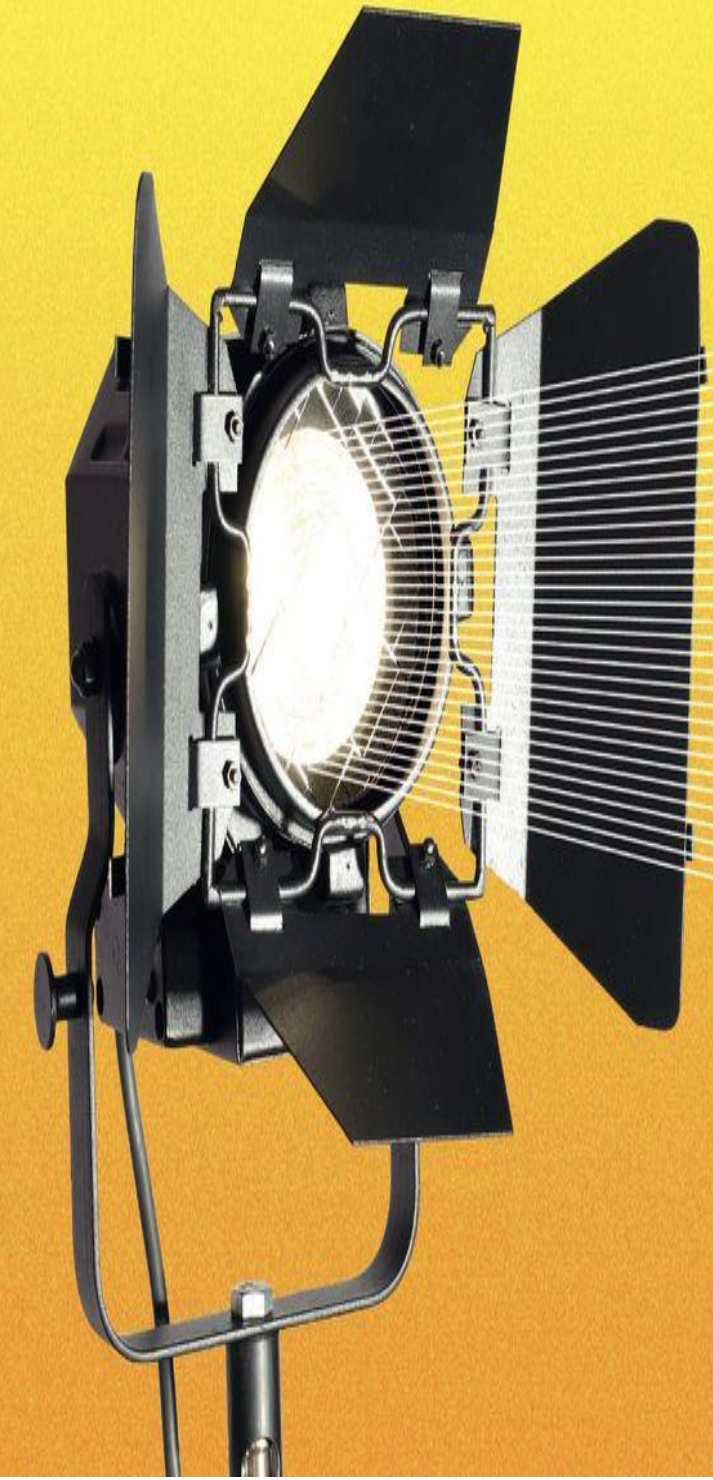
nationalgridESO

Mid-year report

Part 1. Executive summary

Part 2. Deep dive on principles

October 2018



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1.

Introduction

Executive summary

Introduction

In March 2018 we set out our long-term vision and an ambitious plan of work for 2018/19 across our four roles: managing system balancing and operability, facilitating competitive markets, facilitating whole system outcomes and supporting competition in networks under the new ESO incentives scheme.

We have made considerable progress against our plan – delivering not only strong baseline performance, but in many areas exceeding the baseline to deliver improved processes, greater transparency, and new products and services to create real consumer value. Our performance in the first half of the year reflects the evolving role of the ESO and of our shift in mindset and ways of working. Throughout the second half of the year, building on an already strong foundation, we will continue to maintain a sharp focus on engagement, to execute on a number of projects and programmes that are currently in development and to lay the groundwork for longer term initiatives that will deliver consumer value in 2019/20 and beyond.

We present this mid-year report to stakeholders and the performance panel as a summary of our performance in the first half of the year and to provide a look ahead at our priority areas of focus for the second half of the year. The report is structured in three parts, with each part providing the next level of detail:

- Part 1. Executive Summary and a Snapshot of our Key Deliverables (~10 minute read)
- Part 2. Deep dive on Principles 1 to 7 (~45 min read)
- Part 3. Evidence Chapters (~2 hour read)

Four performance themes

While Parts 2 and 3 of this mid-year report summarise our performance in the context of the seven principles for the ESO as set out in the Forward Plan, our approach to driving performance is to look more broadly - across all of our activities - and in doing so deliver benefits across more than one area.

With this overarching view in mind, and as we seek to summarise our performance efforts across the full breadth of our activities, four themes emerge:

1) Deep engagement - with customers and stakeholders, to understand challenges and opportunities and to providing transparency in our plans to address them
2) Process improvement - to deliver better service
3) Thought leadership - on complex industry topics where the ESO can provide a unique perspective; and
4) Consumer focus - driving innovation and supporting competition for the benefit of consumers

These themes are evident in the highlights of our work for the first half of the year.

It's our job to operate Great Britain's electricity network to ensure that supply and demand are balanced second by second and in the longer term, whilst ensuring power flows across the network safely and

reliably. Under principle 2 whilst ensuring we deliver secure supplies of energy we take actions to reduce balancing costs in the short term without jeopardising longer term efficiencies. In summer 2018, collaborating with Ofgem, WPD, Southern Electric and UKPN, we implemented a new commercial approach mitigating **Vector Shift,** delivering benefits of up to £30m. We published several roadmaps providing greater clarity on what services we need to operate the system. We also delivered new, and improved use of, IT systems including **dispatch of Non-BM Fast Reserve** and **Ancillary Services Dispatch Platform** as part of **Platform for Ancillary Services** and facilitated aggregators and smaller parties access into the BM. We heard the feedback that we need to better communicate the changes in our approaches to delivery of IT systems and will continue to hold various forums, including our new IS Change Forum, to provide a venue for engagement and information sharing.

To support this, under principle 1, we have shifted our emphasis to addressing and reducing three barriers we have identified that limit information transparency and accessibility. So far this year, we have published several insight documents including our **Future Energy Scenarios (FES)** and **Summer Outlook**, improved our monthly balancing services statement, introduced a new monthly **BSUoS Report** and implemented machine learning technology to our forecast National PV generation increasing forecast accuracy by 40% compared to previous models. We also further expanded the **Carbon Intensity platform**, adding a new regional forecast of Carbon Intensity.

Following our System Needs and Products Strategy (SNaPS) under principle 3, we continue to ensure that the rules and processes for procuring balancing services maximise competition, reduce barriers and provide a level playing field. In several roadmaps, specifically **roadmaps for Reactive Power, Restoration and Wider Access to the Balancing Mechanism**, we outlined the improvements and changes that we started to implement and will continue to deliver upon over the coming years. This summer, we **facilitated wider access to the balancing market** for aggregated balancing mechanism (BM) units whilst continuing to work towards the required changes to facilitate Great Britain's (GB) participation in Project TERRE (Trans-European Replacement Reserves Exchange).

Under principle 4, we actively engaged on complex topics, bringing the unique perspective of the ESO to the table on key industry challenges. We worked with Ofgem to change the **Charging Futures Forum** to ensure it provides stakeholders with sufficient opportunity to engage, reducing barriers and levelling the playing field. As code administrator, we listened to stakeholder feedback that we need to continually improve the transparency of our processes and decision making. Whilst feedback recognised this improvement via the latest **Code Administrator Code of Practice (CACOP**) survey, we continue to improve our processes and provide greater visibility to stakeholders.

We provide thought leadership on **Facilitating Whole Electricity System** strategy using our position as the system operator to look across the transmission and distribution boundary. This year, we continue to actively engage in the Energy Networks Association (ENA) Open Networks, bringing our perspective and insights to an

industry discussion. We progressed our whole system approach using unprecedented collaborative ways of working, sharing modelling information and data with UKPN and more recently WPD. This could unlock additional capacity on the network and develop new solutions to issues on the transmission and distribution networks. In parallel, under principle 5, we are implementing the study results of this learn-by-doing approach with Scottish Power Transmission and Distribution in Scotland.

