system optionality	Exceeding – we identified 9 non-TO initiated options against a target of 3
Metric 17: NOA consumer benefit	Exceeding – we have exceeded our target for adding value in NOA 2018-19 by delivering 11 ESO options (against a target of one) resulting in £711m of value
Metric 18: NOA engagement	On-target – stakeholder feedback score averaged 7.3/10 over the year

1. Evidence of Delivered Benefits

- ✓ Reduced spend on commercial actions to manage future high voltage issues, leading to reduction in BSUoS and TNUoS charges
- ✓ Led changes to the NOA methodology to enact the upcoming changes to SLC C-27 which included the assessment of connections against the competition criteria
- ✓ Added commercial solutions to the NOA process leading to up to £100m per year reduction in constraint costs.
- ✓ Improved the Strategic Wider Works (SWW) assessments via improved cost benefit analysis processes which considers the network impacts of the investment. This creates greater insight to help industry decision making savings of up to £400m
- ✓ Developed tools to enable a systematic approach to identifying future network issues

The key areas we focus on across Principle 7 to deliver benefit are understanding the future needs of the network, and determining the optimum cost paths to get there. This year we added value by developing and publishing our key document suite of the NOA and ETYS, alongside ENA reports and our consulted-on Network Development Roadmap.

These documents encourage and inform debate, leading to changes that ensure a secure, sustainable and affordable energy future.

We deliver **lower bills** through:

- Ensuring least worst regrets options for network development are identified and pursued.
- Choosing economically optimum locations for new connections.
- Optimising the cost of planned network development.
- Improving our power system study capability and methods giving greater insight into future network issues and how to best resolve them.

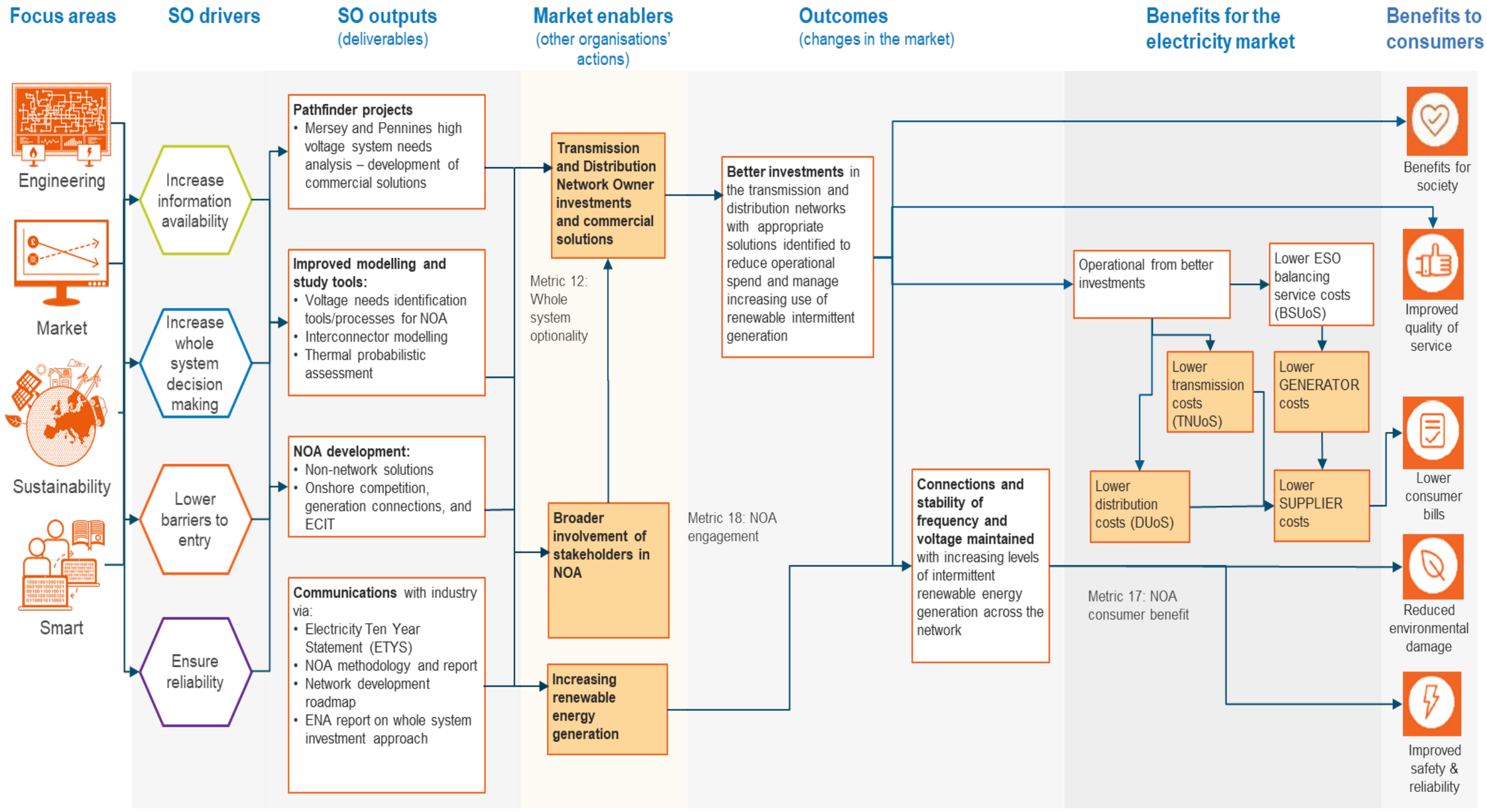
Reduced environmental damage will be an outcome from us working to develop the network at optimum cost as it transforms into a low-carbon system.

