Annex 08

RIIO-T3

ET Load Strategy

National Grid Electricity Transmission's Business Plan

December 2024

Overview of this document

Purpose of this Annex

Our load strategy annex provides details on the investments we are proposing to expand the capacity of the electricity system to support Great Britain's future growth and decarbonisation ambitions.

It sets out our process, building on the needs identified by the NESO and requests from customers for new connections, and details our plans to deliver the required network capacity to connect and transport clean energy to meet expected future electricity demands. This will enable new sources of low carbon generation to connect across the country at pace in line with government targets.

It details the RIIO-T3 plan and investments we are proposing, how we have determined these, and what mechanisms we are putting in place to ensure consumers, both current and future, only pay for what is delivered. It also details how we will ensure our plans are developed and delivered on time and at cost.

How to navigate this annex

The table below provides a short summary of each section and where information requested in the Business Plan Guidance (BPG) has been provided.

Section	Detail	BPG reference[1]
1	**Executive Summary –** Provides an exec summary of the annex and links to the key ambitions, commitments, success factors introduced in our main document.	4.14 - 4.15
2	**Drivers of our RIIO-T3 load portfolio –** Details the key drivers used to construct our RIIO-T3 business plan across boundary capacity, new connections, operability, and interaction with asset health.	4.25, 4.28 – 4.29, 4.35 – 4.38
3	**Regional and Stakeholder perspectives –** Provides details on our regional approach to capturing feedback from stakeholders and developing site and circuit strategies across our network	4.19, 4.28
4	**Managing competing priorities in our RIIO-T3 portfolio –** Details our approach to dealing with competing interests including delivery, speed, cost, network access for works	4.22, 4.31 – 4.33
5	**The investments in our RIIO-T3 business plan –** Provides a breakdown of our plan, noting baseline and pipeline funding and uncertainty mechanisms	4.20 – 4.21, 4.34, 4.44 – 4.46
6	**Governance and assurance of our RIIO-T3 business plan –** Explains the governance and assurance processes followed in developing our RIIO-T3 plan	4.22 – 4.23
7	**Project development –** Details our gated process for progressing new projects, from identification, development, sanction, construction and close, including detail on optioneering, strategic investment	4.16 – 4.17, 4.22 – 4.24, 4.26 – 4.27, 4.30, 4.43, 4.46
8	**Procurement, contracting and the role of competition –** Provides details on supply of equipment and our approach to competition	3.18 - 3.22, 4.22, 4.40 – 4.41
9	**Project delivery –** Details our process for delivering projects, managing budgets, timelines, and risks.	4.39, 4.42

[1] These are the BPG requirements relevant to this Annex. These requirements may also be addressed in other business plan submission documents.

Our RIIO-T3 objectives, commitments and success measures

Our plan is anchored on our three ambitions, each underpinned by clear objectives, commitments and success measures for the RIIO-T3 period. These allow us to target stretching levels of performance and track progress. The specific ambitions, objectives and commitments that are most relevant to this annex are shown below:

	Our Plan Objectives		Our Commitments: We will:	Success Measure / Target
A1	Maintain world class levels of network performance and resilience, and ensure that the new network we build is designed to reflect future security and climate challenges	A1.1	‣ Ensure our assets continue to provide a resilient network, delivering high quality and reliable electricity to consumers	‣ 99.9999% network reliability ‣ <135MWh per year Energy Not Supplied
		A1.2	‣ Not allow the overall risk of our network to increase, as we deliver across multiple drivers (network growth, safety, resilience and environment)	‣ Maintain asset risk at RIIO-T2 levels whilst the network grows more than in previous periods
A2	Deliver the capacity our customers need now, by looking holistically across multiple investment drivers to deliver at the pace and scale required to support Government's ambition on growth and decarbonisation	A2.1	‣ Enable the connection of new generation to the electricity transmission system	‣ 35 GW connercted
		A2.2	‣ Enable the connection of new demand customers to the electricity transmission system, including to support the Government's new Growth Driving Sectors	‣ 19 GVA connected
		A2.3	‣ Develop and deliver major new network expansion projects identified by NESO	‣ 21 projects delivered ‣ 35 projects developed/in development, this includes in construction, with a number having high potential to accelerate and deliver in RIIO-T3
		A2.4	‣ Replace overhead line conductors to meet load and non-load needs of our customers	‣ Reconductor 8% of our overhead line network (215 circuit km per year) with pipeline planning for an additional 13% of the network (365 circuit km per year)
		A2.4	‣ Improve our customers' experience of the connection process	‣ Provide increased transparency throughout the connections process, from application through to energisation ‣ Increase customer satisfaction rating from 7.2 to above 7.7 ‣ Provide additional support to customers, in particular as the new connections process are applied to the existing pipeline of customers
A3	Future-proof our network with strategic capacity and flexibility for the longer term, using the network modelling capabilities we developed in T2 to surface insights and inform strategic decisions.	A3.1	‣ Develop and deliver strategic investments which include optionality for the future	‣ Options created for 26 GW (through future proofing approach to investment)
		A3.2	‣ Create long-term strategies for major underground network upgrades	‣ Three cabling strategies (Leeds, Severn Crossing, West London)
C1	Transform our asset management, network development, network operation and telecoms capabilities to ensure we can deliver the step-up in work required during this period, and manage a larger, more complex, decarbonised network	C1.2	‣ Enhance ournetwork development and planning capabilities through enhanced power system and economic analysis, scenario testing and visualisations	‣ Develop new probabilistic power system engineering and economic analysis tools to enable enhanced scenario analysis at a greater level of detail and agility ‣ Develop enhanced capabilities to visualise the impact of differing scenarios, enabling greater stakeholder input and engagement

Contents

1. Executive Summary

The scale of the challenge to achieve net zero is unprecedented - to keep up we will need to invest at a level never seen before, transforming the way we work.

Our most significant workload and investment in the RIIO-T3 period will be to increase network capacity. Compared to RIIO-T2, our load-related plan will accelerate the rate at which we connect new generation and demand to our network.

We will deliver projects that will expand the capacity of our network to move more energy from where it is generated to where it is needed through 17 Accelerated Strategic Transmission Investment (ASTI) projects. Five new marine cables will be built. Four of these are joint ventures with Scottish transmission owner (TO) partners to bring wind power from the North of Scotland. Three will be completed during the RIIO-T3 period and two shortly afterwards. Twelve major onshore projects will be completed during or shortly after this period.

We will provide the capacity to connect:

- 35GW of new generation in England and Wales (including 32GW of low carbon generation), and options for a further 26GW in the future.
- 19GVA for new demand connections (including demand needed to support the UK Government's new Growth Driving Sectors[2]).

These projects will involve reconductoring almost one tenth of our existing network in the RIIO-T3 period and delivery of more than 30 new or rebuilt substations[3].

Our baseline and pipeline plan for increasing network capacity represents up to c.£23bn of the potential £35bn investment over the period. The main components are:

- £11bn for network capacity projects the need for which has been approved as part of the Accelerated Strategic Transmission Investment (ASTI) programme, of which £4bn have set allowances through project assessment processes we have already concluded with Ofgem
- £3bn for further network capacity projects subject to approval as set out in the ASTI development pipeline and NESO's *Beyond 2030* plan, and for supporting work for these investments
- Up to £9bn for projects which will connect our customer to our network, of which £1.8bn we have a high confidence it will be needed (although not all of this is in our baseline plan because we do not yet have certainty of the costs for these projects). The remaining potential investment is less certain because the plan will need to change when the impacts of the government's Clean Power 2030 action plan and connections reform are known.

We plan to deliver the network upgrade work in a way which maximises integration with asset maintenance requirements. This is most efficient for consumers, as it ensures that we optimise the work on an asset-by-asset basis. It also reduces the requirement for system access. It has been our practice to do this where possible historically, but we are adapting our asset management strategy to take a longer term view and accelerate or defer planned maintenance to fully align with network upgrade work.

Our load-related business plan is aligned to the needs and feedback from our stakeholders

The UK Government has targets to achieve clean power by 2030 and achieve net zero carbon emissions across the economy by 2050. To achieve this, renewable energy will need to rapidly increase in line with expected growth in electricity demand - both to facilitate a switch from other energy sources to clean electricity, and to meet the growing demand from new sectors including data centres and artificial intelligence. This will require the transmission network to significantly increase capacity in the next decade, setting the foundations for its continued expansion through to 2050 and beyond. While our T3 load plan has been formulated to facilitate delivery of decarbonisation of the electricity system by 2035 (noted below), it can be adapted to government plans to accelerate to 2030.

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[2] Invest 2035: the UK's modern industrial strategy, HM Government, 2024

[3] Combined with our non-load work we expect to reconductor one tenth of our network by 2031. Further details on our non-load plan is included in Annex 10: Network asset management

The National Energy System Operator (NESO) has laid out the pathway to achieve the targets through a sequence of publications[4]. They have designed this pathway to achieve the best balance of progress towards decarbonisation and reduced cost for consumers. The network upgrade plan set out in our load plan is in accordance with this NESO guidance5.

We have also undertaken extensive stakeholder engagement to plan the implementation of this pathway with a strong understanding of the needs of our customers, communities and industry partners. The plan we set out here balances the need for due progress towards decarbonisation, best value for consumers, meeting customer expectations, a positive impact for local communities and the best foundation for transmission and distribution networks to provide the full expansion needed to 2050. By investing to future proof the network, it underpins our ambition to deliver the grid of tomorrow, today.

Clean Power 2030 and customer connection reform

The NESO report *Clean Power 2030 (CP2030)* makes recommendations for changes across the electricity sector in order to meet the government ambition to accelerate the decarbonisation of electricity networks.

One of these recommendations is that Ofgem should reform the process for customer connections. Implementation of this recommendation is currently being considered. Should it be accepted, we will need to review our plan to assess the impact on the volume and sequencing of the work set out here, particularly the elements relating to new substations.

If the government's response does not include near term implementation of the NESO recommendation, we will need to discuss what is achievable within the existing process. As a minimum we will need a methodology to objectively assess customers' ability to meet planned timelines so we can target our investment accordingly. As described below, this plan is critically dependent on system access, and a high degree of compliance with schedules will be a pre-requisite for its delivery.

Clean Power 2030 also recommends acceleration of three ASTI schemes from 2031 to 2030 – these are the marine cable SEAlink between Suffolk and Kent, and two onshore schemes in East Anglia. For these three schemes the critical time factor is receipt of planning permission. Therefore, if it is possible for government to facilitate improved timescales for this, we will adapt the plan to bring these schemes forward.

Critical constraints to delivery of our plan and what we are doing to mitigate issues

Our plan is dependent on achieving unprecedented levels of planning permission, system access, supply chain and workforce capacity. Given the scale of the challenge and the significant increase in workload, we have undertaken unprecedented testing of the deliverability of this plan. We highlight here four critical constraints and the action needed to manage them, which will need to be a joint effort between NGET, NESO, Ofgem and government:

- **Planning permission** – The scale of infrastructure build set out here will impact many communities. Government is due to set out the expectations of how affected communities will benefit from these developments early next year, and we consider this to be a contributory factor to gaining local acceptance and expediting the relevant permissions. We will also need government support to ensure the planning system makes prompt and robust decisions and that we are agreed about what happens in the event of judicial review causing delay.
- **System access** – we have optimised this plan to minimise the system access requirement through work processes which avoid the need for outages, integrating network upgrade and asset maintenance work, and more efficient use of the outages granted. Even with these interventions, delivery of the plan will require NESO to coordinate an system access plan which creates 3-4 times the level of outage required historically, and enforce a new level of discipline across customers and suppliers so that work is fully aligned to planned outages.

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[4] *Network Options Assessment, Holistic Network Design* and *Follow Up Exercise, Transitional Central Strategic Plan* and *Beyond 2030.*

[5] In line with Ofgem's RIIO-3 Business Plan Guidance, the plan supports the Future Energy Scenario (FES) 2024 Holistic Transition pathway.

- **Workforce and Supply chain** – as described in the annex on this subject, our approach to the supply chain will need to allow growth of 3-4 times the level of current capacity, and a commensurate increase in the skilled workforce for the supply chain as well for as NGET. The annex sets out the government and regulatory changes we will need to allow us to manage this challenge.

We are taking a regional approach to long term planning to ensure our customers needs, both now and in the future, shape our plans

To help transform our approach to delivering our plan have developed regional approaches to help us develop site and route strategies, integrate our load and non-load plans prioritise investment. We have engaged extensively and are actively working with local and regional authorities and industry to incorporate their insights into our plans developing Future Network Blueprints for each region.

2. Drivers of our RIIO-T3 load portfolio

2.1. Introduction

The previous sections have set the out the content and investments included in our Load-related plan and how it supports the drive towards the energy transition to the Grid of Tomorrow and re-emphasised our commitment, excitement, and a clear responsibility of delivering a clean, fair, and affordable transition delivered. Within this section, we describe the building blocks of the analysis to create our RIIO-T3 Load related plans to deliver the infrastructure fir for a low-cost transition to Net Zero. We then go on to explain how we have analysed each of these.

Network drivers include our electrical network designs for bulk power transfer, ratified by NESO processes. In the last two annual planning cycles, this has consisted of the Holistic Network Design (HND) and Transitional Centralised Strategic Network Plan (tCSNP) in 2022, and the HND Follow Up Exercise (HNDFUE) and tCSNP2 in 2023 to produce two off and onshore coordinated designs for bulk power transfer of offshore wind to demand centres. We worked closely with the NESO through the development of these outputs, providing key data, network design and insight in to shaping the outcomes and defining the strategic direction of the Network design. These outputs form a key source from which our load-related plans are built. Many of these projects carry a high degree of uncertainty driven either by their relative maturity or other factors explained in Section 1 above.

Other drivers result from new generation and demand connections, expected growth from existing generation and demand customers, requirements to meet network standards and ensure an operable network, the condition of our existing assets, plus consideration of the broader future needs of customers, stakeholders, and the networks we interface with (namely other transmission and distribution networks). Regional engagement and requirements are also a key consideration and have been woven into our plan.

Within our plan, we use the concepts of “baseline” and “pipeline”. Our baseline investments include those where there is high confidence in the need, costs, and target delivery dates of our preferred solution. We have reasonable confidence in the need for the investments in our pipeline but currently we have insufficient confidence in final costs (e.g. for projects yet to obtain consent) or detailed scope since many projects in the pipeline are at a low level of maturity and require further development work. We will continue to refine the scope and costs of our pipeline projects ahead of, and during, RIIO-T3 before using the uncertainty mechanisms in the RIIO-T3 regulatory framework to fund these investments. Alternatively, where projects may be funded though the ASTI framework, we will request funding through pre-agreed processes once planning consents and supply chain are confirmed.

We will also use the uncertainty mechanisms to address the need for other investments as they emerge during the RIIO-T3 period, for example projects identified or confirmed through ongoing NESO processes, CP2030 and connections reform.

2.2. Driver 1 - Requirements from the NESO’s network planning activities

Our commitment

A2.3

Develop and deliver major new network expansion projects identified by NESO

The foundations of our business plan are the onshore bulk power transfer or wider works investments in England and Wales (and those joint projects with Scottish Transmission Owners) that we have designed to meet the requirements determined by the NESO (also known as wider works).

Traditionally, wider works have been established by the Network Options Assessment (NOA), which is a process overseen by the NESO that utilises Future Energy Scenarios (FES) to determine requirements across geographical network boundaries that bisect groups of circuits. Transmission Owners (TOs) design and propose network solutions with estimated earliest in service dates and cost estimates to resolve needs. The NESO approves or pauses delivery of these solutions informed by economic analysis that compares the cost of managing the system without the reinforcement compared to network investment proposed by the TO as described in section 3.3 below.

The NESO has historically conducted its NOA process annually. However, the rapid decarbonisation needs of the transmission network have now driven the NESO to modify this process so that the annual onshore bulk power transfer works assessment has been preceded since 2022 with an analysis to create a complimentary offshore coordinated network.

The HND provided an offshore and (via the subsequent 2022 NOA process) an onshore design with the aim of facilitating 50 GW of offshore wind by 2030 (prior to latest government targets for CP2030). NGET's ratified Transmission Network design solutions to meet requirements were outlined in the NESO's publication in 2022. The HND Follow-Up Exercise (HNDFUE) was published in 2023 to provide reinforcement recommendations to connect a further 23 GW of offshore wind, predominantly resulting from Scotwind announcements by Crown Estate Scotland in January 2022 that NESO could not accommodate into the original HND analysis.

In line with the decision taken by Ofgem in December 2023, the NESO is now building on the centralised planning approach introduced by the HND and NOA processes (also referred to as the first transitional centralised strategic network plan) and is developing the methodology for the first Centralised Strategic Network Plan (CSNP). This is expected to be published by 31 December 2027 and will identify onshore and offshore transmission network planning needs. As Ofgem's future, enduring network investment planning process, we expect a proportion of future investment to be determined by the CSNP framework. We are proactively engaging with Ofgem, NESO and DESNZ on how a future CSNP framework could look and what the desired outcomes from the process are. We have also been attending NESO workshops on this topic and will continue to attend working groups they gave scheduled to develop the detail of the CSNP framework.

We are also engaging with Ofgem, NESO and the Department for Energy Security and Net Zero (DESNZ) on the Strategic Spatial Energy Plan (SSEP), which will be a key input into the CSNP process. The SSEP is expected to split the country into zones and spatially set out capacity requirements in each zone, enabling the needs for each to be identified. Our expectation is that new major projects confirmed by the CSNP (first publication expected in late 2026/during 2027) during the RIIO-T3 period will be funded via the CSNP-F uncertainty mechanism.

During RIIO-T3 we will continue to work with the NESO and other electricity transmission stakeholders to develop the requirements of the network. We will continue to progress development of these necessary investments at pace, based on the latest available information.

Our transmission wider works for delivery during the RIIO-T3 period (including ASTI, Projects Enabling ASTI, Provisional ASTI, tCSNP2 projects and other NOA projects) were therefore identified and signalled to progress from:

1. **The Network Options Assessments (NOA)** in 2021 and prior, and/or
2. **The transitional Centralised Strategic Network Plan (tCSNP1)** - published as 'Pathway to 2030' and comprising the NESO's Holistic Network Design (HND) for a coordinated offshore network (plus onshore enabling works) and the onshore Transmission Owner works from the subsequent 2022 Network Options Assessment (NOA), and/or
3. **The transitional Centralised Strategic Network Plan (tCSNP2)** - published as 'Beyond 2030' and comprising a Holistic Network Design Follow Up Exercise (HNDFUE) to coordinate further offshore wind into a NESO offshore network design (plus onshore enabling works), plus the onshore Transmission Owner works from the subsequent 2023 Network Options Assessment.

2.2.1 Overview of the wider works network planning activity and our role

The NESO initiates wider works network planning activities by identifying the requirements for increased capacity across network boundaries to meet a range of Future Energy Scenarios.

NGET then identify options that could fulfil the future network boundary requirements within England and Wales. As part of this, we conduct detailed power system analysis to understand the system benefits of the options. Options are provided to the NESO with an indication of the boundary capability benefit they provide, the earliest potential date to be in service and initial cost estimate. Based on this information the NESO conducts cost-benefit analysis to evaluate the projected capital costs versus the monetised constraint reduction benefits of our proposals. The outputs of this evaluation allow the NESO to provide investment signals i.e. 'Proceed', 'Hold', 'Stop' or 'Do Not Start'.

It is worth noting that all investments with 'Proceed' and 'Hold' signals are required and will provide benefits to consumers. However, a project on 'Hold' will provide consumer benefits after its earliest in-service date (EISD). Our RIIO-T3 business plan includes investments with Proceed and Hold signals where the NESO has asked us to deliver them. These projects must commence in RIIO-T3 to be in service by the optimal delivery date identified by the NESO (where this is credible in the context of the earliest in-service date indicated by the Transmission Owner). This date may be during RIIO-T3 or during the next price control and therefore we may commence some projects during RIIO-T3 for delivery during the next price control.

