

ESO RII0-2 Business Plan 2 Supporting Information

Annex 1

April 2022



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Section 1: List of Activities and Sub-activities

The following table contains the full list of activities and sub-activities by role.

Role	Activity	Activity name	Sub-activity	Sub-activity name
1 – Control Centre Operations	A1	Control Centre architecture and systems	A1.1	Ongoing activities
			A1.2	Enhanced Balancing Capability
			A1.3	Transform Network Control
			A1.4	Control centre architecture
			A1.5	Operational coordination with DSO and DER
	A2	Control Centre training and simulation	A2.1	Ongoing activities
			A2.2	Enhanced training material
			A2.3	Training simulation and technology
			A2.4	Workforce and change management tools
	A3	Restoration	A3.1	Ongoing activities
			A3.2	Restoration standard
			A3.3	Innovation project in restoration
	A17	Open data and transparency	A17	Ongoing activities
	A18	Market monitoring	A18.1	Ongoing activities
A19	Data and analytics operating model	A19.1	Ongoing activities	
2 – Market Development and Transactions	A4	Building the future balancing services markets	A4.1	Manage existing balancing services and markets
			A4.2	Power Responsive
			A4.3	Deliver a single day-ahead response and reserve market
			A4.4	Deliver a single, integrated platform for ESO Markets
			A4.5	Facilitate whole electricity system market access for DER
			A4.6	Balancing and ancillary services market reform
	A5	Transform access to the Capacity Market and Contracts for Difference	A5.1	Electricity Market Reform (EMR) Delivery Body
			A5.2	Deliver an enhanced platform for EMR
			A5.3	Improve our security of supply modelling capability
			A5.4	Long-term capacity adequacy
	A6	Develop code and charging arrangements that are fit for the future	A6.1	Code management / market development and change
			A6.2	European Union (EU) code change and relationships
			A6.3	Industry revenue management
			A6.4	Transform the process to amend our codes
			A6.5	Work with all stakeholders to create a fully digitalised, whole system Technical Code by 2025
			A6.6	Look at fully or partially fixing one or more components of Balancing Services Use of System (BSUoS) charges
			A6.7	Fixed BSUoS tariff setting
			A6.8	Digitalisation of codes
			A6.9	Whole system codes reform
	A20	Net Zero Market Reform	A20.1	Net zero market reform programme
A21	Role in Europe	A21.1	Cross-border initiatives	

Role	Activity	Activity name	Sub-activity	Sub-activity name
3 - System insight, planning and network development	A7	Network Development	A7.1	Analyse and communicate future network needs
			A7.2	Advise on economically efficient ways to address networks needs
			A7.3	Undertake ad hoc analysis in response to external requests
	A8	Enable all solution types to compete to meet transmission needs	A8.1	Rollout of pathfinder approach and optimise assessment and communicate of future needs
			A8.2	Enhance tendering models
			A8.3	Support Ofgem to establish enabling regulatory and funding frameworks
			A8.4	Early Competition
	A9	Extend NOA approach to end of life asset replacement decisions and connections wider works	A9.1	Expand network planning processes to enable more connections wider works to be assessed
			A9.2	Trial assessment of all connection wider works in one region
			A9.3	Expand to all Connections Wider Works (CWW)
			A9.4	Develop process with TOs to input into ESO analysis of end of life asset replacement decisions
	A10	Support decision making for investment at distribution level	A10.1	Support DNOs to develop NOA type assessment processes
	A11	Enhance analytical capabilities	A11.1	Refresh and integrate economic assessment tools to support future network modelling needs
			A11.2	Implement probabilistic modelling
			A11.3	Build voltage assessment techniques into an optimisation tool
			A11.4	Build stability assessment techniques into an optimisation tool
	A12	SQSS Review	A12.1	Scope project, building on the BEIS recommendations
			A12.2	Identify solutions
			A12.3	Implement changes to the SQSS
	A13	Leading the Debate	A13.1	Carry out analysis and scenario modelling on future energy demand and supply
			A13.2	Conduct mathematical modelling and market research on local and wider geographic demand information
			A13.3	Maintain external communication channels with consumers and stakeholders
			A13.4	FES: Bridging the gap to net zero
			A13.5	FES: Integrating with other networks and supporting DNOs to develop their own DFES processes
	A14	Take a whole electricity system approach to connections	A14.1	Provide contractual expertise and management of connection contracts including provision of connection offers to customers
			A14.2	Ensure Grid Code compliance of new connections
			A14.3	Further enhance the customer connection experience, including broader support for smaller parties
			A14.4	Facilitate development of the customer connections portal
	A15	Taking a whole energy system approach to promote zero carbon operability	A15.1	Develop the <i>System Operability Framework (SOF)</i> and provide solutions up to real time of network related operability issues
			A15.2	Provide technical support to the connections process
			A15.3	Assess the technical implications of framework developments and implement changes into business procedures and systems
			A15.4	Manage operational data and modelling requirements for the ESO
			A15.5	Regional Development Programmes (RDPs)
			A15.6	Transform our capability in modelling and data management
			A15.7	Deliver enhanced frequency control by 2025
			A15.8	Facilitate distributed flexibility and whole electricity system alignment
			A15.9	Net zero operability
	A16	Delivering consumer benefits from improved network access planning	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
			A16.2	Scope a whole electricity system decision-making policy
			A16.3	Work more closely with DNOs and DER to facilitate network access
			A16.4	Whole system outage notification
			A16.5	Network access planning automation
A22	Offshore Coordination / Network Planning Review	A22.1	Offshore Coordination	
		A22.2	Network Planning Review	

Section 2: Activity Roadmaps

The following roadmaps represent the transformational sub-activities and deliverables for BP2.

