February 2025

Transmission Acceleration Public Consultation 2025

NESO response to the Electricity Networks Commissioner’s Report on accelerating electricity transmission network build.

NESO
National Energy System Operator

NESO response to the Electricity Networks Commissioner's Report on accelerating electricity transmission network build

Purpose of paper: This paper describes the approach and outcome of the NESO project to deliver the Outage Planning Actions (OP1 through OP4) as identified in the Electricity Networks Commissioner's Report on Accelerating Electricity Network Transmisson build.

Executive Summary

In June 2023 the Electricity Networks Commissioner – Companion Report Findings and Recommendations[1] (the Commissioner's Report) was published, this was followed in November 2023 by the Government response to the Electricity Networks Commissioner's report[2] on accelerating electricity transmission network build. Within the Commissioner's report, four recommendations were made in relation to Outage Planning which were assigned under the Government's response to NESO as the action owner.

In November of 2023, NESO initiated a project to deliver the Commissioner's Report outage planning recommendations, and this report sets out the approach and outcomes of the project. Following establishment of the project, it was extended to include representation from the GB Transmission Owners (TOs) at both the project management and project delivery team level. Within the project, four workstreams were established, each to progress one of the four outage planning recommendations.

Engagement with the Distribution Network Operators (DNOs) also took place during the course of the project including a combined briefing session held in early November 2024. Further dialogue continued with all interested stakeholders through one-to-one sessions, multiparty meetings & workshops and through forums hosted by NESO through 2024.

The outage planning recommendations within the Electricity Networks Commissioner report seek to deliver benefit across a number of different areas:

- Improved longer term strategic system access planning, optimised across years to both maximise the amount of system access that can be provided whilst maximising the amount of work that takes place within each outage.
- Improved plan stability to better support the optimal phasing of outages to maximise the amount of system access that can be provided.
- A review of system access risk management processes to identify opportunities to increase system access where risk mitigations exist.
- A focus on long term project design to ensure the holistic costs including the network constraint costs associated to the project build phase are taken into account to support an increased use of less intrusive methods such as off-line build and temporary circuits where benefits can be realised to allow more work to progress.

Outcomes:

The four workstreams (OP1-OP4) outcomes are set out below:

- OP1 Winter Emergency Return to Service (ERTS): All outages of transmission assets have an ERTS time provided by the TOs as part of the outage agreement process. This ensures that during an emergency, the timescales by which assets can be returned to service is understood. This is a factor that is particularly important during the winter, when system

1 Electricity Networks Commissioner – Companion Report Findings and Recommendations
2 Transmission Acceleration Action Plan: Government response to the Electricity Networks Commissioner's report on accelerating electricity transmission network build

demands are higher and there can be periods where the amount of extra available generation capacity in comparison to system demand can become lower. A new way of working has been identified that allows NESO and the TOs to schedule outages on transmission assets with longer ERTS times than was previously permitted during the winter. A risk assessment based approach has been trialled over the last year which will facilitate more outages through the winter season. This involves a robust risk assessment showing that for the whole duration, there is sufficient generation elsewhere to satisfy the GB demand.

- OP2 SQSS Risk Review: NESO operate the TO's assets within risk criteria set out in security and quality of supply standards (SQSS). These rules set out the acceptable tolerances for the system voltage, frequency, thermal loading and many more characteristics of the network. A review of the SQSS standard was undertaken to identify areas where a change in approach to risk management could be adopted that would allow more outages to proceed whilst still ensuring that the operational security was not unreasonably impacted. A framework for temporary relaxation of operational rules on a local level to facilitate outages is proposed, with a probabilistic risk assessment and mitigations to ensure system security. This would allow outages to proceed where it is in the wider interest of consumers and any increased risk can be mitigated. Furthermore, following a review of acceptable voltage standards an opportunity for a small relaxation to the steady state[3] voltage standard for the 275kV network was identified which will also support increase system access.
- OP3 Long Term Project Design: A process was followed to understand and enhance the existing project costing methodologies utilised by the TOs and NESO. All parties have agreed a process for incorporating, in better detail, forecast network constraint costs for different build options into the total project cost. This allows for an improved estimation of the total cost to consumers of reinforcement works. There are proposed changes to System Operator Transmission Owner Code[4] Procedure (STCPs) 16-1[5]: These modifications would ensure the holistic costs of long-term construction projects include a more detailed forecast of the network constraint costs associated to the build phase of the project. Which would then in certain cases provide the financial case for project designs incorporating off-line build and temporary circuits which will allow more work to progress overall.
- OP4 Outage Planning Process Review: A review of the outage planning process was undertaken by NESO and TOs with the aim to improve the coordination of outage requirements, provide increased long term system access planning and increase plan stability by reducing foreseeable short term changes to an optimal outage plan. Across this activity, 28 actions and recommendations have been identified. The project highlighted the need to improve long term strategic planning and propose a review of resourcing levels, technical changes to process, review project approval process, and a review contractor arrangements. Actions and recommendations are proposed to improve plan stability

3 Steady state refers to an operating condition where the system is stable and network parameters are operating within a defined range.
4 The System Operator Transmission Owner Code (STC) defines the relationship between the transmission system owners and the system operator.
5 STCP16-1 Investment Planning

centred around improving co-ordination with remote field teams, improved terms of reference for system access meetings, a review of generator outage arrangements, and technical process around outage readiness. Further recommendations were identified to provide greater transparency of the performance of the system access process to support optimal plan build and manage plan stability, with the aim of supporting the maintenance of an optimal plan that will deliver increased system access.

This paper explains the process that the project team followed setting out the problems statements, engaging with the stakeholders and reaching the outcomes stated above. To meet the requirement of the Electricity Commissioner's Report, senior stakeholder support will be required from the Transmission Owners and other industry parties (Generators, DNOs and directly connected customers).

Further to the above, the Government's Clean Power 2030 Action Plan[6] was published in November 2024 which sets out UK Government's ambition for Great Britain to be supplied with clean power by 2030.

Support in expediting the approval of proposed Code Changes will be required to deliver the actions necessary to support the areas of outage planning and accelerate transmission build to deliver a clean power system by 2030.

6 Clean Power 2030 Action Plan: A new era of clean electricity

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Consultation Questions

We welcome your feedback on the proposals outlined in this document. To help guide your response, please see below the key policy questions that we are seeking your views on.

Ref	Policy Questions	Section
1	Do you agree with the proposal to extend the Emergency Return to Service process into the winter months to allow greater access to the network?	3 OP1 - Winter ERTS
2	Do you agree with the recommendations identified in the report to modify the Security and Quality of Supply Standard (SQSS) to seek additional outage opportunities?	4 OP2 - Security and Quality of Supply Standard
3	Do you agree that constraint costs should be included in the assessment of various build options, and that they should be included in the currently developing CSNP methodology?	5 OP3 - Long Term Project Design
4	Do you agree that the implementation of the actions and recommendations for outage planning will lead to a better long term plan and increased stability to the short term plan?	6 OP4 – Outage Planning

List of abbreviations

BESS	Battery Energy Storage Systems
CSNP	Centralised Strategic Network Plan
CP2030	Clean Power 2030
CUSC	Connection And Use of System Code
DESNZ	Department for Energy Security & Net Zero
DCC	Directly Connected Customer
DNO	Distribution Network Operator
DSO	Distribution System Operator
DC	Double Circuit
ENCC	Electricity National Control Centre
eNAMS	Electricity Network Asset Management System
ERTS	Emergency Return To Service Time
GW	Gigawatt (1,000,000,000 Watts)
IEC	International Electrotechnical Commission
kV	Kilovolt (1,000 Volts)
MITS	Main Interconnected Transmission system
MVArh	Megavolt-Amperes Reactive Hour
MW	Megawatt (1,000,000 Watts)
NETS	National Electricity Transmission System
NESO	National Energy System Operator
NGET	National Grid Electricity Transmission
NOA	Network Options Assessment
Ofgem	Office of Gas and Electricity Markets
OFTO	Offshore Transmission Owner
OnCom	On Completion
OP	Outage Planning
OHL	Overhead Line
pu	Per Unit
SHE-T	Scottish Hydro Electric Transmission

SPT	Scottish Power Transmission
SQSS	Security and Quality of Supply Standard
SSEP	Strategic Spatial Energy Plan
SAM	System Access Meeting
STC	System Operator Transmission Owner Code
STCP	System Operator Transmission Owner Code Procedure
TO	Transmission Owner

1 Introduction and Background

1.1 Electricity Networks Commissioner's Report

In June 2022 the Electricity Networks Commissioner was appointed and tasked with providing advice to the Government on how to reduce the time it takes to deliver transmission infrastructure in Great Britain.

The Electricity Networks Commissioner's Companion Report[7] (the Commissioner's Report) was published in August 2023, presenting the findings of the review (chaired by Nick Winser) on how to accelerate the deployment of electricity transmission infrastructure to deliver the Government's ambitions for Net-Zero emissions by 2050. The overarching purpose of the Commissioner's Report is to identify methods to streamline the end-to-end planning and delivery process of transmission infrastructure projects from, 12-14 years, down to 7 years.

The Government published its response[8] to the Commissioner's Report in November 2023. Within the report there are a number of specific actions that sit directly with the National Energy System Operator (NESO) to lead, these are:

- Strategic Spatial Energy Plan (SSEP)
- Route Design Standardisation
- Cost Benefit Analysis
- Outage Planning

1.2 Outage Planning Recommendations

The Commissioner's Report recognises that there are challenges to address in securing access to the network, leading to congestion and ultimately delaying the delivery of key projects. As such it makes four recommendations for Outage Planning (OP1 – OP4) that are intended to help manage the risk of delivery. For each of the recommendations the report also provides a commentary on how they shall be implemented.

The NESO Transmission Acceleration Project was set up to deliver the Outage Planning actions. The project was structured with specific workstreams for each of the recommendations and included representation from NESO and the TOs.

1.3 Clean Power 2030

Following the publication of the Electricity Commissioner's report in 2023, the UK Government has set out a renewed vision to achieve a clean power system by 2030, five years earlier than had been planned by the previous Government. This is set out in the Government's Clean Power 2030

7 Electricity Networks Commissioner – Companion Report Findings and Recommendations
8 Government response to the Electricity Networks Commissioner's report on accelerating electricity transmission network build

Action Plan[9] which was published in December 2024 following advice from the NESO. To achieve this will require rapid deployment of additional new clean energy capacity across the whole of Great Britain:

- 43-50 GW of offshore wind
- 27-29 GW of onshore wind; and
- 45-47 GW of solar power

This will be complemented by flexible capacity, including:

- 23-27 GW of battery capacity
- 4-6 GW of long-duration energy storage, and
- development of flexibility technologies including gas carbon capture utilisation & storage, hydrogen, and substantial opportunity for consumer-led flexibility.

NESO was formally commissioned by the Secretary of State and the Department for Energy Security and Net Zero (DESNZ) to provide independent advice on the pathway towards the 2030 ambition. NESO developed pathways, with expert analysis about the location and type of new investment and infrastructure needed to deliver it. Achieving clean power by 2030 is a huge challenge that will only be met by doing things differently, by prioritising pace of delivery, and by working together across the industry towards a shared vision.

To achieve the Clean Power 2030 Action Plan, network build must proceed at more than four times the rate of the last decade, delivering twice as much in half the time, leading to an increased requirement for system access.

Progressing the actions contained withing the Electricity Commissioners Report will put NESO and the TOs in a better position to be able to deliver on the obligations under CP30. Each of the 4 actions (OP1 to OP4) will contribute to streamlining processes and/or developing innovative ways to grant access to the transmission network.

NESO and TOs will be in a strong position to facilitate the network transformation by making changes to winter outage placement and application of the SQSS. Also, through changes to the long-term costing process and the management of planning workload

9 Clean Power 2030 Action Plan

2 Transmission Acceleration Project

In November 2023 the Electricity System Operator, which was the predecessor to NESO, established the Transmission Acceleration project to deliver the Outage Planning recommendations as identified in the Commissioner's Report with representation from NESO and the TOs.

The Project was structured with a workstream for each of the four Outage Planning Recommendations.

2.1 Governance and Reporting

2.1.1 Project Level

A working level project board was established with the TOs, led by the system operator. This met on a weekly basis to review progress across the four workstreams. As noted above, the Electricity System Operator (ESO) predates NESO and in respect of this project has an identical remit. NESO is a publicly owned company with independence from government and which was formed in October 2024 and has system operation responsibilities across the entire GB network, just as the privately owned ESO did. In order to avoid confusion and duplication, the system operator will be referred to as NESO through this document, whether the activity being described is before or after NESO formation.

2.1.2 Electricity Network Delivery Forum

Within NESO the project reported into the project sponsor, the System Operations Head of Network Access Planning, and upwards into the Electricity Networks Delivery Board (ENDB) and the Electricity Networks Delivery Forum (ENDF) via the NESO Director.

Regular (monthly) updates were provided into the EDNB by the Project Manager/Project Sponsor.

Similarly, the TOs provided updates into their representatives on the ENDB and ENDF.

2.1.3 DESNZ

Monthly review sessions were held with DESNZ to report on progress and to flag pertinent flag risks and issues.

2.1.4 Ofgem

Bi-monthly review sessions were held with the Chief Engineer (Ofgem) to report on progress and to flag pertinent flag risk and issues.

2.1.5 Governance and Reporting Structure

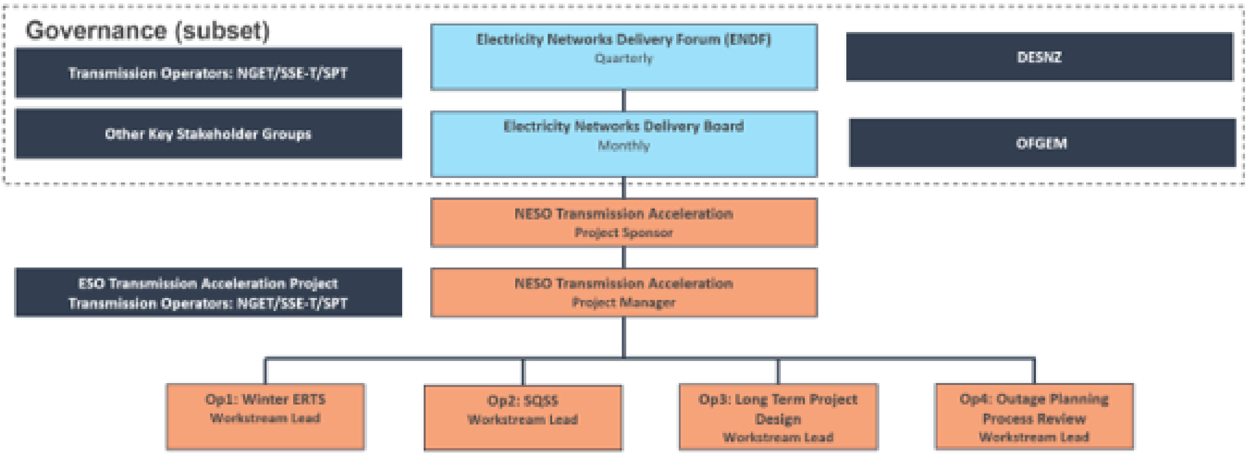

Figure 1: Project Governance

2.2 Project Structure

The project was structured with a specific workstream created to address each of the four recommendations:

- OP1 – Winter Emergency Return to Service (ERTS)
- OP2 – Security and Quality of Supply Standard (SQSS)
- OP3 – Long Term Project Design
- OP4 – Outage Planning

Each workstream was assigned a lead and a NESO project manager was appointed to oversee the delivery of the project.

2.3 Extended Project Team

The project delivery team was extended across NESO and the GB Transmission Owners to ensure a joined-up approach for the delivery of the recommendations.

2.4 Project Outcomes Summary

The outcomes from the workstreams range from:

- The immediate (Winter 24/25) implementation of a new process (OP1)
- Recommended changes to the System Operator Transmission Owner Code Procedures (STCPs):

    - STCP11-1[10] Outage Planning; and
    - STCP16-1[11] Investment Planning (OP1 and OP3)
- Recommended changes to the Security and Quality of Supply Standard (SQSS) (OP2)
- Post project actions and recommendations to be implemented through 2025 (OP3 and OP4)

Refer to the subsequent sections of this report for the specific details for each workstream.

2.5 Report Structure

The following sections of this report set out the approach taken by each workstream to deliver the Outage Planning Recommendations and broadly follow a standardised structure:

- Introduction

  Sets out the background for the area which the Electricity Commissioner's report action has been assigned against.
- Current Position and Challenge

  Describes the current/starting position that the Commissioner's Report has identified as requiring attention, in doing so setting the scene for the approach taken to deliver the recommendation.
- Commissioner's Report Recommendation

  The recommendation and Implementation as described in the Commissioner's Report are captured here.
- Approach

  Each workstream's approach is specific to the Commissioner's recommendation and is described to support the delivery of the workstream outcomes.
- Workstream Recommendations

  Details the proposed outcomes of each workstream. These sections also include the specific actions and recommendations from the workstream.
- Benefits

  Summarises the benefits that will be achieved by implementing the workstream proposals.

10 STCP 11-1 Outage Planning
11 STCP16-1 Investment Planning

3 OP1 - Winter ERTS

3.1 Introduction

NESO uses the Balancing Mechanism[12] and trading, to ensure that demand and generation remain balanced, and that the system frequency stays within statutory limits. Forecast national electricity demand and available generation are closely monitored through the year. The difference between the two, while accounting for losses, breakdowns, and reserve generation, is known as system margin.

When transmission assets such as overhead lines, cables, supergrid transformers[13] and busbars are taken out of service it is known as an outage, and the capability of the network to transfer power from one part of the network to another can be reduced. This is known as a network constraint. These network constraints can restrict the overall generation capacity available to meet national demand and have the potential to contribute to a shortfall in generator margin. The time required to return transmission assets to service in an emergency is known as the Emergency Return to Service (ERTS) time.

The time it takes to return transmission assets to service in an emergency can range from minutes to days, depending on the type of work involved. This ERTS time is determined by the transmission owner based upon the specifics of the work they are undertaking. In some cases, the option to return the asset to service in an emergency is not available. These are known as On Completion (OnCom) outages as there is no option to return them until the planned work has completed. Every transmission outage in winter is carefully assessed to ensure that generation restriction is either avoided entirely, or that a plan is in place to remove the restriction in an emergency.

3.2 Current Position and Challenge

3.2.1 Winter ERTS

The Winter Period is defined in STCP 11-1[14] as the period spanning from week 45 of the calendar year to week 9 of the next (November until the end of February). In the past, any outage in winter that restricts generation, or puts generation at increased risk with an ERTS greater than 24hrs would generally be avoided. More frequently, in recent years a risk-based approach has been applied, and longer ERTS outages have been planned when checks and mitigations have been explored, and the risk has been deemed to be acceptable. The OP1 workstream has focused on the review and implementation of a risk-based approach with checks and mitigations put in place. NESO and the TOs agree with the Electricity Commissioner's recommendation that a review

12 Balancing Mechanism
13 Supergrid Transformer is a key piece of transmission equipment that increases (steps up) or decreases (steps down) the voltage on the network.
14 STCP 11-1 Outage Planning

of the approach to outage planning in winter and taking a risk-based approach to accepting transmission outages with longer ERTS times, will allow more outages to be planned through winter. This in turn will allow projects and schemes to progress through winter that in the past would not have been possible. Early analysis of the output from this recommendation shows that the new process could allow 60 additional weeks' worth of outages through the winter period. This figure was determined by demonstrating the volume of outages that were progressed through the new winter ERTS process. These are outages that otherwise would be rejected but were accepted based upon analysis performed with the outlined constraint and margin calculations.

