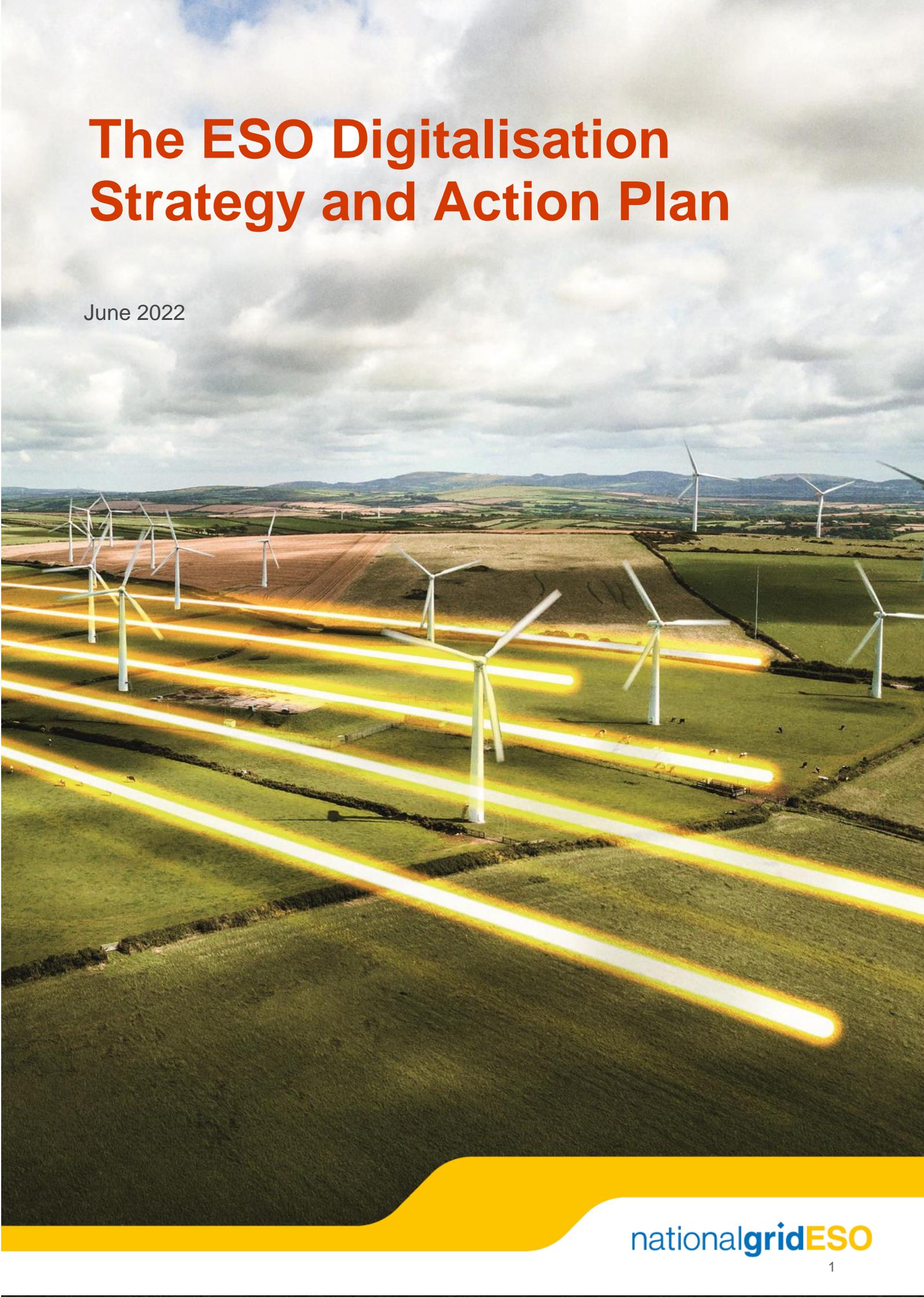


# The ESO Digitalisation Strategy and Action Plan

June 2022



## Contents

Contents .....	2
Foreword .....	3
1. Document purpose.....	4
<b>Part one – digitalisation strategy.....</b>	<b>4</b>
2. Introduction .....	4
3. Our strategy – the ‘what?’ .....	6
4. Our tactics – the ‘how?’ .....	9
5. Digital leadership .....	21
<b>Part two – digitalisation action plan .....</b>	<b>22</b>
6. Conceptualising our digitalisation strategy and tracking our delivery .....	22
7. Role 1 activities, deliverables, and investments.....	24
8. Role 2 activities, deliverables, and investments.....	28
9. Role 3 activities, deliverables, and investments.....	31
10. Digital transformation (Ways of Working).....	36

## Foreword

Our mission as the Electricity System Operator (ESO) is to drive the transformation to a fully decarbonised electricity system by 2035 which is reliable, affordable, and fair for all.

The ESO has a unique opportunity to shape the way we use and consume energy for generations to come. We have committed to be able to operate a zero-carbon system by 2025, which supports the UK's plan to achieve net zero greenhouse gas emissions by 2050. This is an exciting and challenging time for the energy sector as we all work together towards a decarbonised and decentralised energy system.

We will reduce our reliance on traditional energy sources and move to a more inclusive energy system with hundreds of connected generation, storage, and consumption assets. Over 600,000 heat pumps could be installed per year by 2028; and with all new cars and vans required to be zero emissions from 2035, the number of electric vehicles connected to the energy network will soar.

Pivotal to the successful delivery of these initiatives is ensuring we have a robust digitalisation strategy and action plan that outlines our approach and details a roadmap of how we will deliver to plan. The ESO's digital transformation is not just an enabler, but a core component of our transition as we progress on our journey to reach zero carbon operability.

Digitalisation and data will underpin the transition to net zero through better monitoring and management of the system, improved sharing of large quantities of high-quality data and the analytics this enables, as well as the developing customer-centric digital capabilities.

We're excited and proud of the role we are playing in the decarbonisation of the energy system to help mitigate climate change and the opportunity to bring about greater value for consumers through digitalisation.

## 1. Document purpose

- 1.1. This document sets out our approach to digitalisation to deliver benefits for our stakeholders. It shares our understanding of stakeholder needs, the customer experience journey they have with us, and the products and services we provide to meet those needs.
- 1.2. Part one is our digitalisation strategy. Section 3 sets out a vision for future digitalisation – the ‘what’, and section 4 shows our tactics – the ‘how’. We have also highlighted where we support the recommendations of the Energy Data Taskforce<sup>1</sup> (EDTF) and align with the Government Digital Service standard<sup>2</sup>.
- 1.3. Part two of this document is our digitalisation action plan which shows our progress towards achieving the vision in our digitalisation strategy.

## Part one – digitalisation strategy

### 2. Introduction

- 2.1. The environment in which we operate is undergoing a level of disruption as electricity generation is decentralised and decarbonised. Our customers need us to digitalise data and processes as we head towards a democratised marketplace that is more accessible to more people. Our independent role in the electricity industry requires us to be increasingly transparent in all our activities.
- 2.2. Our mission is to enable the transformation to a fully decarbonised electricity system by 2035 which is reliable, affordable, and fair for all. To achieve this success in 2025 looks like:
  - 2.2.1. Ensuring the electricity system can operate carbon-free by 2025.
  - 2.2.2. Engaging as a trusted partner.
  - 2.2.3. Driving competition for the benefit of consumers
  - 2.2.4. Being the net zero employer of choice
  - 2.2.5. Being innovative, digital and data-driven.
- 2.3. We have an ambitious five-year business plan<sup>3</sup> that is supported by our stakeholders. To achieve this, and provide the value and experience our customers desire, we need to become more digital in the way we design, develop, and provide the products and services articulated in our business plan.
- 2.4. In April 2022 we released our RIIO-2 Draft Business Plan for 2023-2025 (BP2)<sup>4</sup> and elicited stakeholder feedback from 29<sup>th</sup> April until 10<sup>th</sup> June 2022 in BP2 consultations. We are now refining our proposal to submit the final version of BP2 in August 2022.
- 2.5. We welcomed the announcement from BEIS and Ofgem in April 2022 to proceed with the creation of a Future System Operator. This organisation, which will build on the existing skills and expertise of the ESO with additional roles and responsibilities, will be key to unlocking additional value for consumers and driving towards net zero. The next update of this publication in December 2022 will quantify the implications on ESO’s Digital Strategy & Action Plan.
- 2.6. We have aligned with Ofgem’s definitions of digitalisation<sup>5</sup> where our digitalisation strategy is the strategic approach taken to digitalise our products and services. We will use technologies to change our ways of working and provide new value-creating opportunities. This is the process of becoming a digital business.

<sup>1</sup> EDTF Recommendations – <https://es.catapult.org.uk/reports/energy-data-taskforce-report/>

<sup>2</sup> Government Digital service standard – <https://www.gov.uk/service-manual/service-standard>

<sup>3</sup> See our December 2019 Business Plan – <https://www.nationalgrideso.com/our-strategy/riio/riio2-business-plan>

<sup>4</sup> See our April 2022 Draft BP2 document - <https://www.nationalgrideso.com/document/249491/download>

<sup>5</sup> Definitions taken from Ofgem’s Digitalisation Strategy and Action Plan, Supporting Information v1, p.8

- 2.7. Our Bridging the Gap to Net Zero<sup>6</sup> programme has allowed us to take a closer look at what is required to reach the UK’s 2050 net zero target. From this we have identified several key topics:
  - 2.7.1. Roles and responsibilities need to be re-defined for a Net Zero system as soon as possible and the rules need to be changed to support this.
  - 2.7.2. Increased data availability and digitalisation of our systems will be fundamental to enable markets and technology to manage our energy peaks and troughs.
  - 2.7.3. The technology to help manage these peaks and troughs is available now but it needs to be both smart and deployed at scale to be effective.
  - 2.7.4. Our electricity markets need reforming, whether they are for short term trading or longer-term contracts, to provide the flexibility required to balance our energy system more effectively.
- 2.8. Harnessing digital technology will enhance our operations, whether that is ensuring reliable, secure system operation to deliver electricity when consumers need it; transforming participation in smart and sustainable markets; unlocking consumer value through competition; or driving towards a sustainable, whole energy future.
- 2.9. Our digital organisation is about having a fanatical focus on people – their needs, wants, desires, expectations, and experiences. It will no longer be acceptable to deliver technology solutions that just do the job, or to provide solutions that users find difficult, clunky, or stressful to use.
- 2.10. Digital means that we will review and reimagine our processes, products, services, and the way we get things done. We will do this without constraint and without the bias of our predetermined assumptions to really understand the needs, wants, and expectations of the people we serve and the future scenarios we might encounter.
- 2.11. We can conceptualise our transformation journey as being composed of three pillars that will collectively enable our digitalisation strategy (See Figure 1). This Digitalisation Strategy sets out how we will modernise our tools and processes, through the usage of digital technology, establish the additional skills and capabilities we will require, and sets out the cultural transformation that we must carry out.
- 2.12. These three strategic pillars are aligned to our three core delivery roles (see Figure 17 – ESO Roles) and will be delivered where appropriate, in coordination and collaboration with other network companies and energy system partners. Addressing the common and specific areas of improvement identified by Ofgem informing our services, data users, consumers and wider stakeholders’ priorities and needs.



Figure 1 – Digitalisation Strategy Pillars underpinning our Vision.

- 2.13. In response to Ofgem’s seven Digitalisation Strategy and Action Plan (DSAP) principles, the EDTF’s recommendations, and the Government’s Digital Services (GDS) standards we have structured our DSAP around three elements: the digital mindset, product model, and agile delivery Figure 2. These are summarised in Section 3 where we define ‘what’ we will achieve in our digital strategy. Section 4 provides our tactics as to ‘how’ we will active this. Our action plan (see Part two) lists the detailed

<sup>6</sup> Read more about Bridging the Gap on our website – <https://www.nationalgrideso.com/document/247071/download>

activities, deliverables, milestones, and technology investments delivering the products and services that will realise our DSAP and EDTF recommendations.

- 2.14. While not explicitly referenced in this document, increasing our digitisation capability comes with a requisite increase in our cyber security preparedness to ensure ongoing reliable and safe operation. We continue to invest in our cyber security proficiency and are working with all key stakeholders and competent authorities including Ofgem, the National Cyber Security Centre (NCSC), and the Department for Business, Energy, and Industrial Strategy (BEIS).

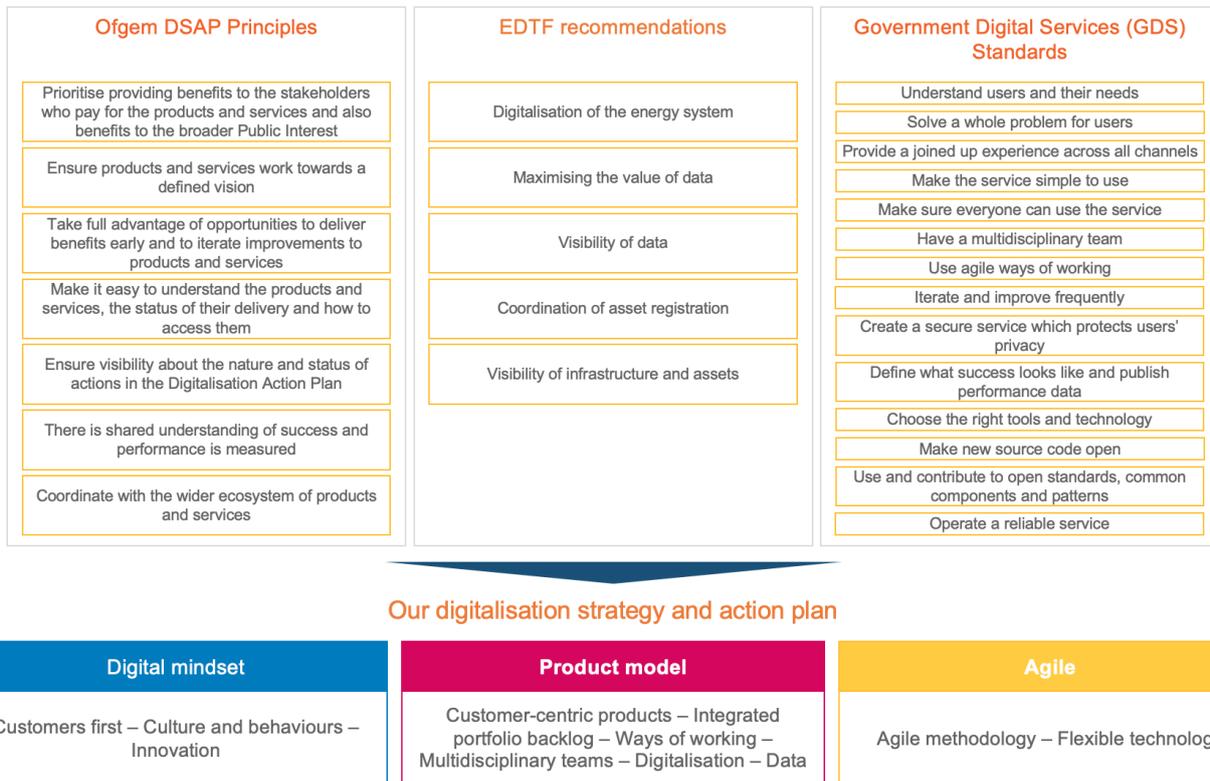


Figure 2 - Our DSAP is informed by Ofgem’s principles, GDS Standards and supports the EDTF recommendations.

