nationalgridESO

ESO RIIO-2 Stakeholder group

Reliable and secure system operation, to deliver energy when consumers need it

Agenda item:	ERSG-4.7
Meeting date:	03/04/2019

Our ambition

As we transition to a low-carbon energy system, our operating environment continues to change dramatically. We must adapt to maintain reliable and secure system operation. Our ambitions are:

- We will transform the operation of the electricity system so that, by 2025, we will be able to operate a carbon free system – the only system operator in the world to do so.
- Our selection and utilisation of resources will be transparent and based on driving consumer value – optimising across generation, storage, demand and other technologies (be they large scale, distributed or embedded) on an equal basis.

The activities under our 'Reliable and Secure System Operation' ambition fall into three categories (we have combined Balancing and Network Analysis from the RIIO-2 Ambition document as these all contribute to our system balancing function):

1. Balancing, Data Management for Control, Network Analysis and Visualisation
2. Resourcing and Simulation
3. System restoration

Stakeholder engagement

Through ongoing market participant discussions on the topic of system operation, we have heard that we need to deliver more effective systems, to be able to adapt more quickly and to have a more proactive role in supporting the markets to deliver what we need from a system operation perspective.

At the Operational Forum on 26th March we presented the ambition and proposals set out in this paper to attendees. Generally, our ambition statements were welcomed by stakeholders at this event, particularly in relation to operating a carbon-free network. A few attendees questioned whether we were being too ambitious so we will seek wider views on this. The more specific stakeholder comments in relation to our proposed activities are set out in the sections below.

More widely, we have engaged with stakeholders on future system operation at our 2030 Ambition workshop in September 2018, at our RIIO-2 workshop in December 2018 and at our Forward Plan event in January 2019. At these events, we had stakeholder representation from network companies, consumer interest groups, service providers, academia and wider interest. We heard in these events that people want to understand the ESO's operational decision-making processes in the control room, illustrated by specific examples of decisions, particularly as the 'choice' of possible actions continue to grow. We have also received feedback on the upgrade of our IT systems through our Forward Plan engagement and that we should be 'thinking about what it is that we actually need and maybe re-vamping things from scratch'.

Stakeholders consider system restoration as a critical part of our role and want us to reduce barriers to entry into restoration services, including greater participation for DNO networks.

Our proposals

Balancing, Data Management for Control, Network Analysis and Visualisation

As the industry becomes more decarbonised we will procure and manage services from a larger number of, and increasingly decentralised, providers. To date our control systems and processes have been designed around centralised dispatch but we now need to focus on developing our systems in response to the rapidly changing operating environment. As the environment changes we need enhanced situational awareness and informed visibility of the operational limits of the network. We require tools to forecast, monitor, assess and manage the technical parameters of the network now and into the future to ensure ongoing reliable operation of the power system. This will provide the confidence and accuracy to support increased optimisation of actions across an increasing number of interfaces as we move to a more integrated electricity system.

As the market decentralises we need to ensure that we maintain a level playing field across industry participants meaning that we need the system capability to dispatch potentially thousands of market players to ensure lowest balancing costs for consumers. This is a significant shift from today where we have dispatch and settlement systems for hundreds of units. We can no longer rely on an evolution of old technology. Bolting on solutions to existing systems will not only hinder future flexibility and adaptability in system operation but also the flexibility of our stakeholders. So, to meet our 2025 ambition of operating a carbon-free system, a complete overhaul of our existing control room systems is required to enable us to manage a network with a greater number of parties, new technologies and increased complexity. This overhaul would include introduction of state of the art, human-machine collaborative decision making capability, development of intelligent situational awareness tools including network simulation and further bringing machine-learning into our forecasting capabilities.

Given the feedback we have received from stakeholders about delivery of IT systems and the potential complexity of new control system capability, we think that the way we manage the development and implementation will be key for stakeholders. We need to work with stakeholders to understand the key capability and interface requirements for the design of new capability through to collaborative integration testing during implementation. We would also seek to discuss with stakeholders the idea of building a whole new control capability from scratch with the support of industry, discussed in more detail below.

Option 1: Build new control capability for a decarbonised, decentralised and digitised system

Under this option, new control system capabilities would be designed and built offline, separately from the current main control room with the support of industry under a cross-industry design group. This new approach will involve stakeholders in the co-design of operational interfaces to their systems, direct engagement in an agile development phase (trialling) and user acceptance testing. We anticipate that the offline build process would involve the creation of a core system hub (a central system that more easily allows other systems to be ‘plugged in’ and talk to each other), for concept development and testing, in conjunction with market participants. Further system capability would then be added and become operational, allowing for the gradual retirement of redundant systems. We currently don’t know how the world will be connected in 2025 so we need industry input on required capabilities and interfaces to develop a control capability fit for the future. A capability that will allow us to fully understand the operational envelope and develop solutions in conjunction with our stakeholders to manage it.