System security and resilience is derived from our 10-year look ahead into system requirements, ensuring we have the network planned and developed to cope with the rapidly changing demands placed on it.

We deliver improved quality of service to our customers through increased engagement to understand how best to meet their needs, information, and data requirements. This will benefit the end consumer as we work with our customers to generate the optimum outcomes for the consumer in terms of a robust network that can be operated and developed safely and economically. Further, improvements in our quality of service ultimately benefit the consumer as interactions in the value chain across the industry become seamless, more efficient and effective.

Figure 24 shows what drives us to prioritise our deliverables and activities within Principle 7, and how these deliverables ultimately provide benefit for the end consumer

Figure 24: Principle 7 Consumer Benefit Map



2. Evidence of Future Benefits / Long term Initiatives

- ✓ Added Commercial Solutions to the NOA Process, with benefit of up to £1.1bn over the next 10 years
- ✓ Developed the High Voltage Pathfinder leading to benefit up to £36m/year, post 2021
- ✓ Initiated low carbon generation options including reduced environmental damage of non-build options
- ✓ Following this year's NOA recommendations leads to avoided costs for consumers of up to £2.6bn over the next 10 years
- ✓ Developed connection and infrastructure options notes (CION) assessment with up to £2bn of consumer value over 25 years
- ✓ Improved the SWW process resulting in savings up to £400m, with the benefits realised over 40 years
- ✓ Initiated economic network development leading to lower costs for consumers by expanding the NOA process to consider wider range of system needs

The outcomes of our work under Principle 7 will deliver benefit for the end-consumer in the future. We are positioned to identify and recommend network development paths and options which have the potential to save the consumer huge amounts of money which would otherwise find its way to the end bill via the TNUoS charge. The TNUoS charge is levied on system users to pay for the development and maintenance of the network assets, and recognised to be passed through to the end consumer bill.

Consumer Benefit Outcome

Adding Commercial Solutions to the NOA Process

Activity	We are developing solutions such as commercial intertrips as part of the NOA process, as an alternative to traditional asset based solutions.
Delivered and future benefit	We expect to deliver up to £100m per year of benefit for consumers, as we publish our NOA recommendations for the development of the network. The benefit will be realised when the necessary equipment can be installed and the contracts negotiated. Full delivery of the benefit is dependent on sufficient participation and capability from stakeholders to deliver the solutions.
Basis of expected benefit	• Commercial intertrips will allow more power to flow pre-fault by securing the network with a post fault commercial action. This has been shown to reduce the costs to alleviate network constraints. • Commercial intertrips may also reduce TNUoS where they fill in for, delay or negate the need to build an asset based solution. • The mechanism to create this benefit was ESO initiated commercial solutions. • The commercial solutions are ESO created, ESO negotiated and ESO operated. There will be minor work for the TOs to build the communications infrastructure.