### 3. Our strategy – the ‘what?’

- 3.1. As outlined above, our digital ways of working consist of three elements: a digital mindset, product model, and agile delivery methods (see Figure 2). We expect these changes to be fully embedded by 2025.

#### The digital mindset

- 3.2. We will generate a people first mindset and put our customers, clients, stakeholders, suppliers, workforce, and users first in designing our end-to-end processes and technology solutions. Putting people first will enable us to think about what people really want to create value in the form of new products and services, or to create new user experiences, in the form of different more effective ways of doing things.
- 3.3. Our customers tell us that the experience of participation in energy markets is too complex, there is no step-by-step guidance for how to participate, information is diffuse, rules and frameworks are ambiguous requiring interpretation and discussion, and they don’t know who to talk to.
- 3.4. They need a more seamless experience when interacting with the ESO – friction free with minimal clicks to get what they need. Engaging with the ESO will become more intuitive and user friendly through the provision of a consistent and personalised user experience including access to information, data, codes, connections, and market participation. We want to make it fluent, easy, and actively engaging to take part in the energy market.

- 3.5. Customers want processes to be automated, data to be machine readable, collected once and reused. They want an engaging experience with high levels of automation. This helps them to be more efficient, to be more proactive, and provide the value that consumers need.
- 3.6. We will better understand the customer journey and the required products/services. Our vision is for this to be a co-creative process where together we will better understand their needs and improve the experience.
- 3.7. We will use external best practice through the Technology Advisory Council (TAC)<sup>7</sup>, our vendor partnerships, and strategic influence from organisations like HM Government, BEIS, Ofgem, the Climate Change Committee, and the Energy Networks Association.
- 3.8. The TAC was launched in December 2020 with an independent Chair. Engagement from all members is extremely high and we are benefiting from the experience, skills, and contacts of the Council members. The TAC supports us in various ways including:
  - 3.8.1. Helping set the strategic direction of the ESO transformation journey in systems (including process and technology) development.
  - 3.8.2. Providing stakeholder input into the ESO transformation, ensuring the changes we make reflect wider market needs.
  - 3.8.3. Bringing transparency around our decision making and helping the ESO communicate change externally in the appropriate manner. This will help stakeholders plan their own IT system changes, including those that will interface with the ESO.
  - 3.8.4. Ensuring accountability from the ESO for delivering on its promises and proactively communicating changes.
  - 3.8.5. Allowing us to consult and engage on the experience of interacting with the ESO and invite input into key design, development, and testing phases of our solutions development. It also provides transparency of the decision-making logic behind our systems.
  - 3.8.6. Contributing to the iterative development our digital strategy through consultations reviewing our approach to technological transformation and feeding into the refinement of our digital strategy and related documents.
- 3.9. On 3 September 2021 we tested our approach to culture, product model, and agile delivery with the TAC. We received valuable insight and affirmation of the importance of customer centricity, one-team approach, empowerment, and leadership. We are working to integrate this feedback into our next change increment.
- 3.10. In addition, suppliers from our application development and maintenance framework (ADAM) and general management consultancy framework (GMC) advise and provide insight from other sectors and introduce innovative solutions.
- 3.11. We continue to develop and nurture a culture of 'we're all in this together' based on shared risk, accountability, ownership and, importantly, success. This is built on a foundation of true empowerment of teams, creating a bias for decision making and action across all levels.
- 3.12. Embedding innovation in our daily operations embodies the spirit of the aggregation of incremental gains – small changes made daily which, over time, create significant benefits.

### Product model – customer-centric and data driven

- 3.13. Using the principles behind design thinking (see Figure 5), we will develop customer-centric products and services that are built with the user in mind. Integrating our customers into the design and development of products allows us to develop a greater understanding of what they need and creates the 'golden thread' from customer to engineer. This insight helps us to offer better solutions, and when combined with agile delivery methods, allows us to deliver value incrementally at speed and scale.
- 3.14. In Part two – digitalisation action plan, we list the specific activities, deliverables, milestones, and technology investments that will deliver the customer-centric products. These have been tested

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<sup>7</sup>The terms of reference and minutes for the technology advisory council can be found on our website here <https://www.nationalgrideso.com/who-we-are/stakeholder-groups/technology-advisory-council/documents>

extensively with stakeholders, are all detailed in our RII0-2 business plan and will be tracked and reported on a quarterly basis as part of our incentives reporting.

- 3.15. Our ambition is to be fully data enabled, demonstrating the policy of 'presumed open' and making data available to facilitate new and efficient markets, zero-carbon system operation, innovation, and unlock further value for our customers and stakeholders. This includes closer coordination with stakeholders to increase the volume, accuracy, timeliness, and types of data.

### Agile delivery

- 3.16. We will use proven technologies and methodologies to transform traditional models of doing business within the energy sector. We will bring together applications as components of a modular, platform-based architecture. Creating these platforms will lay the foundations that enable consistent adoption of digital initiatives. We will introduce multiple platforms, including a digital engagement platform, insights and data platform, integration platform, and engineering services platforms (including network operation, control, and development; energy balancing; and commercial and markets).
- 3.17. Within our platforms, we will embed modelling and simulation using digital twin (see Figure 8 – A digital view of the energy system) and artificial intelligence technologies. The platforms will be designed to grow in line with customer priorities. We will use cloud computing and on-premises services to achieve this.
- 3.18. We will change the methods in which we implement change to make us more agile and flexible in adapting to market changes. We launch sprints that are short, two- to four-week activities, after which, we review and feedback – 'Is this what you want?', 'Is this what you are after?'. If we're not meeting the customer need, we will iterate, continuously improving until we delight our customers.

## 4. Our tactics – the ‘how?’

### Stakeholder Engagement

- 4.1. As part of our delivery, we recognise the need to engage with our stakeholders in order to continually improve and align delivery standards. We have evolved our engagement strategy to an ‘always on’ approach to increase opportunities for all customers to engage through business as usual (BAU) touchpoints. Further information on this is articulated in our recent BP2 IT Annex submission and within the dedicated Stakeholder Engagement [Annex 3] document which articulates our approach to stakeholder engagement.
- 4.2. As part of our ongoing delivery, our IT plans and in-flight work are reviewed and assessed through lenses reflective of the full range of our stakeholders: regulatory, operational, advisory, and formal Business Plan content.
- 4.3. Following our customer first principle, we want our stakeholders to be informed and come with us on this implementation journey. We already inform our stakeholders and will continue to do so via various forums, reports, and publications, adapting the needs as the industry itself changes. Table 1 below summarises our key engagement touchpoints.

Forum / Report / Publication	Objective	IT investments in scope	Cadence
Incentives reporting	Outline of ESO performance against plan delivery, metric, stakeholder evidence, plan benefits and value for money.	Any that materially contributes to role cost increases or changes to delivery plans.	Main reports every 6 months RIIO-2 deliverables tracker updated quarterly
Technology Advisory Council	Ensure stakeholder input into the ESO transformation, guaranteeing the changes we make reflect wider market needs.	Any that materially contributes to role cost increases or changes to delivery plans. Any that is of interest to industry.	Every month
Digitalisation Strategy	Provide an overview of what our data and digital vision is and ensure alignment to industry needs.	Any that forms part of the action plan.	Main strategy every 2 years. Action plan every 6 months
Ofgem early view of ESO value for money reporting	Share an early indication of our cost updates and reasons for any deviations. Allowing further deep dive engagement.	Any that materially contributes to role cost increases or changes to delivery plans.	Every 6 months
RIIO-2 Business Plan	Give clarity on what is new / materially changed in our 5-year business plan (covering 2021-2026).	All	Every 2 years
Specific investment engagement	Allow clarification of external stakeholder needs and updates on delivery plans	Any that impact external stakeholders	Ad hoc based on each specific investment needs

Table 1 – A summary of our key engagement touchpoints across our stakeholders.

**Digital mindset – customers first**

4.4. Our customers and stakeholders (see Figure 3) span the electricity industry from generation to consumption. We balance Great Britain’s electricity system and ensure that, whatever the generation mix, electricity is always there when it’s needed<sup>8</sup>.

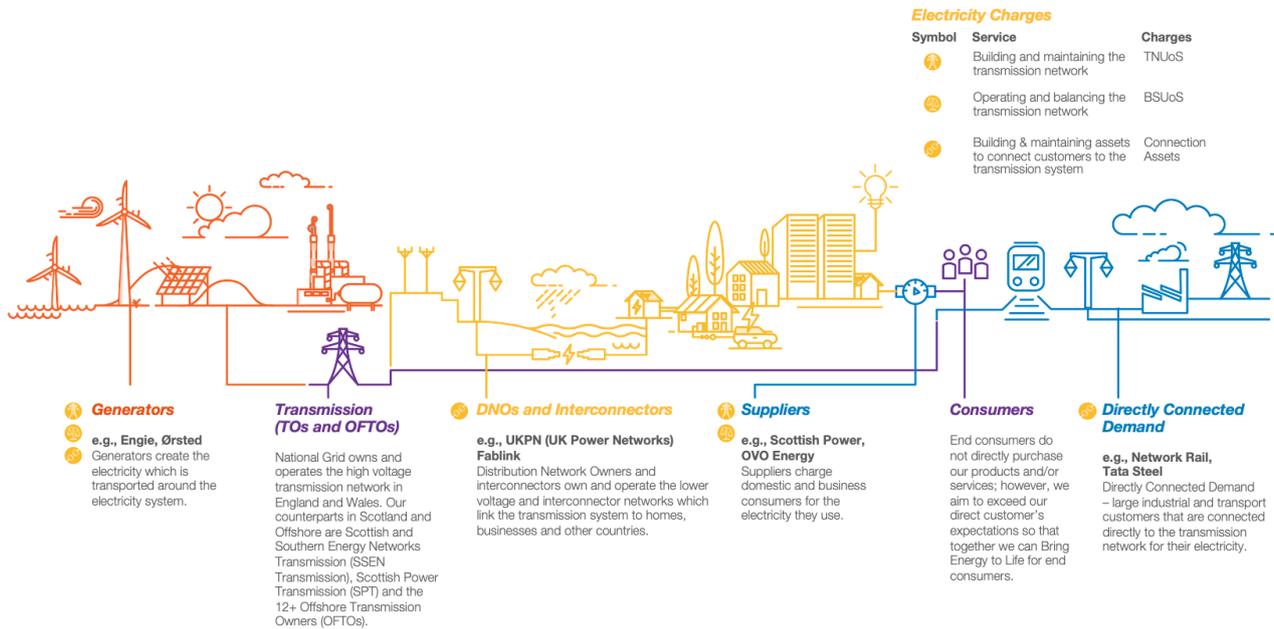


Figure 3 – Customers and stakeholders explained.

- 4.5. We will build technology solutions that people – internal and external to the ESO – want to use and that get the job done. Solutions that maximise productivity and increase wellbeing.
- 4.6. Digital technologies are a piece of technology where the user’s interaction or experience with the technology is paramount. Users don’t care, and nor should they, about the actual underlying code or system – they want a personalised, friction-free, seamless start-to-finish experience that delivers the right outcome to them. Equally, our organisational structure will not be visible in the product/service as we increase interdepartmental collaboration through multidisciplinary teams.
- 4.7. It is important for us to provide digitalised products and services in an inclusive way. We intend that digitalisation of our products and services should not become a barrier to any of our stakeholders.

<sup>8</sup> Read more about what we do on our website <https://www.nationalgrideso.com/who-we-are/what-we-do>

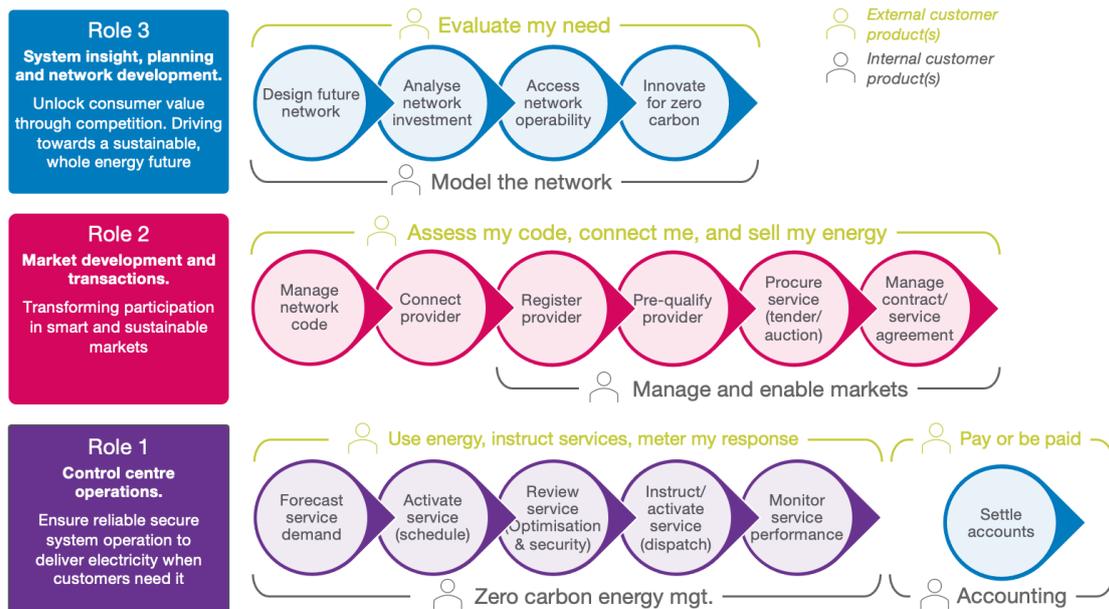


Figure 4 – A high-level example customer journey.