Once the signal is confirmed, we consider the boundary capacity determined by the NESO to be a minimum requirement. We describe in section 7 how we use our network development processes to identify options and preferred solutions to accommodate current and potential future needs.

2.3. Driver 2 – Accelerating connections for our customers

A transmission system ready to facilitate the timely connection of new customer projects sits at the heart of our T3 investment load plan. We recognise the growing importance that our connection investment strategy will have in delivering clean low carbon technology to the system across the generation sector, as well as providing important economic benefits across other sectors such as rail, data and digitisation and large strategic demand projects nationally. The growing diversity of projects wanting to connect has never been so great, there is an increasing expectation on how our investment strategy delivers to meet ambitions across our customers and support government policy.

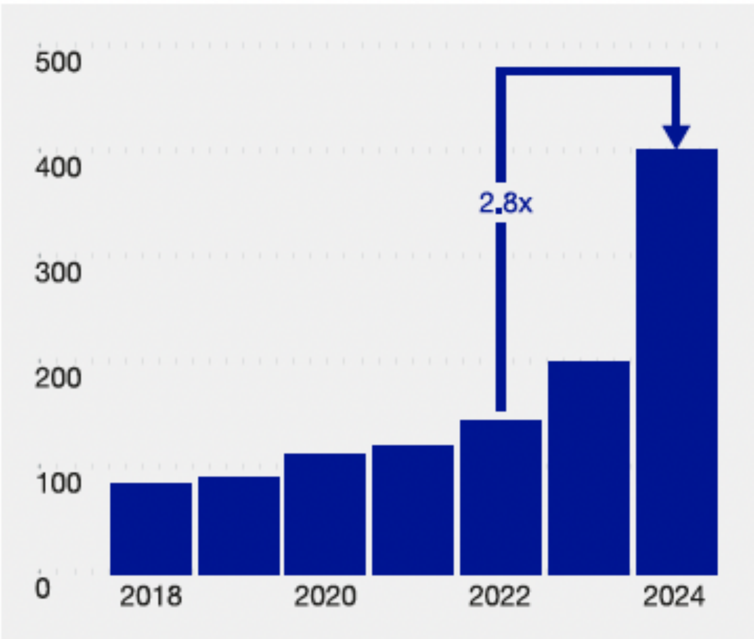
Our commitment

A2.1

Enable the connection of new generation to the electricity transmission system

The number of customers that are contracted to connect to our network has grown at an unprecedented rate, as shown in Figure 1 our contracted pipeline now exceeds 400 GW, far greater than the new capacity needed to deliver net zero under the FES 2024 Holistic Transition Pathway scenario, which indicates that only 35 GW of new generation is required during the 5-year RIIO-T3 price control period, this may need to be evaluated in light of CP2030. Likewise, we do not expect all contracted commercial demand projects to proceed and the forces driving attrition that will occur to generators seeking a transmission connection will equally apply to those seeking a distribution connection.

Figure 1: Annual growth of the NGET pipeline of contracted customers (GW)



The NESO (with support from the Department for Energy Security and Net Zero and Ofgem) is developing changes to the industry's approach to address the level of oversubscription in the connections queue, for example, by raising barriers to entry and encouraging contracted customers to progress the development their projects. This is part of Connections Reform. CP2030 will also play a role here as it will not only support raising the barriers to entry but also identifying and prioritising the right customers that are ready to connect where they are needed in the context of enabling a low carbon electricity sector by 2030.

Implementation of connections reform is due to commence in 2025 and the impacts will not be fully realised for some time. These circumstances present us with a challenge to identifying the connections projects to include within our T3 plan. To develop the network in a way that represents value for consumers, we have used two key tools in identifying the connection investments to include in our business plan:

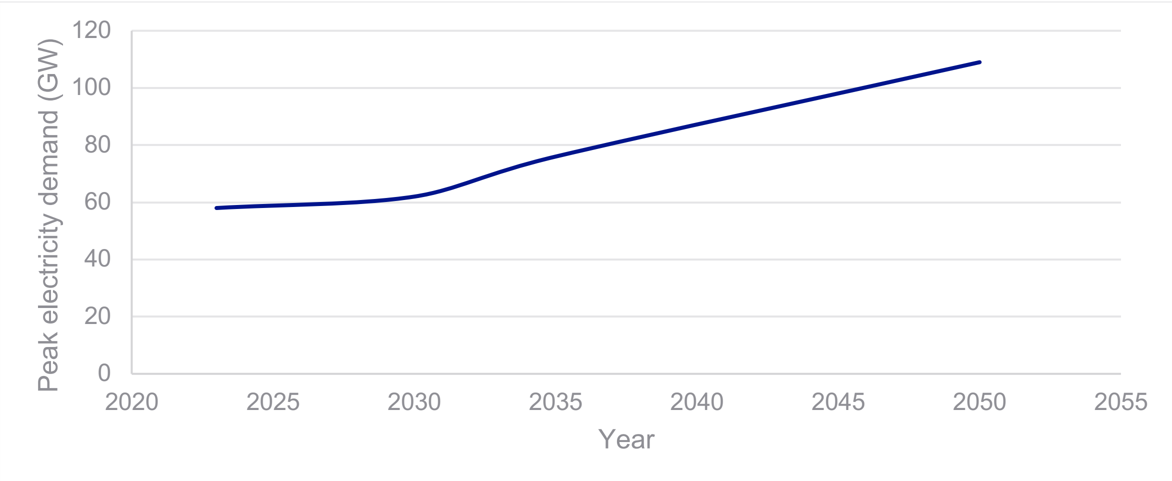
- 1) the NESO's Future Energy Scenarios (FES) indicates the capacity and balance of technologies that may be required on the pathway to net zero; and
- 2) our customer confidence methodology supports us to identify the customers that are most likely to connect to our network and which we should prioritise investment for.

These tools are expanded on in section 3.3.1 and 3.3.2 respectively.

2.3.1 Connecting customers: role of the Future Energy Scenarios

Electricity use is anticipated to grow throughout Great Britain. The FES Holistic Transition Pathway is the energy scenario with the highest capacity of renewable energy. It anticipates that peak demand for electricity will reach 109 GW by 2050 (see Figure 2) driven by increases in the use of electricity for heating, transport and hydrogen generation as well as data centres. The use of electricity by data centres in particular is expected to continue to grow rapidly, having increased by an order of magnitude during RIIO-T2 to 6.4GWh today we expect demand to reach 9GWh by the start of RIIO-T3 and 22GWh by the end.

Figure 2: FES Holistic Transition Pathway growth in peak demand

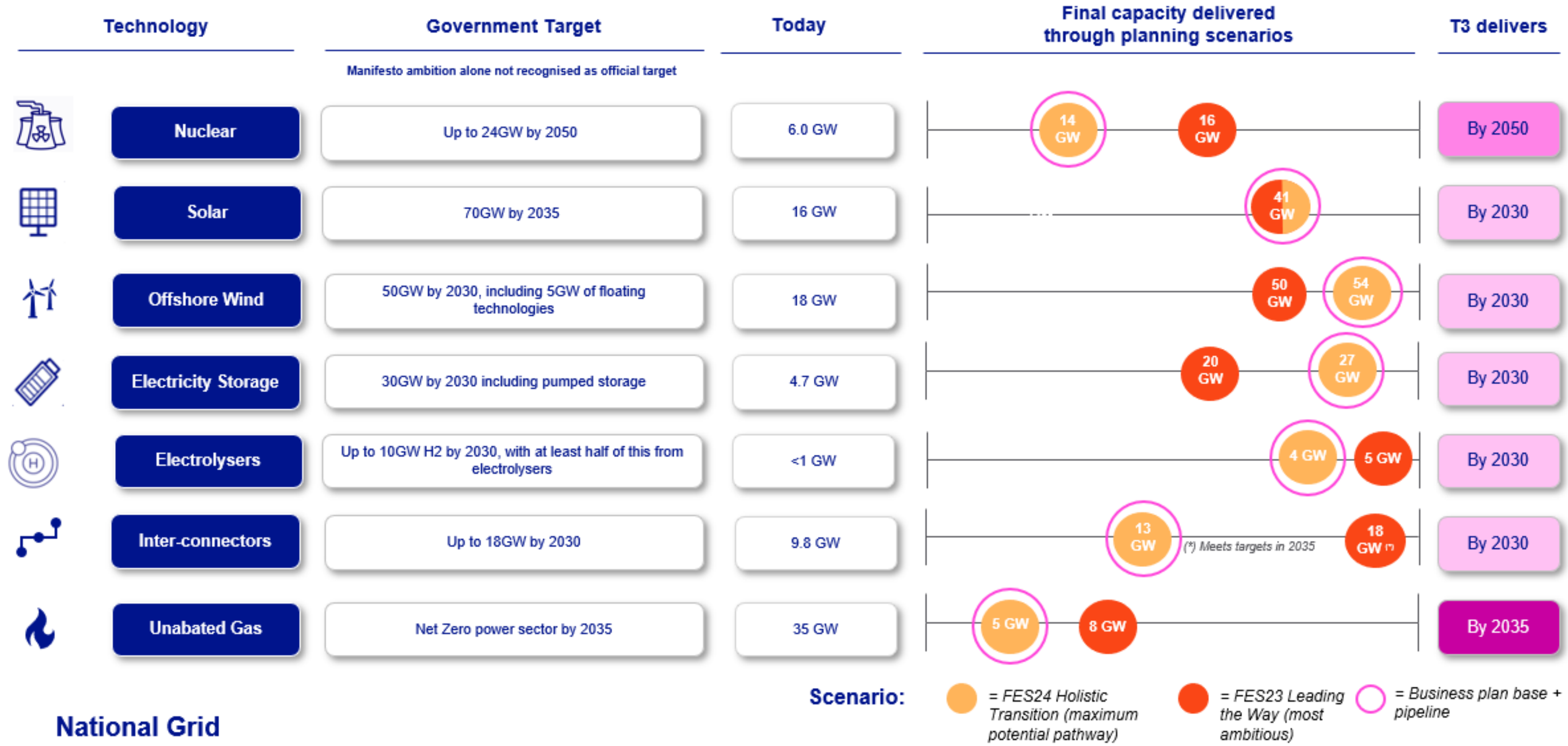


The Holistic Transition Pathway meets net zero through a mix of electrification and hydrogen and incorporates demand shifting from smart homes and electric vehicles. As instructed by Ofgem, this is the energy scenario that we have used to guide the customer connections investment decisions in our business plan.

Figure 3 below shows the level of ambition for connections by technology, comparing today's landscape across transmission and distribution networks in Great Britain with the current Government target as well as the current (2024) and comparable previous (2023) FES scenarios. Notably, whichever scenario is selected, nuclear is set to at least double in connected capacity by 2050, solar will grow by 2.5x by 2030, and battery storage is set to grow from just over 4.7 GW installed capacity today to 20 – 27 GW by 2030. Notably, the target to connect 50 GW of offshore wind by 2030 has been much publicised, with the two highest growth FES suggesting that 50 GW or 54 GW will be achieved by 2035.

The connections and connections options included in our RIIO-T3 plan deliver on the capacity that is indicated as being required by the Holistic Transition scenario and enable the delivery of technology specific targets such as the previous UK Government's target of 50GW of offshore wind by 2030.

Figure 3: Government Target by Technology versus Final Capacity Delivered through Planning Scenarios (for Great Britain)



2.3.2 Connecting Customers: customer confidence methodology

Our methodology for determining which customers to prioritise within our RIIO-T3 business plan is centred around an analysis of those generation and demand projects that are contracted to connect to our network by 2034. The scoring methodology, while developed prior to the NESO's proposals for connections reform, is consistent with its intent to progress connections for projects that demonstrate characteristics of 'readiness' to connect. Our methodology for transmission-connected generation and demand (either in DNOs' networks or directly connected to the transmission system) scores the following:

- **Technology:** to represent for the technologies and capacities that are required to meet the FES 2024 Holistic Transition Pathway scenario as well as the maturity of each technology. For example, applying our methodology, an offshore wind farm will score more highly than a storage project; and a floating offshore wind farm will score lower than a fixed foundation offshore wind farm; and
- **Project:** to represent the developer's level of experience of developing the proposed technology and whether the project has achieved key milestones (e.g. planning consents, success in the capacity market or secured a contract for difference).

The combined technology and project scores indicate each project's likelihood of proceeding to connect to our network. Figure 4 demonstrates the scoring criteria for generation projects and Figure 5 demonstrates how we interpret the output of the scoring. The scores are relative and so a customer assessed as 'most likely to connect' is not guaranteed to connect and a customer that is 'less likely' to proceed could proceed to connect.

Figure 4: Example of project scoring criteria for generation

Generation scoring (all transmission-connected)

Technology Score

Subscription Level	Score
Contracted <=1.0x Energy Scenario	2.5
<=1.5x	2.0
<=2.0x	1.5
<=5.0x	1.0
>5.0x	0.5

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Maturity	Score
Has been connecting to NGET for over 5 years	2.5
Relatively new to NGET but built elsewhere extensively	2.0
Relatively new to tx / dx but proven at lower capacity / worldwide	1.5
Handful of projects connected to NGET or other tx / dx worldwide	1.0
Not proven / significant issues. Very few / no projects worldwide.	0.5

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Project Score (Max 5)

Customer track record	Score
Generation - existing portfolio	3.5
Generation - new portfolio	3.0
Generation - new one off	1.0

\+

Milestone	Score
Contracts for Difference	1.0
Capacity Market Contract	1.0
Planning	2.0
Seabed lease only (no planning)	1.0

=

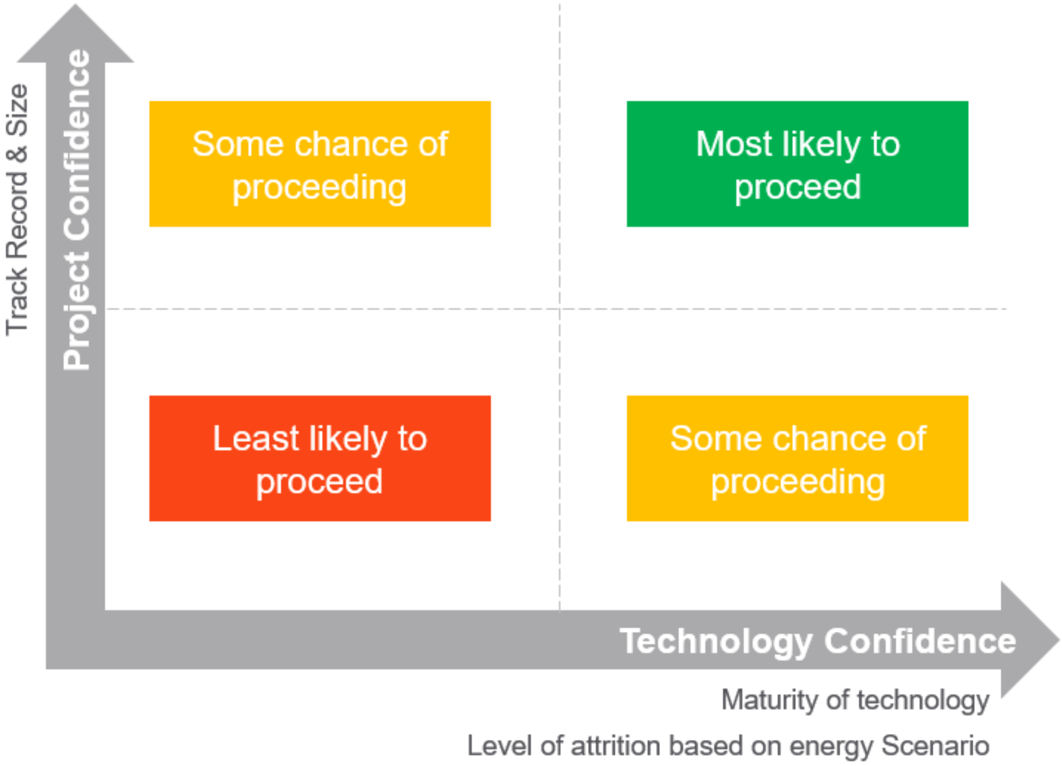
Overall Confidence Score

RAG	Score
Green	>=8
Light Green	>=7
Amber	>=5
Light Red	>=4
Red	<4

RAG / score shows the relative likelihood of projects proceeding at the time of assessment.

It does not guarantee a project will / won't connect, but provides a balanced assessment of project and technology

Figure 5: Combining technology and project scores results in an overall confidence for the project



Some generation customers are embedded within distribution networks and are contracted with the relevant distribution network operator (DNO). When a DNO identifies that its contracted level of embedded generation will adversely impact the transmission system then it must notify us using a 'Project Progression' that its headroom will be exceeded.

DNOs do not assume that there will be any attrition of their contracted generation. Therefore, to identify how much embedded generation is likely to progress at each substation we applied attrition rates consistent with those used in the NESO's Construction Planning Assumptions (CPAs). We produced four attrition rate scenarios to reflect the impact of attrition on various types of embedded generation. The embedded generation technology scores are determined based on the number of scenarios under which the current capacity of the grid supply point is exceeded and the extent to which it is exceeded. We also calculate a project score for embedded generation that assumes project-specific risk is diversified because the transmission investment is not dependent on the progression of any one embedded generator.

We combine the individual technology and project scores to produce an overall confidence score as described above. Our scoring for DNOs has been designed so that all DNO demand connections are 'most likely to connect'. After accounting for attrition, most embedded generation is considered to have at least 'some chance of connecting'.

2.3.3 Connecting customers: Prioritising our sites

To understand which sites will be developed within our business plan, we have ranked our sites based on the confidence we have in our customers and the number of customers requesting connections at a particular site. This is illustrated in Figure 6 below.

Figure 6: Aggregating project information for each site informs the approach we take to providing connections

Investment Type	Site Strategy	Site Strategy	Site Strategy	No investment	Standalone
Need Confidence	High	High	Moderate	Low	High

To deal with both the uncertainty around the connections queue and the fact that it is significantly oversubscribed in comparison to the requirement for net zero under the FES 2024 Holistic Transition Pathway scenario, during RIIO-T3 we are taking two main approaches to providing infrastructure for new connections:

- Delivering a connection-ready network comprising of connections delivered for a specific customer; and
- Delivering connections options for potential future customers at specific sites.

We opt for site-scale investments where the number of customers and the confidence we have in these justifies a site-scale solution that considers the needs of multiple customer drivers. Site strategy investments typically have multiple drivers that could include a mix of connections and options, other load investments (e.g. new/ upgraded circuits for bulk power transfer, shunt reactors to manage voltage) and/ or non-load drivers such as asset health.

We may also include connections options where there are many customers contracted that may individually have lower levels of confidence but collectively indicate a need to invest at a specific site as part of a site-scale investment. The provision of connection options, in parallel with Connection Reform, this provides scope for us to invest ahead of need and through this manage customer uncertainty and build an inventory of future connections to be more ready to connect customers once their own business case is firm.

We opt for standalone connections where a site-scale intervention is not justified by the current and anticipated contracted background at a site but we have high confidence in the readiness of a single customer to connect to our network.