2.1 Role 1

2.1.1. Activity 1 – Control centre architecture and systems

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25				
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Milestones												
Control centre architecture and systems (A1)	Enhanced Balancing Capability (A1.2)	Inertia forecasting, emergent technology and system management (D1.2.2)	First-of-their-kind inertia monitoring tools delivered and integrated with existing situational awareness tools				Inertia monitoring tools integrated with Data and Analytics Platform				Inertia monitoring tools integrated with new Network Control Tool	
	Transform Network Control (A1.3)	Network Control tool (D1.3.1)	Significantly enhanced existing situational awareness capabilities		Look-ahead functionality running in development environments	Commence build of environments for Voltage Stability Analysis and Online Stability Assessment tools	Shadow Control Centre operational			Integration with Data and Analytics Platform commences	New network control tool and its digital twin are delivered	
		Network modelling (D1.3.2)	Proof of concept of look-ahead analysis functionality delivered			Common Information Model (CIM) integration requirements complete				Common Information Model (CIM) integration complete	Integrate models with new Network Control tool	
		Control centre user tools (D1.3.3)	Requirements scoped for ENCC Operator Console		Design phase	Commence build		Commence solution testing				
	Control Centre Architecture (A1.4)	Data and Analytics Platform (D1.4.1)	Digital Engagement Platform and Single Markets Platform integration Data catalogue publication	Data available and accessible to all parties via application programming interfaces							Network Control data discovery	Network Control integration
	A1.5 Operational coordination with DER and DSO (A1.5)	Increased DER visibility in real-time operations (D1.5.1)	N/A				Data required from DERs identified. Control room IT system and process impacts understood and planned for				DER data has been delivered into real-time operations	
		Development of RDP and LCM functionality into real-time environment (D1.5.3)	N/A				Learnings from RDPs and LCMs are captured with plan for broader roll-out of functionality				Broader functionality being rolled out	

2.1.2. Activity 2 – Control centre training and simulation

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25				
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
				Milestones								
Control centre training and simulation (A2)	Enhanced training material (A2.2)	Academia (D2.2.1)	Trial delivered with two academic institutions for updated course modules and work-based placements	Deliver work-based placement years	Deliver updated modules and placement year opportunities		Receive feedback on placement opportunities	Review and update summer placements for 2024		Update opportunities for placement years		
		Industry (D2.2.2)	Requirements for possible training collaboration explored with industry	Further develop cross-industry secondments			Develop requirements for connectivity of training simulators		Engage with selected DNOs on simulator training options		Trial training DNO staff on ESO simulators	
	Training simulation and technology (A2.3)	Enhanced simulators (D2.3.1)	Requirements scoped for joint network control and balancing training simulator		Initial new Network Control training simulator stood up		Requirements completed for joint training simulator		Commence development and training phases of joint training simulator		Move to implementation of joint training simulator	
		New training platforms (D2.3.2)	New platforms for training include e-learning options	Initial suite of e-learning packages built	Learning packages tried and tested on trainees		24/7 access to learning packages established	Comprehensive suite of learning packages available			Simulation training can be accessed remotely	
	Workforce and change management (A2.4)	Automation (D2.4.1)	Repository created for all data relating to shift authorisation, development and training		Delivery of mobile application			Develop document management and rota improvements	Users can register for training and receive training when it suits them			Document management and rota improvements implemented
		Training plans (D2.4.2)	Capabilities for roles are regularly assessed and updated where necessary		Annual review of training plans			Personalised training plans in place with continued gap analysis	Develop automation of training plans	User testing of automation of training plans		Roll-out of automated plans for operational training

2.1.3. Activity 3 – Restoration

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
				Milestones							
Restoration (A3)	Restoration standard (A3.2)	Restoration standard (D3.2.1-D3.2.3)	Industry engagement to develop regulatory solutions is concluded and the first restoration assurance framework was published in April 2022	Update regulatory framework following Ofgem's approval		Engagement with industry during tender process to secure restoration service providers			Engagement with industry to ensure progress with network changes	Engagement with industry for training and upskilling	
		Restoration decision support tool (D3.2.4)	The development of the tool is significantly progressed, incorporating requirements from across industry			Tool available for integration with Network Control tools					Tool testing in progress
	Innovation (NIC) project in restoration (A3.3)	Subject to industry adoption, implement Distributed ReStart findings (D3.3.2)	Distributed ReStart project is complete and the roadmap for productionising the recommendations of the project is published	Fully understand project recommendations and their implications		Decide which recommendations will be implemented in future (subject to industry adoption)					

