

ESO RIIO-2 Updated Delivery Schedule

We welcome the opportunity to be able to provide an updated Delivery Schedule now that we have a better understanding of how it is to be used. The detailed feedback provided by Ofgem in Draft Determinations has been very useful and we strongly believe we have substantively addressed it in the areas identified for improvement.

Key areas in which we have significantly enhanced our Delivery Schedule include:

- Providing greater clarity on how our BP1 proposals drive us towards our 2025 ambitions for : An electricity system that can operate carbon free; Competition Everywhere; A whole system strategy that supports net zero by 2050; and The Electricity System Operator (ESO) is a trusted partner.
- Where major IT programmes are being delivered through an agile methodology, we have provided much greater clarity on what we expect to deliver in each year.
- New deliverables have been added to better articulate how we are working to align flexibility markets across transmission and distribution and develop new markets for reactive power and stability services.
- Where there is significant uncertainty, we have provided examples of what we expect to deliver in each year of the BP1 period .
- We have provided several supplementary documents: Balancing and Network Control Roadmaps; DSO-ESO alignment-Delivery Schedule view; and updated Role 3 aims. The intention of the additional material is intended to support better understanding of our Delivery Schedule and should not be treated as additional commitments.
- Whilst not included in this Delivery Schedule, significant further information on the IT investments referenced below can be founded in documents submitted either as part of the December 2019 Business Plan submission or the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020. A table signposting further information for each of these investments can be found at the end of this document.

When reviewing the below updated Delivery Schedule there are a number of key points, we would like Ofgem and stakeholders to keep in mind:

- For a wide variety of reasons, it is very likely that some milestones will change over time. The milestones documented in the Delivery Schedule are our best current view. The Forward Plan Tracker, or its RIIO-2 equivalent, should always be considered the master document.
- In all areas, we have articulated very ambitious proposals for the BP1 period that we consider to “exceed expectations” and failure to deliver every one of them to the letter, should not be considered that the ESO has not “met expectations”.
- In some areas there is significant uncertainty on specific future developments, such as specific codes changes or IT system module delivery. In these cases, we have sought to make our proposals more tangible through clear articulation of the strategic purpose, alignment with end goals, and providing examples of changes that may be delivered in the BP1 period. It should not be expected that all the examples of change will be delivered exactly as articulated.
- A large proportion of deliverables in the ESO Delivery Schedule are dependent on the actions of other parties. It has been widely acknowledged that through the development of our RIIO-2 Business Plan we have built very strong alignment across industry on our strategic goals. However, it should be noted that delivery and timescales are often not within the full control of the ESO.
- The ESO’s IT delivery model is currently under review with significant implications for the delivery of ESO IT investments and associated activities in RIIO-2. Numerous deliverables and milestones in this schedule may need to be revisited depending on the timing and scope of separation determined.
- The original ESO RIIO-2 Business Plan was submitted almost one year ago. The updated Delivery Schedule contains both new deliverables and updated timelines for some deliverables to reflect our latest thinking and Ofgem’s feedback. Where there are implications for additional resource or investment that were not captured in the original submission, these have been signposted alongside the relevant deliverable. It is intended that detail on these additional requirements should be communicated through ongoing regulatory engagement.

We firmly believe that this ambitious Delivery Schedule should exceed the expectations of Ofgem and other stakeholders. We would welcome the opportunity to discuss further in advance of Final Determinations if this would be helpful.

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Role 1 – Control centre operations

A1 Control Centre architecture and systems

Our proposals for A1 Control Centre architecture and systems help deliver our **zero carbon operation ambition** giving us the control centre systems and processes to analyse, optimise, schedule and dispatch the zero carbon energy market of the future.

To enable this, we will build and develop a new control centre architecture (A1.4) that our new balancing and control centre tools (A1.2 and A1.3) integrate with in a modular fashion. Such a fundamental reconfiguration of our control centre environment will be challenging to deliver, but it will enable: a more “plug and play” or “app-like” approach to system developing, promoting flexibility; a central location for all data, providing accessibility and transparency, and; a consolidated graphical user interface for our control centre engineers.

A1.1 Ongoing activities allows us to continue running the electricity system safely, efficiently and economically. D1.1.5 will provide the necessary legacy asset upgrades whilst we deliver our transformational capability. D1.1.7 will upgrade our forecasting capability, allowing us to provide more frequent better-quality forecasts, helping the market self-balance and operate efficiently.

A1.2 Enhanced Balancing Capability will enable us to schedule and dispatch a far greater number of market participants than we can today. This is crucial to our ambition because a zero carbon system will have higher numbers and more diverse market participants than today.

By the end of BP1 we will have:

- A clear roadmap for prioritised pipeline of developments, developed through stakeholder engagement including the Technology Advisory Council (TAC).
- Made incremental improvements to system balancing capability based on priority modules delivered.
- Determined the future balancing architecture for future modular development of new systems development.
- Developed a sandbox environment for developing and testing new balancing modules.

This helps ensure our 2025 zero carbon operation ambition is on track by:

- Finalising the balancing architecture for zero carbon operation, providing the foundations for balancing modules to integrate into.
- Establishing the production environment for future tool development.

A1.3 Transform Network Control will enable us to safely and efficiently operate the network by providing enhanced situational awareness – real-time visibility of the status of the network. Our current tools will not be able to manage the increased levels of data coming into the control room from the network from a zero carbon system due to the increased numbers of market participants and associated data points. Look ahead functionality and the ability to simulate what is about to happen is vital to manage a system with more renewable generation, due to its variable output and consequential network volatility.

By the end of BP1 we will have:

- Started, and be continuing with, the integrated energy management system (iEMS) life extension work to ensure we maintain our existing situational awareness tool while the new tool is being built.
- Delivered the core system of our new situational awareness tool (although it will not be operational).

This helps ensure our 2025 zero carbon operation ambition is on track by:

- Providing the core situational awareness tool that additional modules then integrate with to build the complete tool.

A1.4 Data and Analytics Platform will develop the architecture for our future systems and market to integrate with. This will provide a single, central location for all data sent between the market and the control room (either directly or by hosting other external facing modules such as the data platform and single markets platform) and a single source of all data used by our new control centre tools to operate the electricity system. This will lead to more efficient system balancing and facilitating greater data sharing with industry.

By the end of BP1, we will have:

- Delivered the data platform foundation.
- Integrated the single markets platform and digital engagement platform with the data platform, providing a single point of access for participation in ESO balancing services.
- A master data management system completed.

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This helps ensure our 2025 zero-carbon operation ambition is on track by:

- Providing the foundation architecture that future systems and markets that are necessary for zero-carbon operation can integrate with.

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A1.1 Ongoing activities	D1.1.1 Balance Great Britain's (GB) demand for energy with supply from generators around the clock.	None	Continuous	N/A	N/A	N/A	Meeting agreed metrics on balancing costs and security of supply.	Meeting agreed metrics on balancing costs and security of supply.	Meeting agreed metrics on balancing costs and security of supply.	Success criteria added.
A1.1 Ongoing activities	D1.1.2 Maintain security of supply in real time and the ability to restart the system in the event of a partial or total loss of power.	None	Continuous	N/A	N/A	N/A	Meeting agreed metrics on balancing costs and security of supply. Carry out necessary work to meet GB restoration standard as described in A3.2.	Meeting agreed metrics on balancing costs and security of supply. Carry out necessary work to meet GB restoration standard as described in A3.2.	Meeting agreed metrics on balancing costs and security of supply. Carry out necessary work to meet GB restoration standard as described in A3.2.	Success criteria added.
A1.1 Ongoing activities	D1.1.3 Maintain the integrity of the transmission network, while manage the economical operation of the system.	None	Continuous	N/A	N/A	N/A	Meeting agreed metrics on balancing costs and security of supply.	Meeting agreed metrics on balancing costs and security of supply.	Meeting agreed metrics on balancing costs and security of supply.	Success criteria added.
A1.1 Ongoing activities	D1.1.4 Liaise with ENTSO-E (European Network for Transmission System Operators – Electricity) and Co-Ordination of Electricity System Operators (CORESO) on the ESO's European operations. Strategic relationships with European institutions are covered in Activity A6.2 European Union (EU) code change and relationships.	None	Continuous	Active participation with ENTSO-E, including membership of: <ul style="list-style-type: none"> • Assembly (ESO Director); • Board (ESO Director); • 3 main Committees reporting to Board (ESO Exec / Senior Management); • 4 other groups reporting to Board (wider ESO leadership); • 18 Steering Groups; • 100+ work groups. Daily liaison with CORESO in operational timescales to support their role as Regional Security Coordinator. Work focusing on:	Q2 – Common Grid Model Stage 3 (bespoke CORESO web reporting tool modifications fit for the NGESO control room) complete. Q2 – become compliant with Common Grid Model requirements - Establishment of two-day ahead, day-ahead and intra-day congestion forecast (D2CF, DACF, IDCF) processes (depending on future trading relationship).	N/A	DACF Stage 3 completed. Compliant with Common Grid Model requirements. Stage 4 – Inter RSC Coordination between CORESO and Nordic RSC defining a system operating region whilst expanding CORESO study capabilities (TBC on interconnector go-live).	Common Grid Model Stage 4 (establishing system operation regions and expanding CORESO study capabilities) (TBC on interconnector go-live).	N/A	Milestones and success criteria added. Note that this only provides a small snapshot of the work we are doing. Note also that many of the deliverables are dependent on the UK's future trading relationship with the EU.

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				<ul style="list-style-type: none"> Future trading relationship with EU; TERRE (Trans European Replacement Reserve Exchange) and MARI (Manually Activated Reserve Initiative) Day Ahead Congestion Forecast (DACF) and Capacity Allocation and Congestion Management (CACM); Codes and frameworks. <p>Common Grid Model – Stage 2 (trial and implementation) complete.</p>						
A1.1 Ongoing activities	D1.1.5 Upgraded legacy balancing and situational awareness tools to deliver continued service levels whilst new tools are being development.	<p>210 Balancing Asset Health Along with building the enhanced balancing capabilities we need to ensure we continue providing at least the same level of service as now. We will need to carry on with lifecycle upgrades, enhancement for near term requirements and transition to new capabilities. Once we have implemented new systems and tools it will be necessary to invest periodically throughout their life cycle in order to maintain their reliability and usability, and to keep them up to date and minimise cyber security risks.</p> <p>240 Electricity National Control Centre (ENCC) Asset Health To operate the grid system, and to handle unforeseen events and emergency situations,</p>	Continuous	<p>Access to the Application Programming Interface (API) widened to allow use across all market participant routes subject to the communication standards (<i>Forward Plan</i>).</p> <p>Dispatch facility expanded to handle a large number of small Balancing Mechanism Units (subject to market take up) (<i>Forward Plan</i>).</p> <p>Work started to re-platform our existing multi-dispatch tool delivery which will fully integrate the current interim process for bulk dispatch of Balancing Mechanism Units (BMUs) into control room systems. This will reduce our manual processes and make it easier for the ENCC to dispatch many small BMUs at once. (<i>Forward Plan</i>).</p>	TBC (dependent on impact assessment) - State of Energy signal defined and implemented for limited energy assets (such as batteries).	N/A	<p>State of Energy signal from limited-energy assets (such as batteries) provides control engineers with visibility of the remaining energy.</p> <p>Incremental targets for Metric 2 CNI (Critical National Infrastructure) system health met.</p>	Incremental targets for Metric 2 CNI system health met.	Ongoing maintenance and incremental upgrades have been completed to maintain our legacy balancing tools while we develop new ones including improving our systems and processes to handle greater levels of interconnection.	Updated to provide more clarity on what will be delivered in BP1.

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		we need to invest in maintaining our stand-alone specific tools and resilient bespoke communication links.		<p>Interconnector systems delivered for IFA2 and also system updates to align processes between interconnectors, aiding intraday markets, enabling new commercial services and streamlining our existing IT systems (<i>Forward Plan</i>).</p> <p>Existing IT systems upgraded to prepare for European Network Codes (<i>Forward Plan</i>).</p> <p>Published outcome of the reserve from storage in the Balancing Mechanism trial (<i>Forward Plan</i>).</p> <p>State of Energy – impact assessment complete with firm delivery date for 2021/22 (<i>Forward Plan</i>).</p> <p>Dynamic Stable Import Limit (SIL)/Stable Export Limit (SEL) impact assessment complete (<i>Forward Plan</i>).</p>						
A1.1 Ongoing activities	D1.1.6 Assessment of future operability challenges communicated through the <i>Operability Strategy Report</i> . Published annually.	None	Continuous	<p>The report explains the future challenges we face in maintaining an operable electricity system and what we are doing about them. Opportunities for engagement are highlighted, as well as where to look for more information. This allows potential service providers to engage with us and help develop services to meet future system needs.</p> <p>The challenges outlined in the report also form the needs case for developing new systems and markets. Our RIIO-1 work has focused on</p>	<p>Q3 – publish <i>Operability Strategy Report</i>.</p> <p>Undertake improvements to these publications in accordance with stakeholder feedback and/or ESO internal publication review.</p>	<p>Q3 – publish <i>Operability Strategy Report</i>.</p> <p>Undertake improvements to these publications in accordance with stakeholder feedback and/or ESO internal publication review.</p>	<p>Market participants have a clear view of the future operability challenges, and where to engage to help develop new solutions.</p> <p><i>Operability Strategy Report</i> developed in line with stakeholders' feedback and published.</p> <p>Positive stakeholder feedback received.</p>	<p>Market participants have a clear view of the future operability challenges, and where to engage to help develop new solutions.</p> <p><i>Operability Strategy Report</i> developed in line with stakeholders' feedback and published.</p> <p>Positive stakeholder feedback received.</p>	<p><i>Operability Strategy Report</i> will:</p> <ul style="list-style-type: none"> Continue to pull out the most significant or new system challenges. Ensure the market understands those challenges (in so far as they want to). Link to potential solutions (e.g. Pathfinders and product roadmaps) to market participants know how to engage. Be used as the needs case for developing control centre tools that are integrated with our 	<p>Overview on how the <i>Operability Strategy Report</i> will be used and potential future developments in line with stakeholder feedback.</p>

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				stability and voltage (through our Pathfinders) amongst other things. For more information see D1.2.2 .					transformational balancing capability (D1.2.2). <ul style="list-style-type: none"> Reflect stakeholder feedback. 	
A1.1 Ongoing activities	D1.1.7 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. Provide data and insight to inform control centre decision making and performance review and integrate relevant IT projects into business as usual. 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.	260 Forecasting Enhancements Continuing with the investment made under RIIO-1, to enhance our mathematical forecasting models and refresh the forecasting system in line with our policies.	Continuous	Approach to Platform for Energy Forecasting (PEF) developed with early benefits realisation, including: <ul style="list-style-type: none"> Improved quality of ESO forecasts through continuous development and implementation of ESO's new forecasting capability on an agile and advanced platform Improved and more frequent energy forecasts delivered by PEF available to market participants and the control room (24 solar, 8 embedded wind, 8 BMU wind and 24 national demand forecasts per day) Innovation project outcomes integrated into forecasting capability. Digital forecasting foundation: <ul style="list-style-type: none"> Development and implementation of machine learning and advanced statistical learning modelling approach for core forecasting products. 	Implementation of forecasting products and sharing outputs from mature products externally where possible: <ul style="list-style-type: none"> Implementation of core forecasting capability (demand, wind and solar power generation forecasts at national and GSP levels) in PEF Embed additional input data into internal forecasting processes – embedded generation metering data, weather data Build further on digital forecasting foundation to deliver improvement in large data processing, model training and forecast prediction time. Decommission existing legacy forecasting capability and system (EFS).	Complete integration of grid supply point (GSP) level demand, solar and wind power forecasts into transmission analysis study and balancing tools (where possible): <ul style="list-style-type: none"> Make GSP level demand, solar and wind power forecasts available for market participants Make additional improved, granular and frequent forecasting data available in machine readable format for market participants to improve decision making ahead of real time. 	Improvement in core energy forecasting KPI - Mean Absolute percentage error (MAPE) as per benchmark for metric 3. With a better use of technology and advanced computing power on the new platform, we aim to deliver a step change improvement in large data processing, model training and forecast prediction time. Improved efficiency in data processing time up to ~70-80%, allowing us to provide forecasts to end users more frequently. We hope to reduce the average refresh time from the current 60 minutes to around 15 minutes. Make additional improved, granular, and frequent forecasting data available in a machine-readable format for market participants to improve decision making ahead of real time.	Maintain or improve (where possible) Energy forecasting core KPI - Mean Absolute percentage error (MAPE) as per benchmark for metric 3 Integration of GSP level demand, solar and wind power forecasts into transmission analysis study and balancing tools (where possible). Positive market participant feedback on usage of published forecasts and data. Maintain challenging forecast delivery time to end users including market participants in line with year 1 base line (or improve where possible).		Updated to provide more clarity on what will be delivered in BP1.
A1.1 Ongoing activities	D1.1.8 Trading solutions to deliver a safe, secure and economical strategy for the Control Centre.	None	Continuous	Trade on up to four interconnectors (IFA, IFA2, BritNed, NEMO) for system and energy reasons.	New interconnectors online, as per Interconnector register ¹ (subject to change).	New interconnectors online, as per Interconnector register (subject to change).	Managing increased trading volumes as: <ul style="list-style-type: none"> New interconnectors come online. 	Managing increased trading volumes as: <ul style="list-style-type: none"> New interconnectors come online. Greater renewable generation increases 	Successfully managed increased trading volumes due to new interconnectors coming online.	Success criteria updated in relation to new interconnectors coming online.

¹ <https://www.nationalgrideso.com/connections/registers-reports-and-guidance>

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							<ul style="list-style-type: none"> Greater renewable generation increases the operability challenges we face. <p>Estimate interconnector trading volumes increase by 25% from previous year.</p> <p>Explore ways to increase trading transparency.</p>	<p>the operability challenges we face.</p> <p>Estimate interconnector trading volumes increase by 25% from previous year.</p> <p>Explore ways to increase trading transparency.</p>	Trading transparency increased.	
A1.2 Enhanced Balancing Capability	D1.2.1 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.	<p>180 Enhanced balancing capability We will develop our core balancing systems and processes in a modular fashion to deliver dispatch and scheduling improvements. Our scheduling solution will be in line with the market gate closure, greater flexibility to respond to market changes market changes, including a new suite of ancillary services, and close to real time auction markets.</p> <p>480 Ancillary Services Dispatch Continue integration of the ancillary services dispatch platform (ASDP) capabilities developed in RIIO-1 into the core balancing capabilities and processes and expanding it to cover any new ancillary services. This will also be integrated with the single market platform so new ancillary services can be</p>	Project	<p>Balancing Roadmap developed with Technology Advisory Council (TAC) and published. It will contain a high-level view of:</p> <ul style="list-style-type: none"> Key drivers and priority user requirements. User stories and user journeys, including how participants will interact with our systems. Backlog and when the first items will be delivered, focusing on 2021/22 and 2022/23, based on the user requirements and asset health. Outputs and outcomes. Dependencies. Progress updates (for later revisions). <p>Early technology proof of concept working completed to:</p> <ul style="list-style-type: none"> Inform technology is appropriate Inform programme structure, resourcing and ways of working Inform future system architecture work 	<p>Q1 – start developing foundational infrastructure and tooling to support applications:</p> <ul style="list-style-type: none"> Testing and automation tools Capacity management tools Alarm and event management Monitoring tools Incident management Coding tools Change management tools Containerisation tools Cyber security tools <p>Q1 – build a platform environment to create applications in (collaboration space with servers, storage and code development infrastructure).</p> <p>Q2 – complete foundational infrastructure tooling work.</p> <p>Q2 – updated Roadmap agreed with TAC and published.</p>	<p>Q1 - Migration roadmap development started, providing a view of when new systems will come online, and legacy ones switched off.</p> <p>Q2 – updated Roadmap agreed with TAC and published.</p> <p>Q4 - updated Roadmap agreed with TAC and published.</p> <p>Deliver first application components (timescales TBC):</p> <ul style="list-style-type: none"> Build the production environment to safely and securely develop code for 24/7 systems Testing in sandbox environment. <p>Ongoing agile delivery of application</p>	<p>Sandbox environment developed for testing components to prove components work, giving industry confidence.</p> <p>Key decisions on architectural design made incorporating feedback from the TAC.</p> <p>Priority technology identified and sourcing decisions made.</p> <p>Potential code changes required to support operation of the tool identified and timeline agreed with codes team.</p> <p>Expected development timeline agreed and roadmap published.</p> <p>Incremental targets for Metric 2 – CNI system reliability met.</p> <p>Updated programme costs to feed efficient cost benchmark review.</p>	<p>Production environment developed.</p> <p>Technology sourcing decisions for further application development completed.</p> <p>Scaled agile approach to development underway and on track against roadmap.</p> <p>Initial modules integrated with new control centre architecture (Activity A1.4).</p> <p>Updated roadmap published.</p> <p>Incremental targets for Metric 2 – CNI system reliability met.</p> <p>Updated programme costs to feed efficient cost benchmark review.</p> <p>Incremental benefits identified in cost-benefit analysis realised.</p>	<p>By March 2024 Control Centre engineers can schedule and dispatch a far greater number of market participants at once than they can in 2020, which is a key enabler of our ability to operate the network carbon free.</p> <p>Using increased automation provides market participants with greater confidence in our decision-making.</p> <p>ASDP has become one module of the 180 Enhanced balancing capability, integrated with other operational tools.</p> <p>Benefits identified in cost-benefit analysis realised.</p> <p>The practical improvements to system operation are:</p> <ul style="list-style-type: none"> Ability to operate the electricity system carbon-free Ability to efficiently and transparently schedule and dispatch significantly more market 	Updated to provide more clarity on what will be delivered in BP1.

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		consistently managed and dispatched.		<p>(see 2021/22 milestone).</p> <p>Included in the above is reviewing the approach taken to develop the Modern Dispatch Optimiser, which is a trial for our RIIO-2 ways of working.</p> <p>Internal baseline roadmap for technology delivery (for iterative ongoing development), taking outputs of proof-of concept work and combining with known technologies. This provides an overview of what technology is available to us for future system development.</p> <p>Internal baseline roadmap for functional capability being delivered for key processes including scheduling and dispatch, based on current known requirements. This provides an overview of what the key system issues to solve are.</p> <p>Identify opportunities for end-to-end balancing process rationalisation, to inform future operating model and system architecture.</p> <p>Programme structure defined and resourcing strategy confirmed reflecting previously described FTE numbers).</p> <p>Clear governance structure defined, including TAC and internal sign-off processes.</p>	<p>Q4 – future system architecture defined, including in-scope modules for future development.</p> <p>Q4 - updated Roadmap agreed with TAC and published</p> <p>Sandbox testing environment developed (timescale TBC):</p> <ul style="list-style-type: none"> Define data inputs and data sets to test components Define expected outputs to compare test against Start testing priority components (to be determined). 	<p>components, using production environment and sandbox (will be determined by Roadmap at end of RIIO-1).</p>	<p>Incremental benefits identified in cost-benefit analysis realised.</p>		<p>participants than today</p> <ul style="list-style-type: none"> Stakeholder confidence in our control room decision making. <p>This helps our zero-carbon operation because:</p> <ul style="list-style-type: none"> We will have the control centre tools to be able to operate the system carbon-free. 	

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A1.2 Enhanced Balancing Capability	<p>D1.2.2 Develop inertia monitoring capabilities and other tools to address emerging technology and system management issues (as required), as outlined in future Operability Strategy Reports.</p> <p>Depending on their urgency, impact and complexity, solutions can range from user-developed tools to real-time data feed tools integrated with our IT estate. These will eventually be integrated with the Enhanced Balancing Capability.</p> <p>System conditions can quickly change, often surfacing challenges that need to be tackled at short notice. One example is inertia, now a key operational constraint leading to significant increase in balancing costs if not managed properly. During RIIO-1, we had to invest in real-time system data for its monitoring and forecasting. We also had to focus on system stability (through the Stability Pathfinder) and control centre visibility (through Power Available) and Voltage (through the Mersey Pathfinder).</p> <p>Future challenges will be determined via the <i>Operability Strategy Report</i>, so we cannot say</p>	<p>130 Emergent Technology and System Management</p> <p>This investment will allow us to tackle new operational challenges more quickly and efficiently throughout RIIO-2. It will use our foundation work, such as the IT investment 180</p> <p>220 Data and analytics platform, being built on a modular basis like IT investment 180</p> <p>Enhanced balancing capability to allow its integration with any other required tool.</p> <p>It will enable control centre users to manage changes to the system in real time, securely and economically.</p>	Project	<p>Operability Strategy Report</p> <p>Regular (likely annual) publication of reports, providing transparency to stakeholders and outlining challenges that new tools should respond to.</p> <p>Inertia</p> <p>First supplier's inertia monitoring tool delivered (<i>Forward Plan</i>).</p> <p>Stability</p> <p>Stability Pathfinder phase 1 and 2 work ongoing (see Role 3).</p> <p>Interim IT solution for phase 1 complete.</p> <p>Visibility</p> <p>Phase 2b of Power Available delivered enabling greater use of wind for Mandatory Frequency Response (MFR). This will improve wind forecasting and response optimisation by blending PA with weather forecasts to provide a real time measure of output for wind units.</p> <p>Published outcome of the reserve from storage in the Balancing Mechanism trial (<i>Forward Plan</i>).</p> <p>State of Energy – impact assessment complete with firm delivery date for 2021/22 (<i>Forward Plan</i>).</p> <p>(Any new market-procured services will be developed in line with our competitive procurement ambitions in Role 2).</p>	<p>Operability Strategy Report</p> <p>Q3 – publish <i>Operability Strategy Report</i> (D1.1.6).</p> <p>Ongoing tool development throughout the year.</p> <p>(Exact challenges and tools are TBC).</p> <p>Inertia</p> <p>Ongoing – ESO uses first supplier's monitoring tool.</p> <p>Q1-2 - Deliver first supplier inertia forecasting.</p> <p>Q2 – Second supplier delivers inertia monitoring tool.</p> <p>Stability</p> <p>Q2 - Deliver Stability Pathfinder phase 1, including enduring IT solution.</p> <p>Q1-2 – requirements and design work for Phase 2.</p> <p>Q3-4 – development and testing work for Phase 2.</p> <p>Visibility</p> <p>TBC (dependent on impact assessment) - "State of Energy" signal defined and implemented for limited energy assets (such as batteries).</p> <p>Voltage</p>	<p>Operability Strategy Report</p> <p>Q3 – publish <i>Operability Strategy Report</i> (D1.1.6).</p> <p>Ongoing tool development throughout the year.</p> <p>(Exact challenges and tools are TBC).</p> <p>Inertia</p> <p>Ongoing use of tools and work with TOs to improve data quality.</p> <p>Stability</p> <p>Q1-3 – development and testing for Phase 2.</p> <p>Q4 - Deliver Stability Pathfinder phase 2, including enduring IT solution.</p> <p>Voltage</p> <p>Q1 – Mersey Pathfinder IT work complete.</p> <p>Q1 – start work on Pennines Pathfinder.</p> <p>Q2-4 Pennines Pathfinder requirements and design work.</p> <p>Q3 – Mersey Pathfinder go-live.</p>	<p>Stability Pathfinder phase 1, Constraint Management Pathfinder and inertia monitoring delivered, with some tools being used.</p> <p>Work ongoing in other areas.</p> <p>Business processes developed to fully utilise monitoring tool outputs in control centre.</p> <p>Lessons learned from development and operation of monitoring tool used to inform design of inertia forecasting tool.</p> <p>Ability to rapidly respond to changing operational environment.</p> <p>(Any new market-procured services will be developed in line with our competitive procurement ambitions in Role 2).</p>	<p>Stability Pathfinder phase 2 and Mersey Pathfinder delivered.</p> <p>Pennines Pathfinder on track.</p> <p>Inertia tools being used.</p> <p>Business processes developed to fully utilise monitoring and forecasting tools outputs in the Control Centre.</p> <p>Ability to rapidly respond to changing operational environment.</p> <p>(Any new market-procured services will be developed in line with our competitive procurement ambitions in Role 2).</p>	<p>By March 2024: Pennines Pathfinder IT enabling works complete</p> <p>User developed tools integrated with enhanced balancing capability during development.</p> <p>By March 2026: User developed tools integrated with network control tool.</p>	<p>The <i>Operability Strategy Report</i> is likely to be an annual publication, rather than twice yearly as previously articulated.</p> <p>We have provided clarification on what this deliverable is, how it builds on previous work and how it links to D1.2.1.</p> <p>Inertia forecasting tool delivery has been brought forward one year to July 2021 Further work on data quality from Transmission Owners will be required for full operational use to be achieved.</p> <p>Second supplier inertia monitoring tool has revised delivery dates of Summer 2021.</p>

