



Gap Analysis and Roadmap

Understanding key principles of quality assurance and appraisal in Strategic Energy Planning

June 2025

“Extract of full report, disclosed under EIR”



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1

Approach and findings

NESO must take concrete steps to embed Green and Aqua Book standards to enhance transparency and credibility

Context of work

NESO's Strategic Energy Planning (SEP) portfolio plays a central role in delivering credible, data-driven plans to support the UK's Net Zero transition.

With NESO's transition to public ownership under DESNZ, there is increased scrutiny on how SEP programmes uphold **public value**, **transparency**, and **quality assurance**.

To meet this expectation, NESO is aligning its programme assurance with **HM Treasury's Green Book** (public sector appraisal) and **Aqua Book** (analytical quality assurance).

"Alignment to the Green & Aqua book, where relevant, enables us to further demonstrate to our stakeholders, and any external challenge, that we have followed good practice principles and standards in what we do."

- Julian Leslie, Director of Strategic Energy Planning & Chief Engineer

Embedding these standards across all programmes will support:

1. **Defensible and transparent** decision-making processes
2. **Consistent** and **proportionate quality assurance**
3. Demonstrable **best practice** in public analysis

Purpose of work

This document provides a **baseline assessment** of how well NESO's SEP programmes currently align with HM Treasury's Green Book and Aqua Book standards. It also provides a high-level **roadmap** to support the adoption of Green Book and Aqua Book principles across the SEP portfolio.

It is not a formal compliance review, but a structured, developmental exercise to help NESO embed **mature assurance** and **appraisal practices** that meet stakeholder expectations and endure external scrutiny

Specifically, this document:

- **Assesses current practices** in governance, assurance, documentation, and risk management across six SEP programmes
- **Identifies areas of strength and improvement** based on self-assessments and interviews
- **Develops tailored, proportionate recommendations** for each programme to improve alignment with Green and Aqua Book guidance
- **Supports NESO's goal** of becoming a trusted, independent system planner through consistent, high-quality, and evidence-based delivery

The document follows Green and Aqua Book training to upskill on Green and Aqua Book principles

Different NESO teams have self-assessed as being at varying stages of maturity along Green and Aqua Book alignment

NESO teams' self-assessed RAG status for Green and Aqua Book alignment

Domain	SSEP RAG
Governance and Analytical Culture	Yellow
Proportionality and Planning	Yellow
Transparency, Documentation and Communication	Yellow
Modelling Approach, Testing and Validation	Green
Risk, Uncertainty, and Sensitivity Analysis	Red
Business-Critical Models	Yellow
Skills, Capability and Capacity	Yellow
Decision-Making and Use of Evidence	Green



- Self-assessed maturity of alignment with Green and Aqua Book **varies across domains**
- The '**Modelling approach, testing, and validation**' domain shows **strong alignment** with best practice, supported by trained experts, version control, and embedded validation - though model sign-off processes could be more formalised.
- The '**Risk, uncertainty, and sensitivity analysis**' domain reveals **more significant gaps**, including the absence of structured model-level risk registers, inconsistent sensitivity testing, and a lack of formal challenge processes.

- Significant gaps against Green Book/Aqua Book expectations; action needed to strengthen governance, assurance, or documentation.
- Foundations in place, but practice is inconsistent or informal; improvement needed to embed standards.
- Good alignment with best practice; approaches are structured, documented, and consistently applied.

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2

SSEP

SSEP: Gap Analysis

SSEP is analytically advanced and methodologically sound, but would benefit from stronger formalisation of QA processes, clearer documentation of uncertainty, and consistent model governance to meet Green and Aqua Book standards.

