INDEPENDENT ASSURANCE REPORT

for SSEN March 2024 DNOA Outcomes

September 2024
Version 2

Threepwood Consulting

Introduction

Statement of Purpose and Scope of this Report

This Report summarises key findings from independent assurance checks undertaken on a sample of DNOA outcomes taken from the DNOA Outcomes Report March 2024 published by SSEN Distribution. The scope relates to 6 DNOA outcomes with a project value above £2M (3 in SEPD and 3 in SHEPD). The conclusions from these checks have been reviewed by the DSO Advisory Board.

SSEN DNOA Reports

SSEN Distribution publishes a DNOA Outcomes Report on its website each quarter. This describes its plans for meeting network needs for the next 7 years, in the North of Scotland (SHEPD) and South East (SEPD) distribution licensed areas. These plans (known as schemes) have been taken through the SSEN Distribution Network Options Assessment (DNOA) Methodology, which was published in its final version in 2023.

Requirement for independent assurance

The DNOA methodology outlines an independent assurance process for schemes with a value over £2M. The objective being to ensure that the DNOA methodology has been applied to the assessment of these schemes and that there is transparency in how outcomes are reached.

Introduction (continued)

Threepwood Consulting and our role

Threepwood Consulting has been appointed by SSEN Distribution to conduct the independent assurance checks required. We are an industry respected consultancy that has expertise in distribution network planning and audit/assurance activities. We have a proven track record in providing independent assurance of network related processes and operations like those required in the DNOA methodology.




Nature of the assurance review

This assurance review is an independent check of a selected number of schemes with a value above £2M. Schemes are selected to ensure that both license areas are covered, different options (flexibility procurement and/or reinforcement) are reviewed and schemes from different planning departments are checked.

There are two types of review: A ‘Sample’ type review is focused on reviewing the Engineering Justification Papers (EJPs), CBA and CEM deterministic tools associated with each scheme. A ‘Deep Dive’ type review involves greater scrutiny of the content of the EJPs, CBA and CEM and seeks further evidence of how the process has been applied and decisions have been reached. The ‘Deep Dive’ includes interviews with engineers that have evaluated the solutions and proposed the recommended solution.

The assurance review is carried out every quarter to align with the publication of the latest DNOA Outcome Report.

Overall Summary of Findings

Findings Topic	DNOA Scheme Reviewed					
	1	2	3	4	5	6
Have future forecasts of demand and generation been done and have system needs been suitably identified (capacity)?						
Have suitable flexibility and asset options been identified and developed?						
Have the options been suitably assessed taking into account strategic requirements etc?						
Does the DNOA outcome report adequately reflect the assessment carried out?						

General Points: The schemes checked were found to follow the DNOA process. All of the options proposed (flex and/or assets solutions) were determined as being correctly identified/assessed. Good practices were common across different licensed areas and planners including the use of a centrally managed/updated load model and cost database and considering outputs from stakeholder engagement. Several opportunities for improvement were identified in relation to the level of detail and consistency of information in the EJP and the CBA and CEM tools. However, these do not have a material impact on the outputs. Improvement opportunities include: greater visibility of liaison and feedback from the DNO, greater visibility of social and economic considerations and alignment of estimated demand and capacity between the DNOA outcome report and the EJP. The DNOA outcome report template is somewhat limited, particularly with respect to communicating strategic approaches and investment beyond 2031 and conveying non load related schemes. There is scope to improve descriptions in the report to better reflect the constraints and proposed options.