3.3 Electricity Commissioner's Recommendation

The Electricity Networks Commissioner's Report Recommendation and suggested implementation approach for this action are listed below.

3.3.1 Electricity Commissioner's Recommendation

Review and regular update of the guidance for the type of outages that can take place at different times of the year should be undertaken. For example, an outage with an Emergency Return to Service (ERTS) of greater than twenty-four hours may be permitted in winter where the system risk is deemed acceptable, following a transparent risk assessment process. This is intended to provide more balance between outages in summer and winter and allow more outages to be agreed throughout the year, where the system risk is deemed acceptable.

3.3.2Electricity Commissioner's Implementation

A risk-based approach has been applied over the past winter to facilitate more outages. Cooperation between NESO and TOs has facilitated this change. To meet 2030 targets this approach can continue and updates to the System Operator Transmission Owner Code (STC) laying out the methodology can support this. Resources and effort from NESO and TOs would be required to implement this approach, including its design, validation and on-going review.

3.4 Workstream Approach

A review of the current end to end process for managing winter ERTS outages was undertaken to identify opportunities to enhance information sharing between NESO and the Transmission Owners (TO) and help with winter outage planning. At the same time, internal NESO workshops were held to consider options that would allow outages with longer ERTS times to be planned. The output of these sessions was a red, amber, green (RAG) status of transmission circuits that will be shared with the TOs, providing them with guidance on the circuits that are likely to have a greater impact on generator margin. Different options and assessment criteria were developed for a risk assessment-based approach to long ERTS transmission outage planning. During the development phase TOs were consulted on the proposed changes, with their views and feedback considered as the process was developed. The draft process was shared with key stakeholders at NESO for review and feedback. Finally, the required internal process changes and proposed STCP 11-1 updates were documented.

Refer to figure 2 for a high level Gantt Chart of the OP1 activities, which start with the establishment of NESO project teams, process mapping, risk review and the categorisation of high, medium and low impact circuits. The project early stages also included a review with the modelling team responsible for the generator margin forecast data. The latter stages from June onwards were utilised for stakeholder consultations and reviews, in parallel with training and documentation updates. The final months of the programme were reserved for trial and implementation of the process

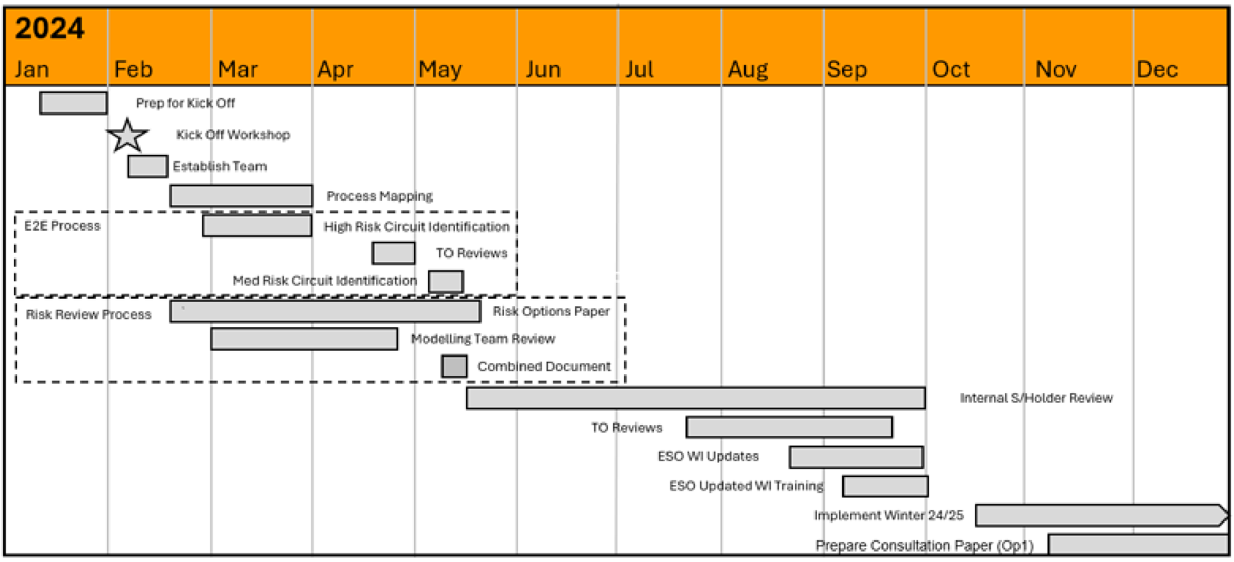

Figure 2: OP1 Workstream Gantt Chart

3.5 Workstream Recommendations

3.5.1 Winter ERTS Summary

The Electricity Commissioners report put forward a recommendation to review the type of outage that can be planned in winter. The following sections describe the output from the OP1 workstream and the approach that will be taken for different situations and types of outage.

The general approach to increasing the number of outages during the winter period is to setup a risk assessment process. The impact of an outage has on system operation can vary considerably depending on several factors including the ERTS time, outage duration and types of generation that are restricted. The OP1 workstream recommendation is that NESO can accept transmission outages on the network with longer ERTS times by completing the risk assessment set out in section 3.5.23.5.2 and closely monitoring margin forecasts. An important consideration in the risk assessment will be whether relevant transmission outages can be returned to service when forecast show that there is a risk of generation shortfall to meet demand in the days ahead.

Any constraint that restricts conventional generation will decrease the generation capacity available that may be required to meet demand during a low wind period. This is significant because during a low wind period we are more reliant on other forms of generation to meet demand. Therefore, outages with long ERTS that restrict conventional generation would not normally be accepted. However, if the outage was short, only for a few days, then it may be possible to proceed if the generation margin forecast was favourable. This would require a certain amount of flexibility in the start date, so that the outage could be delayed if for example the wind forecast was low and there was a shortage of generation in the margin forecast.

Where the constraint is in a region of high wind generation, a transmission outage with a long ERTS can be accepted provided that offline assessment shows a minimum of 40% of the wind capacity can be exported from the constraint group. This is because constraints that restrict wind generation are unlikely to be active during low margin periods. The risk of a shortfall in generation to meet demand is highest when wind generation output is low. If a proportion of the total wind capacity can be exported, the transmission outage and associated constraint will not pose any additional risk to generator margins.

The workstream also considered how outages that impact interconnector flows should be treated. Interconnectors enable electricity to flow between electrical grids, and the interconnectors that link the GB network to other countries play a significant role in ensuring the safe, reliable, and efficient operation of the energy system. A risk assessment will be required before accepting transmission outages that restrict interconnector flows. Any restriction to interconnector imports to GB have a direct impact on system margin and will be treated in the same way as a generator restriction. Restrictions to interconnector exports do not impact GB margin but could impact margin in other countries and could result in very high cost balancing mechanism and trading actions being required by NESO to ensure that the network is operated securely.

Depending on the outage, there are a number of different factors that determine the risk. Therefore, every transmission outage with a longer ERTS time, that causes a generator or interconnector constraint, will only be considered following a risk assessment process, the results of which are available to the TOs in the interests of transparency.

3.5.2 Increased ERTS

NESO continually monitors levels of forecast demand and available generation capacity. When the generator margin forecasts show an increased risk of generation shortfall, transmission outages can be recalled to service to prevent further restriction contributing to the potential shortfall. Under the Op1 workstream proposals and process changes, outages with longer ERTS times will be monitored carefully alongside the generation margin forecasts to ensure that they are recalled to service in time. Increasing the acceptable ERTS time increases the exposure to margin forecast error. The margin forecast error is driven by uncertainty in the interconnector flow, generator availability, demand, and wind generation. As an exercise to test the new process the daily margin forecasts from winter 22/23 were checked to see if an outage with ERTS greater than 24hrs would have been correctly recalled given the forecasts issued compared with the resulting generation margin. The results showed that if an outage with a long ERTS had been planned, there would have been sufficient time to recall it when tight margin periods occurred.

A risk assessment process will be completed for all outages planned in the winter period that have an ERTS time greater than 24 hours. A Winter Risk Policy form will be used to capture the information provided by both NESO and the transmission asset owner. The list of information required for the risk assessment is listed below.

- Description of work and associated system issues,
- Summary of approaches considered, and proposed approach,
- Work criticality,
- What are the impacts of delaying or not completing the work?
- Mitigation of operational risk
    - Timing, why does the outage need to be planned in winter?
    - Can arrangements be put in place to reduce and/or profile the ERTS through the outage period?
    - What checks have been completed to confirm that ERTS times can be met?
    - Have the ERTS times been checked and confirmed with site in delivery timescales?
    - What other options have the transmission asset owner considered to mitigate operational risk? (For example: extended working hours, works bundling, enhanced circuits rating, network reconfiguration, operational tripping schemes)
    - Are there any conflicting outages that could be deferred or recalled?
- NESO constraint information

- Outage description, dates, ERTS time, outage reference number
  - Network boundary constraint limits,
  - Enhanced ratings,
  - System security, faults and overloads, constrained volume, total generation capacity, wind capacity, synchronous generation capacity, group demand,
  - Scenarios considered,
  - Generation outages, have any outages been aligned with generation outages.
- Record of decision
  - Conclusion of agreed approach,
  - Summary of agreed changes or actions by the transmission owner and NESO.

All restrictive transmission outages with ERTS greater than 24hrs will have a completed Winter Risk Policy form. Before the transmission outage can proceed all details and risk mitigation captured in the Winter Risk Policy form will be reviewed and approved before final approval.

3.5.3 ONCOM Outages

Depending on the type of work involved, some transmission outages do not have an Emergency Return to Service time (ERTS). The transmission asset is unavailable until the planned work has been completed. These transmission outages are referred to as On Completion (OnCom) outages. If an OnCom outage causes a network boundary constraint that restricts generation, it is not possible to return the asset to service and remove the restriction in an emergency. Planning OnCom outages in winter requires careful assessment to avoid a situation where generation is restricted due to a network boundary constraint and prevented from contributing to meeting national demand when there is a need to do so during a low margin period.

As with transmission outages with ERTS times greater than 24hrs, a risk assessment will need to be completed for ONCOM outages, to document all checks, mitigations, and final approval. During winter, ONCOM outages that restrict synchronous generation are unlikely to be accepted unless the outage duration is short, and the generation restriction is small. For ONCOM outages of 5 days or less, a forecast of demand and generation can be used to assess the risk of generation shortfall during the period, and a decision to proceed or delay can be made before any work commences. Outages of 5 days or more are less likely to be accepted because the forecast generation output, mainly from wind generators, has much greater uncertainty.

An ONCOM outage that restricts wind generation is acceptable as long as at least 40% of the wind capacity can still be exported from the constraint group. Since low margin is likely to occur during low wind periods, and a wind constraint would not be active during low wind, a transmission outage and the associated constraint that only limits a proportion of the wind generation would not introduce a significant risk. If a good proportion of that wind capacity can still be exported from a group, then the outage would never become a contributing factor to insufficient margin.

A scenario is possible where wind is low across most of the country but high in a small area. If this high wind group was restricted by an ONCOM outage, then this could reduce export from the constraint group and lead to insufficient margin. For example, a scenario with low wind across GB, except for an area of high wind in the far north of Scotland, restricted by an ONCOM outage. The likelihood of this scenario is low, and the 40% minimum capacity restriction mitigates the risk.

If a constrained generation group contains both synchronous and wind generation, then typically the full synchronous generation capacity and a minimum of 40% of the wind capacity will need to remain unrestricted for an ONCOM outage to be agreed.

Since ONCOM outages cannot be returned to service in an emergency, a general rule of one ONCOM transmission outage on any one constraint boundary is required to ensure that the total reduction in constraint capacity is limited. The size and duration of the restriction will be assessed on a case-by-case basis using the risk assessment process.

3.5.4 Interconnectors

Long duration ONCOM transmission outages that restrict interconnector flows will generally be avoided in winter. Restricting interconnector flows from other networks to GB has a similar impact to restricting synchronous generation on the GB network from a national margin viewpoint. On days of low wind generation, an interconnector restriction could contribute to insufficient overall generator margin. Restricting interconnector export flows does not increase the risk of low margin in GB, but it can have an impact on other European networks. Managing export restrictions through the balancing mechanism and trading can result in very high balancing costs when other networks are short or become impossible to secure the trading volume required.

3.5.5 Actions and Recommendations

3.5.5.1 Proposed Change to STCP11-1

Recommendation OP1_1: It is proposed that paragraph 6.4 of STCP11-1 be modified as detailed below:

Currently documented as:

> The types of faults on the National Electricity Transmission System in winter tend to have a greater potential for longer repair times and there is a greater potential for circuits to be recalled to secure the Transmission System against severe weather conditions. All Outages placed in the Winter Period that have an Emergency Return to Service Time greater than 24 hours must be pre-approved by both The Company and the relevant TO. (See Appendix D - Emergency Return to Service).

Replace with:

> The types of faults on the National Electricity Transmission System in winter tend to have a greater potential for longer repair times and there is a greater potential for circuits to be

recalled to secure the Transmission System against severe weather conditions. All Outages placed in the Winter Period that have an Emergency Return to Service Time greater than 24 hours, and restrict generation, must have a completed Winter Risk Policy form. The form will capture the nature and criticality of the work along with details of completed mitigating actions. NESO will provide details of the constrained generation. The agreed approach will then be signed off and retained for future reference. The Winter Risk Policy form will be used for at all stages of the planning process to assess the risk of longer ERTS outages in winter.

Owner: NESO

Estimated completion: 3-6 Months.

3.6 Workstream Benefits

With the above benefits unlocked, and with the winter months being utilised for a risk assessed placement of outages that would not otherwise have been viable, it is forecast that 60 additional weeks' worth of outages can be progressed. This is an equivalent 420 days of outages and will invariably be made up of a small number of lengthy outages and a larger number of short duration outages. This calculation has been done by making a comparison between previous years when this process was not followed and the 2024/2025 winter.

The network transformation impact of this process is relatively pronounced. Transmission reinforcement schemes, and other works requiring major transmission network outages through the winter are required to optimally modernise the network. A number of the reinforcement and upgrade projects across all 3 onshore transmission networks span several months or in some cases years. Having the winter months available for construction activities can reduce the overall duration of schemes. This is because the contractors do not have to spend time and planning resource with preparing to return assets over the winter.

These circa. 60 weeks of network outages through the winter would otherwise have to be planned outside of this winter time window and the knock-on impact would be significant. If not implemented, scheme delays and planning congestion would slow down the network upgrades, including the connections and reinforcements required to achieve for CP30.

This recommendation by the Electricity Network Commissioner instigated a formal investigation into the optimal use of outage planning in the winter months. As a result, both NESO and the TOs are now satisfied that this risk based approach can become business as usual going forward.

4 OP2 - Security and Quality of Supply Standard (SQSS)

4.1 Introduction

The Security and Quality of Supply Standard sets out the criteria and methodology for planning and operating the National Electricity Transmission System (NETS). This defines the criteria under which the network must be operated in steady state[15] conditions and following network faults (post fault conditions). The SQSS covers thermal, voltage and stability standards across England and Wales (E&W) and Scotland. The SQSS also caters for different background conditions using the concepts and terminology of 'normal' and 'adverse' conditions. Depending on conditions such as, high winds, lightning, high and low ambient temperatures and the perceived likelihood of a major event occurring; the criteria can tighten across GB through the declaration of 'adverse conditions'. The decision to operate to adverse conditions criteria is made by NESO in agreement with the TOs. This declaration of adverse conditions is however infrequent. If 'adverse conditions' are declared, then the operational criteria temporarily become more stringent. In Scotland the change is more stringent and impacts all standards, whereas in E&W there is only an impact on the thermal criteria. The differences to the operating criteria in Scotland are referred to in the document as 'Normal' or 'Adverse' working conditions.

Within the SQSS, there are a range of credible faults that could occur on the network, and these are broken into three main categories which include a single circuit fault, double circuit fault and busbar fault criteria. Often the layout of the network connects two substations with two adjacent circuits connected to the same tower (pylon). If the fault occurs on one side of the circuit, then this is classed as a single circuit fault. If the fault occurs simultaneously on both sides of the circuit, then this is classed as a double circuit fault. Within substations, circuits are connected at a central point known as a busbar which allows power to be transported across different circuits. If a fault occurs at this central point within a substation, it will disconnect all circuits attached to the busbar and this is known as a busbar fault or a mesh corner fault.

4.2 Current Position and Challenge

NESO uses offline modelling to represent the network and will simulate hundreds of faults to understand the potential impact of those faults and ensure the network remains within the defined criteria. The defined criteria outline the maximum number of customers (the demand, usually expressed in MW) that are permitted to be affected and it dictates the maximum impact on voltage permitted following the various fault types. Currently, if any violations are observed in offline studies against the SQSS criteria, then system access may be restricted through the rejection of specific network outages or the combination of them that would cause the violation.

15 Steady state refers to an operating condition where the system is stable and network parameters are operating within a defined range.

This allows NESO to ensure the network remains secure whilst planning network outages and that they can identify mitigations such as post-fault actions like re-configuring the network. This offline modelling is all completed in advance of the outages being switched out from the live network.

4.2.1 Current Thermal Standards

The below outlines the criteria which are applied to the different fault types within the SQSS:

- For a single circuit fault, the criteria are consistent across the whole of GB, so there is no difference between E&W criteria and Scotland criteria.
- For a Double Circuit (DC) overhead line (OHL) fault, the criteria are mostly aligned across E&W and Scotland 'Normal'. The main difference in Scotland 'Normal' is that NESO is "allowed to thermally overload primary equipment" which can facilitate 'cascade tripping'[16] post-fault which occurs via automatic protection. 'Cascade tripping' can only be implemented if there is no widespread disturbance[17] observed following the cascade.

  This allows NESO to simulate the impact on the network and confirm the network remains secure. The 'cascade trip' is only implemented if there is a constraint[18] limit increase and once confirmed with the Scottish TO's. This concept is not currently allowed in E&W.
- For busbar or mesh corner faults, in E&W "there shall not be unacceptable overloading of any Primary Transmission Equipment" which means following a busbar fault the network must remain secure (stable). Whereas, in Scotland "there are currently no substations where the system is required to be secure against a fault outage of a busbar or mesh corner under planned outage conditions." Therefore, busbar faults are not required to be secured under the SQSS in Scotland unless the fault would cause widespread disturbance.
- All assets on the network must be operated by NESO to the thermal limits that the TOs provide to NESO. Extensive suites of thermal limits data are provided for each asset for use in offline analysis tools as well as real time system management systems. NESO will always operate strictly to the limits calculated and proffered by the TOs. There are processes in place that permit NESO to request thermal enhancements on equipment and the responsibility for recalculating limitations upon request and agreeing them if they are viable lie with the TO.

16 Cascade tripping – where a circuit or asset is allowed to be overloaded and removed from service automatically via protection following a fault on the network.
17 Widespread disturbance - A loss of supply greater than 1500MW, unacceptable frequency conditions, unacceptable voltage conditions at GSPs totalling more than 1500MW or system instability on the supergrid (275kV or 400kV) network.
18 Constraint – the maximum power transfer capability between two points on the network which could be limited by the infrastructure.