Domain	RAG rating (NESO self-assessed gap)	Comment
Governance and Analytical Culture	●	Analytical leadership is strong and QA culture is maturing, but formal assignment of assurance roles is still in progress.
Proportionality and Planning	●	Analytical planning is detailed, but formal risk assessments and proportional QA are not consistently applied across teams.
Transparency, Documentation and Communication	●	Key outputs are documented and shared, but assumptions, limitations, and uncertainty are not always clearly communicated to non-specialists.
Modelling Approach, Testing and Validation	●	Modelling is technically robust and well-structured, but internal QA and validation processes are not yet formalised across all tasks.
Risk, Uncertainty, and Sensitivity Analysis	●	Risks and uncertainties are recognised, but there is no consistent documentation or structured sensitivity analysis framework.
Business-Critical Models	●	There is no formal register or owner-based tracking of business-critical models, and model governance is inconsistently applied.
Skills, Capability and Capacity	●	The team has deep expertise, but relies heavily on individual experience; structured capability planning and training remain underdeveloped.
Decision-Making and Use of Evidence	●	Modelling strongly supports programme decisions, but visibility of how evidence shapes outcomes could be improved, particularly around uncertainty.

- Significant gaps against Green Book/Aqua Book expectations; action needed to strengthen governance, assurance, or documentation.
- Foundations in place, but practice is inconsistent or informal; improvement needed to embed standards.
- Good alignment with best practice; approaches are structured, documented, and consistently applied.

Overview of SEP-led vs programme level actions

Programme-level actions apply QA and analysis practices within delivery teams, while SEP-led actions set the overarching standards and governance frameworks they follow.

Domain	SEP-led	Programme (SSEP) level
Governance and Analytical Culture	Define and formalise QA roles (e.g. Commissioner, Assurer) and embed into governance structure.	Assign named QA roles within teams and apply them consistently in projects.
Proportionality and Planning	Mandate risk-based assurance planning and embed it in templates and guidance.	Apply tiering tools to assess analysis risk and document QA needs accordingly.
Transparency, Documentation and Communication	Set organisation-wide standards for assumptions logs, documentation, and storage (e.g. SharePoint).	Maintain and update logs for assumptions, limitations, and versioning at model level.
Modelling Approach, Testing and Validation	Approve minimum model validation standards and sign-off requirements for all Tier 1 & 2 models.	Complete QA validation logs and checklists; coordinate Assurer/Commissioner sign-off locally.
Risk, Uncertainty, and Sensitivity Analysis	Require inclusion of risk and sensitivity analysis at key project stages (e.g. kick-off, delivery, submission).	Populate and maintain model-specific risk and assumption logs and sensitivity testing outputs.
Business-Critical Models	Define what constitutes a business-critical model and introduce registration and governance requirements.	Classify and register active models using agreed tiering system and maintain supporting documentation.
Skills, Capability and Capacity	Define core analytical role standards and succession planning expectations across the organisation.	Map current capability, engage in targeted training, and monitor skill development at workstream level.
Decision-Making and Use of Evidence	Require analytical evidence to be referenced in decision documents and governance submissions.	Clearly document and link analysis to recommendations and record this in templates and decision logs.

SSEP Gap Analysis

SSEP can strengthen governance by defining QA roles, aligning assurance to risk, and integrating tiered oversight