- 4.8. Core to this is the customer journey, which helps us to understand the needs of our customers (see Figure 4 for an example). A more apt name is the customer experience journey as it is a map of how and what people experience when they interact with ESO to achieve their outcome. The usability of our systems for both internal and external users is critical for our success and is a key design principle for our products.
- 4.9. During 2022, we are continuing to iteratively create and define our approach for mapping personas and customer experience journeys to better understand the needs of our customers. We will adopt a unified strategy throughout the organisation and coordinate through three methods. The first is our digital transformation programme where we will map our high-level, end-to-end customer experience journeys. This is complemented by a parallel activity of our digital engagement platform development,<sup>9</sup> which details elements of those journeys to a greater depth and begins to realise the journey as a seamless experience in the supporting technologies. Our customer team will develop any journeys not captured by the former activities. This will then become a process of continuous improvement.

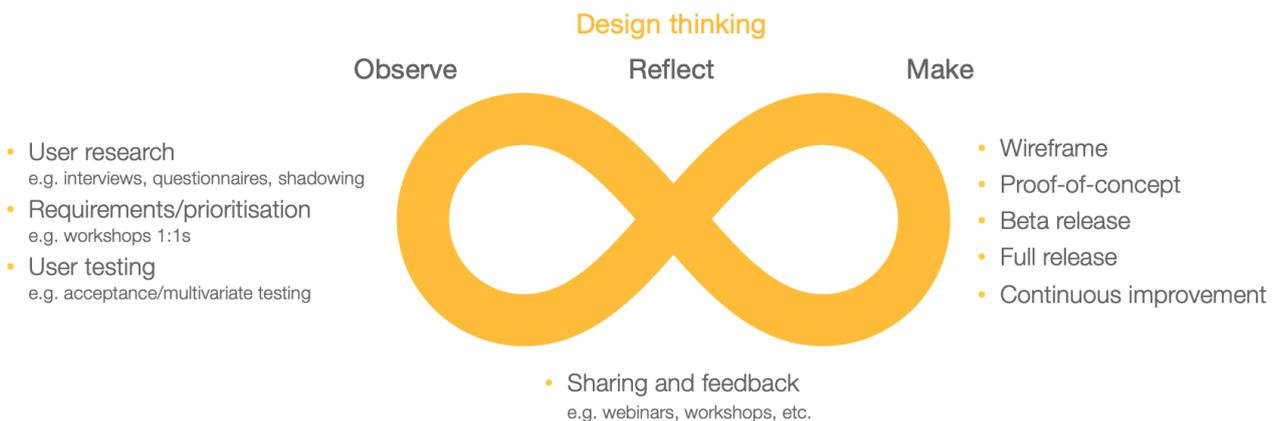


Figure 5 – Customer engagement and design thinking approach used within digital engagement platform development.

- 4.10. We carry out regular customer surveys using online tools to capture immediate feedback following events and key milestones. We also run a biannual customer satisfaction survey to gather feedback on our Role commitments and general performance. We look for themes to turn these insights into actions that deliver customer value. We will publish this insight and action in 'you said/we did' documents. From

<sup>9</sup> For more detail about our digital engagement platform, see investment '250 – digital engagement platform' in Annex 4 of our May 2022 Business Plan <https://www.nationalgrideso.com/document/250421/download>

2021 in line with our license obligations, we have now begun reporting on our bi-annual independent survey scores and feedback against our three Roles as part of our incentives reporting.

- 4.11. Our digital engagement platform is also one of the leading programmes to integrate the customer into the development lifecycle through interviews, questionnaires, and workshops. We then share this insight more broadly through webinars to access further feedback. A summary of that process is shown in Figure 5 above. This is a model that we will embed in all digital delivery. A more detailed explanation to the digital engagement platform can be seen in the case study below (see Figure 6).

## Case study

### Demonstrating an external customer first mindset

*Digital engagement platform (investment 250)*

This investment brings a single point of access into our solutions, providing a joined up experience, and making it easy to do business with the ESO. Engaging with us will become more intuitive and user-friendly through a consistent and personalised interface which includes access to our data, digitalised Grid Code, connections hub, market participation, and planning and outage data.

The user's experience is paramount and our focus on customer research means we have co-developed a list of key user needs. These user needs will inform the iterative design and development, ensuring that the user can engage and interact with the ESO, not just consume static information.

Our vision is that through the sharing of data and insight on platforms such as this, we can be a catalyst for driving the quality of information and debate that will hasten our progression towards zero carbon operation.

Figure 6 – Digital engagement platform: demonstrating a customer first mindset.

## Digital mindset – culture and behaviours

- 4.12. Culture is a critical enabler of the digital mindset and fundamental to our success. There are characteristics of our culture that we want to encourage. Developing the right capabilities and skills in our workforce alongside a supporting culture and behaviours will foster a proactive, innovative, and collaborative operating environment.
- 4.13. Enabling cultural principles are:
  - 4.13.1. Open, transparent, and inclusive – so people can see what we're doing and be part of it.
  - 4.13.2. Shared purpose and vision to give clarity and focus.
  - 4.13.3. Empowered teams with defined roles and accountability that reflects and supports the way in which we create value.
  - 4.13.4. Quick, efficient, and continuous decision making.
  - 4.13.5. Coaching style leadership incentivised on purpose or mission.
  - 4.13.6. Learning culture with a continual rapid iteration of thinking, doing, and learning to innovate and operate in a flexible and adaptable way.
  - 4.13.7. Ask 'Why?' – create an inquisitive organisation that is connected to outcomes.
- 4.14. As part of our ongoing Ways of Working transformation and supported by our engagement with the Katzenbach Centre<sup>10</sup>, we conducted a culture baseline survey designed to highlight our organisational strengths, as well as identify challenges for ongoing focus and continuous improvement. This work conducted in Q2 2021/22, helped us to align on culture aspirations, and prioritise critical behaviours that will drive greater alignment between our culture, operating model, and ongoing technology strategy.

<sup>10</sup> <https://www.strategyand.pwc.com/gx/en/insights/katzenbach-center.html>

## Case study

### We have a supportive and collaborative culture

*Developing our cultural priorities and attributes for continuous improvement and success*

Working with the Katzenbach Centre we conducted a culture survey across our ESO technology and business operations (TechOps) community that highlighted our relative strengths and challenges. The cultural baseline surveys emphasised a highly purpose driven, supportive and respectful culture.

The challenges from the survey allowed us to define our strategic priorities that focus on customer care, collaboration, and operational excellence. These are underpinned by the five TechOps mindset attributes.

Subsequently, a series of transformational initiatives have been launched across the TechOps community to foster collaboration and empower individuals in their decision making.

The introduction of a RAPID\* decision making framework has been instrumental in helping to define clear roles and responsibilities and create a strong sense of accountability.

\*RAPID (Recommend, Agree, Decided, Input, Perform)



Figure 7 – We have a supportive and collaborative culture.

- 4.15. We are constantly considering how our approach to decision making, motivators, commitments, mindset, and our structure all contribute to our culture. Our culture change sprint in 2022 aims to increase collaboration and empowerment and we see the cultural transition being fully embedded over the RIIO-2 period.
- 4.16. One of the ways we are encouraging internal collaboration across teams, is by establishing communities of practice (CoP). Two examples are the data management/ advanced analytics (modelling) CoP and the Business Analyst CoP. Through these forums, we share best practices, educate, and upskill others, and provide *ad hoc* project support. In the following months, we plan to set up several other CoPs for product management, scrum masters, architects, DevOps etc.

## Digital mindset – innovation

*“As we evolve and transition to a greener future, we’ll need to respond to a range of future challenges. And how we innovate and adapt the energy system will require a range of tools, which is where the Virtual Energy System comes in - a shared, digital national asset to help optimise the route to net zero.”*

**Fintan Slye** (Executive Director, ESO)

- 4.17. The Virtual Energy System is one of the ultimate aspirations listed in the ESO’s 2022/23 innovation strategy<sup>11</sup> and digital transformation and data will be key to enabling it. On a day-today basis, technology will underpin the vision, whether that be through the building of operational digital twins, or the creation of scheduling and forecasting tools that will utilise artificial intelligence and machine learning (see Figure 8).

<sup>11</sup> Read our full innovation strategy on our website <https://reports.nationalgrideso.com/innovationstrategy/>

## Case study

### A digital view of the energy system

*Virtual energy system (innovation)*

Our goal is to build a 'digital twin' of the UK power system and energy markets which can validate the benefits and impacts of changes to the market and physical network.

Our Virtual Energy System will utilise machine learning to run multiple, complex scenarios in a real-time training and simulation environment. This will inform the way we develop our new balancing and control tools, which will then be built offline in a modular and agile way. In a cultural shift, we will move away from large tools and IT systems, where the algorithms, data and control centre user interface sit together, to smaller tools that only house the system algorithms, with data sitting on the central data and analytics platform. This benefits energy consumers, by making it easier for us to upgrade tools in the future and respond faster to change.

Our use of digital twin technology is aligned to the vision for the UK national digital twin (NDT). We are actively engaging with stakeholders, such as via the Centre for Digital Built Britain Digital Twin Hub4. We envisage our Virtual Energy System as a 'federation' of organisations and educational institutions developing digital twins, sharing APIs and data across an entire network. Working in collaboration, we seek to develop a home-powering system from the bottom up and this could bring significant benefits for system operation. For example, connecting a digital twin of our electricity system balancing tools to those that model electric vehicles (EVs) could help us better understand the challenges and opportunities from the future increase in EV uptake.

This will be a large programme of work, researching and testing different elements before starting to pull together the enduring system.

Figure 8 – A digital view of the energy system.

- 4.18. Innovation is not limited to the investments listed in the 2022/23 innovation strategy. At the ESO, innovation also comes in the form of asking questions like 'is my customer happy?', 'how can I make this better?', or 'how can I improve on my previous best?'. In these marginal gains we will improve our products and services, and the way we deliver them.

### Product model – customer centric products and services with integrated backlog

- 4.19. A product delivers a distinct offering that is valued by customers and is managed as a distinct unit across its lifecycle. It might be made up of many applications or components but to the user it is a single product.
- 4.20. We have chosen to align our products to the customer journey rather than a technology platform or business capability. This enables us to focus on the product as a whole and the value and benefits it delivers to customers as opposed to individual or groups of components or features delivered through a project.
- 4.21. Products can exist within products as part of a product family meaning our product model will be a hierarchy. This will ensure that the sub-products integrate within the product family and that the user's experience is the same across all products and is simple, seamless and friction free.
- 4.22. For example, a potential example of a product could be the balancing product that enables engineers to visualise and manage the entire network at an appropriate level of detail. This product is made of other sub-products (like forecasting, scheduling, and dispatch) and multiple applications which come together to form a single solution that meets the engineer's needs. Figure 9 provide examples of potential customer centric products that are being explored by the TechOps community.
- 4.23. Each product and service will have a prioritised backlog of functionality and features with closely managed dependencies.
- 4.24. The cross-cutting activities including innovation, customer and stakeholders, regulation, assurance, and business change, will either be part of a product within our key product areas or have standalone products that suit their needs.

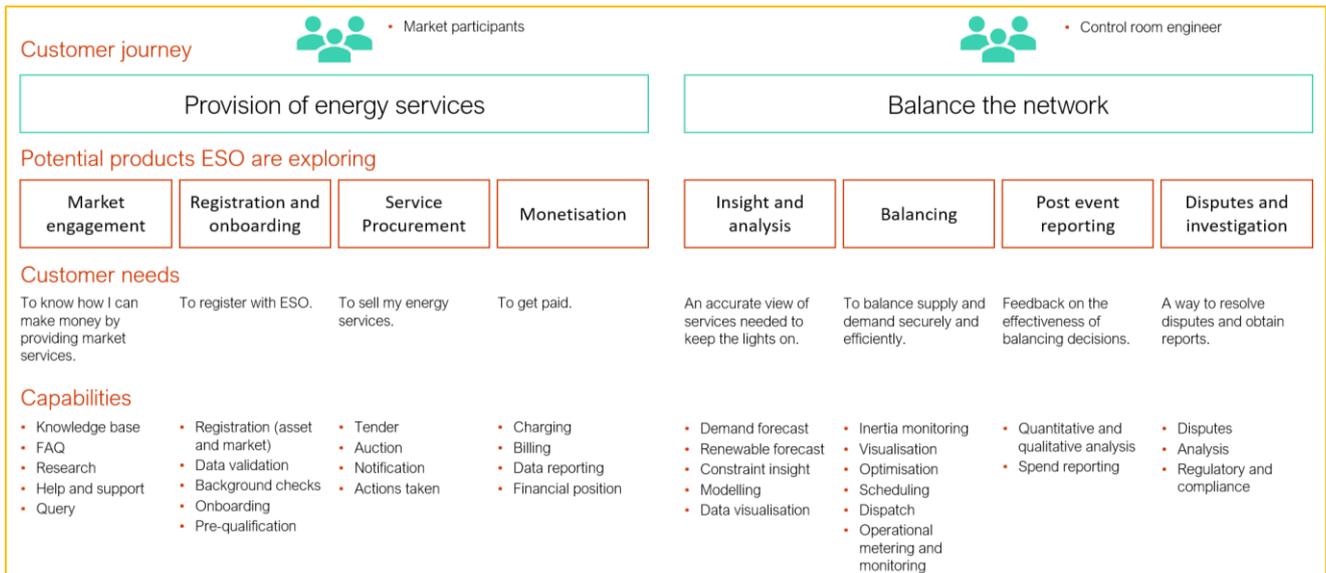


Figure 9 – Potential examples of customer-centric products that ESO are currently exploring.