ESO RIIO-2 Delivery Schedule

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	<p>exactly what issues we will need to respond to or the tools we will need to develop.</p> <p>The deliverables in this section relate to the IT and system investments required. Other changes (e.g. markets) are in other Roles.</p>			<p>Voltage Mersey Pathfinder work ongoing.</p> <p>Constraints Constraint management pathfinder impact assessment complete to determine if any IT solutions are required.</p>	<p>Q1 – finish requirement and design work for Mersey Pathfinder.</p> <p>Q2-4 – development and testing for Mersey Pathfinder.</p> <p>Constraints (This is TBC on the impact assessment).</p> <p>Q1-2 – development and testing for Constraints Management Pathfinder.</p> <p>Q3 – implement Constraints Management Pathfinder.</p>					
A1.2 Enhanced Balancing Capability	D1.2.3 Projects running, using innovation funding, to consider how greater automation, machine learning and use of artificial intelligence can be used across our activities to handles increases in the amount of data and the number of expected actions.	450 Future Innovation Productionisation This investment covers future Network Innovation Allowance (NIA) projects only. This funding is needed to enable us to respond to challenges as they appear. The ongoing nature of the NIA pipeline requires funding to be available for NIA productionisation. We are evaluating several projects that would mature towards the end of the RIIO-1 period and may require funding early in RIIO-2. This investment also includes an opex element to cover IT support for new innovation projects. Known NIA and Network Innovation Competition (NIC)	Continuous	N/A	N/A	N/A	N/A	N/A	N/A	

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		projects are covered by their own investment lines, included elsewhere in the RIIO-2 submission.								
A1.3 Transform Network Control	D1.3.1 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. These modules are developed as part of D1.3.2 / IT investment ref 150 . The exact modules developed will be decided over the course of BP1.	110 Network Control The new capabilities will integrate with IT investment 220 Data and analytics platform, ensuring a single network model for Control Centre operators. Although not switching or moving transmission equipment, i.e. no large-scale asset control, the new tool will still need to send signals to ask for services (e.g. sending instructions to the DSOs' automated network management (ANM) systems). In a similar way, we will still need to see substation configurations even if we do not need to receive all the detailed alarms.	Project	iEMS Life Extension Detailed asset health assessment undertaken. Technical approach with stakeholders and vendors agreed. In-depth technical options analysis developed. Asset risk mitigation options determined. Network Control Strategy Forward Plan - Control capability development, including life extension of current system, capability requirements work ongoing between SO-TO in prep for separation of systems, user stories for new product. Network Control Roadmap developed with TAC and published. Will contain high-level view of: <ul style="list-style-type: none"> Key drivers and priority deliverables What will be delivered and when (within the detail possible) Outputs and outcomes Dependencies Progress updates (for later revisions). 	iEMS Life Extension Q1 & Q2 - Vendor negotiations to support life extension. Q3 & Q4 – Deliver high priority software and hardware life extension projects. Network Control Strategy Q1 – validate scope and transition strategy, based on Roadmap. Q1 – start procurement activity for core system. Q1 – commence proof of concept work. Q1 – determine core system “to be” architecture and options Q1 – commence core system requirements. Q2 – procurement approach confirmed. Q2 – finish core system requirements work. Q2 – roadmap updated with input from TAC. Q2 – finish work with NGET on capability mapping. Q2 – validate scope and transition strategy, based on Roadmap Q3 – validate scope and transition strategy, based on Roadmap Q3 – confirm high level modular design Q3 – commence core system design work.	iEMS Life Extension Q1 & Q2 - Deliver medium priority software and hardware life extension projects. Q3 & Q4 – Deliver low priority software and hardware life extension projects. Network Control Strategy Q1-4 - build of core situational awareness system. Q2 – roadmap updated with input from TAC. Q4 – finish proof of concept work. Q4 – roadmap updated with input from TAC. Q4 – start project to integrate core system with data and analytics platform.	iEMS Life Extension Design work completed. Agile delivery starting. Life extension of current systems continued including development work where necessary to manage changing network. Incremental targets for CNI system reliability metric met. Network Control Strategy Supplier engagement and sourcing strategy in action. Project scope for new tools developed through stakeholder engagement (e.g. TAC) and finalised. Core system requirements work completed. Core system design work complete. Proof of concepts work ongoing. Potential code changes required to support operation of the tool identified and	iEMS Life Extension Life extension of current systems continued including development work where necessary to manage changing network. Voltage stability analysis capability implemented Improved fault level analysis implemented Delivery continuing in an agile manner. Incremental targets for Metric 2 – CNI system reliability met. Network Control Strategy Core situational awareness tool delivered (but not yet in operation). This will be the core system, that links to the control centre architecture (Activity A1.4), including the data and analytics platform, and other modules. Core system delivered at this time is likely to comprise (subject to change): <ul style="list-style-type: none"> Foundation architecture established Data acquisition from Transmission Owners (TOs) Integration with Data & Analytics platform for data storage 	iEMS Life Extension Final delivery in March 2026 with the decommissioning of iEMS Network Control Strategy By March 2025 Business process implemented ensuring Control Centre engineers can manage and visualise far greater volumes of data than in 2020 which is a key enabler of our ability to operate the network carbon free. This information is used to better understand the operating envelope, allowing Control Centre engineers to run a more efficient system safely and at lower cost to consumers. Specific deliverables include: <ul style="list-style-type: none"> Integration with new NGET SCADA system complete Enhanced situational awareness capability delivered Enhanced real-time modelling tools and look-ahead capability delivered Enhanced control room visualisation delivered Full training simulator integration (D2.3.1 / IT investment ref 200) Shadow control room live. 	There are no significant changes. However, we have provided further detail, breaking the project down into two components: <ul style="list-style-type: none"> iEMS Life Extension – maintenance of legacy system. Network Control Strategy – transformation investment in the new situational awareness tool to replace iEMS.

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					<p>Q4 – finish core system design work.</p> <p>Q4 – finish procurement activity. Procurement approach confirmed.</p> <p>Q4 – roadmap updated with input from TAC.</p>		<p>timeline agreed with codes team.</p> <p>Incremental benefits identified in cost-benefit analysis realised.</p>	<ul style="list-style-type: none"> State estimator Basic alarm management. <p>Other potential in-scope items delivered at this stage (subject to change):</p> <ul style="list-style-type: none"> Display capability Contingency analysis. <p>Core system initially running in a non-operational sandbox alongside iEMS, allowing for testing and tuning of modules.</p> <p>Updated roadmap agreed with TAC and published.</p> <p>Incremental benefits identified in cost-benefit analysis realised.</p>	<p>Benefits identified in cost-benefit analysis realised.</p> <p>iEMS decommissioned (for ESO use).</p>	
A1.3 Transform Network Control	<p>D1.3.2 Enhanced network modelling capabilities with online analysis of voltage and power flow profiles closer to real time.</p> <p>This deliverable outlines the potential modules that will be incorporated into the new Network Control tool (D1.3.1).</p> <p>The exact tools and timing are still to be determined, but here we provide a view of what they could be.</p>	<p>150 Operational Awareness and Decision Support</p> <p>Enhanced look ahead capability will be required to predict transmission problems in a more volatile operating environment.</p> <p>Apart from new tools or enhancements to current tools, we will need greater alignment between real-time online and offline tools to allow for a more efficient control centre operation. These tools will be integrated via the IT investment 220 Data and analytics platform and 110 Network Control tool.</p>	Project	<p>Restructured internally to bring modelling into more efficient structure and processes.</p> <p>Lessons learned from investigation into system events such as 9 August 2019.</p>	<p>Ongoing:</p> <ul style="list-style-type: none"> Engagement with the TAC on required tools. Scoping and development work. Agile build. Tool delivery. <p>Tools may include:</p> <ul style="list-style-type: none"> Lookahead capability. Leveraging additional data sources (e.g. Phasor Measurement Units). Heatmaps of network issues. More intuitive display of alarms to speed up root cause analysis. Enhanced analytics. 	<p>Ongoing:</p> <ul style="list-style-type: none"> Engagement with the TAC on required tools. Scoping and development work. Agile build. Tool delivery. <p>Tools may include:</p> <ul style="list-style-type: none"> Lookahead capability. Leveraging additional data sources (e.g. Phasor Measurement Units). Heatmaps of network issues. More intuitive display of alarms to speed up root cause analysis. Enhanced analytics. 	<p>Project scope and prioritisation for development of new tools developed through stakeholder engagement (e.g. TAC) and finalised.</p> <p>Roadmap produced for priority tools.</p>	<p>Progress on track against previous roadmap with first set of tools delivered and integrated with data platform.</p> <p>Project scope and prioritisation for development of new tools developed through stakeholder engagement (e.g. TAC) and finalised.</p> <p>Updated roadmap produced for named priority tools.</p> <p>First tools integrated with new Network Control tool core system (D1.3.1).</p>	<p>By March 2026: we will have enhanced network modelling capabilities delivering consistent and accurate outputs which support better operational decision making across all time scales.</p> <p>Our modelling systems will have the option to be interoperable with DNO/DSO systems, allowing two-way data exchange to enhance whole system decision making.</p>	Updated to provide more clarity on what will be delivered in BP1.

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A1.3 Transform Network Control	D1.3.3 Upgraded Control Centre video walls and operator consoles, with a single interface giving an overall state of the power system. This will allow Control Centre engineers make better and quicker decisions.	140 ENCC Operator Console This will also give an overall view of the state of the power system in one place enabling Control Centre managers to make better and quicker informed decisions. In emergency cases, the silver command team will also be able to have faster reaction times and give the most up to date and relevant information to external stakeholders. Control Centre users will get all data from our IT investment 220 Data and analytics platform. Critical modules and applications will be delivered by IT investments 180 Enhanced balancing capability and 110 Network control.	Project	Current Control Centre facilities maintained.	N/A	Q1 – start user experience (desks and graphical user interface) project. Q2 – scope requirements. Q3 - begin design work. Q4 – continue design work.	Current Control Centre facilities maintained.	Current Control Centre facilities maintained. Requirements for new Control Centre visualisation tools understood and scope agreed. Understand technology required to enable iEMS tool to drive the video wall. Delivery timeline agreed and progress tracked. Design work commenced on schedule.	By March 2026 Our enhanced Control Centre video walls and operator consoles will integrate all of the tools developed to ensure Control Centre engineers can visualise the real-time state of the network. Using these tools, they will be able to understand and analyse the increased data coming into the Control Centre and use it to make optimal decisions.	
A1.3 Transform Network Control	D1.3.4 Increased operational liaison with DNOs. The Regional Development Programmes (RDPs) will highlight new ways of working with a range of network companies across time horizons. This deliverable relates to the incorporation of these new ways of working into our operational processes. Due to the “learn by doing” approach to RDPs, we cannot say at this stage exactly what the changes will be.	N/A	Continuous	Learnings from Optional Downward Flexibility Management (ODFM) learning; rudimentary work on managing voltages, learning from DNOs, information sharing.	Q1-Q2 - Engage DNOs to develop view of further information to support service coordination. This may include identifying services covered, granularity of information to be shared in both directions and timescales. Ongoing – learnings and new ways of working from RDPs incorporated into operational processes and ways of working.	Engage DNOs to develop process to share further information to support service coordination. Ongoing – learnings and new ways of working from RDPs incorporated into operational processes and ways of working.	View of further information to support service coordination, to be shared with DNOs complete (building on ODFM learnings and delivered in coordination with ENA Open Networks Project). Key concepts from RDPs identified and utilised to demonstrate better ways for whole network to work together in real-time.	Process in place to share further information to support service coordination (building on ODFM learnings and delivered in coordination with ENA Open Networks Project). Key concepts from RDPs identified and utilised to demonstrate better ways for whole network to work together in real-time.	Key concepts from RDPs identified and utilised to demonstrate better ways for whole network to work together in real-time.	Further clarity added on this deliverable.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	This deliverable will also help facilitate enhanced coordination in network access planning by ensuring liaison in operational timescales.									
A1.4 Control Centre Architecture	D1.4.1 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.	220 Data and Analytics Platform The data and analytics platform will retire many of our data legacy systems. It will include analytics capability, so we can access, share and shape any type of data we store. This is critical to allow quicker, accurate operational decisions and give our customers value added information.	Project	Data portal in operation with application program interfaces (APIs) available. Learning captured from data portal use of APIs and data management for use with data platform work.	(The work-breakdown structure associated with this deliverable is complex. We have provided a summary here. For full details please see IT ref 220 Data & analytics platform). Q1-4 – build data platform foundation. Q1-4 – develop master data management strategy. Q2 - phase 1 data management scoping complete for modelling and data management for Operability (Role 3, A15.6.1). Regular progress updates with the TAC.	(The work-breakdown structure associated with this deliverable is complex. We have provided a summary here. For full details please see IT ref 220 Data & analytics platform). Q1-3 – continue building data platform foundation. Q3 – deliver machine learning for balancing and forecasting. Q4 – integrate data platform with digital engagement platform Q4 – integrate data platform with single markets platform. Regular progress updates with the TAC. Q1-Q4 - Explore opportunities for Data and Analytics Platform to support real-time operational data exchange in support of Regional Development Programmes.	Evidence of ongoing, constructive, planned engagement with stakeholders ensuring their requirements are fully considered. Code changes identified and roadmap of activity for next 12 months agreed. Data platform foundation build on target. Master data management strategy developed and implemented. Incremental benefits identified in cost-benefit analysis realised.	Master data management system completed. Data platform foundation delivered including successful testing of plug-and-play approach with modules in development/delivery phase. Stakeholder able to submit and access single version of the truth data for an agreed subset of data. Digital engagement platform and single markets platform migrated to data platform, providing a single point of access for participation in ESO balancing services. Planned code change activity completed. Further code changes identified and roadmap of activity for next 12 months agreed. Evidence of ongoing, constructive, planned engagement with stakeholders ensuring their requirements are fully considered. Incremental benefits identified in cost-benefit analysis realised.	By March 2023 Data is available in a common environment accessible via APIs. All parties can use and harvest data. The completed communications architecture allows new systems to be integrated seamlessly in a 'plug-and-play' or 'app-like' way. This allows our plan, and future system upgrades, to flex with the need to meet the challenges of facilitating the transition to net zero. By March 2026 All relevant systems are integrated a single version of the truth becomes available for all data, providing accessibility and transparency for stakeholders. Control Centre engineers are using a consolidated graphical user interface allowing them to better visualise and analyse the operational data. Demonstrated efficiencies from internal process through availability of single complete and consistent data set. Benefits identified in cost-benefit analysis realised.	Updated to provide more clarity on what will be delivered in BP1.

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A1.4 Control Centre Architecture	D1.4.2 Creation of the ESO Technology Advisory Council (TAC), open to external stakeholders, who we will work with on the development of new balancing and control tools.	none	Continuous	TAC set up to inform the overall direction and provide input into the design, development and testing phases of our solution development.	Ongoing – regular meetings with the TAC (likely to be at least quarterly).	Ongoing – regular meetings with the TAC (likely to be at least quarterly).	Positive feedback from the TAC and wider stakeholders on ESO transparency, accountability and engagement.	Positive feedback from the TAC and wider stakeholders on ESO transparency, accountability and engagement.	From April 2021: The ESO will work with a cross-sector TAC to guide the digital and technological transformation. The TAC will provide stakeholder input, transparency and accountability into the development of new systems and markets.	Updated to provide more clarity on what will be delivered in BP1.

A2 Control Centre training and simulation

Our proposals for A2 Control Centre Training and Simulation help deliver our **zero carbon operation ambition** giving us the training and simulation capability to be able to operate the zero carbon system of the future. We expect this to be a step-change in complexity from today, with more market participants and greater volumes of embedded, weather dependent and asynchronous generation.

A2.1 Ongoing activities ensures that the control centre is appropriately resourced to continue operating the system safely, efficiently and economically. We will have the appropriate policies and carry out technical investigations as necessary.

A2.2 Enhanced training material will ensure we develop a pipeline of talent and skills into the control centre by forging deep relationships with universities and wider industry to train students and our colleagues across the industry in system operation.

By the end of BP-1 we will have:

- Strengthened relationships with existing universities and built relationships with new ones to start delivering new modules and courses in system operation.
- Laid the foundations for partnering with universities, DNOs and other industry participants to ensure the skills identified for development industry wide are those required to operate a zero carbon system by 2025.

This helps ensure our 2025 zero carbon operation ambition is on track by:

- Delivering modules in system operation that, based on feedback, we can update and iterate, including building into longer (e.g. one-year long) courses.
- Providing the enhanced training we need for future control centre engineers to manage the operational landscape of the future. For modules starting in September 2022, we may see some flow into the ESO for 2023/24.
- Developing relationships that will equip staff and organisations across the energy industry with the knowledge and skills that we need to achieve our 2025 aims and attract them to a career in the ESO.

A2.3 Training simulation and technology will mean our control centre engineers will be better equipped in BP1 to manage the operating environment associated with a zero carbon system.

By the end of BP-1 we will have:

- Control engineer training based on up to date scenario snapshots that reflect the increase in balancing services providers and opportunities to operate the system in a less-carbon intensive way.
- Delivered practical improvements to system operation as control centre engineers have better training on how to use key systems and how to manage the changing operational environment. This will help improve their decision making, leading to safer and more efficient system operation. It also means that experienced control engineers do not have to be released from operational duties to directly support training and allows training to focus on the power system being developed in addition to the power system of today.

This helps ensure our 2025 zero carbon operation ambition is on track by:

- Ensuring that our new training and simulation technology that we will deliver in subsequent years reflects industry best practice.

A2.4 Workforce and change management will mean the control centre reflects (where possible) modern, flexible working and training practices. Control engineers are better supported in delivering the complex requirements of carbon-free system operation by ensuring we have the correct processes for maintaining staff wellbeing and providing them with the latest updates in easy to digest formats.

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A2.1 Ongoing activities	D2.1.1 Develop and drive control centre strategic resource planning, scheduling and training.	None	Continuous	N/A	N/A	N/A	N/A	N/A	N/A	
A2.1 Ongoing activities	D2.1.2 Incident analysis and investigations of abnormal events, implementing	None	Continuous	N/A	N/A	N/A	Sustained or improved investigation quality and to 75%. investigation actions	Sustained or improved investigation quality and to 85%. investigation actions	Sustained or improved investigation quality and investigation actions closed on time from 2022/23.	Updated to provide more clarity on what success will be in BP1.

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	improvements where needed.						closed on time from 2020/21 to 95%.	closed on time from 2021/22 to 97%.		
A2.1 Ongoing activities	D2.1.3 Monitoring and reporting of system performance to regulatory bodies and ENTSO-E.	None	Continuous	N/A	N/A	N/A	N/A	N/A	N/A	
A2.1 Ongoing activities	D2.1.4 Guidance on operational policies for use in the control centre produced.	None	Continuous	N/A	N/A	N/A	N/A	N/A	N/A	
A2.2 Enhanced training material	D2.2.1 Development of new modules and (based on feedback) new qualifications in system operation formed via an enhanced partnership with academic institutions.	None	Project	Building relationship with selected universities to understand what is possible and plan how best to encourage development and inclusion of course content on electricity system operation.	Q1 – develop plan for engaging academia, including detail of the institutions to talk to, how we can work together, understanding the process for creating modules and the skillset for future power system operation. Q2-4 – work with industry to define skillset for future power system operation. Q3-4 – work with institutions to develop new module(s), for delivery in September 2022.	Q1-2 – work with institutions to develop new module(s), for delivery in September 2022. Q3 – run new university modules. Q4 – run new university modules.	Skillset for future power system operation agreed across industry. Plan for engaging with universities, including the topics we want content developed on and an understanding of which institutions we can partner with. Details of partnership agreed with selected universities to design and deliver optional electricity system operation modules for existing university courses which provides an overview of all elements of system operation, including power system engineering, market operation and commercial and regulatory frameworks.	ESO supports delivery of new module content delivered within university courses during academic year 22/23. Evaluation of new module content. More academic partnerships built to deliver new module content. Support the dissertation process of existing university courses, allowing candidates to work on an ESO-relevant project and gain experience of the ESO as part of the development of their project. This work lays the foundation for partnering with universities to ensure the right skills are developed that are required to operate a zero-carbon system. For modules starting in September 2022, we may see some flow into the ESO for 2023/24.	By March 2023 See Second Year success. By March 2026 UK institutions that already offer courses in relevant subjects such as power system engineering, data science and energy systems have been given the option partner with the ESO to ensure that existing qualifications remain relevant. Exploring potential for use of future training simulators in support of university projects and courses. Regular recruitment from graduates of these courses supports workforce planning by providing a secure pipeline of high-quality talent joining the ESO (and wider industry) who are ready to be developed through a recognised career track to fill business critical roles.	One-year delay due to covid-19, meaning preparatory work with academia in 2020/21 has not been possible.

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								The first suite of modules will have been run that, if successful, will form the basis of future partnerships between institutions and the ESO (see March 2026 aims).		
A2.2 Enhanced training material	D2.2.2 Enhanced training and simulation with DNOs and wider industry.	None	Project	Engage with cross ESO high level planning for engagement with energy industry stakeholders during RIIO-2 to ensure coordinated approach makes effective use of stakeholder time and resources.	Q2 – develop plan for engaging with energy industry, including detail of the organisations to talk to, how we can work together. Q2 – develop plan for engaging with energy industry, including detail of the organisations to talk to, how we can work together. Q2 – understand the requirements for cross-industry secondments including post-COVID-19 safeguards. Q3-4 – work with industry to define skillset for future power system operation and understand potential opportunities for wider industry/whole system training in RIIO-2/ED2.	Q1-4 – explore requirements with industry on possible training using enhanced ESO simulators. Engage DNOs on sharing data, what their interest is and how we can help each other. Q1 – Implement cross industry development initiatives for individuals (up to and including secondments where possible).	Team set up and liaising with external parties to understand DNO needs and appetite to work together on wider industry training in ED2. Team set up and liaising with external parties to understand DNO needs and appetite to work together on wider industry training in ED2.	Cross industry development initiatives for individuals (up to and including secondments) are now normal, with best practice being regularly shared. Positive engagement with industry on partnerships to develop whole electricity system training. An understanding of the appetite of DNO's and other industry participants to develop future opportunities for training and development initiatives which reflect and are in response to wider energy industry needs. Practical improvements to system operation will be delivered through the sharing of best practice across the industry.	By March 2026, whole electricity system training and joint exercises will be standard across industry. ESO capable of providing training to meet the needs of other parties reflects the needs, in particular working together to enable the DNO to DSO transition. Best practice will be continuously shared. This will lead to optimal decision making and increased levels of safety and reliability. Potential for use of future training simulators in support of whole electricity system training is being explored, enabling the DNO to DSO transition.	One-year delay due to covid-19, meaning preparatory work with academia in 2020/21 has not been possible. Due to covid-19, secondments are likely to be more a-hoc and based on bilateral relationships rather than a more structured programme.
A2.3 Training simulation and technology	D2.3.1 Upgrades to current simulators, including annual scenario snapshot refreshes, ahead of developing new training simulation capability, including end-to-end bespoke	200 Future training simulator. We will use our new simulation capabilities to deliver a training suite that includes end-to-end	Project	Annual refreshment of existing simulator snapshot scenario completed to reflect key changes to the energy landscape.	Q1 – Develop plan to explore best practice training and simulation technology including understanding requirements for post-COVID-19 safeguards.	Q1 – continue exploring best practice training and simulation technology. Q2 – continue exploring best	Annual refreshment of existing simulator snapshot scenario completed to reflect key changes to the energy landscape.	Annual refreshment of existing simulator snapshot scenario completed to reflect key changes to the energy landscape.	By March 2025 Control Centre engineers will be using training simulators which accurately reflect the changing energy landscape. This will allow them to learn	Prioritisation of IT portfolio due to COVID-19, meant development of Balancing Mechanism training simulator to support energy and strategy training for Control

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	<p>training scenarios and simulated operational systems using live data.</p> <p>This functionality will be delivered as a training capability through D1.2.1 Enhanced Balancing Capability and D1.3.1 Transform Network Control to ensure training environment is able to duplicate real time operations.</p>	<p>scenario simulations. The training simulator will also integrate capabilities from IT investment 400 single markets platform to easily create complex scenarios.</p> <p>The same capabilities can be used to use different data sets and train DSOs and other industry stakeholders, if such need arises, as well as our own teams.</p>		<p>Current status of energy and strategy training for control engineers understood and improvements for Balancing Mechanism training simulator planned to support training in managing the changing energy markets.</p>	<p>Q2 – begin exploring best practice training and simulation technology.</p> <p>Q3 – update existing simulators with scenario snapshots.</p> <p>– continue exploring best practice training and simulation technology.</p> <p>Q4 – continue exploring best practice training and simulation technology.</p>	<p>practice training and simulation technology.</p> <p>Q3 – update existing simulators with scenario snapshots.</p> <p>– continue exploring best practice training and simulation technology.</p> <p>Q4 – continue exploring best practice training and simulation technology.</p>	<p>Balancing Mechanism training simulator improved and started supporting energy and strategy training for control centre engineers.</p> <p>Findings from best practice training and simulation technology shared with D1.2.1 and D1.3.1 project teams.</p> <p>Control engineer training is based on up to date scenario snapshots which reflect the increase in balancing services providers and reflect the increasing opportunities to operate the system in a less-carbon intensive way.</p> <p>Control Centre engineer training is based on up to date scenario snapshots which reflect the increase in balancing services providers and reflect the increasing opportunities to operate the system in a less-carbon intensive way.</p>	<p>Balancing Mechanism training simulator supports energy and strategy training for control centre engineers.</p> <p>Findings from best practice training and simulation technology shared with D1.2.1 and D1.3.1 project teams are being incorporated into development of training capability.</p> <p>Control engineer training is based on up to date scenario snapshots which reflect the increase in balancing services providers and reflect the increasing opportunities to operate the system in a less-carbon intensive way.</p>	<p>from a range of past and future scenarios, including using real-time data as opposed to the current snapshots used in 2020.</p> <p>Our training capabilities will be fully aligned with the new balancing and network control tools, and any future updates, providing fully integrated training and simulation capability on energy and transmission.</p> <p>Potential for use of future training simulators in support of university courses and whole electricity system training is being explored, enabling the DNO to DSO transition.</p>	<p>Centre engineers in 2020/21 has not been possible.</p>
A2.3 Training simulation and technology	D2.3.2 New training methods and platforms, including online and e-learning, introduced to support training and new starters and continued development of existing staff.	None	Project	<p>Training for some roles moved into classroom and becomes less reliant upon shadowing Control Centre colleagues and learning “on the job”.</p> <p>Potential alternative options explored, initially video and E-learning including costs and timelines</p>	<p>Q1 – understand lessons learnt from Project TERRE E-learning trial including cost considerations and effectiveness of training delivery.</p> <p>Q1 – identify and evaluate other opportunities to deploy E-learning and develop plan.</p>	<p>Q1-4 - use new video and e-learning training enhancements.</p> <p>Q3-4 – incorporate use of new video and e-learning training enhancements into design of new academic modules, due to start in September 2022.</p>	<p>Delivery via video and e-learning evaluated against success criteria including student experience.</p> <p>Continued exploration of ways to reduce reliance upon shadowing Control Centre colleagues and learning “on-the-job” with different options</p>	<p>Delivery via video and e-learning evaluated against success criteria including student experience.</p> <p>Continued development and implementation of training materials and approaches which reduce reliance upon shadowing Control Centre colleagues</p>	<p>By March 2023 Control Centre engineers will be trained on a variety of platforms to meet individual and organisation training needs, reducing the specialised resource needed to support each individual.</p>	<p>Use of the new video and e-learning enhancements in new academic modules to start from September 2022 rather than September 2021, due to delay in starting new modules.</p>

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				E-Learning trialled for Project TERRE.	Q2-Q4 –develop and deploy of new E-learning modules as required.		such as classroom, video, E-learning, etc including NG Academy platform. Next steps identified and planned.	and learning “on-the-job”. New training methods become part of the new academic modules, providing deeper and more flexible training.		
A2.4 Workforce and change management	D2.4.1 Personalised updates and automated shift logins, allowing for learning and operational investments to made available on different platforms and updated to a user's profile, giving better training and operational decision making.	190 workforce and change management tools. We will integrate these management tools with our IT investments 180 Enhanced balancing capability and 110 Network control tools to enable personalised updates. They will be linked to the rota and change management tools to allow for relevant updates to be given as required, for example, when a Control Centre user returns from a day off to perform a specific role. Automation of workforce related processes will allow for more flexible rota planning as well as ensuring all users have the most up to date information to do their job.	Project	Review of rotas to ensure protection of staff wellbeing while providing efficient Control Centre staffing levels. Rota management automation project Phases 1 and 2 completed providing better management of the authorisation database containing details of which individual control engineers are qualified for which duties.	Q1-Q2 – evaluate Phase 1 and 2 of Rota management automation project implementation and operation with users. Q2 – understand capabilities of underlying systems and understand opportunities for enhancement in Phase 3. Q3 – agree Phase 3 requirements. Q4 – define high-level scope for Phase 3 with IT provider.	Q1 – start work on Phase 3 of Rota management automation project. Q1 - start work on document management (e.g. control centre policy) improvements project. Q2 - Scope requirements for document management improvements. Q3 – start design work for document management improvements. Q4 - Continue design work for document management improvements.	High level scope for Rota management automation enhancements work (Phase 3).	Rota management process reviewed, improvements identified and specified. Design work for automation of workforce related processes including development of personalised updates and automated shift logins underway.	By March 2025 Control Centre engineers' wellbeing and development is supported using greater automation in producing rotas and personalised training packages. The enhanced user experience will provide flexibility to both the trainee and the trainers through their authorisations and training needs.	
A2.4 Workforce and change management	D2.4.2 Content and infrastructure for personalised training plans designed, developed and delivered.	See D2.3.1	Continuous	Generic assessment used to identify candidates with aptitude for control engineer role. Current simulator technology does not support more refined assessment which would enable standard training programmes to be adjusted to fit	N/A	N/A	N/A	N/A	By March 2025 Potential control centre engineers will be assessed using training simulators which can support identification of individual aptitude for control engineer roles and inform adjustment of the standard training programme to ensure	

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				individual requirements.					each suitable candidate receives training tailored to their existing knowledge and skills set which results in more effective preparation for Control Centre roles in a shorter time.	