Domain	RAG	Findings	Actions	Green and Aqua Book practices	Owner & due date
Governance and Analytical Culture	●	The programme has highly skilled analysts and a commitment to quality but lacks formalised analytical assurance processes and roles. Aqua Book roles are recognised in strategy but have not yet been formally assigned or operationalised. While assurance activities are happening, they rely heavily on informal processes and individual expertise. Governance structures like the Design Authority and PMB are well-developed. However, assurance sign-off milestones were not initially embedded in the analytical planning or governance routes.	Immediate focus: Embed clear roles for QA across the programme (e.g., Commissioner, Assurer) to be assigned in June.	1. Review the Aqua Book QA roles (e.g. Commissioner, Assurer) and adapt them to suit your programme's context.	[owner]
				2. Appoint named individuals to each role and clearly communicate their responsibilities to the team.	[due date]
				3. Integrate roles into governance processes and review effectiveness after implementation, adjusting as needed.	[owner]
			Core priority: Establish tiered assurance and governance checkpoints. (<i>Medium-term</i>)	1. Set out risk-based assurance tiers (e.g. Tier 1–3, see <i>Appendix</i>).	[due date]
				2. Link each tier to the appropriate level of scrutiny and assurance required.	[owner]
			Strategic opportunity: Start building a culture of assurance by rolling out training and encouraging practice sharing. (<i>Long-term</i>)	1. Roll out a training plan covering assurance principles, Aqua Book roles, and QA techniques.	[due date]
Proportionality and Planning	●	The programme developed a robust analytical plan early on, with strong effort in scoping and sequencing analytical work. While analysis was well-planned, formal QA processes and assurance checkpoints have not been largely considered, with risk-based assurance planning emerging only after assurance leads were brought in. The team is focusing on areas of highest risk, but this prioritisation is retrospective, with some areas not receiving equivalent assurance attention.	Immediate focus: Introduce a simple tiering system to classify all current and planned analyses by risk and complexity (e.g. Tier 1: high-risk/high-impact, Tier 2: medium, Tier 3: low).	1. Develop a simple tool or matrix using Aqua Book risk factors (e.g. stakeholder sensitivity, decision criticality – See <i>Appendix</i>).	[owner]
				2. Use the tool to assess ongoing and planned analytical workstreams.	[due date]
				3. Share tiering outcomes with team leads and governance boards to determine the appropriate level of QA scrutiny, effort, and resource allocation for each piece of work.	[owner]
			Core priority: Build formal quality assurance checkpoints into the lifecycle of each analysis, aligned with proportionality and governance expectations.	1. Define the minimum QA required for each tier (e.g. independent assurance for Tier 1, peer review for Tier 2) to ensure proportionality.	[due date]
				2. Recognise that formal checkpoints are in place, and ensure tiered QA is consistently applied to.	[owner]
				3. Allocate named assurance roles (e.g. Assurer) to each product or analysis at the start of the planning phase to ensure accountability.	[due date]
			Strategic opportunity: Embed proportional analytical assurance into planning standards across the organisation.	1. Revise programme planning templates to include risk tiering and QA planning requirements.	[owner]
				2. Train leads to apply proportional assurance effectively.	[due date]
				3. Track with quarterly reviews and make proportional assurance mandatory for all new analytical workstreams.	[owner]



SSEP Gap Analysis

SSEP can enhance analytical robustness by formalising documentation standards, and embedding assurance processes

Domain	RAG	Findings	Actions	Green and Aqua Book practices	Owner & due date
Transparency, Documentation and Communication	●	While some internal documentation exists (e.g. for the Plexos model), formal user guides are either incomplete or not shared beyond the modelling team. There's no clear, standardised format or central repository for assumptions, limitations, or decision. The team acknowledges difficulty in balancing technical depth with accessibility, particularly when engaging stakeholders or drafting external publications (e.g. methodology documents). SOPs and user guides have now been drafted and implemented for key models. Documentation responsibilities have been assigned to the incoming Eco Modelling Assurer (starts 09/06).	Immediate focus: Introduce a consistent set of templates to document assumptions, limitations, version history, and change logs across all modelling workstreams. Core priority: Build the capability and expectations for analysts to clearly communicate modelling insights to non-specialist audiences. Strategic opportunity: Embed documentation standards and audit trail requirements into programme and analytical governance frameworks.	1. Develop templates for assumptions logs, user guides, version history, and change logs.	[owner]
				2. Make template use mandatory for all Tier 1 and Tier 2 products and store them in a central, access-controlled location (e.g. SharePoint).	[due date]
				3. Designate analysts or modellers to maintain and regularly update the documentation.	[owner]
				1. Check team adoption of standard phrases and uncertainty language for consistency.	[due date]
				2. Provide training or peer support to help analysts communicate complex analysis effectively to non-specialist audiences.	[owner]
				1. Define tiered documentation standards (e.g. version history, QA records, signed-off assumptions) and make them mandatory for all Tier 1 and Tier 2 analysis.	[due date]
Modelling Approach, Testing and Validation	●	SSEP uses novel and complex modelling (MCDA, geospatial, Plexos) requiring niche expertise. The role of the Analytical Assurer has been clearly defined and incorporated into the Assurance Strategy. SOPs for logs are in draft form. External consultants provide some validation, with internal processes for model verification, testing, either ad hoc or absent. Limited internal application of Aqua Book validation principles has been recognised and addressed with a QA resource is being onboarded. Challenge and review panels are not yet active.	Immediate focus: Embed model validation using the Aqua Book roles of Analyst, Assurer, and Commissioner. Core priority: Introduce a formal log to document key validation steps, tests, issues, and sign-offs across each model's lifecycle. Strategic opportunity: Develop and embed a modelling guide that outlines the minimum technical and assurance standards for all bespoke models.	2. Integrate documentation checks into assurance gateways, with logs reviewed at each stage and recorded in a central assurance log.	[owner]
				1. Specify that Analysts must document model design, assumptions, and initial testing.	[due date]
				2. Ensure Assurer is trained review validation activities and Commissioner to confirm models meet assurance standards.	[owner]
				3. Require Assurer and Commissioner approval before any Tier 1 model outputs are shared with governance or stakeholders.	[due date]
				1. Create an Aqua Book-aligned log template covering purpose, assumptions, testing, issues, and sign-off.	[owner]
				2. Make completion mandatory for all Tier 1 and Tier 2 models and ensure it's reviewed monthly.	[due date]
				1. Develop a modelling standards guide that reflects Aqua Book principles and NESO best practice. It should cover model design, documentation, validation processes, version control, and reuse.	[owner]
				2. Make adherence to the guide mandatory for all new modelling work, with evidence of compliance required before approval.	[due date]
				3. Review and update the guide annually, drawing on lessons learned, assurance reviews, and feedback.	[owner]