Assurance Review Methodology

Summary

- The same methodology applies to the assurance check irrespective of the type of review carried out.
- A standard question set is used to ensure all relevant requirements of the DNOA methodology are checked. There are 32 questions in total. These cover the four steps that make up the decision-making process: 'Identifying Future Load Related System Needs', 'Developing Options', 'Assessing Options' and 'Update Plan & Deliver'.
- For each scheme, an assessor reviews the EJP and supporting information and records findings.
- The findings against each question are recorded in a standard template and the assessor assigns a score depending upon the degree to which the requirement has been met. For 'Deep Dive' type reviews, the assessor documents any further evidence or clarifications required from the SSEN engineer(s).
- Scores are assigned as either 'Red', 'Amber' or 'Green' where:
  - Red - Requirement not met (to the degree that the outcome could be materially affected or is inaccurate)
  - Amber – Requirement partially met (process not robust, opportunities for improvement identified but the deficiency is not material and the outcome wouldn't change or its accuracy not affected)
  - Green - Requirement met (process followed)
- For each 'Deep Dive Review', the assessor conducts a detailed interview with the relevant SSEN engineer(s) to seek further clarification / evidence in order to conclude whether the process has been followed.
- Based on the recorded scores, the assessor concludes whether each key step in the decision-making process has been adequately followed and the outcome is valid.

DNOA Outcome Schemes Reviewed

Ref	DNOA Scheme Name	Type	Area	Sample/Deep Dive Review
1	Abernethy, Kinross, Dollar	Procure Flex	SHEPD	Deep
2	Birdham	Procure Flex	SEPD	Deep
3	Culloden (Inverness)	Procure Flex	SHEPD	Sample
4	Ealing and Hounslow	Asset Solution	SEPD	Deep
5	East Bedfont	Procure Flex	SEPD	Sample
6	Errochty/Tummel Bridge	Asset Solution	SHEPD	Sample

All SSEN March 2024 DNOA Outcome Schemes reviewed have been developed to Strategic Justification Validation stage. This is prior to a completion of detailed asset optioneering and feasibility design.

Findings - 1. Abernethy, Kinross, Dollar (Deep Dive Review)

Scheme Details

Ref:	Scheme Name:	Scheme Title:	Planning Area:
1	Abernethy, Kinross, Dollar	Abernethy 33kV Reinforcement	SHEPD

Identifying Future Load Related System Needs

- Future load modelled using DFES scenarios beyond ED2 (up to 2050).
- CT future scenario used for developing and assessing options – high confidence.
- Future load including committed connections (load and generation) and output from stakeholder engagement accounted for with high confidence.
- Thermal and voltage issues have been identified as key constraints.

Developing Options

- Five options have been considered in reasonable detail of which only two can address the thermal and voltage constraints.
- Although some options resolved the thermal constraint, they do not resolve the voltage issues.
- Flexibility option was considered and feasibility of delivering the required reduction in demand was assessed in detail. Confidence in this option was medium.

Developing Options (...continued)

- Suitable reinforcement options were adequately considered, including upgrading overhead lines, adding a new single feeder and adding two new feeders.
- A strategic and proactive investment to allow for future load growth and extension has been considered by adding two new feeders and creating a new 33 kV ring.
- The age and conditions of the existing switchgear and transformer assets at Milnathort and Abernethy have been considered.
- Site input by the DNO was not transparent in the EJP – the engineer confirmed a site meeting with the DNO had taken place but because there were no major issues this was not highlighted.
- Meeting notes are kept for future reference.

Assessing Options

- CBA and CEM tools were adequately used to support the proposed solution. There is scope to populate more detail in the CBA and CEM although this would not materially affect the outcome.
- Deliverability and operability risks have been identified.
- A hybrid flexibility and reinforcement approach was correctly identified as the preferred option. This defers reinforcement for 3 years.
- Meeting whole system requirements beyond ED2 (up to 2050) was a factor in the proposed solution.
- Social and environmental aspects were not covered in detail. However, it is recognised that the DGIF process addresses this in more detail at the next stage. No social or environmental aspects are believed to materially change the decision.
- DNO feedback on the proposed options was not specifically mentioned in the EJP. However, the planner confirmed that DNO staff have had an input at this initial stage as described in the DGIF process. The engineer confirmed that the DNO had not highlighted any safety concerns.
- The correct approval protocol was believed to be followed.

Findings – 1. Abernethy, Kinross, Dollar (Deep Dive Review) *continued…*

Scheme Details

Ref:	Scheme Name:	Scheme Title:	Planning Area:
1	Abernethy, Kinross, Dollar	Abernethy 33kV Reinforcement	SHEPD

Update Plan and Deliver

- Key driver correctly identified as thermal and voltage constraints not fault level.
- It correctly identifies the solution but does not recognise the solution also addresses the voltage constraint.
- The DNOA Outcome Report does not capture the flexibility and reinforcement solution correctly up to 2031. The flexibility solution should be 3 years as stated in the EJP.