2.3.4 Connecting customers: connections in our RIIO-T3 Plan

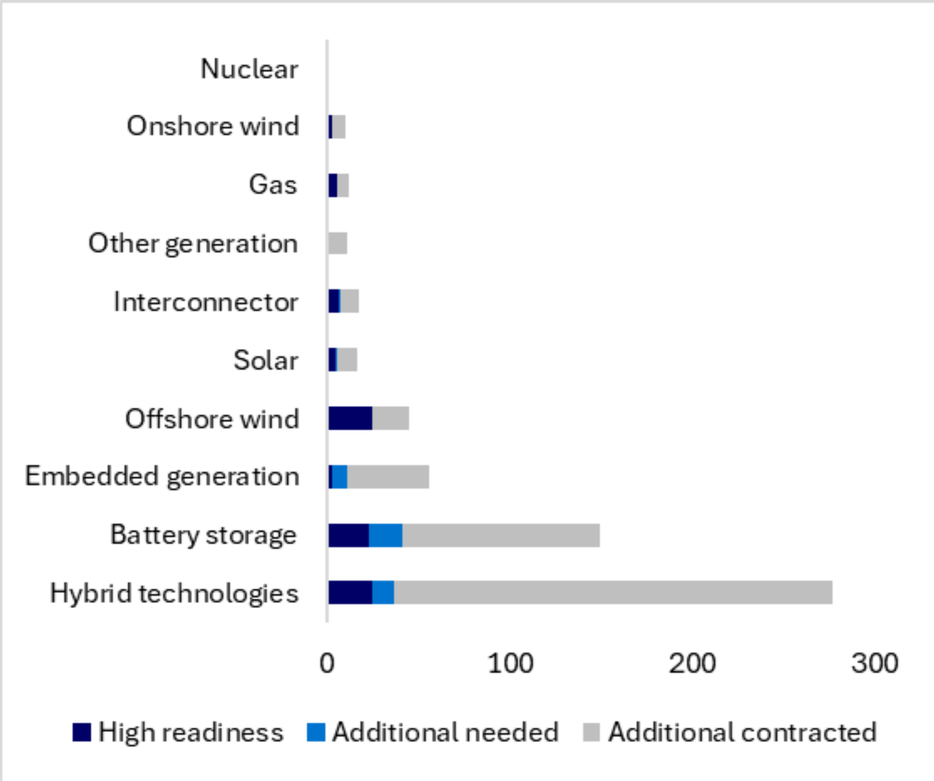
Following our analysis of our contracted background, we have provided our current view of the capacities of each connection technology versus the contracted queue that we will connect within RIIO-T3. This shows that we have high confidence in the majority of customer connections included in our business plan, see Figure 7 but, for the reasons described above, that this is a relatively small proportion of the customers currently in our contracted background.

Our business plan includes some projects that we have rated as medium or lower confidence, for example where we have additional intelligence that demonstrates that their development is mature. It also excludes some projects that we have rated as higher confidence, for example because the number of green projects exceeds the capacity required by the Holistic Transition Pathway energy scenario (in the case of generation) or because we have additional intelligence that demonstrates that the need or scope of the project has changed.

We have summarised this approach in the main business plan document of this submission. In that document, we have used the term 'high readiness' to represent the projects included in the business plan that scored highest in our customer confidence methodology. Where projects are needed to match the energy scenario and / or still have good indicators of readiness, we have summarised those projects as 'additional needed'. For completeness, projects that do not currently fit either of these categories are shown as 'additional contracted'.

Importantly, we will connect any customer who is ready to connect. We intend to refresh our assessment during RIIO-T3 to account for new information and the potential impacts of CP2030 and connections reform.

Figure 7: Our confidence in the customers included in our RIIO-T3 plan



2.3.5 Connecting customers from the queue: Enabling Works

Our commitment

A2.4

Replace overhead line conductors to meet load and non-load needs of our customers

Once connections to be included within our business plan are established, then the reinforcements associated with accommodating these connections (over and above the major investments informed by wider works strategy such as HND, ASTI etc) must be understood.

Most customers waiting to connect to our network are dependent on us completing 'local' enabling works that often include overhead line upgrades or new overhead lines and, in some cases, cables. Enabling works are defined in the 'Connections and Use of System Code' (CUSC) and allow customers to safely and securely generate up to the maximum capacity stated in their respective contracts. A single piece of enabling works can benefit multiple customers. Where a customer offer is made under the 'Connect and Manage Arrangement', the 'Connect and Manage Derogation Criteria' define the extent of the enabling works. The full suite of construction works required to provide a secure connection for the customer will then need to be completed after the customer connection has been established, which need to be based on assessment of a stable and consistent connection background.

We, and other transmission owners, use power system modelling to determine the enabling work that is required on the network. We model the existing network, planned reinforcements, and overlay an energy background provided by the NESO called the Construction Planning Assumptions (CPAs). CPAs are produced, as required by the NESO's Transmission Owner Code (STC), for specific years and eight regions and account for:

- Attrition of contracted generation
- Dispatches from remaining generation within the region
- Flows to / from other regions reflecting other generators' likely use of the network and demand
- Exports from embedded generation within the region based on probabilistic modelling

Modelling for our RIIO-T3 plan is informed by the CPAs produced as part of the NESO's Transmission Works Review. The process (demonstrated in Figure 8) identifies the suite of works that are required to maintain network compliance under winter and summer backgrounds and relevant SQSS contingencies. This allowed us to identify which circuits require reinforcement and when during RIIO-T3.

Figure 8: Process for assessing the need for enabling works on the transmission system

The resulting process determined the enabling works needed for each CPA region. We have included reinforcements in our RIIO-T3 baseline where they are necessary to enable the customer investments in our baseline. This means that, in limited cases, where we could identify reinforcements were driven solely by a specific customer that had low customer confidence, these have not been included in our business plan. Our pipeline includes the customer enabling works for the customer investments in our pipeline. The remaining construction works that are required to maintain secure and economic operation of the network have not been included in our RIIO-T3 business plan. But they are expected to be progressed over subsequent price control periods as visibility of enduring network topology becomes clearer.

We expect the NESO to update its CPAs periodically during RIIO-T3. This may result in changes to some of the enabling works in our business plan, or their timing. We expect to use the RIIO-T3 uncertainty mechanisms to deliver these investments as needs emerge.

2.4. Driver 3 – Network compliance and operability reinforcements

As described above, in addition to reinforcing the network to reduce operational constraints, connect new customers and deliver new transmission capacity we must also:

- Maintain compliance with network standards, and in doing so;
- Ensure the network that we propose is operable in real time.

2.4.1 Maintain compliance with network standards

Our load-related investments must be consistent with the Security and Quality of Supply Standard (SQSS). The outputs driven by from the NESO's planning processes (such as NOA and tCSNP, and the Transmission Works Review) addresses specific elements of network compliance and so consistency with the SQSS is built into our solutions that address these drivers.

Our commitment

A1.1

Ensure our assets continue to provide a resilient network, delivering high quality and reliable electricity to consumers

For investments that are not driven by the NESO's industry planning processes we must address voltage management, network stability (via SQSS) and specific detailed technical requirements of the network and it's interfacing customers (via SQSS and Grid Code) during RIIO-T3. The NESO plays a key role in the discussion, development, and agreement of our network design solutions. To ensure that we are prepared to offer asset-based solutions for the needs we forecast, our submission includes these proposals ahead of further discussion with the NESO, which could lead to the use of market-based solutions. The NESO's CP2030 publication has highlighted similar network needs that will need to be addressed during RIIO-T3 and recognises the key role TOs will play in this area.

Network standards compliance needs will also be driven by CP2030 and the generation and demand customers that connect to our network. As these impacts emerge, we expect to identify further needs beyond those already included in our business plan. Subsequently, proposed investments within this driver category for RIIO-T3 presently form part of our Load Pipeline, and will become firmer as aforementioned industry processes, plus finalised network analysis, conclude.

2.4.2 Operability

Electrical Network Operability is the ability of the power system to remain stable and secure in real time operation to reliably transport power to where it is used under various conditions and disturbances. It is key to is key to ensuring that network conditions can be maintained in real-time under various conditions and disturbances to securely transport electricity to where it is used without adverse effects on the network, it's assets or electricity users. It depends on the balance between supply and demand, the quality and reliability of power, and the coordination and control of components both within the transmission network and at its interfaces. Operability is increasingly impacted by the switch from fossil fuels to intermittent renewable energy sources and alternative technologies, e.g. High Voltage Direct Current (HVDC) convertors used to connect offshore wind.

During RIIO-T3 we must ensure that the network is equipped with the appropriate 'toolbox' to manage foreseeable network conditions. For example:

- Reactive power compensation is required to enable the transmission of power from and to new connections and maintain voltages within acceptable limits.
- High voltage management is required to ensure that we can regulate network volts without reliance on generation dispatch for reactive power production.
- Dynamic reactive power compensation will be needed to address future stability challenges and limited unplanned network outages.
- Harmonic filtering will be needed to prevent harmonic headroom constraining new connections.

We have used several tools to identify the interventions that may be needed during RIIO-T3, including the operability needs identified by NOA and our annual voltage compensations assessment. We will continue to identify and address operability needs during RIIO-T3 as the generation mix, it's location, demand patterns and the resulting network topology emerge from CP2030 and subsequent connections reform activities.

2.5. Related non-load drivers - asset health

A key factor in our overall network development approach for our load related investment plan is to maintain and, increasingly, expand and rebuild our sites and routes to manage asset health risks so that we can continue to deliver a safe and reliable network.

Once we have identified the load needs of our network we consider non-load requirements. In this way we have sought to identify how and when to invest in a way which balances limited opportunities to access the system with delivering value for consumers.

Consequently, several of the investment in our RIIO-T3 plan has 'shared drivers', for example the need to create capacity on our network and address asset health issues concurrently. The rationale for specific condition-related drivers is outlined in annex A10 - Network Asset Management Strategy.

Our commitment

A1.2

Not allow the overall risk of our network to increase, as we deliver across multiple drivers (network growth, safety, resilience and environment)

3. Regional and Stakeholder Perspectives

Since our last price control submission, we have been developing our regional strategies approach to assist the definition of network investments for the period. The RIIO-T3 plan therefore represents the first application of this developed approach.

These reinforcements represent the first phase of the strategic upgrade of the electricity network, growing significantly to meet the needs of a prosperous, Net Zero Britain.

We intend to extensively adapt and grow our electricity transmission network to meet future needs nationally, regionally and locally with network partners. Our plans are appreciating the nuances of regional network needs, individual stakeholder priorities and the growing role of regional authorities in energy planning.

Our regional network plans seek to address the significant changes in the energy landscape that we can see and further anticipate. They apply 4 principles to guide our design to a network that is both future-proof and capable of meeting decarbonisation targets.

1. Planning for the long term
2. Collective network needs
3. Collaboration with Local Authorities and Industry
4. Societal impact on decision making

3.1. Strategic Approach Considerations

Our electricity transmission network has evolved incrementally since the majority of its construction in the 1950s, 60s, and 70s. There are a combination of converging network drivers on the horizon; infrastructure requiring modernisation, the significant increases in ‘signalled’ bulk power transfer network capacity upgrades (via earlier mentioned ‘Pathway to 2030’ and ‘Beyond 2030’), and the extensive connection applications volumes that more than meet anticipated consumer demand and Net Zero targets. Our intent is therefore to strategically upgrade our transmission network to meet modern requirements and anticipated future demands.

It is impossible to create a “perfect” hypothetical strategy for the strategic upgrade of an in-situ network which must continue to deliver electricity to businesses and homes throughout. It is also necessary to balance the need for a long-term strategy with the imperative to meet shorter term needs, such as connecting customers, enabling large demand projects critical for local employment and facilitating progress to evolving government Net Zero targets.

The pace of change and focus on networks to facilitate that change is greater than ever before, and so the right balance of long-term strategy and shorter-term response has to be found. We are collectively mobilising for decarbonisation, whilst target dates for decarbonisation of both the sector, and the whole economy, accelerate.

Our approach to tackling this challenge was to consider short term industry initiatives and network factors impacting within the price control period, whilst maintaining a long term and strategic course of network development for Net Zero, aligning these ambitions wherever possible. This approach ensures that we meet our design standards and license obligations while addressing the significant changes in the energy landscape.

Our RIIO-T3 plan has been informed by this strategic approach to electricity transmission network evolution. Table 1 below demonstrates our regional strategies approach and examples from our business plan:

Table 1: Considerations of our regional approach and examples from our business plan

Consideration	Examples from our business plan
Planning for the long term: We are thinking about the long-term future needs of the electricity transmission network. This involves designing networks for the RIIO-T3 period that are cognisant of future requirements beyond the period, beyond the 'next window' of incremental industry network assessment, out to 2050 and beyond, to match the expected useful lifetimes of the assets we will build. Given that we do not have a 'crystal ball' for this period, rather than trying to make 'perfect' decisions, we seek not to preclude future needs in our RIIO-T3 proposals where possible.	In some of our reconductoring solutions, our initial optioneering proposes the largest conductor we can place on our existing towers, knowing that as further requirements become clear, we are leaving 'room for growth' on our existing network.
Collective Network Drivers: Our regional strategies are designed to surface and address the combined and varying requirements of designing future electricity networks. We are consciously thinking about collective network drivers to make optimal decisions wherever possible. Whilst those drivers are mostly traditional ones such as wider works, connections triggered by customer applications, and asset condition, we are increasingly needing to consider broader, less definitive information. For example, energy growth scenarios and the future plans of distribution companies that are between their current price controls are also needed to better forecast the future network needs of a decarbonised Great Britain. Our decision-making is based in practicality of multi-driver requirements that must address multiple stakeholder perspectives of future network needs whilst still ensuring a secure and reliable electricity transmission network.	At [redacted] the 275kV substation is proposed to be re-developed within a smaller footprint to afford future space for a new 400kV substation in the mid 2030's within the existing NGET land footprint. This combines customer, asset health and future growth needs. The proposal is supported by the local council and Mayor, as it does not take up land earmarked for local redevelopment plans, and supports them with a long term new capacity strategy through the concurrent 400kV substation redevelopment in the mid 2030's.

Consideration	Examples from our business plan
Collaboration with Authorities and Industry: We have extensively engaged with stakeholders throughout the development of our network plans. During 2023, we convened and hosted 6 regional stakeholder events, bringing local organisations, councils, and businesses together with network companies (i.e. NGET, NESO, regional distribution networks), to engage on our regional network plans and gather perspectives. At a macro-level, this has reinforced our view that strategic long term network solutions are needed, and that their implementation is most likely to be required post 2030. i.e. proceeding the RIIO-T3 period, once the requirements of CP2030 and the first part of connections reform have been met. It has also kick-started a series of structured regular stakeholder engagement sessions on our plan, as well informal and ad-hoc engagements with contacts generated from the regional sessions. We are now working closely with local authorities, such as the Greater London Authority, and industry partners like NETZERO Northwest as well as our distribution network colleagues across England and Wales. This collaboration ensures that our network design is informed by a greater set of stakeholders who 'know best' about the future development of regions and areas – information that we can consider in our regional strategies, include and iterate with our stakeholders.	In London we have worked closely with the Greater London Authority (GLA), and we have been the convenor of several workshops involving GLA, ourselves, NESO and the distribution companies serving London, SSEN and UKPN. In doing so we have worked with SSEN to unlock some short term capacity [redacted] **Our commitment** **A3.2** **Create long-term strategies for major underground network upgrades**

Consideration	Examples from our business plan
Societal Impact on decision making: By undertaking more specific regional and local stakeholder engagement, it has educated us further on what matters to society and the role we play – where the electrons flow, prosperity grows. Now more than ever, we know that our network is a key contributor to societal impacts through our electrical decisions; job creation, growth, and other factors that are not defined by specific megawatts at substation sites. This is prevalent in our plan where network decisions are needed to enable job creation and societal benefit.	[redacted]

3.2. Implementation and Adaptation

Whilst significant strides have been taken to incorporate a wider consideration of drivers and stakeholder needs, we continue to refine the approach with experience. We are also continuously adapting our near-term plans within the context of longer term network design based on recent evolving industry initiatives (‘Pathway to 2030,’ ‘Beyond 2030’ and most recently CP2030). We expect short term plans to continue to need to adapt as the outputs of CP2030 and then connections reform become clear in mid 2025, with potential impacts on our proposals for RIIO-T3 as we seek a consistent and harmonious set of backgrounds against which to apply our network standard (SQSS and Grid code). In the longer term, we also intend to align our regional strategies with the NESO’s Strategic Spatial Energy Plan. The development of NESO’s Regional Energy Strategic Planner role is welcomed- it shows commonality in the recognition of more granular and nuanced approaches to regional network planning, and we shall seek to align our regional plans with this approach. We think that we can support the NESO’s ambition in this regional remit with the groundwork we have undertaken in recent years with industry, local authorities and stakeholder groups.

How the electrical network design of our RIIO-ET3 plan interacts with existing industry processes is further outlined below.

Despite the need for short term action to meet clean power decarbonisation targets, our long-term direction for strategic upgrade is anticipated to be enduring in order to enable net zero, with RIIO-T3 modifications being an adjustment on the enduring path to a 2050 network. To enable this, we are developing future network blueprints (regional strategies) across our network.

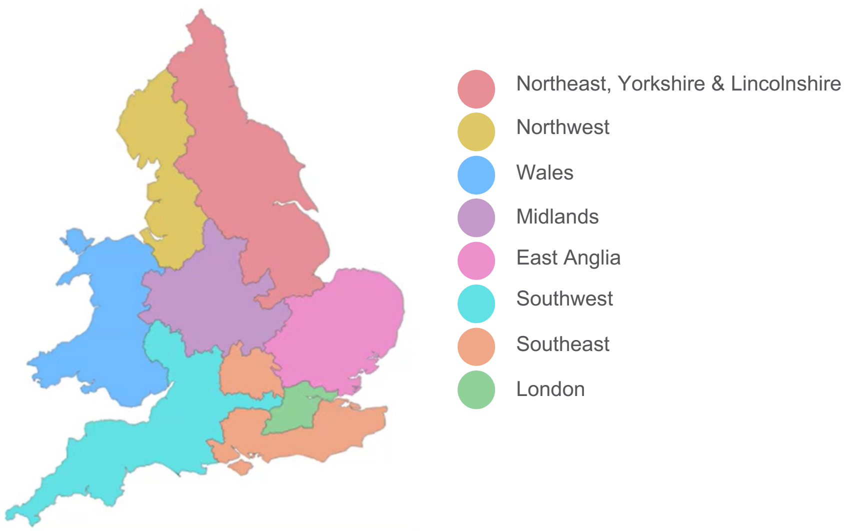
3.2.1 Regions

To best facilitate our regional strategies, we have divided our transmission network into eight distinct regions (see Figure 9). These regions are defined based on both geographical and electrical separability within the network. The factors considered in defining these regions include:

- Electrical Factors: We account for challenges such as power transfer in, out, and through the region, as well as access for outages.
- Geographical Factors: We consider customer demographics, anticipated stakeholder needs, and the locations of existing and planned future networks.

Currently, our regional split allows us to also map to any other regional definitions, such as those used by Distribution Network Operators (DNOs) or Local Authorities. This coordinated approach ensures that whether the geographical definitions are strict or loose, the overall outcome remains unaffected.

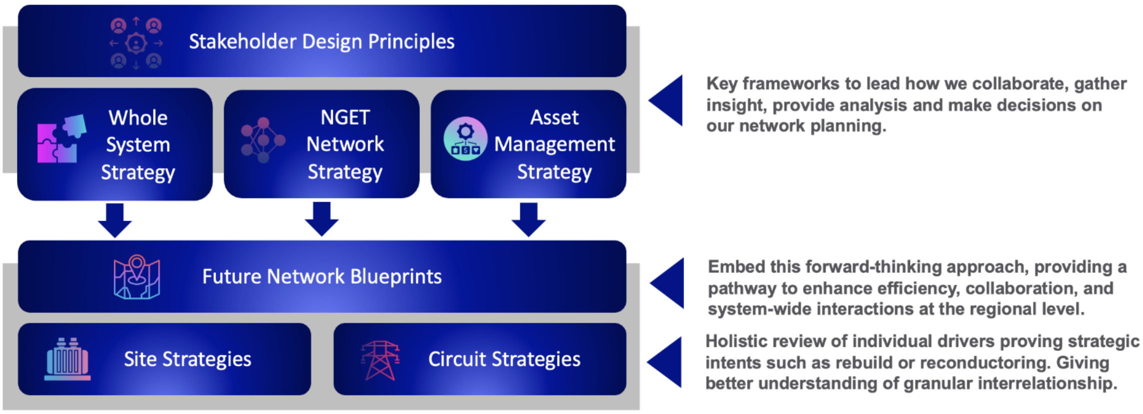
Figure 9: Network Regions



3.2.2 Future Network Blueprints

Within each region, we have developed a regional strategy, supported by site and circuit intents which evolve into detailed phased strategies. Our Regional Strategies take the form of a Future Network Blueprint, which builds on our commitments, overall Whole System Strategy, Network and Asset Management Strategies. This relationship can be seen in Figure 10 below.