A3 Restoration

Our proposals for restoration are fundamental to delivering our **zero-carbon operation ambition** and **competition everywhere ambition** in the services we procure.

Details of the specific activities are provided below. It is important to understand the relationships between the different elements.

- **D1.3.5** Fully competitive Black Start procurement process will establish and test approaches to competitive procurement for black start.
- **A3.3** Innovation project in restoration will establish a proof of concept for the provision of black start services from Distributed Energy Resources (DER). If the project establishes that DER can deliver this service, the competitive procurement process can be evolved to establish a route to market for DER to provide black start.
- **A3.2** Restoration standard includes **D3.2.4** Restoration decision making support tool. The requirements and design for this tool are heavily dependent on the outcomes of **A3.3** Innovation project in restoration and subsequently cannot start until the conclusions of the innovation project are known.

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A3.1 Ongoing activities	D3.1.1 Control Centre has fully tested skills, processes, plans and tools to support incident management and disaster recovery.	None	Continuous	N/A	Control Centre staff trained to fulfil their role under new licence condition imposed following publication of Restoration Standard.	Ongoing training of Control Centre staff to ensure all are aware of their roles under restoration.	Planning for 60% of demand restored within 24 hours, on a zonal basis if economic, as per Black Start procurement methodology ² .	Planning for 60% of demand restored within 24 hours on a zonal basis, if economic, as per <i>Black Start Strategy and Procurement Methodology</i> .	TBC – will be based upon new restoration standard.	The Restoration Standard is now anticipated to be in place (i.e. in ESO's licence) from April 2021. Milestones have been adjusted accordingly.
A3.1 Ongoing activities	D3.1.2 Restoration plans for GB with the necessary stakeholders, developed, maintained and validated.	None	Continuous	N/A	Review and update of plans as required on individual review dates. 2021/22 <i>Black Start Strategy and Procurement Methodology</i> consulted and published.	2022/23 <i>Black Start Strategy and Procurement Methodology</i> consulted and published <i>System Restoration Plan</i> reviewed and consulted.	Restoration Plans reviewed in line with ESO's review criteria (minimum of every 3 years). <i>Black Start Strategy and Procurement Methodology</i> accepted by Ofgem.	Restoration Plans reviewed in line with ESO's review criteria (minimum of every 3 years). <i>Black Start Strategy and Procurement Methodology</i> accepted by Ofgem.	Relevant restoration plans aligning with Black Start Strategy restoration approach.	Annual publication of <i>Black Start Strategy and Procurement Methodology</i> as per licence obligation.
A3.1 Ongoing activities	D3.1.3 Engage and collaborate with industry to plan and develop the new GB restoration standard, including the annual assurance framework, consistent with our licence obligations.	None	Continuous	N/A	N/A	N/A	N/A	N/A	N/A	
A3.1 Ongoing activities	D3.1.4 Advice and oversight of Black Start and restoration strategy for the future provided.	None	Continuous	N/A	N/A	N/A	N/A	N/A	N/A	
A3.1 Ongoing activities	D3.1.5 Fully competitive Black Start procurement process with	None	Project		As per Section 8 of procurement methodology.	As per section 8 of procurement methodology.	Contracts awarded to successful parties for the South West / Midlands and Northern Tenders with	By March 2022 We will have delivered the first of these tenders enabling the transition	Final delivery of this activity will be a fully implemented competitive process for Black Start.	This activity has been reclassified from "continuous" to "project" to

² <https://www.nationalgrideso.com/document/173826/download>

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	submissions from a wide range of technologies connected at different voltage levels on the network, with DNOs playing a more active role in the restoration approach.				<p>Q1-Q2 Deliver competitively tendered Black Start contracts from the South West / Midlands and Northern tenders.</p> <p>Q1-2 Carry out preparatory work for future tender opportunities in South East, in preparation for future tender event.</p>	<p>Q1-Q2 Deliver competitively tendered Black Start contracts from the South East tenders.</p> <p>Q3 contract award and service commences.</p>	<p>support provided to parties through the process before they start delivering the contracts.</p> <p>Preparatory work for future tender opportunities in South East complete.</p> <p>Publication of an updated restoration roadmap to highlight future opportunities for Black Start services – including integration of the findings from Distributed ReStart project</p>	<p>of Black Start from a service which is bilaterally procured to one with a more open and transparent procurement approach.</p> <p>Contracts awarded to successful parties for the South East Tenders with support provided to parties through the process before they start delivering the contracts.</p> <p>Something about a plan/updated roadmap for next stages?</p>	<p>Opportunities for engagement will be published with clear technical requirements to enable participation from the whole market and all service providers who meet these.</p>	<p>reflect its transformational nature</p> <p>COVID-19 impact: The tendering process for Black Start contracts has had revised timescales due to provider delays in completing feasibility or commercial studies due to lack of resource during COVID19.</p>
A3.2 Restoration standard	D3.2.1 Facilitate and compile, on behalf of the GB industry, the annual assurance process for GB Black Start.	None	Project		<p>[These timescales are based on the GB standard go-live in April 20210, with ESO have 12 months to implement].</p> <p>Q1 – Restoration Standard in ESO's licence conditions.</p> <p>Q2 – External plan for licence implementation consulted on.</p> <p>Q4 Publication of Assurance Framework for consultation.</p> <p>Q2-4 – Continue implementing GB restoration standard licence conditions.</p>	<p>Q1 – Restoration Standard in place.</p> <p>Q2 – Complete annual assurance framework data collection and validation - use outputs to recommend improvements.</p> <p>Q3 - Implement improvements.</p>	<p>Detailed plans in place to complete implementation within 12 months after licence condition; including training, industry agreements, code modifications, and changes to processes and systems required.</p> <p>A communicated implementation plan, with code changes identified to support the annual assurance process under a Restoration standard.</p> <p>Publication of Assurance Framework.</p>	<p>Control centre engineers, ESO leaders and staff and wider industry fully prepared to deliver GB restoration standard supported by necessary industry agreements, code modifications, processes and systems.</p> <p>First annual assurance framework data collection and validation successfully completed and identified improvements implemented.</p> <p>A communicated implementation plan, with all necessary code changes fully consulted on and passed to support the annual assurance process under a Restoration standard.</p>	<p>By December 2022 GB industry has successfully completed the first annual assurance process for GB Black Start readiness, including agreeing and implementing improvements.</p>	<p>The Restoration Standard is now anticipated to be in place (i.e. in ESO's licence) from April 2021. Milestones have been adjusted accordingly.</p>

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A3.2 Restoration standard	D3.2.2 Validate restoration timelines for GB using the assurance data.	None	Project	See D3.2.1	[These timescales are based on the GB standard go-live in April 2021, with ESO having 12 months to implement]. Q1 Produce statement of restoration timescales. Q2 – Implementation of restoration standard (in line with D3.2.1). Q3 – restoration standard in place (12 months after licence condition).	Q1 -Q2 – continue implementing GB restoration standard licence conditions. Q1 – restoration standard in place (12 months after licence condition). Q3 – begin validation of restoration timelines using output from first annual assurance process (D3.2.1).	Statement of restoration timescales (i.e. what restoration times are nationally & zonally) to be produced for restricted review to establish the current status in 2021 of restoration timescales and to enable future monitoring of standard effectiveness.	Confirmation provided new restoration timescales can be met across the industry, leading to faster system restoration (should the need ever arise). Statement of restoration timescales to demonstrate that restoration timescales are decreasing (if all industry codes & supporting measures in place).	ESO have produced a standard statement of restoration to demonstrate the year on year improvement to the Restoration Standard. This uses results from the assurance framework to update model variables in line with reported assurance areas.	The Restoration Standard is now anticipated to be in place (i.e. in ESO's licence) from April 2021. Milestones have been adjusted accordingly.
A3.2 Restoration standard	D3.2.3 Maintain obligations and requirements against the new standard for Black Start capability provision.	None	Project	Compliance with current Black Start obligations.	These timescales are based on the GB standard go-live in April 2021, with ESO have 12 months to implement. Q1 – Restoration Standard in ESO's licence conditions. Q2 – External plan for licence implementation shared and consulted. Q3&4– Continue implementation of GB Restoration standard through code and or contractual means.	Q1 & Q2 Continue to implement GB Restoration Standard Licence conditions to meet new obligations.	ESO has maintained its license and code obligations whilst designing the necessary frameworks to implement a GB Restoration Standard, including design and training towards application of the Assurance Framework.	ESO has maintained its license and code obligations whilst facilitating the annual validation of the GB standard via the Assurance Framework.	Obligations under the standard become BAU compliance obligations once in force, and implementation period across the industry is completed.	The Restoration Standard is now anticipated to be in place (i.e. in ESO's licence) from April 2021. Milestones have been adjusted accordingly.
A3.2 Restoration standard	D3.2.4 Restoration decision making support tool designed and developed to aid faster restoration times in line with stakeholder expectations.	510 Restoration decision support tool. We will implement a tool that runs live with the latest network configuration, providing a dynamic decision tree for the best	Project	N/A	Q3 – Develop high level scope and requirements. Q4 – Restoration decision support	Design, build and delivery activities during 2022/23 aligned to our Solution Delivery Framework.		Engagement with stakeholders on the requirements and design for the restoration decision support tool (e.g. input data needed from across industry).	By March 2024 Control Centre engineers have the ability to have a dynamic tool with current advice on the best route to restoration and are enabled to manage potentially hundreds of	In response to Ofgem's feedback we have reviewed the timescales for the Restoration Decision Making Tool. We do not believe it is possible to articulate further

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		route to restoration. It will change its output every time the network configuration changes and update live in a restoration situation if the initial recommendation is overruled. It will be flexible to accommodate learnings from restoration innovation project and meet Government restoration standards, including user defined scenarios for multiple restoration strategies.			tool project start up.	Q1 - Finalise restoration decision support tool project start up. - Engage with TAC on project requirements. Q2 - Scope requirements. Q3 – Engage with design authority on design. - Commence design work. Q4 – Commence development work on restoration decision support tool.		Tool design and development underway.	restoration providers. Plans can respond immediately to changes in the restoration situation.	system changes that will be made in BP1 due to: <ul style="list-style-type: none"> Requirements and design for the Decision Support Tool are dependent on the conclusions of A3.3 Distributed ReStart (Innovation project in restoration) Expert restoration business resources will be deployed in delivery of the new restoration standard as well as the innovation project in this period. In addition to the previous point we consider attempting to bring this investment forward would undermine the deliverability of the restoration activities as a whole.
A3.3 Innovation project in restoration	D3.3.1 Trial case studies based on different technology types. Innovation project in restoration will establish a proof of concept for the provision of black start services from Distributed Energy Resources (DER).	None	Project	Innovation project ReStart ongoing: <ul style="list-style-type: none"> With process for restoration defined; control systems design and power engineering live trials have begun. 	Q1 – Project progress report. Q2 – implement 2 or 3 proof of concept case studies to confirm feasibility and cost. Q2 – Refined organisation, systems and telecoms requirements. Q3 – Demonstration of Black Start for DER. Q3 - Final version of generic procurement terms. Q3 – Project progress report. Q4 – Final proposals for functional and	N/A	Case studies selected, implemented and concluded. Control systems designed. Power Engineering Live trials complete. End to end procurement design complete. Telecommunications functional specification complete. Relevant learning gathered and used to determine distributed restart feasibility and go/no go decision for D3.3.2.	N/A	By March 2022 (see First year success), we will have established proof of concept for distributed restart, including an understanding of the challenges to implementation.	Updated to provide more clarity on what will be delivered in BP1.

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					testing requirements.					
A3.3 Innovation project in restoration	D3.3.2 (Subject to project findings) Proof of concept findings implemented and new system and communication methods implemented.	460 Restoration We will support for the innovation project for technological solutions and procurement recommendations. From these, put in place changes ranging from secure communication links to distributed energy resources (DERs), to creating auctions for restoration services.	Project	See D3.3.1 above.	See D3.3.1 above.	Q1 – Q2 –assess learning from innovation project, working with stakeholders across the industry. Q3 - engage with industry on productionisation. Q4 - produce roadmap for productionisation.	See D3.3.1 above.	Roadmap published for delivery of the collaborative and comprehensive solution developed jointly by the ESO and DNOs to allow DER to participate in the restoration market.	By March 2026 (subject to proof of concept findings), distributed resources are able to participate fully in restoration services. This will include completion of necessary framework, market, system and infrastructure work.	

A17 Transparency and open data

Our proposals for Transparency and Open data drive progress towards our Trusted Partner ambition as well as our ambition to be able to operate a zero carbon system. Through transparency of our actions, stakeholder and market participants will be able to understand, and have greater confidence in, the decisions that we take to balance the system in real-time. In addition, by providing far greater diversity and volumes of operational and market data we anticipate that we will stimulate a fresh wave of innovation in low carbon and whole electricity system operation solutions. These solutions may mature into tools that will help us to operate the zero carbon system of the future.

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A17 Transparency and Open Data	<p>Transparency Roadmap</p> <p>This new deliverable defines the outcomes, timescales and steps to achieve the ESO's ambition to provide the highest level of transparency possible.</p> <p>Further detail on the specific elements contained within the Roadmap are shown in the rest of the Transparency and Open data section below.</p> <p>Note that whilst Energy Forecasting publications are in scope of the Transparency Roadmap, the details on publication updates for forecasting are covered in section A1.1 (D1.1.7) above.</p>	<p>220 - Data and analytics platform: It will be the key 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.</p> <p>250 - Digital engagement platform: This investment will offer a single point of access into the ESO systems and external-facing processes, providing secure, open access to data, compliant with data classification policies and standards. We will consolidate our ESO data publication and reporting channels, offering stakeholders access to our data, including multi device capability and Application Programming Interfaces (API) functionality.</p>	Continuous	Initial <i>Transparency Roadmap</i> published with feedback on scope and methodology received.	<p>Q1 – Publish <i>Transparency Roadmap</i> refresh.</p> <p>Q3 – Publish <i>Transparency Roadmap</i> refresh.</p>	<p>Q1 – Publish <i>Transparency Roadmap</i> refresh.</p> <p>Q3 – Publish <i>Transparency Roadmap</i> refresh.</p>	<p>ESO <i>Transparency Roadmap</i> refresh published informed by stakeholder feedback.</p> <p>This will provide clarity on information that we share and future developments.</p> <p>Positive stakeholder feedback received.</p>	<p>ESO Transparency Roadmap refresh published informed by stakeholder feedback.</p> <p>This will provide clarity on information that we share and future developments.</p> <p>Positive stakeholder feedback received.</p>	N/A	This is a new deliverable, not included in December 2019 Business Plan.
A17 Transparency and Open Data	<p>Transparency of operational decision making.</p> <p>Provision of enhanced data to provide greater clarity and consistent</p>		Continuous	<p>Transparency of operational decision-making actions delivered including:</p> <ul style="list-style-type: none"> N-BM STOR (non-Balancing Mechanism Short 	Engage stakeholders to review and refine scope and quality of information shared.	Engage stakeholders to review and refine scope and quality of information shared.	Transparency of operational decision making will be further enhanced, for example through sharing data sets on operational decisions	Transparency of operational decision making will be further enhanced with information on operational decisions		This is a new deliverable, not included in December 2019 Business Plan.

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	<p>information about the individual actions taken in the Balancing Mechanism (BM). Sitting alongside this data will be a methodology statement which sets out the data provided and how it can be interpreted.</p> <p>Data to be published includes:</p> <ul style="list-style-type: none"> All Bid Offer Acceptances (BOAs) including reasons potential alternative actions. <p>For actions not accepted reason codes which explain the operational need which is not resolved by the available actions not accepted. These actions when assessed on price comparison alone might be perceived as more optimal.</p>			<p>Term Operating Reserve) instructions & system operator plan</p> <ul style="list-style-type: none"> Machine readable system operator plan <p>Initial publication on BM decision making</p>	Rolling delivery of improvements identified.	Rolling delivery of improvements identified.	<p>for a wider range of services and ancillary service contracts publication.</p> <p>Positive stakeholder feedback received.</p>	<p>shared for a wider range of services.</p> <p>Positive stakeholder feedback received.</p>		
A17 Transparency and Open Data	<p>Trading transparency</p> <p>This deliverable aims to provide industry with greater transparency of our trading decisions. It will be driven by the feedback we get from engaging with our stakeholders on what information is most helpful to them and how it should be prioritised.</p>		Continuous	<p>Trading transparency engagement complete and action plan published.</p> <p>Transparency actions delivered including:</p> <ul style="list-style-type: none"> Publishing Super - SEL Enactments Publication of additional trading information based on a prioritized action plan in line with stakeholder feedback. 	<p>Q1-Q4 - Engage stakeholders (through the TAC and surveys at the Transparency Forums) to review and refine scope and quality of information shared.</p> <p>Q1 - Q4 - Rolling delivery of improvements identified, informed by stakeholder prioritisation and assessment of deliverability.</p>	<p>Engage stakeholders (through TAC?) to review and refine scope and quality of information shared.</p> <p>Rolling delivery of improvements identified.</p>	<p>Transparency of trading actions will be further enhanced, through sharing data sets that are identified and prioritised through stakeholder engagement and surveys. This may include information such as the Balancing Mechanism Unit IDs (or other identifier) and names of trading counter-parties, migrating trade publications to the data portal, presenting the information in a more</p>	<p>Transparency of trading actions will be further enhanced, through sharing additional data sets that are identified through stakeholder engagement.</p>		<p>This is a new deliverable, not included in December 2019 Business Plan.</p>

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
							usable format, providing historic trade information, providing more information on the use of balancing services contracts.			
A17 Transparency and Open Data	<p>ESO Transparency Forum</p> <p>During the Covid-19 pandemic, NGESO establish weekly preparedness webinars with industry. We received great feedback that these webinars were helping industry to understand our operational decisions.</p> <p>The webinars have been rebranded as Transparency forums, with a renewed focus on answering transparency questions and helping industry to understand the operational decisions that we make.</p>		Continuous	ESO Transparency Forum delivered regularly.	Transparency Forum delivered regularly.	Transparency Forum delivered regularly.	<p>Stakeholders are able to better operate their assets through improved understanding of the operational decisions that we make.</p> <p>Stakeholder engagement and transparency of operational issues and decisions maintained.</p> <p>Continued positive stakeholder feedback received.</p>	<p>Stakeholders can better operate their assets through improved understanding of the operational decisions that we make.</p> <p>Stakeholder engagement and transparency of operational issues and decisions maintained.</p> <p>Continued positive stakeholder feedback received.</p>		This is a new deliverable, not included in December 2019 Business Plan.
A17 Transparency and Open Data	<p>D17.1 Open data portal with limited data sets (initial go live 2019)</p> <p>This deliverable refers to the foundational data portal acting as a proof of concept for the RIIO-2 data portal which will be powered by the Data and analytics platform and utilise the user interface of the Digital</p>	<p>220 - Data and analytics platform: It will be the key 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.</p> <p>250 - Digital engagement platform: This investment will offer a single point of</p>	Project	We will have developed a detailed strategy for our data and analytics platform, understanding the business requirements across ESO. This will have been translated into an IT architecture for implementation in RIIO-2.	<p>Q2-Q3 – Data and analytics platform foundation requirements and design.</p> <p>Q2-Q4 - Digital engagement platform requirements and design.</p> <p>Q4 - Master data management implementation.</p>	<p>Q1-Q2 – Data and analytics platform foundation development and testing.</p> <p>Q3 - Data and analytics platform foundation implementation.</p> <p>Q1-Q3 – Digital engagement platform development and testing.</p>	<p>An increasing number of data sets will be shared with stakeholders through the foundational data portal.</p> <p>Requirements of the enduring data portal will have been considered in the development of the enabling IT investments: 220 - Data and analytics platform and 250 - Digital engagement platform.</p>	<p>Integration of the data platform into the digital engagement platform will enable the acceleration of data upload automation and make publishing new datasets more efficient.</p> <p>Agile approach to adding new data sets, prioritising by overall benefit, accelerated due to data and analytics platform capabilities.</p>	<p>2024-25 All published data automated reducing publishing times (D17.4).</p> <p>All ESO data accessible through the single interface of the digital engagement platform.</p> <p>All published data available through an API.</p>	This content has been moved to sit alongside the Data and analytics platform and new <i>Transparency Roadmap</i> .

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	engagement platform. Milestones for the foundational data portal and enabling IT investments are included in this row with specific points captured in the deliverables below.	access into the ESO systems and external-facing processes, providing secure, open access to data, compliant with data classification policies and standards. We will consolidate our ESO data publication and reporting channels, offering stakeholders access to our data, including multi device capability and Application Programming Interfaces (API) functionality.				Q4 - Digital engagement platform implementation. Q4 - Digital engagement platform integration with data and analytics platform.		As new data sets are published, they are automatically in machine readable format.	Additional functionality driven by user requirements (such as subscriptions and notifications).	
A17 Transparency and Open Data	D17.2 All published ESO data in machine readable format.	220 - Data and analytics platform: It will be the key 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. 250 - Digital engagement platform: This investment will a single point of access into the ESO systems and external-facing processes, providing secure, open access to data, compliant with data classification policies and standards. We will consolidate our ESO data publication and reporting channels, offering stakeholders access to our data, including multi device capability and	Project	All published ESO data available via the ESO data portal with limited exceptions (e.g. data published through Balancing Service Report Service (BMRS)). Subset of ESO published data is machine readable.	Q2 All published ESO data in machine readable format.	Q1-Q4 – Further data sets released. Q1-Q4 – Further data sets automated. Q1-Q2 – Data and analytics platform foundation development and testing. Q3 - Data and analytics platform foundation implementation. Q1-Q3 – Digital engagement platform development and testing. Q4 - Digital engagement platform implementation. Q4 - Digital engagement platform integration with data and analytics platform.	All of the data published by the ESO is machine readable. Data is available to download manually or through an API, which will allow consumers of ESO data to integrate published data into their systems and models programmatically.	As new data sets are published, they are automatically in machine readable format.	2024-25 All published data automated reducing publishing times (D17.4)	This content has been moved into Role 1 consistent with Ofgem's organisation of feedback.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		industry standard APIs.								

Role 2 - Market development and transactions

A4 Build the future balancing service markets

Our plans for future balancing markets will see us make significant steps towards our ambition for **Competition Everywhere** in the BP1 period. Where competition already exists, we are focusing on removing barriers to entry by moving procurement closer to real time and making it much easier to provide us services through the Single Markets Platform. In support of our ambition to be able to operate an electricity system carbon free we are also developing competitive approaches for system services such as stability and reactive power.

Alongside these new markets we are also delivering **Competition Everywhere** through the removal of barriers in our activities to transform industry codes and frameworks in our proposals in the codes and charging section of this document. Competitive approaches are also being developed in our Restoration activities in Role 1.

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A4.1 Manage existing balancing services markets	D4.1 Balancing and ancillary services efficiently procured to deliver security of supply at optimal cost We manage an end-to-end process to ensure that balancing services are procured to deliver security of supply at lowest cost to consumers. We manage relationships and contracts with the growing volume and diversity of service providers.	410 Ancillary services settlements refresh: required to ensure we have the capability to perform settlements for much higher volumes of market participants.	Continuous	N/A	N/A	N/A	N/A	N/A	N/A	
A4.2 Power Responsive	D4.2.1 Regular and specific metrics and publications across Distribution System Operator (DSO) development and co-development	N/A	Continuous	Power Responsive will have raised awareness of Demand Side Response (DSR) opportunities and shaped the growth of the DSR market through extensive engagement with businesses including, regular Flexibility Forums and the annual publication of <i>Power Responsive Annual Report</i> . We will have extended our engagement to provide a	N/A	N/A	N/A	N/A	N/A	

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	of local flexibility markets through a variety of innovation projects			direct route for dialogue between the demand side community and the ESO subject matter experts. This will ensure that the views of the demand side community are reflected in the development of new products and markets.						
A4.2 Power Responsive	D4.2.2 Regular and specific metrics, and publications for multi sector approaches focusing on opportunities for household, community energy, small business participation, zero carbon technologies, and electrification of heat in Demand Side Flexibility (DSF).	N/A	Continuous	Power Responsive will have raised awareness of DSR opportunities and shaped the growth of the DSR market through extensive engagement with businesses including, regular Flexibility Forums and the annual publication of <i>Power Responsive Annual Report</i> . We will have extended our engagement to provide a direct route for dialogue between the demand side community and the ESO subject matter experts. This will ensure that the views of the demand side community are reflected in the development of new products and markets.	N/A	N/A	N/A	N/A	N/A	
Alignment of ESO-DSO flexibility markets	ESO-DSO flexibility services contract alignment.		Project	<p>We are supporting Open Networks Workstream 1A, Product 4 Contract alignment.</p> <p>Simplifying service terms and aligning where possible will provide increased market confidence and help improve market liquidity.</p> <p>RIIO-1 end point for this product is expected to be defined in Q3 2020/21.</p>	<p>Commence implementation of agreed contract alignment</p> <p>Delivery of this activity is dependent on the coordinated actions of the ESO with the ENA and 6 Distributed Network Operators (DNOs).</p>	<p>Complete implementation of ESO-DSO Contract alignment</p> <p>Delivery of this activity is dependent on the coordinated actions of the ESO with the ENA and 6 DNOs.</p>	<p>Review current commercial arrangements adopted by DNOs and the ESO in the contracting of flexibility services and agree the areas where contract alignment will be considered valuable.</p> <p>The success of this activity is dependent on the coordinated actions of the ESO with the ENA and 6 DNOs.</p>	<p>ESO-DSO flexibility services Contract alignment delivered as appropriate.</p> <p>The success of this activity is dependent on the coordinated actions of the ESO with the ENA and 6 DNOs.</p>	<p>Success will be reduced barriers and enhanced liquidity for ESO and DSO procured ancillary services.</p>	<p>This is a new activity, not previously included in the December 2019 Business Plan.</p>
Alignment of ESO-DSO flexibility markets	ESO-DSO flexibility services tendering and procurement		Project	<p>We are leading Open Networks Workstream 1A, Product 2 tendering and procurement timescales alignment. RIIO-1 end point</p>	<p>Commence implementation of ESO-DSO flexibility services tendering and</p>	<p>Complete implementation of ESO-DSO flexibility services tendering and</p>	<p>Agreed approach and end-state for implementation of ESO-DSO flexibility services tendering and procurement timescales alignment.</p>	<p>ESO-DSO flexibility services tendering and procurement timescales alignment delivered as appropriate.</p>		<p>This is a new activity, not previously included in the December 2019 Business Plan.</p>

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	timescales alignment.			for this product is expected to be defined in Q3 2020/21.	procurement timescales alignment. Delivery of this activity is dependent on the coordinated actions of the ESO with the ENA and 6 DNOs.	procurement timescales alignment. Delivery of this activity is dependent on the coordinated actions of the ESO with the ENA and 6 DNOs.	The success of this activity is dependent on the coordinated actions of the ESO with the ENA and 6 DNOs.	The success of this activity is dependent on the coordinated actions of the ESO with the ENA and 6 DNOs.		
A4.3 Deliver a single day-ahead response and reserve market	D4.3.1 We will work with stakeholders, including DNOs, to ensure that ESO market design decisions are future-proofed for the establishment of DSO markets.	400 Single markets platform: Will ultimately provide a platform providing a full end-to-end customer journey, allowing market participants to access the data relating to: how to become a provider (obligations, sign up, test, application progression), contract tender (to see contracts status and manage contracts), unit management (to see what units are registered for, see and change aggregation configuration s), dispatch (to access instructions), performance	Project	Some initial alignment of distribution and transmission flexibility markets will have been agreed including completion of relevant ENA Open Networks WS1A activities to promote coordination and cooperation.	Q1 – Day Ahead market for frequency response. Q2 - Control and dispatch solutions for reserve. Q3 – Provide input into RIIO-ED2 business plans to promote alignment of ESO and DSO markets. Q3 - Standard contract terms for reserve. Q4 - New reserve products go live.	Q4 - Single day-ahead response and reserve market go live.	Alignment of ESO and DSO services as appropriate to the maturity level of DSO service procurement.	Alignment of ESO and DSO services as appropriate to the maturity level of DSO service procurement.	As per year 2	This deliverable has been replaced by two more specific deliverables in the two columns above.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		<p>monitoring (to see how units behaved under instructions), payment.</p> <p>420 - Auction capability: This investment will provide extension of the auction capability developed for frequency response in RIIO-1 to all relevant services.</p>								
A4.3 Deliver a single day-ahead response and reserve market	D4.3.2 Day ahead market for frequency response.	<p>410 Ancillary services settlements refresh: required to ensure we have the capability to perform settlements for much higher volumes of market participants.</p> <p>420 Auction capability: This investment will provide extension of the auction capability developed for frequency response in RIIO-1 to all relevant services.</p> <p>400 Single markets</p>	Project	Full functionality of frequency response weekly auction trial deployed, and learnings shared with market.	<p>Q1 – Day ahead market for frequency response operational.</p> <p>Q1 - Day ahead response market integrated with foundational market platform (the foundational market platform comprises the automation of a subset of key processes, allowing users to set own parameters).</p> <p>Q3 – End of auction trial.</p> <p>Q4 – Phase out monthly tenders for Firm Frequency Response (FFR).</p> <p>The milestones documented in this Delivery Schedule were correct as of December 2019 and are subject to change. For 2020/21, the regularly updated Forward Plan Tracker, or its equivalent in RIIO-</p>	<p>D4.3.2 Day ahead market for frequency response evolves into D4.3.4 Full co-optimised auction for response and reserve at day ahead or even closer to real time. Please see D4.3.4 for further frequency response developments beyond year 1.</p>	<p>Auction trial complete with learnings applied to day ahead market for response. Day ahead market for response operational and we are procuring volumes for use in the control room.</p>	<p>D4.3.2 Day ahead market for frequency response evolves into D4.3.4 Full co-optimised auction for response and reserve at day ahead or even closer to real time. Please see D4.3.4 for further frequency response developments beyond year 1.</p>	As per year 1	