4.2.2 Current Voltage Standards

Steady state limits are consistent across GB and are specified in Table 1 below. It shows the SQSS limits for the different nominal voltage levels on the network. The voltage criteria are defined using the Per-Unit (pu)[19] system:

Table 1 - Steady State Voltage Limits

(a) Voltage Limits on Transmission Networks			
Nominal Voltage	PU Value (1pu relates to the Nominal Voltage)	Minimum (percentage of Nominal Voltage)	Maximum (percentage of Nominal Voltage)
Greater than 300kV	0.90pu-1.05pu	-10%	+5% ***Note 7***
200kV up to and including 300kV	0.90pu-1.09pu	-10%	+9%
132kV up to and including 200kV	0.90pu-1.10pu	-10%	+10%
(b) Voltage Limits at Interfaces to Distribution Networks and Non-Embedded Customers			
Nominal Voltage			
132kV	0.90pu-1.10pu	-10%	+10%
At less than 132kV	0.94pu-1.06pu	-6%	+6%

Notes
7. May be relaxed to 110% for no longer than 15 minutes following a *secured event*.

Voltage step change[20] limits are consistent across GB and are specified in Table 2 below. It shows the SQSS limits for the nominal voltages:

Table 2 - Voltage Step Change Limits

Type of Event	Voltage Fall	Voltage Rise
(a) At substations supplying *User Systems* at any voltage		
1. Following *operational switching* at intervals of less than 8 minutes	In accordance with Figure 6.1	
2. Following *operational switching* at intervals of more than 8 minutes, 3. except for *infrequent operational switching* events as described below	-3%	+3%
4. Following *infrequent operational switching* ***(Notes 8, 9)***	-6%	+6%
5. In planning timescales, following a *fault outage of a double circuit supergrid* overhead line ***(Note 10)***	-6%	+6%

19 Power Systems analysis commonly uses the per-unit system to express the system quantities as fractions of the defined base unit quantity. The base unit quantity is the nominal voltage of the equipment which could be represented at 0.9 – 1.1pu, this means there is an allowed voltage range of -10% up to +10%.
20 Voltage step change refers to a rapid change in the voltage magnitude from the initial operating voltage.

4.2.3 Current Stability Standards

No instability is to be seen on the 400kV or 275kV for E&W criteria or Scotland 'Normal' criteria. However, this is tightened under Scotland 'Adverse' criteria, where the rules are that there should be no instability on the 132kV network either.

4.3 Workstream Approach

A collaborative working group between the Transmission Owners and NESO was established to ensure a wide range of views and expertise across industry fed into this workstream. The working group met regularly to review the Electricity Commissioner's Report recommendations and investigate opportunities within the SQSS to increase network access. As the project evolved, analysis was shared with the Distribution Network Operators (DNOs) to present the working group findings and recommendations for feedback. This process was repeated to fine tune the recommendations outlined under this workstream.

Refer to figure 3 for the workstream Gantt chart containing the agreed deliverables and which was used to track progress.

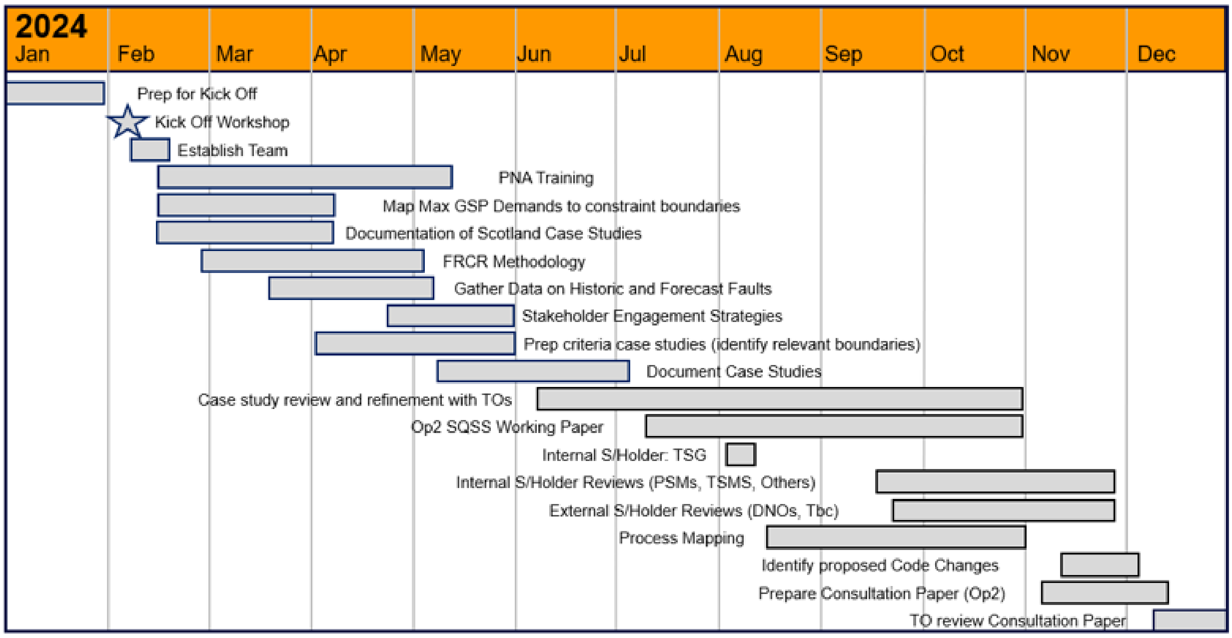

Figure 3: OP2 Workstream Gantt Chart

4.4 Electricity Commissioner's Recommendation

The Electricity Networks Commissioner's Report recommendation and suggested implementation approach for this action are listed below.

4.4.1 Electricity Commissioner's Report Recommendation:

The Electricity System Operator (NESO) should investigate use cases where operational rules can be relaxed to allow outages to go ahead, for example, relaxing network security from network minus 3 circuits (N-3) to network minus 2 circuits (N-2) during the right conditions. An impact assessment can be carried out to identify when it would be appropriate to relax security standards. For example, a double circuit can be taken out of service if there is a local impact to demand following a fault, but not if it causes a widespread system issue. This is intended to find specific cases where rules can be relaxed, rather than a general relaxation of rules.

4.4.2 Electricity Commissioner's Implementation

NESO would investigate which operational rules could be relaxed and the use cases for when there would be a benefit to do so. The Security and Quality of Supply Standards (SQSS) sets out the operational standards to be followed, and a deviation from them may be required. A deviation and a trial of relaxed standards would be required ahead of changes made to SQSS. A trial could be undertaken ahead of the increase in outages expected for 2030 projects. A model to assess the impact-related risk would need to be developed and resource from NESO required to implement and apply the model. If it is found that SQSS modifications would be beneficial, there would be a requirement to progress a formal change.

4.5 Workstream Investigation

A review of the standards across E&W against Scotland was undertaken to determine if there are any benefits of adopting a similar methodology to 'Normal' and 'Adverse' in Scotland that could be applied to E&W. This focused solely on thermal and voltage. Stability was excluded due to the stringent requirements across GB of having no instability on the supergrid[21].

4.5.1 Thermal Analysis

Analysis of the thermal conditions on the network are broadly twofold; NESO must ensure that in steady state operational conditions there are no thermal overloads. This simply means ensuring that there is not an excess of current being transferred through an asset and that all equipment remains within its individual rating and capability. Secondly there is the post-fault condition, NESO must ensure that following any fault on the network, there is not an excess of current being transferred through an asset. The below paragraphs discuss the explorations that were

21 Supergrid: The part of the national electricity transmission system operated at a voltage above 200kV.

conducted for faults under N-2 and N-3 conditions, using the same terminology described in the previous chapter.

Single Circuit Fault during a planned outage (N-2):

The first investigation was to assess nine key Electricity Ten Year Statement[22] (ETYS) boundaries within E&W to determine if the operation in those areas could be relaxed to a single circuit fault criteria with a planned outage (N-2[23]) without causing 'widespread disturbance'. The results outlined a clear conclusion that all of these constraint boundaries could not be relaxed to a single circuit fault criteria. This is because if a double circuit fault then occurred at this power transfer, there would be a risk of widespread disturbance and unacceptable thermal overloads of primary equipment. Therefore, it was not possible to align with the Scotland 'Normal' criteria.

Double Circuit Fault during a planned outage (N-3):

The nine ETYS constraint boundaries were assessed to determine if 'cascade tripping' following a double circuit fault during a planned outage (N-3[24]) could be secured against the SQSS criteria. It was identified that on two constraint boundaries this could be implemented and the increase in the constraint capacity was between 150MW and 600MW. The other constraint boundaries that were assessed in the same way resulted in 'cascade trip' and 'widespread disturbance' which would not be SQSS compliant. Therefore, it demonstrates that this relaxation can only be applied to certain constraint boundaries. If this was applied to such boundaries then NESO could optimise the network by increasing the constraint limit which could lead to a reduction in constraint costs, or alternatively increased system access. This could be implemented by installing thermal overload schemes onto the network to simulate cascade tripping and without causing any unacceptable thermal overloads. Therefore, the benefits that have been identified could in theory be implemented without any modification to the current SQSS criteria.

Busbar faults:

Studies were conducted against the nine ETYS constraint boundaries to see if any busbar faults could be relaxed in England and Wales without causing 'widespread disturbance' like Scotland. It was shown that only two constraint boundaries yielded the benefits of increased constraint capacity, up to 450MW. The other constraint boundaries when assessed, resulted in widespread disturbance and a 'cascade trip' could not be applied to remain SQSS compliant. Therefore, it demonstrates this relaxation can only be applied to certain constraint boundaries. If this was applied to certain boundaries then NESO could optimise the network by increasing the constraint limit which could lead to a reduction in constraint costs, or increased system access. This could be implemented by installing thermal overload schemes onto the network to simulate cascade tripping and without causing any unacceptable thermal overloads. Therefore, the benefits that have been identified could in theory be implemented without any modification to the current SQSS criteria.

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22 Electricity Ten Year Statement (ETYS) 2023
23 N-2 terminology refers to a single fault occurring during planned single outage on the transmission network. Therefore, resulting in two circuits down from the intact network.
24 N-3 terminology refers to a double circuit fault occurring during planned single outage on the transmission network. Therefore, resulting in three circuits down from the intact network.

4.5.2 Voltage Analysis

A review of previous versions of the SQSS was conducted to ascertain voltage standard variations alongside a review of events to identify voltage violations that NESO had observed in offline studies. Furthermore, the TOs set up a joint working group to investigate and respond to the below findings and recommendations.

Steady State voltage limits:

One key finding was that the 275kV upper voltage limit was reduced from 302.5kV (+10%) to 300kV (+9%) in 2017 following an SQSS review conducted in 2010. The reason for this change was to align with an International Electrotechnical Commission (IEC) standard rated voltage. The report concluded this was "expected to have negligible effect on investment or operating costs, or on plant performance", under section 4.2.3.1 within the SQSS Fundamental review[25]. NESO has identified multiple case studies where outages were either rejected due to non-complaint volts of approximately +10% on the 275kV network and NESO internal voltage reports were issued. In some cases, outages would need to be agreed by seeking a derogation to the SQSS to facilitate key works, despite the TO being agreeable to operating their equipment at an increased voltage. These challenging outages have predominantly been driven by large generators being unavailable, or voltage support equipment on outage alongside key network reinforcement outages. As a consequence, these can hold up key projects where the value of delivery of the project would outweigh the risk of the outage on the network.

Furthermore, it was identified that historically in Scotland, following a 'Major system fault', the 275kV could be run up to 316kV (+15%) for 15 minutes but this provision was subsequently removed in 2017. The reinstatement of the provision was reviewed with all three TOs who concluded that it was not possible due to the variability of equipment ratings on the network. A similar assessment was reviewed against the 400kV network to see if there was any potential to relax the upper voltage criteria. It was concluded again that it was not possible due to the variability of equipment ratings on the network and the extensive risk assessments required on each individual asset.

Consequently, any proposal to increase the upper voltage limits beyond the current ratings on the 400kV and above +10% on the 275kV network would need to be treated on a case-by-case basis with the local risks being considered.

Voltage Step Change limits:

The last area reviewed under the voltage category was to determine if voltage step change following a fault was a network limitation. The SQSS outlines the permissible positive and negative voltage step changes which must be adhered to, and all fault types (single circuit, double circuit or busbar) allow a maximum upper voltage step change of +6%. However, for a double circuit or busbar fault, the criteria allow up to a -12% voltage step change.

25 SQSS Fundamental Review from 2010

A high-level review of voltage step change results from analysis in the last 2 to 3 years indicated that there have only been a few occurrences of voltage step change > +6% on 132kV nodes in NESO's offline analysis, and the issue has been rarely observed on the 400kV and 275kV nodes. The historic cases were resolved by modifying running arrangements, taking a switch action, or recommending transformer tap changes that were all proactively identified and actioned. Therefore, whilst there wasn't a need to explore this further based on current analysis, there could be benefits in the future to having flexibility in agreeing changes to voltage step change SQSS standards should the need arise.

4.6 Workstream Recommendations

It is proposed that the following recommendations 4.6.1 – 4.6.3 be reviewed with the SQSS Panel for incorporation into an updated version of the standards. Recommendation 4.6.4 is to be explored outside of the SQSS panel as the existing criteria would allow this to be implemented without a change to the SQSS.

4.6.1 Incorporation of greater flexibility within the SQSS for thermal Constraints

The SQSS currently dictates that NESO operates the network based on ensuring system security for the worst-case scenario regardless of the likelihood of a fault occurring depending on whether 'Normal' or 'Adverse' criteria is being applied. This means that all faults outlined in the SQSS are secured regardless of the frequency or the likelihood of them occurring. Furthermore, there are examples where the SQSS can prevent certain outages from being agreed even where the Transmission Owners and local system users would be agreeable to the risk. An important part of this review and project was to determine if there is a more sensible way of assessing and managing that risk.

It is proposed that a more flexible approach utilising a probabilistic assessment could provide benefit in certain circumstances where there is a significant consumer benefit from the outage proceeding. It would consider the likelihood of a fault occurring to establish a risk factor for it and identify mitigations that would reduce the risk. This risk-based methodology could result in allowing works to proceed that offer a substantial benefit, such as extensive new infrastructure build that could ultimately reduce system risk when completed.

This would need to be passed through a thorough risk assessment process which would be completed either bi-laterally between NESO and the TO, or tri-laterally if a DNO or Directly Connected Customer (DCC) is also affected. The proposed risk assessment form has been created in collaboration with all three TOs and is shown in Appendix 1: SQSS Risk Assessment Form.

If the probabilistic assessment determines that the fault likelihood is low and there are sufficient risk mitigations that have been implemented by NESO, TO, DNO or DCC with their agreement, then it will be reviewed by NESO. This will confirm that the impact is deemed an acceptable risk before being signed off by NESO as the final signatory. If there is failure to agree the risk mitigations on time or to the satisfaction of any of the parties, the outage(s) will not proceed.

As an example, this was applied to one of the ETYS constraint examples explored where the double circuit fault limiting the constraint was calculated to be 1 in 39.4 year risk when taking into account the probability of the fault. Therefore, the likelihood of this fault is deemed low and, by adopting this risk-based approach, rather than the existing process of considering all faults equally, it would be possible to make an informed risk assessment based on knowledge of the system and conditions. However, a more depleted network will be more susceptible to adverse voltage or thermal conditions following a fault. The use of a risk assessment methodology would factor in the likelihood of the fault as well as the potential conditions following the fault. This process would incorporate the identification of mitigations to ensure that the impact of any fault would be limited. This in turn would allow certain outages to be planned that would have not otherwise been the case, particularly where it would be in the wider consumer interest to make progress on a project or scheme to deliver benefit.

Expanding further on the work to investigate flexibility within the SQSS, it has been proposed that the parameters related to the maximum permitted loss of supply could be investigated. This section of the SQSS dictates the maximum permissible loss of supply (demand) that can occur following various fault types. Currently, under 'Normal' conditions the largest loss for a double circuit fault is 1500MW, and this figure is decreased to 300MW under 'Adverse' conditions (unless there is significant economic penalty). It is proposed that it may be possible to add to the criteria and the flexibility to adjust these parameters under certain outage conditions if there are significant consumer benefits for the works completing, and the likelihood of a fault event is assessed as being low. This would be in order to safely increase system access in limited and secure system conditions. This would be a variation from the existing blanket criteria which can prevent many outages proceeding but without anything similar to this risk assessment or the technical and economic judgement. This proposal, however, needs further examination and exploration with key industry stakeholders.

4.6.2 Revert the upper voltage limit on the 275kV network back to +10%

The working group explored the possibility of returning to the +10% on the 275kV following the decrease to +9% in February 2017. It was identified that the Grid Code (CC.6.1.4)[26] and Relevant Electrical Specifications for connections to each TOs network still refer to the +10% (303kV) values and that equipment should be capable of withstanding the revised limit.

The working group also reviewed the impact and concluded that it would be acceptable to change the current pre-fault steady state (Table 6.3) and post-fault steady state (Table 6.4) upper voltage limit for 275kV from +9% (300kV) to +10% (302.5kV) in the SQSS. Ultimately, reverting to the limits defined prior to the SQSS modification made in 2017. Based on the analysis outlined under section 4.5.2, it was shown that there were multiple cases where system access was restricted due to the +9% upper voltage limit. With the additional voltage headroom from this

26 Grid Code details the technical requirements for connecting to and using the National Electricity Transmission System (NETS).

recommendation, there will be a higher likelihood of future outages on the 275kV network proceeding. Or rather, fewer outages will be delayed as a result of voltage non-compliance.

4.6.3 Incorporation of greater flexibility within the SQSS for Voltage Constraints

Due to the safety risks associated with operating voltages outside of the current SQSS limits and the need for a thorough risk assessment to be completed on equipment that could be overstressed, there were concerns raised by all parties to modifying the nominal steady state voltage limits. Instead, it is proposed that each scenario where non-compliant volts are observed in offline studies are managed on a case-by-case basis.

The current methodology to overcome any scenarios, where the TOs and/or DCCs are agreeable, to operate above the SQSS criteria would require a time-consuming derogation process. As the network topology and connected generation is continuously changing, the process does not offer the required flexibility to optimise system access. Therefore, it would be beneficial to have the flexibility of a process within the SQSS to conduct a similar risk assessment with mitigations, which would be agreed by all parties. The same risk assessment form referenced in Recommendation 5.4.1 is shown in Appendix 1: SQSS Risk Assessment Form. This was created in collaboration with all three TOs for operating beyond the normal steady state limits. A probabilistic risk assessment approach would be used. If the likelihood of an onerous event is low and there are sufficient risk mitigations that have been implemented by NESO, TO, DNO or DCC with their agreement, then NESO would confirm that the expected risk(s) is acceptable before finalising.

An example where this could have been implemented recently is in a section of the transmission network where two significant generators had declared themselves unavailable due their own essential outages. This meant that a transmission overhead line outage could not be facilitated due to a potential voltage risk within the advised capacity of the local network but outside the SQSS standard. Consequently, this delayed the connection of new network infrastructure that would support the voltage challenges in the region despite the risk being mitigated.

Lastly, the recommendation from the Electricity Commissioner's Report outlined a proposed trial to the SQSS to determine if any benefits could be obtained from any relaxation identified. However, upon further investigation within NESO it was determined that this would be a very time consuming task that would require a derogation process and instead a code modification could be completed in a similar timescale. Therefore, the recommendation for this additional flexibility process with an SQSS modification is the preferred option to proceed with.

4.6.4 The use of thermal overload schemes to simulate 'cascade tripping' in E&W

The findings demonstrate there are some examples where a benefit could be harnessed if E&W adopted a similar methodology to Scotland where 'cascade tripping' is implemented. This could only be progressed on the condition that a risk of widespread disturbance was not identified and any overloads cleared through circuit protection arrangements.

