EJP/SEPD/MANN/SALI/BEME/001

BEMERTON 33KV NETWORK ENGINEERING JUSTIFICATION PAPER

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1 Executive Summary

Summary

This EJP provides recommendations for the load-related reinforcement works on the Salisbury BSP 33kV network to deliver the forecasted, stakeholder supported, increased load demand presented in the Distribution Future Energy Scenario (DFES). This EJP presents further development of the following existing EJP document:

"RIIO ED2 Engineering Justification Paper (EJP), Bemerton 33kV Ring Investment, Reference No: 156/SEPD/LRE/BEME"

The existing EJP outlines the need for reinforcement of the existing 33kV circuits feeding Bemerton Meshed Network before the end of the RIIO-ED2 period due to forecasted demand.

In this EJP, the annual increase in demand was based on the Consumer Transformation (CT) scenario of the latest DFES forecast. This EJP considers a range of options to address the thermal overload issues, that have been considered and rejected prior to the Cost Benefit Analysis (CBA), with a clear rationale for including or excluding each option.

The Net Present Value (NPV) is given as Whole life NPV for the cost base of 2020/2021.

Table 1 Options Summary

Option	Brief description	CBA consideration and result
1. Do Nothing	The option to do nothing is not viable. [redacted]	Not progressed to CBA
2. Flexibility + Option 5 **Preferred Option**	Flexibility can be used to defer the reinforcements proposed in Option 5 and to manage thermal constraints while the reinforcements are being completed. This will improve the NPV and benefit our customers in optimising the reinforcement planning. This is progressed to the CBA and is the preferred solution.	**Progressed to CBA** [redacted]
3. Reinforce the ring network using Overhead lines	This option considers reinforcing the ring network using overhead lines to the maximum rating possible without changing the network topology. [redacted] Since this solution is not future proof until 2050 and contains high risks, this is not progressed to CBA.	Not progressed to CBA
4. Isolate Netherhampton PSS alone and add additional circuit to Petersfinger PSS	This option considers adding three feeders - two from SALI BSP to Netherhampton BSP and one from SALI BSP to Petersfinger PSS. [redacted]	Not progressed to CBA

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Option	Brief description	CBA consideration and result
5. Isolate Netherhampton and Petersfinger PSS from the meshed network	The basis for these reinforcements is to isolate Netherhampton Primary and Petersfinger Primary from the 33 kV meshed network by installing 4 x new underground cables directly from Salisbury (SALI) BSP. In this way we can break the meshed network and create dedicated feeder connection to the primaries. This option will allow 2 x dual circuits to be laid in the same trench for part of the overall cable route. This solution ensures P2 compliance at least until 2050 on the Bemerton ring network based on the actual available DFES data and the new connections works contracted in the SSEN system.	Progressed to CBA [redacted]

The preferred option for the EJP is Option 2 – Flexibility + Option 5. The option is to isolate both Netherhampton and Petersfinger PSS from the ring network, and to upgrade the Netherhampton 33/11kV transformers in combination with flexibility to deliver the optimal solution. This ensures P2 compliance and enable future customer connections.

The asset and cost breakdown of this solution is shown in Table 2.

Table 2 Asset Cost Breakdown of Option 2

Assets	Unit cost	Volume	Cost
33 kV UG Cable (Non-Pressurised)	[redacted]		
33 kV - TRAFO – 15/30 MVA 33/11 kV			
33 kV CBs (Gas Insulated Busbars) (ID) (GM)			
Land + Switch room building cost Netherhampton and Petersfinger			
Land + Switch room building cost for Salisbury			
Bridge crossing (subjecting to site survey)			
Flexibility to manage the thermal constraints before completion of reinforcement.			
Flexibility for reinforcement deferral			
Total			

[redacted] The price base is 2020/2021. The works are planned for the investment year starting from 2025/26 using a phased approach. By using Ofgem's CBA tool, the most cost-efficient option was chosen.

2 Investment Summary Table

Error! Reference source not found. provides a high level summary of the key investment information relevant to this Engineering Justification Paper (EJP).