How benefit is realised in the consumer bill	Network constraints are managed and paid through the BSUoS charge, levied on system users and passed through to the end consumer. Transmission builds are paid for through the TNUoS charge, paid by system users and also ultimately paid by the end consumer. This work will optimise, to minimise the spend on BSUoS and TNUoS when looking at the ideal solutions to manage network constraints.
Additional non-monetary benefit	There are additional benefits to society of reduced visual amenity impacts if we do not have to build physical assets across the landscape.

Initiated the High Voltage Pathfinder projects

Consumer Benefit Outcome

Activity	A pathfinder project is a 'trial by doing' approach to develop new processes, expand capabilities and learn along the way often requiring collaboration between us, TOs and DNOs. We use pathfinder projects to develop the capabilities that we and other parties need to take forward expanding our approach to network development: developing a cost-benefit analysis that compares network and non-network solutions that have different lifetimes or contracting periods
Delivered and future benefit	Potential benefit of up to **£36m per year** after 2021 across the voltage pathfinder projects. The value will materialise after completion of the RFI and subsequent project recommendations (due 2019-20) and be realised once solutions are implemented. Solutions are likely to be in place after 2021.
Basis of expected benefit	Currently reactive voltage services are procured in the Balancing Mechanism (BM). This pathfinder project will consider whether a long-term contract (1+ years) or an asset solution can provide the reactive support that is needed to secure the network. The trade-off will be between short term BM options or a long-term commercial contract potentially with new market participants or a new-build solution. This pathfinder also considers options across the whole system. Breakdown of savings across the voltage pathfinders are: • Area 1: CBA to estimate constraint cost saving will be carried out as part of the option assessment. Utilisation cost saving estimated at £1.3m per year. • Area 2: Potential constraint cost saving between £12m and £33m per year; utilisation cost saving estimated at £2m per year.
How benefit is realised in the consumer bill	We will choose an optimal solution, likely resulting in a trade off in BSUoS or TNUoS but should overall be net better off regarding total spend. This will result in consumer savings as both BSUoS and TNUoS are passed through to their bill.

Network Options Assessment process

Consumer Benefit Outcome

Activity	The Network Options Assessment (NOA) provides an annual decision on what investments to progress (or not progress) in the next 12 months. This is based on an optimal set of solutions which need to be delivered at the correct time to provide the most efficient and economic overall consumer solution.

Delivered and future benefit	**Up to £2.67bn** avoided cost over a 40-year rolling period, updated annually. In the NOA we recommend a set of options to proceed over the next year. In the 2018-19 NOA we recommended to proceed on £59.4m of investment options, these recommendations ensure the network will have the reinforcements needed at the correct time. If these recommendations do not proceed (hence a 12-month delay in getting an optimal set of recommendations) the consumer would lose up to **£2.67bn of value**. This loss of value is avoided by ensuring we have the correct decisions for the next 12 months to make sure we have the correct network in the future
Basis of expected benefit	The NOA is a complex analysis. We use market optimisation software to identify how and where the latest Future Energy Scenarios impact the transmission system, and forecast the operational cost to manage this. We systematically look to alleviate congestion on the network with solutions which can be either asset investments or commercial management of the network. We time the delivery of these solutions to provide the most benefit.
How benefit is realised in the consumer bill	Network constraints are managed and paid through the BSUoS charge, levied on system users and passed through to the end consumer. Network investments are paid for through the TNUoS charge, paid by system users and also ultimately paid by the end consumer. By recommending the optimal asset investment options, we optimise the charges that are passed onto the consumer. We will only recommend investments which reduce BSUoS by more than the corresponding increase to TNUoS, so that the net cost is kept to a minimum.
Additional non-monetary benefit	By facilitating timely connections, we are allowing generation to connect earlier than may have been the case before the NOA process was installed. Much of the new generation connecting to the network is low-carbon.

Connection and Infrastructure Options Note process

Consumer Benefit Outcome

Activity	When an interconnector or an offshore windfarm apply for connection to the transmission network a choice of connection locations is possible. Some of these locations could have a significant impact on network congestion. We complete a cost benefit analysis (CBA) to make sure the best overall solution is delivered for the consumer. This could be connecting to another substation outside of a congested zone. This is known as the Connection and Infrastructure Options Note (CION) process.
Delivered and future benefit	Up to **£2bn over 25 years**. The number of connection applications is determined by the energy market and each individual application will have its own assessment. Since 2017 the average overall reduction in consumer costs through CION assessments is £260m per application, with up to eight applications per year.
Basis of expected benefit	We create benefit by ensuring the connection location is optimal in the interests of the consumer. For example, a windfarm or an interconnector would want the lowest cost of connection, however this could have a high congestion impact and for a slightly increased connection cost a large reduction in congestion is possible. We model potential future congestion costs with and without the new connectee at various different locations and the lowest overall cost solution is provided.