By exploring this concept further, and the creation of a NESO internal process to assess 'cascade tripping' in E&W, it would allow NESO to engage with the TOs to install new automatic schemes through the STCP 11-4 Enhanced Service Provision [27]. This could be used to increase a constraint limit and ultimately reduce the cost passed onto the end consumer and/or increase system access. Ultimately, by using new automatic schemes there would be no requirement to modify the SQSS from the current criteria.

Furthermore, several case studies have been worked through within the working group to implement this proposed 'cascade trip' through automatic switching via a software solution. The benefit of this approach is that it would not require network outages to install physical thermal overload protection and provides greater flexibility for a changing network topology.

4.6.5 Actions and Recommendations

4.6.5.1 Modify Paragraph SQSS Paragraph 5

Recommendation OP2_1: Add a new sub paragraph 5.13:

> 5.13 Under certain circumstances in operational timescales it may be possible to operate beyond the criteria outlined in 5.1 and 5.3 by completing a joint risk assessment and mitigation process that must be agreed and signed by The Company[28], TO and any affected Users.

Owner: NESO
Estimated completion: 9-12 Months.

27 STCP 11-4 Enhanced Services
28 "The Company" refers to NESO in SQSS terminology

4.6.5.2 Update SQSS Table 6.3

Recommendation OP2_2: Replace Table 6.3 with the updated table below:

(a) Voltage Limits on Transmission Networks			
Nominal Voltage	PU Value (1pu relates to the Nominal Voltage)	Minimum (percentage of Nominal Voltage)	Maximum (percentage of Nominal Voltage)
Greater than 300kV	0.95pu-1.05pu	-5% ***Note 6***	+5%
200kV up to 300kV	0.95pu-1.10pu	-5% ***Note 6***	+10%
132kV up to and including 200kV	0.95pu-1.10pu	-5% ***Note 6***	+10%
(b) Voltages to be Achievable at Interfaces to Distribution Networks and Non-Embedded Customers			
Any Nominal Voltage	Target voltages and voltage ranges as agreed with the relevant Distribution Network Operators or Non-Embedded Customers, within the limits of Table 6.4		

Owner: NESO
Estimated completion: 9-12 Months.

4.6.5.3 Update SQSS Table 6.4

Recommendation OP2_3:

Replace Table 6.4 with the updated table below:

(a) Voltage Limits on Transmission Networks			
Nominal Voltage	PU Value (1pu relates to the Nominal Voltage)	Minimum (percentage of Nominal Voltage)	Maximum (percentage of Nominal Voltage)
Greater than 300kV	0.90pu-1.05pu	-10% **Note Y**	+5% ***Note 7 Note Y***
200kV up to and including 300kV	0.90pu-1.10pu	-10% **Note Y**	+10% **Note Y**
132kV up to and including 200kV	0.90pu-1.10pu	-10% **Note Y**	+10%, **Note Y**
(b) Voltage Limits at Interfaces to Distribution Networks and Non-Embedded Customers			
Nominal Voltage			
132kV	0.90pu-1.10pu	-10% **Note Y**	+10% **Note Y**
At less than 132kV	0.94pu-1.06pu	-6%	+6%

Owner: NESO
Estimated completion: 9-12 Months.

4.6.5.4 Update SQSS "Notes for Tables"

Recommendation OP2_4

Add the additional note to "Notes for Tables":

> Note Y: Under certain circumstances in operational timescales, it may be possible to operate beyond the criteria outlined in 6.3 and 6.4 by completing a joint risk assessment and mitigation process that must be agreed and signed by The Company, TO and any affected Users.

Owner: NESO
Estimated completion: 9-12 Months.

4.7 Workstream Benefits

All of the above recommendations being put in place would result in a small number of additional outages being permitted to proceed. It would not enable TOs to progress with large tranches of additional work as the opportunities for SQSS relaxations aren't common. Further to this, no change to the design standards is being proposed, rather it has been a process to explore a short-term decision-making process to enable flexibility in the SQSS rules. It would give TOs and NESO an additional tool that would allow some major construction schemes to progress concurrent with maintenance works in limited circumstances.

During the early phases of this process, 13 constraint cases were explored of which 4 were seen to have positive impact when relaxation criteria were applied. These 13 cases identified were ones in which engineering judgement had been used to give early indication of their validity. Although these recommendations being accepted may not result in large volumes of additional outages, the risk assessment process would be used in cases where NESO and the relevant TO have the opportunity to keep on track or accelerate large and significant works. Therefore, it is foreseen that the use of these SQSS relaxation processes have the potential to unlock many millions of pounds of opportunity.

Extrapolating the results of the test cases would indicate that around 10 opportunities could be found per year through enacting the new decision making processes identified during the test phases. Further extrapolating this over the years between 2025 and 2030 would suggest that 50 or more large scale transmission projects could be kept on schedule. This, when combined with the counterfactual knock-on impact to the outage plan of not utilising the process, is forecast to result in tens of millions of pounds of additional opportunity.

Delays to major schemes which impact significant boundaries have vast financial ramifications with regards to both management of the constraints by NESO and resource and planning impact by the TOs. It cannot be understated how financially significant it can be to find innovative ways to allow MIS work to progress. This initiative, which will allow schemes to continue in previously untenable scenarios will prevent some of the long delays that have previously been suffered and unlock many millions of pounds which would otherwise be absorbed in consumer bills.

There are no expectations on the TOs to alter the way they apply the SQSS criteria in the longer term timescales. These recommendations are solely to be applied in the current year optimisation and delivery phases (16 weeks ahead to a day ahead). The OP2 recommendations would unlock the potential to take a risk based and probabilistic approach to the short term assessment of network conditions. They should not be considered a wholesale change to SQSS standards.

5 OP3 - Long Term Project Design

5.1 Introduction

The Main Interconnected Transmission System (MITS) is the high voltage electric power network supporting the GB electricity market, connecting power stations and major substations ensuring that electricity generated anywhere on the grid can be used to satisfy demand elsewhere. To continue to carry this energy from where it is generated to homes and businesses, we need to build new electricity transmission infrastructure, as well as upgrading existing infrastructure to ensure that there is sufficient capacity and security of supply is maintained. These upgrades or new builds are completed through transmission projects.

All key projects and schemes on the MITS should be included in the long term transmission plan, which is constructed through a close co-ordination between NESO and the respective TO. The STCPs provide descriptions of the roles and responsibilities for various planning timescales. The current year is broken down into the delivery phase (zero to three weeks ahead of real time) and the optimisation phase (4 weeks ahead up to a maximum of 52 weeks ahead). The timescales beyond the current year are similarly broken into 2 distinct time periods:

- the plan build phase which is a rolling year ahead up to 2 years ahead and contains clearly defined timescales for production of draft and final plans;
- the years beyond 2 years ahead and up to 6 years ahead, during which the aforementioned key outages are first introduced to the transmission plan.

For the purposes of this section, the term "long term" can also be considered to also incorporate the years beyond 6 years ahead.

As a part of the strategic network development obligations, NESO is responsible for taking a long-term approach to planning which identifies whole energy system needs and ensures that the system can be designed and built accordingly. TOs create proposed solutions to meet these needs which include refurbishing, upgrading or building new essential infrastructure.

The development of the network requires system access and the long-term system access plan is delivered through the co-ordinated development of outage proposals (the requirement to undertake work) by each TO and preparation of outage plans by NESO, taking into account these proposals. The outage plan includes the detailed operational and work plans to enable each individual outage to take place.

Typically, however, the long-term planning timescales are reserved for planning system access for key investment outages and major construction projects on the MITS. The more detailed operational design of the construction scheme has historically been developed in the shorter term timescales (Year Ahead and 2 Year Ahead), with the long-term space theoretically being used for determining access requirements. There are usually a range of options available to the TOs to deliver the work and there is a balance between the costs of construction incurred by the TO and the constraint costs incurred by NESO. Ultimately all of these costs are borne by the consumer so it's important the due consideration is given to both.

5.2 Current Position and Challenge

The transmission system has become increasingly complex over recent years due to the integration of new technologies, new forms of generation/storage and an increasing volume of customers as we decarbonise the transmission system on the path to achieve net zero. Understanding the impact of reinforcements requiring system access, on security and cost has therefore become more complex. The transformation required to meet the net zero challenges has resulted in an increased number of projects and an increased interaction between these projects. This means that more focus must be given to the proposed delivery of projects and associated outage plans to ensure the most optimal holistic solutions.

TOs typically consider multiple options and approaches for project delivery that will likely have different outage requirements, each of which may have an associated cost due to the necessity to restrict the output of generation, known as Constraint Costs[29]. Ensuring the forecast constraint costs of the build process are routinely considered in detail during the route design stage, will ensure that any decisions made on the options will take a more holistic view. With this approach, options that may have been discounted in the past on the project costs alone could actually become viable when constraint costs are considered. Furthermore, if a decision to proceed with an offline (network intact) project build is made, this may result in increased opportunities for other access to the network allow more work to be progressed overall.

To date, outage requirements for the various build options in long-term planning timescales have been dictated by project maturity. There sometimes isn't the level of detail available to understand the different project delivery options. For example, NESO don't have sight of the outages required so are unable to advise on system benefits. Currently, internal analysis by the TO's during early project optioneering provide them with a preferred approach. However, optioneering is not routinely done by NESO and therefore the option chosen might not be the most suitable from a whole system cost perspective with constraint costs included

5.3 Electricity Commissioner's Recommendation

The Electricity Networks Commissioner's Report Recommendation and suggested Implementation approach for this action are listed below:

5.3.1 Electricity Commissioner's Recommendation:

The National Energy System Operator (NESO) should be involved in long-term outage planning during the route design stage. NESO should provide guidance and input advising on the overall system benefits of different build approaches, which may require a more expensive asset build (offline) but results in a lower whole system cost when constraints are considered. This is

29 When there are physical constraints on the network (the network cannot physically transfer the power from one region to another), we ask generators to reduce their output to maintain system stability and manage the flows on the network. Generators are then compensated via a constraint payment.

intended to give visibility of outage costs to the Transmission Owner (TO) when planning the project delivery and to give NESO visibility of the project costs for different outage arrangements.

5.3.2 Electricity Commissioner's Implementation

Cooperation between the TOs and NESO will be required during the delivery planning process. Additional resource will be required from NESO to support this. A new methodology for evaluating project costs will be required that takes account of delivery costs and constraint costs. Ofgem will need to update the methodology they use when evaluating project costs to support a whole project cost. Resources from NESO, TOs and Ofgem will be required to support this and to undertake development and deployment of a new cost analysis method.

5.4 Workstream Approach

5.4.1 Collaboration

A collaborative approach between the TOs and NESO was undertaken from the outset. It was imperative that all parties, both internally and externally were engaged from the beginning.

Following initial workshops, weekly sessions were formed to drive the workstream forward. A project Gantt chart was produced (see figure 4 containing agreed deliverables and used to track progress.

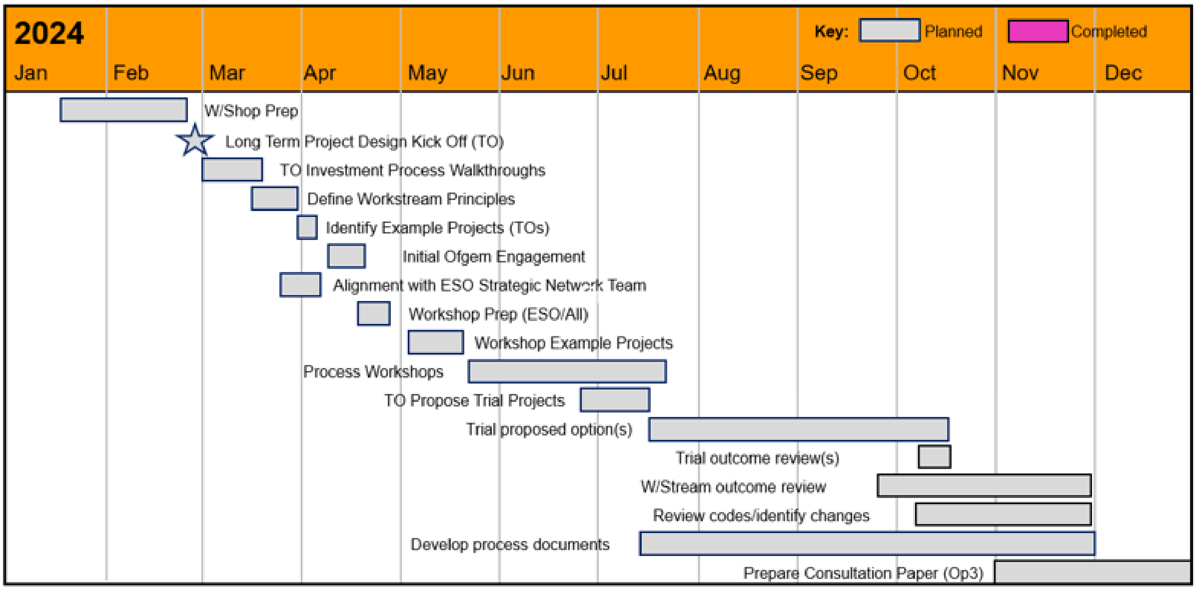

Figure 4: OP3 Workstream Gantt chart

Project Delivery Process Review

A review of both TOs and NESO existing project delivery processes was undertaken. This was to identify any potential improvement options during the project delivery phase and ascertain the existing ability of NESO to provide constraint costs during the build phase. STCP 16-1[30] investment planning, and STCP 11-1[31] outage planning, were reviewed alongside the TO's and NESO's processes.

30 STCP16-1 Investment Planning
31 STCP11-1 Outage Planning

5.4.2 Historical analysis

Historical analysis of transmission projects was undertaken, with a focus on projects where constraint costs were a key factor in the development of the overall cost forecast. In doing so, the workstream looked back at occasions where the TO's required support from NESO to ascertain constraint costs. Analysis considered which data was shared between parties, what existing methodologies were used for any costings and what recommendations were made at the time. The review identified potential areas of improvement including:

- the requirement for a consistent approach to the analysis being used to determine outage costs for a project,
- the requirement for more detailed outage proposals within the long-term time frames,
- a clear definition of what costs were to be provided back to the TO and how they would factor them into their future assessment.

5.4.3 Process Development

An initial process was developed based upon the existing investment planning procedures which are detailed in STCP 16-1. It was developed to capture options for project delivery that were suitable for both the NESO – TO interface and the TO-TO interface (where projects spanned the boundary between TO licence areas). A set of criteria were then developed to determine which projects would be taken through the process; these criteria included:

- the perceived impact on major constraint boundaries that were caused by transmission reinforcement projects and;
- the potential number of outages included in the transmission reinforcement project.

However, the criteria-based approach was deemed impractical due to the differing levels of project maturity and the availability of outage data. It also meant that some transmission projects wouldn't meet the selection criteria in the required timeframes.

It was also recognised that projects should not be selected in isolation because of the interaction between multiple concurrent projects and the whole system impact. Analysing and costing a project in isolation would result in unrealistic cost forecasts and potentially the need for several later iterations of reprofiling.

A review of the existing and developing NOA[32], and CSNP[33] methodologies was conducted to understand if these provided the best route to capture option assessments, including constraint

32 NOA Methodology: describes how NESO assess major National Electricity Transmission System reinforcement projects.
33 The Commissioner's Report Recommendation SS3: Two Centralised Strategic Network Plans (CSNP) should be developed from the Strategic Spatial Energy Plan (SSEP) by the Future System Operator (FSO) – a shorter-term plan and a longer-term plan. The shorter-term plan should cover a ten-year period and be refreshed on a yearly basis. While recommendations suggested within this report are being implemented to achieve a seven-year end-to-end process, a shorter-term CSNP with a timeframe longer than ten years may be required to ensure all projects are identified in time to be delivered. The longer-term plan should cover a minimum of twenty-five years and be refreshed every five years. In the near-term there may be a need to refresh the plan more regularly due to changes in Government policy.

cost calculations. The CSNP methodology is currently being defined as a part of the wider actions covered by the Electricity Commissioner's report and it is anticipated that the constraint costing for optioneering of project build approaches will be undertaken as a part of the CSNP detailed design and development stage. This will be based on project maturity.

Following the review, the working group agreed on using the CSNP methodology alongside some amendments to the processes in STCP 16-1.

5.4.4 Costing Methodology

It was agreed that due to the tools already used and data already held in house by NESO such as the:

- Vision of the entire transmission outage plan across all 3 TO licence areas,
- Historic and forecast demand figures at GSP level and national level,
- Foresight of all upcoming connections in all regions including offshore connections,
- Pre-existing constraint cost calculation tools,
- Knowledge of interacting and complimentary constraints spanning TO areas.

That NESO would be responsible for conducting the boundary capability analysis required for this holistic costing methodology.

The consensus was that the TOs providing the proposed outage dates and durations to NESO, rather than NESO providing the above (refer to bullets) to the TOs would be the simpler option and would avoid any potential for breach of data security obligations.

It was also agreed that constraint costings provided to the TO's would be the difference between the constraint costs per option against not delivering those options as opposed to the net cost for each option.

5.5 Workstream Recommendations

5.5.1 NOA/CSNP Methodology

The working group, recognising the fact that the CSNP process is in a period of ongoing development, took the opportunity to make recommendations pertinent to the progress of OP3 and capitalising on the obvious synergy. The recommendation is that the CSNP process should include constraint cost calculations for various build options. As detailed above, it was recognised that NESO are best placed to determine the constraint costs which are a result of reduced boundary limits and management thereof. If these recommendations are accepted then they would be progressed under the Commissioner's Report, Recommendation SS3[34]. Refer to figure 5.

If accepted this will be progressed under the Commissioner's Report, Recommendation: SS3[33].

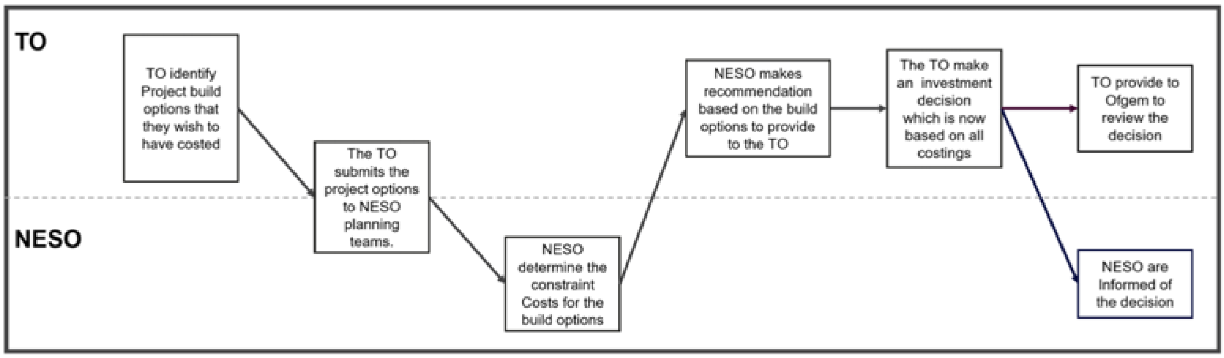

Figure 5: Proposed Modification to be included in the NOA/CSNP Methodology

5.5.2 STCP16-1 Investment Planning

It is also recommended that STC Procedure (STCP) 16-1 be modified to allow for the incorporation of constraint costs for different build options on an ad-hoc basis when requested by the TOs.