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		platform: Experience of participation in frequency response markets will be enhanced by the capabilities of the single market platform.			2, should be considered the master document.					
A4.3 Deliver a single day-ahead response and reserve market	D4.3.3 New Reserve Products Development and introduction of a new suite of products to provide reserve to the control room.	410 Ancillary services settlements refresh: required to ensure we have the capability to perform settlements for much higher volumes of market participants. 420 Auction capability: This investment will provide extension of the auction capability developed for frequency response in RIIO-1 to all relevant services. 400 – Single markets platform: Experience of participation in reserve markets will be enhanced by the capabilities of the single	Project	Market design for reformed reserve products published. (<i>Forward Plan</i>)	Q2 - Control and dispatch solutions for reserve. Q3 - Standard contract terms for reserve. Q4 - New reserve products go live. The milestones documented in this Delivery Schedule were correct as of December 2019 and are subject to change. For 2020/21, the regularly updated Forward Plan Tracker , or its equivalent in RIIO-2, should be considered the master document.	D4.3.3 New Reserve products evolve into D4.3.4 Full co-optimised auction for Response and Reserve at day ahead, or even closer to real time. Please see D4.3.4 for further frequency response developments beyond year 1.	New reserve products are operational and we are procuring volumes for use in the control room.	D4.3.3 New Reserve products evolve into D4.3.4 Full co-optimised auction for Response and Reserve at day ahead, or even closer to real time. Please see D4.3.4 for further frequency response developments beyond year 1.	As per year 1	

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		market platform.								
A4.3 Deliver a single day-ahead response and reserve market	D4.3.4 Full co-optimised auction for Response and Reserve at day ahead or even closer to real time	<p>410 Ancillary services settlements refresh: required to ensure we have the capability to perform settlements for much higher volumes of market participants.</p> <p>420 Auction capability: This investment will provide extension of the auction capability developed for frequency response in RIIO-1 to all relevant services. This will include algorithms for co-optimised response and reserve day-ahead auction which also considers impact on DSOs.</p> <p>400 Single markets platform: Will ultimately provide a platform providing a full end-to-end customer</p>	Project	See D4.3.1 and D4.3.2 for relevant RIIO-1 deliverables and milestones end state.	<p>D4.3.4 Full co-optimised auction for Response and Reserve at day ahead or even closer to real time evolves from D4.3.1 and D4.3.2.</p> <p>Please see D4.3.1 and D4.3.2 for relevant year 1 deliverables and milestones.</p>	Q4 - Single day ahead response and reserve market go live.	<p>D4.3.4 Full co-optimised auction for Response and Reserve at day ahead or even closer to real time evolves from D4.3.1 and D4.3.2.</p> <p>Please see D4.3.1 and D4.3.2 for relevant year 1 successes.</p>	<p>Market participants will be able to participate in a day ahead co-optimised Response and Reserve Market;</p> <p>Business processes for Response and Reserve products integrated through single markets platform. (see D4.4.1 below for more detail).</p>	<p>Auction capability integration with Single markets platform will be in early 2023-24.</p> <p>Market participants able to participate in market auctions through interface of Single markets platform (alongside other processes such as contracts and settlements).</p>	

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		journey, allowing market participants to access the data relating to: how to become a provider (obligations, sign up, test, application progression), contract tender (to see contracts status and manage contracts), unit management (to see what units are registered for, see and change aggregation configuration s), dispatch (to access instructions), performance monitoring (to see how units behaved under instructions), payment.								
A4.3 Deliver a single day-ahead response and reserve market	D4.3.5 Auction capability	420 - Auction capability: This investment will provide extension of the auction capability developed for frequency response in RIIO-1 to all relevant services. This will include algorithms	Project	Auction capability tested for weekly frequency response. Understanding of options available for wider implementation of auction capability in RIIO-2.	Q1-Q3 - Auction capability development and testing. Q4 - Auction capability implementation.	Q4 – Electricity Market Reform (EMR) and Contracts for Difference (CfD) integration.	Auction capability implemented supporting Day Ahead frequency response procurement. Market participants will access all ESO auctions through one single auction platform.	Auction capability implemented supporting co-optimised day ahead response and reserve procurement.	Auction capability integration with Single markets platform will be in early 2023-24. Market participants able to participate in market auctions through interface of Single markets platform (alongside other processes such as contracts and settlements).	

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		for co-optimised response and reserve day-ahead auction.								
A4.4 Deliver a single, integrated platform for ESO Markets	D4.4.1 (shared with D5.2) 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	400 Single markets platform: Will provide a platform providing a full end-to-end customer journey, allowing market participants to access the data relating to: how to become a provider (obligations, sign up, test, application progression), contract tender (to see contracts status and manage contracts), unit management (to see what units are registered for, see and change aggregation configurations), dispatch (to access instructions), performance monitoring (to see how units behaved under instructions), payment. Inclusion of sandbox	Project	This project will not have started in RIIO-1.	Q1 - Day Ahead response market integrated with foundational market platform for subset of processes. Q4 – Single markets platform requirements and design. Q4 Reserve products integrated with foundational market platform for subset of processes. Q3 - Asset register requirements and design. Q4 - Asset register development and testing.	Q3 – Single markets Platform Development and testing. Q4 - Procurement of all ESO balancing and ancillary services through single markets platform for full range of processes. Q1 - Asset register implementation .	Market participants will be able to manage upstream processes for participation in frequency response markets integrated through foundational market platform. Asset register requirements and design and development and testing phases complete.	Market participants will be able to access all ESO balancing services markets through Single markets platform. Business processes for all ESO balancing services products integrated through single markets platform. Asset register implemented providing one place for market participants to register for ESO markets, accessed through Single markets platform.	Auction capability integration with Single markets platform will be in early 2023-24. Market participants able to participate in market auctions through interface of Single markets platform (alongside other processes such as contracts and settlements).	

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		functionality will allow us to test new products and services, reducing the time and cost to deploy them into market whilst ensuring they meet both commercial and operational needs.								
A4.4 Deliver a single, integrated platform for ESO Markets	D4.4.2 Common standards, including interoperable systems, a common data model and shared minimum specifications between ESO and other flexibility platforms as well as at the distribution level.	400 – Single markets platform: Development of this investment should be aligned with DSO services procurement platforms where possible.	Project	This project will not have started in RIIO-1.	<p>Q1 - Day Ahead response market integrated with foundational market platform for subset of processes.</p> <p>Q3 – Provide input into RIIO-ED2 business plans to promote alignment of ESO and DSO markets and platforms.</p> <p>Q4 – Single markets platform requirements and design.</p> <p>Q4 - Reserve products integrated with foundational market platform for subset of processes.</p> <p>Q3 - Asset register requirements and design.</p> <p>Q4 - Asset register development and testing.</p> <p>The milestones documented in this Delivery Schedule were correct as of December 2019 and are subject to change. For 2020/21, the regularly updated Forward Plan Tracker, or its equivalent in RIIO-</p>	<p>Q3 – Single markets platform Development and testing.</p> <p>Q4 - Procurement of all ESO balancing and ancillary services through single markets platform for full range of processes.</p> <p>Q1 - Asset register implementation</p>	Single markets platform requirements and design aligned with developments of other platforms including those for DSO markets as appropriate to maturity of distribution level markets. Asset register design aligned with developments of other markets including DSO as appropriate to maturity of distribution level markets.	Single market platform implemented with common standards. Platform coordinated with DSO platforms development as appropriate to maturity of distribution level markets.	As per year 2.	

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					2, should be considered the master document.					
New services market development	<p>Development of competitive approaches to procurement of stability.</p> <p>Networks Option Assessment (NOA) stability pathfinder³ phase 1 – Procurement of proven technologies focusing on Great Britain national inertia requirement</p> <p>NOA stability pathfinder phase 2 – Procurement of broader range of solutions focusing on regional short circuit level requirement in Scotland</p> <p>Stability market – enduring market structure for procurement of stability services</p> <p>Activities in A8 (Role 3) and A4 (Role 2) share common milestones. This is because the</p>	<p>130 Emergent technology and system management : Development of IT solutions for phase 1 and 2 to register, model, instruct, settle and report new services</p> <p>400 Single markets platform: Stability market integration.</p>	Project	<p>Stability pathfinder phase 1 tenders awarded.</p> <p>Early stability pathfinder phase 1 contracts deliver.</p> <p>Stability pathfinder phase 2 feasibility study in progress.</p> <p>Interim IT solution for phase one (IT investment 130). Develop IT requirements for phase 2.</p>	<p>Q2 - Award contacts for stability pathfinder phase 2.</p> <p>Q2 - Implement enduring IT solution for phase 1 (IT investment 130).</p> <p>Q3 - Complete design of IT solution for phase 2 (IT investment 130).</p> <p>Q1-4 - as required review Great Britain wide requirements at a regional level for stability.</p> <p>Expand pathfinder process to further region(s) and align with voltage requirements.</p> <p>Define scope of stability market development and start engagement with industry.</p> <p>Develop plan to deliver stability market.</p>	<p>Q1-4 - as required Complete implementation of IT solutions for phase 2 (IT investment 130 Emergent technology and system management).</p> <p>Q1-4 - as required Initiate plan to deliver stability market.</p>	<p>Stability pathfinder phase 2 tender assessment complete, contracts awarded, and outcome published.</p> <p>Phase 1 enduring IT solution implemented</p> <p>Remaining stability phase 1 contracts deliver.</p> <p>GB wide requirements for stability understood.</p> <p>Roadmap for stability market development published.</p>	<p>Early stability pathfinder phase 2 contracts deliver.</p> <p>IT solutions for phase 2 complete.</p> <p>Detailed implementation plan for stability market published.</p>	<p>This is a new activity not in our December 2019 Business Plan.</p> <p>Implications for additional resourcing will be communicated through ongoing regulatory engagement.</p>	

³ Our pathfinder projects look to work with stakeholders to establish methods to identify the most cost effective approach to addressing system issues - <https://www.nationalgrideso.com/research-publications/network-options-assessment-noa/network-development-roadmap>

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	activities are being delivered both as part of our work to ensure a level playing field for all technology types to be able to provide solutions to network challenges (Role 3) and develop competitive means to procure those new system services (Role 2). Pathfinder projects deploy virtual teams of cross-functional resource bringing together world-leading technical and economic analysis skills and tools (Role 3) alongside innovative commercial approaches to procurement and market design (Role 2). Both activities and skillsets are required to deliver the milestones outlined for the Pathfinder projects and the enduring markets solutions that will build on those learnings.									

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
New services market development	<p>Development of competitive approaches to procurement of reactive power.</p> <p>Pathfinders are pilot projects to explore innovative approaches to the procurement system services.</p> <p>Mersey Pathfinder: discrete geographical area with small requirement (all new build assets)⁴.</p> <p>Pennines pathfinder: much larger geographical area and larger requirement than for Mersey⁵.</p> <p>Further regions: interaction with stability on setting requirements</p> <p>Activities in A8 (Role 3) and</p>	<p>130 Emergent technology and system management : Development of IT solutions to register, model, instruct, settle and report new services</p> <p>400 Single markets platform.</p>	Project	<p>Publish strategic approach for reactive review and reform.</p> <p>Contracts awarded for Mersey pathfinder.</p> <p>Tender published for Pennines pathfinder.</p>	<p>Q3: Define and agree scope of reactive power services reform with industry (including suitability of ongoing mandatory reactive power service).</p> <p>Q4: Identify, agree and publish plan with industry to deliver reactive reform.</p> <p>Award contract for Pennines Pathfinder.</p> <p>Expand pathfinder process to further region(s) and issue tender (aligned with stability requirements).</p>	<p>Initiate delivery of enduring plan for reactive reform as required.⁶</p> <p>Q1 - Deliver IT changes for Mersey pathfinder.</p> <p>Q3 latest - Go-live of new Mersey pathfinder reactive service.</p>	<p>Industry agreed plan for enduring reactive services reform published.</p> <p>Pennines Pathfinder contract awarded.</p> <p>Deliver pathfinder tender process to one further region with tender issued.</p> <p>Way forward with Ofgem and industry agreed for how 'OMW' connections should be treated and exposure to certain costs (level playing field between commercial providers and network owners).</p>	<p>Delivery of enduring plan agreed with industry initiated.</p> <p>Delivery of new reactive service from Mersey pathfinder.</p>	<p>End state is expected to be reformed procurement of reactive power services with supporting code and technical arrangements in place including control room systems.</p> <p>Specification of end state is dependent on outcome of strategy and plan development with industry.</p> <p>Pennines Pathfinder service delivery in 2024</p>	<p>This is a new activity, not in Dec 2019 Business Plan.</p> <p>Implications for additional resourcing will be communicated through ongoing regulatory engagement.</p>

⁴ Quarterly milestones available as no dependency on direction of travel for zero MW connections

⁵ Quarterly milestones not available as dependent on direction of travel for zero MW connections

⁶ Dependent on expected approval/ rejection of way forward for CMP304 Improving the Enhanced Reactive Power Service or CMP305 Removal of the Enhanced Reactive Power Service - any delivery requirements will be planned as necessary.

<https://www.nationalgrideso.com/industry-information/codes/connection-and-use-system-code-cusc-old/modifications/cmp304-improving>

<https://www.nationalgrideso.com/industry-information/codes/connection-and-use-system-code-cusc-old/modifications/cmp305-removal>

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	<p>A4 (Role 2) share common milestones. This is because the activities are being delivered both as part of our work to ensure a level playing field for all technology types to be able to provide solutions to network challenges (Role 3) and develop competitive means to procure those new system services (Role 2). Pathfinder projects deploy virtual teams of cross-functional resource bringing together world-leading technical and economic analysis skills and tools (Role 3) alongside innovative commercial approaches to procurement and market design (Role 2). Both activities and skillsets are required to deliver the milestones outlined for the Pathfinder projects and the enduring markets</p>									

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	solutions that will build on those learnings.									

A5 Transform access to the Capacity Market

Our business plan for Transforming access to the Capacity Market (CM) is focused on driving changes required to achieve our goal of Competition Everywhere. Our plans under **A5.1** Electricity Market Reform (EMR) Delivery Body focus on driving improvements to the customer experience through enhanced guidance, stakeholder engagement and a new change prioritisation process. **A5.2** Deliver an enhanced platform for the CM within the single, integrated ESO markets platform focuses on reducing barriers and improving the customer experience through transformation of the EMR portal. **A5.3** Improve our security of supply modelling capability focuses on enabling the effective consideration of new energy technologies in our calculations and delivery of consumer value through enhancing our use of tools and data to ensure we are procuring optimal volumes of capacity.

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A5.1 Electricity Market Reform (EMR) Delivery Body	D5.1 Continuation of EMR Delivery Body obligations. As EMR Delivery Body, we will deliver the prequalification and auction processes for the Capacity Market (CM) and Contracts for Difference (CfD). We will also deliver our agreement management obligations for the CM. We will also ensure our processes and system comply with regulatory changes and communicate these to industry.	Forms part of the portal update in deliverable in D5.2	Continuous	We provide updated guidance as soon as practicable after rule changes have occurred. We use the lessons learnt from previous auctions rotation to inform the planning for, and delivery of, subsequent auction rounds, including improvements to guidance. We expect to work with Ofgem/BEIS on rule changes at the end of RIIO-1 period which will come into force at the start of the RIIO-2 period.	Q1 Publish a cocreated guidance document covering 2021 rule changes (in collaboration with Ofgem, BEIS and industry) open within 4 weeks of the rules being laid. Q1 - Publish a co-created guidance document covering 2021 rule changes (in collaboration with Ofgem, BEIS and industry) open within 4 weeks of the rules being laid. Q1-4 - Use previous Customer Relationship Management (CRM) tool data to upskill front desk and feed any frequently asked questions into guidance documentation.	Q1 - Guidance to rule changes are incorporated into Portal Q2/3 - EMR portal will allow disputes to be attached to applications, reducing the burden to appeal.	Improved guidance leads to improved level of understanding of the rule changes across industry, contributing to an increase in first-time passes at Prequalification, ultimately removing a barrier to entry for the Auctions. Use of CRM data allows us to better anticipate and respond to customer needs, leading to improved customer service, as reflected in customer feedback. Customers will know we have used real query data to ensure guidance reflects user needs.	Rule guidance and interpretation becomes part of the portal. This will improve the customer journey for Prequalification and reduce the number of administrative rejections at application stage. Dispute process easier to follow and less burden on the applicants as reflected in customer feedback.	Guidance to be incorporated into single markets platform as part of integration in 2022/23.	Updated to reflect deliverables that will enhance the customer experience.
A5.1 EMR Delivery Body	An improved prioritisation process in how we implement change in the EMR Delivery Body. This is about embedding the process and not the	N/A	Continuous	By the end of RIIO-1 prioritisation occurs at a high level at Regulatory Change Advisory Board (RCAB) and at an annual process to determine which changes can be	Q1 - EMR Delivery Body delivers full assessments of the backlog of changes with estimated impacts of implementation	Q1 – EMR Delivery Body runs informal consultation with industry to refine the improved prioritisation process for changes that are deliverable and ensure transparency of those that are not.	Delivery Partners address the backlog of change. EMR DB proactively working with Ofgem and BEIS to ensure prioritisation process	The prioritisation process is broadened out to include input from external stakeholders.	As year two but with an annual process to gain feedback on the approach to allow improvements.	This is a new deliverable, not reflected in December 2019 Business Plan.

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	delivery of specific changes for each year.			delivered for the following delivery cycle.	<p>Q2 – Backlog of change is prioritised at RCAB to understand changes for next delivery cycle.</p> <p>Q3 – Delivery Body implements a robust estimation process for assessing future changes using robust and transparent criteria including: Whether there are any unintended consequences of the change, anticipating the impact on all stakeholders (ESO, applicants, Delivery Partners etc), the anticipated impact on the Delivery Body Portal and IT and ultimately the overall cost to consumer.</p> <p>Q4 – outputs shared with wider industry</p>	<p>Q2 – Improved change prioritisation process is published by EMR Delivery Body.</p> <p>Q3 Industry take part in prioritisation process.</p>	<p>occurs on an ongoing basis by assessing each change.</p> <p>The prioritisation process is broadened out to include external stakeholders to enhance transparency. This will allow market participants to understand the prioritisation of rules and system changes.</p>			
A5.2 Deliver an enhanced platform for the Capacity Market within the single, integrated ESO markets platform	D5.2 (shared with D4.4) IT system to allow all participants in ESO markets (including CM and CfD) a single point of access for services and data	IT investment 320 EMR Portal Improvements (Capacity Market and Contracts for Difference) Will deliver a 'new' EMR solution which will be flexible, scalable and adaptable to respond to customer and regulatory requirements faster and at a lower cost than currently experienced. It will offer a step change in the current user experience, implementing self-service and improved navigation. Also process automation and optimise any remaining manual processes and controls.	Project	<p>Completion of EMR Portal Roadmap to confirm the design, requirements, timescales and costs to deliver a new EMR Portal solution.</p> <p>Solution and system integrator identified through competitive process.</p> <p>Mobilisation and design activities for new EMR portal commenced.</p> <p>Prioritised requirements will deliver improvements in process efficiency, customer experience and reporting along with Capacity Market Restoration changes</p>	<p>Q1 - Essential regulatory changes delivered on existing EMR portal.</p> <p>Q1-4 - First elements of the new EMR Portal delivered via agile delivery.</p>	Q1-4 - Additional elements of the new EMR Portal delivered through prioritised agile delivery.	<p>Migration to new portal delivered for subset of capabilities depending on prioritisation.</p> <p>Subject to prioritisation, capabilities for year 1 are expected to include optimised user journeys and on-line user guidance for application process. This will reduce the amount of time applicants need to spend following the process (as reflected in customer feedback and satisfaction scores).</p> <p>We will have delivered a significant amount of regulatory-driven change to ensure</p>	<p>All key processes will be fully supported by the system by the end of year 2, enabling customer self-service.</p> <p>By the end of 2022/23, there will be demonstrable and measurable (e.g. elements of customer satisfaction scores) improvements in agility, automation and customer experience.</p> <p>Cost and timescale to deliver change on existing portal will be reduced.</p> <p>Integration of new EMR portal with Single markets platform</p>	<p>We anticipate that by March 2026, the EMR Delivery Body will:</p> <ul style="list-style-type: none"> Have integrated the EMR service into our IT investment 400 Single Markets Platform by 2022/23, enabling existing customers and new entrants to participate in CM and CfD alongside other ancillary services. Have implemented self-service, process automation and optimised any remaining manual processes and controls. Run a customer-centric query 	The investment has been updated to reflect the significant changes in the policy and regulatory framework for EMR since the ESO Business Plan was drafted in December 2019 and the implications for EMR portal development.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		400 Single markets platform: A platform providing a full end-to-end customer journey allowing market participants to access the data relating to: how to become a provider (obligations, sign up, test, application progression), contract tender (to see contracts status and manage contracts), unit management (to see what units are registered for, see and change aggregation configurations), dispatch (to access instructions), performance monitoring (to see how units behaved under instructions), payment.		on the existing EMR portal. Reporting capabilities will leverage one of the first use cases of the reporting and analytics capabilities from the new ESO data and analytics platform (IT investment 220).			compliance with all BEIS and Ofgem requirements. Only essential investment will be made in the existing portal to deliver regulatory compliance. Cost and timescale to deliver change on existing portal will be reduced.	We will have ensured that the portal continues to comply with changing regulatory requirements.	management process that resolves queries efficiently and effectively within agreed Service Level Agreements (SLAs). We will continue to have systems and processes that ensure regulatory compliance.	
A5.3 Improve our security of supply modelling capability	D5.3 Use of enhanced modelling and more granular data sets to improve security of supply modelling. In a world of rapidly evolving energy systems, we will need to deploy the latest modelling techniques to ensure we can keep pace with these changes. We will need to develop new data sets, models and methods to correctly model the growing interactions of new generation and the demand side. This will ensure their contributions to security of supply remain appropriate and help to ensure the Great Britain reliability standard ⁷ is met.	220 Data and analytics platform: It will be the key 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. It will underpin our advanced data analytics capability that is critical for the data capture and modelling required to improve our security of supply modelling.	Project	Modelling methodology to calculate available capacity for cross-border participation in capacity markets on a consistent basis across Europe will have been developed in conjunction with European Network Transmission System Operators-Electricity (ENTSO-E). The various sources of technology type and capacity data that would enable a robust method to be developed and implemented into the future will have been investigated. In particular, information available on embedded generation from implemented Distribution Connection and System Use Agreement (DCUSA)	Q1 - Production of the Electricity Capacity Report Q4 – In line with the prioritisation agreed with the Panel of Technical Experts (PTE), BEIS and Ofgem enhancements will be made to our modelling. Following the production of the Electricity Capacity Report in Q1 we will agree with the PTE, BEIS and Ofgem and begin to work through, the prioritised list of enhancements. It is not possible to provide a more granular timescale for this activity. Priorities are expected to include; enhancements to the modelling for distributed generation, duration-limited storage and demand response, maximising the use of	Q1 - Production of the Electricity Capacity Report Q4 – In line with the prioritisation agreed with the PTE, BEIS and Ofgem enhancements will be made to our modelling. Following the production of the Electricity Capacity Report in Q1 we will agree with the PTE, BEIS and Ofgem and begin to work through, the prioritised list of enhancements. It is not possible to provide a more granular timescale for this activity. Priorities are expected to include; • improved modelling of security of supply for intermittent technology and Demand Side Response (DSR); support modelling changes to the review of the reliability standards, in particular around the implementation of the	The PTE continue to endorse our analysis in response to the changing energy landscape in their published reports. Subject to agreement with PTE, BEIS and Ofgem we currently believe that successes could include the following: Refined approach to calculating the de-rating factors for embedded generation technologies to improve the data quality and categorisation of embedded assets. (Using data from the DCUSA mod and working with DNOs) Modelling demand assumptions reviewed,	The PTE continue to endorse our analysis in response to the changing energy landscape in their published reports. Subject to agreement with PTE, BEIS and Ofgem we currently believe that successes could include the following: • Better understanding of the economics of embedded generation and whether it is contributing to over-delivery in the CM. • Review of how we construct our generation distribution assumptions complete (we currently assume generators are fully	We will continue to deliver ongoing improvement projects in line with the prioritisation of the PTE, BEIS and Ofgem.	Updated to provide more clarity on successes and milestones.

⁷ The decision on how much capacity is needed to ensure security of supply is informed by an enduring Reliability Standard which is 3 hours Loss of Load Expectation (LOLE) / year.

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	With growing interconnection across Europe and between Great Britain and other countries, our pan-European modelling needs to be able to better model different markets. We will improve our pan-European modelling in 2021 and 2022. This will include participation of interconnectors and/or European generators in the CM. It will require significant development of the model and data collection to correctly model the interactions of future plant mixes within Europe. It will have to factor in the different operating regimes and security of supply standards across the various European capacity markets.			modification is expected be in use by the end of the period. This data will allow us to assess whether it is more appropriate to calculate de-rating factors for embedded generation technologies directly from distribution data.	the data from the DCUSA modification in RIIO-1; and enhancements of European market modelling, as level of interconnection increases over RIIO-2 period. This includes supporting ENTSO-E in developing a methodology for cross-border participation in the CM.	clean energy package; and review and continued enhancements of European market modelling, as level of interconnection increases over RIIO-2 period.	to assess viability and develop hourly timeseries of historic underlying demand, which could improve the robustness and self-consistency of our modelling. Plan developed for further modelling improvements of DSR, and in particular, new demand-side technologies that could participate in the CM and whether the performance of this DSR is duration-limited.	on / fully off in our modelling and that units are independent). Models further developed to ensure we are compliant with the Clean Energy Package legislation (Building on the work to support ENTSO-E in developing a methodology for cross-border participation in the CM)		

A6 Develop code and charging arrangements that are fit for the future

Our plans to develop code and charging arrangements that are fit for the future are key to achieving our strategic goals for Competition Everywhere, an electricity system that can operate Carbon free and whole energy system solutions. Our code change activities (A6.1 and A6.2) enhance competition and progress towards net zero thorough changes that remove barriers to market participation for the broadest set of organisations. Our plans for a whole system Grid code and SQSS review will also remove barriers to entry and help to align industry arrangements across transmission and distribution.

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A6.1 Code management / market	D6.1 Continued facilitation of industry changes to the Grid Code, Connection and Use of System Code	280 - GB regulation: This investment allows us to deliver mandatory GB	Continuous	Targeted Charging Review ⁹ (TCR) process has completed including Ofgem decisions to	Q1 - GC0137 ¹³ /139 ¹⁴ /145 ¹⁵ code change process completed.	Q2 Submit Access and Forward Looking Charges Modification Proposals to Authority.	While modifications are dependent on external factors such as industry participation and governance, we currently	While modifications are dependent on external factors such as industry participation and		Greater articulation of likely areas of focus provided.