How benefit is realised in the consumer bill	Network constraints are managed and paid through the BSUoS charge, levied on system users and passed through to the end consumer. Network investments are paid for through the TNUoS charge, paid by system users and also ultimately paid by the end consumer. By recommending the optimal overall solution, we optimise the charges that are passed onto the consumer.
Additional non-monetary benefit	We ensure we can facilitate the energy market and renewable generation by minimising the curtailment of generation.

Strategic Wider Works (SWW) process

Consumer Benefit Outcome

Activity	When a TO investment hits certain trigger levels (£50m for SHETL, £100m for SPT, £500m for NGET) a special regulatory process is triggered which scrutinises the options to deliver the investment.[14] We perform a part of the SWW assessment, the cost benefit analysis which considers the network impacts of the investment.
Delivered and future benefit	Up to **£400m** with the benefits realised over 40 years. • The number of SWW applications is determined by the TOs and each individual application will have its own assessment. • There are on average 4 applications per year. • Since 2017, the average overall reduction in consumer costs as a result of the SWW assessment is **£101m**. • The benefit is calculated by taking the difference between the first and second best option.
Basis of expected benefit	We create benefit as we make sure the chosen option is in the best interests of the consumer. Each investment has multiple options of various sizes, which are delivered in multiple different years. Our CBA makes sure the correctly sized option is delivered at the correct time, this is done by forecasting congestion costs and analysing the impact of each option vs the capital expenditure.
How benefit is realised in the consumer bill	Network constraints are managed and paid through the BSUoS charge, levied on system users and passed through to the end consumer. Network investments are paid for through the TNUoS charge, paid by system users and also ultimately paid by the end consumer. By recommending the optimal overall solution, we optimise the charges that are passed onto the consumer.
Additional non-monetary benefit	We ensure we can facilitate the energy market and renewable generation by minimising the curtailment of generation.

[14] https://www.ofgem.gov.uk/ofgem-publications/125277

3. Plan Delivery and New Ways of Working

- ✓ Reactive power / voltage Pathfinder projects – 'learning by doing' approach
- ✓ Explored market and DNO solutions as alternatives to transmission assets
- ✓ Published Network Development Roadmap providing a clear roadmap of enhancements to the NOA process
- ✓ Developed thermal probabilistic assessment case studies
- ✓ Improved interconnector methodology and modelling

Outcome	2018-19 Deliverable	Target	Actual	Status
Improve the NOA models and methodologies to support Extending Competition in Transmission (ECIT)	Publication of the NOA methodology	Q1	Q1	NOA methodology published for consultation in April, with the final document published in July
	Publication of the NOA report	Q4	Q4	We have conducted a number of stakeholder meetings with the TOs on the results of the economic analysis. These have been very positively received. We have also run the first of the NOA Committee meetings as part of the governance process of our recommendations. This also ran smoothly and was attended by Ofgem and the TO for their relevant items. We published the NOA report on 31 January 2019, notifying interested parties by email and also posting on social media. We also launched a webpage on the pathfinder projects at the same time to better engage stakeholders.
	Publication of the 2019 NOA recommendations.	Q4	Q4	The NOA report was published on 31 January 2019 which contains all the recommendations which have been communicated to the TOs.
	Publication of the Network Development Roadmap consultation and the final Roadmap.	Q1	Q1/Q2	Roadmap consultation published in May, final version in July.