Refer to figure 6: the TOs can submit a project to NESO for consideration under this modified process. The chosen projects will be ones that the TO know to have multiple build options and, in some cases, will include both offline and online builds. NESO will determine the boundary or boundaries that are being impacted, the potential reduction in power transfers for the duration of the impact and therefore the costs associated with managing the relevant boundaries. These costs will then be communicated back to the TO and they will form a part of the holistic decision making, a part of which will therefore be an understanding of the total costs of the project.

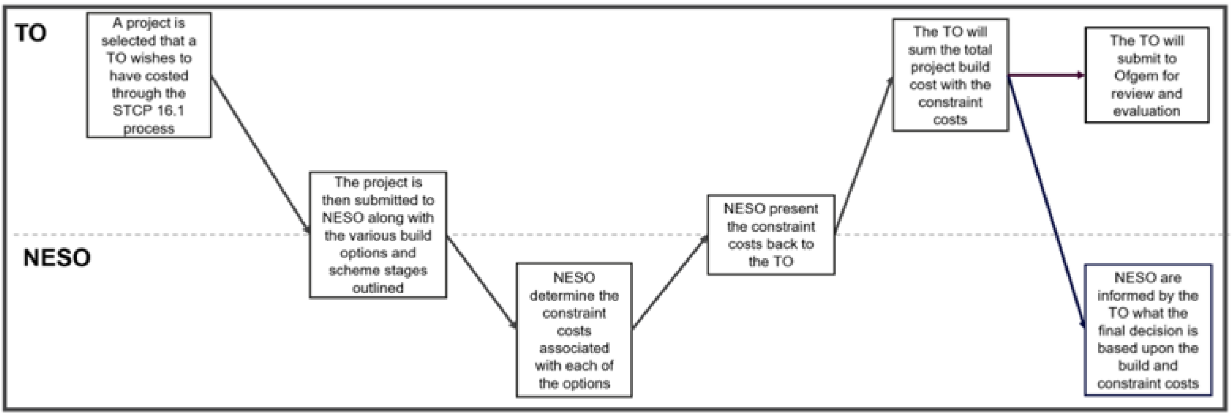

Figure 6: Proposed Modified Process for STCP16.1

Reviews of the output, which can now be considered a joint TO and NESO evaluation will be communicated to Ofgem, with a description and explanation of the calculations performed. Following review by Ofgem, NESO will be informed of the outcome, and the programme of works, including asset outage dates and, durations will then be visible in the long term plan.

5.5.3 Actions and Recommendations

5.5.3.1 Incorporate Constraint Costing for Build Options into CSNP

Recommendation OP3_1:

Liaise with the owner for Recommendation SS3 to include the methodology for boundary capability and constraint costs in the CSNP methodology
Owner: NESO
Estimated completion: 12 Months.

5.5.3.2 Update STCP 16-1 Paragraph 4.2.7

Recommendation OP3_2:

Replace the existing paragraph, currently documented as:

> Where a TO identifies a number of options for system reinforcement or modification that meet the deterministic and economic requirements of the NETS SQSS, they may request additional data from The Company in order to complete a more detailed economic comparison of the options. This request will be in the form of a planning request as set out in Appendix C. Additional data may include estimates of MWh & MVArh costs, constraint volumes and constraint locations.

With the following paragraph:

> Where a TO identifies a number of options for system reinforcement, modification or project design that meet the deterministic and economic requirements of the NETS SQSS, they may request additional data from The Company in order to complete a more detailed economic comparison of the options. Additional data may include estimates of MWh & MVArh costs, constraint volumes and constraint locations.
>
> The TO shall provide as a minimum the following information:
>
> - Requesting party
> - Party to whom the request is being made
> - Date request made
> - Description of the request (including reference to relevant investment plan where appropriate)
> - Reason for the planning request
> - Outages requested inclusive of dates and durations (per project delivery approach where applicable)
> - Assessment of Operational Impact
> - Note of any Health and Safety Impact
> - Note of impact to any third party

Planning request to be submitted to appropriate Investment Planning data co-ordinator:

NESO	<Include details of NESO email/dotbox>
NGET	IP.DATA@nationalgrid.com
SHETL	Betta.rtsdata@sse.com
SPT	IP.Data@spenergynetworks.com

Owner: NESO
Estimated completion: 6 - 9 Months.

5.5.3.3 Update STCP 16-1 Paragraph 4.2.8

Recommendation OP3_3:

Replace the existing paragraph, currently documented as:

> The Company shall provide any data to the TO as reasonably requested in 4.2.7, to facilitate economic comparison of TO options. The data will not however, be detailed about the economics of any particular generator.

With the following paragraph:

> The Company shall provide any data to the TO as reasonably requested in 4.2.7, to facilitate economic comparison of TO options. The data will not however, be detailed about the economics of any particular generator. The Company will respond to any such requests in a reasonably practical timeframe

Owner: NESO
Estimated completion: 6-9 Months.

5.6 Workstream Benefits

The changes proposed under this workstream, if implemented, will lead to a better understanding of whole system project costs, leading to improved decision making for project build options and leading to reduced whole system costs in the ongoing development of the MITS.

There is also the secondary benefit of a reduction in system access requirements. This holistic cost benefit analysis process, which includes constraint costs as an input, will undoubtedly result in some signals to perform works offline. Offline builds are not only less disruptive to the system, requiring less short term recalculation of constraints and customer liaison, but they also result in greater opportunity system access to perform alternative works that are required. In simpler terms, the result of offline builds is that there is more space in the plan to progress other essential programmes of work.

The concept of an offline build is that work being undertaken is not disruptive until such time as it has to be connected to the live system or infringes on the live system (such as working in proximity of live equipment). The duration of these impactful sections of work is very low and is mostly limited to the periods during which asset commissioning or decommissioning is taking place.

So, if a project, or parts of a project are being built offline, there will necessarily be less disruption to the remaining assets, their configuration and their technical arrangements on the existing network. This means that the potential for other unrelated works to be performed is higher. Therefore, by progressing with an offline build, much more unrelated refurbishment, replacement, modification and maintenance work can be conducted on the whole MITS.

6 OP4 – Outage Planning

6.1 Introduction

Transmission outages are required on the NETS to enable the transmission network owners to connect new generation, develop the network and for the maintenance of existing assets. They are also required to undertake construction activities to connect new assets and customers to the transmission system.

There are a number of industry codes and procedures that set out the obligations on all parties with respect to outage planning. The collective purpose of these codes is to ensure that there is a mutual understanding of the need to plan access requirements in a timely manner and that this is done uniformly across all TO license areas.

- STCP 11-1 describes the outage planning timelines, the NESO reporting obligations and the requirements for data exchange between parties. This document sets out the requirements for submission of outage plans to NESO and is broadly broken down across years from 6 years ahead to real time.
- STCP 11-2[34] describes the outage planning process and data exchange requirements between NESO and the Onshore and Offshore TOs.
- The Grid Code covers many topics and technical subjects, the section concerning outage planning is set out in Operational Code 2. Grid Code OC2 "Operational Planning and Data Provision", section OC2.4 describes the processes for the coordinated release (outages) of Generators and other System Users.

As mentioned above, STCP11.1 outlines the system access planning process from 6 years ahead to real-time (See Figure 7), and the roles of TOs and NESO in planning and scheduling outages across those time frames. In practice, it is an ongoing process, with NESO working with TOs to create outage plans for each plan year.

In the 6 years ahead to 3 years ahead phase the Initial Outage Plan is built and should include Investment Outages and Key Outages[35]. In the 2 year ahead to 1 year ahead phase this then becomes the Provisional Outage Plan which is intended to cover all outages on the MITS[36], culminating in the week 49 plan completion and publication of the Final Outage Plan.

The outages in the Final Outage Plan are released over the next plan year commencing in week 14, April, running through to week 13 at the end of March the following year.

34 STCP 11-2 Outage Data Exchange
35 Key Outages: Outages which affect the operation of the MITS and/or those outages that are agreed between the TO's and The Company. These will include outages on connections to generators that have only a single connection to the transmission system.
36 MITS – Main Interconnected Transmission System (400kV, 275kV, 132kV in Scotland, offshore networks that run parallel to onshore system). Excludes generation circuits, transformers to lower voltage systems, external interconnectors)

The plan year in which the outages are delivered is referred to variably as year zero or current year. Outage requests continue to be processed in current year to accommodate essential changes, opportunity outages, additional work and previously unplaced outages.

The period from the publishing of the Final Outage Plan to 4 weeks ahead is known as the Optimisation Phase where NESO and TOs continue to maintain a review of the system access plan for each week and resolve new or outstanding outage conflict issues, manage system risks and continue optimisation of the outage plan to minimise constraint costs.

The period from 3 weeks ahead to real time is known as the Delivery Phase and NESO and TOs should work together to implement each outage. A key objective being to minimise disruption to the existing programme and resources. Outage changes in this period should be limited to Essential Outages and Opportunity Outages.

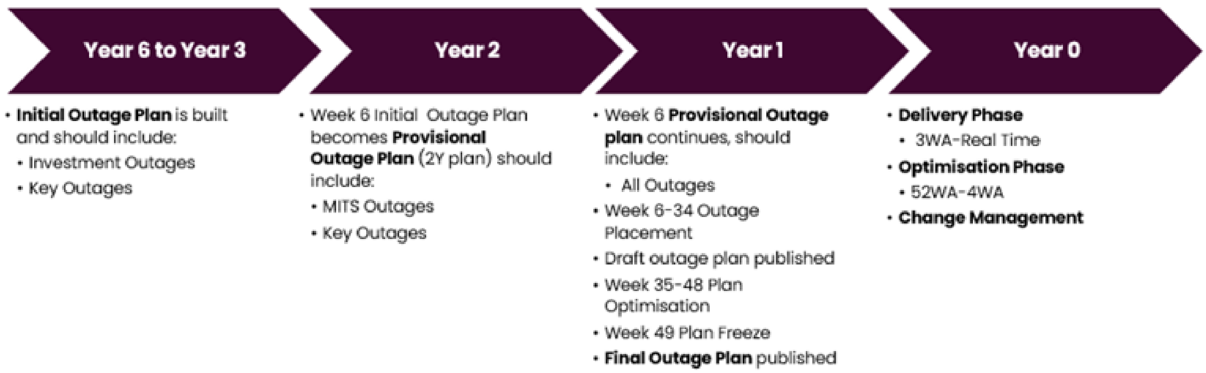

Figure 7: STCP11.1 planning time frames

Within all timescales, from the delivery stages all the way out to the planning of long term planning investment programmes, the outage requirements are sent as formal requests for assessment. They are not accepted into the plan until several criteria have been met and/or measures put in place to secure and optimise the outage. This is to ensure that the SQSS is adhered to, and the consumer impact is minimised.

Therefore, once received NESO will assess the outage requests to:

- Demonstrate compliance with operational standards such as circuit thermal rating limits, voltage limits, fault levels limits and stability. These assessments against operational safety standards are performed with the use of simulation software and with reference to various sections of the Grid Code and the SQSS. The thermal rating schedules of assets are provided by the TOs directly to NESO for use in the planning and operational tools, both offline simulation models and the online systems used for real time management.

- Calculate the costs of managing constraints on the transmission system arising from the outages. Outages may reduce the transmission system's capacity to transfer power from where it's generated to where it's needed and as a result, a constraint can be introduced with will incur costs to manage in the Balancing Mechanism and through forward trading. These costs must be commercially sanctioned at the appropriate level as part of a transparent and auditable process. This ensures that consumer impact is minimised.
- Coordinate outage placements with affected parties such as distribution network operators, generators, 3rd party transmission owners and directly connected customers. Customers already connected to the network can be affected by outages on both an operational or financial basis. Consultation and agreement with impacted asset owners is required, the aim of which is to secure agreement to proceed with an outage. In a minority of cases, it is not possible to achieve this agreement, and NESO must decide on whether to proceed based upon the criticality of the work. A process to understand, articulate and relay the criticality of the outage to the connected party must be followed. In these instances where the impacted party is not supportive of the outage placement, measures are often taken to minimise the effect before the TO proceeds with the work. Typically, multiparty conference calls with TO, NESO and the affected party are arranged to discuss and agree the options. As the number of network users has increased over recent years, there are increasing occasions where it is necessary to balance dissimilar requirements of multiple parties. It can be necessary at times to agree an outage without gaining a full agreement from every involved party. NESO are obliged to make this final decision with all the relevant information gathered from the impacted parties and in the interests of the end consumer.
- Optimise the placement and duration of transmission system outages to maximise the efficiency of the outages required. This is often conducted through negotiations between NESO and TOs on the duration and emergency return to service, "ERTS", of an outage, which in turn can require technical innovation by TO teams to minimise impact.
- Carry out generator system margin assessments to ensure that the volume of energy potentially restricted by an outage or outage combination does not result in a shortfall at peak demand periods. This requires an understanding of the availability of generation not just within the relevant constraint but also elsewhere on the network. Therefore, knowledge of generation availability elsewhere on the network can impact outage viability at a local level.

Once all of these areas have been assessed and the outage has been deemed viable by all parties then the outage will be accepted as "planned" and reported to all involved parties. This process, although complex is vital for the secure, reliable and cost-effective operation of the system. It requires extensive coordination across the industry and outages can range from straightforward inspections taking a matter of just hours, to very involved assessments taking weeks.

Despite the requirements set out in the STC, it is recognised that many more new outages for additional work are requested and planned throughout current year than were identified and placed in the final, year ahead plan. There is also a high volume of change applied to outages that have already been planned. Throughout current year, outage over-runs, faults and the withdrawal of assets from service on an emergency basis are all contributing to the volume of changes to be managed within the current year planning time frame.

Minimising changes to the outage plan, providing more notice to affected parties and successful use of metrics to measure the levels of adherence to the STCs has been a longstanding challenge. The sections below will further articulate these challenges and make recommendations to improve on the visibility of outages.

6.2 Current Position and Challenge

The initial aims of the Electricity Commissioners Report published in June 2023 was to reduce the transmission build end to end process from 14 years to 7 years and acknowledges the significant increase in system access that would be required to meet a fully decarbonised electricity system by 2035. In November 2024 the UK Government published the Clean Power 2030 Action Plan which further accelerates the delivery of the development of the electricity system. To achieve a clean power system by 2030, network build must proceed at more than four times the rate of the last decade, delivering twice as much in half the time. Furthermore, up to c285 GW of generation, interconnection and storage capacity will be needed by 2035, according to the Holistic Transition pathway in Future Energy Scenarios 2024. A three-fold increase from today will require a significant increase in system access to deliver.

The current position regarding the system access planning process is shown in Figure 8 and provides a high-level overview of the outage planning process timelines from 6 years ahead through Current Year/Year 0 together with the volume of outages that currently take place actually planned in those timescales.

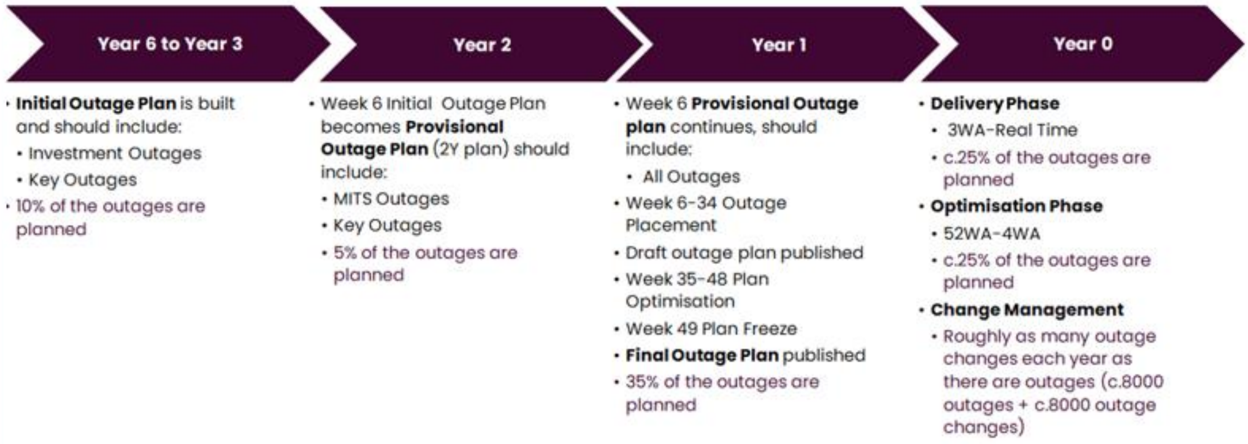

Figure 8: STCP planning time frames and current outage planning activity

In Figure 8, it can be seen that in the first 5 years of the 7-year system access planning cycle only 15% of the plan is built in total. A further 35% of the plan is built in the Year Ahead phase and 50% of the outage requests are submitted in the current year. Furthermore, 25% of the plan is requested in the Delivery Phase from 3 weeks ahead to real time in a period where disruption to the existing programme and resources should be a key focus. However, as can be seen in Figure 9 system construction activities, the majority of which would be classed as Investment and Key Outages accounted for 50%[37] of the overall system access activity in 2023/24. The current low volumes of outages that are being planned in the longer term and more strategic timescales, if allowed to continue unchallenged and unmitigated, would represent a risk to delivery of a clean power system by 2030.

37 Data derived from unavailability data in National Electricity System Performance Report 2023/24

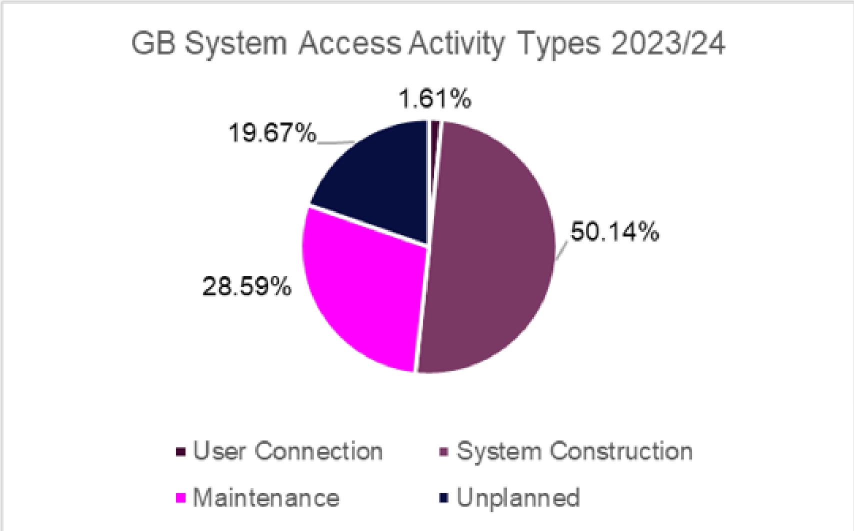

Figure 9: GB System Access Types

An aim of the OP4 workstream was to reduce the numbers of outage being requested in the current year with the aim of building a more strategic system access plan built across years to maximise the system access that can be provided creating an optimally phased plan across years.

It should be noted that removing all the current year change is neither possible nor desirable. There will always be windows of opportunity in short term timescales for some outages to be taken without a negative impact commercially or technically, or even to positive effect by capitalising on prevailing system conditions. It's important that NESO and TOs can take these opportunities where it is in the wider consumer interest, and this can demonstrate the importance of flexibility. Further to that there will always be a need for access to the network for genuinely unforeseeable reasons, for example where an asset requires inspection following a technological concern that if not investigated would damage the equipment, for short term protection modifications and repairs. There are also many instances where commercial opportunity should be seized upon, and an asset can be removed without incurring costs for a limited period of time – for example where generation export is low within a usually constrained area.

So, there is no expectation or desire to reduce this 50% figure to zero, simply to ensure that it is kept at a sensible minimum level that maintains flexibility whilst still ensuring that all foreseeable system access is planned before the current year.