⁹ <https://www.ofgem.gov.uk/electricity/transmission-networks/charging/targeted-charging-review-significant-code-review>

¹³ <https://www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0137-minimum-specification-required>

¹⁴ <https://www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0139-enhanced-planning-data-exchange>

¹⁵ <https://www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0145-updating-grid-code-include-manually>

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development and change	<p>(CUSC), System Operator Transmission Owner Code (STC) and Security and Quality of Supply Standards (SQSS). Also, delivery of Great Britain driven regulatory change through the open governance process. We will facilitate the code change required for Great Britain markets to adopt recommendations from Significant Code Reviews (SCRs) and to ensure that they remain compliant with European regulations where necessary. Examples include Balancing Services Use of System (BSUoS) Taskforce outcomes and Access and Forward Looking Charges⁸ modifications.</p> <p>We will work with market participants to ensure that codes evolve to reflect the changing market environment, ensuring that market codes and charging is equitable, efficient and accessible for all participants.</p> <p>Support significant IT system changes across the ESO and with industry participants to ensure that code changes are embedded into ongoing activities with minimal disruption.</p>	regulatory and market-driven change which impacts across ESO systems, particularly market operation.		<p>allow post TCR processes to occur.</p> <p>Imbalance harmonisation impact assessment¹⁰: Ofgem decision received and implementation date known.</p> <p>GC0130¹¹/ P408¹² implementation.</p>	<p>Post TCR modification proposals identified.</p> <p>Q3 - Raise Access and Forward Looking Charges Modification Proposals.</p> <p>Clean Energy Package non-BM imbalance correction proposal submitted to Authority</p> <p>Management of any further modifications received through open governance for which the resource requirement can vary considerably.</p>	<p>Q3 – Manually Activated Reserve Initiative (MARI) Go-Live</p> <p>Management of any further modifications received through open governance for which the resource requirement can vary considerably.</p>	<p>expect to progress modifications in the following areas in year 1:</p> <ul style="list-style-type: none"> Stability and restoration of a decarbonising system: GC0137 (facilitating new commercial service contributing to grid stability), and CMP326¹⁶ (introducing a 'Turbine Availability Factor' for use in Frequency Response Capacity Calculation for Power Park Modules. <p>Facilitating access for new and smaller market participants: GC0134 (Removing telephony requirements for small, distributed and aggregated BM participants), GC0140 (Grid Code Sandbox for innovative propositions), CMP316 (co-location proposal approved), and supporting P415 (extending wholesale market access to VLPs).</p> <p>Facilitating progress towards whole electricity system: GC0139 (coordinated network planning between NGESO & DNOs), GC0117 (Improving consistency of access arrangements across GB, and raising modification proposals from the Access and Forward Looking Charges SCR.).</p> <p>Implementation of European regulatory and code changes: GC0145 (MARI) and P410 (Imbalance harmonisation).</p>	<p>governance, we currently expect to progress modifications in the following areas in year 2:</p> <ul style="list-style-type: none"> Access and Forward Looking Charges Modification Proposals submitted to and approved by the Authority delivering on changes as Directed. Clean Energy package non-BM imbalance correction proposal implemented. Post TCR modification proposals approved 		

⁸ <https://www.ofgem.gov.uk/electricity/transmission-networks/charging/reform-network-access-and-forward-looking-charges>

¹⁰ [https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%202018-2020%20on%20the%20harmonisation%20of%20the%20main%20features%20of%20imbalancesettlement%20\(ISHP\).pdf](https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%202018-2020%20on%20the%20harmonisation%20of%20the%20main%20features%20of%20imbalancesettlement%20(ISHP).pdf)

¹¹ <https://www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0130-oc2-change-simplifying-output-useable>

¹² <https://www.elexon.co.uk/mod-proposal/p408/>

¹⁶ <https://www.nationalgrideso.com/industry-information/codes/connection-and-use-system-code-cusc-old/modifications/cmp326-introducing>

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	Technical support delivered to this activity through A15.3 in Role 3.						Agreed plan of work established through Charging Futures for 21/22 and 22/23 for transmission charging reform linking to wider market reforms/development where necessary Support of IT system changes driven by Targeted Charging Review, MARI, TERRE, and the introduction of the Common Information Model under GC0139.			
A6.2 European Union (EU) code change and relationships	<p>D6.2 Continued facilitation of EU driven code changes into Great Britain market.</p> <p>Over RIIO-2, we will increase the size of the team supporting this area to step up our presence in the key working groups and ensure we respond to consultations where we can influence on behalf of Great Britain's consumers. This activity is highly dependent on our overall European strategy which will impact our approach and its delivery.</p> <p>Specifically, in BP1 we will work to ensure the most efficient progression of EU exit arrangements. Code changes that are necessary to support EU exit arrangement will be implemented as directed by Ofgem and BEIS. Support significant IT system changes across the ESO and with industry participants to ensure that code changes are embedded</p>	270 EU regulation: This investment enables the mandatory EU regulatory driven change which impacts across ESO systems, particularly market operation.	Continuous	<p>Planned Trans European Reserves Replacement Exchange (TERRE) go-live (subject to legal status after EU withdrawal).</p> <p>Submission of data files for Short Term Adequacy¹⁷ (STA).</p>	<p>Q2 MARI Grid Code and BSC modifications complete.</p> <p>Q3 MARI implementation project – definitions of system changes.</p> <p>Q2 Clean Energy Package – changes for Short Term Operating Reserve (STOR) ready for new auctions.</p> <p>Q4 Implementation of Coordinated Security Analysis.</p> <p>Q2 Grid code and BSC change for Emergency and Restoration (Supporting activity A3 in Role 1).</p>	<p>Q3 IT investment 270 clean energy package development and testing.</p> <p>Q2 Delivery of MARI.</p> <p>Q2 Implement harmonised Re-dispatching and Countertrading.</p> <p>Q4 Coordinated calculation of Interconnector capacity.</p> <p>Q2 Full compliance with Article 6 of the Clean Energy Package.</p>	<p>Cost benefits for GB consumers from use of TERRE.</p> <p>Enhanced cooperation with other TSOs increasing operational security.</p> <p>Compliance with Clean Energy Package supports our already stated aims (see A4.3) for markets closer to real-time.</p>	<p>Use of the Capacity Calculation platform allows ESO to coordinate with other Transmission System Operators (TSOs) on the calculation of maximum capacity over interconnectors in both long-term, Day Ahead and Intra day timescales.</p> <p>Use of Re-dispatching and Countertrading provides tool for controlling flows.</p>	<p>Cost benefits for GB consumers through use of MARI.</p> <p>Cooperation with other EU TSOs further enhanced through the coordinated use of remedial actions to solve operational security issues.</p>	Greater articulation of likely areas of focus provided.

¹⁷ <https://www.coreso.eu/services/short-and-medium-term-adequacy-smta/>

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	into BAU with minimal disruption.									
A6.3 Industry revenue management	D6.3 Continued managing, collecting and disbursing charges relating to the operation of the transmission system. Also delivering a refresh of charging and billing IT system and changes to the charging regime for CUSC.	<p>290 The Charging and Billing (CAB) system manages Transmission Network Use of System (TNUoS) charges, BSUoS charges and connection charges. It calculates the charges for market participants to pay the ESO. TNUoS charges go to the TOs, BSUoS charges to ESO, and connection charges are shared.</p> <p>This investment completes the re-engineering of the charging and billing system, making it much more flexible than the current system, reducing the lead time and cost for change to manage and accommodating the increased number of market participants.</p> <p>300 Charging regime and CUSC changes: This investment enables mandatory market-driven change to the CUSC and/or the charging regime. There are two Ofgem Significant Code Reviews (SCRs) in progress: the Targeted Charging Review and the Access and Forward Looking Charges Review which are expected to drive system changes.</p>	Continuous	<p>Roadmap on enduring CAB solution complete confirming the high-level design, timescales, resource requirements and costs to deliver a new solution.</p> <p>Delivery of Targeted Charging Review BSUoS, connection charge, TNUoS generation re-zoning and BSUoS charging methodology for storage generators onto the existing CAB solution.</p>	<p>Investment 290 Charging and Billing Asset Health Deliver critical system changes necessary to improve/ sustain the foundation of the CAB system in order to deliver the regulatory changes (investment 300) up to April 2022. Asset health improvements will be delivered quarterly throughout the year.</p> <p>Change delivery for Investment 300 Charging Regime and CUSC Changes include:</p> <ul style="list-style-type: none"> • Transmission Demand Residual bandings and allocation (CMP343 - TCR TNUoS); • Enabling reform of residual network charging as directed by the TCR (P402): • Q1 - Requirements and design • Q2/Q3 – Development and Testing • Q4 Implementation 	<p>Investment 290 Charging and Billing Asset Health Minimum Viable Product for an enduring solution which will enable delivery of regulatory changes under investment 300 - Charging regime and CUSC changes, including Access & Forward Looking Charges:</p> <ul style="list-style-type: none"> • Q1 - Start up • Q2 – Requirements and design • Q3 Development and Testing • Q4 Implementation. 	Implementation of Transmission Demand Residual bandings and allocation (CMP343 - TCR TNUoS); and Enabling reform of residual network charging as directed by the TCR (P402) onto the existing CAB solution.	Delivery of a Minimum Viable Product for the enduring solution, including successful delivery of; Changes to the BSUoS charging methodology driven by the BSUoS Taskforce, due in 2023; and Changes to the TNUoS methodology driven by the Significant Code Review for Access Forward Looking Charges	<p>Continued timely collection of revenue on behalf of the industry, in line with the evolving charging framework.</p> <p>All processes migrated to the new solution by the end of 2023/24 and human error risk is sufficiently mitigated by bringing the offline processes into the new solution.</p> <p>Customer charging experience enhanced with the more customer centric IT solution.</p> <p>A scalable and configurable solution allowing the introduction of changes faster to the market to accommodate the addition of customers, increasing data requirements and regulatory changes.</p> <p>Flexible solution allowing changes to existing and new regulatory changes without standing up an IT project for small and medium complexity changes.</p> <p>Sarbanes-Oxley compliance requirements fully</p>	New content provided to reflect updated view of frameworks change and supporting systems development.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
									supported within the enduring solution. Full delivery of scope for Investment 290 Charging and Billing Asset Health by Q4 2023/24	
A6.4 Transform the process to amend our codes	D6.4 Change from a code administrator to a code manager. Create and own a strategic and incremental industry change plan for our codes. Seek more explicit powers to assess and prioritise code change to ensure the delivery of more strategic change which is expected to be of benefit to consumers. Seek more explicit powers for managing the change process. This will help ensure change is delivered at pace, relevant modelling is undertaken if not available, and we have more ownership of change development and delivery throughout the process. .Place more emphasis on engagement with wider stakeholders outside our standard working groups. Make better use of technology through initiatives such as code digitalisation, a more customer-friendly and accessible website, and better information management and communication channels. Provide better user guidance and supporting documents that support	N/A	Project	Improvements to code administration implemented including: <ul style="list-style-type: none"> Easier to read industry emails and processes allowing users to better manage their communication preferences. Updated onboarding documentation for new industry parties for ease of access and use. Web pages refreshed with plain English content.	Q1 - Dedicated ESO legal support for code changes. Q2 - Recruit people and set up new teams and investigate the methods to transform the process to amend our codes. Q3 - Stakeholder engagement and consultation on the process to amend our codes. Q4 - Investigate licence changes required to transform the process to amend our codes. Q4 – Create plan to deliver the transformed codes process. Q4 – Consult stakeholders on plan to deliver the transformed codes process.	Q1 – Initiate licence change to support transform the process to amend our codes. Q2 - Begin detailed scoping and prioritising work for new process go live. Q4 – An ambitious go live in Q4 of Transform the process to amend our codes (subject to outcome of Energy Codes Review and scope of change required). Q4 Strategic and incremental industry change plan implemented. Q4 Greater emphasis on larger and more coordinated programmes of work for our codes.	Resource in place to deliver transform the process to amend our codes. Stakeholder supported plan for transformed codes process in place. Discussion with Ofgem and BEIS initiated on how to deliver change.	Prioritisation of strategic change has begun with a new process in place. ESO has created and owns a strategic and incremental industry change plan for our codes. ESO has more explicit powers to assess and prioritise code change and seek necessary amendments to the management of the change process. Clarity on objectives for remaining years	Strategic change is systematically being prioritised and delivered by year 3 Q1. By year 2 we will not have reached our vision for code manager. In the BP1 period, in parallel with leading the strategic code change activities detailed in A6.1 and A6.2, we will be building capability and putting tools and processes in place to enables us to; place extra emphasis on larger and more proactive coordinated programmes of work for our codes, and; give more focus to other industry change, which is less directly relevant to ESO but where we feel we could add value to the process.	Further clarity provided on progress to be made against long term aims in the BP1 period.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	self-service, but also have a service-focused and well-resourced team available to be a great critical friend where stakeholders require. Take on additional responsibilities for developing code modification and directing incremental improvements for our own codes. For example, analysing and modelling change proposals, engaging stakeholders on proposals and developing options.									
A6.5 Work with all stakeholders to create a fully digitalised, whole system Grid Code by 2025	D6.5 The Grid code combines transmission and distribution codes in an IT system with AI-enabled navigation and, document and workflow management tools.	330 - Digitalised code management: Investment to transform the stakeholder experience of the code management process through artificial intelligence enabled navigation, and document and workflow management tools.	Project	The Grid Code at the transmission level and Distribution code at the distribution level are separate and static documents from a user-experience perspective. No work is proposed on this initiative in the RIIO-1 period.	Q1 - Recruit people and set up project team. Q2 - Scope detailed project work plan. Q4 - Engage and consult industry to refine scope, in particular distribution stakeholders, on whole system Grid Code and digitalised capability. Q4 – Go/No go decision on whole system digitalised Grid Code.	Q1 – First code modifications and licence changes initiated. Q2-Q4 – Continue to deliver against detailed stakeholder-backed plan by raising and progressing code modifications and licence changes, and digitalising codes.	Scope, objectives and capabilities for digitalised whole system Grid Code agreed with stakeholders. Clear outline for whole system Grid Code structure and governance published. Detailed project work plan and resourcing plan in place. IT requirements defined.	Code modifications and licence changes initiated as required to facilitate whole system Grid Code.	Go live of digitalised whole system Grid Code in year 5, 2025/26. The whole system Grid Code will focus on providing minimum standards to allow safe and secure operation of the electricity systems. The latest data technologies will support navigation of the codes, tailored to each code user's individual needs. Supporting documents will provide examples of how the requirements might be met. The digitalised, whole system Grid Code will provide users with a more user-friendly, inclusive and tailored experience.	Year 1 and Year 2 milestones and success factors updated to drive an extremely challenging timeline.

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A6.6 Look at fully or partially fixing one or more components of Balancing Services Use of System (BSUoS) charges	<p>D6.6 Delivery of the recommendation from the BSUoS taskforce around reducing the volatility of BSUoS forecasting.</p> <p>This requires the collection of BSUoS to change from an arrangement in which charges are set after the costs have been incurred, to one whereby charges are set on the basis of an ESO forecast.</p> <p>This, in effect, transfers forecasting risk from industry to the ESO. It also fixes the charge in a given period, with any under or over-recovery being accounted for in a subsequent chargeable period.</p>	It is envisaged that the BSUoS taskforce decision will require significant system changes and hence would be implemented on a new Charging and Billing solution.	Project	<p>This deliverable is highly dependent on the outcome of the Balancing Services Charges Task Force.</p> <p>In November 2019 the first Task Force concluded that Balancing Services Charges should be treated as cost-recovery charges. In order to develop this work further, Ofgem requested a second Balancing Services Task Force, led by National Grid ESO.</p> <p>By the end of RIIO-1 the Task Force is expected to have answered the following questions: Who should be liable for Balancing Services Charges, and how should these charges be recovered?</p> <p>Further progress is dependent on Ofgem direction following the conclusion of this work.</p>	Q1-Q4 – Continue the process to modify industry codes to allow for a fixed BSUoS price – including industry engagement, project implementation and ESO financing arrangements.		Code modifications raised and approved to implement fixed BSUoS with ESO licence changes providing for funding arrangements, risk mitigation and appropriate reward to do so.		April 2023 expected implementation of fixed BSUoS product into the new Charging and Billing solution.	Updated to reflect current situation.

Role 3 – System insight, planning and network development

A7 – A11 Network Development

Our plans for Network Development will see us make significant steps towards our ambition for **Competition Everywhere** in the BP1 period. They will enable us to take the learning from the RIIO-1 period, to continue to 'learn by doing', and to identify and address the blockers (with Ofgem and wider industry).

Key outcomes in this area for the BP1 period are:

- NOA and NOA pathfinders projects will remain separate processes but be brought together under the NOA umbrella; with learning from the NOA pathfinder projects incorporated into the NOA methodology on an ongoing basis.
- We will take steps to widen the NOA to study more of the network and give more recommendations generating more consumer value. We will work with DNOs and TOs to identify and seek resolution to regulatory funding challenges associated with broadening participation in our NOA and NOA pathfinder work.
- We will start to engage with DNOs, providing bespoke support to help them implement their own NOA-type activity.
- And lastly, develop new tools that will enable the above to come together: By March 2023, we will have retendered our Economic Assessment tool, the core tool for the NOA, and implemented Probabilistic Modelling. The new Voltage Optimisation tool will be at the testing phase and the Stability Assessment tool will be ready to go into the testing phase.

A7 Network Development

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A7.1 Analyse and communicate future network needs	D7.1 <i>Electricity Ten Year Statement (ETYS)</i>	Relies on <i>Network Options Assessment (NOA)</i> tools with no direct IT investments. Once implemented, this activity will benefit from improvements introduced via the IT investment 390 NOA enhancements. (Described under A11 Enhance analytical capabilities).	Continuous	Undertake a fundamental review across our suite of ESO publications to determine the best way to represent the information we publish. A redesigned <i>ETYS</i> web page that contains more interactive content to engage a broader stakeholder base. Initiate developments to integrate pre and post-fault actions within our probabilistic analysis.	Q1 / Q2 Review usefulness of System Requirements Form (SRF) for interested options submission process and work with industry to improve the needs information. Q2 Proof of Concept for a bespoke joint network and market tool for probabilistic thermal analysis. Q2 Proof of Concept for integration of probabilistic network analysis into the NOA process. Q3 / Q4 Review how pathfinder needs could be integrated into the <i>ETYS</i> whilst retaining flexibility to publish needs via RFIs outside of the main publication. Q3/Q4 Create slimmed down <i>ETYS</i> publication with traditional chapters available on our website and results	Q2 Show a greater integration of all types of system needs within the <i>ETYS</i> publication. Q2 / Q3 Review how <i>ETYS</i> can help signal needs considering the Whole system across Transmission / Distribution interface.	Ofgem approved enhancements to <i>ETYS</i> following the annual <i>ETYS</i> consultation process that results in an increased number of stakeholders engaging with this process. These enhancements will be stakeholder-led and dependent on the feedback received through the annual consultation process. Slimmed down <i>ETYS</i> publications with traditional chapters available on our website and results visualised through interactive website content Improved System Requirements Form process which encourages more Interested Persons to enter options into the NOA. Proof of Concept for a bespoke joint network and market tool for probabilistic thermal analysis.	Ofgem approved enhancements to <i>ETYS</i> following the annual <i>ETYS</i> consultation process that results in an increased number of stakeholders engaging with this process. These enhancements will be stakeholder-led and dependent on the feedback received through the annual consultation process. Greater integration of all types of system needs within the <i>ETYS</i> publication. <i>ETYS</i> can help signal needs considering the Whole system across Transmission / Distribution interface.	Continuous deliverable Measurement of consumer value realised as a result of the related NOA process.	More detailed milestones and successes added for Years 1 and 2 of RIIO-2 as to how <i>ETYS</i> will be developed.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
					visualised through interactive website content.		Proof of Concept for integration of probabilistic network analysis into the NOA process.			
A7.2 Advise on economic efficient ways to address networks needs	D7.2 NOA Annual Report	Relies on NOA tools. No direct IT investment. Once implemented, this activity will benefit from improvements introduced via the IT investment 390 NOA enhancements. (Described under A11 Enhance analytical capabilities).	Continuous	Undertake a fundamental review across our suite of ESO publications to determine the best way to represent the information we publish in NOA. A redesign of our Network Development roadmap website with dedicated pages for each NOA pathfinder project. This will help ensure our stakeholders have a strong understanding of our NOA pathfinder projects and how they can get involved. Undertake assessment of some simple Offshore Wider Works proposals in the 2020/21 NOA in order to incrementally improve the process. Undertake evaluation of extending Least Worst Regrets to Least Worst Weighted Regret approach (LWWR). A redesigned NOA web page that contains more interactive content to engage a broader stakeholder base Work with the early competition project (ECP) team seeking to ensure that any agreed output can be implemented taking due consideration of the NOA process.	Q1 Review outputs from our Offshore Wider Works assessment in NOA 20/21 and devise the process and tool requirements to fully evaluate the benefit of OWW options. Q1. Review outputs from NOA 20/21 and consider extension of Least Worst Regret approach to Least Worst Weighted Regret (LWWR) to explore sensitivities to different scenarios, to inform NOA 2021/22 methodology. Q3/Q4 Create slimmed down NOA publication with traditional chapters available on our website and results visualised through interactive website content.	Q1 Undertake enhancements to the NOA Annual Report in response to stakeholder feedback. Q2 Review and consolidation of NOA methodology, including learning from the LWWR investigation. Q4 Establish a process to assess the benefits of OWW including the wider social benefits alongside onshore transmission reinforcement plans [this milestone is dependent upon the outcome of preceding development work and on developments made as part of the BEIS Offshore Transmission Network Review].	NOA methodology evolution. Approved enhancements to the NOA methodology which result in more participants involved in the NOA process. The NOA process document is examined by stakeholders and approved by Ofgem which determines how we will do network options assessment and outlines which recommendations or investments will be taken over the next twelve months. Multiple complex OWW options assessed with a recommendation(s) of which OWW projects should be progressed in the best interest of GB consumers and how they could impact the latest/future NOA recommendations if delivered. Understanding the LWWR approach to inform future direction.	NOA methodology evolution. Approved enhancements to the NOA methodology which results in more participants involved in the NOA process. NOA methodology slimmed down improving accessibility for stakeholders. Tools developed to enable a strategic approach to optimising both OWW and onshore transmission reinforcements. Depending on the outcome of the LWWR investigation, an updated NOA methodology further enhancing understanding of sensitivity to scenarios.	Continuous Measurement of consumer value realised because of the NOA process.	More detailed milestones and successes added for Years 1 and 2 of RIIO-2.
A7.3 Undertake ad hoc analysis in response to external requests	D7.3 Strategic Wider Works (SWW) (or Large Onshore Transmission Projects	Relies on NOA tools. No direct IT investment.	Continuous	Continued support for ongoing SWW/LOTI (including Eastern HVDC,	Q1 Finalise processes to facilitate LOTI requirements in	Ad hoc support as required.	Ad hoc support of LOTI projects, and successfully take projects through the	Ad hoc support of LOTI projects, and successfully take projects through the	Continuous Measurement of consumer value	Updated to include reference to the new LOTI process; We anticipate that

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	(LOTI) for RIIO-2 projects, Connections and Infrastructure Options Note (CION) and Cost Benefit Analysis (CBA) for small schemes.	Once implemented, this activity will benefit from improvements introduced via the IT investment 390 NOA enhancements. (Described under A11 Enhance analytical capabilities).		and Isle of Skye) and CIONs. Developing processes to facilitate LOTI requirements, particularly relating to Eastern HVDC Final Needs Case.	collaboration with TOs and Ofgem.		initial and final needs case in collaboration with the TOs and Ofgem. Ad hoc support of other CBAs and CIONs when required.	initial and final needs case in collaboration with the TOs and Ofgem. Ad hoc support of other CBAs and CIONs.	realised because of the NOA process.	the new threshold for LOTI will result in increased workload for the team who will have to conduct cost-benefit analyses and assess a greater number of projects. This is therefore a change in scope to our December Business Plan and will require additional resource. Implications for additional resourcing will be communicated through ongoing regulatory engagement.

A8 Enable all solution types to compete to meet transmission needs

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A8.1 Rollout of pathfinder approach and optimise assessment and communication of future needs (As described under A4.4 New services market development in Role 2).	D8.1 New areas of need identified, and 3-6 tenders run. Activities in A8 (Role 3) and A4 (Role 2) share common milestones. This is because the activities are being delivered both as part of our work to ensure a level playing field for all technology types to be able to provide solutions to network challenges (Role 3) and develop competitive means to procure those new	130 Emergent technology and system management: Development of IT solutions for phase 1 and 2 to register, model, instruct, settle and report new services	Project	Stability Phase 1 pathfinder outputs have been incorporated into the NOA methodology. Pennines voltage pathfinder Request for Information (RFI) has been issued, followed by a tender. Constraints management pathfinder - Stakeholder engagement and commercial aspects are communicated.	Annual assessment undertaken to identify system needs / next priority area Pennines voltage pathfinder outputs /recommendation is available. Q2 Conclusion (contracts awarded) of Stability Phase 2 tender. Q4 Conclusion (contracts awarded) of Pennines voltage tender. Q4: Constraint management	Annual assessment undertaken to identify system needs. Review of constraint management pathfinder success. Constraint management pathfinder phase 1 year 2 tenders concluded. Constraint management pathfinder phase 1 year 3 tenders communicated.	First year success will result in Stability phase 2, Pennines voltage and constraint management pathfinder phase 1 year 1 tender being complete. Pathfinder lessons learned and developments are incorporated into the NOA methodology. We will ensure our pathfinders adopt a co-ordinated approach where there is a clear benefit in doing so such as where there needs to be overlap.	Up to 3 additional tenders completed which may include new areas of need identified. This will be driven by the needs identification process and will determine size and scope of the tender processes and whether there will be continuations of previous pathfinders or new areas. Pathfinder lessons learned and developments are incorporated into the NOA methodology. We will ensure our	The measure of success is that we tender for solutions. Also, that we are able to evaluate if cheaper solutions exist than if the tender was not run. Measurement of consumer value realised because of the NOA process. Success is having a broader range of options to assess considering that we may use existing solutions if these were the most optimal after further evaluation.	Updated to include details of known tenders (also reflected in new activities in Role 2, Activity group reference A4).

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	<p>system services (Role 2).</p> <p>Pathfinder projects deploy virtual teams of cross-functional resource bringing together world-leading technical and economic analysis skills and tools (Role 3) alongside innovative commercial approaches to procurement and market design (Role 2).</p> <p>Both activities and skillsets are required to deliver the milestones outlined for the Pathfinder projects and the enduring markets solutions that will build on those learnings.</p>				<p>pathfinder outputs are incorporated into the NOA methodology.</p> <p>Constraint management pathfinder phase 1 year 1 tender concluded.</p> <p>Constraint management pathfinder phase 1 year 2 tenders communicated.</p>			<p>pathfinders adopt a co-ordinated approach where there is a clear benefit in doing so such as where there needs to be overlap.</p>	<p>Measured by the appropriate counterfactual costs compared to actual contract costs.</p> <p>This facilitates finding solutions to transmission problems from sources other than transmission owners. i.e. Market solution or Distributed Network Operator (DNO) solutions in line with introducing competition into the market and enabling market participants.</p>	
A8.2 Enhance tendering models	<p>D8.2 Improved tender approaches that enable more participants to enter the market.</p> <p>Activities in A8 (Role 3) and A4 (Role 2) share common milestones.</p> <p>This is because the activities are being delivered both as part of our work to ensure a level playing field for all technology types to be able to provide solutions to network challenges (Role 3) and develop competitive means to procure those new system services (Role 2).</p> <p>Pathfinder projects deploy virtual teams of cross-functional resource bringing together world-leading technical and</p>	None	Project	<p>Lessons learned exercise from Stability Phase 1 results in additional time in the process and the introduction of a feasibility study stage.</p> <p>Following the Voltage pathfinder, we have conducted an internal and then external Lessons Learned exercise.</p> <p>Following the Voltage pathfinder, we have conducted an internal and then external lessons learned exercise. Changes we will be looking to implement for future events to be fed back to participants.</p> <p>Categories for review were communication, pre-qual and compliant bids, assessment including transparency, participation and "level playing field", and process timeline.</p>	<p>Q4: New areas of need identified that will be tendered.</p> <p>Through lessons learned on earlier tender exercises undertaken in consultation with tender participants and wider industry, we will strive to improve the tendering experience.</p> <p>We will seek to broaden the market by reducing barriers to entry, increasing the scope of participants where possible (see D8.3 below).</p> <p>Specific timing of the lessons learned process is dependent upon tender timescales.</p>	<p>Q4: Tenders prepared and run on 2021-22 work (which are currently not known)</p>	<p>Improvements to tender processes result in new and varied tender participants.</p> <p>Improvements to tender processes are in line with stakeholder feedback.</p> <p>For example, for the voltage pathfinders we will look to remove ambiguity on what we expect to receive in a tender.</p>	<p>Improvements to tender processes result in new and varied tender participants; lessons learned from 2021/22 applied to tender processes in 2022/23.</p>	<p>D8.2.3</p> <p>RIIO-2, year 3: year 2023-24: Improved tender approaches that enable more participants to enter the market.</p> <p>Successfully attracted more participants and / or the tender process is more efficient for participants.</p> <p>We have received feedback that more people are aware of the process and are considering participation.</p>	<p>Further information added to RIIO-1 end point, milestones and success measures.</p>

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	<p>economic analysis skills and tools (Role 3) alongside innovative commercial approaches to procurement and market design (Role 2).</p> <p>Both activities and skillsets are required to deliver the milestones outlined for the Pathfinder projects and the enduring markets solutions that will build on those learnings.</p>									
A8.3 Support Ofgem to establish enabling regulatory and funding frameworks	<p>D8.3 Frameworks based on competitive regime not monopoly regime.</p> <p>Activities in A8 (Role 3) and A4 (Role 2) share common milestones.</p> <p>This is because the activities are being delivered both as part of our work to ensure a level playing field for all technology types to be able to provide solutions to network challenges (Role 3) and develop competitive means to procure those new system services (Role 2).</p> <p>Pathfinder projects deploy virtual teams of cross-functional resource bringing together world-leading technical and economic analysis skills and tools (Role 3) alongside innovative commercial approaches to procurement and market design (Role 2).</p>	None	Project	<p>Q4: Support Ofgem and TOs to consider RIIO-2 TO funding implications of competition.</p> <p>Start discussions with DNOs on their RIIO-ED2 business plans and how any applicable funding arrangement proposals work with the NOA process.</p> <p>Initiate policy intent for wider level playing field via Ofgem approval of CMP334 WACM1 to remove voltage support sites from paying TNUoS demand residual charge.</p>	<p>Q1 Identify further possible changes to CUSC to remove blockers to competition depending on the outcome of CMP334.</p> <p>Q4: Assess and adapt processes to accommodate any new regulatory funding arrangements.</p> <p>Establish, through stakeholder engagement following each phase, a prioritised list of actions required to remove or reduce blockers to tender participation (level playing field discussions to be facilitated through 'learning by doing').</p>	Q1-Q4: Work with industry and BEIS (for wider policy aspects) to identify and implement any other framework changes that may be needed; support Ofgem to consider RIIO-ED2 funding implications.	Depending upon outcome of CMP334, changes to charging arrangements are implemented.	Relevant modifications raised in response to any blockers identified.	<p>Engagement with OFGEM and industry on specific aspects of funding and level playing field so that frameworks are taken forward to be modified to assist creating a more level playing field.</p> <p>Be able to recommend funding solutions.</p> <p>Enable a more levelled playing field for all participants in tender process.</p>	Changes to RIIO-1 end point and milestones in year 1. Reference added to specific ongoing work (with Ofgem) to promote competition and a level playing field via framework changes.