Under principle 7, we made improvements to our **Network Options Assessment** (NOA) and **Electricity Ten Year Statement** (ETYS) to deliver additional value by driving innovation and increasing competition. We set out our commitments to enhance the NOA through the **Network Development Roadmap**, encouraging greater competition by expanding the analysis to consider a wider range of options. Our **pathfinding projects**, using a 'trial by doing' approach, are helping us to deliver on these commitments today as we develop our whole system NOA-style process to address regional voltage issues. This may allow us to find alternative distribution solutions to transmission issues and also to compete options between distribution, transmission and the market. Closer to operational timescales under principle 6, the volume of embedded generation connecting to the DNO's network is growing significantly. We are evolving our processes to support the changing technology and ensuring flexibility and transparency, whilst ensuring value for consumers remains at the heart of our decision making. We have been working with UKPN and WPD to find a better way and have rolled out the **Appendix G** process to all DNOs; the update of the 'Appendix G' process has provided DNOs with greater transparency and headroom to make connection offers up to a 50MW limit without requiring discussions with us, creating value through a more agile approach as we move to a more decentralised future.

Alongside all of this, we are laying the foundations for our legal separation from the wider National Grid group in April 2019. In September 2018, we launched our new identity and branding as we establish our distinct, more independent voice within the industry. This is why on 28th September, we invited stakeholders to help shape our 2030 ambition, discussing the activities and outcomes that we can deliver as an industry to deliver benefits to consumers.

We are proud of what we have achieved over the last six months and the plans we have outlined for the next six. We would like to thank Ofgem and our stakeholders for sharing their views and feedback which helps us to continually improve our plan and performance in a way that benefits consumers. We are now preparing our Forward Plan for 2019/21 and invite stakeholders to also join this discussion and help us to shape a plan which will deliver real consumer value in 2019/20 and beyond.

Duncan Burt
Director of Operations, System Operator

Deliverables summary

This table summarises, per principle, the baseline and exceeding activities we have delivered in the first six months of the year.

Principle	Baseline Activities	Exceeding Activities
1	Insight Publications: FES and Summer Outlook *FES received exceeding baseline stakeholder feedback*	Improved Monthly Balancing Services Summary *Provided more data on the balancing actions we take to help the market make informed decisions*
	Trades reporting *Published information about the trades taken at near real time*	Monthly BSUoS report *Improved accuracy of our BSUoS forecast, detailed monthly forecast and outturn*
	Demand and wind forecast *Delivered new demand and wind forecast models leading to resulting in increased accuracy*	Energy Forecasting Website *Created new energy forecast area bringing together daily demand and wind forecasts*
	Electricity Operational Forum (April & July) *Received positive feedback from stakeholders*	Solar power forecast model *40% improvement in solar forecasting using new machine learning forecasting models*
	Ancillary and Balancing Services Tenders Delivered enhanced transparency of our balancing decisions. Webinars received positive stakeholder feedback	Carbon intensity forecast Provided consumers with information about the carbon intensity of the power the use, allowing them to make decisions about when to use it
		Self-serve data portal *Data portal trial completed, receiving positive feedback from stakeholders*
2	Balancing spend *Spend from April to August was below forecast with significant balancing costs during September pushing us above forecast. The benchmark was discounted by £136.4m to take account for the benefit of the Western HVDC Link on balancing costs. Commissioning problems have meant that this asset has not been available and we expect to adjust the benchmark upwards by £59.7m to take account.*	Vector shift *Delivered up to £30m of savings over summer 2018 period*
	Delivered first IS Change Forum *Positive feedback received from stakeholders*	Ancillary Services Dispatch Platform (ASDP) *Phase 1 of the new platform implemented, facilitation of new market previously closed to N-BM market participants*
	Publication of the 2019/20 ESO Innovation Priorities *Consultation launched in September*	
	Future of the Electricity National Control Centre (ENCC) scoping study findings *Sought initial views of stakeholders on Future of the ENCC ahead of Thought Piece to be published by end of October*	

3	Standardisation and Simplification of FFR and simplify the contract *Use of 4 hourly blocks and seasonal windows in the FFR May tender and consulted on proposals for change presented in Detailed Change Proposal*	Publish roadmap on Reactive Power *Published our Product Roadmap and received positive feedback from stakeholders*
	Deliver new, standardised products and simplified contracts for reserve *Consulted on our Outline Change (OCP) Proposal for STOR and presented to industry our OCP for Fast Reserve*	Publish roadmaps on the development on Restoration. *Published our Roadmap, improved the transparency around cost information for Black Start via MBSS*
	Grow Power Responsive including annual conference *Hosted our fourth annual Power Responsive Conference, Executive Dinner, Workshops and received positive feedback from stakeholders*	Publish Wider Access for BM Roadmap *Published our roadmap setting out our commitments to enable wider BM access. Worked closely with members of the industry to facilitate wider access to the BM, receiving positive feedback from an aggregator*
		Publish a new FFR testing and compliance policy. *Published draft policy for performance monitoring requirements*
		Deliver a new, highly scalable and flexible dispatch solution for reserve (PAS) *Successful implementation of Phase 1 of the Platform for Ancillary Services*
		Publish and consult on exclusivity clauses. *Invited stakeholder views on what is meant by 'service stacking'*
4	Improved transparency and publication of charging data – Phase 1: Customer access to information. *Made improvements to our processes and website, refined our TNUoS tariff reports, consulted on our five-year view of TNUoS*	Deliver Charging Futures Forum (CFF) and deliver webinars, podcasts and publications *Held two CFFs, hosted numerous podcasts, facilitated several webinars providing accessible information covering several topics*
	Publication of an agreed code administrator strategic improvement action plan. *Code administrator code of practice saw a significant increase in overall satisfaction and development of a prioritisation process*	Brexit Preparations *In a highly uncertain environment, collaborating closely with Ofgem and BEIS on developing the scenarios for the energy market following GB's exit from the European Union establishing a project management approach to enable good planning and preparations when considering security of supply, operability and both codes and licences*
	Publish Electricity Capacity Report *Published report including adjustment and improvements to our analysis*	
	Delivering Code Changes *European Network Code and Clean Energy*	

	Package stakeholder support. Engaging regularly with customers on charging proposals to ensure their thinking is aligned with Ofgem-led reform work	
5	Standard Planning data exchange and modelling processes (e.g 'week 24; 42') *Delivered process improvement by rolling out standardised data submission templates with DNOs*	Publication of the WPD and UKPN Regional Development Programme Learnings *Improved transparency by creating a new web page to act as a central repository for all RDP-related publications*
		Unlocking further DER connection capacity from existing asset base *Created consumer value through earlier and cheaper connections, such as in UKPN's South-East Coast network area*
		Enhanced transmission constraint management service that works better for DER *Improved network operability and potential for lower BSUoS spend through increased competition*
6	TOGA Replacement *Extensive stakeholder engagement, ensuring new functionality is customer-led through hosting three customer events workshops during July and August to collect input*	'Facilitating Whole Electricity System Outcomes' paper *Industry paper inviting stakeholders to comment on our Facilitating Whole Electricity System Outcomes paper*
	Increased connection application volumes and Sprint process *Use of 'Sprint' approach to the customer offer process enabling delivery of double the volume of connection applications compared with the same period last year*	Extend Appendix G trial processes *Rolled out the improved Appendix G with all remaining DNOs enabling quicker connection times and reduced costs for connection*
	Customer Connection seminars *Delivered successful Customer seminars in Glasgow and London receiving excellent feedback*	ENA Open Networks Future Worlds consultation *Received positive stakeholder feedback on the delivery of the consultation*
	Network user planning workshops to reduce outage 'churn' *Delivered stakeholder events with TOs focusing on outage planning optimisation, addressing the levels of change and creating a more accurate plan to deliver system access for maintenance and connection works*	
	DNO Operational Liaison *Quarterly operational workshops with DNOs improving information sharing, seasonal operating challenges addressed and improved cross network collaboration*	
7	CION (Connection Interface Optioneering Note) *Delivered consumer savings of circa £1bn*	Increase scope of NOA to include non-network solutions

	Five non-TO initiated options submitted to date
Network Options Assessment (NOA) 2019 methodology *Incorporated NOA interconnector methodology for the first time and methodology for assessing generator and demand connections against the competition criteria*	Network Development Roadmap consultation and the final Roadmap *Received positive feedback from stakeholders on engagement during consultation*
2019 NOA recommendations *Identified nine SO initiated options, currently assessing whether they are in the optimal path. The value the options in the optimal path is also currently being assessed*	

Purpose and contents of report

Purpose of the Mid-Year report

This is the first year of the new incentives regime. As per Ofgem's Electricity System Operator Reporting and Incentive arrangements[1] note, we are required publish a report covering our performance over Q1 and Q2 of our Forward Plan. The purpose of this report is to give stakeholders an update on our progress against our Forward Plan, our deliverables, outturn performance against metrics and provide evidence of delivered benefits created and how we have engaged industry and acted upon stakeholder feedback.