Progress delivery of the pathfinder projects to implement the Network Development Roadmap	Q4	Q4	We are implementing the pathfinder projects. The timeline for these is shared on our website We published an RFI to seek market solutions to high voltage needs in the Mersey area and the update to the case study for Thermal Probabilistic Assessment.
Agree a route to fund DNO solutions in RIIO-1 and RIIO-2	Q4	Q3	Ofgem have indicated that they are broadly happy with the approach identified for RIIO-1, subject to the specifics of each case. The proposals for RIIO-2 were fed into Ofgem December consultation and will form part of RIIO-2 discussions.
Publication of the Electricity Ten Year Statement (ETYS), which includes some of the methodology improvements mentioned.	Q3	Q3	Published November 2018.
Showing up differently through our ETYS publication	Q3	Q3	We have expanded the needs covered in ETYS, beginning to cover some of the high voltage needs being explored through the pathfinder projects and explored the use of thermal probabilistic analysis for boundary assessment
Publication of the ENA Open Networks approach to whole system investment and operability options across transmission and distribution networks.	Q3	Q3	The report was approved at the ENA Open Networks Workstream 1 and Steering Group meetings in December. It has been published on the ENA Open Networks website.
Increase the scope of the NOA methodology to include non-network solutions.	Q4	Ongoing 2019-20	This will be included in the NOA methodology 2019-20 which will go for public consultation in Q1 2019-20.
Improve and develop our modelling capability, further embedding the interconnector modelling and our analysis of offshore networks.	Q1	Q1	NOA interconnector methodology incorporated in overall NOA methodology April 2018 (consultation)/ July 2018 (final) includes a number of modelling improvements. The NOA for interconnector analysis is complete and published as part of the

				NOA report on 31 January 2019. A range of optimal level of interconnection has been identified, based on the FES 2018. This year's improvements to the process also include an assessment on ancillary service analysis.
	Progressing probabilistic year-round assessment to understand how often the network boundaries are exceeded.	Q3-Q4	Q3 Q4	We published an initial report on the use of the thermal probabilistic analysis in ETYS. This will be followed up with the remaining analysis and plans to take this approach forward in Q4. We published the remaining analysis and approach for taking this modelling technique forward in an update to the case study for thermal probabilistic analysis.
	Integrate changes in our models and methodology to include analysis of generator connections to the transmission network that are suitable for competition. This is in addition to the current identification of wider works projects (in expectation of the ECIT policy development to embed the potential for competition in delivery of generation connections).	Q2	Q2	Delivered in April/July 2018 as part of the NOA methodology.
	Design developments to the NOA to support the introduction of competition in delivery of the onshore transmission network.	Q4	Q4	We fed into the RIIO2 framework response and continue to have discussion with Ofgem on this topic. We published connections which meet the criteria for competition in the 2018-19 NOA which supports the proposed changes to licence condition C27.
	Progressing with the process and methodology development for the high voltage regional network options assessment process.	Q4	Q4	We presented the proposed methodology to the TOs at the joint planning committee and the DNOs at the ENA Open Networks projects to get their input ahead of wider public consultation.

4. Stakeholder Evidence

- ✓ DNOs involved in the development of processes including industry forums
- ✓ Hosted a TOs workshops with feedback score of 7.3/10
- ✓ ESO 2030 Ambition Workshop and customer seminars in October 2018 and March 2019
- ✓ A number of bilateral conversations with a range of interested parties, e.g. Citizens Advice, Scottish and Welsh governments, BEIS, project developers, ADE, Renewable UK, Energy UK

During this year, we have increased awareness of the existing network planning process and options assessment with a wider group of stakeholders. We have also shared changes in approach and implementation through the Network Development Roadmap and the pathfinder projects. Historically the main focus has been engaging with the TOs but we have widened this to include DNOs and other stakeholders.

Network Development Roadmap

We consulted on our Network Development Roadmap which received 13 responses, from network companies, academia and potential market participants. The feedback was positive about the proposals and how we responded to the comments from stakeholders was shared alongside the final Network Development Roadmap.

Many respondents sought clarification on elements of the proposals and had helpful suggestions for improvements, which we aimed to pick up through this finalised roadmap or will do through the pathfinder projects. There was a general push to work through ENA Open Networks but others also challenged whether the group would move at sufficient pace. More than one response also highlighted the need to ensure the focus on system security remains.

We have continued to raise awareness with a much broader range of respondents (e.g. market participants, devolved governments and citizen's advice) across the year through ESO forums, industry representative groups, bi-laterals, newsletters and websites. We have also worked closely with network companies through the ENA to progress our transformation activities.