Good Practices

- System model includes all FES, connections etc. and NDR is centrally owned and managed by the Modelling and Reporting Team.
- Stakeholder engagement feeds into load and generation forecasts.
- Future load growth takes account of DFES scenarios.
- Strategic and whole system aspects have been considered beyond ED2 (up to 2050).
- Flexibility has been exploited to defer reinforcement.
- Deliverability and operability have been adequately considered.
- High level risks have been assessed and documented in the EJP.

Opportunities for Improvement

- Visibility of DNO liaison and feedback on the proposed network options are not generally shown in the EJP, as issues are only reported by exception.
- DNO feedback is recorded in meeting notes, which are available for future reference..
- Visibility of social and environmental considerations in the EJP and CBA.
- Completeness of fields and detail in the CBA and CEM tools.

Summary

- Future forecasts of demand and generation have been suitably considered and system needs have been suitably identified (capacity).
- Suitable flexibility and asset options have been identified and developed.
- The options have been suitably assessed taking into account strategic requirements etc.
- The DNOA outcome report generally reflects the assessment carried out but does not correctly capture the flexibility period required or that the proposed solution removes the voltage issues.

Findings – 2. Birdham (Deep Dive Review)

Scheme Details

Ref:	Scheme Name:	Scheme Title:	Planning Area:
2	Birdham	Hunston BSP - Birdham and Selsey Primaries	SEPD

Identifying Future Load Related System Needs

- Future load modelled using committed connections and DFES scenarios beyond ED2 (up to 2050).
- CT future scenario used for developing and assessing options – high confidence.
- Previous committed projects considered i.e. replacement of legacy overhead line.
- Operational Safety and Thermal issues have been identified as key constraints.

Developing Options

- Six options have been considered, all of which have been subject to detailed analysis.
- The options considered variations in network configuration
- Flexibility was considered were relevant for reinforcement deferment. Flexibility was not appropriate for the operational safety issue on the legacy overhead line.
- Site specific considerations were considered including the likely routing of new 33kV circuits and high risks.

Developing Options (…continued)

- Management of the operational safety issues has been analysed.
- Network load, voltage and fault level have been analysed for the options.
- Engagement with regional council has been conducted to ensure alignment of plans.
- The age and condition of the existing transformer assets at Birdham and Selsey have been considered, this information is available to the DSO via the DNO INVEST asset database.
- Strategic and economic aspects have been considered for the reinforcement options i.e. transformer size and cost.
- Site input by the DNO captured in the EJP in the form of high risks.
- The engineer confirmed that liaison with DNO had taken place which comprehensively considered the merit of the options.
- Notes of meetings with DNO are kept for future reference.

Assessing Options

- All viable options were subject to a CBA.
- Flexibility is evaluated using the CEM tool.
- The preferred option was subject to the CEM and it was concluded that flexibility is an economic option to defer transformer replacement at Birdham and Selsey
- Deliverability and operability risks have been identified. This included site specific considerations for the new 33kV cable routes (private land, major roads).
- A hybrid flexibility and reinforcement approach was correctly identified as the preferred option. This defers reinforcement for 3 years.
- Meeting whole system requirements beyond ED2 (up to 2050) were a factor in the proposed solution.
- A rigorous process (DGIF) considers social, economic and deliverability (although this was not all recorded in the EJP
- Environmental impacts, including land use, protected land, SSSIs, fluid filled cables, noise mitigation, nearby residential properties, public rights of way, using non-SF6 equipment where possible, etc, are all captured in the above mentioned DGIF process.

Findings – 2. Birdham (Deep Dive Review) *continued…*

Scheme Details			
Ref:	Scheme Name:	Scheme Title:	Planning Area:
2	Birdham	Hunston BSP - Birdham and Selsey Primaries	SEPD

Update Plan and Deliver

- There was originally confusion in the Outcome Report – as this scheme is one of two linked EJPs. This EJP covers the reinforcement of the 33kV circuits only.
- The drivers for the interventions are quite well explained
- Selsey transformer replacement is part of the EJP, but due to timing it falls outside the scope of the Outcome Report (beyond 7 years). This is a little confusing when reviewing the Outcomes.
- The sequencing of the reinforcement is not fully shown as this spans two outcomes.