- 4.25. Our Business Plan is structured by roles/themes, activities and deliverables that define the measures of success. We are currently undertaking consultations to update our BP2 Delivery Schedule submitted in April.
- 4.26. In this DSAP, the milestone statuses reflect ESO’s published April Incentive Report and the activities and investment updates provide the best-known position of ESO initiatives at the time of publication. Post-August, stakeholders should refer to ESO’s BP2 submission until the next DSAP update is provided.
- 4.27. In our digitalisation action plan, we show the relevant activities and deliverables from the ESO RIIO-2 delivery schedule. Each deliverable has detailed 2021/22 and 2022/23 milestones, success criteria, and outcomes.
- 4.28. The ESO RIIO-2 delivery schedule shows the related technology investments. This includes the scope, architectural approach, deliverables, timelines, work breakdown structure, risks, and resourcing. These are detailed in our recent draft BP2 submission within the dedicated Technology Investment Annex 4<sup>12</sup>. A final version of this will be published in August 2022.
- 4.29. We are tracking progress against detailed milestones, deliverables, and activities. This is published on our website quarterly starting from July 2021 and aligns with our incentive reporting<sup>13</sup>.

**Product model – ways of working**

- 4.30. We will partner and collaborate with our customers and truly include them in the product development lifecycle. As we bring together our own team to operate with a one-team mindset, we will be able to innovate faster and reduce the time between an initial idea and a product launch, thereby enhancing the customer experience.
- 4.31. We are moving to a product approach and away from a project approach (see Figure 10), where the business is ready to adopt that model, in how we govern and manage business initiatives.

<sup>12</sup> See our May 2022 RIIO-2 business plan: Annex 4 – technology investment report here <https://www.nationalgrideso.com/document/250421/download>

<sup>13</sup> See our website ‘How we’re performing under RIIO-2’ <https://www.nationalgrideso.com/our-strategy/riio/how-were-performing-under-riio-2>

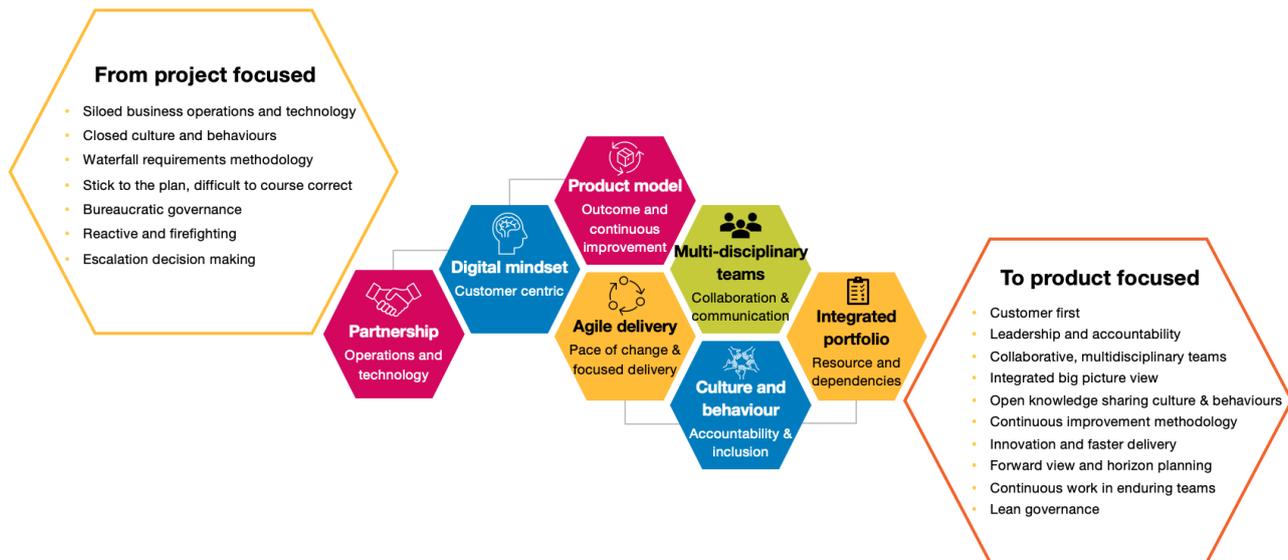


Figure 10 – What we are going to do differently, from project to product focus.

- 4.32. Products are people centric and developed with a holistic view to people’s needs and expectations and are long term endeavours that are continuously improved. Projects tend to be one off endeavours with a narrow view, a set scope, a start/end date, and a defined goal, where change is not easily accommodated.
- 4.33. Our transition from a project to product focused model will be phased (see Figure 11), as we evolve our capabilities, establish multidisciplinary teams, and incrementally add new products to cover our key end-to-end customer journeys.

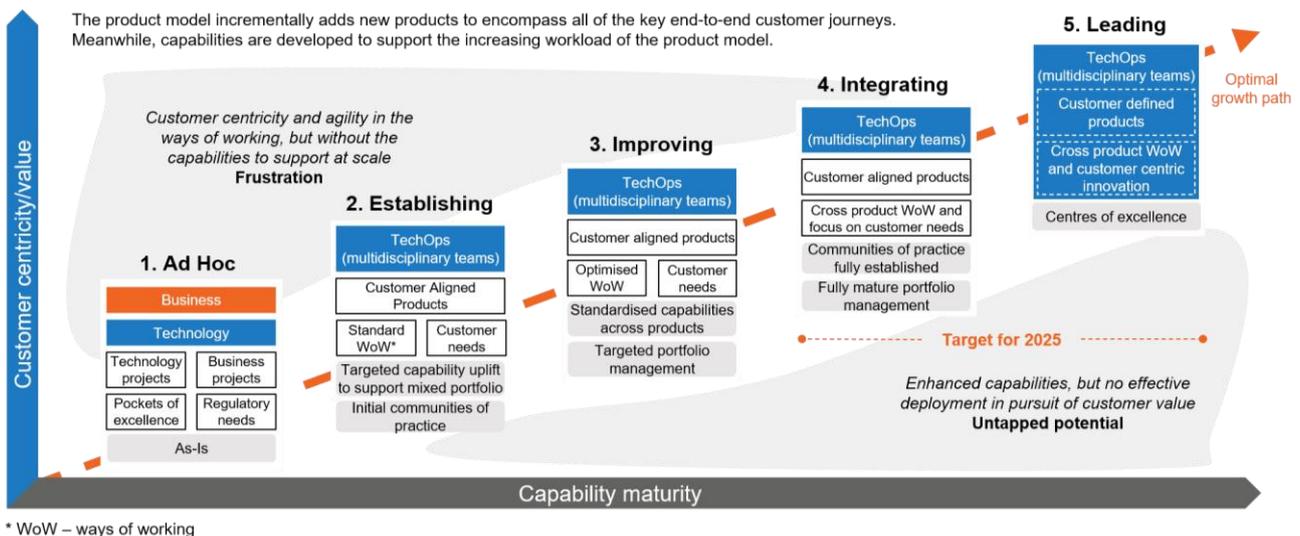


Figure 11 – Our phased approach to increasing our product model maturity.

- 4.34. We are developing our product management capabilities – the practice of having individual, long-standing teams dedicated to the development, enhancement, and support of products that deliver value for end users.
- 4.35. We will implement new ways of working with early adopters. These early adopters will trial the operating model, providing valuable feedback and lessons learnt, before it is rolled out across the teams (see Figure 11). There will be an engagement plan to take people along the journey from awareness to empowerment.
- 4.36. For one such pilot programme we have understood customer needs through user research and customer journeys. We are working on creating a set of standard products and iteratively refining them as we deliver via show and tell. We will then create standard scalable products – all contributing to build and refine the product roadmap.

4.37. A critical component of the new ways of working is the partnership between technology and operations (TechOps), building collaborative teams focused on outcomes. We will come together as equal partners in enduring, multidisciplinary teams to deliver this.

**Product model – multidisciplinary teams**

- 4.38. We will create cross-functional teams that foster collaboration and inclusion. Involving the relevant people connects the users to the people that design, develop and support the products and services. This leads to a higher quality outcome.
- 4.39. Individual sprint teams are purposefully built with ESO leadership and supported by high-calibre people from cross-functional teams. An example is shown in Figure 12 below. The team composition will vary depending on the product context. For example, in a data product, we would also include data engineers and/or machine learning engineers.
- 4.40. We will draw on deep technical competencies from our own teams and those of our framework partners and niche suppliers. This will allow a core/flex model, increasing our own competencies while allowing flexibility for scale or niche skills.
- 4.41. We will move to a model where development, security, and IT operations (DevSecOps) are integrated in the multidisciplinary teams to give high performance and throughput.
- 4.42. We are mapping existing roles across ESO IT to align with a new way of working that is structured to deliver products.

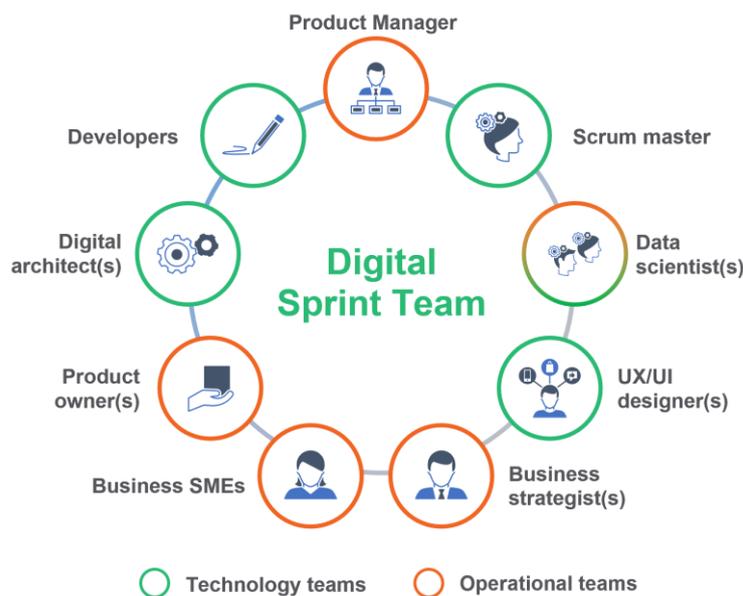


Figure 12 – Example multidisciplinary team.

**Product model – digitalisation**

- 4.43. To fully embrace a digital culture, there are two key prerequisites – digitisation of data rather than analogue storage, and digitalisation to optimise processes through increasing levels of automation. This means removing paper, reducing manual processes, removing duplication, and making data transparent. We will use automation and workflow tools in combination with machine learning and artificial intelligence to optimise processes and procedures for our teams and for customers.
- 4.44. Examples includes energy forecasting, system operation and network planning to enable secure and efficient operation of the electricity system and markets.
- 4.45. As with customer centric products, digitalisation will be achieved through the technology investments that support our business plan ambition.
- 4.46. An important investment is '250 Digital engagement platform' as this will enable a single point of access for all ESO data and services, including the markets, connections, digitalised Grid Code management,

and data and analytics platform. It sits at the heart of our vision for digital capability across all our themes, providing a common engagement experience for stakeholders.

### Product model – data

- 4.47. Data is fundamental to digitalisation. We will set targets, measure, monitor, and act to continuously improve our data. As we listen through data, we will better understand how our customers behave and under what conditions.
- 4.48. We anticipate vast growth in the volume of data, and an expectation from external stakeholders for our data and insights to be shared.
- 4.49. We will adopt the principle of ‘presumed open’ and make all our shareable data<sup>14</sup> available in an accessible format. Improving transparency is a key commitment within our RIIO-2 Business Plan 2021-2023. To support this, we will:
  - 4.49.1. Publish a transparency roadmap every six months setting out the projects we are working on to improve transparency<sup>15</sup>.
  - 4.49.2. Share data publicly wherever we can. This will help our stakeholders hold us to account by publishing information on how we operate and perform and will increase transparency of the decisions we make and how we make them. Increasing access to data we hold will encourage analysis, understanding and innovation.
- 4.50. We will increase transparency in compliance with all relevant guidance and legislation including (and not limited to,) data protection laws, licence obligations around disclosure of System Operator Functions Information (SOFI), confidential or commercially sensitive data, and the Utilities Act 2000.
- 4.51. Data will help us make better decisions through consolidation of information, machine learning, and artificial intelligence. This extends beyond control centre operations (Role 1) into all aspects of the ESO, including market development (Role 2) and system insight, planning, and network development (Role 3).
- 4.52. Gathering customer insight into how people use our products and services is also vital for continuous product improvement.
- 4.53. We’ve already begun evolving our data-sharing platforms to meet the demands of today’s more data-intensive energy ecosystem. We’re in the early stages of this journey, and our first milestone is the development and rollout of a new pilot data portal to support our ambition to make our data easier to discover, understand and consume.
- 4.54. Our investment ‘220 Data and analytics platform’<sup>16</sup> is foundational work to enhance the value of the data we hold (see Figure 13). It will be the technology underpinning all our internal and external data management, pulling together data from a variety of sources, and ensuring there is only one source of the truth.
- 4.55. Through the consolidation of our data assets, this new capability will enable enhanced analytics and the generation of new insights and forecasting services, improving our overall operational efficiency, and maintaining balancing costs/security through enhanced real time decision making.
- 4.56. As we engage with stakeholders, we will understand their roles and how data can support them. Through a process of standardisation and classification, we will make it easier for stakeholders to find and understand data. We will support data sharing at a greater volume and frequency as desire for transparency and insight increases.
- 4.57. Cloud-based data management and analytics are now universal and essential for modern data analysis approaches and even more so for artificial intelligence implementations. This investment will evolve ESO’s traditional data management and analytics to the cloud. It is indispensable for much of the RIIO-

<sup>14</sup> In accordance with Ofgem’s open data triage process, defined on p.11 of ‘Data best practice, supporting information’ 25 May 2021.

