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ESO RIIO-2 Business Plan Annex 7 – Metrics and measuring performance

9 December 2019

Contents

Overview

An effective suite of metrics, endorsed by stakeholders and Ofgem, will show how we are performing against our plan. Our proposed metrics demonstrate the value we bring to the energy industry and the benefits we either directly deliver, or influence, for consumers.

We have undertaken a thorough stakeholder engagement process to develop this suite of metrics; inviting stakeholders to propose areas we could measure, understanding their views on our *Forward Plan 2019-21* metrics, and using these conversations to inform development of metrics before testing with stakeholders to refine further. We are therefore confident our proposed metrics will provide effective measurement of both our transformational activities and delivery of consumer benefit.

Our metrics will show how our investments in RIIO-2 have delivered improvements, which in turn drive the benefits in our cost-benefit analysis detailed in Annex 2 – Cost-benefit analysis (CBA) report. Tracking our proposed metrics will therefore help to show how we are delivering the benefits of our plan.

The proposed metrics in our RIIO-2 business plan are our current best view of what we believe we should measure, given the content in our proposals and current stakeholder views. We consider it would be prudent to review the proposed metrics and their associated targets ahead of the start of RIIO-2, to ensure the metrics are appropriately stretching and that they reflect the activity the ESO will undertake in RIIO-2. We will also need to understand how metrics will be used in the incentive scheme, along with the outcome from both the draft and final determinations. We recognise Ofgem's proposals for 'core metrics' and would be happy to work further next year to understand how the incentive and reporting methodology could accommodate them. Our *Forward Plan* for 2020/21 will also include updates to metrics to ensure a smooth transition from the last year of the *Forward Plan* into RIIO-2.

1 Development of our metric proposals

1.1 Overview of our proposals

The table below provides an overview of our proposed metrics and year 1 performance targets. Further detail on each metric can be found in section 2 of this document.

Role/ Theme	Business activity	Metric number	Proposed metric	Performance target	Further information
Theme 1/Role 1: A1 Control Centre Architecture and Systems	Control room	1	Balancing cost management	Annual benchmark: 5-year historic average cost	Page 8
				Day ahead benchmark	Page 8
	Critical National Infrastructure (CNI) Systems	2	CNI system reliability	To be confirmed when baseline data is calculated	Page 12
	Energy forecasting	3	Day ahead demand forecast accuracy	Monthly mean absolute error: improvement on last year's forecast accuracy for 6-8 months of the year	Page 14
				Mean absolute error over year: 5% year on year improvement	Page 14
	Security of supply	4	Security of supply	0 excursions per year	Page 18
	Zero carbon operability	5	Delivery of zero carbon operability ambition	Green rating for delivery milestones	Page 20
Theme 2/Role 2: Theme 2/Role 2	A4. Build the future balancing service and wholesale markets	6	Proportion of balancing services procured through competitive means	60% (for Fast frequency response and reserve)	Page 24
		7	EMR decision quality	Percentage of applications overturned by	Page 28

Role/ Theme	Business activity	Metric number	Proposed metric	Performance target	Further information
	A5. Transform access to the capacity market			Ofgem lower than previous 2 year average	
		8	EMR Demand forecast accuracy	2% for year ahead (T-1), 4% for four-year ahead (T-4)	Page 31
	A6. Develop code and charging arrangements that are fit for the future	9	Code Administrator Code of Practice survey	Increase on previous year's average satisfaction score	Page 34
Role 3/Theme 3: Unlocking consumer value through competiti on	Network Options Assessment (NOA)	10	Consumer value savings from NOA	£50m forecast consumer value per option the ESO is involved in	Page 38
Role 3/Theme 4:	A14 Take a whole electricity system approach to connections	11	Right first time	95% right first time (year 1)	Page 41
	A15 Taking a whole energy system approach to promote zero carbon operability	12	Future balancing costs saved by operability solutions	£75m	Page 42
		13	Capacity saved through operability solutions	£22m	Page 46
	A16 Delivering consumer benefits from improved network access planning	14	Capacity saved through our access planning actions	+10% on previous year	Page 48
		15	Number of short notice changes to planned outages	Less than 5 per 1000 outages delayed by more than an hour or	Page 50

Role/ Theme	Business activity	Metric number	Proposed metric	Performance target	Further information
				cancelled within day	
Cross ESO	A17 Data portal	16	Proportion of ESO data shared	Delivery of shareable data plan	Page 52
	Customer and stakeholder satisfaction	17	Customer and stakeholder satisfaction	Average score out of 10, and average ‘trust equation’ score out of 30	Page 54

Table 1 Metric proposals

1.2 Building on the *Forward plan*

Development of metrics for RIIO-2 is informed by stakeholder feedback on the metrics in our *Forward Plan 2019-21*. We propose to keep six of the existing metrics that have received positive stakeholder feedback on how they measure the ESO’s performance, and we have made alterations to our proposals where there have been concerns raised from stakeholders.

These metrics are:

- Customer value savings from the *Network Options Assessment (NOA).*
- Code administration customer and stakeholder satisfaction.
- Balancing cost management.
- Energy Forecasting.
- Right first time for customer connections.
- System access management for outages.

Where appropriate, we have made improvements to the existing *Forward Plan* metrics. For example, on energy forecasting we will now measure annual accuracy as well as monthly.

2 Detailed Metric proposals

2.1 Role 1 Theme 1

2.1.1 Summary of proposed metrics in Theme 1:

Business activity	Proposed metric	Frequency of measurement
Control room	1 Balancing cost management	Monthly
CNI Systems	2 CNI system reliability	Monthly
Energy forecasting	3 Day ahead demand forecast accuracy	Monthly
Security of supply	4 Security of supply	Monthly
Zero carbon operability	5 Delivery of zero carbon operability ambition	Annual

Table 2 - Proposed Theme 1 metrics

These metrics align to our transformational activities and CBA as follows:

Theme	Transformational activity	Supporting metric	CBA (5yr NPV £ million)
1	Control Centre architecture and systems	Balancing cost, Outages of critical national infrastructure (CNI) systems, Security of supply, Zero carbon operability ambition	£210
	Control Centre training and simulation	Balancing cost, Security of supply, Zero carbon operability ambition	£16
	Restoration	Number and type of restoration providers, Zero carbon operability ambition	-£8

Table 3 - Metric alignment to transformational activities in Theme 1

Please note this also includes items considered as part of our annual reporting proposal

In section 6 we outline further electricity system data items that we will report on. These will provide a more rounded picture of performance, in addition to the metrics listed above.

2.1.2 Metric 1 - Balancing cost management

Introduction

The ESO typically spends around £1 billion per year balancing the electricity system. This ultimately gets passed onto consumers' bills. It is therefore important we continue to efficiently manage balancing costs with due regard to system security. We will measure the ESO's spending on electricity system balancing actions, excluding black start, which is subject to a separate cost disallowance incentive, and produce a day-ahead balancing cost benchmark, with post-day analysis, to provide transparency around control centre actions and drivers of balancing cost.

Context

Efficient management of balancing costs is part of the ESO's core role and as such can be used to help assess our performance in all areas. It is, however, most applicable to Theme 1 and Theme 2, where our proposals for the development of new systems and markets will reduce balancing spend below what would otherwise be the case (note that longer term balancing cost reduction, as claimed in Theme 3 and 4, is subject to a separate metric). As our balancing spend is passed through to consumers, any reduction gives an immediate reduction in consumer bills.

The ESO has had various regulatory metrics and incentives on balancing cost in recent years. From 2013-18 the Balancing Services Incentive Scheme (BSIS) incentivised the ESO through modelling a counterfactual balancing cost. There were some difficulties with this approach, including setting an appropriate target for efficient balancing spend, a lack of transparency and understanding of the underlying models. As part of the 2018 and 2019-21 *Forward Plans*, balancing cost has been one of a suite of broader metrics.

Stakeholder views

Stakeholders agree with the need to efficiently manage balancing costs. They are aware, however, that many of the drivers of balancing spend are outside the ESO's control which can limit its effectiveness as a measure of ESO performance.

We heard from a trade associations that creating an annual target through the application of a five-year rolling average could be suboptimal, given the changing energy landscape. They proposed a six-month look back *ex post* evaluation that would consider both balancing cost and percentage of times dispatched in merit order. While we do not believe that a merit order dispatch metric is appropriate (see Transparency of control room decision making below), we agree with the need for the ESO to be transparent on balancing spend. Feedback from a consumer group echoed this, saying the closer to real time we can produce forecasts and targets the better. We believe that our proposals for a day-ahead benchmark would address this.

Internal and external drivers affecting metric outturn

Internal factors include:

- Control Centre decision making and quality of systems (e.g. situational awareness, scheduling and dispatch capabilities).
- Accuracy of national demand and generation (e.g. wind and solar) forecasting.
- Services available in relevant markets.
- Trading activity, given services can usually be procured cheaper in advance.
- Opening existing balancing and ancillary service markets to new technologies and players, and the development of new markets.

External drivers include:

- plant, network and service availability influencing the actions the ESO must take
- code and licence obligations
- electricity system events
- wholesale electricity price
- number of actions needed due to changing energy landscape (e.g. variable generation requiring more actions)
- market conditions (e.g. interconnector flows).
- government policies, for example Connect and Manage.

Measurement methodology

We propose a two-step metric, consisting of an annual benchmark and an indicative day-ahead benchmark

Annual benchmark

The current approach, as per the *2019-21 Forward Plan*, would continue. A benchmark will be derived from the application of a linear trend to five-year moving averages of historic balancing costs. A certain number of upward and downward drivers are then applied to set the final benchmark. Data sources are historic balancing costs and projections of the impact of the drivers. Black start costs will be excluded.

We intend to use historic data to develop a baseline cost. By using a historical dataset that intrinsically reflects a broad range of operational situations we hope to capture enough observations to establish a representative baseline. There are many foreseeable fundamental drivers that might affect balancing costs but which historical costs might not reflect, which we would adjust for in setting the final benchmark. The final output would be a benchmark with a small range.

Our target would be:

- Exceed baseline expectations: outturn spend less than the lower bound of benchmark range.
- Meets baseline expectations: outturn spend within benchmark range.
- Below baseline expectations: outturn spend greater than the upper bound of benchmark range.

Given the rapidly changing energy landscape and increasing complex operating environment, we feel that this would create an ambitious and suitably calibrated target.

Day ahead benchmark

In our engagement, stakeholders have called for greater transparency around the key drivers behind balancing spend and the decisions our control centres make. We agree that is it is important the market has confidence in our actions and propose a day-ahead balancing cost benchmark to address this. Our methodology is as follows.

Once we receive physical notification for the next day, we will run our scheduling tool to produce a snapshot of the actions we need to take for efficient system operation in the following 24-hour period from 5am to 5am. A cost estimate based on these actions would be recorded.

After the day in question, we will review the actions we took against those in the benchmark suggested by our scheduling tool. Whilst there is likely to be a difference, because many factors including forecast wind and solar PV generation, national demand, the weather and system events, can change between day-ahead and within-day, there are two main benefits of this approach:

- It allows us to be open and transparent on the actions we took based on a reasonable estimate. We would explain the reasons why we may have taken different actions to those suggested by the scheduling tool, for example for system security or other operational reasons.
- Presently, it is hard to review Control Centre performance because there is no guideline. Setting a benchmark and performing post-day analysis would give an indication of performance and where we should concentre improvements.

It should be noted that it would not be our intention to beat the benchmark per se, because system and market conditions are likely to change from day-ahead to within-day. We will be reporting on the actions that we have taken to keep balancing cost spend to a minimum through our control room activities

We would publish the benchmark ahead of time, and report on the differences between the actions taken and the benchmark proposed actions. The publication of this would replace our current day-ahead Balancing Services Use of System (BSUoS) forecasts.