Benefits

- Development of control room capability built to meet our 2025 ambition and beyond that can effectively manage the decarbonised, decentralised and digitalised energy landscape;
- Development of a system built with visualisation and situational awareness required to truly understand the operational limits of the network and support greater optimisation and integration.
- Control capability truly developed with the market and stakeholders at the heart of the capability design;
- Industry collaboration will ensure a whole system focus;
- Helps to achieve transparency through a cross-industry design body that determines what data should be made available and the system capabilities required; and
- Build a flexible system that can be adapted to industry needs, for example, in terms of transparency, facilitating a level playing field and the DNO to DSO transition.

Drawbacks

- Higher initial upfront investment cost due to the creation of a shadow control capability requiring building, staff and facilities. This could be minimised by the potential use of our current estate & facilities, through revising our business continuity arrangements.

Option 2: Continue to replace current capabilities on a system by system basis

The alternative to an offline, cross-industry approach is to replace existing capabilities on a system by system basis while the control room is still online and 'live' as we have done for recent developments. While our existing systems are familiar to market participants, they are based on tried and tested systems and are not capable of being easily modified to reflect system and market developments. In addition, there is a higher complexity in amending large interconnected systems while they are live leading to slower implementation times and increased operational and commercial risk. We recognise that the way we have developed systems to date has not delivered the rate of change to our capabilities that stakeholders want.

Benefits

- Lower cost, as capabilities are replaced while the control room is still online; and
- Familiar to ESO as this is the approach we have taken historically.

Drawbacks

- This approach involves managing a system that is centralised, based on dispatch of typically large transmission connected generation, and puts the ESO at risk of not meeting its 2030 ambition or being able to safely operate the network;
- More specifically, if we try to evolve existing systems there is increased risk to the reliable operation of the network with little agility and flexibility to accommodate further change;
- The current outdated communication systems do not readily afford the development of a fully transparent control room decision making process; and
- We understand that stakeholders and market participants want visibility and input to the capabilities and interfaces of new systems and this approach does not easily allow for that visibility.

Stakeholder views

We discussed this proposal and related delivery options at the Operational Forum. At this event, we received general agreement from stakeholders that we need to implement new capability and that current systems were developed for a very different operating environment. People were interested to understand when our last overhaul of systems was and whether the big technological shift of the last decade should be reflected in the control room. We heard that we shouldn't be going into a room alone to develop any new capability and that the industry is well placed to provide insight into what will happen in the future.

This engagement provided us with a consolidated view that option 1 above would be welcomed by stakeholders and that we need to approach development and implementation of new capability differently in future.

Whilst it was clear that people agreed we need new capability, the question was how much would it cost so this is something that we need to start talking about with stakeholders in more detail.

Resourcing and Simulation

As we deliver the balancing, data management for control, network analysis and visualisation capability described above to meet our ambition, we need to ensure that we have the right people with the right capabilities to operate the system. We need to be able to engage, recruit, train, develop and retain people to operate the control facility of the future. With DNOs transitioning to DSOs there will be increasing demand for power system engineer skillsets across the industry so there is significant value in developing operating engineers in partnership to meet the overall industry demand. Our proposals have the ability to accelerate the development of DSOs and future system operator capability, recognising that we need to develop skillsets that are fundamentally different from the past. This will require, amongst other factors, the ability to simulate our new capabilities to deploy people effectively into real time operations. We propose to collaborate with industry, in particular DNO parties, and academia to acquire, train and retain this talent.

Resourcing and talent acquisition

We propose the creation of a Centre of Excellence Training Academy for System Operators for the whole electricity industry. This will involve the creation of a GB training standard and partnering with academia to design and develop a funded degree in Energy System Operation. Our previous links with universities have been focused on power system

equipment teaching. We would look to develop a course that better reflects the role the ESO and other operators take, including system operation, market structures, finance, regulation and strategy. We will explore possible partnership with DNOs to develop this.

Once recruited, we will adopt more flexible working contracts (hours, duration, notice period) to ensure the wellbeing and resilience of staff as the complexities of system operation increase.

Benefits

- Ensure we have the right number of power system engineers with the right capabilities and knowledge. This will be different than today, particularly when you take a view across the whole industry;
- Delivery of more efficient, bespoke and specialist learning for system operators to manage more complex and integrated system operation;
- Increased wellbeing and resilience among critical operational staff across the industry; and
- Collaborative approach that defines future control room roles and ways of working with industry parties.

Drawbacks

- Initial set up cost of and investment in the training academy but this should be offset by delivery of future value for the whole industry.