Figure 10: Elements making up our Future Network Blueprints



The Future Network Blueprints (Regional Strategies) integrate both load and non-load requirements and bring stakeholder engagement in to achieve three key objectives: **enhancing planning efficiency, fostering collaboration, and adopting a whole system approach** to our outcomes.

As we continue to decentralise generation on the network and local areas advance their decarbonisation energy plans, each region on our network becomes increasingly unique. Together with our industry partners, we must recognise, understand, and plan for these differences through our site and circuit strategies.

Our Future Network Blueprints integrate key steps outlined in Figure 11, each supported by various digital tools and processes. Once all elements are in place, we can step back to view the regional landscape comprehensively. **This holistic review allows us to meet the 4 principles: collective network needs, collaboration with local authorities and industry, planning for the long term and recognising social impact on decision making.**

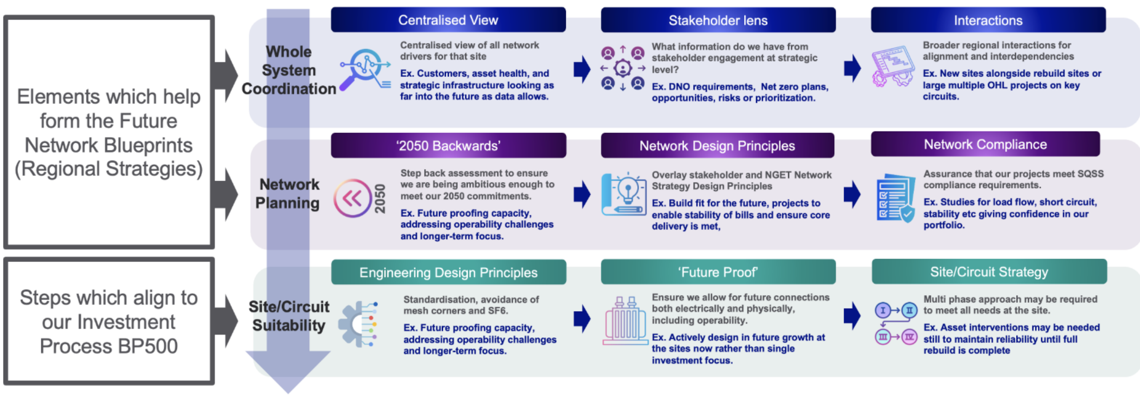
Additional outcomes also reveal opportunities for whole-system collaboration, enabling us to test the timing of interventions for efficiency and priority based on stakeholder needs, while ensuring the network remains safe, reliable, and secure.

Our commitment

A3.1

Develop and deliver strategic investments which include optionality for the future

Figure 11: Linkages across our Future Network Blueprints



The uncertainty which exists currently around the energy industry makes the flow of information from regional to site and circuits more dynamic than linear. As site and circuit options become more developed this may also surface challenges around feasibility of regional assumptions (for example we may not be able to expand substations for new infrastructure). Therefore, continuous refinement and evolution of these elements will continue on regular cadence.

The regional strategies aim to bring together load and non-load requirements earlier, alongside the Network Development Team these regional pictures can be tested from a future Network Compliance understanding and Operability check so we can identify the challenges, opportunities and risks to account for in our plans to develop the network. These challenges, opportunities and risks can then be accounted for in the early development stages for site and circuit strategies.

To date, we have **identified over 250 opportunities** through engagements with our Distribution Network colleagues and Combined Authorities, which we are actively working on and plan to expand further. These opportunities are captured and mapped to our regions, sites, and circuits, allowing us to test them against our Load and Non-Load plan. They are categorized by factors such as urgency, sustainability outcomes, and socio-economic benefits beyond our network planning. The points captured will also support our ambition to improve visibility externally of our plans and approach.

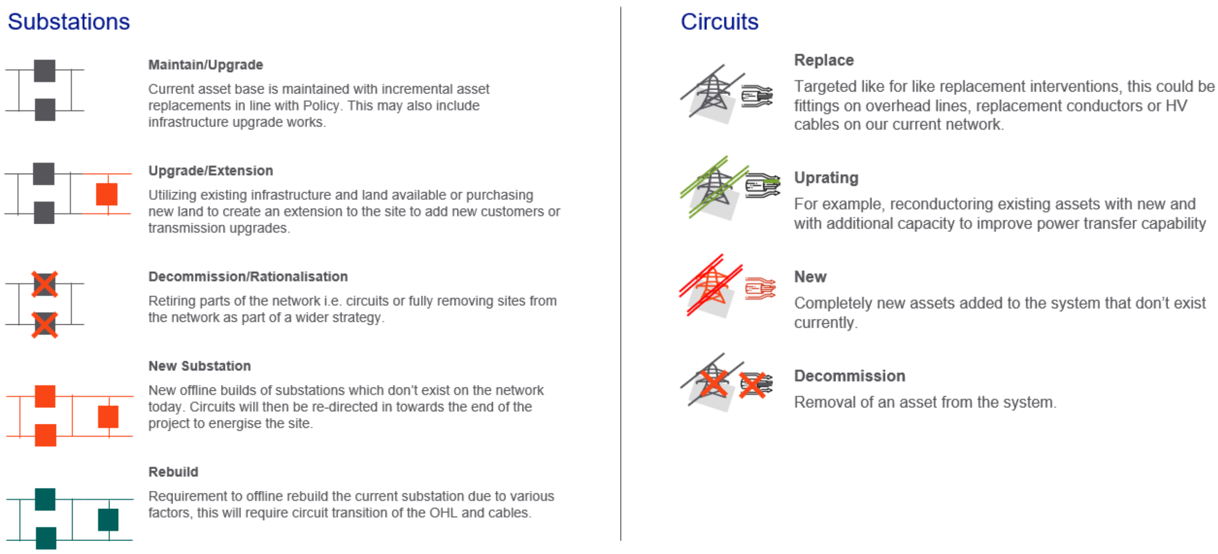
3.2.3 Site and circuit strategies

The future network blueprint will be used to help refine our long term site and circuit strategies. Each site and circuit strategy will be given a strategic intent (see Figure 12 below). This intent will be formed around agreed logic based on the network drivers we know.

In the main we try to maximise the use of existing land and infrastructure first before looking to acquire or build new. We will utilise existing spare bays or build small extensions to busbars on substations for new connections or new circuits. This approach we call 'Upgrade/Extension'. For just asset health drivers which will be incrementally replaced this is referred to as 'maintain/upgrade'.

For more complex projects where new infrastructure is needed, we will assess current infrastructure in the locality to optimise and reduce impact on communities. We will account for future possibilities into the design and ensure whole system needs are explored including Distribution Network requirements into the future.

Figure 12: Strategic Intent Overview



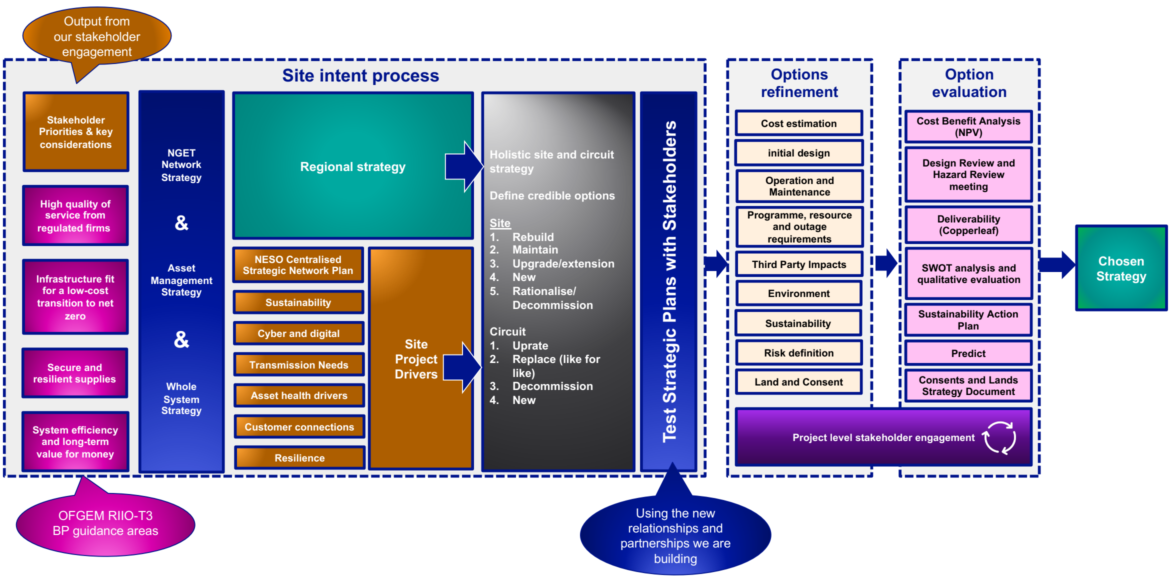
For most of our sites this intent forms the basis of the site or circuit strategy. However, we are seeing a growing number of more complex sites where multiple drivers overlap, in some cases wider works, asset health and customer connections. These sites require a more focussed and comprehensive strategy to address all requirements.

At our older substations, we must tackle a combination of ageing infrastructure, space constraints and new customer needs. We have identified that the most cost beneficial way to address these needs is to rebuild sites with load and non-load drivers overlapping. For the remaining sites we are looking to deliver new capacity through extensions or building additional new sites to connect new customers. Where necessary, we address non-load drivers at our existing sites alongside our load investments.

On our circuits, we also assess long term requirements in addition to short term needs. We see circuit uprating being triggered by customer connections in the area, as well as NESO triggered upgrades required overlapping with asset health drivers. It is important to identify which drivers needs to be addressed first to identify when to invest and select the right option which covers all requirements.

Figure 13 below shows the high-level process. Step 1 and 2 address the high level intent for sites and circuits against the backdrop of the regional strategy, Step 3 moves into a more detailed strategy as the investments progress into development. We describe in Section 7 below how we use our network investment processes to develop and refine options.

Figure 13: Future process flow linking regional strategies, site and circuit strategy and network development processes



4. Managing competing priorities in our RIIO-T3 portfolio

Consumers demand for, and reliance upon, electricity is growing as the UK moves towards the Government's target of a net zero economy by 2050. During RIIO-T3 we will upgrade and expand our network to deliver the 'grid fit for tomorrow' that will connect consumers to clean power and allow it to flow across the network. Customers and consumers expect us to do this in a way which maintains our current high standards of safety, reliability and resilience. Our approach must manage affordability constraints for consumers while also being deliverable within the constraints of system access, resources and the supply chain capacity that is available to us.

4.1. Strategic planning principles

Our RIIO-T3 ambitions represent a rounded set of priorities and have been informed by our engagement with stakeholders. We periodically assessed the indicators that sit below each high-level ambition to evaluate the extent to which they were suitably represented in our business plan. Reviewing our delivery against these indicators allowed us to identify the need for changes and make them accordingly.

Additionally, during our investment plan builds we applied our strategic network planning principles to ensure that we have optimised and maximised opportunities to invest in the network during RIIO-T3 and so minimise affordability and deliverability pressures. Our strategic design principles and their impact on our RIIO-T3 is set out in Table 2 below.

Table 2: Impact of NGET strategic planning principles on our RIIO-T3 plan

Strategic planning principle	Impact on our RIIO-T3 plan
Enabling investments: We will move away from the current focus on 'no regret' investments. We will instead plan and build a network platform today that is ready for future requirements, making sure we are not the blocker to the energy transition	We have developed a plan for the network, not just for drivers that we are certain about today, but also with a view to facilitating potential future requirements. Our business plan builds electrical and physical capacity to accommodate future growth, ensuring that we are helping to facilitate the energy transition. For example, our RIIO-T3 baseline plan includes 26 connection options and, where we need to reconductor overhead lines, we have sought to use the highest rated conductor.
Do it once, do it right for the future: We will plan the scope and timing of network investments to address multiple drivers at once. We will coordinate delivery	We have looked ahead at the load and non-load investments that will be required on our sites and routes both now and in the future. Where we have identified a firm need to act now, we have also brought forward future investments so that all needs are addressed together. In this way we maximise our opportunity to work on the network and only 'touch' it once.
Whole system network planning: We will work with other utilities, across vectors, and with stakeholders at all levels to ensure planning and delivery of our future network is coordinated and optimised for UK plc.	We engage with the DNOs on an ongoing basis to understand their needs and ensure that our planned reinforcements are coordinated and align, such as in [redacted] on the right whole system options for that region. In addition, through our connections work we regularly engage with many customers looking to connect to our networks. We hold regular Local Area events around the UK where feedback is incorporated into our future plans.

4.2. Addressing deliverability challenges

Assessing the deliverability of our proposed Investment Plan has been a central part of developing our T3 plan. Deliverability represents an assessment of the portfolio of work to meet strategic outcomes against the risks and delivery constraints[6] we face in delivering the work.

The projects in our T3 load related business plan will increase capacity across the transmission network and help maintain system stability and operability. This will enable more renewable generation to connect to the network and help lower constraint costs in the longer term. However, delivery of these projects requires system access, a suitable workforce and supply chain, - all potential deliverability constraints.

To mitigate this risk, we have undertaken a deliverability assessment to better understand ***what it would take*** to deliver our portfolio. This task has assessed our T3 plan against each potential deliverability constraints: resource capacity, system access, and supply chain. We discuss our transformation plans for the workforce and supply chain in the annex A03: NGET Workforce and Supply Chain Resilience Strategy, detailing our mitigation strategy and our plans for system access below.

4.2.1 Why T3 is different

Our BAU detailed planning process looks at, and optimises, outage constraints within a year ahead view. As required by the System Operator-Transmission Operator Code, this includes a joint "Long Term Plan" (LTP), where we log and schedule projects related to our forward view of interventions such as those detailed in this annex. In addition, we also consider other projects that may require outages and authorised persons to carry out outage switching and/or commissioning actions in our Year Ahead view. This includes:

- Asset health replacement, maintenance and inspection work, detailed in annex A10: Network Asset management Strategy)
- SF_6 replacements, detailed in annex A01: Environmental Action Plan
- Cyber works, provided confidentially to Ofgem.

In previous price controls the volume and scale of work was lower, where items in our year ahead view were able to be scheduled alongside those in the LTP, with minimal conflict The key difference for T3 is the scale of load related projects we are now seeking to deliver. This has changed the way we have approached system access planning, to enable early identification of deliverability risks and constraints, and prepare mitigations.

Furthermore, given future uncertainty from initiatives such as Clean Power 2030 described elsewhere in this document, our approach must adapt as existing needs change and others emerge. We must therefore move from the idea of a fixed LTP and year ahead view and accept that aspects will invariably change over time, post submission. As such, our deliverability assessment has informed our T3 business plan as it has been built, helping access its deliverability and identify potential conflicts.

4.2.2 Our approach to assessing system access

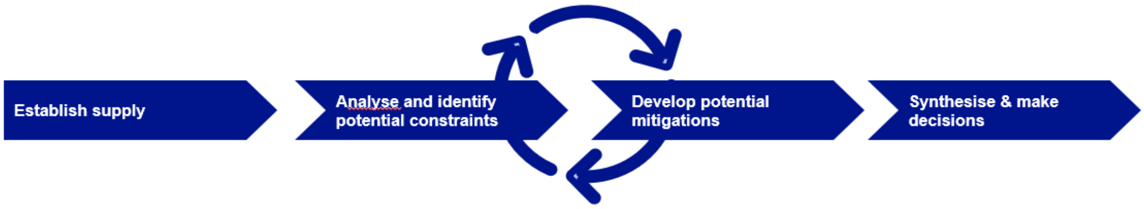
Our understanding and management of potential deliverability constraints relating to system access is formed through an iterative process (see Figure 14) that continually considers:

- wider dependencies,
- prioritisation of some kinds of work over others,
- shifting work earlier where it made sense,
- or accepting increased asset risk and / or delaying projects (potentially into the next price control if possible).

[6] Note that we use the word constraints to represent two separate things: Delivery constraints are system access in terms of SQSS requirements, supply chain, and resourcing. Network constraint costs are the price required to balance the network in operational timescales. Whilst system access constraints and constraint costs are related, we did not consider constraint costs as part of our assessment due to the difficult nature in forecasting their location and value. Therefore, in most cases in this section, the constraint is referring to deliverability system access constraints at network boundary levels.

The process has forced us to identify projects that are most mature in their development, to add to our LTP and year-ahead view, and consider what projects are likely to be delayed or not materialise, based on our current assessment of the drivers. The outcome of this process is the identification of the location and timing of specific deliverability constraints arising from system access. Some of these constraints have persisted as the plan has evolved, while we have been able to mitigate others by changing the timing of or work within the portfolio.

Figure 14: Iterative process used to analyse deliverability



4.2.3 Deliverability of our T3 plan

To assess and manage deliverability from system access constraints, we have gathered the outage requirements associated with the baseline investments included in our RIIO-T3 business plan for comparison against system access availability. We used an optimisation tool called 'Copperleaf' to analyse the business plan outage requirements and optimise delivery though 'bundling' work that can be carried out during the same outage so that the opportunity to access the system is maximised. For the purposes of our T3 assessment we have assessed projects over various time horizons (where they are flexible) considering the differing levels of scheme maturity across the five years of the regulatory period.

The approach to bundling is based on three key elements:

- **System Boundary constraints:** Some parts of the country are more constrained than others due to the design of the network. Boundaries in Southeast England are particularly constrained. For example, due to high demand, high density of generation, interconnection from Europe and reliance on long single circuits.[7]
- **Outage Equipment Lists (OELs):** to do any work on an asset or make a new connection, we must shut off that part of the network. Depending on the design of the substation and the specific asset needing work, there may be multiple assets or even an entire circuit in the OEL. We can maximise our use of an outage by working on all the assets within a single OEL at the same time rather than taking the same part of the network out year after year.
- **Outage durations:** Each project has a series of outages that last a specified number of days. The durations form the backbone of the plan in any given year, based on its location on the network.

We used Copperleaf to build bundles of work that aligned the activities required to deliver the projects in our business plan to high level OELs, and as necessary the year in which the output is required. We also applied approximately 85 modelling factors to system access in our RIIO-T3 plan, with key assumptions being:

- Connecting generation at a rate that allows achievement of the FES Holistic Transition Pathway;
- Maintaining network resilience at our RIIO-T3 target level;
- Meeting the already-defined outage plans for the ASTI projects, which is critical to meeting strategic targets;
- Ensuring that maintenance is consistent with our maintenance policy for each asset; and
- Capping the length of an outage required to deliver a bundle based on the Security and Quality of Supply Standard (SQSS) requirements for each boundary;
- A 15% tolerance of over-subscribing on network access to account for the conservative assumptions built into the Copperleaf model.

We then used our existing mapping of OELs to boundaries to assess whether the volume of work would trigger a boundary constraint. We iteratively optimised system access (i.e. outage days) based on where we plan to conduct load-related investment on our network. This resulted in bundles that

[7] To understand all boundaries, see the "*Electricity Ten Year Statement (2023)*": neso.energy/document/286591/download

maximised work (load and non-load) within each outage while minimising downtime. The bundles were reviewed by subject matter experts to assess their credibility. We repeated this process as we built our plan and in response to identifying deliverability constraints.

Our assessment of system access highlighted potential deliverability constraints at three network boundaries, where demand for access exceeds permitted outages in several years during the RIIO-T3 period. These boundaries are all in the south and southeast of England, i.e. LE1-N, Upper Flow South and Lower Flow South. The driver of the reduced access for planning work is due to power flows going through London from wind farms in the North to the continent and vice versa.

To relieve these constraints, we looked in detail at what work was driving the constraints and considered options for moving work so that it is delivered earlier or later (including into RIIO-T2, between years within the RIIO-T3 period or into the next price control period) or to minimise risk through different assets. Despite this, we identified persistent constraints on the LE1 boundary.