<sup>15</sup> For more information visit our website ‘Increasing the transparency of our operational decision making’ here <https://www.nationalgrideso.com/news/increasing-transparency-our-operational-decision-making>

<sup>16</sup> See p.40 of our December 2019 RIIO-2 business plan: Annex 4 – technology investment report here <https://www.nationalgrideso.com/document/158071/download>

2 change programme, including unlocking the value of our digital twin technology investments and hosting data from the asset register which is fundamental for our Single Markets Platform.

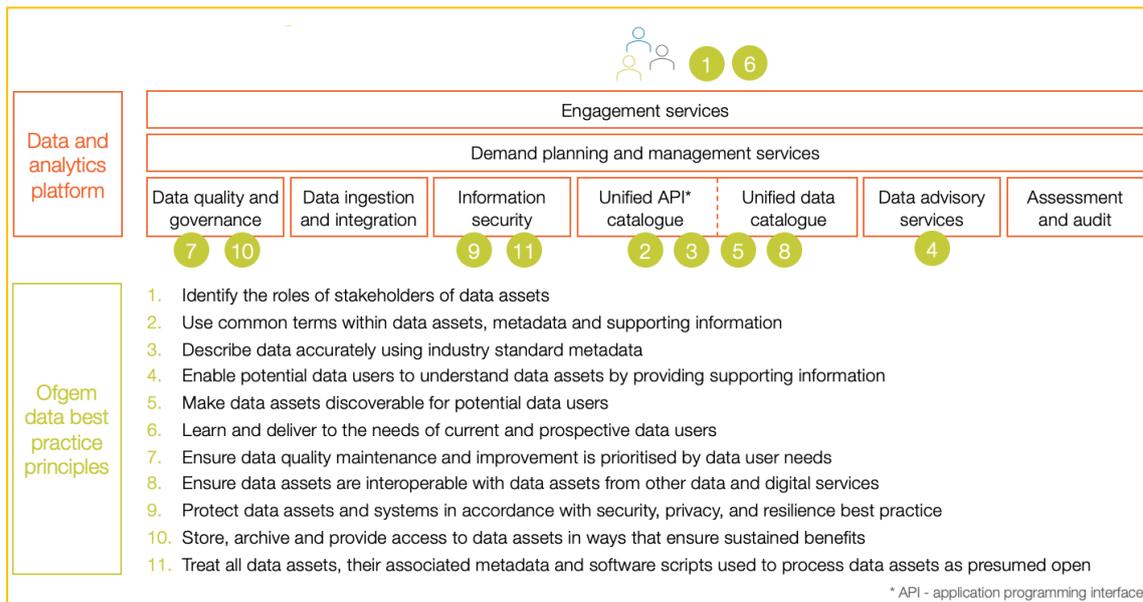


Figure 13 – Mapping between Ofgem's data best practice principles and our data and analytics platform approach.

## Agile – Methodology

- 4.58. We want to delight our customers through early and continuous delivery of value.
- 4.59. Agile and iterative development methodologies will enable us to cycle through the design thinking loop where we observe, reflect, and make. By integrating our customers into the design and development process, we can focus on high-value outcomes that meet the customers need (see Figure 14).
- 4.60. Using methodologies like SAFe<sup>17</sup> we will organise our delivery teams in value streams to focus on outcomes and people's experiences. Working in mixed discipline teams to achieve timeboxed (weeks not months or years) results that enable stakeholders to continuously test against the relevant outcomes, user experience, and course correct the solution as required.
- 4.61. As part of our digital transformation, we are drawing on expertise from our agile transformation office. This team are focused on the practical implementation of agile methodology include agile scrum ceremonies, backlog management and DevOps tools, and training.
- 4.62. We have conducted a delivery team agile maturity self-assessment to gauge the readiness of existing programmes to pivot to product focused model.

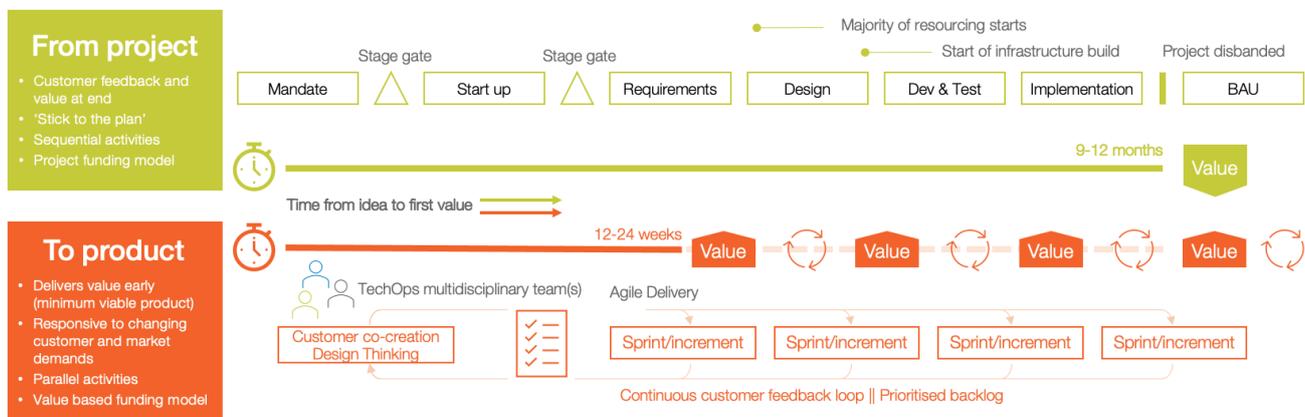


Figure 14 – From project to product. Prioritising the customer and delivering value sooner.

<sup>17</sup> See the Scaled Agile Framework website for more detail <https://www.scaledagileframework.com>

4.63. Our customer focussed product model will be delivered using iterative development methodologies (see Figure 15) and will combine elements of SAFe, Agile and Waterfall delivery frameworks.

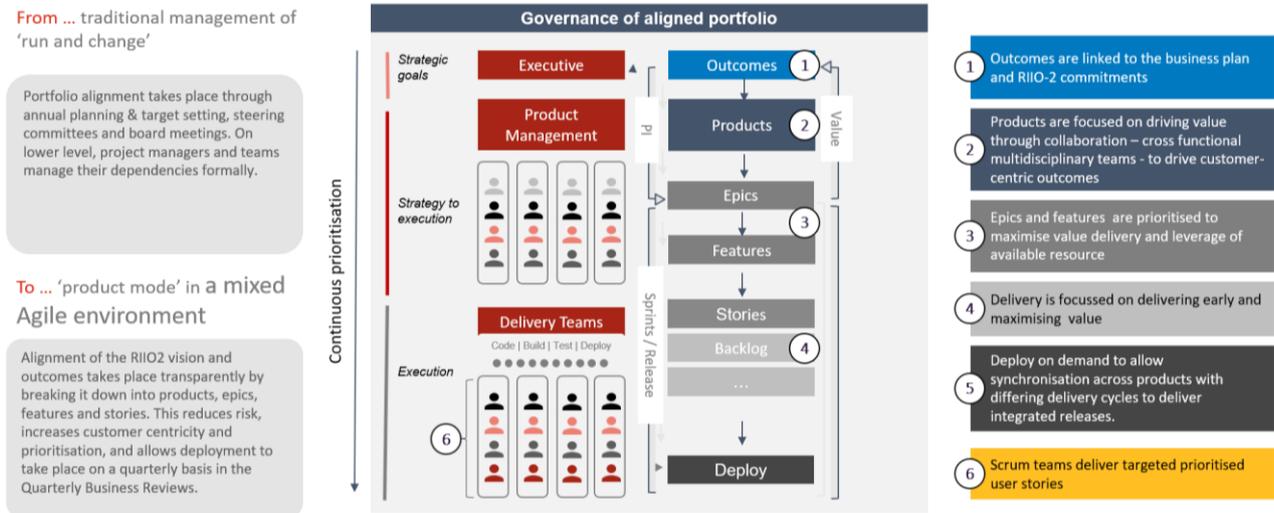


Figure 15 – Our customer focused product model will be delivered using iterative development methodologies.

### Agile – flexible technology

- 4.64. We will use modern game-changing digital technologies, which are architected in modular way in to enable flexibility, i.e., we can upgrade or change parts of the solution more easily to meet changing needs. It provides opportunities for a simplified, consistent, and accessible customer experience.
- 4.65. We will build solutions that facilitate and expedite change (easier and faster). Using a modular architecture approach will enable flexibility for change and growth – modules can be replaced/updated for more modern technologies without impacting other modules – and modules can be reused across the ESO, eliminating duplication (interoperability by design).
- 4.66. Our approach will be to consolidate applications and capabilities onto standard platforms. Creating these platforms will lay the foundations that move us away from interdependent systems and enable consistent adoption of digital initiatives.
- 4.67. This allows multiple enabling capabilities (activities) to be hosted on the same platform and consumed by customers via a product. For example, the balancing solution will host forecasting, scheduling, and dispatch. These capabilities will be exposed to the end-user through the ENCC operator console product. The single markets platform will host registration, auction participation, and reporting – all exposed to the end-user through the single market platform product.
- 4.68. An insights and data platform will embed modelling and simulation using digital twin and artificial intelligence technologies. The platforms will be designed to grow in line with customer priorities. We will use cloud computing and on-premises services to achieve this.
- 4.69. For openness of information and interaction, we will enable application programming interfaces (API) through our digital engagement platform.
- 4.70. Our non-CNI solution platforms will be hosted in the Microsoft Azure cloud and CNI solution platforms will be hosted in the CNI data centre. All shared IT infrastructure investments (e.g., data centre, networks, and identity access management) take into consideration the possible separation of the ESO from National Grid Group.
- 4.71. Rationalisation and decommission of legacy applications and technologies is a key focus for the following two to three years. On an enduring basis, we will dedicate a proportion of our capacity to removing the technical debt that is a normal part of technology evolution and change.

## 5. Digital leadership

- 5.1. The ESO leadership is fully committed to ensure senior ownership and the ESO Board accountability of our Digitalisation Strategy and Action Plan (see Figure 16). Across the Non-Executive Directors on the ESO Board there is significant experience in digitalisation and digital transformation<sup>18</sup>.
- 5.2. The ESO IT leadership team, led by our CIO, who sits on both the ESO Executive Team (ESOET) and the National Grid Group IT Leadership Team (ITLT), provides thought leadership and guidance into the short and long-term business and technology plans. They are paving our transition to a product model way of working, changing ESO's culture to move into a TechOps one team mindset.
- 5.3. Our leadership team owns our IT strategy and investment plans, and our ESO-specific IT investments are delivered by IT resources dedicated to ESO projects. More general business IT projects, such as infrastructure or cybersecurity, are delivered by a central IT function.
- 5.4. Our Head of Data has created a hub and spoke model to integrate the data strategy with our day-to-day delivery. Projects and programmes draw from this central expertise and have established multidisciplinary teams who adopt agile practices to deliver customer-centric products incrementally.
- 5.5. Our Director of Product Ways of Working will oversee the ESO's transition from a project to a product model and drive the ways of working transformation across the TechOps community, working closely with the wider ESO IT Leadership team.
- 5.6. We have implemented a Head of Programme function to drive consistency and ownership across our technology investments and deliverables.
- 5.7. We have implemented a Head of Portfolio function to manage holistic change, dependencies, and planning across ESO.
- 5.8. We have recruited a chief information security officer (CISO) who will report to the ESO Executive Team, to develop and own cybersecurity strategy, service, and compliance for the ESO.

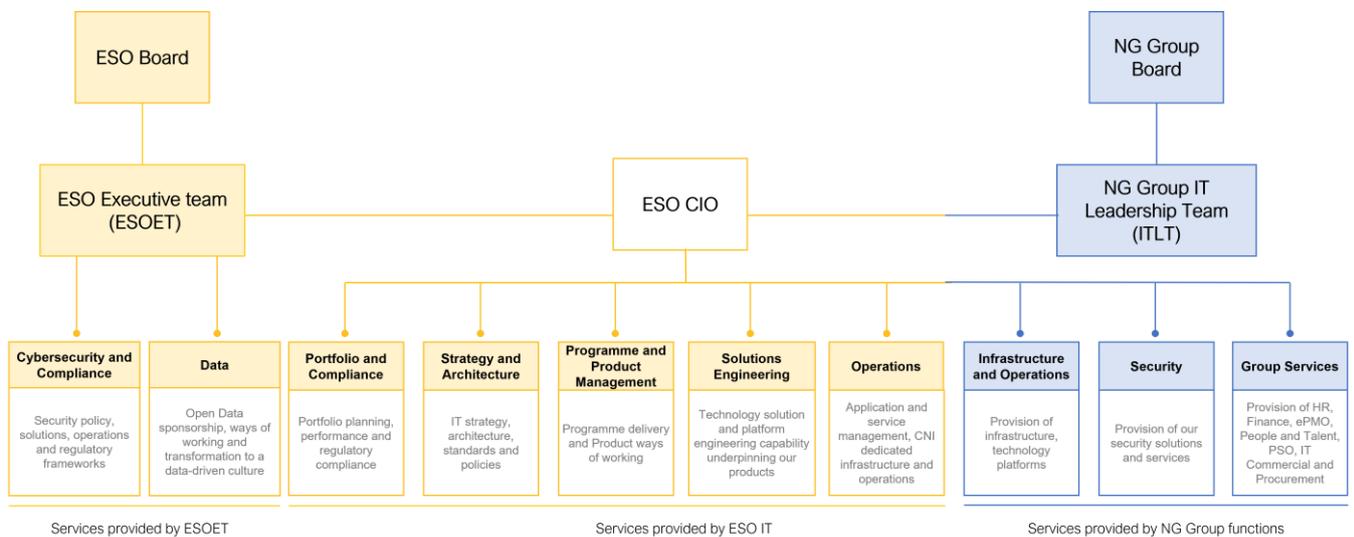


Figure 16 – An illustration of our ESO IT leadership structure and governance.