2.2 Role 2

2.2.1. Activity 4 – Build the future balancing services markets

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
				Milestones							
Build the future balancing service markets (A4)	Manage existing balancing services and markets (A4.1)	Frequency management strategy (D4.1.1)	N/A				Delivery of FRCR report with enhanced look-ahead				Delivery of FRCR report with enhanced look-ahead
	Deliver a single, integrated platform for ESO markets (A4.4)	A platform enabling market players to participate in balancing market (D4.4.1)	Market participants able to participate in auctions through interface of Single markets platform	Initial integration with Enduring Auction Capability		Query Management process aligned with wider ESO digital process	Integration with Settlements system		Enhance the wider BM registration process		All balancing services procured through SMP
	Facilitate whole electricity system market access for DER (A4.5)	Reforming markets to facilitate future distributed flexibility technologies and models (D4.5.3)	N/A				Prioritised plan for ESO market reform to facilitate distributed flexibility				Progress against prioritised plan for ESO market reform to facilitate distributed flexibility
		Ensure co-ordination of markets across the whole electricity system (D4.5.5)	New deliverable	Developed locational DER data exchange							

2.2.2. Activity 5 – Transform access to the Capacity Market and Contracts for Difference

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
				Milestones							
Transform access to the Capacity Market and Contracts for Difference (A5)	Electricity Market Reform (EMR) Delivery Body (A5.1)	Continuation of Electricity Market Reform (EMR) Delivery Body obligations (D5.1)	Have an active role in Ofgem's new Capacity Market Advisory Group (CMAG)	Develop a clear process for capturing and assessing policy, rule and process improvements	Run the improvement process on an ongoing basis			Undertake informal review of the improvement process	Implement process refinements and run refined improvement process		
	Deliver an enhanced platform for EMR (A5.2)	IT system to allow all participants in ESO markets (including CM and CfD) a single point of access for services and data (D5.2)	Delivered mandatory regulatory changes on the existing EMR portal and development of the new EMR platform		Additional improvements to EMR portal delivered & regulatory changes implemented for annual processes		Use portal and data to increase automation of ESO processes		Additional improvements to EMR portal delivered & regulatory changes implemented		Deliver planned integration of EMR within the SMP
	Improve our security of supply modelling capability (A5.3)	Use of enhanced modelling and more granular data sets to improve security of supply modelling (D5.3)	Delivery of the Electricity Capacity Report (ECR) and associated modelling enhancements	Production of 2023 ECR	Develop further enhancements to security of supply modelling			Production of 2024 ECR	Develop further enhancements to security of supply modelling		
	Longer-term capacity adequacy (A5.4)	Building our capacity studies (D5.4)	N/A	Stakeholder engagement and modelling enhancements following first study published in 2022				Production of capacity adequacy study		Stakeholder engagement and modelling enhancements	

2.2.3. Activity 6 – Develop code and charging arrangements that are fit for the future

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Milestones											
Develop code and charging arrangements that are fit for the future (A6)	Code management/ market development and change (A6.1)	Enable major net zero programmes - Offshore Coordination (D6.1.1)	Technical and Commercial Code changes have been identified				Delivery of code modifications associated with implementation of the offshore project				
		Enable major net zero programmes - Onshore Competition (D6.1.2)	Technical and Commercial Code changes have been identified				Modification(s) are completed and approved by Ofgem				
		Enable zero carbon operation - System Restoration (D6.1.3)	Requirement is to complete code mods by end of 2023; trying to beat this to maximise stakeholder leadtimes	Delivery of code modifications to set equipment specifications	Completion of code changes						ESRS compliance deadline is Dec 2026
		Enable zero carbon operation - Stability (D6.1.4)	Initial specification approved through completion and approval of GC0137 Grid Code modification	GC0137 'Grid Forming' Grid Code modification - guidance document							
		Support charging reform (D6.1.5)	Subject to Ofgem's next steps following the Call for Evidence on TNUoS reform				Identify required code changes	Raise TNUoS modifications to facilitate charging reform			
		Support Market Wide Half Hourly Settlement (D6.1.6)	Identified the areas where code change is needed		Produce required CUSC legal text and modifications raised				Code modifications concluded		
	European Union (EU) code change (A6.2)	Continued facilitation of EU driven code changes into Great Britain market (D6.2)	Submission of data files for STA, changes for Short Term Operating Reserve (STOR) ready for new auctions	Draft Interconnector Framework shared with industry	Ramping solution is SOGL compliant	Interconnector framework consulted upon	Long-term ramping solutions are investigated	Interconnector Framework Implemented			Long-term ramping solution started to be implemented
		Implementation of the TCA and maintenance of European relationships (D6.2.1)	Developed technical procedures for Cross Border Balancing and Day Ahead Capacity Calculation	Agreed UK Position on Day ahead and Interim solution to cross border balancing at UK and EU level		Draft UK Position on Intraday and Long Term	UK position on enduring balancing options agreed with all relevant parties	Interim solution being Implemented			UK position and enduring solution agreed at UK level on going negotiations with EU
	Industry revenue management (A6.3)	Market half-hourly Settlement (D6.3.1)	New deliverable		High Level Discovery	Impact Assessment & Agree Approach	Design, test and Implement	Design, test and Implement			
		New TNUoS reform (D6.3.2)	New deliverable			High Level Discovery	Impact Assessment & Agree Approach	Design, test and Implement			
	Amend the process to transform our codes (A6.4)	Change from a code administrator to a code manager	Improvements including processes Implemented	To be updated for August Plan (after outcome of consultation)							
	Work with all stakeholders to create a fully digitalised, Whole System Technical Code by 2026 (A6.5)	The Grid code combines transmission and distribution codes in an IT system with AI-enabled navigation and, document and workflow management tools (D6.5)	Defined scope and objectives on the 2 workstreams, lead by project team and steering group		Identify, prioritise and raise the modifications required						Progress high priority modifications
	Digitalisation of Codes (A6.8)	Implementation of digital solutions (D6.8)	New deliverable				Implementation has commenced				Implementation is complete
	Whole system codes reform (A6.9)	Whole electricity system framework assessment (D6.9)	New deliverable			Establish team to deliver assessment of frameworks.	Detailed workplan and stakeholder engagement.		Full assessment of delivery areas		Identify and raise or recommend changes