Good Practices

- The system model includes all DFES, connection projections and load growth and is centrally owned and managed by the Modelling and Reporting Team.
- Stakeholder engagement feeds into load and generation forecasts.
- Strategic and whole system aspects have been considered beyond ED2 (up to 2050).
- Flexibility has been exploited to defer reinforcement.
- Deliverability and operability have been adequately considered.
- High level risks have been considered and documented in the EJP.
- Environmental impacts have been thoroughly considered.

Opportunities for Improvement

- Better visibility in EJP of DNO liaison (site visits, etc.) and feedback on the proposed network options, rather than just reporting on aspects by exception.
- However, notes of meetings with DNO are kept for future reference.
- Visibility of social and environmental considerations would be beneficial
- Completeness of fields and detail in the CBA and CEM tools.
- Clarifying in the Outcome report the drivers for the interventions, timescales and flexibility details.

Summary

- Future forecasts of demand and generation have been suitably considered and system needs have been suitably identified (capacity).
- Suitable flexibility and asset options have been identified and developed.
- The DNOA outcome report does not fully reflect the asset interventions due to the timings. This is valid but nonetheless a little confusing.

Findings – 3. Culloden (Sample Review)

Scheme Details

Ref:	Scheme Name:	Scheme Title:	Planning Area:
3	Culloden (Inverness)	EJP_SHEPD_INVE_CULL_001	SHEPD

Identifying Future Load Related System Needs

- Future load modelled beyond ED2 (up to 2050) based on all four DFES scenarios.
- Future load including committed connections (load and generation) accounted for with high confidence.
- Space constraints have been identified at existing substation limiting feasible options.

Developing Options

- Suitable reinforcement options, including flexibility procurement to defer reinforcement, were adequately considered.
- A proactive investment to allow for future growth and extension has been considered.
- The conditions of the existing assets (using the DNO's INVEST database) and the physical constraints for installing new transformers have been considered in the options.

Assessing Options

- CBA and CEM tools were used to determine the most beneficial whole system solution, including deferment of reinforcement using flexibility.
- Deliverability and operability risks have been identified.
- A combined flexibility and reinforcement approach was correctly identified as the preferred option, taking into account whole system requirements beyond ED2 (up to 2050).

Update Plan and Deliver

- Key driver correctly identified of load related growth triggering overloading of the 2 off existing transformers at Culloden.
- The DNOA Outcome Report captures the flexibility and reinforcement solution correctly up to 2031.

Good Practices

- Stakeholder engagement feeds into load and generation forecasts.
- Future load growth takes account of all DFES scenarios.
- Strategic and whole system aspects have been considered beyond ED2 (up to 2050).
- Social (local community) aspects have been factored into the assessment of options.
- High level risks have been assessed and documented in the EJP.

Opportunities for Improvement

- More visibility of DNO liaison and feedback on the proposed network options, rather than just reporting on aspects by exception.
- However, notes of meetings with DNO are kept for future reference.
- Visibility of technical assessments (fault levels) and stakeholder engagements in the EJP.
- More detail in the EJP of environmental aspects covered.
- Visibility of social and environmental considerations in the CBA and CEM.

Summary

- Future forecasts of demand and generation have been suitably considered and system needs have been suitably identified (capacity).
- Suitable flexibility and asset options have been identified and developed.
- The options have been suitably assessed taking into account strategic requirements etc.
- The DNOA outcome report adequately reflects the assessment carried out up to 2031.

Findings – 4. Ealing and Hounslow (Deep Dive Review)

Scheme Details

Ref:	Scheme Name:	Scheme Title:	Planning Area:
4	Ealing and Hounslow	Ealing GSP 66kV Reinforcement	SEPD

Identifying Future Load Related System Needs

- Future load modelled using DFES scenarios beyond ED2 (up to 2050).
- CT future scenario used for developing and assessing options with high confidence.
- Future load including committed connections (load and generation) and output from stakeholder engagement accounted for with high confidence.
- This included TfL EV charging infrastructure.
- Fault level and lack of space for substation expansion identified as key constraints.