6.2.1 6 Years Ahead to Year Ahead - Outage Request Volume

Typically, the system access for the major projects that we would expect to see in the 6 years ahead to 3 years ahead phase, are not progressed sufficiently to define the dates and the duration of the asset outages required. There are various reasons that have been highlighted for this that include regulatory process, procurement, contractor arrangements. Not exhaustive. Figure 10 shows the current number of outages that have been requested by year over the next 5 years.

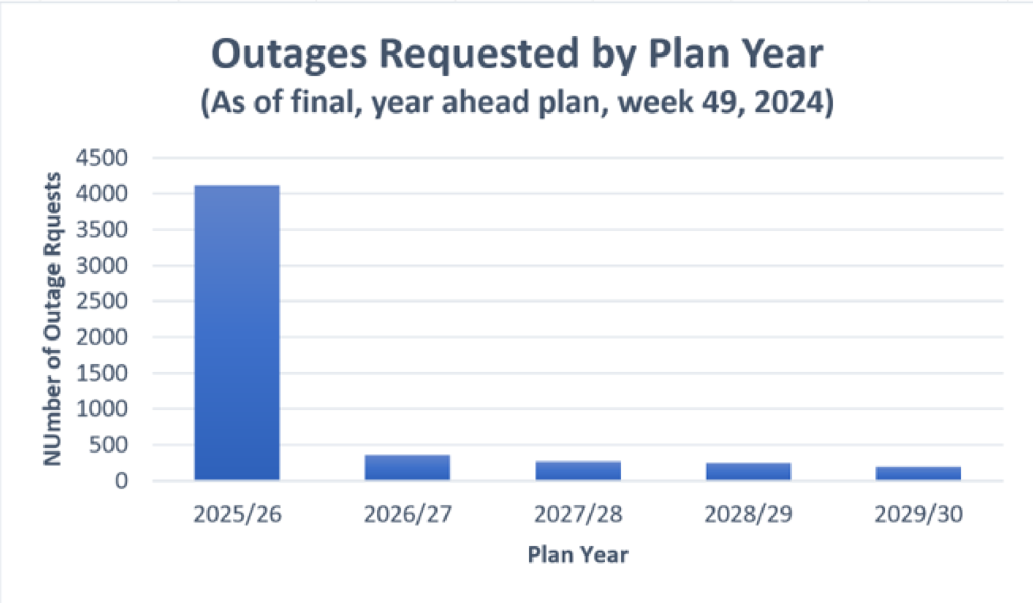

Figure 10: Requested by Plan Year

Currently, a baseline outage plan which includes major construction and connection scheme outages is not deliberated over until towards the middle of the year ahead phase.

For the purposes of illustration, the year ahead plan for FY26 now has over 4000 outages secured across GB, with the following years showing fewer than 500 each.

A greater planning focus needs to be applied to build the outage plans in the 6 year ahead to 2 year ahead phase. This would not only be consistent with the obligations of the STC but there would also be benefit to consumers, customers and stakeholders.

Detailed and complete outage plans developed up to six years ahead would support:

- The maximisation of system access through the building of a more strategic, holistic and optimally phased outage plans with efficiencies realised across all plan years through to six years ahead.
- The maximisation of the work that takes place on the network within the finite amount of system access that can be provided, by combining multiple work elements into fewer outages, maximising the value delivered from each planned outage.

- The minimisation of the forecast increase constraint costs by providing better optimisation of the system access plan and finding solutions to constraint challenges in timescales where there are more favourable options to address problems such as redesign leading to offline build and enhanced services.
- The provision of certainty regarding system access, on the deliverability of the reduction in transmission build times and supporting the delivery of the Clean Power 2030 Action Plan.
- If delivered, the actions and recommendations from this workstream will see all plan years up to 6 years ahead populated with all foreseeable scheme and key outages. Key Outages means outages which affect the operation of the MITS and/or those outages that are agreed between the TO's and NESO. These will include outages on connections to generators that have only a single connection to the transmission system.

6.2.2 2 Years Ahead and Year Ahead Outage Plan Build

As defined in STCP 11-1, the 2 Years Ahead and Year Ahead plan build phase commences in week 6 with the submission to NESO of the TOs' provisional outage plans that should contain all known construction and key outage work. The plan then develops through iterative optimisation and co-ordination activities between NESO, the TOs and affected parties with a view to NESO issuing the Final Outage Plan in December, week 49 of year ahead. Typically, only around 50% of the outages that will actually take place are included in the Final Outage Plan. This results in a process that can only focus on short term optimisation and means there are missed opportunities to optimise the plan across years with reduced options available in shorter timescales to address challenges.

The main challenges associated with the 2 year ahead and year ahead plan build are:

- Uncertainty around the outage requirements of generators: Transmission outages are aligned or "nested" with generator outages wherever possible to reduce operational constraints. Generators are permitted to change the dates of their planned shutdowns at short notice while still maintaining compliance with the Connection And Use Of System Code (CUSC). Where transmission outages have been nested with generator outages, any changes to these generator outage dates can result in wholesale changes to a transmission plan.

- The TO year ahead outage planning teams are often not fully aware of the specific outage requirements for delivery of a major schemes. Some outage requirements are missing from year ahead timescales due to factors such as incomplete project development, site specific factors, external parties and project complexities or risks. Also, the site based teams have less knowledge of the requirements of the STCP11-1 timings and requirements.

- The performance of the outage database: The electricity Network Asset Management System (eNAMS) is the application into which details of outages are stored. There have been difficulties in providing a reliable, outage "bulk upload" facility into eNAMS for the TOs.

It can become a time intensive job for TOs to enter their outage requests in bulk.   A change request has already been made to the eNAMS support team in NESO to rectify this. Initial indications are that the complex bulk upload code, as a whole will need to be re-written. This will take an estimated six months to complete not least because other upload options such as APIs are being considered

- Resourcing: When operational issues emerge in real time or short term planning time frames, any party may be required to move people resource into the current year, away from year ahead plan build.

- Customer agreement is one of the biggest challenges in the year ahead planning space: Transmission System users such as generators, distribution network owners and large directly connected customers (such as steelworks and refineries) need to agree with the outage plan where it impacts their operations or security of supply. These conversations can be protracted, requiring several multi-party calls and negotiations over several months for NESO to obtain agreement from all parties. This can lead to delays in NESO accepting an outage request into the plan and limiting opportunities for plan optimisation. Delays may also be cause by affected parties may not reply to NESO's requests to discuss relevant outages leading to year ahead outage requests remaining unplanned, passing into current year time frames for resolution.

- Outage requests after week 49: The plan freeze at the end of the year ahead phase is in week 49, December. This is the point at which NESO are required to produce the final, year ahead outage reports for all affected parties. It is common for additional outage requests to be received very close to or after this deadline meaning that outages often remain unplaced. Thereafter, NESO maintains this list of unplaced outages as required by the STCs. Data in section 6.3.3 and 6.3.4 show the volumes actually received after plan freeze.

- Completeness of the week 6 provisional outage plans. The volume of outage requests submitted to NESO each week of a typical year ahead plan build is shown in Figure 11. It is evident that the provisional, year ahead outage plan submitted in week 6 does not contain all the construction and key outages for the full year ahead with significant volumes of new outage requests appearing from week 21. Note: The term "with SO" simply means an outage has been requested and sits with NESO awaiting assessment. A planned outage is one that has been through the full outage planning assessment process and has been accepted into the plan by NESO.

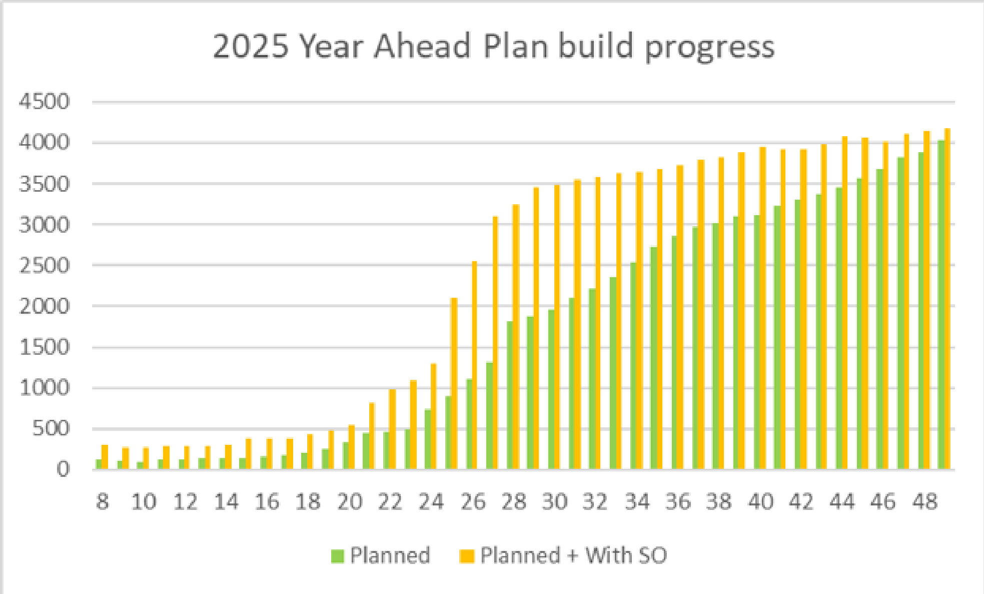

Figure 11: 2025 Year Ahead Plan Build Progress

6.2.3 The Current Year Planning Process

Following the plan freeze in week 49 of year ahead, and the plan handover in week 6 of current year, the new current year outage plan follows the financial year calendar and runs from Week 14 of the current calendar year through to the end of week 13 in the next.

There are two planning time phases in current year;

- The Optimisation Phase which covers the period from 52 weeks ahead of real time to the end of four weeks ahead. During this period, the TO and NESO hold monthly System Access Meetings, (SAMs). The purpose of the SAMs is to review the outage plan from four weeks ahead to sixteen weeks ahead and for NESO to work with the TOs to identify any opportunity outages or unplaced outages that could be placed in the review period. They are also intended to be used for agreeing any operational requirements which are needed to facilitate planned outages and to provide data for commissioning or testing of plant or equipment in the SAM review period. The main focus of the review is the 16 weeks ahead to 4 weeks ahead period.
- The Delivery Phase which, on a rolling basis, runs from 3 weeks ahead through to a day ahead. A stated objective within STCP11.1 of this phase is to minimise disruption to the existing programme. Resources or outage changes in this period should be limited to essential changes or opportunity outages. At this stage of the process, the NESO outage planners' focus is on the production of a large suite of operational documents (Op Notes), for the operational teams in NESO and the TOs. These Op Notes contains all the relevant outage details such as network topology changes, study analysis results and affected

parties' consents for all the planned outages. This enables the continued efficient and effective operation of the system as the outage plan is enacted, ensuring that the system is operated within the capabilities set by the TOs and the requirements of the SQSS are maintained throughout

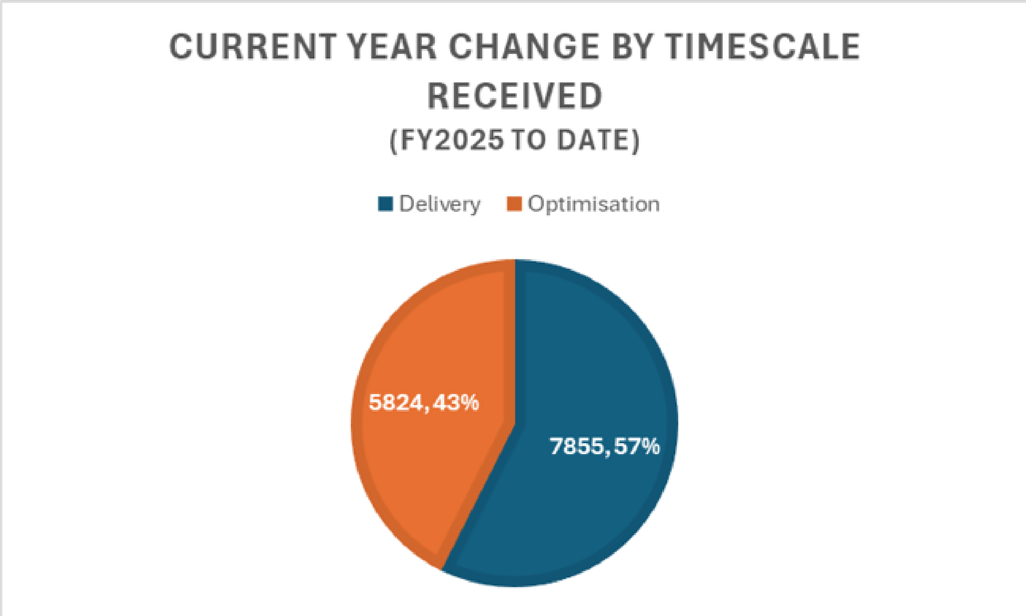

Figure 12: Current Year Change by Time scale Received

During the Delivery Phase the expectation is that new outages are not requested in this period except for essential changes or opportunity placements. Figure 12 gives a breakdown of the new outages and outage changes throughout the current year (based upon the 24/25 plan year).

The figure shows that this plan year to date across GB the majority of change to the outage plan in current year occurs in the four weeks prior to outage release and return dates (the delivery phase), with a lesser but still significant volume of current year outage plan change occurring in the optimisation phase (medium term).

The high volume of change to the outage plan in the current year, can reach levels that are challenging for both NESO and the TO planners to manage in a timely manner.   DNOs, DNOs, and affected Users are finding it increasingly difficult to support this volume of late notice volume of change to the outage plans so close to real time. Such late notice makes it incredibly challenging to be able to complete their analysis and the coordination work necessary to achieve agreement for outage changes and new requests.

Furthermore, the low level of plan stability, 8000 plan changes additional to 8000 outages taken per year in total, leads ultimately to a sub-optimal phasing of the outage plan, which in turn leads to increased constraint costs and increases the risk of non-delivery of key projects, schemes, and connections which will be essential for the delivery of accelerated transmission build to achieve clean power by 2030.

6.2.4 Plan Transparency and Performance Measures

There is limited transparency of the end-to-end system access process across industry. Increasing the transparency of the health and performance of the system access planning process could enhance scrutiny and support a change to a stronger long-term focus with greater plan stability. This approach could address and manage conflicting factors to delivering an efficient and cohesive plan. Metrics to consider might include quantitative measures with clear targets regarding plan build, plan delivery, and key blockers and enhancers to an optimally phased outage plan, that would ensure maximum effort is focussed in the most effective areas to support that objective. There are currently no penalties or incentives in place explicitly for performance against the STCP11-1 timelines.

6.3 Electricity Commissioner's Recommendation

The Electricity Networks Commissioner's Report recommendation and suggested implementation approach for this action are listed below.

6.3.1 Recommendation

NESO, in collaboration with industry, should lead a review of existing arrangements for outage planning (including, transmission outages, relevant distribution outages and generation outages) in the short, medium and long-term to develop actions to:

- Improve the timely identification of all outage requirements and their coordination.
- Drive down the number of foreseeable changes to those outage plans to improve greater certainty for stakeholders.
- Provide a stronger focus on the development of medium/long-term solutions to system access whilst minimising short term change and those impacts on an optimal system access plan.

6.3.2 Implementation

Cooperation between the TOs, system users and NESO will be required during the delivery planning process. Additional resource will be required from NESO to support this. Resources from NESO, TOs and users will be required to develop an action plan.

6.4 Workstream Approach

This workstream was led by NESO's Network Access Planning team, working with outage planning representatives from within the three onshore TOs; NGET, SPT and SHE T. Weekly meetings were held over Teams from May to December 2024 to review the outage planning process from day ahead through to six years ahead.

The OP4 workstream provided a unique opportunity for all three onshore TOs and NESO to carry out a full review of the end-to-end outage planning process. The workstream focussed largely on working with NESO, NGET, SPT and SHE T as these four parties, between them, had the greatest potential to deliver positive change to the outage planning process in the areas identified in the Electricity Commissioner's Report. Refer to figure 13 for the high level approach and deliverables for the workstream.

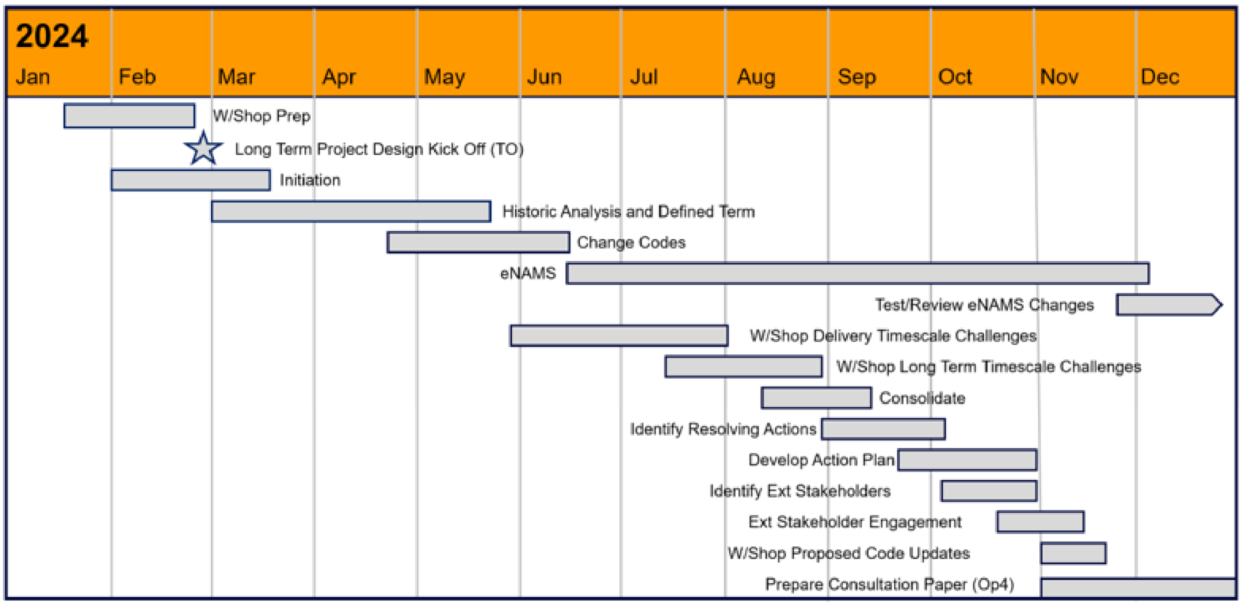

Figure 13: Workstream Gantt Chart

The primary goals of this workstream were to deliver positive improvements in three key strategic areas:

- Long term strategic outage planning
- Plan stability
- Planning process transparency

Improvements in long term planning, year ahead to six year ahead, would see all foreseeable system access requirements for system developments and key MITS outages[38] presented to NESO for assessment in each plan year from year ahead out to six years ahead.

Improved plan stability would see significant reductions to the 40% of changes that were deemed to be foreseeable in current year outage planning timescales. This 40% figure was calculated by the TOs and is an average across all NGET, SPT and SSEN-T outages- see section 6.5.1.3.1.

Developing key performance indicators and providing transparency in tracking the improvements to the outage planning process will provide accountability and assurance that positive progress is being delivered.

The stability and transparency of the outage plans in all of these timescales can have a significant impact on DNO and offshore transmission owners (OFTOs) also. Whilst the preparation and execution of this project involved the 3 large onshore TOs, the codes and procedures are relevant to OFTOs and impact DNOs as in many cases there must be co-ordination of outage requirements between transmission and distribution levels.