Historic performance

Year	2014/15	2015/16	2016/17	2017/18	2018/19
Balancing costs (£ million)	824.8	849.2	873	940	1139

Table 4 – Historic Balancing cost spend

Alternative measurement options considered

Transparency of control room decision making

During our engagement, some stakeholders called for a metric that would reflect the transparency of our Control Centre decision making. A suggested metric was the percentage of times the Control Centre has dispatched in merit order. We do not believe such a metric would be appropriate because:

- There are numerous factors that our Control Centre engineers must balance when they make decisions, including the cost, timescale and location of any service they dispatch, as well as the overall operability picture. These must be considered together to judge whether a decision is in merit order. We feel that a discrete metric that selects some of these factors will not accurately reflect this.
- We are already externally audited on our balancing decisions, in line with Condition C16 of the Transmission Standard Licence Conditions and the audit report is published on our website.
- Such a merit order metric would not address the root cause of stakeholder feedback, which is the lack of transparency of our decision making. We believe that our proposals under Theme 1 and Open Data, including the creation of a data platform to provide access for stakeholders to all of the data we had to make a decision, and our subsequent actions, will provide the necessary levels of transparency. This will build on our *Forward Plan* work which includes planning to increase the transparency of our despatch decision making process.

2.1.3 Metric 2 - Critical national infrastructure (CNI) system reliability

Introduction

Our Theme 1 proposals include the development of new balancing and control capabilities. Many are defined as critical national infrastructure (CNI) systems. They include our core situational awareness, scheduling and dispatch tools. An outage or failure of these system can have significant cost and system security consequences. Given this, it is important we measure and report on the health of our CNI systems.

Context

Given that outages of CNI systems can increase costs for consumers due to reduced market fluidity, or from increased balancing costs through adopting defensive measures following the loss of situational awareness, there is a direct link to consumer benefits. Our proposals under Theme 1 should reduce unplanned CNI outage time, so there is a direct link to our plan. Stakeholders have reported a lack of transparency from the ESO on system health, which this metric would address.

Stakeholder feedback

We received feedback on this metric at the ESO RIIO-2 event on 2 October 2019:

- One stakeholder said a metric is needed on reliability per level of cost. The Theme 1 CBA sets out how we will reduce balancing mechanism outage downtime, helping to lower bills.
- A representative of the regulator stated that, given we are asking them to sign off on over £100 million of IT spend in Theme 1, the metrics need to link to the CBA outputs. We agree, and our cost-benefit analysis (CBA) already includes a line on balancing mechanism outage downtime.
- At an industry round table, we were told that the ESO needs to be more transparent about the health of its CNI systems. This metric will provide this.

Internal drivers affecting metric outturn

Internal factors include:

- Delivery of new balancing and control capabilities.
- Performance of new balancing and control capabilities.
- ESO ability to accurately forecast and deliver within planned outages.

Measurement methodology

We propose to consider the outages of our CNI systems (for example our electricity system control, scheduling and dispatch tools). The measure would be time of planned outage accuracy ± time of unplanned outages. In other words, we would be measured to accurately forecast and deliver planned outages, and minimise unplanned outages. We consider an unplanned outage to be an early or late conclusion of a planned outage, or an outage that was not planned (for example due to system failure).

Historic performance benchmarks and targets

We currently only have data available for our Balancing Mechanism system. Below we have included a table that contains recent unexpected planned outages. Ahead of RIIO-2 we will provide additional data to establish a meaningful historic benchmark and target.

Unexpected unplanned outages

Date	Length	System	Reason
22/1/2016	2hrs 25mins	Balancing Mechanism outage	Database locking caused critical processes to cease
8/2/2019	4hrs 57mins	Balancing Mechanism outage	Database locking caused critical processes to cease

Table 5 – CNI system outage historic performance

2.1.4 Metric 3 – Day ahead demand forecast accuracy

Introduction

The ESO produces and publishes forecasts of national electricity transmission system demand and wind generation (Balancing Mechanism Unit (BMU) generators) at various timescales ahead of real time (for example week ahead and day ahead). These are used by both the ESO and market participants, and it is important they are the best possible and timely. Our objective is to continuously identify opportunities for improving the forecast accuracy.

We propose to measure the accuracy of our day ahead national transmission demand forecast.

Context

Accurate forecasting ultimately reduces bills for consumers and ensures system security and reliability. It does this in two main ways:

- Sending best price signals to market, allowing companies to schedule efficiently. This reduces the number of balancing actions we need to take, helping to minimise bills for consumers.
- Helping our control room hold the appropriate levels of reserve and response. Holding too much is uneconomical, holding too little could result in an unnecessary system security risk.

Demand forecasting is becoming increasingly challenging. This is mainly due to the rise of "invisible" embedded generation, particularly solar generation, which is weather-dependent. Non-weather-dependent embedded generation, for example batteries that are more sensitive to anticipated market prices for electricity, also increase uncertainty of demand.

Given previous feedback and performance, it is important that the ESO is transparent about its forecasting accuracy and drivers of errors, and looks to improve its performance. A metric will help deliver these.

Stakeholder feedback

At our 2 October 2019 RIIO-2 event, one stakeholder questioned how the metric would demonstrate consumer value delivered. They highlighted the difficultly in quantitively translating forecasting accuracy into reduced balancing spend. We agree that a quantitative measurement is challenging, but believe that a qualitative link is there.

One piece of feedback we have received from a consumer organisation on the current forecasting metric is that the on target benchmark (defined by being within pre-defined errors for 6 to 8 months of the year) could lead to a loss of focus if, for example, the target has already been beaten or, within a month, it seems apparently that the month's target will not be met. We do not believe this will be the case, because acting in this way would not be in line with our obligations to operate the electricity system efficiently and economically. In general, our evaluative performance assessment framework is designed to consider overall behaviours. There is a constant focus on the forecasting performance to be as accurate as possible. In response, however, we are proposing to also measure our forecast accuracy over the course of the year.

One stakeholder suggested that we should measure the mean absolute percentage error, rather than the mean absolute error. We do not believe this provides the correct incentive on our forecasting activities because it would incentive us to focus on demand forecast errors at times of lowest demand, rather than trying to minimise errors consistently across the day.

Internal and external drivers affecting metric outturn

Internal factors include:

- ESO forecasting capabilities.
- Accuracy and provision of relevant data (e.g. solar forecasts, weather forecasts).

External drivers include:

- Control Centre decisions, based on the evolving real-time energy landscape
- weather, in particular how much it deviates from forecasts
- behaviour of market participants, which changes energy demand
- unforeseen electricity system events
- quality of external data inputted into models
- validity of historical data being used to predict future demand.

Measurement methodology

We propose to measure:

- day ahead demand forecast accuracy (monthly mean absolute error) at day-ahead lead time
- day ahead demand forecast accuracy (annual mean absolute error) at day-ahead lead time.

Day ahead demand forecast accuracy (monthly mean absolute error)

Methodology

The day ahead demand forecast accuracy is defined as the Mean Absolute Error (MAE) calculated for each cardinal point and is based on:

- operational national outturns in MW
- national demand forecast in MW.

More information can be found on cardinal points in our *Forward Plan* metric proposals[1]. The accuracy of this is calculated monthly to provide a Monthly Mean Absolute Error (MMAE, MW), and is calculated as follows:

$$MMAE\,(MW) = \frac{\sum_{CP}^{Month} |Forecast\ (MW) - Operational\ Metering\ (MW)|_{CP}}{Total\ number\ of\ CPs\ of\ the\ month}$$

Figure 1 calculation method - Day ahead demand forecast accuracy

The methodology for this metric considers every single forecasting error for all cardinal points in the month. In this way, the size of large errors will have an impact on the monthly performance calculations. Evening peak performance over the triad period (period from November to February when triad charges are incurred by market participants) will be based on the triad avoidance calculation methodology described and shared on our website[2]. Every

[1] https://www.nationalgrid.com/sites/default/files/documents/Performance%20Metrics%20Definition.pdf
[2] https://demandforecast.nationalgrid.com/efs_demand_forecast/faces/DataExplorer

month, the resulting MMAE is compared to the respective monthly target to identify whether we have achieved our target for the month.

Performance benchmarks

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

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

The target for each month is the average MMAE (MW) over the past three financial years, e.g. targets for the scheme financial year 2019/20 consist of average of MMAE from 2016/17, 2017/18 and 2018/19. This way any improvements in any of the component financial years feeds through to the next year's scheme targets making it more difficult. This acts as an improvement factor.

The graph below demonstrates last financial year scheme's monthly targets (blue), current scheme's monthly targets (brown) and next financial year scheme's monthly targets (red). We will revise this data and targets for the RIIO-2 period when the outturn data for the last year of the *Forward Plan* is available.

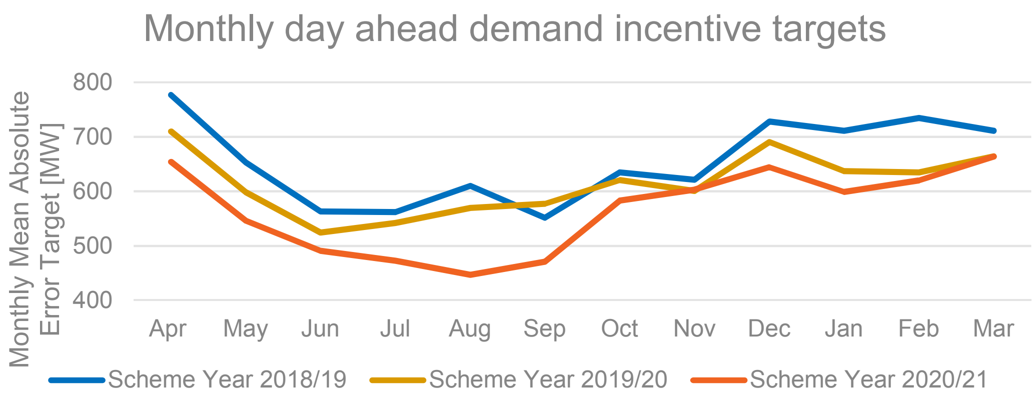

Figure 2 Historic MMAE targets

The targets for the current scheme compared with 2018/19 scheme are on average, 6% more ambitious. Next financial year's scheme targets, compared with the ongoing one are on average, 9% more challenging. Since both years are used in the calculation of the next year's targets, the targets are already much more challenging to meet. An introduction of an additional improvement factor is unnecessary.

In the future, we will consider whether the metric could be expanded to look at all 48 half-hourly settlement periods, and will seek stakeholder feedback to this effect.

Day ahead demand forecast accuracy (annual mean absolute error)

Methodology

This metric would work in similar way to the above, but be defined and measured over the course of the year to calculate an annual mean absolute error (AMAE (MW)):

$$AMAE\,(MW) = \frac{\sum_{CP}^{Year} |Forecast\ (MW)\ -\ Operational\ metering\ (MW)|_{CP}}{Total\ number\ of\ CPs\ of\ the\ year}$$

Figure 3 calculation method – Day ahead demand forecast accuracy (annual mean absolute error)

Performance benchmarks

We would aim for a 5 per cent improvement from the previous financial year.

Wind generation

Wind generation will become increasingly difficult to forecast as more generators collocate storage on site, and output from wind farms becomes dependant on the generators' commercial strategy. In addition, particularly for larger wind farms, any improvements in wind generation forecasting will require considerably more detailed information from the wind farms, potentially at an individual turbine level. Recent work on power available signals strongly suggests that the techniques and data generators that will be used to predict power available will also be required to improve wind forecasts. We wish to engage with wind generators to discuss whether ESO should remain responsible for wind forecasting, or whether wind farms should assume responsibility for providing forecasts of their own output. If the ESO is to remain responsible we would need feeds of detailed turbine level data and planned use of onsite storage.