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	Both activities and skillsets are required to deliver the milestones outlined for the Pathfinder projects and the enduring markets solutions that will build on those learnings.									

A9. Extend NOA approach to end of life asset replacement decisions and connections wider works

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A9.1 Expand network planning processes to enable more connections wider works to be assessed	D9.1 Developed and trialled connection wider works (CWW) processes with TOs.	Relies on NOA enhancements investment 390 . Once implemented, this activity will benefit from improvements introduced via the IT investment 390 NOA enhancements (Described under A11 Enhance analytical capabilities).	Project	Most connections wider works are subject to NOA assessment, but some are not. Most connections wider works are subject to NOA assessment, but some are not.	Q3 Review existing network planning processes and identify where and how to extend.	Q2 Undertake initial conversations with TOs and Ofgem, and explore initial technical feasibility, and potential exchange processes. Identification, in collaboration with TOs, of the zone for the CWW trial. Q3 Undertake trial.	Initial proposals for extending the existing processes prepared.	TOs engaged on the CWW trial. More of the transmission network will be evaluated under NOA processes resulting in reaping the benefits identified in the cost benefit analysis.	This deliverable is scheduled to complete in Q3: RIIO-2 year 2. The overall final deliverable is defined below in D9.3 in 2026. Overall objective is to yield benefits for consumers.	More information added to the milestones and successes.
A9.2 Trial assessment of all connection wider works in one region	D9.2 Completed and published connection wider works trials, in selected geographic regions, in NOA.	Relies on NOA enhancements investment 390 Once implemented, this activity will benefit from improvements introduced via the IT investment 390 NOA enhancements (Described under A11 Enhance analytical capabilities).	Project	Most connections wider works are subject to NOA assessment, but some are not. Most connections wider works are subject to NOA assessment.	Q3 Review existing network planning processes and identify where and how to extend.	Q4: Complete and publish outputs from connection wider works trials, based on the study work and trial undertaken in A9.1 .	Initial proposals for extending the existing processes prepared.	Connection wider works trials in selected geographic zones have been included in NOA. Trials allow for stakeholder engagement on the outcomes and process employed.	This deliverable is scheduled to complete in Q4: RIIO-2 year 2 The overall final deliverable is defined below in D9.3 in 2026.	

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A9.3 Expand to all Connections Wider Works (CWW)	D9.3 Incremental expansion of the process (following trials) which results in making recommendations on all connections wider works in NOA 2026.	Relies on NOA enhancements investment 390 Once implemented, this activity will benefit from improvements introduced via the IT investment 390 NOA enhancements. (Described under A11 Enhance analytical capabilities).	Project	N/A See D9.1 and D9.2 for deliverables which enable this deliverable.	N/A. See D9.1 and D9.2 for deliverables which enable this deliverable.	N/A. See D9.1 and D9.2 for deliverables which enable this deliverable.	N/A. See D9.1 and D9.2 for deliverables which enable this deliverable.	N/A. See D9.1 and D9.2 for deliverables which enable this deliverable.	Following completion of the trials in D9.2 (2022/23) there will be an incremental expansion of the process leading to full implementation in NOA 2026. This enables us to manage the scale of change to the NOA and smooth the resulting impact for all industry parties. Recommendation of network solutions which are outside of historic defined boundaries. Larger portion of the GB network being assessed through NOA. Extending NOA and increasing the defined set of boundaries or moving to a nodal assessment of the network (depending on the technical and computational feasibility delivered in IT investment 390).	
A9.4 Develop process with TOs to input into ESO analysis of end of life asset replacement decisions	D9.4 Efficient planning process agreed with TOs NOA 2024 makes recommendation on future end of life asset replacement	Relies on NOA enhancements investment 390 Once implemented, this activity will benefit from improvements introduced via the IT investment 390 NOA enhancements (Described under A11 Enhance analytical capabilities)	Project	End-of-life asset replacement decisions do not form part of the NOA assessment. End-of-life asset replacement decisions do not form part of the NOA assessment.	N/A – activity to start in year 2.	Q1 We will start to engage with TOs to determine, evaluate and agree the eligible set of criteria: <ul style="list-style-type: none"> Identify equipment categories to be evaluated Undertake investigatory runs using the NOA tools to understand if feasible and sensible to do so. 	N/A	RIIO-2 year 2 we will explore developing the process and understanding the criteria we will use for defining which equipment will go through the process with TOs. The network development team will facilitate and establish the criteria list, and undertake exploratory technical workThe network development team will facilitate and establish the criteria list and undertake	NOA 2024 will make recommendations on future end of life asset replacement. Measurement will take place at the end of the RIIO-2 period. New options will go through a cost benefit analysis and be included in NOA. This will increase the range and type of options that can be optimised to deliver the optimal solution for consumers. The NOA CBA will establish the	Milestones clarified and successes updated to reflect when we would engage with TOs.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
								exploratory technical work	value of this process and the scope and nature of future iterations will be kept under review based on this output. Establish criteria and agreement with TOs on scope of this activity.	

A10. Support decision making for investment at distribution level

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A10.1 Support DNOs to develop <i>NOA</i> type assessment processes	D10.1 <i>NOA</i> expertise shared with DNOs	None	Project	Initial engagement with DNOs on the requirements for <i>NOA</i> type assessments and where support may be required (to feed into RIIO-ED2 plans)	Engage with ENA Open Networks work stream, to continue discussions with DNOs. Q1 Engage with DNOs to support them to develop <i>NOA</i> type proposals for the RIIO-ED2 business plans.	Q1 Engage with DNOs on what support they want to develop <i>NOA</i> type proposals; develop support materials for DNOs as required on the existing <i>NOA</i> methodology. Q2-Q4 Continue to provide support to DNOs heading into the RIIO-ED2 period.	DNOs are engaged with the ESO on this topic and we have jointly scoped where support is required and when with each DNO.	DNOs continue to be engaged with the ESO on this topic and we have jointly scoped where support is required and when with each DNO.	Support DNOs to establish consistent methodologies and processes by providing information on our existing <i>NOA</i> processes should they want or need it.	Updated milestones to reflect earlier engagement with DNOs prior to submission of RIIO-ED2 Business Plans. Updated success measures.

A11 Enhance analytical capabilities

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A11.1 Refresh and integrate economic assessment tools to support future network modelling needs	D11.1 Improved identification of when is the most economical time to invest and the most efficient solution needs	<i>NOA</i> Enhancements investment 390 Data and analytics platform investment 220 . The data and analytics platform will provide the foundational architecture to enable the development of an interchangeable suite of tools with a	Project	Informal engagement with potential tool providers and understanding limitations of current tool.	Q1: Start Economic Assessment (EA) tool refresh. Q2-3: Gather requirements and design / procure future EA tool. Q4: Commence development and testing of EA tool.	Q3: Continue development and testing of EA tool, including parallel working with existing tool. Given the complexity of the tool, seek independent analysis to provide assurance of the new model.	Procurement exercise for new EA tool completed, with design decisions made to design the right tool for the future.	A new EA tool, which reflects the latest modelling approach and technologies, and therefore enables: <ul style="list-style-type: none"> Quicker evaluations and issues identification At lower cost. More network being evaluated 	RIIO-2 year 4; 24/25: Started cyclical EA tool refresh (D11.1.5) RIIO-2 year 5 25/26: Full integration with Data and analytics platform complete, enabling a joined-up analysis process that allows us to stack different network needs and adjust the	More detail added to the milestones and successes.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		common dataset, and seamless exchange of data between tools. The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.				Data and analytics platform foundational architecture in place. Q4: Implement EA tool.		<ul style="list-style-type: none"> Evaluation of additional quantities, and/or on additional boundaries. 	<p>level of detail in the analysis, to deliver the most economic decision.</p> <p>This can be measured by measuring savings or efficiencies from NOA that is comparing costs, network coverage, speed of evaluation before and after implementation of each tool enhancement.</p>	
A11.2 Implement probabilistic modelling	D11.2 Improved identification of network needs	<p>NOA Enhancements investment 390</p> <p>We need to manage the increasing number of scenarios and modelling complexity driven by the growing interaction between different network needs. The better we understand likely needs, the better we can identify where and when to invest most efficiently.</p> <p>Data and analytics platform investment 220. The data and analytics platform will provide the foundational architecture to enable the development of an interchangeable suite of tools with a common dataset, and seamless exchange of data between tools.</p> <p>The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.</p>	Project	Proof of concept to demonstrate how to integrate pre and post-fault actions within our probabilistic analysis in line with our commitments within our Network Development Roadmap and ETYS.	<p>Q1: Gather requirements and design Probabilistic Model (PM).</p> <p>Q2: Develop and test PM; Proof of Concept for a bespoke joint network and market tool for probabilistic thermal analysis.</p> <p>Proof of concept for integrating probabilistic network analysis into the NOA process.</p> <p>[These milestones are in line with our commitments within our Network Development Roadmap and ETYS].</p>	<p>Q3: Data and analytics platform foundational architecture in place.</p> <p>Q4: Implement PM.</p>	<p>Model that enables Year-round assessment of Thermal needs. Needs identified across the year rather than single winter peak snapshot.</p> <p>Analysis completed across all available FES scenarios and not just focussed on one.</p> <p>Proof of Concept for a bespoke joint network and market tool for probabilistic thermal analysis.</p> <p>Proof of Concept for integration of probabilistic network analysis into the NOA process.</p>	<p>Year-round analysis completed on all solution types: Asset reinforcements, reduced build, commercial solutions.</p> <p>Year-round analysis completed on solution types submitted by multiple parties: TOs, ESO and Interested Persons.</p> <p>Probabilistic modelling Integrated within NOA process.</p>	<p>RIIO-2 year 4; 24/25: Developed and implemented online portal (D11.2.4)</p> <p>The online portal will provide an interactive platform to allow stakeholders to view network needs and see the impact selected generic options will have on addressing those needs from a technical perspective.</p> <p>RIIO-2 year 5 25/26: Full integration with Data and analytics platform complete, enabling a joined- up analysis process that allows us to stack different network needs and adjust the level of detail in the analysis, to deliver the most economic decision.</p> <p>This can be measured by measuring savings or efficiencies from NOA that is comparing costs, network coverage, speed of evaluation before and after implementation of each tool enhancement.</p>	More detail added to milestones and successes.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A11.3 Build voltage assessment techniques into an optimisation tool	D11.3 Improved assessment of voltage requirements, and ability to look across a range of network needs at the same time	NOA enhancements investment 390 Data and analytics platform investment 220 . The data and analytics platform will provide the foundational architecture to enable the development of an interchangeable suite of tools with a common dataset, and seamless exchange of data between tools. The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.	Project	Completion of the innovation project: “Application of Convex Optimisation to Enhance the NOA Process”.	Q4: Start full Voltage Optimisation (VO) tool development. Dependent on the success of the innovation project we would look to start this work earlier.	Q1-Q2: Gather requirements and design VO tool. Q3: Data and analytics platform foundational architecture in place. Q3-Q4: Develop and test VO tool. Q4 Proof of concept for integrating year-round voltage analysis into the NOA process.	Taken outputs and learnings from the Innovation project “Application of Convex Optimisation to enhance the NOA process” and completed the initial Proof of Concept work to understand which optimisation model and algorithm will be best suited to the NOA process for voltage assessment.	Completed development and testing of the VO model. Model that enables a national assessment as well as a local assessment of needs. Proof of concept for integrating year-round voltage analysis into the NOA process. Model that enables Year-round assessment of voltage needs. Needs identified across multiple year-round snapshots rather than single summer minimum snapshot. Analysis completed across all available FES scenarios and not just focussed on one.	RIIO-2 year 3; 23/24: Implemented VO tool and identified further enhancements. RIIO-2 year 5 25/26: Full integration with Data and analytics platform complete, enabling a joined- up analysis process that allows us to stack different network needs and adjust the level of detail in the analysis, to deliver the most economic decision. (D11.3.4) This can be measured by measuring savings or efficiencies from NOA that is comparing costs, network coverage, speed of evaluation before and after implementation of each tool enhancement.	More detail added to successes in BP1 and linking to the innovation work that is supporting model development.
A11.4 Build stability assessment techniques into an optimisation tool	D11.4 Improved assessment of stability requirements across the network.	NOA enhancements investment 390 We need to manage the increasing number of scenarios and modelling complexity driven by the growing interaction between different network needs. The better we understand likely needs, the better we can identify where and when to invest most efficiently.	Project	12 months completed of 18-month innovation project with TNEI. Probabilistic Planning for Stability Constraints. Work Package 1 complete: Initiation and Review. Work Package 2 complete: Development and Reduced-scale Testing.	Q1: Work Package 3 completed: Trialling on Full GB Model. Q2: Work Package 4 completed: Future Roadmap and Plan for implementation.	Q2: Start-up phase for full Stability Assessment (SA) tool development. Q3: Data and analytics platform foundational architecture in place. Q3-Q4: Gather requirements and design SA tool.	Completion of the innovation project with TNEI: Probabilistic Planning for Stability Constraints. Successful trials of the initial concept developed in the innovation project on full GB model which shows comparable accuracy to our current process. This is dependent on the success of the innovation project.	Proof of Concept for new stability assessment tool that can be used in the NOA process.	RIIO-2 year 4; 2024-25: Implemented SA tool (D11.4.4) . RIIO-2 year 5 25/26: Full integration with Data and analytics platform complete, enabling a joined- up analysis process that allows us to stack different network needs and adjust the level of detail in the analysis, to deliver the most economic decision.	Further detail added to the milestones and Year 1 and 2 successes.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		<p>These investments are necessary to support delivery of all the <i>NOA</i> activities.</p> <p>Data and analytics platform investment 220. The data and analytics platform will provide the foundational architecture to enable the development of an interchangeable suite of tools with a common dataset, and seamless exchange of data between tools.</p> <p>The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.</p>					A plan for the implementation of the findings from the innovation project has been developed		<p>Enable efficiencies, greater insights into the future network requirements and how to meet them.</p> <p>This can be measured by measuring savings or efficiencies from <i>NOA</i> that is comparing costs, network coverage, speed of evaluation before and after implementation of each tool enhancement.</p>	

A12 SQSS Review

Our plans to review the SQSS will remove barriers to entry to ensure that it enables decarbonisation of the electricity system and help to align industry arrangements across transmission and distribution. We have updated this deliverable to drive a very challenging timeline, thereby implementing 'quick win' amendments to the SQSS by March 2023.

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
<p>A12.1 Scope project, building on the BEIS recommendations</p> <p>A12.2 Identify solutions</p> <p>A12.3 Implement changes to the SQSS</p>	SQSS updated to ensure it is designed to enable decarbonisation of the electricity system	N/A	Project	Evaluation of recommendations from BEIS review of technical standards (depending on publication timescale).	<p>Q1: Engage key stakeholders and initiate scope review.</p> <p>Q2: Consult on SQSS Review scope, issues and options.</p> <p>Q2-3 Engage stakeholders (including network companies) to co-create prioritised list of issues and action plan.</p>	<p>Milestones on delivery of quick wins and initiation of actions on broader topics are dependent on the outputs delivered in 2021/2022.</p>	<p>Key issues identified and prioritised with industry stakeholders including the SQSS Panel.</p> <p>Clear understanding of impact of key strategic projects on SQSS including Energy Standards Review, Offshore coordination and implications of extending competition in the <i>NOA</i> process to meet transmission system needs.</p>	<p>Quick wins implemented.</p> <p>Broader changes on strategic topics such as Energy Standards Review, Offshore coordination and implications of extending competition in the <i>NOA</i> process to meet transmission system needs initiated.</p>	<p>Strategic changes implemented by end of 2025/26 to ensure that SQSS is designed to enable decarbonisation of the electricity system.</p>	<p>Year 1 and Year 2 milestones and success factors updated to drive an extremely challenging timeline.</p> <p>Three sub-activities</p>

ESO RIIO-2 Delivery Schedule

					Q4 Publish prioritised list of issues to be addressed and action plan. Engage stakeholders.		Published report including horizon scanning and potential code modifications identified.			merged into one overall deliverable.
					Q4: Publish plan for quick wins and initiate action if appropriate.		Quick wins identified and action initiated if appropriate.			

A13 Leading the Debate

We will continue to build on the valued insights we already produce through our Future Energy Scenarios (*FES*) and associated documents thereby underpinning our ‘Whole system strategy that supports net zero by 2050’ ambition. By the end of BP1 we will have developed and implemented our proposed energy and electricity demand models which will be more robust and allow for greater interrogation of the scenarios. Through our proposal to Bridge the Gap to Net Zero, we will create an environment for debate and additional thinking with industry stakeholders to explore and present thinking on subject areas without necessarily having a fully formed or ‘right’ answer. Given the stakeholder-driven nature of this activity we therefore currently do not know what insights will be provided and how extensive they will be until we engage with stakeholders.

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A13.1 Carry out analysis and scenario modelling on future energy demand & supply	D13.1 Published <i>Future Energy Scenarios (FES)</i> , <i>Winter Outlook</i> and <i>Review</i> , <i>Summer Outlook</i> and other regular external commentary such as blogs from ESO employees on our website.	Investment 220 . Data and analytics platform. The data and analytics platform will store the data and provide analytical capabilities to support the <i>FES</i> modelling. The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.	Continuous	Undertake a review of ESO publications, including <i>FES</i> , to ensure they work together as a suite of documents for stakeholders.	Q1: <i>Winter Review</i> Q2: <i>FES</i> Call for Evidence Q2: <i>FES</i> Launch Q2-Q3: <i>FES</i> Network Forum (this is a new initiative) Q3: <i>FES</i> Stakeholder Feedback Document Q3: <i>Winter Outlook</i> Q4: <i>Summer Outlook</i>	Q1: <i>Winter Review</i> Q2: <i>FES</i> Call for Evidence Q2: <i>FES</i> Launch Q2-Q3: <i>FES</i> Network Forum (new) Q3: <i>FES</i> Stakeholder Feedback Document Q3: <i>Winter Outlook</i> Q4: <i>Summer Outlook</i>	Ongoing success of the delivery of <i>FES</i> as set out in the ‘Final delivery date and what success looks like’ column. We adjust our bottom up process outputs each year to system actuals to keep them as close to outturn as possible. Using our bottom up processes, we include as much actual data as possible. where this does not behave as we expect we investigate and engage to understand this to reflect our scenarios. We begin with the scenario framework, assessing its suitability each year. The process is consulted upon and documented in our scenario framework document giving reason for changes and how this will be	Ongoing success of the delivery of <i>FES</i> as set out in the ‘Final delivery date and what success looks like’ column. We adjust our bottom up process outputs each year to system actuals to keep them as close to outturn as possible. Using our bottom up processes, we include as much actual data as possible. where this does not behave as we expect we investigate and engage to understand this to reflect our scenarios. We begin with the scenario framework, assessing its suitability each year. The process is consulted upon and documented in our scenario framework document giving reason for changes and how this will be	The <i>FES</i> will continue to be one of our flagship documents. Performance is subjective and qualitative in many areas. We aim for the <i>FES</i> to remain relevant and reflect changes in the market/policy/technology. It will continue to be built on stakeholder engagement and research but not just reflect the scenarios and thinking already published. It will continue to show a stretching but credible range of scenarios. It will focus on key aspects to whole energy and net zero. It will not be a handle turning exercise but one where our expertise and capacity is spent on the most integral aspects of the scenarios taking a lead from the Bridging The Gap outputs (A13.4).	Updated successes to reflect the current <i>FES</i> development process.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
							applied to the new scenarios.	applied to the new scenarios.		
A13.2 Conduct mathematical and modelling and market research on local and wider geographic demand information	D13.2 Created pan-European and country level electricity and energy demand models	Investment 220 . Data and analytics platform. The data and analytics platform will store the data and provide analytical capabilities to support the <i>FES</i> modelling. The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.	Continuous	Introduction of the pan-European power dispatch model - a market model that attempts to replicate the power dispatch model including trades on the Interconnectors (used for <i>FES</i> development but also for <i>NOA</i>). We have expanded the data that we put in to this from an initial small set of directly connected countries, to a much wider geography of European countries (data sourced from ENTSO-E and TSOs).	Work with ENTSO-E to collate the latest European "Ten Year Network Development Plan" (TYNDP) 2020 scenarios, cleanse the data, and incorporate the resulting data in to our pan-European dispatch model.	As the TYNDP is only published every 2 years, we would use this year to gather updates from key neighbouring TSOs and to update these in our pan-European dispatch model. This will help us keep in sync with any net zero policy changes occurring in the EU without having to wait for the next TYNDP cycle.	Each year we make modelling improvements as well as collate new information. For demand including embedded generation and demand side response we report on the changes to our modelling methodology and the performance of the recent outturn winter peak demand to Ofgem as part of the Capacity Mechanism process.	Each year we make modelling improvements as well as collate new information. For demand including embedded generation and demand side response we report on the changes to our modelling methodology and the performance of the recent outturn winter peak demand to Ofgem as part of the Capacity Mechanism process.	N/A	RIIO-1 end point and milestones updated to reflect current processes and specific reference to European model and data development.
A13.3 Maintain external communication channels with consumers and stakeholders	D13.3 Shared insights on future energy expectations and requirements	N/A	Continuous	We have implemented the Network Forum and are using this as a forum to discuss our modelling assumptions and outputs on a national basis with the regional network experts who engage with local authorities etc on a more detailed basis. This is then reflected in our <i>FES</i> .	Q1: Develop a communication strategy aligned to target audiences. Create future energy insights content to share through selected channels. Q2: <i>Future Energy Scenarios</i> Publication and Launch Events; Introduce Bridging the gap topic and invite core stakeholders to co-creation events. Q3: <i>Future Energy Scenarios</i> Call for evidence, workshops and bilateral meetings; Bridging the gap stakeholder events Q4: <i>Future Energy Scenarios</i> Bilateral meetings; Bridging the gap report launch Annual <i>FES</i> activities comprise continuous engagement with stakeholders throughout the year. Communication is	Q2: Publication and Launch Events Q3: Call for evidence, workshops and bilateral meetings Q4: Bilateral meetings Annual <i>FES</i> activities comprise continuous engagement with stakeholders throughout the year. Communication is managed via various communication channels such as: email, <i>FES</i> newsletter, social media, <i>FES</i> website and the ESO website.	See final success column	See final success column	Continued positive scores from our stakeholders following targeted surveys. Performance will not be measured on the number of people we engage with but the value and breadth of the engagement. Good performance will demonstrate that engagement is beyond the traditional energy industry. A range of methods will be used to engage. This is relevant not only to the <i>Future Energy Scenarios</i> but also Bridging the Gap to Net Zero.	Updated milestones and success measure to reflect our engagement process for <i>FES</i> .

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
					managed via various communication channels such as: email, <i>FES</i> newsletter, Social media, <i>FES</i> website and the ESO website.					
A13.4 <i>FES: Bridging the gap to net zero</i>	D13.4 This work draws from each annual <i>FES</i> publication, and the engagement activity referenced in A13.3 above, to provide insights and analysis beyond <i>FES</i> . We look to ensure that we are examining topics of relevance to our stakeholders which can inform energy policy development and the strategic thinking of our customers and stakeholders.	N/A	Project This work will require a project to mobilise and embed the new changes into the existing process, however there are no specific deliverables related to this project besides enabling the existing process.	Support BEIS and industry in developing a strategy for clean heat. Shared and tested thinking on Clean Heat pathways with networks and industry.	Q3: Establish broad industry engagement and interactive collaborative spaces. Q4: Publish focused and extensive whole energy system report.	Q3: Establish broad industry engagement and interactive collaborative spaces. Q4: Publish extensive whole energy system report.	We create environment for debate and additional thinking and explore and present thinking on subject areas without necessarily having a fully formed or 'right' answer. We currently do not know what insights will be provided and how extensive they will be until we engage with stakeholders.	We create environment for debate and additional thinking and explore and present thinking on subject areas without necessarily having a fully formed or 'right' answer. We currently do not know what insights will be provided and how extensive they will be until we engage with stakeholders.	Success can be measured via stakeholder feedback (see above) which can evidence the value this work brings to other external parties. Conclusions and findings from Bridging the Gap are also fed onwards into the following annual <i>FES</i> publication. Our work therefore supports a closer loop across our ongoing work to Lead the Debate.	Updates made to the deliverable, the milestones and successes to demonstrate that the specific outputs from this deliverable are unknown until we have engaged stakeholders.
A13.5 <i>FES</i> : Integrating with other networks and supporting DNOs to develop their own DFES processes - This project will require a cross organisation project group at a senior stakeholder and working level with the national and regional network companies. <i>FES</i> : Integrating with other networks and supporting DNOs to develop their own Distribution <i>FES</i> (<i>DFES</i>) processes - This project will require a cross organisation project group at a senior stakeholder and working level with the national and regional network companies.	D13.5.1 Working with DNOs to understand what information we need to share to support development of DFES and ED-2 submissions Working with DNOs to understand what information we need to share to support development of <i>DFES</i> and RIIO - ED2 submissions	Investment 220 . Data and analytics platform. Investment 220 . Data and analytics platform. The data and analytics platform will store the data and provide analytical capabilities to support the <i>FES</i> modelling. The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform. Key milestones relevant to this deliverable are: Data platform foundation delivered including	Project	The RIIO-1 end point has been where we have defined the first set of building block data to be shared which has been trialled in <i>FES</i> 20 and used once in full in <i>FES</i> 21. <i>FES</i> Network Forum established to enable all network organisations to input into <i>FES</i> on a more regular and timely manner. Initiate engagement with DNOs on development of regional <i>FES</i> and development of RIIO-ED2 business plans.	Q2: Completed ESO electricity demand modelling requirements gathering and design work. Bring DNO data into the process (enhanced building blocks information as a result of a DCUSA modification) to compare with national data in order to inform discussions on how we can support DNOs to develop their own regional <i>DFES</i> (and inform ESO <i>FES</i> each year). Q3 Engage with DNOs and provide input to RIIO-ED2 business plans.	Q2 Share <i>FES</i> building block data with industry parties and engage with stakeholders; Develop and share data reports and insights (with DNOs) to further develop our regional assumptions.	Electricity demand modelling requirements compiled and well understood by stakeholders. Positive engagement with DNOs on supporting their <i>DFES</i> processes.	Positive engagement with DNOs on supporting their <i>DFES</i> processes.	ESO working closely with DNOs to share relevant and timely data to support development of <i>FES</i> and <i>DFES</i> for the benefit of stakeholders.	Further detail added to the deliverable description, the RIIO-1 end point and successes. Reference also made to engagement activity with DNOs.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
It is dependent on a clearly aligned strategy between parties and collaboration with Ofgem. There may also be code change requirements. It is dependent on the engagement and resource available from the other companies and as such we cannot define a plan of work. The first step will be to define the project scope and set a strategy.		successful testing of plug-and-play approach with modules in development/delivery phase.								
A13.5 FES: Integrating with other networks	D13.5.2 Developed new energy demand model – this brings together all energy demand data in one place	Investment 220 . Data and analytics platform. The data and analytics platform will store the data and provide analytical capabilities to support the <i>FES</i> modelling. The associated IT investment 250 Digital Engagement Platform will provide the ability to share the data with 3rd parties. The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.	Project	We have defined the first set of building block data to be shared with DNOs which has been trialled in <i>FES</i> 20 and used once in full in <i>FES</i> 21.	Q3: Completed review of available energy data and established stakeholder modelling requirements.	Q1: Developed energy demand model plan, including pilots and full-scale development. Q3: Built, tested and validated model. Q4: Implemented model.	Energy Data availability and sources understood. Relevant stakeholders engaged on modelling requirements with their requirements documented and agreed.	Developed energy demand model plan, including pilots and full-scale development. Built, tested and validated model Implemented model. The functionality of the data platform will allow for better sharing of data into and out of the ESO and analysis of a greater level of granularity and volume (to enable us to support the development of Regional <i>FES</i>). The ability to use consistent formats and inputs/outputs will gain efficiency savings internally and externally allowing us to manage the increasing levels of data we need to share between organisations.	Provides longer term forecasting by incorporating annual profiles and vectors while integrating currently separate models such as transport.	Detail added on the additional functionality delivered by the new model.