4.2.4 Further analysis into the LE1 boundary constraint

To satisfy ourselves that our RIIO-T3 plan is credibly deliverable given the persistent constraints on LE1, we performed a manual deep dive analysis using inputs from business experts to identify alternative phasing, bundling and sequencing of investments and opportunities to operate the network differently to enable more access.

Our review of the phasing, sequencing and bundling of work on the LE1 boundary identified scope to change the bundling only. Several asset health interventions were not bundled as efficiently as possible. We retained all the unbundled asset health investments in our baseline but removed unbundled asset health interventions from the pipeline (ie deferring them to T4), once we had confirmed that they were not at high risk. We also identified several opportunities to operate the network differently and make work on the LE1 boundary deliverable, specifically by:

- **Using additional capacity enabled by dynamic line ratings/ rating enhancements** that were implemented recently and so not included in our deliverability assessment but may be used by the NESO to release additional capacity.
- **Enhancing control using Grid Enhancing Technologies**. For example, increasing quad booster operability limits and using static synchronous series compensators on the LE1 boundary which may result in higher boundary capacities.
- **SQSS Derogations**: The Transmission Acceleration Project is considering a route to relaxing the SQSS rule of not allowing single circuit risk in England and Wales (OP2). We will wait for the results of the Transmission Acceleration Project to assess the impact of this option but explore some of the potential impacts below.

Our analysis has provided us with confidence that we can resolve the issues on the LE1 boundary to allow delivery of our baseline business plan using a combination of actions. With relatively high uncertainty underpinning our pipeline of works, it is not possible to complete a definitive deliverability assessment. We have used the outputs from our assessment to provide insight about the investment plan, that can inform decisions, highlight areas of constraint and drive actions to mitigate these. This allows us to identify where we will need to be prepared to flex and scale our mitigating actions as the plan becomes more certain.

4.2.5 Conclusions from our assessment

We have strengthened the credible delivery of our business plan by identifying and seeking mitigations for constraints. It has also identified where we need to transform internally and where we must manage and work collaboratively with external stakeholders to mitigate delivery risk. Our deliverability assessment has steered us to broader transformation strategies that are fundamentally changing how we plan, prepare, and execute work, how we attract and develop our people, and how we engage our supply chain. It has also demonstrated where we must work collaboratively with external stakeholders to mitigate delivery risk.

We have begun detailed planning for the first three years of RIIO-T3. We are considering various transformational activities that are set out in Table 3: Current and future transformation activities for delivering system access. While these approaches will be initially focused on resolving pressures at the three boundaries, and in particular LE1, we will seek to scale these where possible to derive similar benefits elsewhere on our network.

Table 3: Current and future transformation activities for delivering system access

Area	Current approach	Future transformation
Embrace digitalization and data utilization	Data sits in multiple platforms.	By leveraging digital tools and data analytics, we can improve coordination and communication among diverse players, reducing the negative impact of their movements on the plan. See the Enterprise Delivery Management PJP.
Expand Planning capabilities to longer time duration	Detailed planning only includes Year Ahead, with longer horizons in the LTP.	We have already started to develop this capability, by forming the Strategic Planning Team which is set to build out the second and third years of T3 in the coming months and eventually continue checking deliverability of long-term plans. • In first year of T3, build 3 years of a detailed plan out to FY29. • In second year of T3, build up to 5 years in detail. Create direct link between NGET planning systems and eNAMS to enable NESO to see detailed plans without signing outages in.
Expand relationship with NESO	Strong relationships, but generally exchanges are driven by Code obligations.	Co-developing with NESO and the other TOs a set of clear proposals to implement the Operational Planning recommendations from the Transmission Acceleration Project, which is a NESO led initiative to develop solutions to recommendations in the "Transmission Acceleration Action Plan (TAAP)." Align transformation programmes, so that changes to process happen in parallel. Upon request, we can provide further detail of our engagement.
Sharing data with our interdependent stakeholders	Plans are shared with DNOs at CY week 28 as per our SO-TO Code, however, meaningful discussions tend to happen closer to delivery timescales.	Encouraging DNOs to provide their long-term plans earlier will enable better coordination and alignment with our own planning efforts. Data sharing between stakeholders can optimize outage plans and improve overall efficiency.

Area	Current approach	Future transformation
Transmission Acceleration Programme (TAP)	SQSS single circuit risk currently never allowed (OP2)	Situational exceptions through a governance process run by NESO to potentially allow single circuit risk to enable works that would reduce future system constraints or stability issues. Decision Process for Voltage steady state limit: 1. Conduct usual deterministic worst-case scenario and determine if running a conventional generator resolves the issue. If it does, send to commercial to sanction the outage. 2. If it is rejected due to high spend or a conventional generator doesn't resolve, then we will check if there is any automatic scheme that can be used. If there is a scheme, then that is used and the outage accepted. 3.To explore if operating outside the normal limits, a Temporary Over Voltage (TOV) study is conducted and will be compared against any affected user settings. If the TOV is less than all users then a risk assessment form is started, otherwise it is not permissible to proceed. 4. Risk assessment form outlines analysis and is processed.
Automating how we operate our network via SCADA Deployment	All work started through the control room operator, requiring coordination with control room and resources on site.	For first time in history, workers on site will have their work started digitally instead of through a control room operator. The primary requirement for ET SCADA is for remote operation of assets and data capture to support efficient asset management. Remote operation is primarily focussed on switching for outages for maintenance and construction, commissioning of new assets, and reconfiguration of the network in response to faults and/or operational requirements. All of these activities free up critical resource to deliver work on site faster. Additionally, data capture including collection and display of asset condition and operational performance data will be automated to support efficient asset management, including alarms for real time decision-making and historic trend analysis. This will enable rapid learning to further improve delivery execution.
De-risk delivery with strategic spares strategy	Strategic spares currently limited to a number of assets and in line with historic fault levels	We are increasing our holding of strategic spares to reduce impact on planned outages and network operation from faults and failures, and are giving our supply chain greater visibility and confidence of our workbook
Supply chain partnerships	We inform OHL suppliers in advance, but do not work with them to smooth the work load between years	[redacted] opening a new training centre for overhead lines workers to meet our demand - and we have invested in our suppliers by placing orders earlier in the project lifecycle to secure manufacturing slots through the HVDC framework.

5. The investments in our RIIO-T3 business plan

Our baseline funding request is weighted to the early years where we have high confidence in our investments. Our pipeline log represents a portfolio of investments that while needed to deliver on the outputs from the NESO's planning processes and the FES Holistic Transition Pathway, we are lacking sufficient certainty. Including projects with significant uncertainties would expose both consumers and us to unnecessary financial risk.

5.1. Driver 1 - Requirements from the NESO's network planning activities

We describe in section 3 above the aims of the NESO's network planning activities and the core groups of projects it identifies. This includes the following projects that we will develop and deliver during RIIO-T3:

Our commitment

A2.3

Develop and deliver major new network expansion projects identified by NESO

- **17 Accelerated Strategic Transmission Investment (ASTI) projects** that we are developing and delivering or will be in delivery to support the delivery of the Government's target of 50 GW of offshore wind by 2030, in some cases as a joint venture in partnership with the other TOs. These projects will connect an additional 23GW of offshore wind by 2030 and so will be delivered during the RIIO-T3 prince control period. In addition, we are developing 4 provisional ASTI projects at Ofgem's request, however the delivery body for these projects is subject to confirmation by Ofgem.
- **7 additional ASTI enabling projects and key sites on the network to connect ASTI projects** and ensure efficient coordination with customer connections and asset health interventions. These projects are mainly reconductoring or substation works. Hence these projects will be delivered alongside ASTI projects in the RIIO-T3 price control period.
- In addition to the ASTI projects above, our RIIO-T3 business plan includes **a further 8 reconductoring projects identified by the NOA process in our baseline plus 2 in our pipeline**. These investments deliver additional capacity at our boundaries to address powerflow demands and system stability issues.

In addition, our portfolio includes 35 projects triggered in the transitional Centralised Strategic Network Plan (tCSNP2) process. These are currently at an early stage of development and we will confirm which projects will progress to full development and/or delivery, subject to further early development work as well as ongoing discussions with Ofgem and NESO and in line with Ofgem's forthcoming response to their tCSNP2 consultation and their decision on delivery vehicles and network competition. These projects are in the T3 pipeline and are currently being developed as a portfolio of projects. These projects will enable the connection of an additional 21GW of offshore wind capacity by 2035 and range from complex marine cables and major new onshore overhead lines to numerous smaller projects, for example up-rating of existing lines.

Our T3 plan includes c. £17.7 billion of investments to meet the requirements of the NESO's network planning activities across our T3 baseline and pipeline.

Table 4: Summary anticipated costs for RIIO-T3 for projects that increase the capacity of the system (£bn)

	Estimated total spend (£m)	Anticipated expenditure (£m)
Baseline	[redacted]	[redacted]
Pipeline	[redacted]	[redacted]
Total	**34,448**	**17,722**

5.1.1 T3 Baseline: Requirements the NESO's network planning activities

Our RIIO-T3 baseline investment for delivering on the outputs required following the NESO's network planning activities is comprised of projects that we have been developing during RIIO-T2 and will deliver during RIIO-T3. The NESO has asked us to deliver these projects, we are confident in the project's design maturity and costs. Our baseline includes:

- **Pre-construction costs** for 17 ASTI projects which were set by Ofgem through the LOTI/ASTI process.
- **Full project costs** for:
  - 3 ASTI projects which have an indicative decision on costs following our Project Assessment submission to Ofgem.
  - 8 NOA reconductoring projects
- **6 ASTI enabling projects** that have been triggered by NOA

Table 5: Summary of baseline expenditure identified through the NESO's network planning activities

Investment type	Estimated total spend (£m)	Anticipated RIIO-T3 spend (£m)
ASTI - PCF	[redacted]	[redacted]
ASTI construction funding	[redacted]	[redacted]
NOA full project costs	[redacted]	[redacted]
ASTI enabling	[redacted]	[redacted]
Total	**5,752**	**3,673**

5.1.2 T3 Pipeline: Requirements the NESO's network planning activities

Our RIIO-T3 pipeline contains a significant volume of investment for which we have varying levels of uncertainty in the need, scope and cost of each project, or they are funded by mechanisms outside of the RIIO-T3 framework. Given the inherently uncertain nature of some of the needs, designs and costs of the investments in our pipeline, these figures are subject to change during RIIO-T3. Our pipeline includes:

- **Construction costs** for 14 ASTI projects for which we do yet not have a Project Assessment decision on costs by Ofgem. These projects (and the 3 allocated to our baseline) are specified in our licence and so we are obligated to deliver them. However, they are currently allocated to our pipeline because we will not have sufficient cost certainty until we completed consenting and tendering activities.
- **Pre-construction and construction costs** for 4 provisional ASTI projects which Ofgem has asked us to develop.
- **1 ASTI enabling project**
- **Full project delivery costs** for:
  - 2 NOA projects
  - 35 tCSNP2 projects[8]

[8] 35 NGET schemes were recommended in 'Beyond 2030', of which two were provisional ASTI [redacted] and two may be reassessed for inclusion with existing ASTI schemes in the future [redacted] and [redacted]. Following publication of 'Beyond 2030', Ofgem published its decision that [redacted] (from the HND Follow-up Exercise) be classified as 'onshore', adding a further scheme for NGET to develop.

Table 6: Summary of pipeline expenditure identified through the NESO's network planning activities

Investment type	Estimated total spend (£m)	Anticipated RIIO-T3 spend (£m)
ASTI Construction	[redacted]	[redacted]
Provisional ASTI (PCF + Construction)	[redacted]	[redacted]
ASTI enabling (Construction)	[redacted]	[redacted]
tCSNP2 full project costs	[redacted]	[redacted]
NOA full project costs	[redacted]	[redacted]
Total	**28,696**	**14,049**

5.2. Driver 2 - Accelerating connections for our customers

Our commitment

A2.1

Enable the connection of new generation to the electricity transmission system

A transmission system ready to facilitate the timely connection of new customer projects sits at the heart of our T3 investment load plan. We recognise the growing importance that our connection investment strategy will have in delivering clean low carbon technology to the system across the generation sector, as well as providing important economic benefits across other sectors such as rail, data and digitisation and large strategic demand projects nationally. The growing diversity of projects wanting to connect has never been so great, there is an increasing expectation on how our investment strategy delivers to meet ambitions across our customers and support government policy.

This growing importance has required an ambitious plan in which we can facilitate investment to deliver the timely connection of customer projects. Headline numbers within our plan submission include facilitating **35GW of generation** and **19GVA of demand capacity**. The plan also provides investment for a future ready system for customers with an additional **26GWs of generation connection options created**. As described above, this plan delivers on the FES 2024 Holistic Pathway at 2035 scenario and enables delivery on technology specific targets. The connection plan is underpinned by investment at our substations totalling [redacted] across the T3 period. To enable customers to connect at our substations, our plan includes reconductoring or hotwiring investments for [redacted] of overhead lines totalling [redacted] across the T3 period.

Our commitment

A2.2

Enable the connection of new demand customers to the electricity transmission system, including to support the Government's new Growth Driving Sectors

A key principle of the plan is the design philosophy which transitions from an incremental and 'just in time' regulatory system to one that delivers strategically with future capacity built in, we refer to these specific investments as site strategies. This approach is therefore proposing investment in over **30 site strategies** that include both generation and demand drivers. The site strategy proposals account for the majority of the overall investment within the customer connection plan.

5.2.1 What our plan delivers for our customers

To help bring to life our plan, we think about how it delivers for our customers. At a macro level our customers can be broken down to segments which include, transmission generation, DNOs and transmission demand, of which the latter is made up of rail, data centres and strategic demand Projects. Table 7 below sets out what our plan delivers for these customer groups.

Table 7: What our plan delivers for our customer groups

Customer group	What our plan delivers
Transmission generation	Our plan will facilitate 35GWs of generation along with a further 26GWs of future options for generation customers. The site strategy approach is central to providing these outputs. We will deliver 10 solely driven generation site strategies. The integrated nature of generation and demand within the contracted background means that a significant number of further site strategies will be delivered which drive mixed outputs across both drivers. Through the T3 period the investments outlined above will deliver a vast increase in the delivery of low carbon technology onto the system. In line with the energy scenario, we expect to deliver 62 customer-driven connection options for generation to facilitate the GW outputs described above. Whilst today this infrastructure is planned for specific projects based on the contracted position, our design proposals will be agile enough so that when changes occur in the contracted background the infrastructure can still be utilised in line with these changes.
DNOs	Two key drivers support the needs of DNOs, demand growth and embedded generation. We see these differing drivers on different points on the network depending on the characteristics of that specific part of the network and its proximity to large demand centres. Across both drivers we are forecasting to deliver 3 new Grid Supply Points (GSPs) as well as installing 23 new transformers to support meeting the required capacity required. This investment will deliver 6.5 GVA of demand capacity across England & Wales. The investment described above is complemented by the work NGET have led while working with the DNOs, where we have implemented new and novel approaches to provide further accelerated capacity specifically for embedded generation. To date this initiative has delivered 30GWs of capacity contractually offered. As of summer 2024, this has equated to approximately 250 embedded generation projects being offered acceleration opportunities by DNOs, with an average acceleration of 7.7 years. Investment in new infrastructure is vital but we also view commercial tools such as the one set out above as a key part of the overall strategy which in totality enables greater acceleration opportunities for DNO customers across this period.
Data centres	We have seen a remarkable growth in data centres looking to connect to the network. Our plan will facilitate the connection of 26 new data centre projects in T3, with investment also underway to deliver a further 4 connections in T4 timescales. Our plan facilitates investment in the construction of 3 new transmission substations driven by this sector, along with investment in the largest volume of new supergrid transformers with 18 units planned to be delivered in this period. This represents a significant drive to deliver on a sector which is deemed significant for government.
Rail	The plan is delivering 3 new GSPs to facilitate the delivery of the new HS2 rail line between London and Birmingham. Significant investment in new SGTs is also planned with 11 new super grid transformers commissioned within the period to support both HS2 and other strategic priorities from Network Rail. Ultimately this plan will enable the delivery of 2 railway initiative programmes of work, improving the capacity of trains on the rail network and enabling improvements to the service customers receive.

Customer group	What our plan delivers
Strategic demand	Specifically in the last few years we have seen the requirement to deliver infrastructure for large strategic demand projects that enable important economic and regional benefits to the economy as well as supporting overall government priorities. Examples of these types of projects include the decarbonisation strategy for steelworks to move to electric arc furnace arrangements and new gigafactories to support the automotive industry. Our plan will deliver 2 new substations along with investment in 15 new SGTs in this period. We are also supporting multiple strategic demand projects that are connected into the DNOs network, these investments are outlined with the DNO part of the plan.

Investments to provide connections and connection options are included in our baseline and our pipeline, see Table 8 for respective values. In both cases, the need for the investment is supported by our customer confidence analysis. Therefore, the decision to include a specific investment in the baseline or the pipeline has been driven by our confidence in the maturity of the design (i.e. the degree to which we have determined the specific scope) which enables us to obtain tendered costs, and whether costs could change once the tendered costs are available due to the volatile supply chain environment.

Table 8: Summary of anticipated costs for connecting customers from the queue RIIO-T3[9]

Funding type	Estimated total spend across all price controls (£m)	Anticipated RIIO-T3 spend (£m)
Baseline	[redacted]	[redacted]
Pipeline	[redacted]	[redacted]
Total	**11,646**	**8,370**

5.2.2 T3 Baseline: Connecting customers

The funding we include in our T3 baseline for connecting customers depends on the project's design maturity and our confidence in the costs of delivery. Table 9 demonstrates the criteria we have applied to determine the costs to include in our baseline.

Table 9: Criteria for selecting the costs to include in our T3 baseline for customer connections

Baseline request	Need	Shortlisted options	Preferred option & confidence in construction costs
Full costs of project delivery	✓	✓	✓
Approval of the needs case & pre-construction funding	✓	✓	
Approval of the needs case & early development funding	✓		

Our baseline expenditure also includes proposed allowance for the Use It or Lose It fund included within the RIIO-T3 load-related funding framework, see section 5.2.2.2.

[9] All pricing in £ 2023/24. These figures include funding we are seeking through the T2 MSIP and LOTI processes but exclude other T2 crossover projects, including those that will be funded through T2+2 arrangements.

Table 10: Baseline funding for connecting customers

Type of expenditure	Estimated total spend across all price controls (£m)	Anticipated RIIO-T3 spend (£m)
Substation connections - Full project costs (baseline)	[redacted]	[redacted]
Substation connections - Pre-construction costs (& needs case approval)	[redacted]	[redacted]
Substation connections - Early development costs (& needs case approval)[10]	[redacted]	[redacted]
Overhead line & cable – full project costs	[redacted]	[redacted]
Load-related Use it Or Lose It[11]	[redacted]	[redacted]
Other load-related	[redacted]	[redacted]
Total	**1,997**	**1,279**

5.2.2.1. Need case approval: connecting customers

During T3 we need to increase our scale and pace of delivery to meet the needs of the future energy system. Needs case approval is a key enabler of this since it allows us to progress our project development at pace, often despite uncertainty over exactly which customers will proceed to connect to our network and/ or when. Delivery at pace benefits customers and consumers, since the former experience shorter waits for a connection while the latter avoid the increased costs that would otherwise arise from delaying the connection of clean energy to the network.

Approval of needs cases in the T3 baseline will provide us with certainty that we can recover our efficient costs subject to a cost assessment process as part of the T3 load-related reopener.

Our business plan includes two approaches to needs case approval in the T3 baseline. In the first we have high certainty of the need and have shortlisted our options. We have identified seven customer connections projects that meet these criteria.