How to navigate this report

The next part of the report is broken down into two main sections

- **Deep dive on principles 1 to 7**
- **Evidence Chapters**

In our principle deep dives, we set out the context, our aims and objectives followed by a summary where we reflect on our performance across the five evaluation criteria. We are candid about what went well and what we could have done better. We also provide a look ahead for the next six months for each of the 7 principles.

The **Evidence Chapter** arranged by principle providing detailed evidence against the five assessment criteria.

- In **plan delivery**, we detail our baseline and exceeding performance over Q1 and Q2, providing a summary table of all our deliverables. We highlight where deliverables have changed over the past 6 months from what we originally set out in our Forward Plan.
- In **consumer value** we demonstrate through worked examples how some of our key activities can deliver consumer value this year and in the future. Each example includes a qualitative narrative for consumer value and lists our next steps for quantification. For Principle 3, we went a step further and quantified the consumer benefits.
- In **stakeholder views**, we provide detailed information on what we have heard from stakeholders and how we responded through our actions.
- In **metrics**, we provide a description per metric and its outturn performance, including justifications /supporting materials.

Evidencing how we deliver consumer value is new to us and we would like to hear your feedback on our consumer value examples in this Evidence Chapter. Please share your views via email by the 9th November.

We hope that this report provides a comprehensive overview of our activities and performance in the first 6 months of the new incentive scheme. We would like to hear your feedback on this report or any other element of the Forward Plan. Please email us on box.soincentives.electricity@nationalgrid.com

[1] https://www.ofgem.gov.uk/system/files/docs/2018/03/esori_arrangements_guidance_document.pdf

2.

Performance Report

Principle 1

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

Aims and objectives

For this Principle, our vision is to be a transparent ESO who provides accurate information to help market participants make investment decisions and facilitate the transition towards balancing across shorter timescales. We are committed to improving the "user experience" in everything we do.

By improving confidence in our forecasts, increasing transparency of our balancing actions and providing more comprehensive information accessible to all, we expect to potentially unlock medium consumer value in the range of £15-£30 million in the short term.

Performance summary

Taking on-board feedback from Ofgem and our stakeholders, we refreshed our vision for this principle in August. We recognise we could do more to improve transparency to the market and have created a more ambitious delivery plan.

In order to monitor progress against our vision and help us assess the effectiveness of individual actions in meeting our goal, we are developing a new *Market efficiency* metric, and we will publish a simplified '**investor, customer and stakeholder roadmap**' to provide confidence in the information provided to the market. We will 'experiment' with different information products and test with market participants to determine if and how that helps facilitate changes in their behaviour to benefit consumers.

At the end of the first six months of the scheme, we are tracking **on target against our delivery schedule**. We completed baseline activities well and delivered some exceeding baseline activities that will maximise the market's ability to act efficiently and ultimately bring value to consumers.

We recognise we were conservative in our ambition in the Forward Plan and the first six months have proven to be a great opportunity for us to learn from market participants and build confidence in our ability to be bolder, as we will not destabilise the market if we sign-post changes effectively. As a result, we have worked on identifying '**the three barriers**' to information transparency. The clear definition of barriers will enable us to mitigate them and thus become the bold yet safe pair of hands acting in the interest of creating an efficient market. The three barriers are:

- The **range of information** that met past needs will not be sufficient (or may be superfluous) to meet future needs.
- The **frequency and accuracy** of information provision was right for the past, but is not fit for the future.
- There are too many **avenues of information** provision which create a complexity barrier to achieving the vision.

We continue to make information available throughout the operational lifecycle, meeting different information needs to improve decision-making and build investment confidence. We provide the long-term look-ahead through, for example, the **Future Energy Scenarios (FES)** publication,

short-term forecasts such as **demand and wind forecast**, as well as historic balancing data such as the **Monthly Balancing Services Statement (MBSS).** This is offered via a range of channels such as our **Ops Forum**, **webinars** and in the future, through the self-serve **data portal**.

FES is a good example of the cutting edge work that is part of our baseline information provision, intended to identify a range of credible scenarios across gas and electricity on a GB-wide basis, stimulating debate across industry and helping inform the decisions that shape the future energy system.

In response to stakeholder feedback we improved the accuracy of our Balancing Services Use of System (BSUoS) forecast, and created a **new monthly BSUoS Report**, that provides a rolling 24 month forecast, and 12 months of outturn with accuracy statistics. We provided a breakdown of the balancing costs that make up the BSUoS charge, and a narrative around the changes we make to the forecast, and deviations we see in the outturn.

In September, we successfully implemented for the first-time machine learning technology to **forecast National PV (photovoltaic, i.e. solar) generation**. This milestone was direct result of an innovation-funded proof of concept developed in partnership with Alan Turing Institute, and further developed and implemented by our cross-functional team leading to consumer benefits by lowering the cost of balancing the electricity network. We expect this new AI solar model will help improve performance of National Demand Forecasts at all time scales. Over the last summer our analyses show that this state of the art approach increases solar model accuracy (mean absolute error) more than 40% compared with previous models. This new PV forecast is published to the market daily through Balancing Mechanism (BM) Reports. We are also committed to publish - within the next six months - these new PV forecasts hourly to the market.

We expanded the **Carbon Intensity platform**, adding a new regional forecast. This provides information to consumers about the carbon intensity of the power they use, allowing them to make decisions about when to use it. Our delivery has been discussed on the international stage and has potential to position us as an innovative leader in artificial intelligence in the energy industry. This platform has 500 daily users and up to 45,000 hits a day and we are working on productionising the system to provide a robust service to the increasing number of users.

We trialled a data portal platform with a small group of suppliers, using data from our existing **monthly BSUoS report**. We would like to make all balancing data provided outside of BM Reports more accessible to the market by sharing them on a data portal platform. We are currently in the process of rolling out a Customer Relationship Management system (CRM), and plan to extend this to provide a data portal function.

One of the outcomes of the new incentive scheme is our increased ambition to be better at articulating how we create value for consumers and how we engage with stakeholders. More detail on our activities under principle 1 can be found in the supporting Evidence Chapter.

Lessons learned

We are continuously improving our stakeholder engagement. By planning our communications to fit the operational cycle and seeking feedback around desired outcomes rather than on our performance, we saw significant improvements in stakeholder feedback. Please refer to the *Stakeholder views* section of the Evidence Chapter for more detail.

We also learned about the importance of gathering inputs from stakeholders in the early stages of implementing change. This applied to both development of metrics and the self-serve data portal for market information, where we engaged extensively with stakeholders to gather requirements in Phase 1.

Forward look

Looking ahead into the next six months, we will:

- Continue contributing towards an efficient fully competitive market place, minimising risk premia through decreasing complexity and providing the right information at the right time through the right channels. We will be able to report on our performance through a new Market efficiency metric at the end of the year.
- Publish a simplified 'investor, customer and stakeholder roadmap' to provide confidence in the information provided to the market. We will 'experiment' with different information products and test with market participants to determine if and how that helps facilitate changes in their behaviour to benefit consumers.

Principle 2

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

Aims and objectives

For this principle, our vision is that we drive overall efficiency and transparency in balancing, taking into account impacts of its actions across time horizons.

Looking to 2030 we intend that the optimal way to deliver secure, sustainable, affordable supplies of electricity is understood for a low carbon, decentralised and digitalised world. We will act as residual balancer, taking actions needed to balance and operate the system efficiently, ensuring stable balancing costs amongst a world of change.

As energy resources connected across the system change this presents new questions on how to best operate it and presents a new and widening range of potential providers, connecting across transmission and distribution. We must match the outcomes we need to deliver with the services offered by the growing market, coordinated through systems fit for the future which have been developed transparently. To achieve this, we will maintain our sharp focus on costs of balancing and operating the system safely and securely. We will support integration of new and existing resources by enhancing our existing IT systems and delivering new ones as needed. We will share our thinking on where changes may be needed to balancing services and codes. We will listen to our stakeholders to ensure we benefit from their experience and ideas as we form our views.

Performance summary

Actions under principle 2 are to ensure delivery of secure supplies of energy while reducing balancing costs in the short term without jeopardising longer term efficiencies and ongoing development of balancing services markets and emerging whole system actions. Our work is focused in four key areas:

- Delivering efficiencies in balancing costs, both now and into the future
- Providing transparency of our requirements and the balancing decisions we make
- Delivering new IT systems and supporting development and maintenance of existing IT systems
- Understanding the future needs of balancing and operability, including the systems required

Efficient balancing spend

Balancing costs were clearly tracking below benchmark up to August, as we managed ongoing access to the system and continued change to the supply mix and associated technical challenges. However, constraint spend increased dramatically in September with the Western HVDC link out of service while also taking proactive action to ensure system security could be managed across the winter with significant plant not being available in Scotland. We worked closely with the TOs to keep costs down in September while looking ahead to manage coming months and potential risks system risks. The balancing costs benchmark was originally

discounted by £136.4m to take account of the benefit of the Western HVDC Link on balancing costs. Commissioning problems have meant that this asset has not been available for all this period and so we would expect to adjust the benchmark upwards by £59.7m to take account of this unplanned unavailability.