SSEP Gap Analysis

SSEP can improve model integrity by embedding risk logs, sensitivity analysis, and formal sign-off for critical models

Domain	RAG	Findings	Actions	Green and Aqua Book practices	Owner & due date
Risk, Uncertainty, and Sensitivity Analysis	●	High-impact analytical risks are recognised (e.g. economic modelling and geospatial MCDA work), and QA resourcing is improving, but more structured model-level risk registers, consistent sensitivity testing across pathways, and formal challenge processes (e.g. for consultant-led work) are needed. Assumptions log is in place. Sensitivity testing is well established and forms a core part of team practice. Risk log is under consideration	Immediate focus: Introduce dedicated risk and assumption logs for each major analytical model (e.g., economic modelling, geospatial, MCDA).	1. Finalise templates to capture model-specific risks, assumptions, dependencies, and limitations.	[owner]
			Core priority: Ensure all major modelling outputs include proportionate sensitivity or scenario analysis to explore uncertainty.	2. Require logs for all Tier 1 and Tier 2 models, to be regularly updated by the analyst or modelling lead.	[due date]
				3. Review logs at key governance checkpoints, and store them centrally for QA, commissioners, and reviewers.	[owner]
			Strategic opportunity: Develop a consistent mechanism for independent challenge of modelling assumptions, especially for third-party/consultant-led work.	1. Define minimum expectations for sensitivity and scenario testing to assess uncertainty in modelling outputs.	[due date]
				2. Integrate these standards into project plans and timelines, and ensure analysts are trained in appropriate techniques.	[owner]
				3. Establish an internal or cross-programme reviewer role for Tier 1 models to provide independent scrutiny.	[due date]
Business-Critical Models	●	PLEXOS and ArcGIS have been confirmed as business-critical. NESO IT procurement is currently reviewing their business justification. Key documentation and logs are being embedded. There is a general risk register, but no modelling-specific risk register. Controls and formal sign-off for model use are being implemented. Key tools lack fully documented business system-level controls.	Immediate focus: Clarify which models are business-critical using standard criteria, building on NESO-aligned definitions and in-development model-specific artefacts.	2. Require structured challenge sessions at key stages, to test modelling assumptions.	[owner]
				3. Document outcomes in an assurance record and ensure all issues are resolved before progressing to major decisions.	[due date]
			Core priority: Establish a formal sign-off process before models are used to inform decisions, with evidence of QA and assurance	1. Develop a checklist using Aqua Book guidance and NESO priorities to categorise models by risk, impact, and complexity.	[owner]
				2. Ask model owners to assess/log all current models using the checklist.	[due date]
			Strategic opportunity: Improve audit trails and change tracking for key models used across the programme.	3. Ensure outputs are linked to model-specific currently being developed as part of assurance and governance processes.	[owner]
				1. Set out the required checks for model use, including QA logs, validation evidence, and commissioner approval.	[due date]
				2. Integrate the sign-off process into governance documents and delivery timelines to ensure it's followed consistently.	[owner]
				3. Maintain a log to monitor sign-off status.	[due date]
				1. Define procedures for recording version history, rationale for changes, and reviewer comments across all models.	[owner]
				2. Require all Tier 1 and Tier 2 models to maintain up-to-date change logs, reviewed at QA checkpoints.	[due date]
				3. Store logs centrally and align with central NESO standards to ensure traceability and support governance oversight.	[owner]