<sup>18</sup> Meet our Board - <https://www.nationalgrideso.com/who-we-are/meet-board>

## Part two – digitalisation action plan

### 6. Conceptualising our digitalisation strategy and tracking our delivery

- 6.1. Success in achieving our digitalisation strategy is closely linked to the successful delivery of our overarching Business Plan. To help conceptualise the relationship between these elements we have developed a ‘Digitalisation matrix’ (see Figure 18). This seeks to demonstrate how our investments, activities and deliverables are aligned to a primary ESO role, whilst also acknowledging that all investments, activities, and deliverables will be cross-cutting to a degree, and collectively contribute to the ESO’s overall digital transformation.
- 6.2. This seeks to illustrate how our transformation activities and associated investments will collectively support our ongoing transformation towards a sustainable energy system. Broken down across our three core ESO delivery roles (see Figure 17), we have highlighted how our change activities link back to improvements across our core business services.
- 6.3. Using the power of data is fundamental to our transformation, as will a cultural shift towards more digital ways of working and associated delivery structures. These two items are the foundation of our matrix, collectively underpinning our overall transformation journey across all business areas.
- 6.4. To provide visibility of our digital transformation progress, Figures 19-21 show a plan view of our transformation activities, deliverables, and milestones. We have updated our action plan to more readily demonstrate our ongoing delivery progress and successes to date.
- 6.5. We report against these activities, deliverables, milestones, and investments on a quarterly basis through the RIIO-2 deliverables tracker<sup>19</sup>. This tracker contains detail about each milestone, and these are linked back in our business plan to agreed performance measures that have been tested with stakeholders and regulatory bodies. The successful delivery of our DSAP is intrinsically linked to the successful delivery of our Business Plan.
- 6.6. Sections 7, 8, 9 and 10 outline our status updates of our activities and investments associated to each ESO role group. Section 10 outlines our status updates for those activities and investments which are cross cutting in nature covering all ESO role areas, and finally section 11 summarises our digital transformation (ways or working) delivery progress.

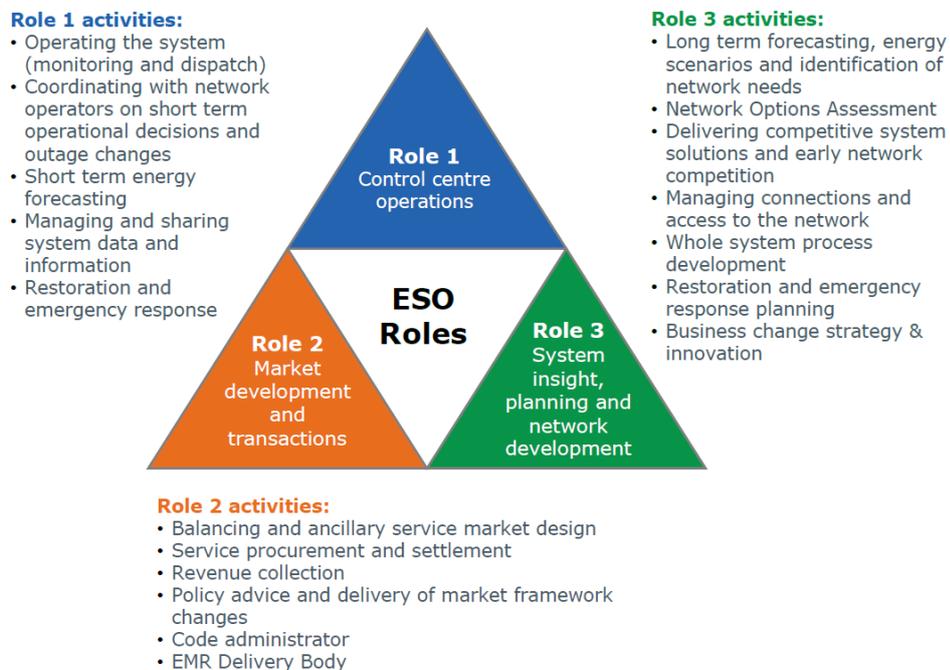


Figure 17 – ESO Roles.

<sup>19</sup> Our deliverables tracker can be found here <https://www.nationalgrideso.com/document/189141/download>

ESO's mission: to enable the transformation to a fully decarbonised electricity system which is reliable, affordable and fair for all			
Role	Role 1 Control Centre Operations	Role 2 Market Development & Transactions	Role 3 System Insight, Planning & Network Development
Services	<ul style="list-style-type: none"> <li>System operations</li> <li>Network coordination</li> <li>Short-term energy forecasting</li> <li>System data &amp; information management</li> <li>Restoration &amp; emergency response</li> </ul>	<ul style="list-style-type: none"> <li>Balancing &amp; ancillary service market design</li> <li>Service procurement &amp; settlement</li> <li>Revenue collection</li> <li>Policy advice &amp; delivery</li> <li>Code administrator</li> <li>EMR Delivery Body</li> </ul>	<ul style="list-style-type: none"> <li>Long-term forecasting</li> <li>Network options assessment</li> <li>Competitive system delivery &amp; early network competition</li> <li>Connection Management &amp; Network Access</li> <li>Whole system process development</li> </ul>
Activities	<b>A1.1 Ongoing Activities</b> D1.1.7 Detailed forecasts and analysis D1.1.8 Trading solutions for the Control Centre	<b>A4.4 Deliver a single, integrated platform for ESO Markets</b> D4.4.1 Market platform D4.4.2 Common standards	<b>A11.1 Refresh and integrate economic assessment tools to support future network modelling needs</b> D11.1 Improved investment analysis  <b>A11.2 Implement probabilistic modelling</b> D11.2 Identification of network needs
	<b>A1.2 Enhanced Balancing Capability</b> D1.2.1 Enhanced balancing tool D1.2.2 Develop inertia monitoring capabilities	<b>A5.3 Improve our security of supply modelling capability</b> D5.3 Enhanced modelling/data sets	<b>A13.1 Carry out analysis and scenario modelling on future energy demand and supply</b> D13.1 Future Energy Scenarios (FES)  <b>A13.2 Conduct mathematical, modelling &amp; market research on local and wider geographic demand information</b> D13.2 Energy demand models
	<b>A1.3 Transform Network Control</b> D1.3.1 Situational awareness tool D1.3.2 Network modelling D1.3.3 Control Centre upgrades	<b>A6.5 Work with all stakeholders to create a fully digitalised, whole system Grid Code by 2025</b> D6.5 Digitalised grid code	<b>A14.4 Facilitate development of the customer connections hub</b> D14.4.1 Connections hub phase 1 D14.4.2 Connections hub phase 2  <b>A15.6 Transform our capability in modelling and data management</b> D15.6.1 Phase 1 data mgt. scope    D15.6.4 Data analytics platform D15.6.2 Grid code modifications    D15.6.5 Data platform extension D15.6.3 Phase 2 modelling scope    D15.6.7 Outage planning
Investments	110 Network control (situational awareness)	330 Digitalised grid code management	360 Offline network modelling
	150 Operational awareness and decision support	400 Single markets platform	350 Planning and outage data exchange
	180 Enhanced balancing capability	410 Ancillary services settlements refresh	380 Connections platform
	260 Forecasting enhancements	420 Auction capability	
	250 Digital engagement platform		
Cross-cutting	<b>A17 Transparency and Open Data</b> D17.1 Open data portal with limited data sets D17.2 All published data in machine readable format	<b>Data</b> Open data unlocking zero carbon system operation and markets	<b>A1.4 Control Centre Architecture</b> D1.4.1 Data and analytics platform
	<b>Digital Transformation (Ways of Working)</b>		<b>220 Data and analytics platform</b>

Figure 18 – ESO digitalisation matrix.

6.7. Figures 19, 20 and 21 below show the high-level timeline for the IT investments that support our activities and deliverables. Given the importance of these enabling investments, we have provided a progress update in Tables 2, 3, and 4, structured via the respective ESO roles that they enable (for mapping see 'Digitalisation matrix' Figure 18).

## 7. Role 1 activities, deliverables, and investments

### Role 1 – Control Centre Operations

We will keep the lights on and get energy to people when they need it, maintaining today’s reliability levels in a rapidly decarbonising and decentralising world. We will ensure our control centres are resilient, flexible, and agile, with the ability to keep pace with the changing energy landscape. We will confidently and regularly operate periods of zero carbon electricity with high levels of renewable output and dynamic demand. The number of market participants will have increased significantly, as a result of growth in distributed energy resources, electric vehicles, and energy storage. We will have invested and adapted ahead of need, to continue to operate securely and reliably through extensive automation, greater use of artificial intelligence and enhanced training and simulation, to deal with the vast amount of data needed to run the electricity system. There will be alignment with distribution system operation (DSO) to enable seamless planning and operational coordination to realise the benefits for consumers of a decarbonised energy system.

Figure 19 below shows a plan view of our transformation activities, deliverables, and milestones corresponding to Role 1 – Control Centre Operations.

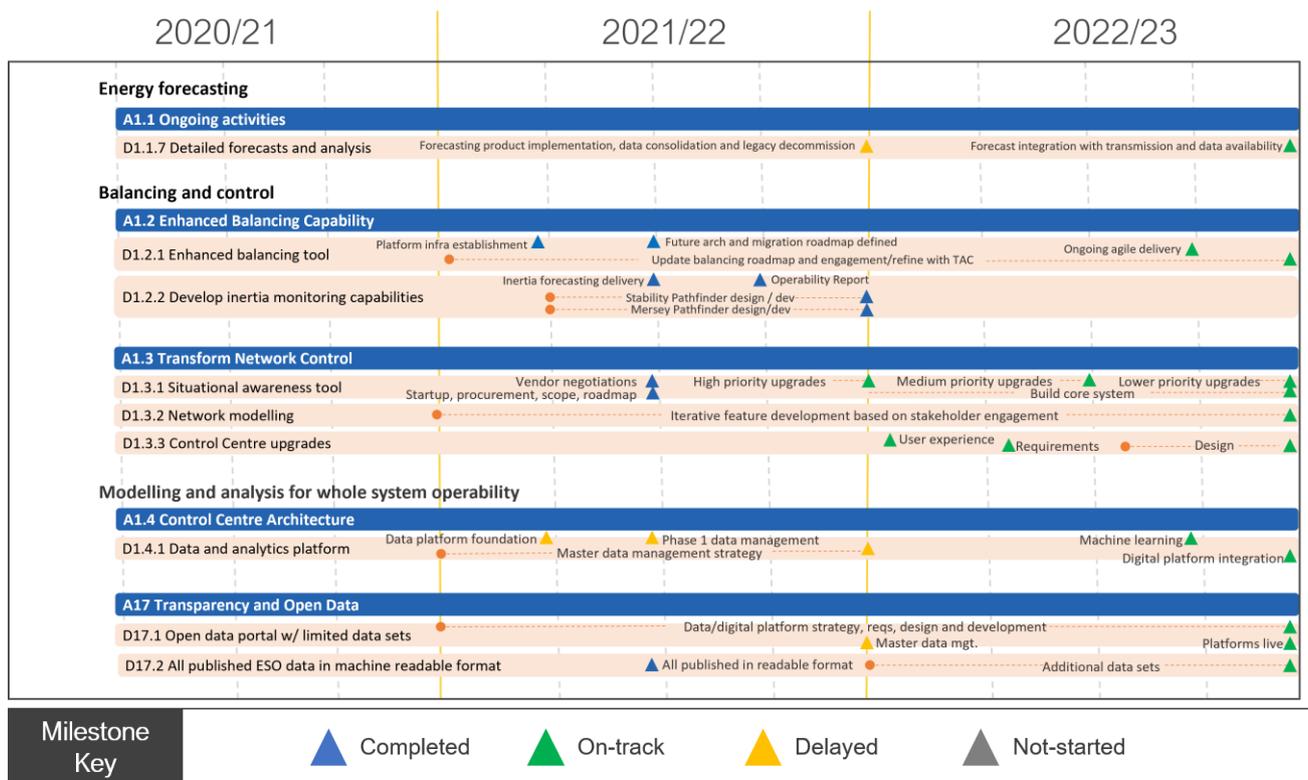


Figure 19 – Our Role 1 digitalisation strategy activities, deliverables, and associated delivery statuses. Data is as per the April 2022 Incentives Report.

**Role 1 activities and deliverables**

Table 2 – Activities and deliverables that support Role 1 – Control Centre Operations (as reflected in the April 2022 Incentives Report).