NOA methodology

We published the NOA methodology and the NOA for interconnectors (NOA IC) and received six and eight responses respectively. Stakeholders want the ability to submit options into the NOA process, greater visibility of the pathfinder projects and queried whether competition in connections should feature in the 2018-19 methodology. For NOA IC stakeholders were keen to see a range of results for the optimum levels of interconnection, that it should include analysis of the impact of interconnectors on services that support system operability and better articulation of the differences between NOA IC and other relevant interconnector analyses, e.g. Ten Year Network Development Plan (TYNDP) produced by ENTSO-E. Responding to this feedback we have set up a webpage for the Network Development Roadmap to provide more information on the pathfinder projects including up to date timescales for planned market tenders where there will be opportunity for third parties to submit options for consideration. For NOA IC, we included a range of optimal interconnection, with a value per scenario, conducted analysis on operability and provided more context and explanation to the findings of NOA IC against other interconnector analyses.

We held a NOA for Interconnectors workshop in May 2018 and because of feedback we launched a survey in June 2018 to capture further views. Stakeholders shared that our process was not transparent enough so we held a workshop about the cost-benefit analysis process for the TOs in May. Following this we also held a NOA developments workshop with the TOs in September 2018 and a NOA for Interconnectors webinar in March 2019 to cover the most recent results and help with queries.

We also hold a regular teleconference with the TOs (normally weekly and dropped as agreed to fortnightly) to provide a communication channel as we work with the TOs in conducting the NOA analysis. TOs tell us this regular meeting is an important communication channel for effective running of the NOA process. We have kept this running all year (rather than taking a break post publication) to keep TOs abreast of developments for the following year.

5. Outturn Performance Metrics and Justifications

Metric	Performance	Justifications
Metric 12: Whole system optionality	Exceeding – we identified 9 non-TO initiated options against a target of 3.	Four credible options were identified in the commercial solution area, and five credible options identified in the high voltage area. We carried out significant research and study work for these projects, as well as extensive engagement with industry stakeholders and potential service providers.
Metric 17: NOA consumer benefit	Exceeding expectations – we have exceeded our target for adding value in NOA 2018-19 by delivering 11 ESO options (against a target of one) resulting in £711m of value	This is the first year that we have actively tracked ESO options – we took a step change approach to setting our target in the first year anticipating the challenges of fundamentally changing the way we upgrade the network.
Metric 18: NOA engagement	On-target – stakeholder feedback score averaged 7.3/10 over the year	We sought feedback from all parties who attended our events, achieving a score of 7.3/10. We launched a survey in June 2018 to capture further views on 'NOA for Interconnectors'.

Metric 12 – Whole system – optionality

Table 19: Metric 12 Whole system optionality performance

2018-19	Non-TO initiated options
Q1	0
Q2	5
Q3	9
Q4	9

This metric is a measure of how effective we are in encouraging non-TO parties to suggest solutions to transmission system needs. Solutions are assessed against transmission network solutions through a cost-benefit assessment (CBA).

We have a target of 3 non-TO initiated options for the year.

We are well ahead of our target with a total of nine non-TO initiated options identified. The target was based on historical information from a previous RDP project This is the first time we developed capability to perform a regional NOA CBA process to assess non-traditional options and non-MW solutions.

We outperformed through making good progress in the two pathfinder projects. Four credible options were identified in the commercial solution area, and five credible options identified in the high voltage area. We carried out significant research and study work for these projects, as well as extensive engagement with industry stakeholders and potential service providers in order to setup the appropriate processes and framework to develop these non-TO options.

Commercial Solutions

Post-fault constraint management commercial solutions (commercial solutions in NOA)

We identified commercial solutions which can provide consumer benefit through the NOA 2018-19 process. The system requirements (region, size of the service, duration, year) for the commercial solutions are in the process of being identified. We expect that the recommended options will progress to market testing to develop the options into a real solution.

We have developed the study methodologies for identifying the effectiveness of potential commercial products to resolve postfault constraints. The study findings and inputs from market providers will be used to develop the tender in summer 2019.

High Voltage Project

This pathfinder project looks into the processes and frameworks required to manage existing and future high voltage challenges in various regions.

Pennine region

Phase 1 focuses on exploring TO and DNO solutions; and Phase 2 will build on the analysis, expanding it to consider commercial solutions. Good progress has been made in Phase 1 to identify the DNO solutions with ENW and NPG to solve the high voltage problem. Findings of our Phase 1 study are available on the ENA website.[15]

We are continuing to work on further developing this through the ENA Open Networks by exploring commercial solutions and taking learnings from the Request for Information (RFI) for the Mersey Ring region before we make our decision on the next step. We are also working to address the challenges highlighted in the ENA report around comparing solutions in a CBA now that we have confirmation of the funding route for RIIO-1.