Training technology

To effectively train and upskill power system engineers following recruitment we require training facilities that reflect latest control capability and to allow engineers to observe and interact with the system on a dynamic basis. We will develop new training simulators to accurately reflect the changing energy landscape to train power system engineers on a range of future scenarios. The new facility will allow us to really understand the operational limits of the system both now and in the future in a safe environment, thus enabling more efficient real time operation. We will also make training more accessible and flexible by exploring new approaches such as desktop or app-based exercises. We will support the DNO to DSO transition through opening our training capabilities to other parties and develop best practice and prevention techniques through simulating past “real-time” events.

Benefits

- Ensures control room staff training reflects the systems, equipment and scenarios they are likely to face;
- Creating an environment where training can be done anytime and anywhere; and
- Reduction in ESO location and facilities costs through greater flexible working and training solutions.

Drawbacks

- Initial set up cost of and investment in the modelling and simulation capability but this should be offset by delivery of future value for the whole industry.

System restoration

While system restoration is the ultimate backstop upon which our economy relies, it cannot be a blocker to achieving our ambition of operating a zero-carbon network by 2025 due to reliance on old methods, processes and technologies. System restoration becomes much more of a ‘self-healing’ and whole system process with the appropriate system control, simulation and training tools in place, facilitated by highly trained power system engineers across all networks. To meet our ambition, the ESO must be able to meet the system restoration standards and expectations of stakeholders in a no-carbon and no transmission generation scenario. The Black Start Task Group, a cross industry government led group, is currently in the process of developing national and regional standards for restoration including time and whole system cost. This work is due to conclude by the end of the year.

We have secured funding through the Network Innovation Competition to look at Black Start provision from Distributed Energy Resources which is due to conclude in 2022. This project will produce a complete whole system project output including the technology required to facilitate and dispatch DER (e.g. tools and communications) and any associated regulatory and commercial framework change which will then require implementation. Alongside the NIC project, by 2021/22 we will facilitate wind and solar participation in restoration e.g. through provision of frequency services. By 2022/23 we will develop industry training on enhanced simulators (see section above) via restoration modelling

developments and better decision making tools. By 2023/24, new technology will be able to participate in restoration as standard, creating a truly level playing field for the industry.

Benefits

- Bringing more parties into the restoration market will facilitate a level playing field and bring down the cost of restoration for consumers;
- Increased system resilience through ensuring new technologies and market participants can provide restoration services; and
- Facilitation of a whole system and low carbon approach to system restoration.

Next steps and future engagement

We will return to the ERSG in June with more detail on costs and consumer benefits for this set of proposed activities and how stakeholder engagement feedback will have shaped our proposals.

We want undertake the following stakeholder engagement on our resourcing and training proposals:

- We will engage universities to understand the process for setting up and delivering an academic course and to look for possible partnerships. We want to determine the level of support we would need to provide an academic institution to ensure the most relevant subjects are being covered.
- We will engage bilaterally with DNOs and TOs on these proposals. We will discuss proposals on new control capability and system interface, content of future power system engineer training requirements and talent exchange. We will also discuss our proposals for system restoration with DNO and TO parties.

More generally, we want to speak to our stakeholders about whether the options we have presented here would meet our ambition and whether stakeholders support further development work. We also want to know if stakeholders have any alternative suggestions or options that we might have missed and will use the following channels to do this:

Channel	Date	Stakeholder groups	Approach
Electricity Operational Forum	26th March	Large, medium and small suppliers and generators, Service providers and networks with a focus on understanding system operation and balancing outcomes and trends	Trade fair approach with a stand for stakeholders to understand and register preferences for different options
Power Responsive round table	10th April TBC	Small suppliers, DSR, aggregators and storage providers interested in access to ESO markets	Round table discussion focused on proposed options.
RIIO stakeholder workshop	11th April	All stakeholder groups	Targeted round table discussion on the topic of system balancing, restoration and training / simulation to facilitate debate, build ideas and capture views
IS Change Forum	30th April	Large, medium and small suppliers and generators, Service providers and networks with a focus on IT system changes and impacts on their business	Round table discussion on the proposed options, particularly around the replacement of control systems capability.
Flexible Generator Group	3rd May		Round table discussion on the proposed options, particularly around the replacement of control systems capability.
Industry association committees and meetings	Ongoing March, April and May	We have invitations from Energy UK, the Association for Decentralised Energy and Renewable UK to attend the relevant meetings to canvass member views on our emerging proposals for future system operation	Dependent on meeting but likely to include a presentation with Q and A

Ask of ERSG

1) Do you agree that these proposals are ambitious and will meet the overall ambition for System Operation?
2) Do you agree that we need to develop new control capabilities that will enable us optimise a rapidly changing and dynamic operating envelope and designed for the operation of a decarbonised system?
3) Do you agree that an approach of incrementally upgrading existing systems will no longer meet this need?
4) Do you agree with the stakeholders we are looking to engage with on these topics?