2.3 Role 3

2.3.1. Activity 8 – Enable all solution types to compete to meet transmission needs

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25					
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
				Milestones									
Enable all solution types to compete to meet transmission needs (A8)	Rollout of pathfinder approach and optimise assessment and communicate of future needs (A8.1)	New areas of need identified, and 3-6 tenders run (D8.1)	Sub-activity Completed but may see new deliverables for August.	Sub-activity completed in BP1									
	Enhance tendering models (A8.2)	Improved tender approaches that enable more participants to enter the market (D8.2)	Improvements to tender processes result in new and varied tender participants.	Continue to run tenders based on 2021/22 work									
	Support Ofgem to establish enabling regulatory and funding frameworks (A8.3)	Frameworks based on competitive regime not monopoly regime (D8.3)	Sub-activity Complete: Worked with Ofgem to develop solutions to current limitations with current regulatory arrangements.	Sub-activity completed in BP1									
	Early Competition (A8.4)	Implementation of the Early Competition Model (D8.4)	Substantial implementation progress	Generic tender documents and processes to Ofgem to be approved			Implementation complete. Project identified for first competition					Technical and commercial input provided to the early competition procurement body	

2.3.2. Activity 9 – Enhanced NOA approach to end-of-life asset replacement decisions and connections wider works

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25					
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
				Milestones									
Extend NOA approach to end-of-life asset replacement decisions and connections wider works (A9)	Expand network planning processes to enable more connections wider works to be assessed (A9.1)	Developed and trialed CWW processes with TOs (D9.1)	Sub-activity complete: developed and trialed CWW processes	Sub-activity completed in BP1									
	Trial assessment of all connection wider works in one region (A9.2)	Complete and published CWW trials in selected regions in NOA (D9.2)	Sub-activity complete: completed and published CWW trials in selected regions	Sub-activity completed in BP1									
	Expand to all Connections Wider Works (CWW) (A9.3)	Make recommendations on all connections wider works in NOA 2026 (D9.3)	N/A - BP2 Commencement				Scaled and implemented effective CWW proposals in NOA						
	Develop process with TOs to input into ESO analysis of end of life asset replacement decisions (A9.4)	NOA 2024 makes recommendation on future end of life asset replacement (D9.4)	N/A - BP2 Commencement				Made recommendations on some asset life replacement in NOA 2024					Expanded number of EoL asset replacements assessed against NOA 2024	

2.3.3. Activity 10 – Support decision-making investment at the distribution level

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25					
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
				Milestones									
Support decision-making for investment at the distribution level (A10)	Support DNOs to develop NOA type assessment processes (A10.1)	NOA expertise shared with DNOs	Completed in BP1	Sub-activity completed in BP1									

2.3.4. Activity 11 – Enhance analytical capabilities

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25				
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
				Milestones								
Enhance analytical capabilities (A11)	Refresh and integrate economic assessment tools to support future network modelling needs (A11.1)	Improved identification of when is the most economical time to invest and the most efficient solution (D11.1)	Implementation of updated economic tool			Integration with our network assessment tools						Full integration with Data and analytics platform complete
	Implement probabilistic modelling (A11.2)	Improved identification of network needs (D11.2)	Proof of concept for year-round thermal assessment of circuit constraints and integration into a NOA process				Developed and implemented digital experience platform					Full integration with Data and analytics platform complete
	Build voltage assessment techniques into an optimisation tool (A11.3)	Improved assessment of voltage requirements, and ability to look across a range of network needs at the same time (D11.3)	Proof of concept for voltage optimisation tool				Implemented VO tool and identified further enhancements					Full integration with Data and analytics platform complete
	Build stability assessment techniques into an optimisation tool (A11.4)	Improved assessment of stability requirements across the network (D11.4)	Innovation project identified learnings and development needed on our data and models				Proof of concept for a stability screening tool					Implement stability screening tool

2.3.5. Activity 12 – SQSS Review

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25					
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
				Milestones									
SQSS Review (A12)	Scope project, building on the BEIS recommendations (A12.1)	Review fully scoped and target issues agreed (D12.1)	Sub-activity complete: A targeted NETS SQSS review was proposed to ensure standard is updated to enable decarbonisation of the electricity system.	Sub-activity completed in BP1									
	Identify solutions (A12.2)	Potential solutions identified and direction established (D12.2)	Potential solutions identified for quick win topics				Prioritised changes identified and potential solutions developed					Prioritised changes identified and potential solutions developed	
	Implement changes to the SQSS (A12.3)	Key changes to SQSS made or in progress (D12.3)	Potential solutions made or in progress				Prioritised changes initiated and made or in progress					Prioritised changes initiated and made or in progress	