Activity/Deliverables	Related Investment	Status	Update
<b>A1.1. Ongoing activities</b>			
<p>D1.1.7 Detailed forecasts and analysis</p> <p><i>Produce and publish detailed forecasts and analysis, for both demand and generation, published at day-ahead and other timescales. Forecasts will be enhanced using detailed statistical and machine learning approaches.</i></p> <p><i>Provide data and insight to inform control centre decision making and performance review and integrate relevant IT projects into business as usual.</i></p> <p><i>Our forecasting enhancements will provide the control room with better quality, more frequent forecasts, allowing them to make better operational decisions. This helps minimise balancing costs and reduce carbon emissions.</i></p>	260 Forecasting Enhancements	On track	<ul style="list-style-type: none"> <li>We are on track for our 2022/23 implementation of forecasting products as we continually develop and implement ESO’s new forecasting capability.</li> <li>All workstreams planned for Release 2 (demand, wind, and solar power generation forecasts at national and grid supply point levels) have started and we have already developed and implemented national solar power generation and national demand forecasting products. Outputs from these mature products are shared with the market through the ESO data portal or BMRS (where possible).</li> <li>We continue to enhance forecasting by improving the user interface and dashboards in the national control room for improved timely delivery of forecast data for better decision making. As part of this we’re embedding additional input data into internal forecasting processes such as embedded generation metering data and weather data.</li> <li>During the next stage, we will build on our digital forecasting foundation to improve large data processing, model training and forecast prediction time to the point where we can start delivering forecasting as a product and decommission our existing legacy forecasting capabilities and systems.</li> </ul>
<b>A1.2 Enhanced Balancing Capability</b>			
<p>D1.2.1 Enhanced balancing tool</p> <p><i>Enhanced balancing tool built and developed in a modular fashion that will incorporate machine learning and artificial intelligence. It will enable us to schedule and dispatch a greater number of market participants than today.</i></p>	180 Enhancing balancing capability	On track	<ul style="list-style-type: none"> <li>We have started developing the foundational infrastructure and tools to support application delivery. This includes creating the platform environment to enable code development to start.</li> <li>Programme 180 has undertaken a detailed engagement with industry to co-create a roadmap of required capabilities and completed the foundational infrastructure tooling. In Q3 2021-22 ESO introduced the programme and its aims to TAC.</li> <li>The programme is now in Core Phase, which is where we begin to build out the core of the new platform, and we are on track to deliver the Core release to integration test as planned in July 2022 with a first go-live planned for 2023.</li> </ul>

Activity/Deliverables	Related Investment	Status	Update
<b>A1.3 Transform Network Control</b>			
<p>D1.3.1 Situational awareness tool</p> <p><i>Develop and deliver new real-time situational awareness tool, so Control Centre engineers can better understand changing network limitations, leading to a more efficient risk-based operation of the system. Modules will integrate with the new Network Control tool to provide advanced situational awareness.</i></p>	<p>110 Network control</p>	<p>On track</p>	<ul style="list-style-type: none"> <li>• We have developed a vision and strategy for the network control management system via user-stories, capturing functional requirements and aligning a proof of concept, in collaboration with two vendors to design Programme 110's product. As part of this the future core system architecture has been determined.</li> <li>• We are engaging with suppliers in a competitive procurement event, where product demos have been completed by suppliers. We are at the final vendor selection stage which is scheduled to be complete by the end of 2021/22.</li> <li>• Over the next six months we will further develop our future capabilities vision and requirements via richer user stories based on real-time operations.</li> <li>• Additionally, based on feedback from TAC, Programme 110 will be enhancing its technology stack to leverage machine learning and collaborate with the Future Balancing Programme and Data Analytics Platform. Work with data centres is underway for initial deployment by mid-2022/23.</li> </ul>
<p>D1.3.2 Network modelling</p> <p><i>Enhanced network modelling capabilities with online analysis of voltage and power flow profiles closer to real time. This deliverable outlines the potential modules that will be incorporated into the new Network Control tool (D1.3.1).</i></p>	<p>150 Operational awareness and decision support</p>	<p>On track</p>	<ul style="list-style-type: none"> <li>• Modules will be delivered as part of deliverable D1.3.1 Situational awareness tool.</li> <li>• We have completed workshops to define modules for the situational awareness toolset.</li> <li>• We are engaging with the TAC as an ongoing activity regarding required tools (lookahead capability, heatmaps of network issues) as we scope our development and agile build approach.</li> <li>• We are working with vendors to ensure the Network Control Management System can deliver the functionality and integration levels required as per our requirements.</li> </ul>

Activity/Deliverables	Related Investment	Status	Update
<b>A1.4 Control Centre Architecture</b>			
<p>D1.4.1 Data and analytics platform</p> <p><i>Creation of a data and analytics platform that will act as the foundation for our new Control Centre architecture. It will house all ESO internal data, including from the Control Centre systems, and allow users to access it in the timescales they need. External stakeholders will be able to access it through the data portal.</i></p>	<p>220 Data and analytics platform</p>	<p>Delayed</p>	<ul style="list-style-type: none"> <li>• Programme 220 has experienced a delay in completing our detailed design and foundation cloud services implementation.</li> <li>• To bring the programme back on track we have through a procurement event selected an external partner with a track-record of successful data and analytics platform delivery to review the current state of our programme, provide recommendations for improvement and work with us to deliver.</li> <li>• To ensure we minimise impact on other dependent initiatives, we are working with our partner to ensure we achieve our original timescale for March 2023 for a core data production capability.</li> <li>• We remain committed to the strategy and technology products selected for the Data and Analytics Platform.</li> </ul>

## 8. Role 2 activities, deliverables, and investments

### Role 2 – Market Development and Transactions

We continue to drive to deliver efficient outcomes for consumers and are always conscious that everything we do has an impact on consumer energy bills. A key focus will be enabling whole system flexibility through the markets we operate. Our balancing markets will be decarbonised and distributed, to help achieve the UK’s commitment to net zero emissions. We will maximise consumer benefit by facilitating competitive markets and managing system costs, attracting high volumes of flexible energy, such as demand-side response and storage.

Figure 20 below shows a plan view of our transformation activities, deliverables, and milestones corresponding to Role 2 – Market Development and Transactions.

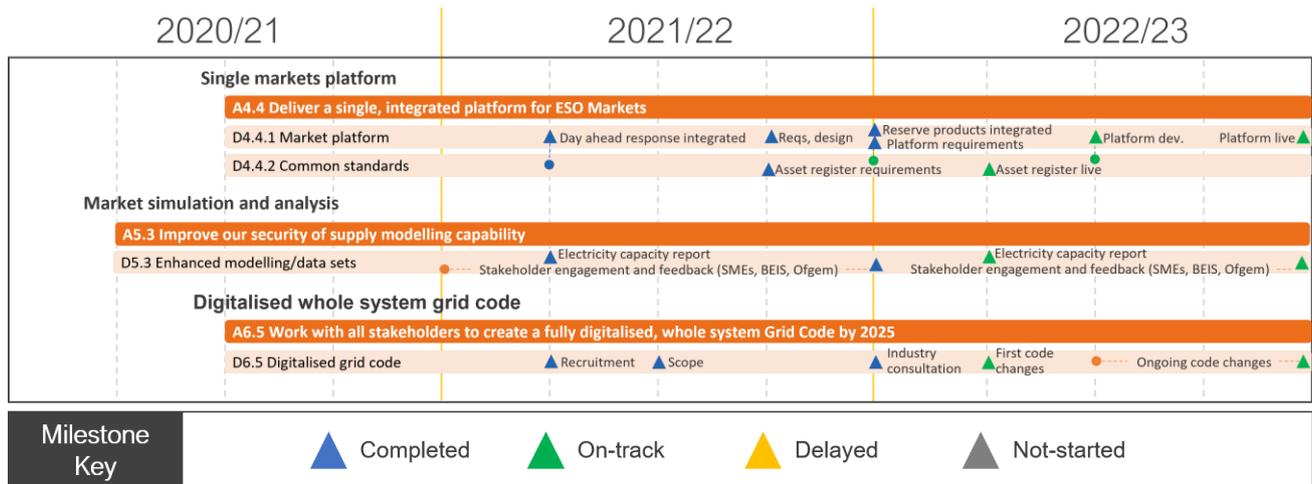


Figure 20 – Our Role 2 digitalisation strategy activities, deliverables, and associated delivery statuses. Data is as per the April 2022 Incentives Report.

**Role 2 activities and deliverables**

Table 3 – Activities and deliverables that support Role 2 – Market Development and Transactions (as reflected in the April 2022 Incentives Report).

Activity/Deliverables	Related Investment	Status	Update
<b>A4.4 Deliver a single, integrated platform for ESO Markets</b>			
<p>D4.4.1 Market platform</p> <p><i>A market platform through which market participants will be able to participate in balancing and capacity markets. The markets platform will cover the end-to-end process for market participation including communications, data input and management, messaging, and validation.</i></p>	400 Single markets platform	On track	<ul style="list-style-type: none"> <li>• The Single Market Platform (SMP) will evolve over time with different elements of functionality deployed for varying markets and services in a coordinated release train.</li> <li>• The first successful release for SMP, delivered on 10 February 2022, and supports the onboarding and operations of the new DC, DR and DM response products launched at the end of March '22.</li> </ul> <p>Benefits from the release include:</p> <ul style="list-style-type: none"> <li>○ Data tables within the first successful release for SMP include those items that will be needed for new Reserve products in the future.</li> <li>○ Service providers have a single log-in for the auction platform and associated functionality.</li> <li>○ Automatic loading of service provider registration information into the auction platform where users can view it.</li> <li>○ Bids are submitted via the platform as opposed to spreadsheet or email.</li> <li>○ Accounts and data for DC providers were also created proactively.</li> </ul> <ul style="list-style-type: none"> <li>• As new Reserve products are developed these will be hosted on the SMP. Additional functionality and more balancing services have been and will be released in stages in subsequent releases (e.g., unit/asset versioning and user management)</li> </ul>
<p>D4.4.2 Common standards</p> <p><i>Common standards, including interoperable systems, a common data model and shared minimum specifications between the ESO and other flexibility platforms as well as at the distribution level.</i></p>	400 Single markets platform	On track	<ul style="list-style-type: none"> <li>• See D4.4.1 Markets platform.</li> </ul>

Activity/Deliverables	Related Investment	Status	Update
<b>A5.3 Improve our security of supply modelling capability</b>			
D5.3 Enhanced modelling/data sets <i>Use of enhanced modelling and more granular data sets to improve security of supply modelling.</i>	220 Data and analytics platform	On track	<ul style="list-style-type: none"> <li>Our first milestone for Q1 2021/22 'Production of the Electricity Capacity Report' was submitted to BEIS on 28 May 2021.</li> <li>Following the production of the Electricity Capacity Report in Q1 2021/22 we will agree enhancements with the PTE, BEIS and Ofgem and begin to work through a prioritised list of changes.</li> <li>Development projects to enhance security of supply modelling have been undertaken in line with the prioritisation process agreed with BEIS and Ofgem. These projects have sought to enhance several areas of the modelling including non-delivery, risks due to adverse weather, new model functionality to provide better insight on interconnector modelling, industry consultation on appropriateness of new data to calculate Capacity Market de-rating factors for some embedded generation technologies.</li> <li>Full details of these projects will be reported in the 2022 Electricity Capacity Report which is on track to be submitted to BEIS by 1 June 2022.</li> </ul>
<b>A6.5 Work with all stakeholders to create a fully digitalised, whole system Grid Code by 2025</b>			
D6.5 Digitalised grid code <i>The Grid code combines transmission and distribution codes in an IT system with AI-enabled navigation and document and workflow management tools.</i>	330 Digitalised code management	On track	<ul style="list-style-type: none"> <li>We have been engaging industry at various forums since June 2021 to build awareness of Programme 330 and inform Consultation 1 which aims to gather views on the scope, objectives, and approach, and guide the formation of an industry-led governance structure for the project.</li> <li>We have engaged with the Balancing and Settlement Code Panel, Ofgem (technical codes representatives), DNOs (bilateral meetings), Grid Code Review Panel, Grid Code Development Forum, Industry Technical Codes Group, The Association for Decentralised Energy Flexibility Forum, Flexible Generation Group, Major Energy Users' Council, Renewable UK's Networks &amp; Charging forum, BEIS and Distribution Code Users.</li> <li>Our Steering Group and ESO team have considered the consultation feedback and developed key areas for scoping. A key focus has been to deprioritise the consolidation element while the Energy Code Reform work is ongoing, whilst trying to realise the benefits of the digitalisation and simplification elements.</li> <li>A go decision was received for 7 of the workstreams that emerged from the consultation responses, with further detail being agreed with our Steering Group. Scoping documents for these workstreams are underway and will feed into the next stages of work in 2022/23.</li> </ul>

## 9. Role 3 activities, deliverables, and investments

### Role 3 – System Insight, Planning and Network Development

We seek the best whole electricity system solutions, working collaboratively with Transmission Owners (TOs) and Distribution Network Operators (DNOs) across transmission and distribution to deliver electricity to Great Britain’s homes and businesses as efficiently as possible. We will use our unique position in the industry to help Great Britain meet net zero through driving debate and collaborative action across the energy sector. This means stepping up and playing a crucial part in the transition to net zero – using our insights to identify and accelerate no regrets strategies that deliver consumer value over the long term. By taking a whole energy system view we will facilitate the transition to clean heat by helping prepare the energy networks and optimising between them. In doing so, we can drive the transition to a low-carbon energy system in a way that maximises benefits to consumers.

Figure 21 below shows a plan view of our transformation activities, deliverables, and milestones corresponding to Role 3 – System Insight, Planning and Network Development.