A14 Take a whole electricity system approach to connections

Our Connections proposals ensure that we continue to support the ongoing increase in numbers and variety of market participants looking to connect to the network, contributing to wards our Trusted Partner ambition and facilitating whole system outcomes. This will be supported by our connections hub proposal to help customers engage through the connections process along with additional customer service and contract management for smaller and distributed connected parties. The connections hub will be developed in co-ordination with network organisations to ensure efficient delivery and an experience that is seamless for the customer wherever they may be looking to connect. Phase 1 of the portal will be delivered by the end of March 2023, enabling customers to arrange meetings with Account Managers, apply to connect and track the progress of their application.

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A14.1 Provide contractual expertise and management of connection contracts including provision of connection offers to customers	D14.1.1 Managing an increasing volume of connection offers for customers (with technical support provided via activity A15). D14.1.2 Contract management of connection agreements	N/A	Continuous	N/A	As required	As required	N/A	N/A	Ongoing activity – ongoing success measured by positive customer feedback on our service.	
A14.2 Ensure Grid Code compliance of new connections	D14.2.1 Compliance monitoring of new connections in accordance with Grid Code provisions	N/A	Continuous	N/A	As required	As required	N/A	N/A	Ongoing activity – ongoing success measured by positive customer feedback on our service; Grid Code compliant connections.	
A14.3 Further enhance the customer connection experience, including broader support for smaller parties	D14.3.1 Establish dedicated Distributed Energy Resource (DER) account management function – this is to support smaller parties, who are not our direct customers and who may have transmission-related issues with their connection applications. The type of support we can provide includes information about system charges and securities, commercial opportunities in system services, contractual / code arrangements and the works required to facilitate their connection.	N/A	Project (becomes continuous once implemented)	An example of where we have sought to develop processes to enhance the connections process for DER customers to-date is the Appendix G process which provides greater control to the DNOs while providing visibility to ESO of what is connecting to the DNO networks, thus facilitating connection of DER more efficiently. Engage with DNOs on the scope of the new DER function and start to foster closer working relationships.	Q1: Review DER internal processes; engage customers and foster closer working relationships with DNOs on the scope of the new proposed DER function. Q2: Establish DER management function (through appropriate training); engage with customers on the new function and identify any additional areas of potential support required. Q4: Request feedback from customers and DNOs.	Continue to deliver the DER function and make improvements to the service delivered in line with customer feedback.	New DER function established and closer working relationships with DNOs established. Positive feedback from DER customers and DNOs on our service provision.	Demonstrable changes in line with customer feedback. Further positive feedback from DER customers and DNOs on our service.	Function established in 2021/22 with ongoing improvement. Positive feedback from DER customers and DNOs on our service provision; ESO has provided DER customers with information about system charges and securities, commercial opportunities in system services, contractual / code arrangements and the works required to facilitate their connection.	Updated to include support areas for DER customers and earlier engagement with DNOs on the new function.
A14.3 Further enhance the customer connection experience, including	D14.3.2 Deliver first whole electricity system connections seminar – these seminars will incorporate DNO input in addition to existing	N/A	Project	Deliver customer seminars using current approach.	Q4: Engage with DNOs on new approach to forthcoming seminar.	Q1: Prepare and plan for whole system seminar; engage DNOs and TOs on approach and content.	DNOs engaged and willing to participate in in whole system seminars.	Positive feedback from customers who attend the seminar and DNOs on the development and preparation process.	Success measured by positive feedback from customers on the first whole electricity system seminar and extent to which DNOs have	First year success added to deliverable

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
broader support for smaller parties.	involvement from the TOs to the customer seminars that we already offer to customers.					Q2: Engage TOs and DNOs on seminar preparation and content; deliver first whole system seminar. Q3: Gather and process feedback on seminar.			engaged with seminar delivery.	
A14.3 Further enhance the customer connection experience, including broader support for smaller parties.	D14.3.3 Whole electricity system connection seminars on an ongoing basis having delivered the first one in the previous deliverable.	N/A	Continuous	N/A	Q4: engage with DNOs on new approach to the first whole system seminar Q4: Engage with DNOs on new approach to the first whole system seminar.	Q4: Refine seminar planning and engagement process from first seminar; deliver second whole system seminar.	DNOs engaged and willing to participate in in whole system seminars. DNOs engaged and willing to participate in whole system seminars.	Demonstrable changes to seminars in line with customer feedback. Further positive feedback from customers who attend the seminar.	Ongoing; success measured by demonstrable changes in line with customer feedback and ongoing positive feedback from customers on the seminars and attendance rates.	Updated to reflect content in related deliverables
A14.4 Facilitate development of the customer connections hub	D14.4.1 Implement first phase of the ESO connections hub, including online account management and integration with other network organisation websites	IT investment ref 380 Connections Portal – this is the IT investment that will enable delivery of the connections hub and electronic management of the connections contracting process, providing an interface for customers, TOs and (ultimately) DNOs.	Project	Agreed way forward with TOs (on their respective portal proposals) on coordinated delivery of portal functionality, including outline plan for delivery.	Q1: Commence project start up; engage the TOs on their portal proposals. Q2: Conduct work on requirements & design; engage with key stakeholders, the ENA and TOs on scope of Phase 1. Q3: Develop & test NGESO portal; establish a customer focus group for testing & engage TOs to align with their portals. Q4: Implementation; check in with key stakeholders.	Ongoing agile developments of the portal: Q1: Further development & testing; engage with customer focus group and TOs. Q2: Implementation of updates to NGESO portal. Q3: Further development & testing; engage with customer focus group and TOs to further align with their portals. Q4: Implementation of phase 1 of the connections hub.	We are aligned with TOs on our respective proposed portal solutions. We have engaged with customers to develop and test key outward-facing aspects of the portal. We have reached the first implementation phase of agile development.	Phase 1 of connection hub complete, enabling Transmission customers to view and manage their connection contracts online and providing central point for the GB connections process. The functionality to be delivered in Phase 1, subject to further stakeholder engagement on scope, includes: <ul style="list-style-type: none"> Ability to book meetings with account managers Online application form process and fee information Ability to track the progress of an application through the process Ability to view a portfolio of projects and apply for modification applications Compliance process monitoring A GB connections landing page which can point customers 	Phase 2 of the connections hub to be complete in Q4 2025 / 2026, helping to navigate customers and providing a seamless connection process to transmission & distribution electricity networks across GB. The system will be integrated with other network company customer portals as required, providing guidance on where to connect across GB. Success to be demonstrated through positive customer feedback.	Successes updated to include functionality delivered by Phase 1 of the portal.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
								to the various Network Companies' own connection processes. As a result, the Connection process runs more smoothly and efficiently for customers. In addition, we will consider interfacing requirements as the TOs develop their own customer portals.		
A14.4 Facilitate development of the customer connections hub	D14.4.2 Phase 2 of the connections hub concluded	IT investment ref 380 Connections Portal – this is the IT investment that will enable delivery of the connections hub and electronic management of the connections contracting process, providing an interface for customers, TOs and (ultimately) DNOs.	Project	Agreed way forward with TOs (on their respective portal proposals) on coordinated delivery of portal functionality, including outline plan for delivery. Initial discussions with DNOs on our connections hub proposals and how we might need to collaborate in the RIIO-ED2 period to integrate systems as required.	N/A – activity does not commence until BP2.	N/A – activity does not commence until BP2.	N/A – activity does not commence until BP2.	N/A – activity does not commence until BP2.	Phase 2 of connection hub to be complete in Q4 2025 / 2026, helping to navigate customers and providing a seamless connection process to transmission & distribution electricity networks across GB. Specific functionality may be impacted by final implementation of Phase 1 and the developments of other network company's systems as required. It is envisaged that functionality delivered by this Phase could include: <ul style="list-style-type: none"> • Delivery of an industry wide tool, providing access to existing heat maps from TOs, showing where capacity is and the relevant connection path to take • Integration with DNO systems requirements. Success of Phase 2 to be demonstrated through positive customer feedback	Expanded to include reference to early engagement with DNOs regarding Phase 2.

A15.5 Regional Development Plans (and A15.8)

Our RDP proposals are key to achieving our strategic goals of an electricity system that can operate Carbon free and whole energy system solutions. As we capture learning from our ongoing work on aligned and consistent markets for flexibility, we will be increasingly looking in RIIO-2 at how we can efficiently scale our RDPs for broader roll-out across each DNO area. We believe this is a step change from the approach in RIIO-1, where we set out to develop initial projects to test new ways of working. In RIIO-2, building on this, and also the 2020 work in the Open Networks project, work will further evolve to deliver standardised markets for flexibility services which embed operational co-ordination with DNOs. This is a significant and new piece of work for the industry. Through efficient scaling we will minimise the overall cost of IT infrastructure and impact on both transmission and distribution control centres. We will also be using RDPs to trial new use cases, for example market development across DNO licence areas and they provide the first step to exchanging operational data between the ESO and DNOs. It should also be noted that RDPs are a collaboration vehicle between us and potentially a number of network parties for any one RDP. Progress of these is therefore heavily reliant on all parties involved driving them forward.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A15.5 Develop Regional Development Programmes (RDPs)	Forward Plan 2020-21 RDP – N-3	IT investment reference 340 RDP Implementation and Extension - This investment will provide the ESO with greater visibility and control of parties connected to distribution networks. IT investment reference 340 RDP Implementation and Extension. This investment will provide the ESO with greater visibility and control of parties connected to distribution networks. It will provide an integrated real-time data exchange, situational awareness and dispatch capability with DNOs thereby facilitating the RDP process. We will look to implement common processes where possible across the RDPs. However, each DNO / TO will have different control systems and interfacing requirements. A separate IT design stage for each RDP will therefore assess requirements to achieve a co-created design.	Project	Delivery of N-3 inter-tripping of DER with UK Power Networks (UKPN). Delivery of communication link between NGESO and Western Power Distribution (WPD). Delivery of communication link between NGESO and Scottish and Southern Electricity Networks (SSE-N).	Q3 Completion (subject to obtaining NGET outage availability)	N/A – RDP complete in 2021/22	Facilitation of efficient access to transmission assets on south coast of England. N-3 Intertrip scheme will create additional transmission headroom allowing the connection of additional DER.	N/A – RDP complete in 2021/22	Project will conclude in Q2 2021/22 resulting in integrated DER intertripping solution with south coast DNOs and NGET. This will maintain system operability of the south coast system facilitating the connection of new DER.	Addition of RDPs from the 2020/21 Forward Plan that are due for completion in BP1.
A15.5 Develop Regional Development Programmes (RDPs)	Forward Plan 2020-21 RDP - Generation Export Management Scheme (GEMS)	IT investment reference 340 RDP Implementation and Extension - This investment will provide the ESO with greater visibility and control of parties connected to distribution networks. IT investment reference 340 RDP Implementation and Extension This investment will provide the ESO with greater visibility and control of parties connected to distribution networks. It will provide an integrated real-time data exchange, situational awareness and dispatch capability with DNOs thereby facilitating the RDP process. We will look to implement common processes where possible across the RDPs. However, each DNO / TO will have different control systems and interfacing requirements. A separate IT design stage for each RDP will therefore assess requirements to achieve a co-created design.	Project	Integrate Scottish Power Energy Networks (SPEN) Active Networks Management (ANM) of local constraints with NGESO management of wider transmission constraints. Detailed design of NGESO commercial systems to interface with GEMS.	Q3 Detailed design & development of IT solution complete. Q4 IT installation complete.	Q3 IT commissioning complete and GEMS go-live.	IT solution is fully developed and installed.	GEMS system will be complete by Q3 2022/23.	Project will conclude in Q3 2022/23 with jointly developed IT solution with Scottish Power Transmission (SPT). This will enable the continued operability of Dumfries and Galloway through an integrated congestion market.	Addition of RDPs from the 2020/21 Forward Plan that are due for completion in BP1.
A15.5 Develop Regional Development Programmes (RDPs)	D15.5.1 Start RDP1 of RIIO-2 – Regional development plans provide a means to working with other network parties to facilitate connection of low carbon energy sources in capacity constrained areas. We plan to	IT investment reference 340 RDP Implementation and Extension. This investment will provide the ESO with greater visibility and control of parties connected to distribution networks. It will provide an integrated real-time data exchange, situational awareness and dispatch capability with DNOs thereby facilitating the RDP process. We will look to implement common processes where possible across the RDPs. However, each DNO / TO will have different control systems and interfacing requirements. A separate IT design stage for each RDP will	Project	2020 / 2021 South West (WPD) MW dispatch RDP detailed development (Commercial and technical) complete.	Q1: Start RDP1 IT requirements and design stage. Q3: IT Requirements & design stage complete. Q4: IT Development & testing phase commences.	Q4: IT implementation phase complete.	RDP1 IT commenced. Requirements and design stage for investment 340 complete.	RDP1 established; Positive feedback received from RDP partner(s) on progress and IT development. IT investment 340 progressed to the first implementation phase.	RDP 1 completed in Q4 2022-23 with learnings feeding into ENA Open Networks project and the development of future RDPs. This will result in the connection of new zero carbon DER and the development of aligned flexibility	Detail added to explain why there is a design phase for each RDP for IT investment 340. DNO area now specified

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	undertake 6 RDPs in RIIO-2	therefore assess requirements to achieve a co-created design.							markets for local and national system needs. RDPs provide the first step to exchanging operational data between the ESO and DNOs. Standardisation, where possible, in dispatch procedures across MW dispatch RDPs.	against the RDP. Success measures updated.
A15.5 Develop Regional Development Programmes (RDPs)	D15.5.2 Start RDP2 of RIIO-2 - Regional development plans provide a means to working with other network parties to facilitate connection of low carbon energy sources in capacity constrained areas. We plan to undertake 6 RDPs in RIIO-2	IT investment reference 340 RDP Implementation and Extension - This investment will provide the ESO with greater visibility and control of parties connected to distribution networks. IT investment reference 340 RDP Implementation and Extension. This investment will provide the ESO with greater visibility and control of parties connected to distribution networks. It will provide an integrated real-time data exchange, situational awareness and dispatch capability with DSOs thereby facilitating the RDP process. We will look to implement common processes where possible across the RDPs. However, each DNO / TO will have different control systems and interfacing requirements. A separate IT design stage for each RDP will therefore assess requirements to achieve a co-created design.	Project	Q4 2020 / 2021 South East (UKPN) MW dispatch RDP detailed development (Commercial and technical) complete.	Q1: detailed RDP IT development commences. Q2: detailed RDP IT development complete. Q3: Start RDP2 IT requirements and design phase.	Q1: IT Requirements & design stage complete. Q2: IT development & testing commences.	RDP2 detailed solution scoping complete.	RDP2 IT commenced with Requirements and Design stage complete. Positive feedback received from RDP partner(s) on progress and IT development.	RDP2 completed in 2023-24 with learnings feeding into ENA Open Networks project and the development of future RDPs. RDPs provide the first step to exchanging operational data between the ESO and DNOs. Standardisation, where possible, in dispatch procedures across MW dispatch RDPs. This will result in the connection of new zero carbon DER and the development of aligned flexibility markets for local and national system needs.	Detail added to explain why there is a design phase for each RDP for IT investment 340. DNO area now specified against the RDP. Success measures updated.
A15.5 Develop Regional Development Programmes (RDPs)	D15.5.3 Start RDP3 of RIIO-2 Regional development plans provide a means to working with other network parties to facilitate connection of low carbon	IT investment reference 340 RDP Implementation and Extension This investment will provide the ESO with greater visibility and control of parties connected to distribution networks. It will provide an integrated real-time data exchange, situational awareness and dispatch capability with DSOs thereby facilitating the RDP process.	Project	Q4 2020 / 2021 Midlands Storage (WPD) MW dispatch RDP detailed development (Commercial and technical) complete.	Q2: Viability of market solution confirmed. Q3: Detailed RDP development starts. Q4: Detailed RDP development complete.	Q1: Start RDP3 IT requirements and design phase. Q3: IT Requirements & design stage complete.	Outline need for RDP 3 identified, detailed RDP solution scoping complete.	RDP3 IT commenced. Positive feedback received from RDP partner(s) on progress and IT development. Requirements and design stage for	RDP3 completed in 2023-24 with learnings feeding into ENA Open Networks project and the development of future RDPs.	Detail added to explain why there is a design phase for each RDP for IT investment 340.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	energy sources in capacity constrained areas. We plan to undertake 6 RDPs in RIIO-2	We will look to implement common processes where possible across the RDPs. However, each DNO / TO will have different control systems and interfacing requirements. A separate IT design stage for each RDP will therefore assess requirements to achieve a co-created design.				Q4: IT development & testing commences.		investment 340 complete.	RDPs provide the first step to exchanging operational data between the ESO and DNOs. Standardisation, where possible, in dispatch procedures across MW dispatch RDPs. This will result in the connection of new zero carbon DER and the development of aligned flexibility markets for local and national system needs.	DNO area now specified against the RDP. Success measures updated.
A15.5 Develop Regional Development Programmes (RDPs)	D15.5.4 Start RDP4 of RIIO-2 Regional development plans provide a means to working with other network parties to facilitate connection of low carbon energy sources in capacity constrained areas. We plan to undertake 6 RDPs in RIIO-2	IT investment reference 340 RDP Implementation and Extension. This investment will provide the ESO with greater visibility and control of parties connected to distribution networks. It will provide an integrated real-time data exchange, situational awareness and dispatch capability with DSOs thereby facilitating the RDP process. We will look to implement common processes where possible across the RDPs. However, each DNO / TO will have different control systems and interfacing requirements. A separate IT design stage for each RDP will therefore assess requirements to achieve a co-created design.	Project	RDP4 not yet initiated – future need for RDPs identified through discussions with TOs and DNOs via the connections process and via DNO network development plan processes when available (as required by the Clean Energy Package).	Q4: Identify outline need for RDP 4.	Q1: Detailed RDP development starts. Q3: Detailed RDP development complete. Q4: Start RDP4 IT requirements and design phase.	Outline need for RDP 4 identified.	Detailed RDP solution scoping complete.	RDP4 completed in 2024-25 with learnings feeding into ENA Open Networks project and development of future RDPs. This will result in the connection of new zero carbon DER and the development of aligned flexibility markets for local and national system needs.	Detail added to explain why there is a design phase for each RDP for IT investment 340. DNO area now specified against the RDP. Success measures updated.
A15.5 Develop Regional Development Programmes (RDPs)	New deliverable Development of roadmap to deliver GB rollout of functionality (visibility & control of DER) developed through initial RDPs. i	As set out above, IT investment 340 RDP implementation and extension provides the initial operational data linkages with DNOs through each project. This project would understand how this investment can be rolled out most efficiently and consistently across GB.	Project	Not started.	Q1-Q3 DNO & TO engagement to understand determine needs case for greater visibility & control of DER. Q4 Review of RDP projects to date to understand potential learnings and synergies.	Q1-Q3 Development of aligned proposals for GB wide rollout. Q4 Publication of roadmap for national rollout.	Common agreement of the needs case for GB roll out. Current position of RDPs understood and factored into strategy development.	A common, standard plan for national roll-out is agreed with DNOs and TOs.	A national roadmap to deliver greater visibility & control of DER will be published by Q4 2022/23.	New deliverable added to provide clarity on broader rollout of RDPs
A.15.8 Provide technical support to DSO and whole	D15.8.1 Completion of any DSO associated code changes ahead of	N/A	Continuous	Active engagement in the development of DSO and aligned national and local	Q1-Q4 Work with stakeholders, including Open Networks, to identify, scope and	Q1-Q4 Provide input to relevant DSO associated	DSO associated Code changes initiated in	The ESO has been actively engaged in the Open Networks	2023/24 Policy changes developed through Open Networks and	Further detail added to milestones

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
electricity system alignment	RIIO-ED2 to facilitate system operation activities.			markets, including Open Networks DSO Implementation Plan (and ongoing updates thereto). Engage with the DNOs on DSO transition topic areas as they develop their RIIO-ED2 plans; Offer opportunities for workshops to discuss alignment of business plans.	submit relevant DSO associated Code mods ahead of RIIO-ED2. This is to include active engagement in Ofgem work on DSO policy; Q1-Q4 Undertake active engagement in the Open Networks project to support ongoing developments and lead Work Stream 4 Whole Energy Systems; Q1; Business plan alignment discussions with DNOs conclude ahead of draft RIIO-ED2 business plan submissions. Q3; Business plan alignment discussions with DNOs conclude ahead of final RIIO-ED2 business plan submissions.	Code mods ahead of RIIO-ED2. Q1-Q4 Undertake active engagement in the Open Networks project to support ongoing developments and lead Work Stream 4 Whole Energy Systems. Q1-Q4: Review and provide support to the RIIO-ED2 business plan development process and broader initiatives as required ensuring alignment with ESO business plan.	readiness for RIIO-ED2. The ESO has been actively engaged in the Open Networks Project and work stream 4. The ESO has been actively involved in the RIIO-ED2 development process and DNO draft business plans are appropriately aligned with the ESO business plan.	Project and work stream 4. The ESO has been actively involved in the RIIO-ED2 development process and DNO final business plans are appropriately aligned with the ESO business plan. Positive feedback on our engagement approach and timeliness. DSO associated Code changes completed in readiness for RIIO-ED2.	progressed through codes are in place to enable DSO in RIIO-ED2. Our business activities are aligned with those of DNOs facilitating efficient whole system processes, including those associated with flexibility services.	and successes.
A.15.8 Provide technical support to DSO and whole electricity system alignment	D15.8.2 Review of aligned technical standards completed – this review will be led by BEIS and requires active engagement from industry participants.	N/A	Project	N/A	Q2 Engage with the review scoping process	Q1-Q4 provide ongoing technical expertise and engagement with the technical standards review	Active engagement on the review	Active engagement on the review.	2023 / 2024 Outcome of review expected to be published and the ESO has provided technical input.	Removed as a discrete deliverable with the milestones from here added to A12 SQSS Review.

A15 Taking a whole energy system approach to promote zero carbon operability

These proposals underpin and enable our zero-carbon system operation ambition through the development of data exchange, offline modelling capability and system operation tools. It is under this activity that we signal the longer-term requirements for system operation through, for example, our System Operability Framework publications. Through activity **A15.6** we will transform our capability in data and modelling ensuring also that regulatory frameworks are in place to support appropriate exchange and use of data by the ESO, network companies and other stakeholders through our data and analytics platform. Activity **A15.7**, the development of a wide area monitoring and control system (MCS), can facilitate zero carbon operation by 2025. By March 2023 Phase 3 of the MCS (an Operational demo) will be halfway through and therefore testing of the system will be underway. Activities proposed in **A15.9** will bring a whole system focus to some of our existing activities including RDPs and System Operability Framework publications during the latter years of the RIIO-2 period.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A15.1 Develop the <i>System Operability Framework (SOF)</i> and provide solutions up to real time of network related operability issues.	D15.1.1 <i>System Operability Framework (SOF)</i> documentation – to identify and quantify operability needs in short and long-term planning timescales, encouraging the development of market-based solutions wherever possible D15.1.2 Innovation projects developing new operability solutions – undertake innovation projects, as appropriate, to test operability solutions	N/A	Continuous	Publication of the Operability Strategy report. Undertake a review of publications looking at how the ESO publications work together for stakeholders.	Deliver System Operability publications to a schedule in response to real time system operation events or other system developments. These currently include: <ul style="list-style-type: none"> Low Demand-Lessons from COVID19 and implications for future operability Impact of future system trends on Power Quality National System Performance Trend and Insights Undertake improvements to these publications in accordance with stakeholder feedback and/or the ESO internal publication review.	Deliver system operability publications to a schedule in response to real time system operation events or other system developments. Topics are under development with wider industry stakeholders including key operability issues to reach zero carbon system operation ambition and what's next including whole energy system issues. Undertake improvements to these publications in accordance with stakeholder feedback and/or the ESO internal publication review.	Positive Stakeholder feedback on clarity of future requirements. Linkage between the requirements published and solutions in deployment.	Positive Stakeholder feedback on clarity of future requirements. Linkage between the requirements published and solutions in development or deployed. Clear view of further whole energy system issues which may need to be resolved.	Ongoing; Our operability strategy ensures future system operability. It will improve network safety and reliability by ensuring that future operational challenges can be addressed securely. It will drive lower bills by changing the way we operate and seek better solutions, tested through innovation projects where relevant <i>SOF</i> publications work together with the <i>Operability Strategy Report</i> to provide clear requirements to stakeholders. Plans and associated frameworks / funding arrangements are in place to facilitate operability outcomes.	Detail added to milestones on topics and approach.
A15.2 Provide technical support to the connections process	D15.2.1 Updates to customer offers and agreements – provide technical support to the connection offer process (as set out in activity A14.1) and assess offers to determine future operability need	N/A	Continuous	N/A	As required and provide technical support to delivery of the connections hub in activity group A14 .	As required and provide technical support to delivery of the connections hub in activity group A14 .	Content for agreements issued within licence deadline.	Content for agreements issued within licence deadline.	Ongoing; Future system operability strategy accounts for technical capabilities of future connections.	
A15.3 Assess the technical implications of framework developments and implement changes into business procedures and systems.	D15.3.1 Changes to business procedures and processes following framework developments – provide technical expertise to development of Codes and Standards and assess impact of	N/A	Continuous	N/A	Q1 - GC0137/139/145 code change process completed; Provide ongoing technical support to modifications as required (including those raised through open governance) –	Provide ongoing technical support to modifications as required (including those raised through open governance) – the level of resource required can vary hugely from one	Change delivered in line with Modification Implementation.	Change delivered in line with Modification Implementation.	Ongoing; amendments to technical codes and standards are appropriate; and any consequential change to ESO internal processes (and, where appropriate, external industry processes)	Linkage provided to A6.1 in Role 2 and milestones clarified.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	change to operability processes. This activity provides technical support to modifications managed by frameworks teams in activity A6.1 , Role 2.				the level of resource required can vary hugely from one modification to the next.	modification to the next.			are made in a timely and efficient way.	
A15.4 Manage operational data and modelling requirements for the ESO	D15.4.1 Data transfers between network organisations in accordance with current Grid Code and STC requirements – managing operational data flows across network companies to underpin offline network analysis in the ESO.	N/A	Continuous	N/A	As required.	As required.	Data received and delivered in line with Grid Code and STC Requirements.	Data received and delivered in line with Grid Code and STC Requirements.	Ongoing; Data transfers occur in accordance with Grid Code provisions and fed into internal models / processes as appropriate.	
A15.4 Manage current operational data and modelling requirements for the ESO	D15.4.2 Technical modelling for use across the ESO – ongoing development and support of system data and models used to analyse future network needs and operability solutions by different teams in the ESO.	N/A	Continuous	N/A	Q3 Deliver <i>ETYS</i> and <i>NOA</i> models.	Q3 Deliver <i>ETYS</i> and <i>NOA</i> models.	All <i>ETYS</i> and <i>NOA</i> models delivered to time and quality.	All <i>ETYS</i> and <i>NOA</i> models delivered to time and quality.	Ongoing; Teams within the ESO have latest offline model developments and data.	Updated milestones to refer to delivery of models to feed current processes
A15.6 Transform our capability in modelling and data management	D15.6.1 Phase 1 data management scoping complete to feed into data & analytics platform (see Role 1 D1.4.1) – modelling and data expertise will be used to scope planning data requirements for the data & analytics platform	IT investment reference 220 Data & Analytics platform - This platform is foundational work to unlock the value of the data we hold and will be the key technology underpinning all our internal and external data management. IT investment reference 220 Data & Analytics platform This platform is foundational work to unlock the value of the data we hold and will be the key technology underpinning all our	Project	Q4 2020 / 2021: Initial O/N Grid Code mod (GC0139) progressed to facilitate Transmission-Distribution data exchange. Progression of Code modification GC0138 Compliance process technical improvement.	Q2 Phase 1 modelling scoping complete to feed into requirements and design stage of the data & analytics platform (foundation implementation).	Q2: Modelling scoping complete to feed into platform extension requirements phase (D15.6.3). Q3 Data & analytics platform foundation complete. (D15.6.4).	Outcomes from Grid Code modifications work informs the scoping exercise for the Data & Analytics platform in terms of frequency of planning data exchange (DSO, TO and user data exchange) and level of granularity / complexity. Scoping work enables timely progression of the platform foundation implementation; key stakeholders have been engaged on the scope.	Data platform foundation delivered in line with scope including successful testing of plug-and-play approach with modules in development/delivery phase. Extension scoping work enables timely progression of the platform extension implementation; key stakeholders have been engaged on the scope.	RIIO-2 year 5 25/26: Full integration with Data and analytics platform complete, enabling a joined-up analysis process that allows us to stack different network needs and adjust the level of detail in the analysis, to deliver the most economic decision. Clear Code requirements have been developed, agreed and implemented to support appropriate exchange and use of data; customers can access data on the	Reference added to the ongoing Grid Code modification GC0139. Deliverables D15.6.3 and D15.6.4 and corresponding successes now included here.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		<p>internal and external data management.</p> <p>The data and analytics platform will provide the foundational architecture to enable the development of an interchangeable suite of tools with a common dataset, and seamless exchange of data between tools.</p> <p>This deliverable supports the delivery of the IT investment.</p> <p>The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.</p>							platform via APIs, for their own analysis.	
A15.6 Transform our capability in modelling and data management	D15.6.2 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)	<p>IT investment reference 220 Data & Analytics platform</p> <p>This platform is foundational work to unlock the value of the data we hold and will be the key technology underpinning all our internal and external data management.</p> <p>The data and analytics platform will provide the foundational architecture to enable the development of an interchangeable suite of tools with a common dataset, and seamless exchange of data between tools.</p> <p>This deliverable supports the delivery of the IT investment.</p> <p>The data and analytics platform will be delivered under D1.4.1. Creation of a data and analytics platform.</p>	Project	Q4 2020/21: Any additional requirements identified from GC0138, Open Networks 2020 work programme for imminent code progression. Outputs from Ofgem's Call for Evidence on Distributed Generation visibility understood and ESO actively involved in next steps.	<p>Q1: Determine what data is required, from which parties and any associated issues with obtaining the data.</p> <p>Any further data-driven Grid Code mods scoped and raised as required. Engage with DNOs on any specific requirements as they develop their RIIO-ED2 plans.</p> <p>Q2-Q3: Code mods or agreements to obtain new data progressed in accordance with governance requirements as required.</p> <p>Q4: Grid Code mods submitted for approval / agreements progressed to facilitate transmission-</p>	Provide ongoing technical support and input to the Code modification process as required. Provide ongoing technical support and input to the code modification process as required.	Code modifications and / or agreements are developed with parties to facilitate data requirements for new processes and data platform (to support connections, design and operability requirements). Relevant stakeholders engaged in the process.	Code modifications are implemented such that any required changes to systems, models and processes are aligned to any new requirements (depending upon timescales of the code modification process).	Frameworks are in place to support appropriate exchange and use of data by the ESO, network companies and other stakeholders through the data and analytics platform.	Addition of milestones to engage with DNOs and reference to Ofgem's Call for Evidence on Distributed Generation visibility.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
					distribution data exchange.					
A15.6 Transform our capability in modelling and data management	D15.6.3 Phase 2 modelling scoping complete to feed into data & analytics platform extension (see Theme 1)	IT investment reference 220 Data & Analytics platform - This platform is foundational work to unlock the value of the data we hold and will be the key technology underpinning all our internal and external data management. This deliverable supports the delivery of the IT investment. The data and analytics platform will provide the foundational architecture to enable the development of an interchangeable suite of tools with a common dataset, and seamless exchange of data between tools. The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.	Project	Q4 2020-21: Initial O/N Grid Code mods (GC0139) progressed on Transmission-Distribution data exchange	N/A	Q2: modelling scoping complete to feed into platform extension requirements phase	N/A	Scoping work enables timely progression of the platform extension implementation; key stakeholders have been engaged on the scope	RIIO-2 year 5 25/26: Full integration with Data and analytics platform complete, enabling a joined- up analysis process that allows us to stack different network needs and adjust the level of detail in the analysis, to deliver the most economic decision. The platform allows ESO customers to make quicker and more accurate decisions; Customers are able to extract and feed the data into their own analytics tools.	This deliverable has been removed for clarity. D15.6.3 has been added to D15.6.1 where scoping work is done for data and analytics platform foundation (this is just the milestone for delivering the platform extension which happens in Role 1).
A15.6 Transform our capability in modelling and data management	D15.6.4 Data analytics platform foundation in place (see Theme 1)	IT investment reference 220 Data & Analytics platform - This platform is foundational work to unlock the value of the data we hold and will be the key technology underpinning all our internal and external data management. This deliverable supports the delivery of the IT investment.	Project	Q4 2020-21 Initial O/N Grid Code mods complete on Transmission-Distribution data exchange	N/A	Q3 Data & analytics platform foundation complete.	N/A	Data platform foundation delivered including successful testing of plug-and-play approach with modules in development/delivery phase	RIIO-2 year 5 25/26: Full integration with Data and analytics platform complete, enabling a joined- up analysis process that allows us to stack different network needs and adjust the level of detail in the analysis, to deliver the most economic decision. The platform allows ESO customers to make quicker and more accurate	This deliverable has been removed for clarity. D15.6.4 has been added to D15.6.1 where scoping work is done (this is just the milestone for delivering the platform which happens in Role 1).