Another achievement in managing consumer costs is our work to mitigate **Vector Shift** risk. We worked closely with Ofgem, WPD, Southern Electric and UKPN to design and implement a new commercial approach to resolve a system issue ahead of significant balancing costs being incurred. Costing approximately £200k, tens of millions of pounds have been saved this summer. Our work to drive development of this first of its kind commercial solution, was undertaken ahead of the wider program to change ROCOF and Vector Shift relay settings (part of DC0079). For more information, please refer to the evidence sections.

Inertia is becoming an increasingly important factor for secure system operation and as the system changes, is critical to understanding how quickly scheduled frequency control needs to respond; it is not typically measured by other system operators. We are working with potential providers of inertia measurement to develop an inertia measurement and monitoring service which can be used to deliver an accurate view of the level of inertia on the whole system into the ENCC and allow us to schedule the right levels of response needed to catch sudden and fast changes in frequency.

Transparency of our actions and requirements

We continued to report our balancing actions taken on the Elexon website, balancing costs in the **Monthly Balancing Services Summary (MBSS)** and through timely trade information. We discussed our actions at the **Operational Forum** to provide more insight into decisions taken but we know we could do more to help industry understand our balancing decisions ahead of real-time. To drive meaningful cultural change in this area, we have started to explore barriers to sharing information within control timescales and have identified concerns including inadvertently providing commercial advantage rather than transparency to the market. We will share our conclusions and proposed next steps over the coming months.

Knowledge of our requirements to balance and operate the system is key to understand decisions taken. We published several Roadmaps of our requirements, focusing on reactive, thermal and restoration, to provide more clarity on what we need to operate the system.

Delivery of IT Systems

Maintaining the suite of IT systems to monitor, assess, operate and balance the transmission system as the market continues to evolve requires delivery of a number of complex and interacting programmes; these cover changes to existing tools and systems as well as ongoing development of new systems. We learned that agile ways of working are required to keep pace with the changing market environment and stakeholder expectations, while still providing the reliability and cyber protection demanded by our role. We successfully delivered a number of new IT systems including systems for dispatch of **Non-BM Fast Reserve**, part of the **Platform for Ancillary Services (PAS)** which we are implementing. We are also working to implement the **Ancillary Services Dispatch Platform (ASDP)**, another component of PAS. This enables

dispatching of Ancillary Services bilateral contracts, regulatory reporting of dispatched contracts and interfaces with the BM we use; initial implementation is focused on Non-BM STOR. Also, we facilitated the first aggregator to gain access to the BM, as part of work to accelerate wider access to the BM.

We implemented an **Electricity Balancing System (EBS)**, mixing a scheduling solution that use both EBS and elements of the existing balancing systems. We continue to update EBS to improve performance and ensure it can meet the TERRE and Wider Access regulation changes required by December 2019. We also established a Design Authority, taking a process driven approach to ensure we deliver value for consumers in partnership with customers and stakeholders. However, implementation of EBS has been a much more complex IT programme than expected and the energy landscape has changed faster than anticipated, resulting in significant delays and functional delivery complications. We recognise that we have not done enough to communicate these challenges and we will need to make significant changes in our approach to keep stakeholders informed.

Future of Electricity National Control Centre (ENCC)

Looking to the future, we are thinking about the suite of tools needed to operate the system of the future. Through our Balancing Design Authority, we have started to explore the interaction between anticipated changes and system balancing over the next 5 years, to allow us to work with stakeholders to create a plan for a robust, cost effective and scalable platform to support the effective balancing of UK power systems beyond 2020.

We have delayed our intended publication on our initial findings on the **Future of the ENCC** from September as we have amended our approach in line with stakeholder feedback to be involved earlier in our thinking. Instead of a publication, we have started the conversation with industry to ensure we can reflect their thoughts and questions in the work. This will be reflected in our Thought Piece published in the coming weeks ahead of a webinar to continue to test and refine our thinking.

Lessons learned

We recognise stakeholders are interested to know more about how we make our balancing decisions. One way for us to improve this is by changing our internal processes to incorporate detailed recording of our actions when we make them, which we started on reporting in August.

The successful onboarding of the first aggregator highlighted that there are system and process improvements we need to put in place in the control room to make any future onboarding of aggregated BMU going live in the BM easier. This is a challenge we will continue to tackle as widening access to the BM brings significant consumer value in the coming years.

Forward look

In the next 6 months, we will continue to focus on **minimising balancing costs** in real-time, looking to anticipate system issues and take timely action to mitigate impacts on consumers. We are already working with European TSOs to understand and respond to the anticipated plant availability in Belgium for commissioning of the NEMO interconnector and across the rest of winter. We will ensure optimum combination of commercial tools and network available for consumers through long-term scenario planning, and finalise plans to complete Loss of Mains Protection work, starting work to change the required relays in 2019.

To increase **transparency** of our requirements and actions, we will publish the Operability report providing more information on long-term issues and our plans for their resolution. Alongside this we will lift the lid on how the ENCC consider and solve the interaction operability and balancing challenges, at and approaching real time. Building on this we will provide greater visibility of real-time system requirements. We are reviewing the Procurement Guidelines to provide clearer information on our requirements for the coming year, how we plan to procure them and how we comply with C16. To ensure the changes reflect the views of stakeholders we will host a webinar and workshop to play back what we have heard to date and explain how we are responding to that feedback before we share the updated document. We will continue to explore how to enact a step change in transparency of our thinking approaching real time, and will share our findings to work together to improve the information provided.

To deliver the **appropriate IT solutions with the transparency and engagement expected by stakeholders**, we will further develop the web-based Platform for Ancillary Services (PAS), support wider access to the BM, support European Network Code changes through implementation of TERRE / MARI. We will engage more with stakeholders as we will deliver our IT programmes.

Going forward we are committed to:

• Adopting a range of communication channels to engage with various market participants

• Applying our learnings from EBS to other programmes

• Continued in-depth engagement on the technical system details

• Sharing more detailed information on each of our programmes and how they interact with each other

• Providing visibility on our progress against plan, highlighting key programme risks and issues as they arise

Stakeholders can expect to see a series of accessible bite-sized update notes on all components of the IS programmes we are delivering which will enhance the information provided at the IS Change Forum and bilateral meetings

We will also continue to explore how we best balance and operate the transmission system, as the energy supply becomes decentralised and decarbonised and The Future of the ENCC and the future of Balancing, with webinars, update notes and workshops as needed to allow interested parties get involved in the manner that is most effective for them.

Principle 3

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

Aims and objectives

Our vision for this principle is to have simple, fair transparent rules for procuring balancing services to maximise competition where possible. In our Forward Plan, we described how we will use this to facilitate new business models and technologies into the market to deliver a distributed, smart, flexible electricity system.

We expect that by promoting competition and developing new markets, together with increasing participation in balancing services markets, we can potentially unlock consumer value in the short term[2]. In the long term, flexible markets are one of the keys to releasing maximised value.

Performance summary

The transition to a low carbon economy brings changes to the way we operate the electricity system. We have responded to in through our summer 2017 System Needs and Product Strategy (SNaPS) and Power Responsive programmes by engaging with industry to reform our balancing services markets to meet our changing system needs reducing costs to the end consumer. We have acted to promote competition, develop new, liquid markets and increase participation by removing unnecessary barriers to entry for all technology types. Since the publication of our first product Roadmaps in December 2017 we have seen a 97% increase in the number of unique non-traditional units tendering into our balancing services markets. We now deal with over 350 market participants, up from just 20 two years ago, and receive in excess of 300 tender responses per month. On a regular basis over 40% of the monthly tendered volume we receive comes from non-traditional providers and sources of demand side flexibility including Demand Side Response (DSR) and battery storage. Some months over 50% of our tendered volume can come from these new providers with new disruptive, challenger business models.

The significant growth in new providers and enhanced competition facilitated by our market reforms has delivered reduced costs to the end consumer. Since January 2017 the cost of Firm Frequency Response (FFR) has reduced from ~£18/MW/hr to ~£2.50/MW/hr in October 2018. In reserve markets accepted availability prices continue to trend downwards over recent tenders, with volume tendered from unique non-traditional units surpassing volume from traditional units in three of the last 4 tender rounds. In recent rounds 293 tenders for 2018/19 have been accepted from non-traditional sources with volumes in accepted contracts ranging from 3MW-45MW and 118 tenders accepted for 2019/20 delivery with volumes in accepted contracts ranging from 3MW-300MW. In both delivery years the volumes of accepted tenders from non-traditional sources have vastly outstripped those from traditional market participants. Indicating that our market reforms are reducing barriers to entry for an increasingly

[2] See Pages 38 – 40 here for details https://www.nationalgrid.com/sites/default/files/documents/Performance%20Metrics%20Definition.pdf

diverse range of technologies to compete. This demonstrates the benefits of the actions we are taking and the importance of continuing to find new ways to facilitate participation in all our markets to balance the system economically and efficiently in the best interests of the end consumer.