2.1.5 Metric 4 – Security of supply

Introduction

We propose to measure the quality of service that we deliver in running the electricity system. This will be measured by the number of voltage and frequency excursions that we incur through running the system and will be reported on a monthly basis

Context

Currently, under licence condition C17, we publish data relating to our performance in maintaining the security standards set out in the Security and Quality of Supply Standard (SQSS) on an annual basis. As this information is a key metric for understanding our performance in ensuring reliable, safe and secure operation of the Great Britain electricity system, it would be appropriate to share this information more regularly with stakeholders. As the system evolves, it will become even more important to not only present information relating to the limits of the SQSS, but also expand and show where the system is running at increased or decreased risk.

Stakeholder feedback

Members of ERSG suggested we include a measure of security of supply within our proposals for RIIO-2 due to the importance of providing visibility of our performance in managing the electricity system within acceptable limits as defined by the SQSS. We agree this is an important aspect to provide visibility on and as a result have added this metric.

Measurement methodology

Security of supply is measured with reference to system voltage and frequency where we will report the number of occasions that we are outside of the permitted operational limits set out below.

Voltage excursions

The Electricity Safety, Quality and Continuity Regulations 2002 permit variations of voltage not exceeding 10 per cent above and below the nominal at voltages of 132kV and above and not exceeding 6 per cent at lower voltages. Any voltage excursions in excess of 15 minutes must be reported. The Grid Code reflects these limits, and imposes a further constraint for the 400kV system in that voltages can only exceed +5 per cent for a maximum of 15 minutes. Consumers may expect the voltage to remain within these limits, except under abnormal conditions e.g. a system fault outside of the limits specified in the SQSS. Normal operational limits are agreed and monitored individually at connection points with customers to ensure that voltage limits are not exceeded following the specified credible fault events described in SQSS.

Frequency excursions

The Electricity Safety, Quality and Continuity Regulations 2002 permit variations in frequency not exceeding 1 per cent above and below 50Hz: a range of 49.5 to 50.5Hz. Any frequency excursions outside these limits for 60 seconds or more are required to be reported. The electricity system is normally managed such that frequency is maintained within operational limits of 49.8 and 50.2Hz. Frequency may, however, move outside these limits under fault conditions or when abnormal changes to operating conditions occur. Losses of generation between 1320 and 1800MW are considered abnormal and a maximum frequency change of 0.8Hz may occur, although operation is managed so that the frequency should return within the lower statutory limit of 49.5Hz within 60 seconds.

We will report on a monthly basis, through our data portal, the number of frequency and voltage excursions that have been incurred for the previous period and a total for the year to date. This will include details of an investigation into the reasons why the excursion took place, the size of the excursion and the relative size to the nominal limits.

Historic performance benchmarks and targets

Until August 2019 we had not had a frequency excursion since the 2008-09 reporting period[3]. We have seen 11 voltage excursions in the previous 5 reporting periods in the years set out in the table below. The details behind these excursions can be found in our National Electricity Transmission System Performance Report[4].

	2014/15	**2015/16**	**2016/17**	**2017/18**	**2018/19**
Voltage excursions	6	0	0	3	2
Frequency excursions	0	0	0	0	0

Table 6 – Historic performance – Security of supply

We believe that it is appropriate to have a target of zero excursions for both voltage and frequency, in line with the SQSS. This is ambitious, given the historic data.

[3] This will be reported in the 2019/20 reporting period
[4] https://www.nationalgrideso.com/document/153121/download

2.1.6 Metric 5 - Delivery of zero carbon operability ambition

Introduction

Our ambition is to be able to operate a zero carbon electricity system by 2025. Our business plan sets out a range of milestones that the ESO will achieve to in order to enable this. We propose to measure the progress and delivery of these milestones in order to provide visibility to the energy industry.

Context

We chose 2025 as the year we would want to deliver the year we would want to be able to operate a zero carbon system based on a number of factors, including:

- the year when the industry will be ready to economically and efficiently provide zero carbon operation, based on analysis of future generation profiles
- Government policy, including net zero, influencing the type of generation on the electricity system, and the timescales resulting from this
- The changes we would need to make, particular to IT systems and markets, to enable safe, efficient and economical zero carbon operation.

Stakeholder views

Stakeholders have overwhelmingly been supportive of our zero carbon ambition and have asked how we plan to measure success. In our October draft submission, we did not propose a zero carbon operation metric, and a number of stakeholders from a range of sectors felt that the existing metrics proposed would not sufficiently assess it. At the November 2019 ESO RIIO-2 Stakeholder Group (ERSG) meeting, we heard feedback that we should report our progress against our ambition, and that this was an area that stakeholders, including consumers and government, really cared about. We agree with this feedback, and it is the driver behind us proposing this metric.

Measurement methodology

Below we have detailed which activities are critical enablers to our ambition. We propose to report annually against these through a red, amber and green (RAG) status. Our target would be for each status to be green. This is a challenging target, given the level and ambition of the transformational activity we are proposing.

The RAG status would be defined by:

- Red: activity behind schedule.
- Yellow: activity at risk of being delivered late.
- Green: activity on track or delivered.

We would highlight the corrective actions for any deliverables marked amber or red. Any formal changes to scope and cost would also be explained and proposed as part of the ESO’s annual reporting cycle.

We are conscious that a metric that measures achievement of delivery milestones could encourage perverse incentives to achieve a milestone at any cost. We will mitigate this through transparency about the decisions we have taken that affect plan delivery, with changes to milestones justified in terms of consumer benefits. Our proposed Design

Authority will help to make sure that industry stakeholders are involved in planning and monitoring the IT delivery programme, and that they have a good understanding of the interdependencies across delivery workstreams and the rationale for any decisions taken.

The following section outlines how our transformational activities contribute to the ambition of being able to operate a carbon free system by 2025. We have put these into three categories:

- Critical activities, that directly contribute to the ambition. That is, without them we would not be able to operate a carbon free system.
- Enabling activities, which are not strictly needed, but would provide benefits (for example cheaper carbon free operation).
- Other activities, which do not impact our ability to operate a carbon free system.

Secondary or other activities will still provide consumer benefits and/or contribute to the delivery of our other ambitions.

Theme	Activity	Category
1	Control Centre architecture and systems	Critical
	Control Centre training and simulation	Critical
	Restoration	Critical
2	Build the future balancing service and wholesale markets	Critical
	Designing the markets of the future	Other
	Transform access to the capacity market	Other
	Transform the process to amend our codes	Enabling
	A fully digitalised whole system Grid Code by 2025	Enabling
	Look at fully or partially fixing one or more components of Balancing Services Use of System (BSUoS) charges	Other
3	*NOA* enhancements	Enabling
	Undertake with industry a review of the SQSS	Critical
	Implement enhanced and improved analytical capabilities	Critical
4	Lead the debate	Enabling
	Taking a whole electricity system approach to connections	Enabling
	A pathway for zero carbon whole system operability and beyond	Critical
	A whole system approach to accessing networks	Enabling
Open Data	Transforming the quantity and quality of data we make available	Enabling

Table 7 – How our transformational activities contribute to our zero carbon ambition

2.1.7 Alternative metrics considered for Theme 1

In addition to the metrics described above we also engaged stakeholders on potential alternative metrics.

We consulted with stakeholders on a metric for our training simulator proposal, based on the number of people who have been trained. However, our stakeholders do not believe this metric would provide visibility of our performance. As a result, we have removed it from our proposals.

2.2 Role 2/Theme 2

2.2.1 Summary of proposed metrics in Theme 2:

Business activity	Proposed metric	Frequency of measurement
A4. Build the future balancing service and wholesale markets	6 Proportion of balancing services procured through competitive means	Quarterly
A5. Transform access to the capacity market	7 EMR decision quality	Annual
	8 Demand forecast accuracy	Annual
A6. Develop code and charging arrangements that are fit for the future	9 Code Administrator Code of Practice survey	Annual

Table 8 - Proposed Theme 2 metrics

These metrics align to our transformational activities and CBA as follows:

Theme/Role	Transformational activity	Supporting metric / reporting item	CBA (5yr NPV £ million)
2	Build the future balancing service and wholesale markets	Proportion of balancing and ancillary services procured through competitive means	£67
	Lead a review of wholesale, balancing and capacity markets	-	-
	Transform access to the capacity market	EMR Decision quality	£62
	Work with stakeholders to create a fully digitalised, whole system Grid Code by 2025	CSAT for code administration	£4
	Look at fully or partially fixing one or more components of Balancing Services Use of System (BSUoS) charges	-	£280

Table 9 - Metric alignment to transformational activities in Theme 2

In section 6 we outline further electricity system data items that we will report on. These will provide a more rounded picture of performance, in addition to the metrics listed above.

2.2.2 Metric 6 – Proportion of balancing services procured through competitive means

Introduction

We will measure the proportion of balancing services procured competitively. This will promote consumer value by ensuring we buy the optimal volume of balancing services at the lowest cost.

Context

Our business plan proposals are underpinned by the rationale that competition for procurement of balancing services, through tenders or auctions, will deliver lower costs to consumers. Our specific proposals on closer to real time markets for response and reserve, new markets for operability services, and transformed access to markets via the single markets platform will deliver enhanced competition. We have estimated the benefits of these activities to be over £100 million over the RIIO-2 period.

Competitive procurement approaches are our default; there are however cases where, for example because of their location, we cannot attract enough participants for a competitive procurement event. In such cases, different commercial arrangements may be necessary.

We have reported against this metric in the *Forward Plan* as part of Metric 5 - Reform of Balancing Services Markets since September 2019.

Stakeholder views

Service providers and trade associations have told us this would be an appropriate measure. A trade association said this proposal is welcome and will aid transparency, while also commenting that we need to be clearer on how the metric will work and what the targets will be. We have increased the metric detail in this chapter and will include historical performance and targets in our Business Plan.

Internal and external drivers

Performance against this metric is dependent on existing and potential service providers participating in our markets.

Benefits also depend on the following transformational activities in our business plan:

- Control Centre architecture and systems (Theme 1) – ensuing the Control Centre has the tools to dispatch new players in the reserve and response markets.
- Open Data – ensuring the data flow allows participants to understand the market requirements.
- Outcome of stability and voltage pathfinders - delivering an appropriate product suitable for delivery through markets.

We believe this is a good measure because unlike many factors influencing the ultimate cost of balancing services, the means of procurement are within our control.

Measurement methodology

We are proposing a three-part metric to give visibility of the level of competition in our balancing services markets. It is proposed to use three different measures updated every quarter, covering the total spend, the total volume procured (where applicable), and the average market price paid. The measures will be by service area rather than individual market (for example ‘frequency response’ rather than firm frequency response (FFR)) to give a holistic view of comparable products and markets.

The data for each measure will be split into two categories: competitively procured or competitive bilateral. competitively procured includes all regularly held markets open to prequalified providers, such as mandatory frequency response, FFR, STOR, fast reserve, the auction trial, etc. It also includes any procurement through an open and competitive tendering process, such as enhanced frequency response, Black Start competitive procurement events, pathfinders, etc.

The measures for spend and volume will also include a target % for competitively procured. This target represents our ambition to move as much of our balancing service procurement activity into competitive markets as possible, and the targets have been identified based on an estimate of the effect of our deliverables and developments on the markets.

We anticipate including all the balancing services, except for the Balancing Mechanism, to ensure we are providing the greatest visibility. We will then measure the proportion of these services (by appropriate unit such as MW of service requirement provided) procured through competitive means such as auctions or tenders, as opposed to bilateral contracts.

This metric will be measured quarterly with an annual review. We will monitor our progress over time and track the impact of key actions such as changes to procurement approaches.

Procurement of balancing services through bid-offer acceptances in the Balancing Mechanism as well as pathfinders and other innovation projects are out of scope for this metric. However, we would expect these projects to deliver new products and markets for future inclusion.

The source of this data will be ESO Settlements (created for the Monthly Balancing service summary report[5]) broken down into greater detail for individual services/markets.