2.3.6. Activity 13 – Leading the Debate

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25				
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
				Milestones								
Leading the Debate (A13)	Provide whole system regional insights (A13.2)	Provide whole system regional insights (D13.2.1)	New deliverable	Working with Local Authorities to scope feedback loop	Whole system regional data and insights provided					Whole system regional data and insights provided		
	FES: Bridging the gap to net zero (A13.4)	Produce evidence-based recommendations to support development of net zero policy (D13.4)	Two successful iterations of the annual project	Working with gas networks to agree breakdown of FES scenarios	Regional data and visualisations added to Website	User-configurable FES view available for Electricity supply and demand				Regional data and visualisations added to Website	User configurable FES view available for Electricity / Gas / Hydrogen supply and demand	
							Delivery of stakeholder informed report with recommendations for near term actions for net zero					Delivery of stakeholder informed report with recommendations for near term actions for net zero

2.3.7. Activity 14 – Take a whole electricity system approach to connections

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
				Milestones							
Take a whole electricity system approach to connections (A14)	Further enhance the customer connection experience, including broader support for smaller parties (A14.3)	Establish dedicated Distributed Energy Resource (DER) account management function (D14.3.1)	Commencement delayed to BP2	Run Connections process-focused meetings with DNOs and TOs		Request feedback from Customers and DNOs		Continuously deliver on the use of DER, learn lessons and implement improvements			
		Improving Systems and Data (D14.3.4)	New deliverable	Submit IT investment paper and obtain approval of scope and expenditure	Further develop new register, platform and connection with other systems; liaise with stakeholders to verify requirements	Further development and testing - engage with focus groups	Implementation of updates to ESO Portal	Obtain feedback on the new platform from internal and external stakeholders	Continuous review, maintenance and updates to the platform	Continuous review, maintenance and updates to the platform	Continuous review, maintenance and updates to the platform
		Leading an industry-wide review of the connection process (D14.3.7)	Ofgem has granted ESO an extension for several connection offers, recognising challenges associated with the process	Issue problem statement and proposal paper to Ofgem Engage with TOs to obtain their support and views for this paper	Work with Ofgem to obtain feedback on the paper, and confirmation of ESO's role and expected deliverables	Initial engagement session with key stakeholders. Timeline for process defined, independent co-ordinator appointed	Workshops with key stakeholders	Produce Connections Review Roadmap and agree deliverables	Deliverables as per Connections Review Roadmap	Deliverables as per Connections Review Roadmap	Define and agree "skeleton" transmission connection process
	Facilitate development of the customer connections hub (A14.4)	Implement first phase of the ESO connections portal (D14.4.1)	Initial delivery of phase 1 of ESO connections portal (last phase of minimum viable product)	Changes based on customer feedback	Changes based on customer feedback		ESO connections portal improved based on customer feedback				
Phase 2 of the connections portal concluded (D14.4.2)		Submit revised IT investment paper through internal governance process and obtain approval of scope and expenditure		Further develop concept of phase 2 deliverables and identify different stages of deliverables along with key stakeholders to work with	Development of concept designs	Clear definition of deliverables and confirmed support from stakeholders; Defined project roadmap	Review and UAT for scheduled deliverables in Q3 & Q4	Continuous development of further elements for later delivery	Delivery of elements of the phase 2; Continuous development of further elements for later delivery	Successful delivery of some elements of Phase 2	