This delivery is underpinned by our engagement through SNaPS and Power Responsive. These initiatives have helped us to better understand the barriers to entry to our ancillary service markets. We have listened to our stakeholders and implemented or are implementing the changes identified.

Product Roadmaps

This year, we published 4 product **Roadmaps (Response & Reserve, Reactive Power, Restoration and Wider Access to the Balancing Mechanism)** following stakeholder consultation and feedback. These Roadmaps set out how we will develop our services to improve transparency, remove barriers to entry, increase competition and meet our operational needs at lowest cost to the end consumer. Giving stakeholders a forward view and the clarity necessary for investor confidence by detailing the steps we will take by when to create these liquid, closer to real time markets that will reduce costs to the end consumer.

We listened to our stakeholders, continuing with the **reforms to our Response and Reserve markets** with implementation of a reduced threshold (10MW to 1MW) for our FFR market. In May, this year we implemented the FFR market standardisation; rolling out 4 hourly blocks and seasonal procurements windows. This saw a significant increase in market participation and a first step in moving to an auction. We consulted with stakeholders on changes to simplify and standardise our response and reserve contracts, which we will begin implementing. Simplification and standardisation increases transparency of our requirements, allowing participants to have a better understanding of the value of individual tenders aiding competition and delivering a lower cost to the end consumer.

Stakeholders have told us that our performance monitoring and testing policy can act as a barrier to entry for new participants. In September, we started streamlining these processes to lower barriers to entry to increase competition, while ensuring value to end consumers by increasing the scale of and efficiency of our ongoing performance monitoring systems and processes to ensure service delivery.

Platform for Ancillary Services

The **Platform for Ancillary Services (PAS)** project is a key enabler for our market reforms. The project provides an end-to-end solution for the ancillary services lifecycle enabling commercial and operational flexibility. It replaces legacy ancillary systems which were design for large centralised generators, a key requirement to unlocking the value of the market reforms detailed in SNaPS and associated roadmaps. It will drive significant cost and process efficiencies for providers, reducing connection time from six months to less than one week from contract award, providing one set of web services allowing providers to move quickly within services, reducing manual work and enabling agile changes to our ancillary services that reflect market conditions. Phase 1 provided an online system for distribution-connected providers of Fast Reserve to communicate with the ENCC, increasing competition and reducing barriers with one new non-traditional unit winning a Fast Reserve contract. Significantly this is the first

battery unit to be accepted, and takes the number of non-traditional parties in the Fast Reserve market from two to three.

Auction Trial

In SNaPS, we received strong stakeholder feedback that we should trial a different procurement method for frequency response. As part of the Response and Reserve Roadmap significant work has been completed on our **Auction Trial**; we have identified a preferred supplier to deliver the trial, completed initial design work based on industry views, and are finalising contractual discussions to deliver and operate the platform. The trial will test closer to real time procurement and facilitate lower barriers to entry, creating increased competition and transparency to deliver lower costs to the end consumer. The development work identified the need for a more sophisticated platform and complex algorithm to deliver maximum benefit. Following consultation with our technology partner we decided to delay the start of the trial to include additional functionality. However, we will still commence our trials in this financial year 2018/19, but have learned lessons we will take forward.

The success of market reforms in increasing participation and reducing prices in markets such as FFR has necessitated the need for market participants to seek value in our markets. We have responded to this feedback by consulting on the exclusivity clauses in our contracts and seeking to accelerate wider access to our Balancing Mechanism.

Through market engagement and consultation with the Energy Networks Association's (ENA) Open Networks Project, we published an initial consultation letter in September to explore what is meant by 'Service Stacking' and the principles we would expect as part of this, to be begin looking reviewing the exclusivity clauses in our current balancing services contracts that prevent providers from providing other commercial services, for example to DNOs.

Wider Access to the Balancing Mechanism

Having listened to stakeholder feedback we have published an additional roadmap and set of deliverables not promised in the Forward Plan on **Wider Access to the Balancing Mechanism (BM**). The BM is a core tool to both energy balancing and resolving a broad range of system operability challenges. Changing market dynamics, increased competition in STOR and FFR with reforms to these markets reducing prices and necessitated the deliberate strategy to enable access to the BM for new non-traditional participants. In August, a demand side aggregator entered the Balancing Mechanism as the first Virtual Power Plant. While this was a significant step in increasing competition and access, as highlighted in principle 2, our control room and the new aggregated Balancing Mechanism units are still on a learning curve in terms of operations. We also have business process and systems challenges to address; progress in this area has not been as fast as we or industry would like but we continue to explore how we can unlock this situation.

The consumer value driven through Response and Reserve reforms has also highlighted the value in extending the process of rationalisation, standardisation and improvement to our other markets.

In May this year we also published roadmaps for **Reactive Power and Restoration (Blackstart)**. In our Reactive Power Roadmap, we set out our approach to broadening competition and participation in our voltage

markets. We are reviewing our current products, procurement methods and information provision to develop better, shorter-term and more transparent market. The first step in this process was the Requests for Information issued for voltage services in South Wales and Mersey Ring regions. Our Restoration Roadmap seeks to improve transparency in procurement of this service including requirements and costs. We have updated our Monthly Balancing Services Summary and took the first steps towards opening participation in this service to a broader range of participants.

Power Responsive

Power Responsive continues to grow, promoting flexibility and providing vital engagement with industry to identify barriers. Not only have the core events, annual conference, steering group meetings and executive dinner continued to grow but the programme has identified new ways of engaging with industry such as the targeted Local Authority workshop and raft of innovation projects looking at vehicle to grid opportunities and new sources of flexibility response such as residential response and local energy markets.

Lessons learned

Our stakeholders have told us that with so much change happening so rapidly, it is often difficult to keep track of everything that is going on, that in thinking about the next challenge to be addressed, we and the industry can sometimes lose sight of our successes and the bigger picture. Going forward we will be clearer in our communications about what has been delivered, signposting future changes and keeping sight of our overarching ambition to create liquid, competitive, closer to real time markets that provide confidence to investors and value to the end consumer.

Forward look

We will continue to deliver on the feedback that we received during the SNaPS consultation and the commitments that we articulated within our Roadmaps for Frequency Response and Reserve, Reactive Power, Restoration and Wider Access to the BM.

Principle 4

Promote competition in the wholesale and capacity markets

Aims and objectives

Globally technological disruption is transforming energy markets. In 2010 only 3% of all the electricity consumed in the UK was produced by solar and wind generation. By 2017 this share had increased dramatically to 18%. Disruptive change is not only transforming market dynamics, it is also creating regulatory gaps because laws and industry frameworks have not kept up with the rapid advances. Competitive markets with clear price signals are essential to allow efficient business decisions; this can be achieved by focusing on the transparency and liquidity of markets together with removing unnecessary barriers to entry.

Our vision and commitment under this principle is to work alongside our stakeholders to embrace the opportunities created by these advances. We will facilitate the evolution of the markets, providing thought leadership and insight to unlock the full potential that a greater diversity of technologies, market participants and business models can deliver for the consumer.

In an increasingly complex world, markets will need to evolve and it is important that this change happens sufficiently quickly. Many of these changes will need to be delivered through the rules and obligations that we and market participants must adhere to the required change at pace.

Performance summary

Earlier this year in our Forward Plan, we set out the case for change and a plan for the important role we, as the ESO, play in facilitating competition in these future energy markets. In September, we published our refreshed commitment to this principle which introduced our new stretching ambition and the key enabling activities to unlock consumer value through competitive markets now and in the future.

Our year to date performance and engagement with customers and stakeholders has helped us better articulate our role in principle 4. While we are achieving our planned activities and in some areas exceeding baseline expectations, we know we have not always presented this and discussed it fully.

Delivering code changes

We are particularly satisfied with our performance to date on our engagement on complex industry change topics using alternative communication styles and techniques - such as webinars and podcasts. We initiated this through **Charging Futures** (CF) but have developed our approach into other topics particularly our engagement on European Network Codes.

After listening to feedback on stakeholder experience of the Charging Futures forum we changed our approach. We worked with the Charging Futures' chair Ofgem to ensure that we could influence a change to the style of the event making it less of an information dissemination exercise and more of an opportunity for stakeholders to contribute views on charging topics.