Measure 1 – Service Spend

This measure is based on the one used in the *2019/21 Forward Plan*. It reports the amount of money we have spent in that quarter on balancing services, including energy costs/payments but excluding any repositioning costs undertaken by the Control Room through the Balancing Mechanism.

There is a risk that, taken in isolation, this measure could be misleading. A reduction in market price could mean a reduction in competitively procured spend, which could give the impression that the market was less competitive, when in fact the reverse would be true.

[5] https://www.nationalgrideso.com/balancing-data/system-balancing-reports

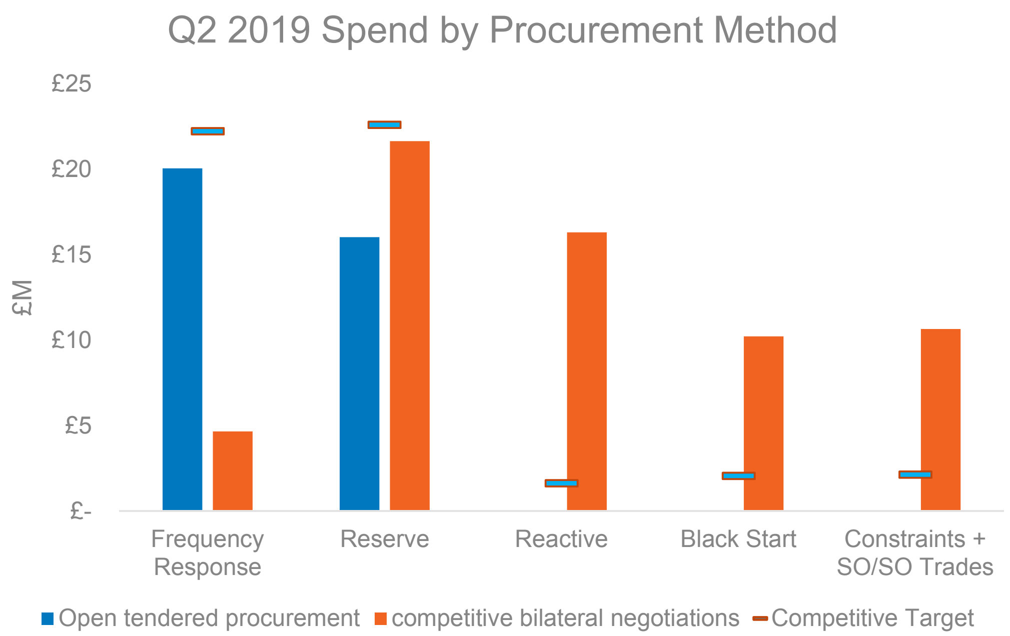

Figure 4 - Q2 2019 spend by procurement method

The targets above have been converted to £s to enable an easier comparison, going forward we will report our targets and actuals by percentage as listed below.

Targets for each year of the RIIO-2 period have been proposed based on our estimate of the impact on the market of our deliverables. Key drivers for each are noted in the table.

Current percentage through competitive procurement (Q2 2019/20)		**2021/22 target**	**2022/23 target**	**Key drivers**
Frequency response	81%	90%	95%	Reduction of the use of optional LF trigger hydro services
Reserve	43%	60%	80%	Separation of optional hydro reserve services into tendered reserve and stability products
Reactive	0%	10%	20%	Reactive Pathfinder and NIC Power Potential project outcomes
Black start	0%	20%	40%	Increase in competitive tender procurement events
Constraints	0%	20%	20%	Constraint Pathfinder and increase in competitive procurement events

Table 10 percentage procured through competitive means and targets

For the first year of RIIO-2 we are targeting 90 per cent of contracts procured through open tenders for our Frequency response and reserve contracts, with this rising to 95 per cent in the second year of RIIO-2. Our reactive, Black Start and constraints targets which are currently at 0 per cent will all increase in the first two years of RIIO-2 when it is possible to provide open market tenders

Measure 2 – Service Volume

This measure will be in the same format as Measure 1. It will report the average daily volume over the quarter, where applicable. For some services which are driven by a requirement other than volume, such as Black Start, use of an alternative figure will be investigated.

There is a risk that, taken in isolation, this measure could be misleading. A reduction in volume bought as a result of a change in short term operability requirements could give the impression that the market was becoming less competitive, which may not be the case.

Measure 3 – Market Price

This measure will report the average unit price paid across all markets within a service type, i.e. there will be one market price reported per service. This average price will be weighted by volume where applicable. For services which are driven by a requirement other than volume, such as Black Start, no weighting will be applied.

No market price information will be provided for bilateral procurement for two reasons: firstly, our bilateral contracts are commercially confidential and we are unable to share details without the consent of the counterparty; secondly, bilateral services are often bundled with other products or are not equivalent to each other, which would make creating an average market price meaningless.

This measure will not include a target price, as this could mislead the market and be an indirect exercise of monopsony market power. It will include historical data to allow the industry to see the progress over time of the effect of increased competition in our markets.

Alternative options

We spoke to stakeholders about two further metric proposals:

- reduction in procurement lead time of services due to introduction of the single market platform
- increase in service providers following introduction of platform and revised service terms (to facilitate smaller providers).

We also considered a measure of market liquidity using the Herfindahl-Hershmann (HHI) index. Our analysis indicated that while this metric will provide a useful understanding of the liquidity of the market it does not provide clarity on our performance and so was not included in our final proposals

We received mixed feedback on these proposals, with many service providers suggesting that simply measuring numbers is not a good enough reflection of the quality of our outputs or the value delivered. As a result, we have decided not to proceed with these metrics.

2.2.3 Metric 7 - Electricity Market Reform (EMR) – decision quality

Introduction

The higher the number of participants in Capacity Market auctions, the more effective these auctions will be. We support applicants through the prequalification process for the auctions, including through our single markets portal when it is available. At the same time, we make sure that applications meet the standards, set by Government and Ofgem, to ensure fairness and minimise delivery risks. The quality of our decision-making is key to promoting high levels of participation in auctions that are efficient.

Context

By 2025, we will deliver security of supply against a clear standard agreed with the Government. We will be responsible for key elements of the Capacity Market; advising the Government on the volume of capacity to purchase, running auctions and managing agreements.

By transforming our approach, we will ensure security of supply through a technology mix that supports the UK's 2050 carbon reduction target at the lowest possible cost to consumers. We estimate the benefits of these activities to be around £100 million over the RIIO-2 period.

Stakeholder views

Service providers and industry associations have told us they welcome our proposals to improve the prequalification process, including the development of a single markets platform for access to all our markets that guides them through the process. Stakeholders want an efficient and transparent process that delivers high quality decisions in line with government and Ofgem requirements. The quality of decision-making is a measure that supports these objectives and builds on the current metrics on EMR that are outside the *Forward Plan* framework.

Internal and external drivers

Performance against this metric and its associated value are dependent on clear Capacity Market rules and regulations set by government and Ofgem. It also requires Capacity Market applicants to meet these rules and regulations to prequalify for an auction.

Our processes, guidance and support, including ease of use of our single markets platform, are vital to the prequalification process.

Benefits are also dependent on the following transformational activities in our business plan:

- Build the future balancing service and wholesale markets (Theme 2) – sharing the single markets platform.

We believe this is an appropriate measure, because efficient and correct decisions will promote successful prequalification. The larger the number of applicants that prequalify and enter the auction, the higher its effectiveness and the lower the costs to consumers. While many factors influencing the cost of auctions are outside our control, we can control elements of their effectiveness. By making sure applications meet the standards set by government and Ofgem, we ensure fairness and minimise delivery risks.

Measurement methodology

We plan to measure the percentage of our prequalification decisions overturned by Ofgem in the tier 2 disputes process.

$$Propotion = \frac{Number\ of\ Reviewable\ ESO\ Decisions\ overturned\ at\ Tier\ 2}{Total\ number\ of\ prequalification\ applications\ received}\ x\ 100$$

$$Example\ calculation:$$

$$Number\ of\ prequalification\ applications\ decided\ by\ the\ ESO\ of\ 2000,$$
$$of\ which\ 5\ were\ overturned\ by\ Ofgem\ at\ Tier\ 2:$$

$$Proportion = \frac{5}{2000} x\ 100 = 0.25\% \ (to\ 2\ dp)$$

Figure 5 calculation method - EMR decision quality

The lower the proportion that get overturned, the more efficient the prequalification process is, particularly for applicants. The measure would and happen after each auction, which are currently run annually.

The source of this data will be the annual regulatory reporting to Ofgem (RRP).

Historic performance benchmarks and targets

Since the start of the Capacity Market, at least 99.7% of our decisions in the prequalification process were not overturned by Ofgem. We have achieved this against the backdrop of a significant increase in the number of applications. The proportion of overturned disputes increased slightly between 2016/17 and 2018/19, from 0.11% to 0.30% (i.e. in 2018/19, 5 disputes out of 1661 applications were overturned).

We propose a rolling target calculated as the average of the two previous years:

	2014/15	**2015/16**	**2016/17**	**2017/18**	**2018/19**
No. of applications	539	598	1751	1948	1661
No. of Tier 2 overturns	0	0	2	3	5
Historic performance	0%	0%	0.11%	0.15%	0.30%

Table 11 historic data - EMR decision quality

Alternative options

We have considered several alternative options, including different metrics on market liquidity. Whilst these would be useful in measuring the performance of the Capacity Market overall, this is mostly influenced by wider drivers (policy, rules, market conditions etc.) over which we have only a very small impact. We also considered a metric on customer satisfaction with our performance, but we think this would be better captured as part of a customer satisfaction metric for the ESO as a whole. We also considered the cost to consumers of our Capacity Market operations (e.g. cost per MW prequalified, cost per application, cost per EMR portal change) but this is already covered in our regulatory reporting. As result, we consider that the proposed decision quality metric, together with the proposed demand forecast metric, provides an appropriate measure for our performance in delivering the Capacity Market functions.

2.2.4 Metric 8 - Electricity Market Reform (EMR) – Demand forecast accuracy

Introduction

We aim to optimise the volume of capacity procured in the Capacity Market during RIIO-2 through more accurate forecasts of peak demand, which is used by the Secretary of State to determine the volume of capacity to procure. Over forecasting leads to unnecessary capacity, increasing the cost to consumers, while under forecasting leads to either more capacity needing to be procured later (potentially at a greater cost) or risks security of supply. We are also proposing a metric on the accuracy of both the T-1 and T-4 peak demand forecasts.

Context

By 2025, we will deliver security of supply against a clear standard agreed with the Government. We will be responsible for key elements of the Capacity Market; advising the Government on the volume of capacity to purchase, running auctions, and managing agreements.

By transforming our approach, we will achieve security of supply through a technology mix that supports the UK's 2050 carbon reduction target at the lowest cost to consumers. We estimate the benefits of these activities to be around £68 million over the RIIO-2 period.

Stakeholder views

Service providers and industry associations have told us this would be an appropriate measure. They also reflect the current metrics on EMR, that sit outside the *Forward Plan* framework.

Internal drivers affecting metric outturn

Performance against this metric and the associated value are dependent on Capacity Market participants fully engaging with the new system and participating in the auctions.

Benefits also depend on the following transformational activities in our business plan:

- build the future balancing service and wholesale markets (Theme 2) – sharing the single markets platform.

We believe this is an appropriate measure because improving the accuracy of peak demand forecasting will optimise the volume of capacity procured in the auction, reducing costs to consumers, either through lower auction costs or reduced security of supply risk. Unlike many factors influencing the ultimate cost of auctions, forecast accuracy is within our control.

Measurement methodology

Our EMR function procure to total consumer demand, our performance metric is based on peak average cold spell (ACS) i.e. weather corrected national demand as this is the most effective proxy for demand that is measurable.