SSEP Gap Analysis

SSEP can build resilience and credibility by developing analytical capability, and linking evidence to decisions

Domain	RAG	Findings	Actions	Green and Aqua Book practices	Owner & due date
Skills, Capability and Capacity	●	Strong expertise exists, but there is a heavy reliance on individual experience rather than structured training. Geospatial modelling poses a resilience and scalability risk, with limited in-house depth. Capability planning and formal development remain underdeveloped. Core modelling capability is in place through September 2025. Final hire (Analytical Assurer) starts 09/06. However, team structure is temporary, many modellers will transition off SSEP after delivery, so capability planning must extend beyond the programme	Immediate focus: Map current analytical capabilities against programme needs, identifying single points of failure and critical gaps (e.g. in geospatial modelling).	1. Review current skills and responsibilities (e.g. Analyst, Assurer, Commissioner).	[owner]
			Core priority: Launch a focused training programme on assurance and modelling skills, prioritising areas of high risk based on factors such as analytical complexity, decision criticality, and stakeholder sensitivity.	2. Flag low-resilience areas (E.g., Tier 1 models reliant on single individuals) and prioritise for upskilling or contingency plans.	[due date]
				3. Ensure capability development and training aligns with NESO-wide resourcing needs, not just SSEP lifecycle.	[owner]
			Strategic opportunity: Embed structured workforce planning, including role definition, skills gap analysis, and succession planning, and targeted capability development for analytical roles.	1. Develop training modules focused on model QA, Green/Aqua Book standards, and effective stakeholder communication.	[due date]
				2. Target training at areas with high analytical complexity, critical decision points, or high stakeholder sensitivity.	[owner]
				3. Position assurance training alongside live delivery to avoid disrupting modelling timelines.	[due date]
Decision-Making and Use of Evidence	●	Decisions are consistently informed by analysis, and records are maintained. Clear ToRs are now required to further formalise governance. Stop/go decision gates are in place. However, real-time feedback loops and structured challenge mechanisms are still maturing.	Immediate focus: Ensure key programme decisions are clearly linked to analysis that informs them.	1. Set role-specific standards and learning pathways for key assurance roles (e.g. Analyst, Assurer, Commissioner) based on Aqua Book expectations.	[owner]
			Core priority: Strengthen the decision-making process by embedding formal mechanisms for analytical challenge and feedback.	2. Ensure all workforce planning is directly linked to the programme's risk profile and assurance requirements.	[due date]
				1. Ensure major decisions reference analysis that supports them.	[owner]
			Strategic opportunity: Create structured challenge opportunities within the governance process.	2. Clearly name and document the models, data, or analysis used to underpin each decision.	[due date]
				1. Run challenge reviews at key analytical milestones, led by Commissioners or independent Assurers.	[owner]
				2. Summarise challenges (e.g. key questions and changes made) to ensure transparency.	[due date]
				1. Build formal challenge slots into the programme's governance cycle for testing assumptions, methods, and findings.	[owner]
				2. Use Assurers, Commissioners, or external experts to lead challenge discussions.	[due date]
				3. Record the results of each challenge and feed them into assurance logs and governance records.	[owner]