We know that as we move to being a more legally separate entity from the rest of the National Grid business in April 2019, we need to earn trust

through the way in which we play a central role in debating key policy and industry change matters, ensuring that we demonstrate independence and transparency. We learned that we should provide more leadership on charging matters through our contribution to Charging Futures. The work we will facilitate on BSUoS (our comprehensive review scheduled for delivery in Q3) serves as an opportunity to show we are listening to our customers and can then provide a view that is informed by others. We have arranged these sessions in response to direct feedback on the level of interest in BSUoS reform to bring about a more collaborative approach to changes.

Throughout the year, we have been collaborating closely with Ofgem and BEIS on developing the scenarios for the energy market following GB's exit from the European Union. This work has involved significant engagement and includes establishing a project management approach to enable good planning and preparations when considering security of supply, operability and both codes and licences.

Facilitating code changes

Ofgem's latest Code Administrator Code of Practice (CACOP) survey results are now available and so we know that our Code Administrator role is moving in the right direction as there has been an increase in satisfaction of our service compared to the previous year (for example an 18% overall increase in satisfaction for Connection and Use of System Code (CUSC)). We are still looking at the survey results (which date from Spring 2018) so that we can understand the aspects of our performance are particularly welcomed by our stakeholders. This assessment will help inform our next deliverable which is the Code Administrator improvement plan. On initial reading, across all codes the reason for the increase in satisfaction is attributed to the interpretation of information and support we have provided our stakeholders. While there is significant scope for improving our performance as a code administrator we anticipate that the incremental improvements we are making can ensure that we are meeting our obligations in a way that best delivers outcomes efficiently and in the interests of consumers.

We know that we must be more transparent, providing more evidence on how we facilitate industry change and how we can drive and influence progress. Our approach to decision making must be clearer and visible to our stakeholders if we are to take changes forward transparently. For example, it is clear from the feedback on our prioritisation work with Code Panels that some find it a sensible and practical approach when there remains so many topics for change that they are struggling to engage. We heard some concerns that in prioritising the change proposals that Code Panels are not giving equal weight and consideration to every modification proposal. We will therefore publish more on our prioritisation work in conjunction with both Grid Code and CUSC Panels so that we can increase the transparency of decision making. We believe that prioritising modifications helps ensure that industry is focusing on driving forward key issues for reform that can best bring about consumer value in an efficient and timely manner.

Managing customer profitability

We provided a detailed explanation of our customer journey approach to charging activities in our relaunch document. We listened to customer feedback on the information we provide to electricity suppliers for BSUoS and thus introduced new monthly and annual performance metrics on our

BSUoS forecasting. These are difficult target to set and we had our doubts about how confident we could be in developing robust metrics. The strength of the feedback we had helped us to challenge ourselves to find metrics like this that would be appropriate and useful to customers.

Our improved performance on bringing a customer focus to charging has already resulted in some positive feedback from customers. As evidence of our progress on our communication with customers we achieved a level of zero open queries on BSUoS charging and settlements in September, at its peak last year we were managing in excess of 50 open queries at any one time and we receive on average about 100 queries a month. This is a tremendous achievement and testament to our new approach which incorporates better data handing, internal information sharing and appropriate internal performance indicators. By dealing with these queries efficiently we could free up vital resource times in our customers' businesses enabling them to focus their time on how best to serve consumers. Our work on improving transparency and accessibility to charging information is also expected to reduce the number of queries we receive.

Capacity Market (CM) modelling

In May, we met our baseline obligations to deliver to BEIS and the Panel of Technical Experts (PTE) our Electricity Capacity Report. This report is crucial to the Secretary of State's decision on how much capacity to secure in CM auctions. We made adjustments and improvements to our analysis to address the 2017 feedback from the PTE and delivered a number of workshops with BEIS, Ofgem and the PTE for scrutiny of the modelling approach and assumptions. We worked bilaterally with Electralink (ensuring legal obligations are met) this year to secure access to data on distributed generation as a critical enabling factor to improving our modelling of distributed generation. This will facilitate the development of derating factors for future CM auctions.

Our modelling teams have also been undertaking analysis in support our Brexit work where we are collaborating with Ofgem and BEIS on post-March 2019 scenarios for energy.

Lessons learned

Following the May Charging Futures Forum we received some strong feedback from participants. The Forum received an average satisfaction score of 6.5 with some direct comments that there was too much information presented and some presentations were neither engaging nor interesting. In response to this as Lead Secretariat we collaborated with Ofgem the Chair of the forum on a lesson learned session to help inform future forum content and facilitation. As a result, the September Charging Futures Forum received an average satisfaction score of 7.9. Providing a better way for market participants to engage in debate of network charging can contribute to future consumer value by delivering reform which has had broad debate and can be implemented more efficiently.

Forward look

As set out in refreshed view for principle Relaunch, we have listened to our customers and stakeholders, who told us to be more ambitious. Over the next six months we will continue to deliver on these commitments to unlock consumer value through competitive markets now and in the future.

In Mid-October 2018 we will be publishing our Action Plan for ongoing improvements in our charging information based on the three key areas of feedback. These include:

- Continuing to improve our website, documents, letter and emails, making them easier to understand, and ensuring they are at the right level for your business.

- Publishing data in a timely and useful way. Making sure you have the best available data on which to make informed decisions to enable you to be fully informed.

- Designing a new holistic onboarding process, a complete suite of support for new suppliers wanting to join the market to help them understand their interactions with us, the charges they will face and their obligations. This will include dedicated web content, checklists, beginners' guides, webinars and one-to-one support. This means that parties understand their obligations and can get active in the market as quickly as possible.

Principle 5

Coordinate across system boundaries to deliver efficient network planning and development

Aims and objectives

It is essential that we, as the ESO, coordinate and work effectively with other Network Operators to deliver the most efficient and economic outcomes for the whole system.

Under principle 5 we aim to develop ways of working and processes that enable the longer-term investments and development of the network to be coordinated across boundaries on a whole system basis.

This year, our objective is to complete three very different Regional Development Plans (RDPs) using a trial by doing basis, so that learnings can be taken and applied in other situations across the network.

There are strong links between this principle and the Operational activities in principle 6 and the Pathfinder projects in principle 7.

Performance summary

Principle 5 entails looking at the whole electricity system in terms of long term planning and investment decisions and developing the right long-term network investments and operational strategies that ensure a safe and secure network and facilitate the decentralisation and decarbonisation agenda to deliver the best value for consumers.

Since we published our Forward Plan, we reviewed the scope of principle 5 to ensure it best reflects both what we currently do in this area, and our ways of working to meet changing needs. Following this review, we provided greater clarity of our activities under principle 5 in our update document and reviewed the content of principle 7, to ensure they are more clearly articulated.

Grid Code week 24 processes

At the start of the RIIO period, our approach to managing the interface between transmission and distribution was to comply with all relevant code and licence obligations that supported network planning and development, collectively known as the **'week 24' processes**, seeking to improve them as issues arose. However, the pace of the low carbon transition was pushing the limits of what could be achieved with the data exchange and modelling approaches that were used to meet those obligations.

It became clear that we needed to transform the way we exchanged data and modelled the interactions between transmission and distribution networks, so that we could better understand the challenges we were likely to face; and develop strategies to tackle them.

Taking a whole electricity system approach to network planning and development is complex due to the way the range of options available interact with current provisions within the technical and commercial codes and regulatory frameworks. For this principle, we adopted a 'learn by doing' approach, seeking to explore what we can achieve within the parameters set by current frameworks, whilst at the same time informing potential future developments to week 24 and other data exchange processes. We made collective progress in this area, for example through

our ongoing work with DNOs on embedding recent Statement of Works processes in trial areas.

To drive wider implementation of this work, following discussion at the April Transmission Charging Methodologies Forum, a Connection and Use of System Code (CUSC) modification proposal (CMP298) was raised, which was sent to a CUSC Workgroup for progression.

Regional Development Programmes

Collaboration is key to the success of this approach. We are currently working with DNOs on **three Regional Development Programmes** (RDPs) – with UK Power Networks (UKPN) on the South Coast of England, Western Power Distribution (WPD) in the South West of England and Scottish Power Energy Networks (SPEN) in Dumfries & Galloway, Scotland. Through the strong collaboration between ourselves and the respective DNOs, we were able to share an unprecedented level of data and modelling information, such that we have a much deeper and better understanding of the performance of each other's network.

This level of data and modelling goes far and beyond the current requirements of the Grid Code week 24 processes. With the enhanced understanding this modelling gives us, we can tackle issues that come to light, formulating plans that cut across traditional ownership boundaries in the pursuit of solutions that deliver best value to consumers.

Each RDP is tackling a different issue and hence allowing us, and the DNOs we are working with, to maximise our learning. The progress and results of this work is shared with the ENA Open Networks Project so that those DNOs not directly involved can also learn from and comment on the progress we are making.