Our second approach seeks needs case approval for projects at sites that have a large contracted background which indicates that connections option will be needed during T3 but for which options need to be developed. If we wait to develop these projects until there is more certainty about which customers will connect and when then we risk taking longer to connect clean energy to the network than otherwise would have been the case, which increases costs for consumers. We have identified a portfolio of 24 projects which require development during RIIO-T3 the details of which may need to change as Connection Reform is implemented and there is greater clarity of the Clean Power 2030 scenarios. The fund would allow us to respond rapidly to changing needs, for example current needs falling away and new needs taking their place. Therefore, we recommend that the fund is set on a Use-It-Or-Lose-It basis (for the avoidance of doubt, separate from the UIOLI fund already proposed within the RIIO-T3 load related funding package) and we are able to direct it towards the needs that we consider most pressing. To protect the interests of consumers, we could be held to account using a price control deliverable that expects a proportion of these sites to proceed to a load related reopener submission.

[10] As we explain in our engineering justification paper for the early development fund, this total excludes our baseline preconstruction funding request for [redacted]

[11] In addition to the load-related UIOLI fund discussed in this annex, the load cost and volumes business plan data table also includes a UIOLI fund for carbon and a true-up for early land purchase. The justification for these investments is set out in the Low Carbon Construction and Early Land Purchase engineering justification papers

In our RIIO-T3 baseline we have included [redacted] of the forecast full project costs for pre-construction activities as an initial position. Ofgem is still considering the level at which pre-construction funding should be set for RIIO-T3. We have adopted the [redacted] provided as an initial allowance in the ASTI framework for our RIIO-T3 submission but intend to revisit this once Ofgem has reached decisions on whether and how to include early enabling works and the scope and operation of its advanced procurement mechanism is.

To demonstrate the need for the projects in these categories our investment decision pack portfolio therefore contains:

- An engineering justification paper for each of the [redacted] projects which have shortlisted options
- A portfolio justification paper for the [redacted] sites identified where we have identified a need to develop options during T3.

5.2.2.2. Load related use it or lose it: connecting customers

The RIIO-T3 load-related framework contains a 'use it or lose it' (UIOLI) allowance to fund specific types of low materiality investment. We have included [redacted] to fund customer-connections related investments and, as described in section 6.3, the remaining investments are intended to address operability.

Except for site separation and circuit breakers investments, the expenditure we have allocated to the UIOLI fund is aligned to Ofgem's provisional categories of UIOLI expenditure in its the Sector Specific Methodology Decision. We also consider that a category for hotwiring investments should be included within the load-related UIOLI since, however we completed the analysis to demonstrate that this low materiality investment cannot be suitably represented using a volume driver after we had completed our final business plan build and so the anticipated costs and volumes do not feature within our proposed fund for the load-related UIOLI. We intend to work with Ofgem on its inclusion through the draft and final determinations.

We consider that the inclusion of site separation, circuit breaker and hotwiring investments is consistent with the aim for the UIOLI fund, which is to reduce the regulatory burden for Transmission Owners to demonstrate the need for, and for Ofgem to assess, low materiality load-related projects. An alternative approach, for example, producing a re-opener submission for each project as it arises would be grossly disproportion to the funding request.

Since the intention of the T3 load-related UIOLI is to reduce the volume of re-openers during the price control period, the costs, volumes and timings of the projects it will be used to deliver is inherently uncertain. The table below describes the methods we have used to derive our [redacted] fund for customer driven projects. Where we have rolled-forward volumes from the T2 period to date, we have scaled the costs proportionate to the increase in our load-related expenditure in our T3 baseline and pipeline.

Finally, we note that the volume drivers and associated thresholds for atypical schemes remain subject to consideration for T3. Therefore, our calculation may need to be revisited once there is more certainty to account for the anticipated effects on atypical schemes.

Table 11: Breakdown of the customer connections driven investments included in our load-related UIOLI fund and methodology for deriving the costs of each

Description	Costing approach	£m
Site separation: Expenditure to separate site services (e.g. power and water) that are currently shared with power stations that are anticipated to close.	The Holistic Transition Pathway energy scenario indicates that [redacted] sites will need to be separated from our network during T3. Costs are based on historical averages.	[redacted]
Circuit breaker replacements: Investments to replace circuit breakers to accommodate increased levels of embedded generation	We have reviewed embedded generation at our sites that are subject to technical limits and assumed that [redacted] of these investments will be needed during T3.	[redacted]
Atypical schemes: Investments for which the T3 volume driver is anticipated to be insufficiently cost reflective and would therefore be funded through a re-opener	We have rolled-forward the costs we have incurred for [redacted] atypical project during T2 and combined these with those that we anticipate would be funded through a re-opener if the RIIO-T2 atypical project thresholds are rolled forward into T2. We have proportioned it to the increase in expenditure across our T3 baseline and pipeline.	[redacted]
Pathfinders: Investment to connect customers providing services to the NESO (e.g. reactive power). These services are identified through a NESO run tender exercise.	We have rolled-forward the costs we have incurred for [redacted] Pathfinder projects during T2 and proportioned them to the increase in expenditure across our T3 baseline and pipeline.	[redacted]
Operational tripping schemes (OTS): Investments that we or the NESO identifies that are required to manage the system or connect customers.	We have rolled forward the costs we have incurred for [redacted] OTS projects during T2 and proportioned them to the increase in expenditure across our T3 baseline and pipeline.	[redacted]
0MW works: Connection works that are required by customers but result in additional network capacity (e.g. to provide operability services to the NESO).	We have rolled forward the costs we have incurred for [redacted] '0MW' projects during T2 and proportioned them to the increase in expenditure across our T3 baseline and pipeline.	[redacted]

5.2.3 T3 Pipeline: Connecting customers

The investments in our pipeline are therefore crucial to delivering on the 35 GW of capacity that the Holistic Transition Pathway indicates is required during RIIO-T3 and in anticipation of additional capacity required to achieve net zero targets.

Our pipeline contains:

- **Standalone connections** with strong needs cases but insufficiently defined scope and therefore/ or low confidence in the costs of delivery.
- **Site strategies** for which we have sought pre-construction or early development funding in our baseline but intend to seek full project delivery costs for during RIIO-T3.

During RIIO-T3 we will seek to fund these projects in full through the load-related uncertainty mechanisms included in the regulatory framework, specifically the volume drivers for generation and demand and the load-related reopener.

In addition to the investments described above, our pipeline includes investments which we are already seeking funding for through the RIIO-T2 reopener mechanisms, specifically the Medium Sized Investment Project (MSIP) and the Large Onshore Transmission Investment (LOTI) Lite reopeners. Our current view of costs for the investments in our pipeline is presented in **Error! Reference source not found.**12. Given the inherently uncertain nature of the needs and costs in our pipeline, these figures are subject to change during RIIO-T3.

Table 12: Pipeline funding for connecting customers from the queue

Type of expenditure	Estimated total spend across all price controls (£m)	Anticipated RIIO-T3 spend (£m)
Standalone connections – full project costs	[redacted]	[redacted]
Site strategies - full project costs (excluding the [redacted] of the full project costs for each requested in the baseline)[12]	[redacted]	[redacted]
Overhead line & cable – full project costs	[redacted]	[redacted]
T2 MSIP	[redacted]	[redacted]
T2 LOTI	[redacted]	[redacted]
Other load re-openers[13]	[redacted]	[redacted]
Total	**9,649**	**7,091**

[12] As we explain in our engineering justification paper for the early development fund, this total includes our preconstruction funding request for [redacted] which should be allocated to the baseline.

[13] This includes investments in operability that we intend to be funded through the load-related UIOLI and the load-related reopener (see section 5.3) and expenditure that contributes to low carbon construction opportunities (see the Low Carbon Construction engineering justification paper)

5.2.3.1. Uncertainty mechanisms: connecting customers

The RIIO-T3 framework will contain volume drivers and a load-related re-opener which can be used to adjust our baseline expenditure allowances. The design of the load related funding mechanisms remains under development with Ofgem, this includes key determiners of the various mechanisms can be used such as the thresholds for atypical projects.

Due to the uncertainty about the final design of the load-related funding framework, in our business plan we are not able to indicate definitively which of the funding mechanisms are suitable for each of the projects in our pipeline. The business plan data tables (BPDTs) require us to allocate each of out RIIO-T3 projects to a funding mechanism. For our BPDTs we have assumed that:

- All complex, site strategy investments will be funded through the load-related reopener
- Standalone generation or demand connections at our substations will be funded through the RIIO-T3 volume drivers.
- Reconductoring driven by customer enabling will be funded by a suitable volume driver.

During RIIO-T3 we will seek to use volume drivers wherever they suitably reflect the costs of the activities we will deliver. This is because we consider that these mechanisms enable us to deliver new infrastructure at pace due to their automatic nature. However, we will use the RIIO-T3 load-related reopener when the costs of the project are not suitably represented by the volume driver or there is no suitable volume driver to represent the activity.

To enable pace of delivery in highly uncertain circumstances and without stifling delivery during the transition from one price control period to the next, we consider that the RIIO-T3 volume drivers for connecting customers at our substations need to:

- **Be driven by measurable outputs that reflect the costs of delivering connections and options**, noting the capacity that will connect using options may be unknown at the time they are built. This requires a change from the approach used in RIIO-T2 which determines the allowance based on the capacity of the connection that is provided.
- **Fund TOs to provide options as well as connections.** In the RIIO-T2 framework, TOs are provided with funding when the customer connects, rather than when the TO makes the infrastructure available for use. This means anticipatory investment will only be funded through a volume driver if / when a customer connects.
- **Continue to provide certainty of funding between price controls** by allowing the RIIO-T3 volume drivers to fund connections and options that commence in the final years of RIIO-T3 and are delivered in the first years of the next price control.

We consider that there should be a standalone volume for funding reconductoring activity. This volume driver should be driven by the need to deliver load-related and/ or asset health interventions.

5.3. Driver 3 – Operability

Investments in operability will be required during RIIO-T3 to allow us to continue to operate our network in a way which is consistent with the SQSS and Grid Code standards. As described in section 3.4, the specific operability needs of our network will be confirmed during RIIO-T3. We propose that these investments should be funded through either the:

- load-related UIOLI if they are < £ 25 million or;
- the load-related reopener if they are > £25 million.

We propose that £549 million should be included in our baseline UIOLI fund. This includes approximately £130 million for investments to address operability[14] investments under the categories set out in Table 13.

Based on our current analysis, our pipeline includes investments for:

- [redacted] for managing dynamic reactive capability
- [redacted] filters for managing the distortions of the electrical wave caused by wind connections

[14] These operability investments are allocated to the pipeline in our business plan data tables but our intention is that they should be included in the baseline load-related UIOLI.

Table 13: Breakdown of the operability driven investments included in our load-related UIOLI fund and methodology for deriving the costs of each

Description	Costing approach	£m
Reactive compensation: Investment to connect new reactive compensation equipment and to manage system voltage within SQSS limits.	We currently anticipate the need for [redacted] Costs are based on our cost book.	[redacted]
Voltage control: Investment to allow controlled switching using point-on-wave controllers, preventing unacceptable stress on the circuit breakers and investment to suppress Investment to supress electromagnetic transients naturally caused by circuit switching using surge arrestors	We currently anticipate the need for [redacted] Costs are based on our cost book.	[redacted]

Once the need is confirmed, we intend to seek funding for these investments through the load-related reopener. Owing to their importance for the effective operation of our rapidly changing and, in the case of reactive compensation, the materiality of the proposed investments we have included two engineering justification papers in our business plan submission (titled Operability and Reactive Compensation respectively).

5.4. Funding projects that began in T2

The development and delivery of electricity transmission infrastructure does not typically fall within a single regulatory price control period. Consequently, we have commenced development of many of the projects in our RIIO-T3 plan during RIIO-T2. In some cases, our expenditure on these projects during T2 is funded by the T2 bridging fund or the RIIO-T2+2 arrangements for load-related volume drivers. In other cases, we need to agree on the need and the mechanism for funding the expenditure.

We have identified four categories of T2 funding situations within our load-related RIIO-T3 plan for which we consider there is a need for us to set out our recommendations for funding expenditure incurred in RIIO-T2. Rather than set out each of our recommendations on a project-by-project basis in our engineering justification papers, we reference 'T2-T3 category numbers' in those documents to describe how we consider our T2 expenditure should be treated. These four categories are set out in the bullet points below and followed by Table 14 which sets out how we propose that our RIIO-T2 expenditure should be approved (if necessary) and the mechanism that should be used for funding it for each of the categories:

- **Category 1:** We have not agreed the need for these projects with Ofgem, but we have incurred expenditure on them during T2. We are requesting **funding for full project costs** for these projects in the T3 baseline plus a determination of T2 funding.
- **Category 2:** We have not agreed the need for these projects with Ofgem, but we have incurred expenditure on them during T2. We are requesting **preconstruction funding** for these projects in the T3 baseline plus a determination of T2 funding.
- **Category 3:** We have agreed the need for expenditure on these projects in T2 with Ofgem; they are funded via the "bridging fund" and we expect funding for the RIIO-T2 period to be trued-up through the T2 close-out process. We are requesting **funding for full project costs** for these projects in the T3 baseline plus a determination of T2 funding.
- **Category 4:** We have agreed the need for expenditure on these projects in T2 with Ofgem; they are funded via the "bridging fund" and we expect funding for the RIIO-T2 period to be trued-up through the T2 close-out process. We are requesting approval of the **T3 needs case** for this project in the T3 determinations.

Table 14: The funding and expenditure situations within our baseline funding requests and our recommendation for funding T2 expenditure

Category number	Funding & expenditure situation			Our recommendation
	T2 expenditure	T2 funding	T3 baseline funding request	
1	✓ Expenditure in T2	✗ T2 funding not agreed	✓ Full project funding	• Need for the project and associated efficient expenditure in T2 and T3 is approved in the T3 determinations. • T3 determinations approve the full costs we will incur to deliver the project and phase these between T2 and T3 appropriately. • T3 allowances are included in the T3 baseline. • T2 close out process recognises the allowances set out in the T3 determinations.
2	✓ Expenditure in T2	✗ T2 funding not agreed	✓ Preconstruction funding	• Need for the project and associated efficient expenditure in T2 and T3 is approved in the T3 determinations. • T3 determinations approve our initial PCF request and our expenditure during T2 (net of the PCF). We will seek funding for the remaining expenditure through a reopener during T3. • T2 close out process recognises the allowances set out in the T3 determinations.
3	✓ Expenditure in T2	✓ T2 agreed through bridging fund	✓ Full project funding	• Need for efficient expenditure during T3 is approved in the T3 determinations. • T3 determinations approve the full costs we will incur to deliver the project and phase these between T2 and T3 appropriately. • T3 allowances are included in the T3 baseline. • Funding for the T2 period is trued-up at T2 close out[15]
4	✓ Expenditure in T2	✓ T2 agreed through bridging fund	✗ Need case approval	• Need for efficient expenditure during T3 is approved in the T3 determinations. • We will seek funding for the full costs of the project through a T3 reopener submission or T3 volume driver. • Funding for the T2 period is trued-up at T2 close out.

[15] This means the funding that is provided in the T3 determinations overrides the T2 bridging allowance

6. Governance and assurance of our RIIO-ET3 business plan

Our business plan and ongoing project development are underpinned by robust governance and assurance. In this section we discuss the governance and assurance that we applied to the development of our RIIO-T3 load investment business plan and to the development of each of our projects.

6.1. Governance of our RIIO-T3 portfolio

We identified a governance framework for our RIIO-ET3 business plan which allowed the executive and the National Grid Electricity Transmission Board to set the direction of, steer, challenge and decide on the plan as appropriate.

We used three key governance forums (as well as individual workstream collaboration) to test, challenge and confirm significant decisions on our investment plan build. These are set out in Table 15.

Table 15: RIIO-T3 governance forums

Governance forum	Purpose	Frequency	Members
Network Investment Plan - Workstream Level Management	Delivery of specific outputs and artefacts required for the T3 business plan submission with regard to the Network Investment Plan (including the Load related investments)	Weekly	Regulatory workstream lead and relevant contributors from the Electricity Transmission and Strategic Infrastructure business units
T3 Programme Delivery Board	Responsible for coordination of our RIIO-T3 programme activities across workstreams and ensuring that business and regulatory timelines and requirements are met	Fortnightly	Responsible Manager for each workstream
T3 Electricity Transmission Executive Steering Group	Primary decision making body for our RIIO-T3 investment plan.	Fortnightly	Executive members of our Electricity Transmission and Strategic Infrastructure businesses – chair: Alice Delahunty, Electricity Transmission Business Unit President;
National Grid Electricity Transmission Board (NGET Board)	Responsibility for approval of the RIIO-T3 Business Plan submission rests with the Licensee Board. This body has tested the robustness and ambition of the overall submission.	Every 2 months	Non Executive Directors; Electricity Transmission and Strategic Infrastructure Business Unit Presidents and Company Secretariat

Alongside the Licensee governance set out above, our RIIO-T3 submission has obtained Group Level strategic direction from the Transmission Policy and Regulatory Overview Group. This forum is attended by National Grid Group Executive members as well as the Electricity Transmission and Strategic Infrastructure Business Unit Presidents.

Collectively, the involvement and engagement of the leadership groups, as well as the Executive's scrutiny and challenge of the T3 plan, has informed and shaped the development of the plan throughout the process.

6.2. Governance of our project development

Our network development processes (see Section 8 below) include multiple 'stage gates' that are intended to assure the quality and completeness of the work conducted at each stage and approve that the next phase can start.

At each stage gate, projects receive technical, commercial and strategic challenge and review from defined responsible individuals called 'gate keepers'. The project team must address any issues identified by the gate keepers before the gate keepers re-review the project and provide their sign-off to proceed to the nest stage of the process once they are satisfied.

Key governance milestones in our network development processes are:

- **Approval to develop and sanction:** the gatekeeper reviews the range of options identified and assesses the suitability of the preferred solution.
- **Financial sanction to proceed with the investment:** the materiality of the investment determines the governance forum that is used. The delivery vehicles' own sanction forum typically approves projects [redacted] whereas our Board sanctions projects [redacted].
- **Approval to execute the project:** at this stage, the gate keeper (i.e. the responsible delivery vehicle Director) reconfirms that investment is needed and that the sanctioned option should progress to delivery.
- **Approval to close execution and then the project:** the gate keeper (i.e. the Project Director or Senior Project Manager) confirms that assets are commissioned satisfactorily and handed over to Operate. Approval is then provided to review the benefits of, and lessons learned from, the project and formally close it.

At any point during the development of the investment, the investment project team or the gate keeper can decide that a project should be returned to the previous stage. This may be because either party is not satisfied with the development work conducted to date or because circumstances have changed and the approach requires reconsideration.

We describe our governance arrangements for scope, costs and schedule during project delivery in section 9 below.

6.3. Assurance

We have extensively challenged and reviewed the processes that have been used to identify our RIIO-T3 load portfolio and the associated data and information. The RIIO-ET3 Assurance Report sets out the approach to assuring our RIIO-T3 business plan.

Our engineering justification papers (EJPs) demonstrate the needs and, if projects are sufficiently mature, our assessment of options and cost benefits analyses. Each EJP has been reviewed and challenged by relevant stakeholders in our business before being signed off by the relevant Director. A sample of EJPs were also assured by an external provider, [redacted]

7. Project Development

The broad objectives of our project development process are to:

- To determine the best overall outcome to meet the needs of consumers, customers and society at large;
- Enable the safe delivery of transmission projects to maintain, upgrade and add to the capability of the transmission network to enable connection of customers and efficient flow of electricity;
- Fulfil the appropriate balance of our legislative and licence obligations, and broader societal expectations, in the development of the transmission network.

When considering how projects are developed it is important to remember that, whilst there is a logical “left to right” process progressing from need case to delivery, which is described in the next section, this process is subject to a number of real world constraints and issues that also impact on the development of projects and the options chosen. This is discussed in section 7.4.