We propose to continue the current calculation method used for the EMR delivery body role where we measure the absolute percentage difference between our peak demand forecast vs outturn peak demand.

$$Peak\ demand\ accuracy\ (\%) = \left| \frac{(Forecast\ demand\ (GW) - Outturn\ demand\ (GW))}{Outturn\ demand\ (GW)} \right|$$

$$Example\ calculation:$$

$$\textit{Forecast peak demand of } 42.9\ GW, \textit{with an outturn demand of } 43.4\ GW:$$

$$\textit{Peak demand accuracy } (\%) = \left|\frac{(42.9\ GW - 43.4\ GW)}{43.4\ GW}\right| = \left|\frac{-0.4\ GW}{43.4\ GW}\right| = |-0.0092\ldots| = 0.92\%$$

Figure 6 calculation method - EMR forecasting accuracy

This percentage gives a value greater than, or equal to, zero, and indicates how accurate the peak demand forecasts are. The closer to zero the percentage, the more accurate the forecast and the more optimal the volume procured and the lower costs to consumers, either through lower auction costs or reduced security of supply risk. We will measure, target and report T-1 and T-4[6] auctions separately due to the separate nature of the processes. The measure will be after the peak demand has out turned, and happen after each T-1 and T-4 auction, currently annually.

The source of this data will be EMR modelling team analysis.

Historic performance benchmarks and targets

Forecasting accuracy can be benchmarked against historic performance. We propose a target based upon our historical data in our December Business Plan with different baselines and targets for the T-1 and T-4 auctions as they are measuring over different time periods.

	2014/15	**2015/16**	**2016/17**	**2017/18**	**2018/19**
Historic performance T-1	3%	3.1%	5%	1%	3.2%
Historic performance T-4	8.1%	13.1%	12.9%	6.9%	7.6%

Table 12 historic data - EMR forecasting accuracy

Against this historic performance we are proposing to maintain our current targets. For our T-1 forecast we are targeting a 2% accuracy, with 4% for our T-4 forecast. As triad avoidance (including demand turndown and peaking embedded generation), storage and distributed generation as a proportion of total demand is forecast to increase, these targets are going to be more challenging to achieve in the future due to the fact that these elements of total demand are not currently accurately measurable. As a result, we believe that these targets will be suitably challenging in RIIO-2 however we believe that there is merit in reviewing the metric proposal in the future to assess if there are more effective methods of measuring our performance in this area.

[6] T-1 refers to the capacity auction for delivery next year, T-4 is for delivery in 4 years time

2.2.5 Metric 9 - Code Administrator Code of Practice survey

Introduction

We administer the following codes:

- Connection and Use of System Code (CUSC).
- Grid Code.
- System Operator-Transmission Owner Code (STC).

We aim to improve the quality of the service we provide as code administrator. A higher quality of service will help our customers be more efficient, and in turn help them to deliver benefits to consumers. It will also remove barriers for smaller parties to be able to participate in the codes process, thus promoting competition. We propose that we continue to be measure using a Customer Satisfaction Score (CSAT) which is aligned with the other code administrators' surveys as part of the Code Administrator Code of Practice (CACoP) process. This survey will be reported separately to our ESO customer and stakeholder satisfaction survey metric as it follows a separate survey process which aligns to the CACoP process.

Context

We want our codes to facilitate the rapid change needed to meet the UK's net zero ambition. Our business plan sets out measures that will allow strategic change to be prioritised and implemented efficiently, while ensuring that it is much simpler and less time consuming to make incremental improvements. This will improve access for all participants and give us the flexibility to deliver forward looking change much more quickly.

Transforming the codes process will also deliver important consumer benefits in both the near term and in the longer term. Modifications will be delivered more efficiently, innovation will be encouraged, and there will be greater harmonisation across electricity transmission and distribution systems. This all ultimately contributes to more efficient and competitive markets, reducing wholesale market costs and creating consumer benefits.

Stakeholder feedback

Service providers, trade associations and a consumer body consulted have told us that this would be an appropriate measure as it is consistent with the other code administrators and it is important for us to provide visibility of performance and be comparable with other entities.

Internal and external drivers affecting metric outturn

We believe this is an appropriate measure because it will directly measure how our customers rate our performance, so driving efficiency and creating value for consumers, and ensure we are delivering their requirements. While many factors influencing cost of code administration are outside our control, the level of service is within our control. We must assume that survey responses provide an accurate representation of the service we have provided, though there is always a risk that parties are influenced by other factors at the time they are completing the survey.

Measurement methodology

We will continue to survey our customers to measure industry collaboration and ability to participate effectively as part of the Code Administrator Code of Practice (CACoP) process. We will then be able to monitor our progress over time and track the impact of key actions. We would undertake this on a quarterly or ad-hoc, dependent on commencement of an activity.

This means greater benefits for consumers. By making sure we improve the quality of service for our customers, they will either directly or indirectly pass any savings onto consumers. The source of this data will be industry-wide survey conducted by Ofgem. This will be broken out into greater detail for each code or modification.

We will use the standard survey script for our survey process which contains 34 questions, 1 of which drives the reported survey results, broken down by the specific code served. Survey respondents are asked to rate on a scale how satisfied they are with the service provided by the ESO, the highest possible result being very satisfied which equates to 100%. We ask customers: "thinking about all aspects of your dealings with the code administrator in relation to these/this codes, overall how satisfied are you with the service provided to your organisation?". These scores are then averaged for reporting of our performance.

Historic performance benchmarks and targets

We are disappointed that the CACoP survey scores for the codes that we administer have decreased for the 2019/20 year to date. We continue to focus on improving the code administration service that we provide to industry. Through our customer journey work, we have developed a programme of improvement activities. These focus on getting the basics right through website improvements, better guidance documentation, improving quality and communications by learning the lessons from the team's lead secretariat role for the charging futures programme. We believe that our proposals for the remainder of the *Forward Plan* period and RIIO-2 will improve this survey score.

	2017/18	**2018/19**	**2019/20 YTD**
CUSC	43	65	47
Grid Code	46	66	59
STC	44	58	45

Table 13 previous years CACoP survey scores by code

We are targeting a year on year improvement from our previous financial year. For the first year of RIIO-2 this will be an improvement on 2020/21.

2.3 Role 3/Theme 3 and Theme 4

2.3.1 Summary of proposed metrics in Themes 3 and 4

Business activity	Proposed metric	Frequency of measurement
NOA	10 Consumer value savings from *NOA*	Annually
A14 Take a whole electricity system approach to connections	11 Right first time	Monthly
A15 Taking a whole energy system approach to promote zero carbon operability	12 Future balancing costs saved by operability solutions	Annually
	13 Capacity saved through operability solutions	Annually
A16 Delivering consumer benefits from improved network access planning	14 Capacity saved through our access planning actions	Quarterly
	15 Number of short notice changes to planned outages	Monthly

Table 14 – Proposed Theme 3 and 4 metrics

These metrics align to our transformational activities and CBA as follows:

Theme	Transformational activity	Supporting metric	CBA (5yr NPV £m)
3	Transforming network planning through competition		£663
	Extending *NOA* to end of life asset replacement decisions	Consumer value savings from *NOA*	
	Extend the *NOA* approach to connections wider works		
	Support decision-making for investment at the distribution level	-	
	Support competition through helping establish the CATO regime.	-	
	Review of the SQSS	-	
	Implement and enhance improved analytical capabilities		
4	Taking a whole electricity system approach to connections	Whole electricity connection customer satisfaction	£2
	Taking a whole electricity system approach to promote zero carbon operability	Balancing cost reduction through new operability approaches	£466
	Delivering consumer benefits from improved network access planning	NAP customer value opportunities	£204
	Leading the debate	-	-

Table 15 - Metric alignment to transformational activities and CBA - Theme 3 and 4

In section 6 we outline further electricity system data items that we will report on. These will provide a more rounded picture of performance, in addition to the metrics listed above.

2.3.2 Metric 10 - Consumer value savings from the *Network Option Assessments (NOA)* process

Introduction

We propose to measure consumer value savings (£ million) annually to demonstrate that our *NOA* process drives economic and efficient outcomes from planning, development and investment in the electricity networks. In this context consumer value is the value gained by following our independent *NOA* process.

Context

We have used this metric in our *Forward Plan* and its ongoing use provides continuity of reporting as we enhance and extend the scope of *NOA*. The enhancements to the *NOA* process should increase its value; as the *NOA* process considers electricity system needs at a more granular level, recommendations should save the consumer more money. For example, our proposal to extend the *NOA* to end of life asset replacement decisions is forecast to save an additional £118 million by the end of RIIO-2.

Stakeholder views

We have received positive feedback about the use of this metric in our *Forward Plan* and more recently at our 2 October 2019 stakeholder workshop. Stakeholders told us that the principle of this is okay in respect to network development. Stakeholders also highlighted that we should take into account the efficiency of delivering resilience and building new capacity; and be mindful of a potential double reward for National Grid plc. This concern arose from the potential for the ESO to be rewarded with an incentive for providing the framework for the competition and running it, and the National Grid Electricity Transmission Operator to be rewarded by winning the competition. Our transparent *NOA* methodology development process, which is approved annually by Ofgem, should provide stakeholders with the reassurance that the successful options are as a result of following the agreed, objective process.

Internal and external drivers affecting metric outturn

External drivers:

- Anything which affects the Future Energy Scenarios, such as energy policy, changes to the Capacity Mechanism, Contracts for Difference. This will affect generation and demand patterns, and the level of future constraints on the networks.
- Options provided by the TOs; few large-scale options mean more opportunity for the ESO to identify alternatives. However, if the TOs' options include smaller, reduced build options then there could be limited scope for the ESO to add value. As options are assessed annually a delay in the delivery could affect the forecast value.

Measurement methodology

We propose to measure the value that undertaking the *NOA* delivers by analysing the increase in constraint costs that we would expect to incur if none of the options in the optimal path were proceeded for one year. This will highlight the importance of delivering the ESO-determined optimal solution at the correct time according to our analysis. We do not believe it is appropriate to have a target against this as the value is very dependent on the level of network investment which is required. This can vary significantly over time and is not something we have direct control over.

We propose targets around elements over which we have control. This is in the options that are put into the *NOA* process and are recommended as part of the optimal paths. We propose a metric measuring the options which are submitted as part of the *NOA* process, categorising options into the following categories:

- ESO Exclusive options – These are options which are exclusively developed or sought by the ESO. These will include operational options, commercial services and options from other interested parties, such as DNOs.
- ESO Collaborative options – These are options on which we have collaborated with a TO. This could be in influencing the design or location of a particular option, influencing build order of options or working more collaboratively with a TO to propose new technology solutions. This can include both reduced build and asset build solutions as there is value in us helping unlock variations to asset build options if it can result in consumer benefits.
- TO Exclusive options – These are options which are submitted by the TOs and which have had no direct input from us. These will include a mix of both reduced build and asset build options.

Historic performance benchmarks and targets

We started to use this metric in our *Forward Plan* in 2018/19, so the data below is presented from this point on.

	2017/18	**2018/19**
Historic performance	-	£711m, £65m per option (11 ESO options)

Table 16 – Historical NOA customer value performance

As the number of options and consumer value will vary year on year influenced by the level of reinforcement required on the networks we propose to target a consumer value saving of £50 million per ESO exclusive and collaborate option. We propose to apply this metric to the *NOA* published annually every January

Alternative options

We considered other ways of measuring the value of the *NOA*, including measuring change of recommendations of marginal options from year to year. For example, those that have changed from ‘proceed’ to ‘delay’ or vice versa, with a view that minimal change means we have made the right decision. However, our information changes each year, so a change in recommendation based on new information does not necessarily mean the wrong decision was made the previous year.