However, the projects to date are demonstrating that significant benefits can be realised through these approaches. With UKPN, we released additional capacity that allows for further embedded generation to connect without network investment, hence allowing for earlier and cheaper connections. For WPD and SPEN we are demonstrating that significant network investment can be avoided through increased use of operational solutions.

We made good progress in the last six months, with the conclusions of the RDP design processes and outcomes published on our website, and the commencement of work to deliver key conclusions. Subsequently, we shared learning with ENA Open Networks and used it to expand into other regions where an RDP may be appropriate. The engagement and understanding of the RDP process and benefits has increased and we are now being approached by the DNOs to work with them in other parts of the network to investigate whole electricity system solutions to regional challenges.

Through the rest of this year we want to progress with the tools and processes that will enable distributed energy resources (DER) within these areas to contractually sign onto the new ways of connecting to and operating the network. To do this, we need to ensure we engage in a clear and concise way, and that the language we use to describe these initiatives and approaches across the industry makes them easy to engage with.

Lessons learned

Upon reflection, the approach to specifying the requirements of the DER transmission constraint service, set within the end to end business process, should have been done sooner. We have continued to be challenged by the need to balance our 'design by doing' ethos with the processes necessary to secure delivery.

Forward look

To improve our cross-industry collaboration for whole system network planning and development, priorities for the second half of 2018/19 include:

- Broader roll-out of innovative DNO connection contracts that support the roll-out of revised Statement of Works processes on a national basis; and the technical ability for DER to provide transmission constraint management services
- Implementation of commercial contracts to allow DER to provide transmission constraint management services in our in-flight RDP areas
- Establishing further RDPs with partner DNOs to tackle new regional challenges

Principle 6

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

Aims and objectives

It is essential that, we as the ESO, coordinate and work effectively with other Network Operators to deliver the most efficient and economic outcomes for the whole system. In principle 6, the aim is to develop ways of working and processes that enable the whole system operation and optimal use of resources across the system.

This year our objective is to listen and act on our customers' and stakeholders' ambitions to inform a clear ambition and strategy surrounding the whole system operation and to use this to take a leadership role within ENA Open Networks project to design and develop ways of working. In the more near term, the objective of this principle is to make a step change in the processes and flexibility around the connections and access to the networks.

There are strong links between this principle and the RDPs in principle 5 and the Pathfinder projects in principle 7.

Performance summary

Operating the GB transmission network against the transition to a decentralised and decarbonised energy market is a huge privilege which comes with challenging responsibility to ensure the network provides the greatest value for consumers. This principle primarily focuses on the demands of our customers and how we can make connecting to and operating the network more responsive and accommodating of our customers' needs by thinking and operating on a whole electricity system basis.

In the first six months of the year, many of the commitments we made in the Forward Plan are on track to deliver for the end of the year. We are stepping up as a more independent system operator considering the whole system approach with the consumer at the heart of our decision making. We have worked with DNOs and their customers to develop whole system solutions that provide more efficient network outcomes. There are several examples whereby the DNO's customer, the DNO and we, the ESO, have worked seamlessly together to achieve the desired outcome for the customer.

The energy market is changing at pace and the scale of these changes is having a significant impact on the way we engage with customers and network owners and affects how we operate the network.

The changes experienced in the energy market since the beginning of the RIIO period require us to continually develop the way we do things, many of our baseline activities such as the connection process or outage planning have changed significantly to meet the changing needs of new customers and the way people use the transmission network. We continued to adapt these activities to ensure we continue to economically operate a safe and secure transmission network.

In some cases we also developed products and practices that exceed baseline expectations, these services were developed in response to the way the market is developing to ensure we are able to operate

economically and efficiently, or to more effectively facilitate access to market as required by customers.

Connections

The volume of embedded generation projects connecting to DNO's networks increased rapidly, this began in the south of England as solar PV investments took off but this trend also extended to other types of embedded generation connections from battery storage projects to gas reciprocating peaking generation plant. We also saw a considerable increase in the volume of applications to connect to the transmission network, in the first five months of the 2018/19 financial year, had processed over 80 connection applications, more than double the application rate for previous years. The increase in connection applications from more diverse technologies requires us to engage with customers in a different way, many of the applications come from new providers who have little or no electricity market experience. With these applicants in particular, we have taken the opportunity to demonstrate our commitment to providing outstanding customer satisfaction by providing detailed support throughout the application and contracting process, ensuring they understand the connection processes and the codes that govern them, provide consistent account management support so they feel supported throughout and ensuring that we achieve a high contract signature rate that will ultimately lead to increased liquidity in the energy market.

Customer satisfaction is a key priority for us and the increased volume of new applications for connection to the transmission network provided a great opportunity to excel at the service we offer. In 2017, we introduced a new fast track approach to the customer connection offer process, this has continued through 2018 with some customers specifically requesting offers in 'Sprint' timescales; whilst other customers have expressed a preference to the standard three-month process. This gave us the flexibility to offer additional services that better meet customers' needs. The focus on customer service delivered increased satisfaction and in both the application process and the connection compliance process, our customer satisfaction surveys are regularly receiving 8/10 and 9/10.

Industry engagement

We developed improvements to our twice year Customer Connection Seminars, as an industry engagement event for all new and existing customers. These events provide insight into the development of the transmission networks and changes and developments in the commercial frameworks that affect our customers. We held events in Glasgow and London to ensure maximum opportunity for attendance, receiving 80 – 100 participants at each location. We received excellent feedback from participants, a recent example being:-

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

TOGA replacement

We are improving our baseline performance with much more liaison around the future system access plan with affected customers and the relevant TO. We are well underway with our development of Transmission Outage and Generator Availability (TOGA) replacement, the tool that customers and TOs use to request system access. We believe designing this new functionality should be customer-led and we held two very

successful customer events asking questions of what they would want to see from TOGA.

Beyond baseline activities, we are working in new ways and developing products and services that are needed to ensure the network can be operated economically and efficiently in a completely new operational environment.

Facilitating Whole Electricity System outcomes

Very early in delivering against this principle, we understood that we needed to define and articulate what 'whole electricity system' meant to us. This led to the publication of our 'Facilitating Whole Electricity System Outcomes' paper in mid-July of this this year. It invited industry to comment on the areas we believe need to be considered as we move to a whole system approach, as well as to provide their insights to us with some 'guard rails' as we develop our thinking.

Industry collaboration: ENA Open Networks

In parallel, earlier this summer, we led the publication of the 'Future Worlds' consultation as part of the Open Networks project. Through a stakeholder-led development process, the consultation provided an accessible means for a broad range of parties to understand and discuss potential future industry arrangements and how they could be affected. We were highly involved in stakeholder events during the consultation period, presenting at both the Future Worlds seminars and also hosting the two Future Worlds webinars.

Innovative connection solutions

We are supporting a new type of innovative connection solution brought forward by a storage provider (Pivot Power) and the England and Wales National Grid TO (NG ET). This product involves the use of the tertiary winding on supergrid transformers (SGT). This new type of connection offers the connecting customer a lower cost and quicker connection than would have otherwise been available but is limited to connections up to 50MW in capacity. In many cases supergrid transformers provide the connection point for DNOs and other customers connected to the transmission system, the use of the tertiary connection for additional customers will change the commercial arrangements for connection charges. We will adopt a collaborative approach to understanding and implementing the required changes with the DNOs. There is more commercial and regulatory development work required to be finalised before the connections are completed, but this is a great example of us, NG ET and the DNOs working together on a whole system basis to find new and innovative ways to facilitate new customer connections.

Appendix G

The "Appendix G" process started as a pilot project between us and two DNOs (UKPN and WPD); the trial was developed to find a better way of providing connection offers to DNO embedded generation projects. The existing Statement of Works Process has been in place for a long time and was not designed to accommodate the volume of applications that DNOs have seen in recent years. This new approach provides DNOs visibility of the volume of capacity available at individual Grid Supply Points up to a set limit and greater transparency enabling them to contract with embedded customers more quickly without individual applications to us, the ESO. This new approach informs the 'Statement of Works' that define

Transmission network reinforcements required. We trialled changes to this process to better progress the large volumes of embedded generation that is wishing to connect and now extended this process to all DNOs. This process saved many hundreds of individual Statement of Works delivering value through reduced application fees and processing time, and providing more agile and cheaper connections to the DNOs customers.

Automation of current processes

In our Network Access Planning team, we worked to develop automated study set up to allow more efficient ways of creating the studies required to carry out system security analysis. This aims to reduce the human processes involved and employ robot functionality to create efficiencies in our day-to-day operations. These studies are critical tools that enable operational planning to be conducted from three weeks ahead and facilitate delivery of an operational plan to the control room to be used in real time operation.