2.3.8. Activity 15 – Take a whole electricity system approach to connections

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Taking a whole energy system approach to promote zero carbon operability (A15)	Manage operational data and modelling requirements for the ESO (A15.4)	Automation of data exchange mechanism and preparation for CIM Implementation (D15.4.3)	New deliverable				Initiative identified to automate data exchange Commence preparation for data exchange enhancements				Implementation of data exchange automation Prepared for enhancements with network organisations
	Regional Development Programmes (RDPe) (A15.5)	Forward Plan 2020-21 RDP - Generation Export Management Scheme (GEMS) (D15.11.2)	Energisation of pilot sites by April 2023 to commission first GEMS boundaries	Testing and commissioning of first GEMS pilot boundaries	Expansion of functionality to further boundaries on a system needs basis				Design and integration of GEMS functionality with SPD ANM scheme	Commissioning of first DER onto combined GEMS and SPD ANM functionality	
		RDP2 of RIIO-2 (MW dispatch, South East, UKPN) (D15.5.2)	New service design developed for thermal constraint management		IT implementation phase complete						
		RDP3 of RIIO-2 (Storage, Midlands, WPD) (D15.5.3)	Commercial development complete including market viability and service design to resolve operability need. IT Requirements and Design phase commenced	Undertake IT requirements and design for new operability functionality with DNOs	Complete IT requirements and design			Complete IT development and testing; ongoing implementation of solution	Assess enhancements to new service in accordance with operability needs and customer feedback	Complete enhancements to new service and final implementation	
		RDP4 of RIIO-2 (Storage, East Anglia, UKPN) (D15.5.4)									
		Deliver GB rollout of functionality (visibility & control of DER) developed through Initial RDPs (D15.5.5)	Development of roadmap to deliver GB rollout of functionality developed through Initial RDPs		Establish enduring process to determine needs at GSPs			Rollout process and seek feedback from stakeholders	Test application of process at one or more sites	Implement enduring ongoing process	
		RDP5 of RIIO-2 (D15.5.6)	New deliverable	Go / No go decision to progress RDP implementation; if yes, commence detailed RDP development			Complete detailed RDP development ahead of IT build		Complete IT requirements and design	Commence IT implementation in order to test new service solution	
		RDP6 of RIIO-2 (D15.5.7)	New deliverable								
	Transform our capability in modelling and data management (A15.6)	Further Grid Code modification Implementation (D15.6.2)	Progress depends upon the timescales of the code modification process				Grid Code mods progressed or submitted for approval	Provide ongoing technical support and input to the code development process			
		Deliver major upgrades to our offline modelling tools (D15.6.6)	Hardware and software upgrade for OLTA offline analysis tool carried out. Offline modelling roadmap developed					Further upgrade to offline modelling tool software / service pack		Integration of offline modelling tools with Data and Analytics Platform	
		Deeper Outage Planning go live in Offline Network Modelling (D15.6.7)	OLTA hardware refresh completed				Feed findings from deliverable A15.3.2 and any Grid Code modifications into modelling scoping and development			Feed findings from deeper access work into offline network modelling development	
		Development & ongoing maintenance of EMT Capabilities (D15.6.8)	New deliverable	Learning from NIA projects to define requirements for EMT modelling work	Engage with wider industry and produce a roadmap to develop and maintain EMT models		Identify the data requirements and develop process to collect required data and build initial EMT model	To carry out initial EMT simulations for the GB network	Define requirements for EMT simulation using learning from NIA projects (D15.6.9)	Developed capability to carry out EMT simulations Developed plan for ongoing maintenance of EMT model(s)	
		Co-simulation analysis innovation project (D15.6.9)	New deliverable	Engage with wider industry to start the potential innovation project for co-simulation works			Evaluate the feasibility of co-simulation modelling between OLTA (PowerFactory) and PSCAD				
	Deliver Enhanced Frequency control by 2025 (A15.7)	Commence System State Targeted Monitoring and Control System (MCS) stage roll out (D15.7.1)	2022/23 milestones pushed out to 2023/24 due to addition of a "Phase zero"	Phase 2 (develop operational demonstration) Development and Testing		Phase 4 first stage rollout start-up	Phase 3 (Operational Demonstration) implementation Phase 4 first Stage Roll-out requirements and design	Phase 4 First Stage Roll-out Developments	Phase 4 First Stage Roll-out Implementation Phase 5 Second Stage Roll-out Startup requirements		
	Facilitate distributed flexibility and whole electricity system alignment (A15.8)	Enabling distributed flexibility service provision to the ESO (D15.8.2)	Roadmap for greater operational visibility in progress and delivering BM operational metering standards designed for residential flex	Engagement with service providers on future technical standards	Identification of optimisation opportunities of existing visibility of DER	Project plan for technical standard reform	Project plan for co-ordination of required IT changes for greater DER visibility		Operational data exchanges in place with all DNOs (ICCP links).	Q4 Building the storage and transfer capability	
		Enabling whole electricity system operational service co-ordination (D15.8.3)	Conclusion of ESO led work in Open Networks to develop initial set of primary rules	Q1-Q4 Delivery plan for national roll-out of co-ordination frameworks into control room systems			Initiate IT project for service co-ordination in operational timescales		Initial systems developed for operational co-ordination		

2.3.9. Activity 16 – Delivering consumer benefits from improved network access planning

Activity	Sub-activity	Deliverable	BP1 End Point	RIIO-2 Year Three - 2023/24				RIIO-2 Year Four - 2024/25				
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
				Milestones								
Delivering consumer benefits from improved network access planning (A16)	Scope a Whole Electricity System decision policy (A16.2)	GB-wide NAP process (D16.2.1)	Training delivered to England & Wales outage planning teams to demonstrate use of NAP process. NAP process integrated across all current-year teams	Stakeholder mapping activities commenced	Stakeholder mapping activities communicated to stakeholders	Organisation of cross industry forum	CBA and summary paper for presentation to industry	Develop framework to facilitate decision making			Agree framework to facilitate decision making	
	Work more closely with DNOs and DER to facilitate network access (A16.3)	Finalise new processes in readiness for approval of code modifications to facilitate closer working relationships and data exchange/modelling. (D16.3.3)	Able to feed the findings from interactions with trial partners into BP2 activities. Potential code modifications identified.				Proposals for draft code modifications completed				Code modifications finalised for approval	
		Deeper access planning go-live – frameworks, processes and models are in place to facilitate deeper access planning with network parties (D16.3.4)	Able to feed the findings from interactions with trial partners into BP2 activities. Potential modifications for models, frameworks and processes identified.				Proposals for frameworks, models and processes completed				Frameworks, models and processes completed to facilitate deeper access planning	
	Whole system outage notification (A16.4)	Scoping exercise for delivery of enhancements to outage notifications (D16.4.1)	Progression delayed due to late release of eNAMS. Milestones dependent on outcomes of A16.3				Scoping complete					
		Delivery of enhancements to outage notifications (D16.4.2)									Whole System Outage Notifications in use	
	Network Access Planning Automation (A16.5)	Agree future platform for any automation and create sandbox environment for application development (D16.5.1)	New deliverable		Continued use and development of sandbox environments Platforms for development of automation tools known and agreed by Q4				Continued use of sandbox environments for A16.5.2 developments			
		Scope future automation development (D16.5.2)	New deliverable	Project delivery timelines and full project plan identified for delivery of contingency analysis automation & multiple cardinal demand point analysis	Proof of concept for agreed automation commenced	Proof of concept for automation completed	Training programme for teams in NAP developed and delivery schedule planned	Training on NAP staff on all tools underway	Training on NAP staff on all tools Complete and systems in use			