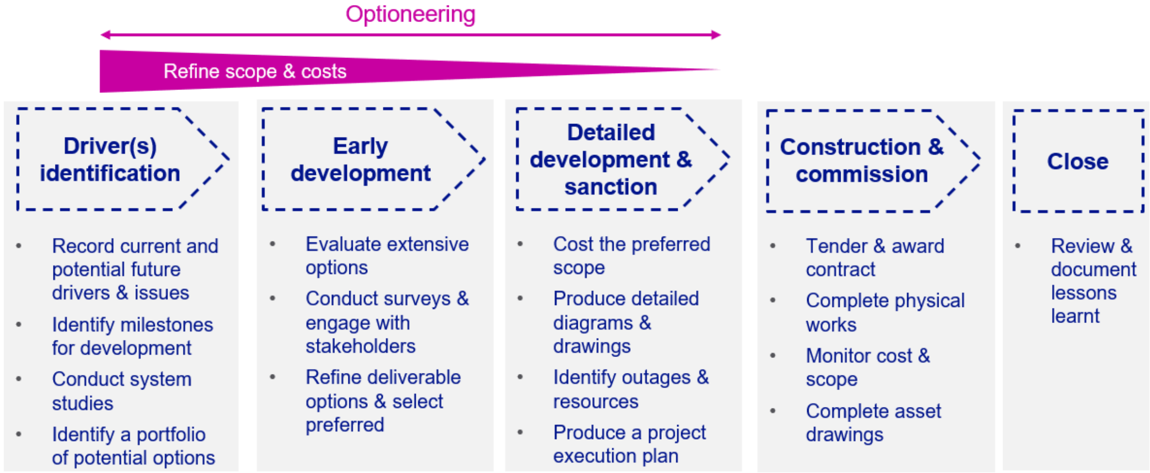
7.1. Idealised process

We have had a systematic process for development of transmission projects in place for many years, with primary policy documentation for our relevant processes known as BP500 or BP500-SI. This process prescribes the stages, stage gates and governance necessary through the development and delivery of capital works. The process is a key part of our ISO55001 certification, and as such is both externally and internally audited and reviewed.

We apply formal processes to develop projects from concept to commissioning to ensure that within business units deliver in a consistent, controlled and measurable way, to the quality and timings required by our stakeholders, and as efficiently as possible.

We use distinct processes for our various business units that reflect the differences in the ways needs are identified and the types of projects that are developed and delivered by each. The processes are comprised of stages with gates controlling the movement from one stage to the next. As described in section 6, gate keepers are assigned at key stages of development and they are accountable for determining whether the project can progress to its next stage. As projects clear each stage the scope is refined and the scope, design and costs become more mature. The common elements of each process are demonstrated in Figure 15 below.

Figure 15: Key stages of project development



7.2. Optioneering and option selection

Optioneering is a key component of our network development processes. Our optioneering process considers various engineering solutions that have the potential to meet the investment drivers we have identified and assess them against key considerations.

7.2.1 Unconstrained options

Our first step for each investment is to identify a long list of unconstrained high-level options. We always include the following for consideration:

- **Baseline option** against which all others are compared. In many cases this is 'do nothing'.
- **Market-based or whole systems** solution which avoids physical interventions on our network. For example, we could agree with the customer and the local DNO that the connection could instead be made to the distribution network.

Additional options in the long list then represent physical interventions on our network which consider current and anticipated future load and non-load drivers. The core high-level options available diverge depending on whether we are connecting new customers at our substations or improving power flows around our network. We set out common high-level options for substations and overhead line investments below.

Table 16: Common high-level interventions for load-related investments

Common high-level interventions	
Substations	**Overhead lines**
• Using an **existing substation**. For example, transferring a connection to a substation with sufficient capacity, extending the substation to which the customer is contracted or rebuilding it with a more efficient configuration • Building a **new substation** in the vicinity of the substation to which the customer is contracted • **Rebuilding** the substation to address asset health concerns in addition to load. This can include rebuilding in a more efficient configuration or on a larger footprint	• Hotwiring • Dynamic line rating • Reconductoring/ adding cables to the route • Creating a new route • Installing **powerflow control** equipment, for example Quadrature Boosters and Series Reactors (to change patterns of flow and balance load between different circuits)

We then develop our high-level options into detailed options that form our longlist. If we are including new sites and overhead lines in our longlists of options then we will also need to consider their siting. When identifying a longlist of options for siting we will identify a study area which considers the needs of the investment (e.g. where the customers' assets are located or the locations between which we need to transfer capacity) and the geographical landscape (e.g. accounting for the terrain).

For substations we identify technologies that could be used, typically air insulated (AIS) or gas insulated (GIS) solutions. For overhead lines we identify potential conductors [redacted] and temperature ratings (e.g. 150 and 180 °C). We also consider opportunities to vary the timing or build incrementally. For example, we can consider buying portions of the land needed at different times and varying the scale of the build accordingly. We combine the high-level list of interventions with our detailed options to identify a longlist of unconstrained options to be considered.

7.2.2 Application of network design principles in optioneering

We have identified network design principles that we apply in the design of our projects so that they align with our Strategic Network Design Principles outlined in section 7.1 above. The design principles enable us to define options for our network over time in a consistent and holistic way which is robust to sources of uncertainty about future needs.

Table 17: Strategic network design principles

Strategic Network Design Principle	What we are doing and why
Optionality and flexibility of connection	Given the uncertainty of future needs, building solutions with space and capacity to accommodate additional customers and other future drivers e.g., operability assets (including for voltage control) or to connect new circuits of power flow control devices. Designing our sites today to optimise physical space for future electrical capacity, designing to avoid sterilising space, and building in the option for future extensions.
Maximising availability, minimising downtime	Increasing the utilisation of existing assets, by installing the highest rated conductors and installing powerflow control devices. Maximising the operability of our substations to allow for maintenance and replacement without the need for proximity outages.
Sustainable construction & operations	Embedding sustainable practices in our construction activity and transforming how we interact with local communities and the environment, taking a strategic and longer-term view that not only considers environmental net gain but also considers societal issues, taking the opportunity to leave things better than they currently are. Addressing the biggest source of our direct emissions through progressively removing SF_6 from our network.
Real-time intelligent and adaptive control	Creating the capability for faster, more sophisticated, automated and intelligent control of our network, that can adapt and make decisions in real-time, self-heal, and predict and respond to external events, to make it resilient to the pace and scale of change of the GB energy mix, the extent of network and customer technology change and the needs of consumers. Ensuring the system is sufficiently robust to the more extreme external conditions it will experience during its life, including climate impacts and an increasingly complex cyber security landscape.

7.2.3 Credible options

Once we have our unconstrained long-list of options, we qualitatively assess each against a set of critical success factors to identify a viable shortlist. To be shortlisted, credible options must be:

- Capable of meeting the driver in a timely manner
- Technically feasible – including whether we have or can acquire the necessary space
- Consistent with the aims of our regional and business strategies
- Value for money for customers

Once we have a shortlist of credible options we refine the scope, costs and schedule for each. Initially we conduct desktop studies to determine:

- Technical feasibility
- Engineering design
- Cost effectiveness
- Environmental and socio-economic impacts

As the scope of each credible option is refined a key decision is whether to use air (AIS) or gas insulated (GIS) technologies. We prefer to use AIS technology but this must be balanced against a number of project specific technical, planning (including stakeholder and environmental factors) and land availability considerations. For example:

- Where additional land is required, we must seek to achieve this and the permission to use it through voluntary agreement. Although we may use compulsory purchase (CPO) there is a very high legal bar for using these powers which requires demonstration that there are no suitable alternatives and there is a compelling case in the public interest.

- We must consider our ongoing relationships and take account of the impact of negative impacts. Our assets and our need for our staff to safely maintain them will remain for many years.
- Specific site constraints (e.g. coastal and urban sites) may dictate the way in which, and how much, land can be used.
- We must balance the time taken to deliver a project with the need to meet the terms of our contract with our customers, use available outages and deliver benefits for consumers by delivering the energy transition.

Therefore, while we continue to seek to reduce our environmental footprint and prepare for application of environmental regulations intended to limit the use of GIS solutions, they feature in our RIIO-T3 plan where we have encountered significant constraints that prevent an AIS solution.

Once we have our list of credible options we then assess each of the credible options qualitatively and then quantitatively using cost benefit analysis. These qualitative and quantitative assessments are described below.

7.2.4 Qualitative assessment

For our RIIO-T3 business plan we have identified and used a consistent set of considerations to qualitatively compare the relative benefits and detractors of our shortlisted options. The criteria represent considerations that are either practical or important for achieving our ambitions for T3:

- Capacity and future expansion potential
- Design & technical complexities
- Operation & maintenance
- Safety, health and security
- Planning & land consent
- Third party impact and network coordination
- Environment and sustainability
- Timing of programme & resources
- Cost

7.2.5 Quantitative assessment

We quantify and objectively compare the costs and benefits of each project. We obtain tendered costs for our preferred solution only once a preferred option has been approved at a sanction committee. Therefore, we develop cost book estimates for each of our shortlisted options to allow us to make direct comparisons between each. However, in our RIIO-T3 plan we are requesting allowances for the tendered costs of our projects where they are available.

For our RIIO-T3 business plan we used a consistent set of guidelines and a CBA support tool to quantify the costs and benefits of our options consistently, as shown in Table 18.

Table 18: Costs and benefits guidelines

Costs	Benefits
• Annualised capex broken down by asset • Future replacement costs, including intermediary replacements as necessary • Annual maintenance costs of new and existing assets where these are judged to vary significantly between option • Constraint costs, if outages are judged to be significantly different between options	• Savings (costs avoided) by reusing equipment • Savings from avoided maintenance costs, if judged to vary significantly between options. • Carbon cost of construction, where the differences between options are treated as benefits • Transformer losses • Transmission losses • Gas leakage, kg of SF_6 and tCO_2 impact of SF_6 leakage assumed at 0.1% over 40 years • Oil leakage, for cables projects • Avoided generation emissions when clean generators are connected instead of carbon generators

The output of the CBA is a net present value. Options with higher net present values are preferable but the detailed quantitative analysis is combined with the output of the detailed qualitative analysis to identify the preferred option.

7.2.6 Preferred option

The preferred option and our reasoning for this preference is presented at a sanction committee for discussion. If the sanction committee agrees then the project can progress to tender and delivery, otherwise the project team must reconsider the options in the context of the committee's feedback.

Once a preferred option is identified we conduct more detailed studies and on the ground surveys to determine optimal sighting. At this stage we must also submit a planning application which must be approved before the project can proceed to full construction.

7.3. Identifying opportunities for strategic investment

During RIIO-T3 we will increasingly invest ahead of need to ensure that we are maximising our use of system access opportunities and creating a capacity rich network that is available for customers when they wish to connect while mitigating some of the risks associated with customer uncertainty.

We describe in section 3.3 how our business plan includes an inventory of connections and options at our substations, with the latter providing an additional 26 GW of potential generation connections during RIIO-T3. Connections options may comprise of a full bay, civils only or additional land with an extended fence line. For our RIIO-T3 baseline we have made these decisions using our professional judgement having considered site specific considerations, such as the:

- overall confidence we have in our contracted background at the site or in the region
- the cost and deliverability of various options
- availability or duration of any relevant land options

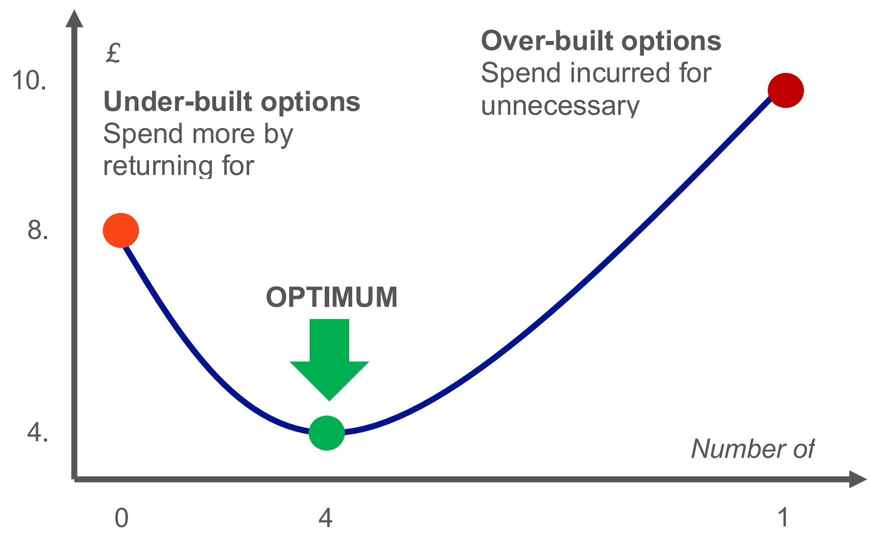
We must balance the need to deliver at pace with the associated costs to consumers. Building the optimum set of connections options will result in costs to consumers (both for delivery and avoided costs of delaying the connection of clean generation) that are lower than they otherwise would be if we had waited until each anticipated customer is ready.

To support more objective assessment, we are therefore developing a decision support tool for identifying the optimum set of options at each of our sites. The optimum is determined using sunk costs of the number of options and the likelihood of customer connections. It is further constrained by commercial and engineering considerations, for example the constraints of the site and surrounding land and future network access.

Figure 16 demonstrates an illustrative output from the tool under development. In this example, 10 customers are contracted to connect at a substation. Whole life costs are minimised if we build 4 options and consumers would incur higher whole life costs as we reduce or increase the number of options from this level.

We continue to refine the methodology and develop our people and processes to use it. Once our approach is sufficiently mature we will use it to inform decisions about the scope of the investments that will be funded through the RIIO-T3 uncertainty mechanisms.

Figure 16: Output from our maturing options assessment tool



During RIIO-T3 we also aim to decouple our land acquisition from our substation design process so that they run concurrently rather than sequentially. By running these two processes in parallel we aim to secure land ahead of connections queue project sanction so that land is available for pre-construction works as soon as our projects are ready to mobilise. This is intended to reduce the time customers spend waiting for a connection. We are requesting £8.27m in our RIIO-T3 baseline to pilot this process. This proposed spend is based on the current costs of negotiated land acquisitions when applied to projects that we expect to materialise within RIIO-T3.

In addition to investing strategically at our substations, we seek to apply the highest rated conductor when we invest to address enabling needs or needs identified through strategic plans. We consider the capacity identified by the NESO or current enabling work needs to be the minimum requirement and use intelligence from longer term planning tools such as our contracted background (adjusted for customer confidence) and our bespoke high electrification energy scenario (called Neptune) to identify the optimum capacity. When uprating any overhead line we consider its interface with the assets at the substation where the route terminates so that we do not cause loading issues and faults that require reinforcement work.

7.4. Competing factors and constraints

The previous section has described the steps and process followed in order develop and deliver transmission solutions in response to drivers. In reality the process is subject to a number of real-world factors and constraints, which need to be managed and addressed in the development process. Often these require a compromise between optimal engineering solutions, time to assess and refine options, and the imperative to deliver infrastructure quickly. A summary of some of the key factors are discussed in this section.

7.4.1 Uncertainty about needs and volumes

The needs of customers and the network are constantly changing and evolving, which means that a project rarely moves through the idealised process presented in Figure 15 from left to right. The current pace of change in our contracted background frequently introduces new needs at sites or on circuits and in some cases the need changes. We must compromise between slowing the pace of delivery to accommodate changing needs and freezing a scope of work to deliver a project. Consequently, there may be more optimal solutions but delivering on these would be at the expense of not delivering a solution.

We must also contend with the volume of customer connections across generation, demand and storage technologies that is unprecedented. As described in sections 3 and 6, not all of these connections will be needed, in fact most will not be required, and we must prioritise customers based on who is most likely to connect. Against this uncertainty, it is impossible to plan optimal sequences of work, outage requirements and resource allocations, although as we describe in section 8 we are developing decision support tools to assist with making low regrets decision that minimise whole life costs for consumers. Whilst Connection Reform and the current CP2030 assessments may create more certainty, these have not yet happened, and so development of projects continues to take place in a background where the need is vastly oversubscribed, and solutions are likely to be suboptimal.

7.4.2 Complex interactions between industry processes

The needs of the network are being assessed in several different processes, resulting in a complicated overlap of drivers. Whilst we have described our process to prioritise customer connections from the queue and the requirements identified from the NESO's network planning activities as separate processes, the impacts on the network cannot be isolated since the network serves both connection and power transfer purposes, and so assessments made on different bases can impact on the same circuits and substations. NESO studies are periodically reassessed and the energy scenarios used change annually. When combined with the pace of change in the contracted background of connections, there is a clear conflict between continually designing "optimal" solutions against changing needs, and crystallising decisions to allow delivery of a physical project with a clear scope.

Additionally, both the customer connection and NESO processes result in an element of "locking in" of certain parameters very early in the process that result in constraints on an idealised development process. The customer connection processes require commitment to a connection date and solution on the basis of a 30 day connection process, which does not allow for the full optioneering described.

The NESO planning processes were explicitly designed to make bold decisions to enable pace in the development of the network, based on very high level optioneering and development. Detailed post-hoc or hindsight assessments of options for both of these processes may well identify other potential solutions that could continue to be refined to achieve an “optimal” engineering solution – but will likely also then compromise the timescales desired by customers, and in the case of the NESO studies, compromise the achievement of Government targets and reduction of constraint costs to consumers.

7.4.3 Planning constraints and risks

Planning regulations drive the need to consider the risk and potential delay of achieving planning consent and are a key element on the timeline of any construction project. Development of overhead lines of 2 km or more in length is subject to the Planning Act 2008 in England and Wales (N.B. the planning requirements in Scotland are different and drive a different process). The Act requires extensive consultation with a wide range of stakeholders and then planning decisions are ultimately made by the appropriate Secretary of State. By contrast, substation developments are largely subject to the Town and Country Planning Act 1990 with decisions made by local planning authorities, but with rights to appeal to the Secretary of State.

The different legal bases between the Planning Act and the Town and Country Planning Act strongly influence our decision making on options. A key difference is that the Planning Act directs a preference for overhead lines, meaning that more expensive cable elements are limited to areas where environmental or local issues make that unavoidable. However, there is no similar preference relating to substations in the Town and Country Planning Act. As such, planners are not required to consider the cost of the solution in their decision making, which is focused on local amenity, environmental and ecological issues. There is therefore inherently more planning risk in seeking solutions known to be less popular for substations than there is for overhead lines.

Additionally, in the physical world, individual site or circuit decision do not sit in isolation and are impacted by other developments. With the pace of development of energy infrastructure, many areas of the country are impacted by multiple developments, both by transmission companies and our customers. The scale of development in a region has a significant impact on the perception of planning applications, and the need for developers to consider the cumulative impact of development as part of the planning process. As such, what may look like a logical solution when viewed in isolation may have significant difficulty in achieving planning consent given the scale of other development in a region.

7.4.4 Political and societal expectations

Increasingly, political and broader societal factors have needed to be taken into account, usually with an imperative of delivering infrastructure quickly in order to achieve broader societal goals. The most significant of these is the drive towards Net Zero, with evolving Government targets, including analysis of the current Government’s 2030 targets, which are being assessed in parallel with the development of our plan. These targets essentially define the achievement of Net Zero as being in the broader interests of the country and consumers, with focus on delivery against those targets. In addition, we have seen a number of important demand customers seeking connection and capacity to the network, including steelworks, battery “Gigafactories” and data centres, each with a drive for pace to secure investment into the UK and jobs for the communities around them.