Network Options Assessment (NOA)

Through the Network Options Assessment (NOA) process we identified a potential alternative approach to enable increased boundary flows without the significant transmission infrastructure investment. This approach will use intertrip arrangements that are typically used for reducing output from generation during fault conditions. We are currently developing this potential alternative and identifying specific areas on the network where it may be a suitable option; initial assessment forecasts potential savings of £400m in the 2020s.

In summary, we are pushing hard to deliver a whole system approach to facilitating connections and managing the network. The solutions we identified to date and are continuing to develop are driving a step change in transparency of data, the speed of connection, and how we engage and listen to both our own customers and the DNOs customers to make the right improvements.

Lessons learned

Through the Appendix G trials and the SGT tertiary connections work, we learned that we must make significant improvements to our communication with all affected parties when we are making changes that can on other network owners. Whilst we engaged widely during the development of these products, we underestimated the level of interest and concern that other network operators had in these products. In response to this, we are using the ENA Open Networks and Electricity Networks Future Group to be the vehicle with which we engage much more than previously.

Forward look

Our priorities for the second half of the year are to:

• Continue to work with our customers to develop the TOGA replacement, ensuring that the new functionality is customer-led, to ensure the solution meets requirements of all system interfaces.

• Continue to perform a valued role in the development of whole system outcomes through the Open Networks project. This includes supporting the timely delivery of 2018 products and helping to shape the direction and focus of work in 2019.

• Identify areas for process improvement under existing contracts between SO and TOs and lead change programmes to optimise consumer benefits.

• Continue to build strong relationships with DNOs and review and develop contractual arrangements and processes to deliver efficient whole system focused outcomes.

Principle 7

Facilitate timely, efficient and competitive network investments

Aims and objectives

This principle aims to drive innovation and the best value for consumers. We aim to do this through building upon the Network Options Assessment (NOA) process to identify the long term needs of the system and to engage with a broad range of solution providers.

This year, our objective is to develop a clear roadmap of enhancements to the NOA process that introduces a new form of competition to the traditional transmission asset build solutions. Following this, the Pathfinding projects will clearly define the processes and benefits of these alternative solutions, be they DNO asset or market solutions.

We will continue to provide input and leadership as to how a competitive allocation of a transmission owner could be implemented and identifying those projects that meet the current competition criteria.

Performance summary

To be really ambitious in this principle, we need to think hard about the technical issues we are forecasted to experience on the network, how we find new and innovative solutions and compare these with the more established transmission asset solutions. In this principle, we made great progress against our objectives and developed a process by which DNO asset solutions can be compared with transmission solutions, and in the next six months we are exploring how we use and compare market solutions.

Network Development Roadmap

Since the development of the Network Development Process (NDP), in RIIO-T1 for NG ET, and then the development of the **Network Options Assessment** for all TOs, we challenged ourselves to drive further value for consumers from the NOA approach. This focused on how the principles of the NOA methodologies, such as economic assessments, least worst regret analysis and comparative option assessment can be applied in new circumstances to solve transmission related issues and introduce new participants to provide the solutions.

This led to the ambitious challenge of looking at regional transmission network issues and creating processes and methodologies through which we can assess TO options alongside options from the DNOs and market participants, to identify which will deliver best value to consumers. This in effect introduces competition between different types of solutions.

This prompted the developments that we published in the Forward Plan against principle 7 and issued in detail through the **Network Development Roadmap** consultation, which laid out our plans for the next three years.

This is in addition to continuing to drive improvements in the existing **Electricity Ten Year Statement** (ETYS) and the **NOA** methodology in response to our own learnings from last year and stakeholder and Ofgem feedback. It is through these established processes, including the CION (connection interface optioneering note) that we have saved the consumer circa £1bn of cost for the next 5 years. The CION is a holistic assessment for interconnectors and large offshore wind connections. The assessment

considers multiple connection points and the associated network constraints of each location. The CION assessment then considers the overall project CAPEX and the network costs and ensures the least cost option for the consumer. The network constraints can be in the range of £100m and this can often be avoided by connecting to a different connection point sometimes only 10km away. The saving is based on what would happen without our intervention.

Pathfinding Projects

In the first six months, it was challenging to develop the intended approach, identify suitable regions and technical issues to put into our **'learning by doing' approach** of pathfinding projects and to gain the stakeholder commitment to work with us to explore the possibilities of this new way of working. However, to date we met all of the commitments we made in the Forward Plan on time.

The first half of the year focused on developing alternative asset solutions from the DNOs to solve transmission issues. The process showed that in certain situations the DNO solutions can technically solve the issues, it also showed that in other areas only a transmission asset can meet the requirements. We are currently assessing which solution provides the best consumer value. We are doing more work to verify our conclusions, but the early indications are that each node in each region where there is a transmission need for voltage control equipment would need to be assessed individually and the right solution identified.

We also took a big step forward in developing a process and tools that allow us to assess the GB transmission network on a year-round basis to a greater extent than we currently do. This is looking to identify the thermal issues resulting from demand/ generation mixes we are likely to see in the year-round operation of the network, and which are increasingly driving requirements on the transmission network. This work highlighted that there are other significant transmission boundaries that need to be assessed that would have otherwise been missed as they are not applicable at the peak flow in the day. We need to develop this tool to cover voltage and stability issues, but this is a good step forward to ensuring the GB transmission network is delivering the best value to consumers all year round.

In the second half of the year, we need to complete the asset assessment work and agree how the recommended solution will be taken forward, if a DNO solution is recommended. There is not currently a clear route for DNOs to be funded for recommended options and there needs to be a way of ensuring the DNOs receive the appropriate funding. We are working with the ENA Open Networks project to develop proposals for funding new options in the NOA in both RIIO-1 and RIIO-2 for agreement with Ofgem.

The second half of the year will also see us move into exploring market solutions to solve the transmission related issues. This will involve engaging with existing and potentially new market participants in the regions where we are conducting the pathfinding projects to engage with the process and to submit information on how they can provide the services we are seeking. These will then be assessed alongside the asset options.

Through the work completed to date there are some key points to highlight:

We identified expensive and technically challenging issues on the network as well as new ways of solving them. From this, have identified some areas to focus on and developed the NOA methodology to assess them.

Our approach was to develop a hypothesis that DNO and market solutions could provide consumer value and then we worked collaboratively with trial DNOs to test the assumptions and perform the analysis. By using trial areas and working collaboratively, we are ensuring that we develop a robust process that can be phased in across GB and which builds trust as we go.

Lessons learned

It was not always a smooth ride in the first half of the year and we have learned from this. The main feedback has been that we weren't communicating our ambition or needs clearly and that it appeared that we were not using the established industry forums, such as the ENA Open Networks, to explore our ideas and to seek input and guidance effectively. We have corrected this, instigating a monthly forward look across our activities and share this with the senior ENA steering groups. This has now led to all DNOs also publishing a similar list. These lists are allowing for a much richer understanding of the activities we are all undertaking and facilitating feedback and challenge as appropriate.

Alongside working with the ENA we have also increased our level of engagement around these developments with NG ET TO, SP Transmission and SHE Transmission, and have attended the Electricity Operational Forum and published an article in the Balancing Services Newsletter.

We learned we need to balance our desire to drive this work forward with bringing our stakeholders with us. This was seen particularly with the network companies and we will need to ensure we apply this across to our engagement with market participants in phase two of the pathfinding projects.

We also learned a lot about how we communicate our network needs to the DNOs in particular. Again, it is about balance and getting the level of specificity right. This demonstrates well why we are taking the pathfinding approach so that it results in a well- developed approach to embed as business as usual.

Forward look

Looking forward, we have a number of key deliverables from our pathfinding projects in Q3 and Q4 in addition to our business as usual licence obligations.

- For Q3, we will deliver recommendations from the first of our pathfinding projects in the Pennine region. This will be the result of the first whole system regional NOA assessment for high voltage issues. The recommendations will take the form of a report published by the ENA Open Networks investment planning product.

- We will publish the 2019 ETYS by the end of November. In this publication we are beginning to explore how we present some of our information in a different way based on stakeholder feedback and this will also contain the first instalment of the case study on year round thermal probabilistic analysis.

- By the end of Q3, we will put out our first marketing campaign seeking information and interest in the market providing solutions for high voltage issues. We will also seek TO and DNO network options for the same regions, giving us the building blocks to compare network and non-network solutions to manage regional high voltage challenges.

- For Q4, we will publish the NOA report and following this, based on the findings, will look to engage the market for commercial solutions to thermal constraints to feed into assessment for the 2019/20 NOA cycle.

- By the end of Q4, we will publish the second instalment of the year round thermal probabilistic assessment case study, understanding the impact a change in analysis technique has on investment recommendations on a specific system boundary.

- Alongside this, we will continue to have a focus on our stakeholder engagement utilising upcoming events such as the Electricity Customer Seminars and Electricity Operational Forum to reach a broad audience and provide updates on our pathfinding projects and emerging market opportunities.

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