Mersey Ring

We have now launched the first of our RFIs in the Mersey Ring region. This will improve our understanding about what providers can offer and what their preferences on contracts are. Teams across the ESO have been working closely and collaboratively to ensure the information we plan to publish in the RFI for this region is clear, accurate, meaningful and easy to understand for our stakeholders. The need for voltage support in different regions will be reviewed and communicated annually.

Next Steps

We will further develop this project following on from the initial RFI for the Mersey Ring, determining whether there is value to run a commercial tender and, where relevant conducting post tender evaluation through NOA based criteria and assessment to determine the best combination of asset and commercial solutions. This will develop the necessary contract arrangements to facilitate participation by new and existing providers. Subject to feedback from RFI, we are aiming to publish a tender in summer 2019.

Metric 17 – NOA consumer benefit

We are incentivised to propose alternative options to those proposed by the TOs for the Network Options Assessment (NOA) to create additional value for the GB consumer.

Table 20: Metric 17 NOA consumer benefit performance

2018-19	ESO Options	Target	Total Consumer Value
Q1	0	0	
Q2	9	1	

[15] http://www.energynetworks.org/assets/files/ON-WS1-P1 2018 Investment Planning Processes - Approach vFinal.pdf

Q3	10	1	
Q4	11	1	**£711m**

Table 21: Number of ESO initiated options

Category	Description	Number of options
ESO initiated options	These are traditional options identified by the ESO and put forward subject to agreement (if required)	6
ESO challenged options[16]	These are additional options that are submitted following efficiency challenges by the ESO	1
ESO collaborative options[17]	These are options that are developed collaboratively between the ESO and the respective TO following the ESO's technical studies	1
ESO commercial options	These are post fault constraint management schemes developed by the ESO	3
		11

We continue to assess the transmission network in greater detail every year. As the NOA process matures the TOs will be challenged to devise more innovative methods to operate and enhance existing assets. Subsequently we may have less opportunity and find it more challenging to identify new ways to drive consumer value over and above business as usual obligations.

The value we create will be delivered through BSUoS savings over the next 20 years.

[16] We will not include the value of challenged options. We have included here to highlight the role we played in developing these.
[17] We will not include the value of collaborative options. We have included here to highlight the role we played in developing these.

Metric 18 – NOA engagement

Table 22: Metric 18 NOA engagement performance

2018-19	Score	Parties	Target
Q1	5/10	3	N/A
Q2	7.8/10	3	6
Q3	9/10	1	8
Q4	7.3/10	2	8
Year to date	7.3/10		

Engagement activities

- We published the NOA methodology for consultation on 9 April 2018 for six weeks. We received six responses for NOA and eight for NOA for Interconnectors.
- We published the NOA report on 31 January 2019.
- We worked on the Network Development Roadmap and Pathfinder Projects with a variety of stakeholders via seminars, workshops and bilateral meetings. The consultation was from May 2018 for six weeks and we got 13 responses.
- We hold a regular teleconference with the TOs (normally weekly and dropped as agreed to fortnightly).

This metric drives us to engage stakeholders in the progress of our network development processes.

NOA and NOA for interconnectors

- We submitted the NOA methodology in July 2018 which Ofgem approved in October 2018.
- We held a NOA for Interconnectors workshop in May 2018 and because of feedback we launched a survey in June 2018 to capture further views. We held a workshop about the cost-benefit analysis process for the TOs in May 2018. This was our response to their concern that the process was not transparent enough. We also held a NOA developments workshop with the TOs in September 2018 and a NOA for Interconnectors webinar in March 2019 to cover the most recent results and help with queries

Network Development roadmap and pathfinder projects

- In June 2018, we set out in the Network Development Roadmap, our intentions to transform our network planning. This followed stakeholder consultation, which received twice as many responses as our usual NOA consultations and from a more diverse range of respondents. We have continued to raise awareness with a much broader range of respondents (e.g. market participants, devolved governments and Citizen's Advice) across the year through ESO forums, industry representative groups, bilaterals, newsletters and websites. We have also worked closely with Network Companies through the ENA to progress our transformation activities. On 29 March 2019, we published our first RFI for the high voltage pathfinder projects and announced a range of upcoming activities where stakeholders can input into our projects.

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