Developing Options

- Four options have been considered in reasonable detail, of which only two can address the fault level constraint and only one can address the substation space constraint.
- Flexibility was not progressed, as it will not resolve the fault level constraint.
- Constraining generation was considered but this would not remove the constraint.

Developing Options (…continued)

- Suitable reinforcement options were adequately considered, in particular the need to replace the 66 kV switchgear, where its fault level rating is exceeded.
- A strategic and proactive investment to allow for future load growth and extension has been considered. This includes procuring compact 132 kV Gas Insulated Switchgear not conventional 66 kV rated switchgear to address the space constraints and to allow future upgrading to 132 kV to meet capacity needs.
- The age and conditions of the existing 66 kV switchgear assets and the physical constraints for installing new switchgear have been considered in the options. Asset replacement is considered reasonable due to age and forecast low Health Index.
- Site input by the DNO was not transparent in the EJP – the engineer confirmed a site meeting with the DNO had taken place but because there were no major issues this was not highlighted.

Assessing Options

- CBA and CEM tools were not used. This is justified given there was only one viable option to resolve the fault level constraint and flexibility could not resolve it.
- Deliverability and operability risks have been identified.
- A reinforcement approach only was correctly identified as the preferred option. This accounts for whole system requirements beyond ED2 (up to 2050).
- Environmental aspects were not covered in detail. However, it is recognised that the DGIF process addresses this in more detail at the next stage. No environmental aspects are believed to materially change the decision.
- DNO feedback on the proposed options was not specifically mentioned in the EJP, but notes of meetings with DNO staff are kept for future reference.
- However, the engineer confirmed that DNO staff had an input at this initial stage, as described in the DGIF process. The engineer confirmed that the DNO had not highlighted any safety concerns.
- The correct approval protocol was believed to be followed.

Findings – 4. Ealing and Hounslow (Deep Dive Review) *continued…*

Scheme Details			
Ref:	Scheme Name:	Scheme Title:	Planning Area:
4	Ealing and Hounslow	Ealing GSP 66kV Reinforcement	SEPD

Update Plan and Deliver

- Key driver correctly identified as fault level compliance, not load.
- The DNOA Outcome Report captures the reinforcement solution correctly up to 2031.
- DNOA outcome report does not make clear why flexibility was not a proposed option – this is not material to the outcome.
- There is a typographical error, where "22 kV" should be "66 kV" – this is not material to the outcome.

Good Practices

- System model includes all FES, connections etc. and the network model is centrally owned and managed by Modelling and Reporting Team.
- Stakeholder engagement feeds into load and generation forecasts.
- Future load growth takes account of DFES scenarios.
- Strategic and whole system aspects have been considered beyond ED2 (up to 2050).
- Proactive consideration of 132 kV switchgear will address future capacity needs.
- Deliverability and operability have been adequately considered.
- High level risks have been assessed and documented in the EJP.

Opportunities for Improvement

- Better visibility of DNO liaison (site visits, etc.) and feedback on the proposed network options, rather than just reporting on aspects by exception.
- Notes of meetings with DNO are however kept for future reference.
- Visibility of stakeholder engagements in the EJP.
- More detail in the EJP of environmental aspects covered.
- Visibility of social and environmental considerations in the EJP and CBA.

Summary

- Future forecasts of demand and generation have been suitably considered and system needs have been suitably identified (capacity).
- Suitable asset options have been identified and developed. Flexibility options were justifiably excluded.
- The options have been suitably assessed taking into account strategic requirements etc.
- The DNOA outcome report generally reflects the assessment carried out but does not capture why flexibility has been ruled out up to 2031.

Findings – 5. East Bedfont (Sample Review)

Scheme Details

Ref:	Scheme Name:	Scheme Title:	Planning Area:
5	East Bedfont	East Bedfont Substation	SEPD

Identifying Future Load Related System Needs
- Future load modelled beyond ED2 (up to 2050) based on Consumer Transformation (CT) scenario from DFES
- Future load includes committed connections (including large data centre) and load growth identified through stakeholder engagement.
- Space constraints have been identified at the existing substation.