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		<p>The data and analytics platform will provide the foundational architecture to enable the development of an interchangeable suite of tools with a common dataset, and seamless exchange of data between tools.</p> <p>The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.</p>							decisions; Customers are able to extract and feed the data into their own analytics tools.	
A15.6 Transform our capability in modelling and data management	D15.6.5 Data platform extension complete (please see deliverable D1.4.1 for further details) – once the data & analytics platform foundation is complete, an extension will be developed as new tools are delivered.	<p>IT investment reference 220 Data & Analytics platform - This platform is foundational work to unlock the value of the data we hold and will be the key technology underpinning all our internal and external data management. This deliverable supports the delivery of the IT investment.</p> <p>The data and analytics platform will provide the foundational architecture to enable the development of an interchangeable suite of tools with a common dataset, and seamless exchange of data between tools.</p> <p>The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.</p>	Project	Q4 2020-21 Initial O/N Grid Code mods complete on Transmission-Distribution data exchange.	N/A	Q2 modelling scoping complete to feed into platform extension phase.	N/A	Modelling scoping complete and sufficient to inform timely progression of platform extension.	<p>RIIO-2 year 5 25/26: Full integration with Data and analytics platform complete, enabling a joined- up analysis process that allows us to stack different network needs and adjust the level of detail in the analysis, to deliver the most economic decision.</p> <p>The platform allows ESO customers to make quicker and more accurate decisions; Customers are able to extract and feed the data into their own analytics tools.</p>	<p>This deliverable has been removed for clarity.</p> <p>This deliverable was simply the milestone for data platform extension completion (occurs in Role 1).</p>

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A15.6 Transform our capability in modelling and data management	D15.6.6 Deliver major upgrades to our offline modelling tools, which will allow us to model a more complex system. This upgrade will include tactical enhancements, for example, compliance with Capacity Allocation and Congestion Management (CACM), as well as establishing the development roadmap for the multi-layered off-line modelling capability needed to facilitate operation of a zero carbon system.	IT investment ref 360 Offline network modelling. This investment is required to enhance network modelling tools to enable larger volumes of data, and a greater number of scenarios to be modelled. These modelling tools will be integrated with the Data & Analytics platform. IT investment ref 270 EU Regulation This investment enables the mandatory European Union (EU) regulatory driven change which impacts across ESO systems, particularly market operation.	Project	Offline Transmission Assessment (OLTA) hardware refresh; decommission Offline Stability Analysis (OFSA) tool Offline Transmission Assessment (OLTA) hardware refresh. Decommission Offline Stability Analysis (OFSA) tool	Q1, Q2 Engagement with TOs on CACM requirements. Q3 CACM and short circuit go-live in offline network modelling.	Q2 Produce Offline modelling development road-map Q2 Produce Offline modelling development roadmap. Q2-Q3 Engage stakeholders on further iteration of the development roadmap. Q4 Offline modelling development roadmap finalised.	Modelling tools upgraded to support CACM capacity validation process as required. Work commenced on the Offline modelling development roadmap.	Increased efficiency through automation of selected modelling processes; Use of enhanced tools to allow more complex modelling arising from operability challenges (for example short circuit levels, virtual powerplants, probabilistic modelling, multi scenario analysis) and to support development of a regime for an integrated offshore grid, as required; Through scoping work in activity A15.6.1 , ensure integration of our offline modelling tools with IT investment 220 Data and analytics platform; Increased efficiency through automation of selected modelling processes. Use of enhanced tools to allow more complex modelling arising from operability challenges (for example short circuit levels, virtual powerplants, probabilistic modelling, multi scenario analysis) and to support development of a regime for an integrated offshore grid, as required. Through scoping work in activity A15.6.1 , ensure integration of our offline modelling tools with IT investment 220 Data and analytics platform. Offline modelling development roadmap developed with relevant stakeholders.	Integration of our offline modelling tools with IT investment 220 Data and analytics platform. This will facilitate an interchangeable suite of tools using a common dataset, and seamless exchange of data between tools, including the analysis tools described in IT investment 390 NOA enhancements. This will allow us to adjust the level of analysis as required depending on the issue that needs to be assessed whilst ensuring that consistent data and assumptions are applied.	Deliverable broadened out to cover general upgrades to offline modelling capability in line with business plan with updated successes.
A15.6 Transform our capability in modelling and data management	D15.6.7 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	IT investment ref 360 Offline network modelling - required to enhance network modelling tools to enable larger volumes of data, and a greater number of scenarios to be modelled. These modelling tools will be integrated with	Project	Complete the Offline Transmission Assessment (OLTA) hardware refresh to facilitate enhanced modelling capability. Progression of Grid Code modifications GC0138 and GC0139.	Q4 feed findings from deliverable A16.3.2 and any relevant Grid code modifications into future modelling scoping and development.	Q3 Data and analytics platform foundational architecture complete. Q4 feed findings from deeper access work into offline network modelling development.	Findings and recommendations outputs from deliverable A16.3.2 are accurately reflected into model functionality development.	Offline network models are developed in accordance with learning from deeper access planning trials and implementation roll out plan; key stakeholders engaged in the model development process.	2023-24 Deeper access planning processes and models go-live. Increased co-ordination between parties resulting in optimisation of flows across the networks and network access. First phase of agile IT enhancements to	Updated with reference to relevant Grid Code modifications.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
	<p>Outage Planning go live in Offline Network Modelling</p> <p>Enables higher volumes of network data, regional models and outage planning data to be exchanged, used and shared by network companies. This activity enables the network access planning activity A16.3.</p>	<p>the Data & Analytics platform.</p> <p>IT investment ref 350 Planning & outage data exchange will enable a whole system approach to access networks, manage significantly increased data volumes, and provide interactive stakeholder engagement.</p> <p>IT Investment ref 220 Data and analytics platform will provide the foundational architecture to replace the existing External Data Exchange system, allowing greater volumes of data and more frequent updates.</p> <p>The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.</p>				Work with DNOs to develop IT requirements for deeper outage planning.			enable deeper outage planning complete.	
A15.7 Deliver an operable zero carbon system by 2025	D15.7.1 Commence System State Targeted Monitoring and Control System (MCS) stage roll out. This activity seeks to roll out a system that has been tested on a small scale via the Enhanced Frequency Control Capability (EFCC) innovation project and is comprised of 5 phases.	IT investment ref 500 – this investment is for a wide area monitoring and control system (MCS). It enables coordinated, fast frequency response, allowing a wide range of technologies to participate in managing system frequency to keep the system stable. It can therefore facilitate zero carbon operation by 2025.	Project	N/A	<p>Q1 Start-up for Phases 1 and 2: Identify industry parties to participate in the Phase 1 non-operational demonstration.</p> <p>Q2 Phase 1 and Phase 2 Requirements and design.</p> <p>Q3 Phase 1 Development and testing: Engage with key stakeholders.</p> <p>Q4 Commence implementation of</p>	<p>Q1-Q2 Phase 2 (Develop operational demonstration) Development and testing.</p> <p>Q3-4 Phase 3 (Operational Demonstration) Implementation.</p> <p>Q1-Q2 Phase 4 (First stage rollout) Start-up.</p> <p>Q3-Q4 Phase 4 Requirements.</p>	<p>Completed a non-operational demonstration and therefore proof of concept to installing on a wider scale.</p> <p>Development of an operational demonstration is underway.</p>	<p>Phase 3 (Operational demonstration) is halfway through and therefore testing of the system is underway. Phase 4 of the roll out commenced and at the Requirements and Design stage.</p> <p>The system's algorithm will be in place, with required equipment installed on the system. Basic integration with existing control systems achieved in order to run the operational demonstration in Phase 3.</p>	<p>2025-26 Roll out of Stage 1 of the MCS complete and facilitates, along with other Theme 1 investments, our ability to operate a zero carbon system; Stage 2 roll out of the MCS commenced.</p> <p>The work undertaken on non-operational and operational demonstrations and staged rollout up to March 2023 will facilitate a checkpoint to determine, in accordance with stakeholders, whether</p>	Timescales adjusted to account for changes to Phases 1 and 2 timescales. Further detail added to success measures.

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
					Phase 1 non-operational demonstration.	Q4 Engage with key stakeholders on the progress of rollout.			to continue the rollout of the MCS as a means to achieving zero carbon operation by 2025.	
A15.9 Identify Future operability needs across whole energy system	D15.9.1 Trial new innovation projects for whole energy system operability	N/A	Continuous	Q4 Support ESO open innovation event with focus on whole system problem statement.	Q1-Q4 Evolve existing approach to identifying innovation projects to give a broader cross-vector view.	Q1-Q4 seek innovation project opportunities to trial whole energy system operability tools in response to operability requirements identified in SOF publications. Provide technical support to further ESO innovation events such as Open Innovation days and to initiatives driven by external stakeholders.	Ongoing proactive external engagement, for example, through Open Networks WS4	Ongoing proactive external engagement, for example, through Open Networks WS4. Innovation projects progressed as appropriate and in line with any future requirements identified via activity A15.1 .	Innovation projects result in increased understanding and potential tools to address future operability challenges. Findings from innovation projects published to industry, along with progression plans as appropriate.	RIIO-1 end point added
A15.9 Identify Future operability needs across whole energy system	D15.9.2 Commence RDP approach to whole energy system challenges – build on the RDP approach used in the electricity sector to develop cross sector operability solutions	N/A	Project	N/A	N/A – initial scoping for this activity to take place in 2023/24 so no milestones applicable here	N/A – initial scoping for this activity to take place in 2023/24 so no milestones applicable here	N/A	N/A	2024-25 RDP approach to whole energy system challenges commenced (hence no milestones detailed here), working closely with stakeholders (for example via Open Networks WS4/Whole Energy System work plan). Scope and undertake first whole system/cross-vector RDP alongside key industry stakeholders.	Updated to reflect that this activity starts in BP2
A15.9 Identify Future operability needs across whole energy system	D15.9.3 Second whole energy system RDP launched	N/A	Project	N/A	N/A – work to commence on this activity in 2024/25	N/A – work to commence on this activity in 2024/25	N/A	N/A	2025-26 Take emerging learnings from the first whole system/cross-vector RDP to develop the second project. 2025-26 Whole system operability framework published (D15.9.4) with key industry stakeholders having been engaged in the process. Positive feedback received on framework.	Updated to reflect that this activity starts in BP2

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A15.9 Identify Future operability needs across whole energy system	D15.9.4 Whole system operability framework published – this extends the ethos of the current system operability reports to cover a wider range of parties and challenges	N/A	Project	N/A	N/A	N/A	N/A	N/A	2025-26 Whole system operability framework published with key industry stakeholders having been engaged in the process; positive feedback received on framework	Deliverable removed. Deliverable reference added to deliverable D15.9.3 which occurs post BP1.
A15.10 Develop a regime for an integrated offshore grid	D15.10.1 Initial scoping report published	Network analysis implications going forward.	Project	Q2 - Gap analysis and scope of Phase 2; Q3 - Phase 1: Complete technical analysis and Cost Benefit Analysis (CBA), including system analysis on conceptual offshore designs (Note 1); Q4 - Deliver Phase 2 Notes 1- Dependency. Relies on Theme 3 tools: NOA Enhancements Investment. 390 <ul style="list-style-type: none"> Economic Assessment Probabilistic Modelling Voltage Optimisation Stability Assessment 	This work may result in a new ongoing role for the ESO, pending its outcome.	Ongoing	Ongoing	Ongoing	Initial report delivered in RIIO-1 Q4 potentially with an ongoing role into the RIIO-2 period, depending on the outcome of the project. Allows us to progress with best approach to connecting offshore projects for consumers and coastal communities.	Deliverable removed Additional information to be provided on the integrated offshore grid deliverables by 15 October as agreed with Ofgem.

A16 Delivering consumer benefits from improved network access planning

These proposals will enable roll out of best practice access planning processes developed in Scotland in RIIO-1 across the whole Great Britain transmission system. We will support increased levels of co-ordination across the transmission-distribution interface to deliver significant consumer benefits, facilitating the connection of low carbon generation and the development of new flexibility market opportunities. By March 2023 we will have developed and implemented the processes, frameworks and infrastructure to facilitate deeper access planning from 2023/24, in line with RIIO ED-2 timescales.

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
A16.1 Manage access to the system to enable the TOs to undertake work on their assets,	D16.1.1 Year ahead regional outage programmes developed in liaison with network parties.	IT investment ref 350 Planning and outage data exchange,	Continuous	Transmission Outage and Generation Availability (TOGA) system replacement complete.	Q4 deliver regional outage programmes.	Q4 deliver regional outage programmes.	N/A	N/A	N/A	

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
liaising with customers where access arrangements impact them.		(Ongoing agile process enhancements)								
A16.1 Manage access to the system to enable the TOs to undertake work on their assets, liaising with customers where access arrangements impact them.	D16.1.2 Detailed week and day ahead operational documentation produced for National Control	IT investment ref 350 Planning and outage data exchange (Ongoing agile process enhancements)	Continuous	TOGA system replacement complete.	Weekly / Day ahead outage plans	Weekly / Day ahead outage plans	N/A	N/A	N/A.	
A16.2 Enhance the Network Access Policy (NAP) process with TOs	D16.2.1 Great Britain (GB) wide NAP process goes live including extension of the existing SO-TO payment mechanism to the whole of GB. Investigate, with TOs, any further mechanisms that will drive consumer value in this area ahead of RIIO-2.	N/A	Project (becoming continuous upon implementation).	<p>Work with the GB TOs in quarterly meetings to develop NAP proposals. Development of proposals to extend SO-TO mechanism to whole of GB, including trial use of STCP 11-3 with NGET, and explore other mechanisms that might drive further value.</p> <p>Develop and approve current methodology for providing a cost forecast for outage change projects identified under STCP 11-4 to incorporate potential boundary reductions for outages that have not been included in the outage plan but we would reasonably expect to have.</p> <p>Commence development for increasing outage change cost visibility via an innovation project. Code changes submitted to authority for approval and licence changes</p>	<p>Q1 GB wide NAP process go-live (and any further mechanisms progressed as appropriate). Draft revised process for STCP 11-4 following engagement with the TOs.</p> <p>Q2 Consult on how the new methodology should be implemented.</p> <p>Q3 Review process with TOs and discuss process improvement.</p> <p>Engage with TOs on type of cost information they would want to see from the ESO.</p> <p>Q4 Provide increased visibility of outage change cost - provide more visibility on an ad hoc basis.</p>	<p>GB NAP Becomes continuous process.</p> <p>Q2 Output from innovation informs new change to outage cost visibility process.</p> <p>Q3 Implement this cost visibility process with the TOs.</p>	NAP process and cost transparency ready to go-live in Q1 with positive relationships with TOs.	Process reviewed and discussed at TO meetings. TOs receive cost visibility that is useful for their own decision making and reduces costs to the consumer.	Ongoing success is the value created through more efficient access planning and working with network parties. Greater visibility of outage change costs allow network parties to assess the possible impact of their actions.	Updates to RIIO-1 end point and milestones.

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
				agreed with Ofgem to facilitate go-live.						
A16.3 Work more closely with DNOs and DER to facilitate network access	D16.3.1 Conclude trials on closer working relationships with DNOs and DER to enhance co-ordination of system access and development of flexibility markets (commenced in 2019-21 Forward Plan). The RIIO-2 deliverables in this area look to broaden the application of deeper access planning and apply trials in different more complex parts of the network. These trials will facilitate a more formal implementation of deeper access.	N/A	Project	Trial for closer working relationships established and underway. Initial learning points documented from trials, via the RDP projects, with WPD-SW, UKPN-SE, SSE-S (N-3 intertripping) WPD-SW, UKPN-SE (MW dispatch) SPD, SPT (GEMS) with an understanding that these projects will be at differing stages of completion. Expand further trial(s) currently in the early stages (SSE-N) and look for further interested trial partners.	Q1-Q2 Ongoing engagement with trial partner(s). Engage and update DNOs on trial progress to inform their RIIO-ED2 plan development. Explore the principle of introducing Network Access Policy-type frameworks with DNOs for coordinating distribution and transmission outage planning. Q2 Completion of trials. Q3 Trials concluded.	N/A for this deliverable – activity progressed further via D16.3.2 and D16.3.3 below.	Enhanced working relationship reflecting joint desire of trial participants to improve network access. Lessons learned by all parties. Interest gained from non-trial parties to be involved.	N/A – trials concluded in year 1.	Q4 2023 / 2024 Deeper access planning processes go-live. Increased co-ordination between parties resulting in optimisation of flows across the networks and network access. We will have set out arrangements for efficient coordination of DER services with the DNOs (DSOs) such that we are able to make pre-operational timescale decisions which consider the impact on both the transmission and distribution networks. We will have the IS, communication and modelling tools available to ensure that there is not conflict between ESO and DSO when decisions over service provision (constraint management, voltage management, margin, reserve, response etc) are made.	Expansion of how the deliverable is a step change to work undertake in RIIO-1 in sub-activity column.
A16.3 Work more closely with DNOs and DER to facilitate network access	D16.3.2 Learnings from trials shared alongside recommendations for GB roll out such that best practice is applied to ongoing processes	N/A	Project	DNOs engaged in the lead up to submission of their RIIO-ED2 business plans on the aims of deeper access. Ensure that the ESO has clearly articulated that the aims of deeper access are to create value for the end consumer by developing a range of services which span the transmission-distribution interface. DNOs to be informed and consulted on the risk and rewards of any such scheme developments with reference to and	Q1-3 Engage relevant parties on ongoing conclusions and learnings from trials. Feed findings into RIIO ED-2 business planning processes. Q4 Develop and share learnings and recommendations for GB roll out, including whether to introduce NAP-type frameworks with DNOs for coordinating distribution and transmission outages.	Progress recommendations in accordance with GB roll out recommendations. Engage with relevant parties to support successful delivery	Agreed published statement on trial learnings and recommendations for broader process improvements.	Implementation of any relevant recommendations. Positive stakeholder feedback and increased co-ordination between parties.	Q4 2023 / 2024 Deeper access planning processes go-live. Increased co-ordination between parties resulting in optimisation of flows across the networks and network access. We will have set out arrangements for efficient coordination of DER services with the DNOs (DSOs) such that we are able to make pre-operational timescale decisions which consider the impact on both the transmission and distribution network. We will have	Update to RIIO-1 end point and successes

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Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
				'conflict of service' lessons learned from trials or analysis.					the IS, communication and modelling tools available to ensure that there is no conflict between ESO and DSO when decisions over service provision (constraint management, voltage management, margin, reserve, response etc) are made.	
A16.3 Work more closely with DNOs and DER to facilitate network access	D16.3.3 Finalise new processes in readiness for approval of code modifications to facilitate closer working relationships and data exchange/modelling. This will ensure that frameworks support any new enduring processes developed in A16.3.1 and A16.3.2	N/A	Project	DNOs engaged in the lead up to submission of their RIIO-ED2 business plans on the aims of deeper access. Ensure that the ESO has clearly articulated that the aims of deeper access are to create value for the end consumer by developing a range of services which span the transmission-distribution interface. DNOs to be informed and consulted on the risk and rewards of any such scheme developments with reference to and 'conflict of service' lessons learned from trials or analysis.	Q1-4 feed findings from deliverable A16.3.2 into preliminary code modification discussions. Instances of conflict of service evidenced from the trials to be a key consideration.	Q1 Code modification requirements assessed, scoped and raised as required. Q2-Q4 Modifications progressed through governance. Q4 Code change process concluded, mods submitted to Authority for decision.	Key learnings from deeper access trials are fed through into scoping phase for Code modifications with relevant parties engaged.	Relevant modifications are scoped and raised in line with outcomes from trials. Frameworks ultimately support and facilitate new best practice processes, determined as a result of trials, between parties.	Q4 2023 / 2024 Deeper access planning processes go-live. Increased co-ordination between parties resulting in optimisation of flows across the networks and network access. We will have set out arrangements for efficient coordination of DER services with the DNOs (DSOs) such that we are able to make pre-operational timescale decisions which consider the impact on both the transmission and distribution network. We will have the IS, communication and modelling tools available to ensure that there is no conflict between ESO and DSO when decisions over service provision (constraint management, voltage management, margin, reserve, response etc) are made.	Update to RIIO-1 end point and successes
A16.3 Work more closely with DNOs and DER to facilitate network access	D16.3.4 Deeper access planning go-live – frameworks, processes and models are in place to facilitate deeper access planning with network parties	IT investment refs 350 Planning and outage data exchange, and 360 Offline network modelling These investments include proposals to exchange more data	Project	Processes in place to model the impact of the most advanced of the schemes in iEMS and OLTA. Currently in-train. TOGA system replacement complete.	Q1-4 feed findings from deliverable A16.3.2 into future modelling scoping and development. Q2 DNOs engaged in the lead up to submission of their	Q3 Data and analytics platform foundational architecture complete. Q4 feed findings from A16.3.3 into further offline network	Offline network models are developed in accordance with learning from deeper access planning trials and implementation roll out plan. Key stakeholders, including DNOs,	Continued development of Offline models. Developments are made to facilitate any code modification outcomes. DNOs engaged in discussions on IT and model development.	Q4 2023 / 2024 Deeper access planning processes go-live. Increased co-ordination between parties resulting in optimisation of flows across the networks and network access. We will have set out arrangements	Updated to include engagement with DNOs, updated successes and final success column on the benefits of

ESO RIIO-2 Delivery Schedule

Sub activity	Deliverable	Related IT investment	Project or continuous	RIIO-1 end point	2021/2022 Milestones	2022/2023 Milestones	First year success	Second year success	Expected final delivery date and what success looks like.	Notes on changes to Dec 2019 Business Plan
		<p>(including for DER) and models with stakeholders, and enhance our modelling tools to enable deeper outage planning.</p> <p>IT Investment ref 220 Data and analytics platform will provide the foundational architecture to replace the existing External Data Exchange system, allowing greater volumes of data and more frequent updates.</p> <p>The data and analytics platform will be delivered under D1.4.1 Creation of a data and analytics platform.</p>		<p>Preliminary discussion with other interested DNO parties around data and model exchange.</p> <p>DNOs engaged in the lead up to submission of their RIIO-ED2 business plans on the aims of deeper access.</p> <p>Offline Transmission Assessment (OLTA) Hardware Refresh Complete.</p>	RIIO-ED2 business plans on the aims of deeper access.	<p>modelling development, assess IT impact of any code modifications to facilitate deeper access planning.</p> <p>Work with DNOs to develop IT requirements for deeper outage planning.</p>	engaged in the model development process.		<p>for efficient coordination of DER services with the DNOs (DSOs) such that we are able to make pre-operational timescale decisions which consider the impact on both the transmission and distribution network. We will have the IS, communication and modelling tools available to ensure that there is not conflict between ESO and DSO when decisions over service provision (constraint management, voltage management, margin, reserve, response etc) are made.</p> <p>First phase of agile IT enhancements to enable deeper outage planning complete.</p> <p>IT investment enables a step change to a more efficient exchange of information and models to facilitate more efficient management of transmission and distribution outages.</p>	deeper access planning.
A16.4 TOGA / Whole system outage notification	<p>D16.4.1 Scoping exercise concluded for delivery of enhancements to outage notifications</p> <p>D16.4.2 Delivery of enhancements to outage notifications, to stimulate flexibility markets as an additional tool for efficient outage management - we will develop the TOGA system to become a more interactive experience for customers, stakeholders and the market.</p>	<p>IT investment ref 350 Planning and outage data exchange.</p> <p>This investment includes development of TOGA to provide digital communications to customers on the status of outages.</p>	Project	TOGA system replacement complete.	Q3 Commence scoping activity and engage with key stakeholders. Align model development and requirements with output from deliverable A16.3.2 (recommendations for roll out of deeper access planning)	<p>Q2 scoping exercise concluded and published.</p> <p>Q3 commence IT project start-up phase.</p>	Industry stakeholders, particularly DNOs and DER, are engaged with the project and scoping is underway.	Agreement and publication of scope for enhancements to outage notification processes, including technology roadmap. Scope adequately informs the design and requirements stage of the system development.	Q4 2024 / 2025 Delivery of whole system outage notification enhancement to support potential flexibility markets which in turn should give additional tools for managing outages.	

Sources of further information on IT investments referenced in the Delivery Schedule tables

IT investment	Source for further information
110 Network control	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
120 Interconnectors	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
130 Emergent technology and system management	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
140 ENCC operator console	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
150 Operational awareness and decision support	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
170 Frequency visibility	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
180 Enhanced balancing capability	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
190 Workforce and change management tools	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
200 Future training simulator and tools	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
210 Balancing asset health	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
220 Data and analytics platform	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
240 ENCC asset health	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
250 Digital engagement platform	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
260 Forecasting enhancements	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
270 EU regulation	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
280 GB regulation	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
290 Charging and billing asset health	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
300 Charging regime and CUSC changes	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
320 EMR and CfD Improvements	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
330 Digitalised code management	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
340 RDP implementation and extension	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
350 Planning and outage data exchange	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
360 Offline network modelling	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
380 Connections platform	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
390 NOA enhancements	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
400 Single markets platform	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
410 Ancillary services settlements refresh	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
420 Auction capability	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.

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IT investment	Source for further information
450 Future innovation productionisation	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
460 Restoration	For further information on this investment please see Annex 4 of the ESO RIIO-2 Business Plan submitted in December 2019.
480 Ancillary services dispatch	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
500 Zero carbon operability	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.
510 Restoration decision support	For further information on this investment please see the ESO RIIO-2 consultation response – Technology Investment detail parts 1-3 submitted in September 2020.