We have considered absolute value, but we have little control over the value the *NOA* delivers. This is driven by the levels of forecast network constraints. The forecast is currently driving a lot of network reinforcement investment. If this changes and less network reinforcement is required, the absolute value of the *NOA* will reduce. This is not directly within our control meaning a percentage measure provides a better longer-term view of our performance

2.3.3 Metric 11 – Customer connections: Right first time

Introduction

As the number of connection applications increases there is an increasing demand on the connections processes. It is important to stakeholders that we continue to offer high quality connection agreements, therefore we propose a ‘right first time’ metric within our business plan.

Context

Historically, customers connecting to electricity transmission networks have been involved in the industry for many years, with experience in developing new projects and the connection application process. With the increase in renewable generation and smaller sized projects connecting to the networks, the customers we now work with have much less knowledge of the electricity network and the processes for connection. This is an opportunity to provide excellent customer service and to use our expertise to help new entrants to the market. This requires us to work much more closely with new customers to ensure we develop a solution that is right for their business. This metric measures how well we deal with this challenge by quantifying how often we get it right first time.

Stakeholder views

A trade association has told us the right first time metric is an important one for making sure the quality of the connections process is right for customers and fed back to us that they believe it should be included within our Business Plan proposals. They have welcomed its inclusion as a metric in our Business Plan.

Measurement methodology

The ‘right first time’ approach will measure the quality of a customer’s connection through considering the connection offers signed within a calendar month and identifying if a ‘re-offer’ has been made (i.e. the offer was not right first time and the root cause for the re-work). Any re-offers directly attributable us will affect the metric. It will exclude any re-work caused by a TO (for example, due to an error in a Transmission Owner Construction Offer (TOCO), or the final TOCO being provided less than 7 days before the customer offer is due). It will also exclude changes requested by the customer, non-material changes (e.g. typographical errors) will be reported for information only.

Historic performance benchmarks and targets

	2018/19	2019/20 (YTD)
Right First time	94%	89%

Table 17 right first time targets - Connections

Exceeds benchmark: > 95% of offers right first time.

In line with benchmark: 90-95% of offers right first time

Below benchmark: < 90% of offers right first time

2.3.4 Metric 12 – Future balancing costs saved by operability solutions

Introduction

We will reduce balancing costs through new implementing new approaches to operating the electricity system. This will reduce costs for consumers.

Context

Our planning and operational activities are underpinned by the need to manage the balancing costs that are borne by consumers, and make sure these are no higher than they need to be. In planning timescales, our annual *Network Options Assessment* (*NOA*) process considers cost benefit analysis of asset solutions against balancing cost spend for ten years. *NOA* allows us to take a long-term forward-looking view on network investment decisions that provide consumer benefit. Through *NOA* pathfinders, we are exploring procurement of long-term market solutions and increasing competition for operability-related system issues. In operational timescales, we use a combination of tools to reduce our balancing spend, e.g. optimising the operating plan, identifying opportunities for automation and opportunities to access new services.

We currently publish a Monthly Balancing Services Summary (MBBS), daily balancing costs and monthly Balancing Services use of System (BSUoS) forecast (containing 24 month ahead forecast and 12 month outturn). All these form part of our Metric 1 in the *2018/19 Forward Plan*.

Stakeholder views

Stakeholders welcomed new approaches that would provide more transparency, reduce balancing costs and increase consumer value. They also emphasised that there needs to be a link back to the benefits from investments that deliver a reduction in balancing costs, and to consider whether transparency of balancing services should be assessed through customer satisfaction surveys. The ESO RIIO-2 stakeholder group (ERSG) and a consumer representative have highlighted the need to be clear that there is not a duplication of counting between this metric and the balancing cost metrics found in Theme 1. We do not believe this is the case as this metric measures balancing cost savings through operability, which takes place over a longer timeframe; between 2-30 years. As a result, the savings will already have been achieved before the Electricity National Control Centre is managing balancing costs in real time.

Internal and external drivers affecting metric outturn

Performance against this metric and its associated value are dependent on the following transformational activities in our business plan:

- enhanced tools to assess our operability requirements in planning and operational timescales
- enhanced tools to bring in new market solutions and services to manage network operability
- enhanced tools to capture our balancing costs spend under different operability constrains categories (thermal, frequency, voltage, stability, black start).

We believe this is a good measure because unlike many factors influencing the ultimate cost of balancing services, the means of forecasting and procurement, and potentially the opportunities to optimise networks, are within our control.

Measurement methodology

Measurement will be based on balancing cost savings through delivering the above transformational activities for each year. It will include, but not be limited to, five main operability constraints categories (thermal, frequency, voltage, stability and black start) and will include the savings achieved through specified initiative such as pathfinders. We will report on the value of each initiative at the point that it was secured (e.g. contract signature) measured over its lifetime and using the analysis that was undertaken to identify the most economic and effective solution.

Savings will be quantified in accordance with a methodology designed to capture a reasonable view of the savings which can be ascribed to an individual initiative. There is a risk of double counting using this process (i.e. the same saving being claimed by multiple projects) which will vary by initiative. Where there is potential for duplication, the extent of this risk will be captured for each initiative that is assessed. There is also a risk that savings are over or under-estimated because the counterfactual market response is by definition unknown. This is a known feature of any forecasting and these effects will be factored into the assessment methodology

This metric will be reviewed every year. We will monitor our progress over time and track the impact of key actions in each transformation activity such as changes to procurement approaches.

The source of this data will be ESO settlements data (created for the MBSS) broken out into greater detail for individual services/ markets, and we will establish a tracking process to monitor the outcome of each transformation activity

Historic performance benchmarks and targets

Historically, the balancing cost is not monitored and reported on each intervention, so we propose to use 2020/2021 - the last year in RIIO-1 - as a trial to deliver transformation activities and track their outcome. The trial target is £75m, based on a desktop study, but could be revised after the trial.

	2017/18	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**
Historic performance (£m)				Trail to set up a baseline		
Target(£m)					£75m	£75m

Table 18 historic balancing costs savings through network operability

Alternative options for metrics

We considered several alternatives, including simply using the total balancing cost reduction to monitor the outcome of transformation activities. There is an established process for this and it is probably easier for stakeholders to understand. But there are too many other factors affecting the monthly, seasonal and annual spend on balancing the electricity system, which make it difficult to identify the outcome and impact from our transformational activities.

We also rejected another other option of simply tracking the number of initiatives delivered, as this would not reflect consumer value.

2.3.5 Metric 13 - Capacity saved through operability solutions

Introduction

We will measure the capacity unlocked by our network operability processes. These create space for more participants, including renewable generation, to access energy markets by optimising the use of infrastructure. The increased competition will lead to a more diverse market, resulting in a potential reduction in consumer bills and reduction of carbon emissions.

Context

Our business plan proposals will support the UK's 2050 net zero target and deliver benefits for consumers. Actions to do this include finding efficient alternatives to building new infrastructure. and connecting more renewable generation.

In our 2018/19 *Forward Plan*, we progressed Regional Development Plans (RDP) which are joint initiatives with DNOs to increase network capacity. We are running these programmes in south-east England, south-west England and south-west Scotland as these areas have limited transmission network capacity that, under normal circumstances, would mean long connection lead times during expensive asset reinforcement. The work undertaken so far has given us a wider range of tools to efficiently manage transmission network issues and system security.

We adopted a metric to quantify the value of this work to consumers in our *Forward Plan* (Metric 10 – whole system, unlocking cross-boundary solutions). Delivery will continue in the period covered by RIIO-2 with roll-out in more regions.

Stakeholder views

Stakeholders including distribution network operators and renewable generators welcomed the Regional Development Programme proposals and supported a metric to quantify the benefits for consumers. A trade association requested additional clarity on how the metric would be calculated, which we have included below.

Internal and external drivers

Performance against this metric and its associated value depends on existing and potential generation development in the networks and markets we influence.

It will also depend on the following transformational activities in our business plan:

- A1 Control Centre Architecture and Systems and A15 Taking a whole energy system approach to promote zero carbon operability – ensuing the ESO and DNOs have the tools to achieve optimal network capacity and constraint management.
- A17 Data portal – ensuring whole system data exchange between the ESO, DNOs and all generators to deliver the most effective network planning and operation decisions.

Measurement methodology

Measurement will be based on two quantities:

Reduced infrastructure costs as a result of avoiding or deferring the need for additional assets to cope with further renewable connections;

- The monetised value of carbon reductions achieved from the RDP.

- This metric will be measured quarterly with an annual review. We will be able to monitor our progress over time and track the impact of key actions, such as changes in systems, policies and service procurement.

The data will be derived from an assessment of a network investment counterfactual and by using a standard value of carbon reduction for each MW of capacity released. These will be reported separately.

Historic performance benchmarks and targets

Historically, infrastructure costs for connecting generation and demand are mainly included in the *NOA* as overall boundary constraint management. Carbon savings are calculated on an ad hoc basis. We therefore propose to use 2020/2021 - the last year in RIIO-1 - as a trial to track the outcome for infrastructure cost saving and carbon saving on a yearly basis. The target for the trial is £20 million, based on a desktop study, but could be revised afterwards. We will then use a rolling target based on this trial with a 10% increase each year. In this example the target would be £22 million for 2021/22 and £24 million for 2022/23.

	2020/21	**2021/22**	**2022/23**
Historic performance	Trial to set up a baseline		
Target		£22m	£24m

Table 19 historic capacity savings through network operability

Alternative options for metrics considered

We considered several alternatives for infrastructure cost saving, including simply using the *NOA* process to monitor the outcome of whole system planning transformational activities. There is an established process to do this and it is probably easier for our stakeholders to understand. It is difficult however to differentiate the consumer values from our transformational activities that are specific to this area.

2.3.6 Metric 14 – Capacity saved through our network access planning actions

Introduction

Our network access planning team works with the TO to plan outages, and with generators to plan and optimise outages. The planners add value to the end consumers and the connected customers by using their expertise and judgment to propose innovative ways of planning outages, and by going beyond our network access planning policies and procedures.

We will measure customer value created through innovative ways of working with TOs and DNOs to release capacity across the whole electricity system. This will demonstrate that we are establishing zero carbon operability of the electricity system and improving our service. This also has a positive impact on our CSAT scores and results in savings to BSUoS charges which should lead to lower consumer bills.

Context

We introduced this metric in our *2019-21 Forward Plan*, as Metric 12, to measure the outcomes of delivering deeper outage planning, customer journey mapping and transmission outage and generator availability (TOGA) system replacement. We are continuing to go above and beyond our network access planning policies and procedures to ensure network operators can access their assets - when they need to upgrade, maintain, or replace them – in a co-ordinated, cost effective way, minimising the duration of the outage. This maintains energy flows and minimises the length of time generators are unable to export power into the network.

We will continue to use this metric through RIIO-2 as our activities extend from Scotland to include England and Wales. We intend to further enhance our network access planning process across the transmission-distribution interface to benefit network owners and consumers. We will work with TOs to establish their long and medium-term project delivery plans and reduce system operating costs. We will also collaborate with DNOs in procuring flexibility services and to coordinate outages at a distribution levels, as greater volumes of distributed renewable generation connect to the electricity system. This will ensure we can facilitate timely construction and maintenance of assets and optimise energy flows for generators and consumers. We expect these activities to realise consumer benefits of £204 million by the end of RIIO-2.

Stakeholder views

A trade association said that while this metric was useful, it would also be beneficial to have a metric to incentivise us to minimise the disruption caused by moving outages. As a result we have included our System access management metric (Metric 15), which has further details below.

Internal and external drivers affecting metric outturn

The following external and internal factors will influence the performance of this metric:

External:

- TO ability and flexibility to deliver work in different ways and on different dates
- the level of collaboration between us, TOs, DNOs, generators and directly connected customers.

Internal

- ensuring different ways of working do not have unintended consequences on system balancing costs
- responsiveness and resourcing of the electricity Control Centre to release additional generating capacity in real time
- resource in network access planning teams to identify and realise opportunities to create additional value.