For initiatives such as this there must be consideration given to whole electricity system issues and coordination. As such, in each of the areas where there is an intention to explore changes to codes and processes, the benefits or the ramifications for both OFTOs and DNOs will be considered.

The transition of DNOs to distribution system operators (DSOs) has seen them take a more active role in local system operation through the management of generation within their licence areas. Changes made within this process will recognise the active nature of the DNOs areas and whole electricity system more generally.

6.5 Workstream Recommendations

6.5.1 Actions and Recommendations

Following a thorough review of the outage planning process from six years ahead through to day-ahead, NESO and the three onshore TOs identified and prioritised 28opportunities to improve the outage planning process. These opportunities were categorised as either actions or recommendations which would be taken forward to deliver a greater focus on long term strategic outage plans, to provide plan stability in current year and to give outage planning performance transparency.

The actions and recommendations from the OP4 workstream are contained in the abridged tables in Appendix 2: Proposed Actions and Recommendations. The actions and recommendations are presented in more detail below.

38 STCP 11-1 defines key outages as outages which affect the operation of the MITS and/or those outages that are agreed between the TO's and The Company (NESO). These will include connections to generators that have only a single connection to the transmission system.

The recommendations, if accepted, will need to be taken forward for review and implementation within each of the NESO and TO businesses; to be incorporated into their strategic business planning activities where appropriate.

6.5.1.1 Long Term Strategic Outage Plans

Thirteen recommendations and six actions have been identified which, if implemented, will positively impact the population of outage plans in each of the planning years from year ahead to six years ahead.

6.5.1.1.1 Greater industry focus on long term plan build obligations

The Grid Code, OC2, requires that NESO discuss and agree year ahead outage proposals with all affected parties with customer acknowledgement being sought in week 34 of the year ahead phase. If all feasible volumes of outages were highlighted prior to the year ahead stages, then this challenge becomes more straightforward.

It is proving to be increasingly difficult to gain agreement from affected parties regarding outage proposals in the plan build phase. This leads to outages remaining in the "unplaced" state when the year ahead plan is closed and handed over for delivery in current year. The TOs then have no certainty that their work can proceed as required and NESO current year planners must allocate resource and time to seeking agreement from the affected parties who failed to respond during the year ahead plan build process.

When finalising the year ahead outage plan, against a background of increasing numbers of new and innovative energy sources connecting to the system, it is proving difficult for NESO to balance the placement of TO outage requests against multiple parties' preferred and differing outage placement windows. There is a risk that significant amounts of time and effort are put into negotiating outage placements only for the outcome to be a failure to agree from one or more affected parties.

Recommendation OP4_7a: Review the relevant Grid Code sections (OC2.4.1 and OC2.4.2 as noted below in action OP4_20a) with all affected parties such that all parties (for example: Generators, Battery Energy Storage Systems (BESSs), DNOs, other Directly Connected Customers (DCCs) who are requesting or who are affected by outage requests, understand their obligations under the Grid Code. This will enable outage discussions to be conducted, and agreements obtained in the year ahead time frame. This will ensure that certainty can be provided to TOs at year ahead that their work can proceed and will reduce the volume of current year outage plan changes releasing current year planning engineer capacity to optimise the plan and deal with unforeseeable, emergent issues. This action is to ensure that all parties are aware of their OC2 obligations at year ahead.

Owner: NESO
Estimated completion: 3 Months (Review) plus 18 months to agree and implement changes/secure agreement. This will include determination on whether modifications are required to the existing codes or if they can deliver what is required by adhering strictly to them.

Recommendation OP4_7B: Once codes have been reviewed, procedural changes will be made where improvements can be realised. For example, to define and implement rules to allow NESO to make outage placement decisions in the best interest of the end consumer where there is a failure to agree. This will expedite the build of the long term and year ahead plans and increase confidence around the delivery of multi-year schemes and support the delivery of Clean Power 2030.
Owner: NESO
Estimated completion: Dependent on (7a) above.

Recommendation OP4_20a: NESO to undertake a review of the connections process to determine whether including increased guidance on outage planning obligations would be appropriate. If implemented, all users will understand their obligations under the codes, better supporting the build of the year ahead plan.

This guidance should aim to improve understanding of the sections of the Grid Code which outline the roles with respect to co-ordination of outages and the transfer of data transfer regarding outages. It will include but not be limited to;

- Grid Code section OC2.4.1 - Co-ordination of outages.
- Grid Code section OC2.4.2 - Data Requirements

Owner: NESO
Estimated completion: 3 months.

Recommendation OP4_20b: To address an increasing challenge in outage agreements due to increased number of affected parties, NESO to work with the relevant code review panels to propose modification that would create a framework to ensure that outages can be progressed when in the interests of end consumers. This will give all parties certainty, particularly at year ahead, that their work or others' outages that might affect them, will proceed.   The volume of current year outage plan changes should reduce, allowing for more plan optimisation opportunity.
Owner: NESO
Estimated completion: 12 months.

6.5.1.1.2 NESO Capability

Delivering Cean Power 2030 will see a significant increase in the diversity of new connections made to the National Electricity Transmission System (NETS). This, in turn, will increase the complexity of the processes required for the assessment, coordination and sanctioning of outage requests on the NETS. Currently, it can take nine to twelve months to train and authorise power systems engineers for roles in NESO's Network Access Planning teams.

There is a clear requirement for increased capability to build a greater focus in the longer term timescales with an aim for cost effective placement of key outages in the 2 – 6 year ahead timescales. This leaves the within year space for seeking cost saving opportunities, enhancing security and delivering a robust plan to manage the system to the respective control rooms (NESO and all 3 TOs). Planning in the longer term allows for a more strategic and less pressurised outage placement, and allows challenges to be addressed when there are more options available to address them

Recommendation OP4_11a: Review the current capability (resource/tools) levels across all planning time frames from the day ahead to six years producing a strategy to support the projected increases in volume and complexity of outage requests as the size and diversity of the NETS grows.
Owner: NESO
Estimated completion: 3 months to produce an initial view.

6.5.1.1.3 Management of the long term plan build process.

The maximisation of system access will require a more strategic long term planning process that build an optimally phased outage plan with efficiencies found by taking a multi-year approach. There is a need to increase the foreseeable, current year outage requests identified and requested within the year ahead plan build time frame or further out still in the period from 6 years ahead to 2 years ahead. This timescale can be better utilised, as is its purpose, for planning of Investment Outages and Key Outages on the Main Interconnected System.

The current STCP 11-1 allows the year ahead plan build process to conclude with a list of "Unplaced Outages". Such outages can be unplaced for numerous reasons including late submission, awaiting responses from affected parties or insufficient capacity remaining on the NETS to support any more outages.

From the issuing of the year ahead plan in week 49 to handing over the plan to the current year outage planners in week 4 in the following year, there is no formal procedure to allocate ownership of the unplaced outages over this six-week period. Opportunities could be lost to further optimise the plan against emergent changes or to continue to look for placements for some of the unplaced outages.

Recommendation OP4_14b: Deliver a more strategic long term system access plan by engaging with affected parties: Users; DNOs; DCCs and others to move the focus, additionally, onto the plan build from two to six years ahead. This will allow the production of more fully populated plans up to 6 years ahead giving affected users greater notice of outages that will affect their operations. This will also provide greater assurance around the deliverability against the requirements of achieving a clean power system by 2030
Owner: NESO
Estimated completion: 12 months to establish and then embed as business-as-usual.

Recommendation OP4_19: Develop and agree a process in which clear accountability and responsibility is given to managing changes to the final outage plan between week 49 and week 4. This will provide additional, continuous support for the year ahead outage plan, to further optimise the plan, and to assess requests for changes to the plan without undue delay with a

reduction in the number of outstanding outage requests rolling forward in current year time frames.
Owner: NESO
Estimated completion: 6 months.

6.5.1.1.4 TO Capability.

The move toward Clean Power 2030 is driving unprecedented levels of investment. This will increase the size and complexity of the asset base for all TOs. Additional capability will be required to enable the TOs to continue to effectively and efficiently manage their growing assets bases.

Recommendation 10a: All TOs to review capability (resource/tools) in the areas critical to outage planning and, where required, increase capability to support the continued effective and efficient co-ordination of outage planning both internally, within the TOs, and externally.
Owner: TOs
Estimated completion: 12 months.

6.5.1.1.5 Identifying scheme outage requirements for the 3 -6 year ahead plan build

NGET recognised that experienced, operational resource is often unavailable to support the development of schemes in the long term time frame. This can result in:

- outage requirements for successful scheme delivery being loosely specified leading to additional outage requests or outage extensions being required in current year,
- outages for final commissioning not being identified and requested until delivery timescales, very late in current year.

This has the effect of increasing the risk of delays to customer connections, knocking on following outages for schemes and maintenance as well as increasing the burden of managing short term change for affected parties such as DNOs and DCCs. Again, the more of this that can be highlighted in the long term plan, the more the year ahead space can be used for consolidation and the more the current year can be used for optimisation and delivery.

Recommendation OP4_14d: Additional allocation of specialist site safety authorised and commissioning resources to be made available for year ahead up to six year ahead scheme development support. This will contribute to better populated long term plans, will improve the timely identification of outage requirements presented to NESO and the affected parties as well as having a significant effect in reducing the number of short notice, foreseeable changes in current year. This recommendation to be passed on to NGET's long term planning strategy review programme.
Owner: NGET
Estimated completion: 1 month.

6.5.1.2 Late approval of TO schemes and major projects

The TOs stated that repeated re-submissions of scheme information for approval was a contributing factor responsible for schemes and major projects not being sufficiently progressed in the long term planning time frame. Late sanctioning leads to short notice change request to both the longer term and current year outage planning time frames.

Recommendation OP4_13a: Review and revise the requirements of the review and approval processes for schemes and major projects. Identify the root causes driving the iterative re-design and re-approval submissions. Design a streamlined, right-first time process giving more stability and certainty to the NETS access requirements to be incorporated into the long term outage plans. The number of new schemes appearing in current year with no or few outages to support their delivery will be reduced as will the consequential requests for scheme and major project outages in current year.
Owner: TOs
Estimated completion: 12 months

6.5.1.2.1 Improvements to the eNAMS, NESO's outage planning database.

All outage requests that affect the operation of the NETS must be logged and managed in eNAMS, the electricity Network Access Management System created and maintained by the Company.

When building the long term outage plans, the TOs require a capability to upload outage requests in bulk in one transaction as opposed to entering outages one at time through multiple transactions. eNAMS provides a bulk outage upload facility but the performance of this functionality can be inconsistent resulting in bulk outage upload files failing to load, this results in limitations being placed on the number of outages that can be uploaded at once or the process failing completely.

Action OP4_26a: Review eNAMS bulk upload options that will enable the TO's to populate long term outage plans in an efficient and effective manner and to give NESO and affected users earlier visibility of outages that affect them. A redesigned or replacement bulk upload functionality if needed.
Owner: NESO
Estimated completion: 9 months.

Action OP4_30: Work with the TOs to identify additional bulk upload functionality requirements in eNAMS that will better support the TOs' management of and interaction with the long term outage plan builds. Areas identified to date:

- Review rules within eNAMS to allow TOs to change outages under review by NESO. The impact on other parties needs to be considered so a "planning lock " may be required when customers have been engaged or when an outage is under assessment by NESO.
- Modify existing eNAMS services to automatically publish long term plans on a regular basis.
- Review bulk uploads methods considering a move away from Excel spreadsheets and implementing APIs and other data products instead.

- Consider flagging scheme maturity in eNAMS against associated outages in the longer term plan.
- Consider adding confidence functionality against schemes in progress.

Owner: NESO
Estimated completion: 12 months.

6.5.1.2.2 STCP 11-1 requirements and milestones for the year ahead plan builds

STCP 11-1 specifies the requirements for the exchange of information across the NESO:TO interfaces throughout the Outage Planning process and includes relevant timescales for submission of outage requests to NESO. It is recognised that there can be a high volume of outage change that can be requested close to issuing the final, year ahead plan in week 49. This can make the completion of final outage placements by the end of week 48, as defined in section 3.2 of STCP11-1, challenging to finalise the plan, ahead of handover.

Action OP4_14a: Review the STCP 11-1 milestones associated with the 1-2 year ahead plan build and confirm, or otherwise, that they are fit for purpose. If the milestones are fit for purpose and can therefore be adhered to by the TOs and by NESO, all parties will strive to meet these requirements. This will reduce the number of outage changes running from the year ahead plan build into current year, the timely identification of outage requirements will be improved and a better populated year ahead plan produced.
Owner: NESO
Estimated completion: This action has been completed with NESO and the TOs all agreeing that the requirements of STCP 11-1 remain fit for purposes and a greater effort must be applied to adhere to these requirements. The benefit of this is that it demonstrates that there is a present-day agreement with all current outage planning teams, that the documentation and timelines are fit for purpose, that they do not require revisiting and that rather than proposing any changes to them, what is required is training and performance indicators to ensure that they are being followed correctly.

Action OP4_14c: Review the long term outage planning process to improve the timeliness and increase the volume of outage requests presented to NESO for the 3 year ahead to 6 year ahead plan builds. Improved processes will increase the content and accuracy of the long term outage plans, reducing the volume of unplaced outages running over into current planning time frames.

This work is currently under way with all three TOs currently reviewing their end to end outage planning processes. In statements received from the TOs:

NGET:

NGET has in 2024 started a transformation programme to review how we plan all our work from long term strategic timescales to operational timescales. This includes reviewing our processes, data and tools. We need to ramp up work delivery and therefore greater quality of planning is critical. Included within this transformation is a full analysis and problem solving of the current issues that drive our short term foreseeable change. We intend to put actions in place to drive these changes down in operational timescales by doing more planning in the long term timescales. We believe that these actions, some of which will happen in phases depending on how complex they are to achieve, will support us in meeting the key deliverables of the OP4 workstream.

We have made good progress with this work in the last year and have received high-level sign off to progress to our next phase, which is detailed engagement across all NGET stakeholders and detailed plan churn analysis.

SSEN-T:

The SSEN Transmission Outage Planning team are working with a new internal Transformation Office, and with appointed contractors, to promote earlier engagement and better efficiency in the Outage Planning process. The aim is to apply more rigour and close monitoring, to achieve further accuracy in the Year Ahead Outage Plan and reduce the volume of 'in year' outage changes and new requests.

SPT:

With the increasing number of outages expected on the SPT network due to project works and connections in RIIO-T3, SPT have committed through their business plan to provide the following:

- Increased resource to manage the growing complexity and volume of outage planning requests,
- Upscaling digital and AI tools for outage planning - Automated outage planning tool using analytics and AI,
- Improved outage planning processes and better network reliability assessments,
- Enhanced Governance on outage planning requests at the year ahead stage,
- Further implementation of readiness reviews in the medium-term stage.

Owner: TOs
Estimated completion: 9 months.

6.5.1.2.3 Availability of skilled resource for scheme development

All TOs recognised that that unavailability of skilled resources in the two to six years ahead times frames, both within the TOs and from contractors, was hindering the development of schemes and major projects in timescales required through STCP 11-1. Without this critical resource, it is not possible to identify and request the NETS outages to contribute to the development of long term outage plans. Winser action SC2, Supply Chain and Skills, is addressing this constraint.

Action OP4_10e: Identify the respective TO leads for Action SC2, Supply Chain and Skills, and inform them of resource requirements/actions as per OP4's actions and recommendations.
Owner: TOs
Estimated completion: 2 months.

Action OP4_13b: Investigate opportunities to secure contractor engagement earlier in the scheme and major project design phase. This will deliver improved (earlier) project development

and identify outage requirements as soon as practicable in the long term planning time frames. These requirements will feed into the Winser Recommendation SC1 Supply Chain and Skills.
Owner: TOs
Estimated completion: 2 months.

6.5.1.3 Plan Stability

Three recommendations and six actions have been identified which, when implemented, will deliver more stable outage plans with greater plan stability meaning fewer, short notice changes needing to be accommodated.

6.5.1.3.1 Foreseeable and unforeseeable change.

Action OP4_31: Foreseeable and Unforeseeable Change.

A priority for this workstream was to look at opportunities to minimise foreseeable change within the current year time frame. All three TOs analysed a full year's worth of their outage plan change data. Consistently, across all three TOs, it was recognised that an estimated 40% of change to the outage plan could be categorised as foreseeable change with the potential therefore to move this foreseeable change into the optimisation phase and long-term planning time scales. By way of example, a time based, 3 yearly maintenance request made in current year could have been identified and requested in the long term, planning time frame. Such a request would be categorised as a foreseeable change.

Change codes are assigned to new outage requests and to requests for changes to existing, planned outages to categorise the reasons for change to the outage plan in current year. The change codes do not capture the root cause of the changes. There are, at present, 44 outage change codes, many of which were deemed to be no longer fit for purpose being either not used, ambiguous, were repeated or didn't capture the main reasons for change. These codes have now been reduced to 19 in number and have been redefined

An example of an unforeseeable change would be an extension to an in-flight outage due to work found on inspection such as a defect during planned maintenance.

To reduce the volume of foreseeable change, it was recognised that improved monitoring and recording of the reasons for change to the outage plan was needed. Changes in three areas were required:

- A review of the change codes contained in STCP 11.2 Outage Data Exchange; Appendix C.5 was undertaken.
- For each of the 19 change codes, a change category of either Foreseeable or Unforeseeable,
- For each outage change a mandatory, root-cause reason for the change must be recorded against the outage change request.

Change codes are used in eNAMS, the electricity Network Access Management System. eNAMS is the NESO application used to manage and record all new outage requests and changes to planned outages across the whole of the GB electricity transmission network that are of interest to NESO and affected Users of the GB electricity transmission network. The 19 new change codes need to be made available in eNAMS, together with their classifications of Foreseeable or Unforeseeable. An additional, new mandatory field to capture the root cause of the reason for change is also required. The changes to eNAMS are currently being developed and tested and should be available in early 2025.

The required changes to STCP 11-2 have now been submitted to the STC change panel. The revised version of STCP 11-2, once approved, will be issued once the modifications to eNAMS are released into production in Q1 2025. From this date, the TOs will be able to monitor and report on the volume of foreseeable change to the outage plan in current year time scales and will be able to understand the root cause of that change. Current processes will then be reviewed, and changes will be developed by the TOs to drive down the current levels of foreseeable change.
Owner: NESO
Estimated completion: 3 months.

6.5.1.3.2 Generator outages

NESO will work with the TOs to align NETS outages with generator shutdowns to maximise system resilience and reduce the costs of constraints.

Challenges arise for NESO and the TOs when generator shutdowns, against which NETS outages were aligned, move. Although the number times this happens in any given plan year is low, the impact for NESO and the TOs is high when it does, often resulting in the TOs cancelling their work which may involve cancelling outages for customer connections. The cancellation of long duration planned outages, often at short notice, causes significant re-work for all affected parties and can cause further disruption to the outage plan when trying to replan the outages to align with the revised generator shut down dates, with other outages needing to change to accommodate the latest moves.

It is recognised the generators may need to move their planned shutdowns at short notice to take advantage of market opportunities or to realign with changes of contactor availability.

The guiding codes on this matter are considered by some to be contradictory and open to interpretation.

OC2 states that, subject to the provisions of the Grid Code, outages can be planned and executed at any time and from time to time:

OC2 Section 3.2.4: Subject to the provisions of the Grid Code, The Company and each User (with Plant and/or Apparatus) shall, as between The Company and that User, be entitled to plan and execute outages of parts of in the case of The Company, the National Electricity Transmission System or Transmission Plant or Transmission Apparatus and in the case of a User, its System or Plant or Apparatus, at any time and from time to time.