Assessing Options
- CBA and CEM tools were used to determine the most beneficial whole system solution including deferment of reinforcement using flexibility.
- Deliverability risks have been identified.
- The transparency of DNO feedback on the network options could be improved in the EJP including commentary on safety aspects.

Good Practices
- Stakeholder engagement feeds into load forecasts.
- Future load growth takes account of different DFES scenarios.
- Strategic and whole system aspects have been considered beyond ED2 (up to 2050).
- Planners use a comprehensive, centrally held and maintained cost database.
- High level risks are assessed and documented in the EJP.

Developing Options
- Suitable reinforcement options and flexibility procurement were adequately considered.
- The condition of the existing assets (via the DNO's INVEST database) and information about the site have been considered in the options, in particular the condition of the existing transformer and the limited space at the site.

Update Plan and Deliver
- The DNOA Outcome Report captures the flexibility and reinforcement solution correctly up to 2031.
- However, it could provide more transparency of full whole system solution (flexibility and reinforcement) beyond 2031 and how constraint is removed

Opportunities for Improvement
- Visibility of DNO liaison and feedback on the proposed network options but DNO meeting notes are available.
- Visibility of technical assessments (voltage levels) in the EJP.
- Visibility of social and environmental considerations in the CBA and CEM.
- Additional information in the DNOA Outcome Report for the period 2031 to 2050.

Summary
- Future forecasts of demand and generation have been suitably carried (load) and system needs have been suitably identified (capacity).
- Suitable flexibility and asset options have been identified and developed.
- The options have been suitably assessed taking into account strategic requirements etc.
- The DNOA outcome report could be improved to reflect the assessment carried out beyond ED2 (up to 2050).

Findings – 6. Errochty/Tummel Bridge (Sample Review)

Scheme Details

Ref:	Scheme Name:	Scheme Title:	Planning Area:
6	Errochty/Tummel Bridge	Errochty-Tummel Bridge GSP Reinf	SHEPD

Identifying Future Load Related System Needs

- Future load modelled beyond ED2 (up to 2050) based on Consumer Transformation (CT) scenario from DFES. This is deemed the most appropriate load scenario.
- Future load includes committed connections and load growth identified through stakeholder engagement – high confidence.
- Transfer of load onto Errochty GSP removes thermal constraint at Tummel Bridge.
- Space constraints have been identified at Tummel Bridge substation.

Developing Options

- Suitable reinforcement options and flexibility procurement were adequately considered.
- Flexibility option not pursued as not practical in resolving the constraint.
- No material environmental, social or economic issues but not clearly stated in EJP.
- Strategic proactive options have been considered to create headroom beyond ED2 (up to 2050).

Assessing Options

- CBA tool was used to determine the most beneficial whole system solution i.e. new capacity at Errochty GSP.
- CEM tool not used as flexibility not a feasible option.
- Operability and deliverability risks have been identified and addressed.
- The transparency of DNO feedback on the network options could be improved in the EJP including commentary on safety aspects.
- But DNO feedback is recorded from meeting notes.

Update Plan and Deliver

- The DNOA Outcome Report captures the scheme and reinforcement solution correctly up to 2031 and that flexibility is not relevant.

Good Practices

- Stakeholder engagement was detailed and gives high confidence in load growth.
- Strategic and whole system aspects provide additional capacity beyond ED2 (up to 2050).
- Planners use a comprehensive, centrally held and maintained cost database.
- High level risks are assessed and documented in the EJP.

Opportunities for Improvement

- Visibility of DNO liaison and feedback on the proposed network options.
- Visibility of technical assessments (thermal loading and voltage levels) in the EJP.
- Visibility of social and environmental considerations in the CBA.
- Additional information in the DNOA Outcome Report regarding estimated peak demand and firm network capacity.

Summary

- Future forecasts of demand and generation have been suitably considered and system needs have been suitably identified (capacity).
- Suitable flexibility and asset options have been identified and developed.
- The options have been suitably assessed taking into account strategic requirements etc..