Measurement methodology

We will measure how we are delivering a more efficient outage planning process by assessing the megawatt hours (MWh) of capacity created by our actions. This will be derived from our outage planning process and measured quarterly. It will include value created for customers by innovative ways of working with TOs and DNOs to release capacity across the whole electricity system, but exclude the monetary value created for customers. Examples include creating savings from the Network Access Policy (NAP) challenge and review paper process; identifying and facilitating opportunities for outages; re-evaluating system capacity; reducing outage duration; optimising the outage plan to reduce constraint costs; aligning outages with customer maintenance; facilitating alternative solutions for lengthy outages that impact customers; and aligning outages with generator shutdowns.

Historic performance benchmarks and targets

The target values are set from historic measurements and performance of the Scotland outage planning team. We do not hold historical data for England and Wales outage planning. However, we have used our experience in Scotland to set targets which are challenging but realistic and achievable. In 2019/20 the England and Wales outage planning teams and the national planning team started capturing the added value with this metric and we have recorded two successful quarters where we exceeded our targets. As a new metric for 19/20 we are continuing to review the targets to ensure we are delivering the maximum benefit. At this stage we are suggesting an initial target of 10% above the previous year's achievement.

	2017/18	**2018/19**	**2019/20**
Historic performance (MWh)	53,418	284,810	2,218,000 year to date

Table 20 historic data - consumer savings through network access planning

Alternative options for metrics considered

We considered measuring the monetary value but decided not to take this forward due to concerns that it would cause confusion when compared with system balancing costs.

2.3.7 Metric 15 – Number of short notice changes to planned outages

Introduction

We propose continuing with the system access management metric from the *Forward Plan*, as stakeholders tell us this is a useful measure in ensuring that we are working to reduce the number of outage changes under its control.

Context

We direct the flow of electricity over the transmission system in real time. The three TOs and Offshore Transmission Owners (OFTOs) own the network assets. To ensure these assets are maintained, the TOs ask us for access. When network access requests are formally submitted, we perform due diligence and, if secure and economic, they are accepted into the master outage plan.

When a request has been incorporated into the plan, parties assume it will go ahead. This includes TOs, DNOs and generators who could, for example, have incurred costs hiring specialist contractors or equipment. Sometimes these requests are delayed or even cancelled for a variety of reasons, from unforeseeable weather conditions to faults on the electricity system to planning process failures. These cancellations can lead to higher costs due to extra actions needed to balance the system; the estimated delay costs to the TOs are between £5,000 and £15,000 a day.

We work with all stakeholders to provide efficient access to the system when they need it. Ideally, we would like advance notice of system access requests, but a lot of stakeholders need flexibility. With flexibility and late notice access comes the additional risk of an outage being cancelled. We do not want to restrict flexibility, so this metric keeps us focused on delivering our processes effectively in a fluid environment. As a result, there is now an interaction between outages for maintenance and network asset build, and new connections.

Stakeholder views

Following the publication of our October draft Business Plan, stakeholder groups told us that system access management measured in the *Forward Plan* is an important performance metric us, as it ensures we are incentivised to reduce the disruption caused by short term outage changes. We have listened to this feedback and included this metric in our proposals for RIIO-2.

Measurement methodology

This metric aims to drive down the number of planned outages delayed by more than an hour or cancelled in the control phase (within day) due to process failure. It investigates the reason for cancellations, and updates the process where appropriate to prevent a repeat. Sometimes we cancel system access requests accepted into the plan because they are no longer securable[7] or the costs are too high. We must continue to be able to cancel system access requests where necessary to ensure the reliability and stability of the system, but this number should be as low as practical to avoid costs for external stakeholders and our own costs in re-planning these requests. The tension between these two aspects is dynamic and we will work to reduce the number of control phase cancellations out of every 1,000 system

[7] An outage is no longer securable when system conditions have changed between accepting the outage into the plan and real-time which means that we can no longer comply with NETS SQSS. System conditions are either changes in generation or demand background or changes to the rest of the transmission or distribution network (from what was expected at the time of placing the outage).

access requests. This measure is a count of the number of outages out of every 1,000 delayed by more than an hour or cancelled within day.

Historic performance and targets

2019/20 YTD performance: 3.36 delays more than an hour or cancellations within day per 1,000 outages accepted into the master outage plan.

Exceeds benchmark: less than or equal to 5 per 1,000 outages

In line with benchmark: between 5 and 8 per 1,000 outages

Below with benchmark: more than 8 per 1,000 outages

2.4 Cross-ESO metrics

2.4.1 Summary of proposed cross-ESO metrics

Business activity	Proposed metric		Frequency of measurement
Digitalisation and open data	16	Proportion of ESO data shared	Monthly
Customer and stakeholder satisfaction	17	Customer and stakeholder satisfaction	Annually

Table 21 - Proposed Cross-ESO metrics

2.4.2 Metric 16 – Proportion of shareable data published

Introduction

We will measure the proportion of 'shareable' data sets held by the ESO that we have published.

Context

We have consistently been told that transparency of data is a key enabler of efficient markets and innovation. Our progress in data sharing is therefore a good measure of our contribution to efficient competitive markets and our role as a key enabler of innovation across the whole energy system.

Stakeholder feedback

Service providers and trade associations have welcomed a metric along these lines. We have received questions from multiple stakeholders regarding details of how this metric would work and the nature of the data that we would be sharing. We have included the answers to this within the proposal below.

Internal and external drivers

We will need to ensure the delivery of our proposed data sharing portal takes place on time to allow data to be published. The IT delivery reporting that we are proposing will support this

Measurement methodology

This metric will measure the proportion of data sets, identified through this process as shareable, that we publish. Once we have established the total shareable data sets, we will work with industry to prioritise this list and release our data in machine readable format via our data portal.

In accordance with our presumed open policy we will work through the data sets and publish those that do not have any commercial, security, privacy or sensitivity risks. This metric will measure the proportion of the data sets identified through this process as shareable that we publish. While the proportion of shareable data is not strictly subject to ESO performance, this metric will hold us to account for the high levels of data openness and transparency that stakeholders want.

2.4.3 Metric 17 - Customer and stakeholder satisfaction

Introduction

We have a vital role to play in the energy transformation. Our ambitious proposals for RIIO-2 highlight the activities that are key to enabling the energy industry to be fit for the future. Through this journey we want to make sure that we are delivering the best possible experience to our customers and stakeholders across the whole ESO; therefore we are proposing to have metrics on both customer satisfaction (CSAT) and stakeholder satisfaction (SSAT) for the ESO during RIIO-2.

Context

We will supplement our assessment of our performance by undertaking customer and stakeholder surveys to ask how they would rate the experience provided by the ESO. By doing this we will be able to understand how well each of our activities are meeting the needs of our stakeholders. Conscious of “survey fatigue,” we will schedule these around key outputs and look to minimise the burden on those we are seeking feedback from. Our baseline will be based on average survey scores taken for the last three years of the RIIO-1 period (i.e. 18/19; 19/20 and 20/21 periods). As these scores are yet to be achieved, we will publish our final baseline score during our first 21/22 ESO performance report.

Stakeholder views

A wide range of stakeholders have fed back that they believe that a customer and stakeholder satisfaction metric is appropriate for us to ensure that the business as a whole is incentivised to improve performance and service to the industry. At our October 2019 Business Plan stakeholder workshop a representative of the regulator suggested that there was merit in reviewing the survey questions that we issue to customers and stakeholders so that we get the most valuable and relevant feedback we can. We agree with this and have included it as part of our proposal.

Internal and external drivers on metric

We are undertaking a review of the most appropriate questions to ask as part of gaining a satisfaction score. We have found that, when people respond to questions about the ESO, they may also reference their experiences and interactions with other parts of National Grid plc. This is particularly complex where there are customer journeys (such as connections) that cut across the ESO and ET. We believe that having a legally separate ESO will help this but also that it would be prudent to review the questions that we ask as part of our survey to make sure that we receive the most useful feedback for us.

Measurement methodology

We are proposing to supplement our existing survey reports with a measure of customer and stakeholder satisfaction which helps us to measure how we are progressing against our goal to be a trusted partner by 2025. We are going to start using the “trust equation” below to set a quantifiable measure against this. The extent to which our stakeholders view us as a trusted partner would be measured by putting scores out of ten in each of the categories in the equation below:

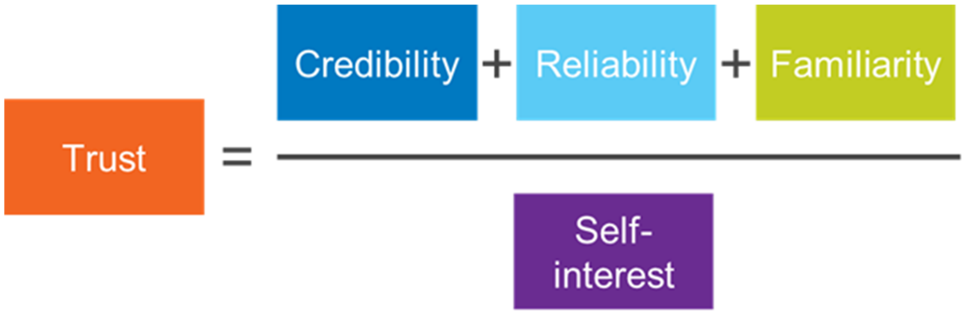

Figure 7 the trust equation

We will need to modify our survey questions to provide us with opinions on how customers and stakeholders view the credibility, reliability and familiarity of the ESO, and the level of self-interest that they believe they see from the ESO. These scores will all be out of 10 and would provide a wider range than is currently available through our current survey method (from a minimum score of 0.3 up to maximum 30). We will report both the annual CSAT and SSAT survey results, as an average out of 10, and our average trust equation score as an average out of 30.

This measure would provide us with valuable feedback on where we can improve our service to our customers and stakeholders and present a more rounded view than would be available through a standard survey alone. A trust equation approach would help to break down specific areas of feedback to help us to improve our service and would help us to monitor progress against our 2025 goal.

Alongside our use of overall customer and stakeholder satisfaction as a measure of our performance, we also propose to report on the customer and stakeholder satisfaction scores for specific processes that we undertake. As we are delivering transformational outputs across the ESO we would like to use a satisfaction survey as a method for measuring whether the industry has seen the improvement proposed in the business plan. We do not propose these items as separate performance metrics due to the potential double counting of performance with an overall satisfaction metric. Therefore, on an annual basis we will report on the results of the following activities in the ESO, as well as the overall satisfaction score:

- customer satisfaction with the connections process
- design authority stakeholder satisfaction
- code administration stakeholder satisfaction
- *NOA* Participant satisfaction.

Historic performance benchmarks and targets

For our regular customer and stakeholder performance measurement we will use the average of the last three years' performance from RIIO-1 to set a benchmark for performance. For reference our performance for the last three years can be seen in the table below.

	2017/18	**2018/19**	**2019/20**
Historic performance: ESO CSAT	7.62	7.75	7.49 up to 19th Nov

Historic performance: ESO SSAT	7.69	7.76	7.74 up to 19th Nov

Table 22 historic performance CSAT and SSAT

To create a benchmark for performance we will use the last year of RIIO-1 to establish a baseline.

3 Evolution of our proposals since the October draft Business Plan

Since publishing our second draft business plan in October 2019 we have engaged stakeholders on our metrics proposals. As a result we have revised our proposals from the October draft. Below is a summary of these changes in response to the feedback we received. The explanation for how we will measure metrics is included in section 5 of this annex. This table does not include the performance indicators which will form part of an annual report as described in section 6.