Section 3: Role 3, A22 Offshore Coordination and Network Planning Review - Supporting Information

1.1. Current best view of enduring requirements to deliver a holistic approach to planning the onshore and offshore transmission network on a strategic basis

Both the Offshore Coordination (OC) and Network Planning Review (NPR) projects are expected to have a positive impact on our Network Planning capabilities, with the potential to be significant in a number of areas. The concept of a Centralised Strategic Network Plan (CSNP) cuts across the entirety of the existing network planning process, and the enduring approach to delivering an integrated offshore network is an essential element of this, introducing new activities for us to undertake.

Due to the early stage of maturity and ongoing uncertainty of both projects, a clearer view will emerge through 2022. For BP2 we are setting out our current best view of the likely impact on our network planning activities and our view of the expected new requirements in terms of FTEs/opex, and IT and modelling capabilities/capex. To do this, we consider likely impacts at key stages of the network development process as follows:

1.1.1. Model supply and demand

The ESO currently undertakes significant activity to develop Future Energy Scenarios (FES). Ofgem envisages a central scenario that can support onshore and offshore strategic network planning. We will look at what would be required in addition to the current FES, or as an evolution to it, that satisfies this requirement. It

is our intention that the OC project's holistic network design (HND), in conjunction with the outcomes of the 2022 Network Options Assessment (NOA), will form a transitional CSNP acting as a bridge with whatever enduring CSNP processes are established in future. This is likely to mean that an enhanced scenario framework will need developing early in the BP2 period to support that enduring CSNP approach.

The exact interplay between scenarios or estimates and associated sensitivities to support CSNP, and what scenarios are required to support other key users for planning purposes, will be one of the key elements that needs to be considered. We do not anticipate a 'one size fits all' approach to be feasible, and we anticipate that the specific needs and potential for different preparation and review timescales will place additional resource requirements on our Energy Insights team.

1.1.2. Potential FTE impact

Our initial view is that we will require an extra 2 FTEs for electricity generation modelling, 2 FTEs for demand modelling (which will include whole system considerations) and 2 FTEs for modelling development - in addition to the current team. We also anticipate requiring a further 2 FTEs to manage the impact of the development and implementation of a strategic seabed leasing plan - this is expected to include modelling resources to support the development and to understand and manage how the output of that plan interacts with the development of the scenarios.

1.1.3. Potential IT/CAPEX impact

We need to ensure our systems can model sensitivities effectively. Disparate, new (and existing) data sources will need to be managed/converted so that they are compatible with existing and new systems. There are links here to existing RIIO-2 deliverables such as the Data and Analytics Platform, which is expected to be required to support efficient running of multiple scenario sensitivities.

1.2.1. Identify system needs

The Electricity Ten Year Statement (ETYS) is focused on major thermal transmission boundaries, with assessment of voltage and stability requirements made using a less systematic, more manual approach. For CSNP the expectation is that we will need to consider the full range of capability and operability requirements in a systematic way out to at least 2050, and to present those requirements in a way that can best support sourcing and delivery of solutions.

We also expect that there will need to be some level feedback and iteration of scenarios, based on their impact on the network. It is anticipated that this will help with optimising and refining the scenarios.

The potential impact of this on the current ETYS process could be significant, depending on the approach taken. To consider all capability and operability needs on a fully systematic basis will be challenging without the development of new tools and models as the current approach is manually intensive. We will need to carefully consider the options and timescales over which this could be achieved and agree how best to progress.

1.2.2. Potential FTE impact

Enhanced provision of network insights and requirements across a broader range of operability needs will need additional modelling tools and resource uplift to conduct the assessments. We expect increased, targeted assessment of voltage and stability needs to require at least 4 additional FTEs, with a further 2 FTEs to develop our modelling approach, for example to allow greater automation and use of machine learning techniques. Scaling this approach up would require significantly more power system engineers to evaluate complex system studies to determine optimal solutions – hence we anticipate that a truly systematic approach to understanding the full range of operability challenges will require a new approach to modelling the impact of future scenarios on the network. The FTE and capex implications of this would need to be worked through in detail before a robust estimate of BP2 requirements could be provided.

1.2.3. Potential IT/CAPEX impact

Adopting a more systematic approach to the identification of system needs is expected to require new ways of assessing the impact of scenarios on the network. The exact needs will be worked through in detail as the projects progress.

1.3.1. Identify system options

This will be an entirely new activity for ESO, from an asset perspective. TOs currently provide options to meet system needs through the 'System Requirements Form' process – CSNP will require ESO to provide high-level strategic options, with appropriate industry collaboration, covering both the onshore and offshore transmission network.

New teams with new capabilities will be required for ESO to be able to undertake high-level design activities for identification and development of strategic investment options, and to engage with stakeholders for expert input. These are expected to consist of power system engineers, economists, environmental constraint experts and land & marine planning experts, and we expect to require expertise in construction and project delivery to understand delivery timescales. Engagement with TOs and other 3rd parties is expected to be required to support these activities.