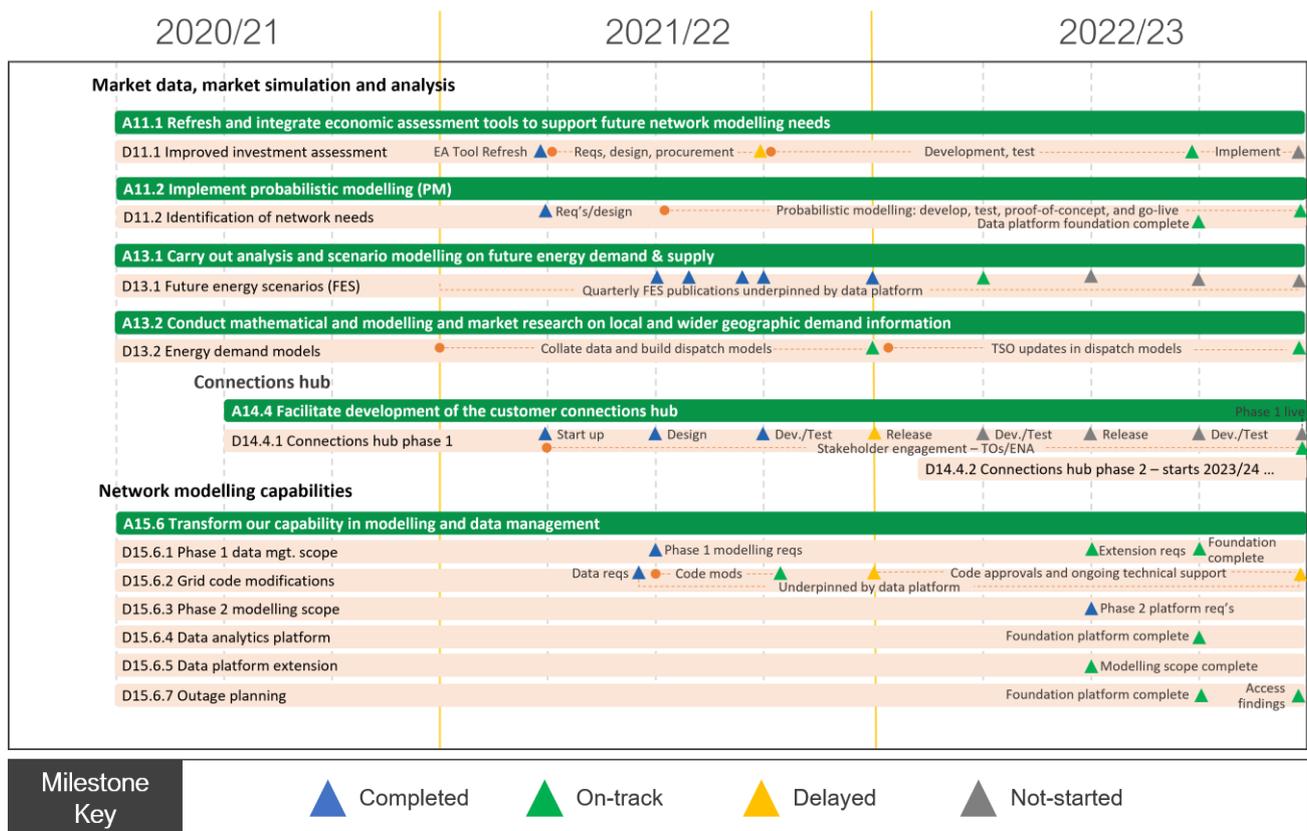


Figure 21 – Our Role 3 digitalisation strategy activities, deliverables, and associated delivery statuses. Data is as per the April 2022 Incentives Report.

### Role 3 activities and deliverables

Table 4 – Activities and deliverables that support Role 3 – System Insight, Planning and Network Development (as reflected in the April 2022 Incentives Report).

Activity/Deliverables	Related Investment	Status	Update
<b>A11.1 Refresh and integrate economic assessment tools to support future network modelling needs</b>			
D11.1 Improved investment analysis <i>Improved identification of when is the most economical time to invest and the most efficient solution.</i>	390 Network options assessment	On track	<ul style="list-style-type: none"> <li>We have gathered current and future requirements and completed the competitive tender to procure a replacement tool and awarded a contract to commence development, for planned implementation in March 2023.</li> </ul>
<b>A11.2 Implement probabilistic modelling</b>			
D11.2 Identification of network needs <i>Improved identification of network needs.</i>	390 Network options assessment	On track	<ul style="list-style-type: none"> <li>A proof-of-concept tool is in place and being used alongside network analysis for NOA7 to demonstrate capability for further integration.</li> <li>Our Q2 2021-22 milestone to develop and test a proof-of-concept for a bespoke joint network and market tool for probabilistic thermal analysis has been re-planned to better fit with the cyclical process of Programme 390.</li> <li>Our specific probabilistic planning tool proof-of-concept has been successful, and we are on track to build the necessary systems to host the tool for business use.</li> </ul>
<b>A13.1 Carry out analysis and scenario modelling on future energy demand and supply</b>			
D13.1 Future Energy Scenarios (FES) <i>Published Future Energy Scenarios (FES), Winter Outlook and Review, Summer Outlook, and other regular external commentary such as blogs from ESO employees on our website.</i>	220 Data and analytics platform	On track	<ul style="list-style-type: none"> <li>Stakeholder feedback is critical to the development of the FES.</li> <li>In that regard we have continued with our publications, most recently releasing our Summer Outlook report which was published on April 14<sup>th</sup>, 2022.</li> <li>Additionally, we published the Ofgem approved stakeholder feedback document at the beginning of March 2022.</li> <li>We are also using the Network Forum to discuss and shape some of our regional FES thinking and development at the bi-monthly meetings which include a range of whole energy stakeholders across gas and electricity.</li> </ul>

Activity/Deliverables	Related Investment	Status	Update
<b>A13.2 Conduct mathematical, modelling and market research on local and wider geographic demand information</b>			
D13.2 Energy demand models <i>Created pan-European and country level electricity and energy demand models.</i>	220 Data and analytics platform	On track	<ul style="list-style-type: none"> <li>In Q4 2021/2022 we have worked with ENTSO-E to collate the latest European “Ten Year Network Development Plan” (TYNDP) 2020 scenarios, cleanse the data, and incorporate the resulting data into our pan-European dispatch model.</li> <li>We have developed two new European scenarios out to 2050 that are now included within our pan-European market dispatch model, as used in FES and NOA. Both new scenarios are compatible with the EU's new net zero targets and therefore represent a more accurate forecast for our interconnected markets than the data they replace.</li> <li>We will review the need for updated European market data for our dispatch model in Q2 2022-23 based on the outcome of our dispatch model re-tender and the level of change to EU decarbonisation policies.</li> </ul>
<b>A14.4 Facilitate development of the customer connections hub</b>			
D14.4.1 Connections hub phase 1 <i>Implement first phase of the ESO connections hub, including online account management and integration with other network organisation websites</i>	380 Connections portal	On track	<ul style="list-style-type: none"> <li>The development of the portal is on track with a planned go live in July/August over two planned releases.</li> <li>As part of the customer focus group and overall stakeholder engagement will take place continuously between January and September 2022. ESO will engage with customers during the first stage of delivery in July, so that we can take the opportunity to obtain feedback and undertake any fixes or enhancement to the portal to complete phase 1 delivery in September 2022.</li> <li>We have mobilised an agile project team which is focusing on the following:               <ul style="list-style-type: none"> <li>Sprint planning including, requirements capturing, development and testing work in progress enhancements.</li> <li>Show &amp; Listen workshops organised in February and April with customers (internal and external) to obtain continuous feedback and implement relevant changes as established in the process. Our next workshop is planned for June.</li> <li>An MVP is planned for end of July release followed by releases in October 22, December 22, and March 23.</li> </ul> </li> </ul>
D14.4.2 Connections hub phase 2 <i>Phase 2 of the connections hub concluded.</i>	380 Connections portal	Not started	<ul style="list-style-type: none"> <li>We will start this activity in 2023/24.</li> </ul>

Activity/Deliverables	Related Investment	Status	Update
<b>A15.6 Transform our capability in modelling and data management</b>			
D15.6.1 Phase 1 data mgt. scope <i>Phase 1 data management scoping complete to feed into data and analytics platform (see D1.4.1) – modelling and data expertise will be used to scope planning data requirements for the data and analytics platform</i>	220 Data and analytics platform	On track	<ul style="list-style-type: none"> <li>In Q3 2021/2022 we defined our Minimum Viable Product (MVP) requirements. Our first data scoping document has been produced to feed into the requirements and design stage of the Data &amp; Analytics Platform.</li> <li>The activity to complete modelling scope to feed into platform extension requirements phase (D15.6.3) depends on Phase 1 modelling scope of the Data and Analytics Platform (D1.4.1) which is on track, in its second stage, and due to be complete by H1 2022.</li> </ul>
D15.6.2 Grid Code modifications <i>Further Grid Code mods (arising, for example, from O/N 2020 work programme, discussions with industry participants and/or in response to Ofgem’s Call for Evidence on Distributed Generation visibility)</i>	220 Data and analytics platform	On track	<ul style="list-style-type: none"> <li>Data requirements have been fed into GC0139 (Enhanced Planning-Data Exchange to Facilitate Whole System Planning) which is currently at Working Group stage.</li> <li>Engagement with relevant TOs and stakeholders to understand CACM and short-circuit technical requirements on offline modelling works has been completed.</li> </ul>
D15.6.3 Phase 2 modelling scope <i>Phase 2 modelling scoping complete to feed into data and analytics platform extension</i>	220 Data and analytics platform	n/a	<ul style="list-style-type: none"> <li>See D1.4.1 Data and analytics platform.</li> </ul>
D15.6.4 Data analytics platform <i>Data analytics platform foundation in place</i>	220 Data and analytics platform	n/a	<ul style="list-style-type: none"> <li>See D1.4.1 Data and analytics platform.</li> </ul>
D15.6.5 Data platform extension <i>Data platform extension complete (please see deliverable D1.4.1 for further details) – once the data and analytics platform foundation are complete, an extension will be developed as new tools are delivered.</i>	220 Data and analytics platform	n/a	<ul style="list-style-type: none"> <li>See D1.4.1 Data and analytics platform.</li> </ul>
D15.6.7 Outage planning <i>Deeper Outage Planning go live in Offline Network Modelling – this will enable higher volumes of network data, regional models, and outage planning data to be exchanged, used, and shared by network companies. D15.6.7 Deeper Outage Planning go live in Offline Network Modelling enables higher volumes of network data, regional models, and outage planning data to be exchanged, used, and shared by network companies.</i>	360 Offline network modelling	On track	<ul style="list-style-type: none"> <li>In Q4 2021-2022 we have fed high level requirements into future modelling development to support A16.3 Deeper Outage Planning.</li> <li>A delivery model is being established to deliver enhanced network modelling capabilities. In parallel a cloud migration software upgrade for the existing tool is in progress with completion currently planned for November 2022.</li> </ul>

Activity/Deliverables	Related Investment	Status	Update
<b>A17 Transparency and Open Data</b>			
<p>D17.1 Open data portal with limited data sets</p> <p><i>This deliverable refers to the foundational data portal acting as a proof of concept for the R110-2 data portal which will be powered by the Data and analytics platform and utilise the user interface of the Digital Engagement Platform.</i></p>	220 Data and analytics platform	On track	<ul style="list-style-type: none"> <li>We have completed the Digital Engagement Platform strategic definition phase and design system development activity is under way.</li> <li>Our procurement exercise for identifying a main digital experience platform has commenced and will elicit requirements and high-level design documents. A vendor is due to be appointed in Q1 2022-2023.</li> </ul>
<p>D17.2 All published ESO data in machine readable format</p> <p><i>All published ESO data in machine readable format.</i></p>	250 Digital engagement platform	On track	<ul style="list-style-type: none"> <li>We achieved our Q2 2021/22 target for all ESO data to be in machine-readable format and have published over 80 data sets.</li> <li>We continue to inform new data sets via engagement with the OTF and are on track for releasing and automating further data sets.</li> <li>Additionally, the Digital Engagement Platform is on track to commence procurement activities for a new platform.</li> </ul>

## 10. Digital transformation (Ways of Working)

- 10.1. We are aligning ESO’s Ways of Working based on a first trial. Figure 22 shows our near-term roadmap.
- 10.2. We have conducted two sets of PO/PM training to upskill TechOps community on agile practices (SAFe). We continue to mature our practise through the use of Agile Drop-in sessions to further develop maturity and increase the team’s knowledge. We currently have 3 programmes using an Agile framework.

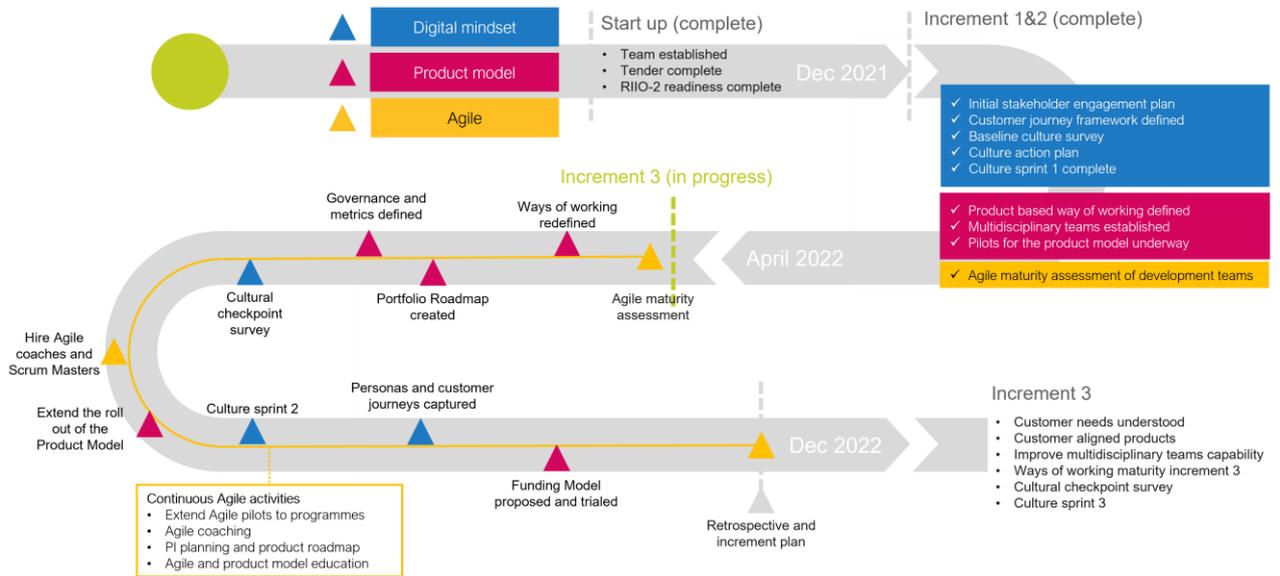


Figure 22 – Digital transformation (Ways of Working) roadmap

- 10.3. We are recruiting more agile coaches so that we can coach more of our teams in the ways of Agile.
- 10.4. We continue to review the adoption of agile practises against the programmes and outcomes where our business functions and practises are complementary to the agile ways of working.
- 10.5. Customer Journeys continue to be created and are seen as cornerstone to our agile ways of working. To increase focus on this we have recruited a head of customer to embed this capability and practise across the organisation.
- 10.6. By the end of August 2022, we will have a portfolio roadmap including dependencies. This will allow us to better understand current and future deliverability constraints and priorities.