Business Plan section	**October draft Business Plan proposed metric**	**Feedback received**	**Revision to proposal**
Customer connections	Customer satisfaction	Stakeholders felt that in addition to stakeholder satisfaction we should be measuring the quality of the connections process	We have included a right first time measure for customer connections
Network access planning	MWh capacity saving network access planning solutions	Stakeholder told us that in addition to this metric we should continue to measure the system access management metric currently in the *Forward Plan* as it ensures the ESO is doing everything in its power to minimise	Renamed: Capacity saved through our access planning actions Inclusion of system access management metrics for network access planning. Also renamed: Number of short notice changes to planned outages

Business Plan section	October draft Business Plan proposed metric	Feedback received	Revision to proposal
		outage disruption	
Zero carbon	Not included in October draft Business Plan	A number of stakeholders felt we should have a metric for the delivery of our zero carbon operability given its importance to the Business Plan and future of the ESO	We have included a zero carbon operability delivery plan metric in our December proposals
Security of supply	Not included in October draft Business Plan	It was suggested by a member of the (ERSG) that we should provide visibility of the security of supply of the electricity system	We have included a security of supply metric in our RIIO-2 proposals
Energy forecasting	Monthly mean absolute error	Stakeholders fed back that they believe that we could measure more in this area to ensure that our performance is visible and improving	We have updated our proposals to also include a mean absolute percentage error which takes the total year into account and includes an ambitious 5% year on year improvement target
Code modifications	Consumer benefits from code modifications	Stakeholders fed back that they do not believe that this metric is	We have moved this proposal to be an annual reporting item, to maintain its

Business Plan section	October draft Business Plan proposed metric	Feedback received	Revision to proposal
		a measure of the ESOs performance as there are areas outside of the ESOs control	visibility, instead of a metric

Table 23 revision of proposals from October draft business plan

4 Stakeholder views

Stakeholders have given feedback on our proposals in two main blocks of activity.

We started by inviting stakeholder views on the areas they believe we should measure. We used stakeholder workshops at the Electricity National Control Centre in Wokingham in July and August 2019 to explore these questions. At these events we heard from stakeholders that we should have a balance of metrics that clearly demonstrates the performance of the ESO and the delivery of our proposed ambitions. We also received views on specific metric areas. In general, stakeholders were keen to see metrics on balancing costs, connections and outages.

After publishing our October draft Business Plan, we tested specific proposed metrics at our launch event on 2 October 2019, followed by meetings with trade associations. Overall, feedback has been positive, however clarification was sought on our measurement approaches. Below we highlight the overarching feedback from stakeholders at the launch event on 2 October 2019, including specific feedback on individual metric proposals throughout this annex. More detailed stakeholder feedback on the metrics can be found in section 5.12 of Annex 3 – Stakeholder report.

A number of stakeholders from a range of sectors suggested we include a zero carbon metric and signpost where metrics support our zero carbon ambition. As a result, we have included a measure of the milestones towards zero carbon operability, which can be found in the Theme 1 chapter of our Business Plan and this annex.

We were challenged on whether some of the annual metrics should be reported more frequently. We have included the proposed reporting process for our metrics as well as the frequency of reporting of each metric in this annex. Some performance metrics, such as those associated to the *Network Options Assessment* (*NOA*) process, can only be reported annually due to the frequency of process. We will ensure we can report performance more regularly aligned to our regulatory reporting process.

A service provider and cross industry representative felt some metrics were focusing on outputs rather than inputs and that total system costs could be a useful metric. Our metrics reflect the performance of the ESO and delivery of its transformational activities as they directly link to our business plan ambitions. We have not included a metric on total system costs as there are large proportions of that cost which are not within the control of the ESO and therefore would not be a fair reflection of the ESOs performance.

A distribution network operator felt it would be useful to clarify which metrics are linked to either incentives or public reporting. Currently there is not sufficient guidance to allow us to provide a link to incentives. When we have further clarity on the incentive mechanism in RIIO-2 we will review our metrics and target proposals.

A representative of the regulator thought there needs to measurement of milestones, costs etc, and metrics against plans. We have had feedback since that we should look to separate reporting of delivery activities from our metric proposals. The measurement of milestones and costs will be included within our regular reporting.

5 Measuring our transformational activities and consumer benefit

5.1 Aligning consumer benefits to metrics

Our proposed metrics will help track the benefits our RIIO-2 Business Plan will deliver. Our metrics either measure benefit directly or measure the driver of benefit with over 90% of consumer benefits covered by either:

- a metric which directly measures consumer benefit e.g. consumer value savings from *NOA*
- a metric which measures the benefit driver, e.g. proportion of balancing services procured through competitive markets.

There are numerous challenges when measuring benefit realisation, in particular determining baseline assumptions and timeframes.

For those consumer benefits not covered by a metric, there is the potential to track these as part of any regulatory reporting for RIIO-2, subject to being proportionate and value adding.

The table below shows the breakdown of consumer benefits across these categories:

Metric / consumer benefit alignment	Consumer benefit	% of total consumer benefits
Measure benefit	£1,428 million	60.4%
Measure benefit driver	£481 million	20.3%
No metric	£457 million	19.3%
Total	£2,366 million	100.0%

Table 24 breakdown of consumer benefits across the categories

These are fully detailed in the table below.

CBA area	Type	Gross benefit of activity	Consumer benefit metric	Driver of consumer benefits	Alignment to consumer benefit metric
Role 1: Control Centre	CBA	£51m		Reduced CO2 - measured by the carbon intensity of our balancing actions vs system as a whole.	No metric

CBA area	Type	Gross benefit of activity	Consumer benefit metric	Driver of consumer benefits	Alignment to consumer benefit metric
architecture and systems		£12m	Balancing cost management N.B metrics are not individually measured	Greater interconnection - measured by taking 2% (our contribution as residual balancer) of Poyry's interconnector benefits	Measure Driver
		£109m		Flexible technology - measured by taking 3% of (our contribution as residual balancer) of Imperial college published system operation flexibility benefits	Measure Driver
		£16m		Inertia forecasting - measured by 10% improvement in forecasting accuracy	Measure Driver
		£117m		Situational awareness - measured by 5% reduction in constraint spend	Measure Driver
		£1m	CNI system reliability	Reduced BM downtime - measured by reduced unplanned outages to one hour per year	Measure driver
Theme 1, Role 1: Control Centre training and simulator	CBA	£5m		Reduced resource cost - measured by opex spend	No metric
		£2m		Reduced training cost - measured reduced training time by three months	No metric
		£28m	Balancing cost management	Improved decision making - measured by 2% reduced reserve and response spend	Measure Driver
Theme 1, Role 1: Restoration	CBA	£5m	Measure via the NIC project	DER NIC project - measured by reduced black start BSUoS spend of £4.6 million per year	Measure Benefit
		£1m	Measure via the NIC project	DER NIC project - measured by reduced CO_2 emissions of 32,400 Tonnes per year	Measure Benefit

CBA area	Type	Gross benefit of activity	Consumer benefit metric	Driver of consumer benefits	Alignment to consumer benefit metric
Theme 2, Role 2: Building the future balancing service and Capacity Markets	CBA	£77m	Proportion of balancing services that are procured through competitive markets	Liquid R&R market - measured by 5% reduced in reserve and response spend	Measure Driver
		£29m	Proportion of balancing services that are procured through competitive markets	Buying optimal volume - measured by 5% reduction in response spend	No metric
Theme 2, Role 2: Designing markets of the future	Break-even				
Theme 2, Role 2: Transform access to the capacity market	CBA	£68m	Demand forecast accuracy	Enhanced modelling capability - measure by a 1 GW / 2% improvement in peak demand forecasting	Measure Driver
		£6m		Reduced barriers to entry - measure by saving two week FTE time from capacity market participants	No metric
Theme 2, Role 2: Transform the process to amend our codes	Break-even				
Theme 2, Role 2: Work with all stakeholders to create a whole system Grid Code	CBA	£10m		Reduced barriers to entry - measure by saving one month FTE time from Grid Code participants	No metric

CBA area	Type	Gross benefit of activity	Consumer benefit metric	Driver of consumer benefits	Alignment to consumer benefit metric
Theme 2, Role 2: Look at fully or partially fixing one or more components of BSUoS	CBA	£324m		Removing risk premia from BSUoS payers, passing to the ESO	No metric
Theme 3, Role 3: Enhance the *NOA*	CBA	£429m	10: Consumer value savings from *NOA*	Facilitating competition - measured by the delta of *NOA* runs with and without commercial solutions	Measure Benefit
		£30m		Support DNOs - measured by £10 million of savings in DNO investment per year	No metric
		£148m	10: Consumer value savings from *NOA*	Connections Wider Works - measured by the delta of *NOA* runs with and without 10% more boundaries	Measure Benefit
		£118m		End of life assets - measured by the delta of *NOA* runs with and without four end of life asset decisions	Measure Benefit
Theme 3, Role 3: Review of SQSS	Break-even				
Theme 4, Role 3: Leading the debate	Break-even				
Theme 4, Role 3: Taking a whole electricity system approach to connections	CBA	£8m	11: Customer connections: Right first time	Reduced barriers to entry - measure by 10% participant cost saving from 2022 and 30% saving from 2025	Measure Driver
Theme 4, Role 3: Take a whole electricity system approach to promote zero	CBA	£503m	12: Future balancing costs saved by	Whole system operability - measured by reduced operability cost of £251 million per year	Measure Benefit

CBA area	Type	Gross benefit of activity	Consumer benefit metric	Driver of consumer benefits	Alignment to consumer benefit metric
carbon operability		£39m	operability solutions And	RDP asset savings - measured by £13 million saving from three RDPs	Measure Driver
		£6m	13: Capacity saved through operability solutions	RDP carbon savings - measured by 974 gigawatt hours increase in renewable generation each from three RDPs	Measure Driver
Theme 4, Role 3: A whole system approach for accessing networks	CBA	£224m	14: Capacity saved through our access planning actions	Expend the NAP - measured by a 11.5% reduction in E&W constraint spend	Measure Benefit
Theme 4, Role 3: Delivering consumer benefits from improved network access planning	Break-even				
Total		**£2,366m**			

Table 25 CBA linked to metrics

6 Reporting ESO performance

Alongside our metric proposals we are also proposing to include performance indicators in a regular report. These would provide a wider view of the ESO performance but are not proposed as formal metrics because:

- they are items over which the ESO may not have direct control
- measurement can be challenging with a risk of duplicate reporting.

We provide more details on these indicators below.

6.1 Customer and stakeholder satisfaction surveys

Our October draft business plan includes satisfaction surveys based on both our ongoing processes and transformational proposals. We propose a single customer and stakeholder satisfaction metric that covers all the activities of the ESO. This metric would be supported in our regular report by performance indicators made up of the customer and stakeholder satisfaction results for key processes. Specifically, this would include satisfaction scores for:

- code administration
- customer connections
- *NOA* (participant satisfaction)
- design authority.

6.2 Electricity system data

The ESO has access to data of the whole electricity system which can be used to measure the impact of the delivery of our RIIO-2 ambitions but we do not have sufficient control over the factors which determine performance, such as the types of different providers tendering for restoration services. We propose including these performance indicators in a regular report to help show the impact our ambitions are having on the energy landscape. These would include:

Electricity system data item	Reason for regular reporting instead of a metric
NOA participant mix	While we can create the conditions in the *NOA* for increased participation, we cannot influence the number of parties participating
Number and type of parties tendering for restoration services	While we aim to increase the level of competition across markets, the ESO does not have control over the actual numbers of parties successful in their tenders. We will also include a breakdown of the different types of providers
Consumer value savings from Code modifications	Stakeholders have questioned if this is genuinely a measure of the ESO's performance or a reflection of the code modifications. While we will be working to prioritise modifications that provide consumer value, we agree there are also elements that are not directly linked to ESO performance
IT delivery, including adherence to delivery timelines and budget	An input-based metric such as adherence to project timescales could have perverse effects if it discouraged efficient changes to these milestones. We also want to avoid duplication with the performance improvements we will report through other metrics. We therefore propose we measure and report on project delivery but that this is excluded from the formal metrics suite.

Table 26 annual reporting items

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Faraday House, Warwick Technology Park,
Gallows Hill. Warwick. CV34 6DA