The same text as above can be found in sections '2.6 Outages' in the CUSC

However, the Grid Code describes a process enabling generators to notify The Company of changes, in writing, with at least eight weeks' notice. However, the Grid Code is silent on generator outage change management in the period up to seven weeks ahead.

Grid Code OC2 Section 2.4.1.3.4 (b) :Each Generator or Interconnector Owner or Restoration: Contractor (as provided for in OC2.3.1(f)) or Network Operator or Non-Embedded Customer may at any time during Year 0, request The Company in writing for changes to the outages requested by them under OC2.4.1.3.3. In relation to that part of Year 0, excluding the period 1-7 weeks from the date of request, The Company shall determine whether the changes are possible and shall notify the Generator, Interconnector Owner, Restoration Contractor (as provided for in OC2.3.1(f)), Network Operator or Non-Embedded Customer in question whether this is the case as soon as possible, and in any event within 14 days of the date of receipt by The Company of the written request in question.

To manage and track generator outages, NESO therefore manually monitors the Remit submissions to align outage requests with declared generator shutdowns where appropriate and to ensure continued alignment.

Recommendation OP4_4: Commence a programme of engagement with generation owners with a view to eventually proposing code modifications and/or alternative working arrangements regarding generator outages. NESO and TOs to articulate to generators and the wider industry what the challenge is and what the consumer impact currently is. Preparation of historic case studies will be required before this engagement, and this should be done by NESO for the cost impact, and TOs for the resource impact. Jointly, and through industry forums, NESO and TOs will make proposals for alternative arrangements on how short-term transmission outage change can be reduced through enhanced liaison with generation companies.
Owner: NESO
Estimated completion: 12+ months.

6.5.1.3.3 Outage readiness

The TOs have recognised that whilst the management of schemes and major projects is a continuous process through to completion, it was felt that the TO project teams and planning teams are not empowered to make the decision to delay or cancel supporting planned NETS outages when there is a demonstrably high risk of the scheme or project being unable to complete all planned works on time within the agreed outage windows.

The failure to make these "go/no go" decisions as soon as the risks are known leads to outages being released as planned followed by short notice requests being made to extend the in-flight outages. This can cause significant disruption to outages following on in the plan. On some occasions, outages associated with schemes and major projects have an Emergency Return to Service time, "ERTS" of "On Completion" or "OnCom". The implication of this is that NESO then has no choice but to accept the extensions as the circuit cannot be returned to service. This can often lead to a sub-optimal phasing of the outage plan, increases in constraint costs and reduced system resilience.

Recommendation OP4_5: Empower the TO readiness review groups with necessary powers to be able to mitigate risks and expedite a "Go" decision if possible. When all else fails then make the "No Go" call. This will reduce the number of short notice outage over-runs, improve plan stability, reduce consequential rework for affected parties, improve system resilience and reduce constraint costs.
Owner: TOs
Estimated completion: 12+ months.

6.5.1.3.4 NESO engagement with contractors

To support the requirements of STCP 19-4, Commissioning and Decommissioning, the TOs are able to invite NESO outage planning representatives to attend commissioning panel meetings. Current NESO resource levels see them attending commissioning panel meetings on a discretionary basis only. Within current year, NESO will usually attend the inaugural commissioning panel meetings for all schemes and major projects and will then attend more frequently as final commissioning approaches.

Attending in this way can lead to NESO missing intervention opportunities that may keep the work on schedule. This can lead to late notice change requests being presented to NESO by the project managers, that otherwise could have been identified at earlier stages. It is not uncommon for sub optimal commissioning strategies to be presented which could have been prevented with NESO attendance at all meetings.

Recommendation OP4_18b: NESO to review Network Access Planning's resource skill base and experience to see if greater support for commission panels can be provided to the point where all commissioning panels have NESO attendance. A cost benefit analysis may be required to ascertain whether additional resource is required for attendance. If deemed not to be cost effective, an analysis will determine the extent to which the exchange of commissioning programme information exchange can be improved. The analysis will determine to what extent these would drive down short notice changes to the outage plan.
Owner: NESO
Estimated completion: 8 months.

6.5.1.3.5 Disconnect between site teams and planning teams within the TOs.

The TOs observed that improved liaison and coordination of outage requirements between site operations and the outage planning and project development teams would improve the efficiency and effectiveness of the outage planning and outage request process.

Opportunities for site engineers to advise the planning teams of risks to scheme and major project delivery are sometimes delayed.

Action OP4_3a: Implement consistent and formal Readiness Reviews for key stages of schemes and major projects to reduce the volume of foreseeable change in delivery time frames and to reduce the number of current year outage requests and changes.
Owner: TOs
Estimated completion: 6 months.

Action OP4_3b: Implement improved/stronger Governance between site teams and planning teams to reduce the number of foreseeable outage changes in delivery time frames, reduced the number of current year requests for new outages and changes to outages. Within SHE-T, a new process is in place with a 5-6WA review taking place on a project by project basis taking feeds from commissioning panel meetings. An option for an additional review looking at 8-16WA RAG statuses is being considered.

Within NGET, this issue is currently under review. The challenge is that the volume of projects is significant but monthly cross-functional meetings are in place. A weekly risk review process currently in place. NGET are looking to improve communications between site and planning.

SP do currently operate with a 6 month ahead period review on a monthly basis. Additionally, the three weeks ahead plan is reviewed weekly.
Owner: TOs
Estimated completion: 6 months continuing.

6.5.1.3.6 System Access Meetings

The purpose of the monthly System Access Meetings, "SAMs", as detailed in STCP 11-1, is for NESO to review with each TO, thirteen weeks' worth of the outage plan from four weeks ahead to sixteen weeks ahead to confirm that all relevant arrangements are agreed and in place to provide assurances that all the outages are able to proceed as planned.

It was agreed that these meeting are not working to the intent of the STC. Rather than confirming the outage plan, the SAMs are used as an opportunity to request additional outages on the NETS in the current year within the four to sixteen weeks ahead period. This volume of requests can be considerable exceeding 100 requests per week across GB.

Action OP4_6a: Review the STCP (11.1) to confirm and support the intent of SAMs and produce an updated Terms of Reference to be agreed between all parties to improve the stability of the outage plan in the four to sixteen weeks ahead period.
Owner: NESO
Estimated completion: 3 months.

6.5.1.3.7 Managing delivery time frame outage request volumes

NESO's outage planning resource is finite and planning outages against the increasing operational complexity of the NETS can extend the time it takes for NESO to assess and approve changes to the outage plan in the delivery period. For the TOs, a fast turn-around of outage plan change requests in delivery time frames is valued to so it is possible to allocate inhouse resource, complete outage preparation activities and to secure specialist contractor resource when required. NESO and the TOs therefore need a process to monitor the volume of change requests in the delivery period such that if NESO's outage assessment capacity reaches a prescribed limit. NESO and the TOs can work together to prioritise the outstanding requests. This will produce earlier go/go-no decisions and should support NESO's goal to enhance plan stability by assessing all outage requirements by close of play, Thursday, a week ahead.

Action OP4_8a: Design and implement a process to quantify the effort required to assess outage requests and outage changes received in delivery timescales based on the complexity of each of the outage requests. Use this data to manage the workload of the NESO outage planners to remove stress and control the volume of short notice change to the outage plan. Note: The delivery of this action has already started. A trial process is in place and NESO now work with TOs to prioritise delivery time frame requests when the effort of outstanding requests breaches the trial's threshold limits.
Owner: NESO
Estimated completion: Ongoing

6.5.1.3.8 Extended contractor and scheme support

Once contractors are assigned to a scheme or major project, the proposed scheme stages need to be produced and checked for compliance with the TOCA (Transmission Owner Connection Agreement) and the enduring BCA (Bilateral connection agreement).

Scheme stages and stage completion dates can change throughout the design and delivery of schemes and major projects so it is important the NESO teams are able to assess the implications of any changes and modify the agreements with the TO and with the customer accordingly. Without this input, commissioning could be delayed, additional or repeat outages may be required or outages may be extended in order to deliver the requirements of the connection agreements.

Action OP4_18a: Review and confirm the benefit of NESO's Connections team providing expertise at the commissioning panel meetings. As a trial, invite representation from NESO's Connections team to attend scheme meetings and commissioning panels to understand the benefit. From this a cost benefit case can be made by NESO to demonstrate how useful this would be for end to end planning. NESO and the TOs will then have a view on whether connection team attendance would limit the risk of outage over-runs and repeat outages.
Owner: TO and NESO
Estimated completion: 2 months.

6.5.1.4 Transparency of Performance

Four actions have been identified which, if implemented will enable all parties responsible for outage planning performance to socialise the challenges experienced and demonstrate the progress made towards delivering improvements in the outage planning process as requested in the Electricity Commissioner's report.

6.5.1.4.1 System access meeting requests

Compliance with STCP 11-1 System Access Meetings, "SAMs", and working to revised terms of reference for the SAMs will be required to see the volume of current year outage changes reduce and move to a period outside of four to sixteen weeks ahead.

Action OP4_6b: Review the impact of action (6a) on the output of the SAMs. Produce a KPI to monitor the volume of new outage requests and outage change requests made for the four to sixteen weeks ahead period. To reduce plan change in current year and to give affected parties as much notice as possible of changes to the outage plan, requests for foreseeable change should be removed and a better optimised plan will be produced.
Owner: NESO
Estimated completion: 6 months.

6.5.1.4.2 Rework KPI

The TOs are mindful that multiple requests can be made for outages on the same assets in the same plan year. Outages may need to be re-requested due to changes in TO resource, contractor resource changes or system access constraint changes. To control rework and capture learning points, the number of times an outage is re-requested and re-planned should be captured in eNAMS.

Action 7 OP4_8b: Write a user story to create a volume of rework metric.
Owner: SP
Estimated completion: 2 Months.

Action 8 OP4_8c: Develop, test and release into production the Volume of Rework metric into the suite of Network Access Policy KPIs produced monthly by NESO. As the volume of re-work reduces, firmer, better optimised plans will be produced with fewer change requests generated.
Owner: NESO
Estimated completion: 5 Months.

6.5.1.4.3 Lack of transparency

The current Network Access Policy KPIs cover many aspects of the TOs' outage planning performance and serves to assist in driving down plan stability blockers. The TO KPIs cover unplanned outages.

Reactive equipment unavailability and short term changes/delays are reported in C17 reports and bilaterally between NESO and TOs respectively. The transparency data for outage performance, although available would be more useful if produced more regularly and made more widely available.

These metrics are reported annually to Ofgem.

Outage planning performance data should be published more widely to evidence the progress being made to reduce short term change, increase outage notification times and place a greater focus on medium and long term outage planning.

Action OP4_9: Review existing TO (C17) and NESO reporting, or consider the creation of a dedicated public domain report to provide greater transparency to KPIs related to outage planning performance in areas deemed beneficial to the delivery of a more strategic, more efficient outage plan while also supporting greater plan stability.
Owner: NESO
Estimated completion: 6 Months.

6.6 Workstream Benefits

The changes proposed under this workstream, if implemented, could lead to a very substantial reduction in wasted time and effort, a reduction in the net cost of the network transformation, and an increase in the throughput of outages in the planning process. The benefits to NESO, TOs, customer and consumers are pronounced.

By introducing transparency into the process using KPIs, all parties will be able to better understand pinch points and problem areas while reporting on improvements. By utilising system access meetings to better effect, the volumes of new outages will be understood and minimised so that there will naturally be more opportunity for outage co-ordination. This is likely to lead to a reduction of the total number of times that a single asset may be taken out of service per year. By tracking the delivery time frame outages, it will be possible to quantify the volume and the impact of short term change. By increasing the interaction between site teams, TO planning teams and NESO planning teams there will be a better understanding across the range of respective challenges. By investigating changes to communications with generators, there will be opportunities to drive down changes that are associated with generator outage placement and re-placements.

Significantly, this workstream seeks to ensure that plans are built with outages submitted, analysed, and agreed as far from real time as possible. Outages that are currently analysed in the delivery phase will be moved out to the optimisation phase, with year ahead outages being moved into 2-6 year phase. The time saving, consumer saving and the resource savings are likely to be significant. Similarly, the upgrade to eNAMS and proposed changes to codes that are planned will ensure that the improvements from this workstream are enduring.

By building plans across years rather than in the current years, the opportunities to unlock system access that would not otherwise have been possible are likely to be substantial. NESO and the TOs already demonstrate (through an initiative known as customer value opportunities) what the benefit of optimisation is from a financial standpoint. The benefits from OP4 will also release value opportunities but more pertinently to transmission acceleration, it will unlock our collective capability to fit more access planning into the system operation, facilitating the network transformation that is needed.

The precise increase in network access will be determined by the number of these recommendations that are accepted and completed so the full understanding of the likely benefits requires further analysis. The compound effect of the completion of these initiatives and the potential for moving up to 40% of short term change into the optimisation and long term planning space will provide a major shift in the opportunity for the additional access that is required to transform the network.

Appendix 1: SQSS Risk Assessment Form

Risk Assessment form to operate beyond the normal standards of the SQSS

National Energy System Operator - Confidential | Power System Risk Management

Assessment to operate beyond normal standards of the SQSS on the MIS network:

Request to operate beyond the normal limits of the SQSS standards (Voltage/Thermal):

Brief description of issue driving the need to be outside SQSS standards (Voltage/Thermal):

Post fault actions (if applicable):

Benefits perceived with the above request:

Probabilistic Assessment Results:

TO response:

Options and risk mitigation actions:

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Third-party response (if required):

Recommendation:

NESO Approval:

On behalf of National Energy System Operator, the Head of Power Systems is invited to:

APPROVE/DISAPPROVE: the strategy required to operate outside of the SQSS on the network

Signed: ______________________ Date:________________

TO Approval:

On behalf of NGET/SPT/SSEN-T, the Head of XXX is invited to:

APPROVE/DISAPPROVE: the strategy required to operate outside of the SQSS on the network

Signed: ______________________ Date:________________

Third-party Approval (delete if not required):

On behalf of Third-party name (e.g., DNO or DCC), the Head of XXX is invited to:

APPROVE/DISAPPROVE: the strategy required to operate outside of the Grid Code on the network.

Signed: ______________________ Date:________________

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Appendix 2: Proposed Actions and Recommendations

Ref	Description	Action or Recommendation	Owner	Timescale
OP1_1	Proposed Change to STCP11-1	Recommendation	NESO	3 – 6 months
OP2_1	Modify Paragraph SQSS Paragraph 5	Recommendation	NESO	9 - 12 months
OP2_2	Update SQSS Table 6.3	Recommendation	NESO	9 - 12 months
OP2_3	Update SQSS Table 6.4	Recommendation	NESO	9 - 12 months
OP2_4	Update SQSS "Notes for Tables"	Recommendation	NESO	9 - 12 months
OP3_1	Incorporate Constraint Costing for Build Options into CSNP	Recommendation	NESO	12 months
OP3_2	Update STCP 16-1 Paragraph 4.2.7	Recommendation	NESO	6-9 months
OP3_3	Update STCP 16-1 Paragraph 4.2.8	Recommendation	NESO	6-9 months
OP4_3a	Implement consistent and formal Readiness Reviews for key projects and schemes.	Action	NGET SPT SSEN_T	6 months
OP4_3b	Implement improved and stronger Governance between site and planning teams	Action	NGET SPT SSEN_T	6 months
OP4_4	Commence a programme of	Recommendation	NESO	12+ months

	engagement with generators			
OP4_5	Ensure that Readiness Review groups have the necessary powers to be able to expedite a "Go" decision and when all else fails then make the "No Go" call.	Recommendation	NGET SPT SSEN_T	12+ months
OP4_6a	Review STCP 11-1 for intent of SAM Meeting and create a SAM Terms of Reference (ToR).	Action	NESO	3 months
OP4_6b	Review meeting behaviours in line with the newly documented SAM ToR (action 6a) to confirm positive change or escalate if necessary.	Action	NESO	6 months
OP4_7a	Through the Connections Process, produce guidance and work with the new connecting parties to ensure understanding of their obligations in the Outage Planning process.	Recommendation	NESO	3 Months (Review) plus 18 months to agree and implement
OP4_7b	Review existing codes to ensure that there is a fair mechanism for NESO to complete its Outage Planning processes in the absence of timely	Recommendation	NESO	Dependant on 7a

	response from affected Users.			
OP4_8a	NESO are currently trialling a process to assess the volume and complexity of outage requests at 2 weeks ahead and one week ahead.	Action	NESO	Ongoing
OP4_8b	Introduce Volume of Rework metric. Write User Story for "Volume of requests v number of outages delivered" metric for implementation in eNAMS	Action	SPT	2 months
OP4_8c	Introduce Volume of Rework metric to the suite of Network Access Policy KPIs. Note: Subject to completion of Action 8b.	Action	NESO	5 months
OP4_9	Review existing TO and NESO reporting obligations (e.g. C17) and update where necessary. Publish all TO and NESO Network Access Policy KPI data on the NESO website.	Action	NESO	6 months
OP4_10e	Identify the respective TO lead for Winser Action SC2 (SC2 Supply	Action	NGET SPT SSEN_T	2 months

	Chain and Skills) and inform them of resource requirements/actions as per this action/recommendation list.			
OP4_11a	Review the current capability (resource/tools) levels across all planning time frames from the day ahead to six years producing a strategy to support the projected increases in volume and complexity of outage requests as the size and diversity of the NETS grows	Recommendation	NESO	3 months
OP4_13a	Review and revise the project approval processes that sometimes leads to the late sanctioning of TO projects.	Recommendation	NGET SPT SSEN_T	12 months
OP4_13b	Secure earlier Contractor engagement to expedite project development for earlier design solutions and outage planning requirements. Feed into other Winser Recommendations (SC1 Supply Chain and Skills)	Action	NGET SPT SSEN_T	2 months

OP4_14a	Review codified milestones and confirm or otherwise that they are fit for purpose. Note: Refer to STCP11-1, Para 3.2 (3.2.4.1) and Appendix C.	Action	All	Complete
OP4_14b	Work with all Users to ensure a final plan is issued by Week 49.	Recommendation	NESO	12 months
OP4_14c	Increase the volume and improve the accuracy of outages in the Year Ahead plan.	Action	NGET SPT SSEN_T	9 months
OP4_14d	Additional commissioning resource to be made available for Year Ahead scheme development support.	Recommendation	NGET	1 month
OP4_18a	NESO to be invited to all commissioning meetings at the Scheme development stage.	Action	NGET SPT SSEN_T NESO	2 months
OP4_18b	NESO to attend all commissioning panels as requested by the TOs or as deemed necessary by NESO.	Recommendation	NESO	8 months
OP4_19	Review and agree ownership for the management of unplaced Outages between the release of the Final Year Ahead plan in week 49 and the	Recommendation	NESO	6 months

	handover of the plan in week 4.			
OP4_20a	Work with Users tom improve their understanding of outage planning requirements through the connections and compliance processes	Recommendation	NESO	3 months
OP4_20b	Consider modifying the Codes to allow NESO to "Tell" rather than "Request" an outage after consultation period has lapsed.	Recommendation	NESO	12 months
OP4_26a	Correct issues with eNAMS' ability to accept bulk uploads	Action	NESO	12 months
OP4_30	Undertake a review of functionality within eNAMS to support TO requirements.	Action	NESO	12 months
OP4_31	Review eNAMS change codes and update to support the differentiation between Foreseeable and Unforeseeable Change. Agree revised list with STCP Panel and implement in eNAMS.	Action	NESO	3 months