7.5. Our approach and response to challenges

Many of the solutions presented in the RIIO-T3 business plan have already been developed, with the original needs being defined several years ago. As such they have been subject to the challenges and compromises identified above. NGET, often working with the rest of the sector, have been seeking to response to these challenges in a number of ways, in order to enable the processes to deliver the best value for consumers whilst delivering new transmission solutions in a timely manner. These include:

Table 19: Sector challenges

<table>
<tr><th>Intervention</th><th>Description</th></tr>
<tr><td>Connections reform</td><td>NGET has a clear vision for the reform of connections arrangements and has strongly influenced policy on:
Tackling the oversubscribed pipeline through the introduction of a gated connections process that raises the bar for new connections and better enables strategic network development
Moving from a ‘first come first served’ approach to connections to a ‘connect or move’ framework, through the implementation of Queue Management and advocating for stronger developer commitments
Enabling investment ahead of need e.g. through the connection options that are included in our investment plan
Creating a fast-track connection route with Government for critical net-zero projects
The customer confidence methodology that we have applied in the development of our RIIO-T3 business plan seeks to pre-empt the potential outcomes of the connections reform process.</td></tr>
<tr><td>Influencing the NESO’s planning processes</td><td>NGET is a key part of the tCNSP2 process because we submit transmission reinforcement options for assessment. Throughout the process we work with NESO to ensure a suitable selection of options. We also:
Work collaboratively with other TOs to ensure we have network options that optimal for Great Britain.
provide thorough and helpful responses to NESO methodologies
propose and support NESO with its Impact Assessments process as further development suggests changes to the HND and HNDFUE design</td></tr>
<tr><td>Adapting our business</td><td>We have created a new directorate which is leading the development and delivering of the requirements identified from the NESO’s network planning activities. This directorate is solely focussed on conducting detailed optioneering, consenting and delivery of these large and urgent projects. It is supported by a bespoke policy for development of these projects to ensure that they have the level of detail that is required at an early stage to support planning requirements.</td></tr>
<tr><td>Regional planning</td><td>As described in section 4, we have developed Future Network Blueprints that draw upon multiple sources of information and demonstrate the impacts of multiple drivers to identify holistic solutions that are robust to anticipated future needs of the network. This enables us to consider longer-term future requirements in the decisions we make today but before customers formally apply for a connection. This may not mean we include provision for them in the scope of investment decisions, but it does help us be cognisant of a possible future need and avoid foreclosing options that might be beneficial.</td></tr>
</table>

Within each of our RIIO-T3 EJPs we comment on relevant factors such as:

- Whether a project contributes significantly to the delivery of net zero targets
- The contractual dates by which we must deliver customer connections and their influence on our timescales and design decisions
- Design standards that must be adhered to which have impacted the timescale for its development
- Whether the project requires land or planning approval to proceed
- Whether there are specific supply chain or workforce constraints that impact the timescales for delivery
- How we have engaged with community stakeholders and incorporated their feedback into our decisions
- How we have planned or are planning for the outages needed for delivery.

8. Procurement, contracting and the role of competition

8.1. Procurement and contracting

Delivering our T3 plan will require a step change in our supply chain capacity. In addition to details provide in annex A03 Workforce and Supply-Chain Resilience Strategy, this will include the contractors who work directly with us to design, build and commission our RIIO-T3 plan.

This increase in scale is also occurring on a global scale, as other countries also embark on network expansion plans in the race to net zero, resulting in an increasingly constrained market, with capacity at historical levels impacting delivery times for equipment and shortages in skills.

Historically, TOs and the Regulator have relied on competitive pressure to secure consumer value and ensure costs are efficient. Changing market dynamics and shortages has let to suppliers, where oversubscribed having limited capacity to take on new projects. on a transactional basis.

To mitigate this situation, for the majority of our load related RIIO-T3 baseline we propose using strategic frameworks with benchmarked pricing, providing suppliers with a longer-term prospect for work. This provides our suppliers with a more stable order book with visibility on future workloads and geographical coherence, allowing them to skill up to meet demand.

Working with the other TOs, we have identified four areas to help address this challenge:

- **Certainty about long term network plans:** Continuing to working with our stakeholders (NESO, Ofgem and government) to identify future capacity needs through the CSNP and SSEP
- **Lock in supply chain capacity through advanced procurement:** Building on future plans, and providing a clear forward view on future capacity, ensuring our supplier can invest to meet expected demand;
- **Move away from Spot Purchasing and towards long-term strategic relationships:** Implementing a new paradigm whereby competition is used to establish strategic long-term relationships; and
- **Ensure collaboration:** Purse a joined-up approach to skill development – particularly those skills specific to building and operating electricity networks.

To advance our long-term vision, we have developed three ‘Signature Strategies’ for our largest asset classes by spend. These strategies articulate the need to secure supply chain capacity much earlier and to provide longer-term investment to grow future supply and are based on the following.

- **Workbook Analysis**: answering four key questions for each asset class. What are the major types of projects and the estimated volume of each? What level of certainty is held over both projects and project scope? What is the geographic distribution of the upcoming work? What are the estimated delivery dates across the RIIO-T3 period?
- **Supply chain market analysis:** What is the total and available supplier capacity for labour, equipment, and machinery for the RIIO-T3 period? What are supplier preferences for contracting and work allocation? What constraints do you anticipate?

Table 20 below sets out a summary of the outcome of this work for critical equipment, are embedded within each of the Signature Strategies where there are specific constraints, such as long-lead times, the overarching recommendation is to collaborate with Ofgem and industry peers to implement long-term strategies including programmatic capacity reservations to secure long-term supply of critical equipment.

The Workforce and Supply Chain Resilience Strategy Annex sets out our approach in detail.

Table 20: Our three signature strategies

Asset class	Signature Strategy summary
Overhead Line	Pivot to long-term portfolio commitments for major reconductoring projects and enable greater flexibility between self-perform delivery versus EPCs for Asset Health work. Collaborate with supply chain to address critical constraints in lineworkers through training and development programmes and setting contractual expectations for the safe operation of any subcontracted lineworkers (domestic or from overseas).
Substations	Scale substation delivery by enabling the supply chain to invest to grow and maximise how we use capacity collaborative contracting approaches depending on scope/complexity and regional long-term partnerships on the basis of specific KPIs.
Cabling and tunnelling	Pivot to a mix of collaborative commercial models to accommodate scope uncertainty with direct buried cables added to the partnership scope, and more collaborative models (e.g., EPCm, alliance) for complex tunnelling [redacted]

8.2. Competition

We have reviewed the investments in our business plan (both in the baseline and pipeline) to provide a best view of whether projects are eligible for Early and/or Late competition. Our assessment takes account of:

- Guidance received from the NESO and Ofgem to date on the criteria for the value of projects and whether they are new and separable.
- The interaction of our investments with the existing transmission network.
- The current maturity of our investments. Due to their level of maturity, several projects in our pipeline do not yet have a preferred option and so we are unable to make a definitive assessment on whether they meet the New and Separable criteria for early and/or late competition. This reflects the position taken in Ofgem's consultation on the competition pilot. Please note, there are some EJPs in our plan seeking pre-construction funding in our baseline plan for projects where there is not yet a preferred option.

8.2.1 Assessment Criteria

We have applied the following criteria to reach our best view of whether projects are or may be eligible and suitable for competition in the following order:

1. **Value:** We consider projects that we anticipate will be >£50 m for early competition and >£100m for late competition.
2. **New**: For investments that are part of routine asset health works across multiple assets (and/or regions), they are not eligible for competition. Investments that include replacing existing infrastructure such as reconductoring, extending or uprating on existing assets are not considered new as per NESO guidance.
3. **Separable**: Substation extensions and replacements are not practically separable and so we do not consider them as eligible for competition.
4. **Maturity:** For investments at an early stage of development, where there is no preferred option, we have not been able to conclude definitely on their eligibility. This is in line with Ofgem's consultation on a competition pilot which relies on the project being sufficiently mature with a preferred option. A further competition assessment can be conducted when the project is more mature.

Having assessed eligibility, we have considered other factors that could create consumer detriment – principally a delay to the project – when considering a best view of whether projects are suitable. Examples of such factors include where we have already started the planning consent process and/

or engaging with communities and a competitive process would delay customers connecting to the network or result in higher / longer periods of constraint costs.

Our Engineering Justifications Papers set out our assessment of the eligibility and suitability for early and late competition of the investments in our plan. Our categorisation of our baseline projects plus our categorisation of projects in our pipeline is summarised in Table 21 (includes projects >£50m and again this is based on our best view and may be subject to change).

Table 21: Competition assessment

Eligibility category	Relevant projects
Projects **meet** the criteria for early and late competition	[redacted]
Projects **meet** the criteria for early and/or late competition however **timely delivery of the project would be at risk** if the project is subject to a competitive tendering process	[redacted]
Projects **may meet** the criteria for early and/or late competition, however further development work is required to identify a preferred option. A further competition assessment can be conducted once projects are more mature.	[redacted]

[redacted]

Eligibility category	Relevant projects
	[redacted]
Projects are in flight and so are not suitable for competition	[redacted]
Part of project is subject to existing Ofgem competition consultation	[redacted]
Projects are not eligible for competition because they are not new or separable	[redacted]

[redacted]

Eligibility category	Relevant projects
	[redacted]

Eligibility category	Relevant projects			
Projects are funded through the ASTI framework and are exempt from competition	[redacted]	[redacted]	[redacted]	[redacted]

9. Project Delivery

We have developed a project control system to monitor and control project delivery to ensure that we are delivering investment safely, on time and to budget.

Our project control process is based on three principles that apply across all stages of project development:

- Establish a realistic and robust cost and programme baseline against which the performance of the project will be measured
- Ensure information is visible and accessible to project teams who are delivering the project
- Use the information about the project to manage budget, schedule, scope and contingency

9.1. Project Baseline

When a project is in development we establish a baseline which sets out the:

- **Scope** of work that needs to be completed
- **Budget** to which the project needs to be delivered, as determined by cost estimates
- **Plan** that the delivery must align, with informed by how long the project is likely to take to deliver

9.1.1 Monitoring the project baseline

9.1.1.1. Reporting framework

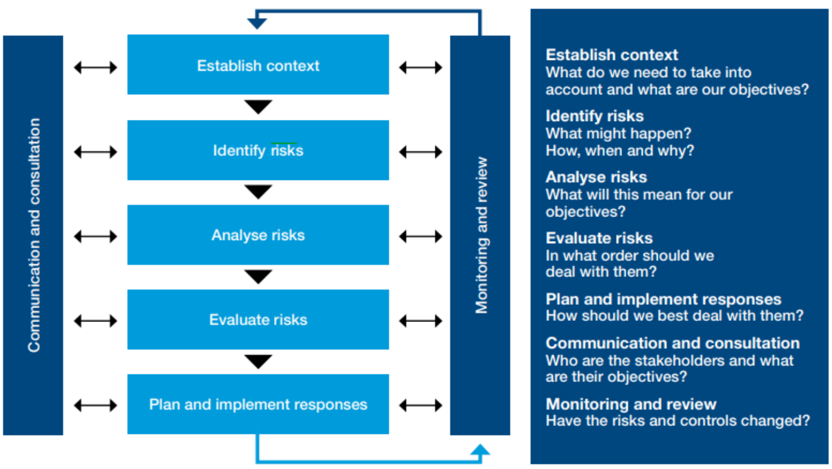
The performance of the project is then monitored against this baseline once it moves into the delivery phase. Changes to the baseline can only be made through controlled processes. Therefore, monitoring against the baseline provides us with an early indication of issues with performance against the agreed scope, budget and plan.

Once a project is in the delivery phase, the team for each project holds monthly meetings to review performance against the baseline. They also consider future risks and issues that could impact the successful delivery of the project. We also ensure that key stakeholders throughout our business have sight of how our projects are performing using a ‘three lines of defence’ model. Project teams report management information monthly which is reviewed by the relevant construction management team. Information on the performance of our portfolio of projects in delivery is reported to the Executive.

9.2. Identifying and managing risks to delivery

The following section considers how we identify and manage uncertainty and risks to project costs and timelines with the aim of minimising threats and maximising opportunities. We use an agreed project risk management process that is demonstrated in Figure 17.

Figure 17: Project risk management process



9.2.1 How we identify and quantify risks

During our project development phase we use information from previous projects and inputs from subject matter experts in risk workshops to identify and quantify risks. We consider several types of risk as standard and record them on the project's risk register:

We use qualitative and quantitative assessments to analyse risks. Qualitative analysis prioritises and ranks risks against a standard set of probability (i.e. likelihood of occurrence) and cost and duration impact criteria. Quantitative analysis determines cost confidence intervals. We assess minimum, most likely and maximum cost impact on the risks we have identified for the project and a percentage probability is used to assess the likelihood of each risk occurring. This information is used to build a cost-risk model that informs the project contingency budget. We determine contingency at P80 confidence level, i.e. we have 80% confidence that we will not exceed the contingency budget. This contingency value is agreed by the business when the project is sanctioned.

For major projects and programmes (e.g. those that are financially material or which contribute significantly to the achievement of Government targets) a 'Schedule Risk Analysis (SRA)' is performed using the same framework as used to determine cost confidence. In addition to delivering a robust project plan, this also demonstrates the probability of meeting the key dates which allows additional mitigations to be identified.

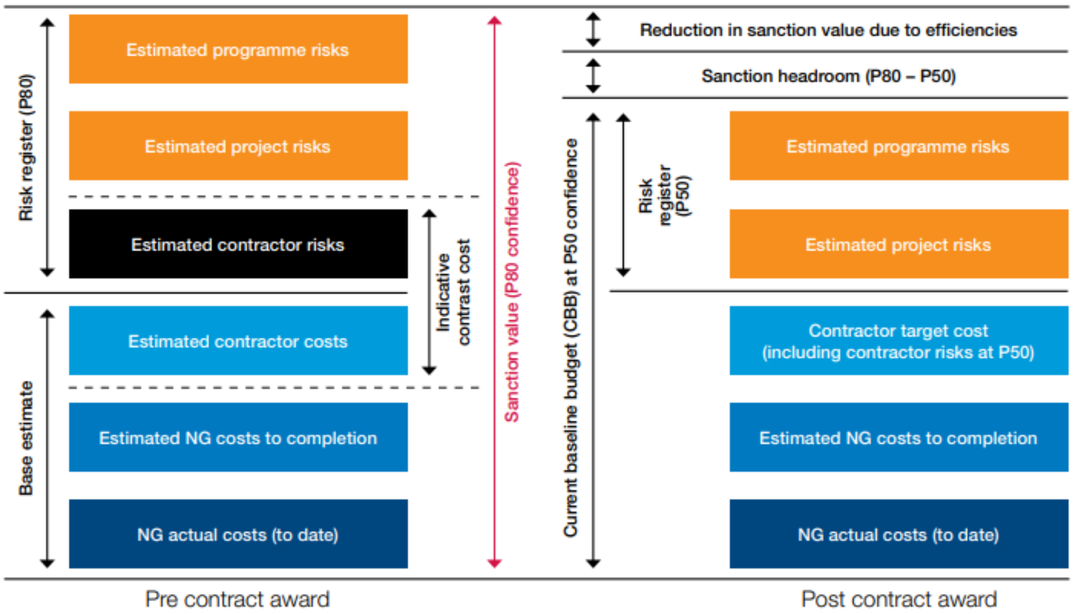
9.2.2 Ownership and management of risks

We identify a high-level strategy for each risk on the project's risk register alongside a risk response comprised of specific actions and risk owners. We allocate risks to the party that is best able to manage the risk; this may be the programme, the project or the contractor.

Once the project has been awarded to a contractor, we update the risk register to reflect the terms, conditions and risk allocation in the agreed contract. All contractor-allocated risks are removed from the register if they are included in the contractor's price.

The contingency budget may only be used for risks identified on the risk register. Anything else must be approved by the relevant committee (see Monitoring Outcomes section below). Once the project has been awarded to a contractor the contingency budget for use is set at P50 with the remaining headroom at P80 allowing for exceptional circumstances. The relationship between P80 and P50 cost contingency is demonstrated in Figure 18 below.

Figure 18: Project cost and contingency structure



Project risks are 'retired' through project delivery, as project risks are mitigated or do not occur during the anticipated time frame. Therefore, as the project is delivered, the risk forecast decreases and the surplus contingency budget can be classed as 'headroom' or returned to the business using change control (see Monitoring Outcomes section).

9.3. Monitoring outcomes

9.3.1 Project monitoring techniques

We monitor the costs, scope and timeliness of project delivery against the sanctioned baseline and the current baseline budget. The latter accounts for controlled changes. Several techniques are applied to enable us to monitor our projects. We use ‘work breakdown structures’ and more detailed ‘cost breakdown structures’ to capture and report the types of work needed, and the associated costs incurred to deliver a project in a structured way. We combine our cost monitoring with progress against the project plan to determine ‘earned value’. Figure 19 presents how earned value demonstrates how a project is performing in comparison with the earned value that is expected in the baseline at any given point in its lifecycle.

Figure 19: Monitoring costs

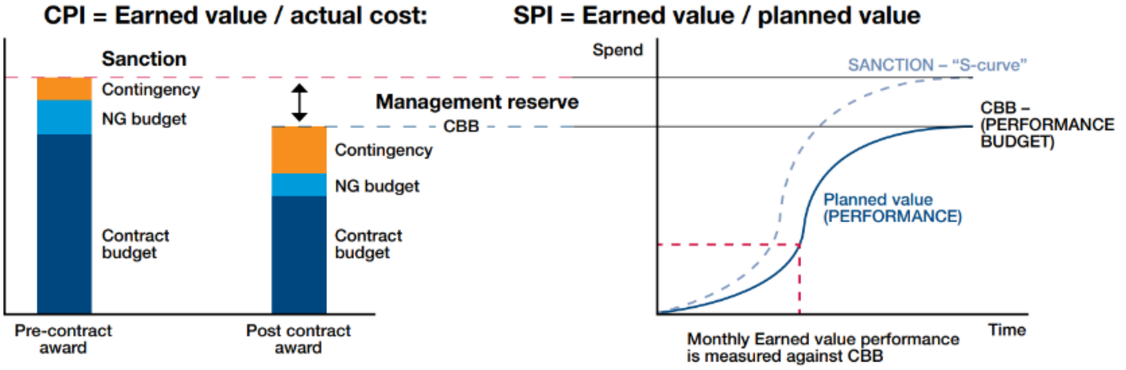


Figure 8.1 Measuring project performance

9.3.2 Portfolio monitoring techniques

All data used for project monitoring and reporting is held in our integrated core systems. This ensures that information shared in our reporting provides a comprehensive picture of the performance of our portfolio of projects.

Our ‘workbook’ contains a consolidated view of all of our projects that are currently in delivery and those that are currently being developed. Reports of the workbook data are used for monthly monitoring.

9.3.3 Resolving risks and issues

We use various forums to identify and resolve issues:

- Project teams review project scope, cost and schedule at their monthly meetings and identify the necessary steps to correct issues and mitigate risks. We also use root cause analysis to identify and prevent recurrence of known issues.
- Contractors may raise ‘early warning notices’ and we will seek to identify suitable mitigations.
- Heads of Construction hold monthly construction review meetings where they review all projects in delivery at portfolio level and assess if any changes are required.

If necessary, risks and issues can be escalated to more senior stakeholders in the reporting framework. If suitable corrective action or mitigations cannot ensure the project is delivered to the expectations set in the baseline then changes may be made. A change request must be raised when a project event is consistent with the following change control triggers show in Table 22.

Table 22: Change control triggers

Category	Type of change
Contingency	• Drawdown/ handback of project contingency above £200k • Any drawdown/ handback of programme contingency • Request for additional contingency
Baseline	• Any change to overall agreed baseline
Financial phasing	• Movement of more than [redacted] between financial years
Time	• Changes to any key milestones • Changes to any sanctioned date
Scope	• New scope to capital delivery • Removal of scope • Project-driven scope change

If a change needs to be made, then the level of governance that applies depends on its materiality, i.e.:

- **Project team** can manage low materiality changes and they can transfer proportions of the budget between different work books structures.
- **Project manager** may drawdown the project's contingency pot up to a maximum of [redacted]
- **Change Board** must approve drawdown of more than [redacted] from the contingency pot; moving key milestones; or using contingency held by the programme.

A project must be re-sanctioned by the relevant governance committee before the change can be approved if:

- The requested current baseline budget on the project will exceed the sanctioned budget
- the ACL (available for commercial load) date is delayed, or the closure paper completion date is delayed beyond the current sanctioned dates
- there is additional scope that was not identified in the latest sanction paper

If the change is agreed then the project baseline is updated and future monitoring is conducted against the updated baseline.

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