There is also an opportunity here to consider how the process of connecting to the transmission system can benefit from a more strategic approach to its development. This is already being considered in an offshore context via the development of the HND, with the connections requirements and strategic investments being considered together. It is anticipated this more integrated approach to planning offshore connections will replace the current Connections and Infrastructure Options Note (CION) process. More broadly we expect that the existence of strategic investments will create certainty of transmission capacity that could then be harnessed for connections in a more coordinated way.

1.3.2. Potential FTE impact

To ensure appropriate coverage of new network design and connection activities we anticipate requiring at least 10 FTEs for detailed design of strategic options and a further 6 FTEs for high-level design activities across Great Britain. The connection FTEs would work closely with the existing connections teams to ensure a consistent and coherent customer experience.

1.3.3. Potential IT/CAPEX impact

New tools will be needed to enable these new design activities. These are expected to include (but not be limited to) software to assist with onshore and offshore route planning for high-level strategic investment options, and to manage visual amenity. Existing tools will also need to be augmented or supplemented to enable these activities to be delivered. Further resources may be identified as necessary to manage whole system interactions, including electricity distribution and, in future, across other energy vectors.

1.4.1. Options Appraisal Process

The assessments currently undertaken as part of the *NOA* process will be impacted by the development of strategic network investment options and the need to assess them in accordance with whatever process is determined to be appropriate. Based on current expectations of what is envisaged for CSNP, this is expected to include strategic options assessed on a longer-term cycle (such as three years), and other 'non-strategic' options that might need assessing on a more regular basis (for example annually, as now).

It is also anticipated that the nature of the assessment of costs and benefits will need to go beyond a pure analytical cost-benefit assessment, to include more qualitative assessment techniques, for example to consider environmental and social aspects of proposed strategic investments, which may require different skills and expertise depending on whether options relate to the onshore or offshore network.

This suggests the options appraisal process will need to be informed by robust analytical techniques, but with additional intellectual debate, stakeholder engagement, consultation, and decision-making. At this stage it is too early to say what the exact impact on the existing *NOA* process might be, however it is reasonable to assume that it will need to transform to reflect the additional needs of CSNP. We anticipate this transformation will affect the scope of work, and also the volume of activity required to be undertaken.

1.4.2. Potential FTE impact

We envisage at least 4 FTEs to manage this increase in workload, which includes one additional FTE to increase our ability to assess the suitability of options for delivery via competitive, rather than regulatory, mechanisms. Whilst from an enduring perspective we would expect to make use of existing expert *NOA* resource to undertake significant elements of the new activities, additional specialist resource will be required for the changed options assessment and environmental and social assessments, although this may only be

needed at certain key points in the process, and hence might be something that we can contract out. This will be investigated as the NPR and OC projects progress.

1.4.3. Potential IT/CAPEX impact

Existing tools may need to evolve to be able to deal with the consequences of a revised options appraisal process that incorporates both strategic and non-strategic developments in a suitable way.

1.5.1. Finalise CSNP

This would represent the bringing-together of all the above, to create a strategic view of the network out to 2035/2050. Our initial view is that this activity will be an amalgamation of aspects of all the above functions, as well as collaboration with the wider industry, in a similar manner to the way the NOA report is prepared at the moment. Whilst we would expect to make best use of existing resource for this, we anticipate one additional FTE will be required to support planning, preparation and delivery of the finalised CSNP report.

1.6. Summary

In total, our initial view is that at least a further 35 FTEs will likely be required to deliver CSNP capability. This is subject to further work through 2022, however for the purposes of this BP2 we prefer to give an indication of likely requirements, rather than waiting for further detail to become apparent post-publication.

3.1 Enduring Offshore Regime – Additional Supporting Information

3.1.1. Strategic seabed leasing plan – additional information



Figure 1: Assumed timescales for development of strategic seabed leading plan

The figure above sets out our assumptions on the timescales for the development of the strategic seabed leasing plan. This suggests the first version of the strategic seabed leasing plan could be available to the ESO for network planning purposes between October 2023 and April 2024. This could also be used to inform future leasing rounds beyond those currently planned and in related connection and network planning processes.

Based on our views on what a strategic seabed leasing plan should be in the context of the OTNR, we think that the ESO is unlikely to be best placed to own it. However, we will be integral to the development and implementation irrespective of the accountable party or parties.

3.1.2. How early competition is applied to the offshore network – additional information

If any strategic network planning related to future leasing rounds does not commence until some point between October 2023 and April 2024, we can assume that the high-level network design associated with the relevant leasing round capacity would not be available until sometime between April 2024 and October 2024. If there is a plan to compete some or all of that high-level design or the underlying network need via an

offshore early competition, there is a need to assess and amend how the proposals for the onshore network need to be adapted for the offshore network. The different licensing arrangements mean that the onshore regime cannot be transferred directly to the offshore network and resources would be required for activities such as adapting frameworks, tailoring contracts and evaluation criteria specifically to offshore and also engaging specifically with offshore stakeholders.

We anticipate the responsible party would need up to 12 months to design and launch the early competition, with preparatory work needing to commence in FY25. We therefore assume that an early competition related to offshore transmission associated with future leasing rounds is unlikely to commence in the BP2 period.