Table 3 Investment Summary Table

Name of Scheme/Programme	Bemerton 33kV Network
Primary Investment Driver	Load related Expenditure

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Scheme reference/ mechanism or category	EJP/SEPD/MANN/SALI/BEME/001	
Output reference/type	**ED2 and ED3 Scope of works:** **Phase 1: (2025/26 – 2028/29)** 1. Petersfinger PSS 33kV circuits: • Addition of 7.84km of dual 33kV circuits from Salisbury BSP to Petersfinger PSS. • 5 x 33kV GIS ID CBs at Petersfinger PSS. • Flexibility was used to manage the demand exceedance in 2027 and 2028 until the reinforcement is completed. • Flexibility Procurement. 2. Netherhampton PSS 33kV circuits: • Addition of 4.32km of dual 33kV circuits from Salisbury BSP to Netherhampton PSS. • 5 x 33kV GIS ID CBs at Netherhampton PSS. • Flexibility Procurement. 3. Salisbury BSP: • Install a new 33kV GIS board at Salisbury BSP (20 x 33kV GIS ID CBs). **ED3 Scope of works** **Phase 2: (2029/30 – 2031/2032)** 1. Netherhampton Transformer replacement: • Install 2 x 15/30MVA 33/11kV transformers at Netherhampton PSS. • Flexibility Procurement.	
Cost	[redacted]	
Delivery Year	2025-2029, 2030-2032	
Reporting Table(s)	CV1: Primary Reinforcement	
Outputs in RIIO ED2 Business Plan	Require additional funding. The initial requested funding for this scheme was based on EJP titled 156/SEPD/LRE/BEME completed on 18th August 2021. The cost was £496,102. Driver CV1: Primary Reinforcement. However, there was only limited 33kV circuits reinforcement proposed. The revised scope of work under this EJP paper revisited the 33kV meshed network considering DFES demand up to 2050 and wider study has been carried out to solve multiple network risks and challenges. The additional funding needs to be secured through uncertainty Mechanism. The driver is still CV1 Primary Reinforcement.	
Spend Apportionment	**ED2**	**ED3+**
	[redacted]	[redacted]

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MVA released	0MVA in ED2 period Please note that the reinforcement work completes in ED3 period therefore 0MVA released in ED2 period.	25.2MVA + 34MVA = 59.2MVA PETF 33kV circuit reinforcement = 8.2MVA NETH Transformer replacement = 17MVA Capacity released on Bemerton 33kV network = 24MVA (by isolating PETF PSS) + 10MVA (by isolating NETH PSS) = 34MVA

3 Appendices Summary

Error! Reference source not found. - **Error! Reference source not found.** contains the abbreviations used in this EJP.

0 – Fault Level Analysis results

Appendix C - Flexibility viability assessment results.

Appendix D – Sensitivity Analysis of the Bemerton 33kV ring network

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4 Introduction

This EJP provides an overview of network upgrades of the Bemerton Meshed Network. Six Primary substations namely Bemerton, Netherhampton, Petersfinger, Redlynch, Salisbury Central and Homington are taken into study for the Bemerton ring network in Salisbury BSP which is in the Mannington GSP area in the Southern Electric Power Distribution (SEPD) licence area.

As this primary is part of a meshed network, the circuit loading is based on the performance of the other areas in the meshed network. This EJP provides a solution for these problems with a full CBA carried out on the selected solution option.

Demand projections derived from the Community Transformation (CT) scenario of the SEPD Distribution Future Energy Scenarios (DFES) have triggered thermal overloading issues on the Bemerton Meshed Network during a First Circuit Outage (FCO).

The proposed upgrades are based on the results of the PSSE based power system analysis and a full CBA that is carried out on the selected option.

Section 5 of this EJP describes our proposed load related investment plan for the reinforcement of the Bemerton 33 kV meshed network in RIIO-ED2 and ED3. The primary driver considered within this EJP is circuit thermal overloading triggered by the demand forecasts. This EJP provides high-level background information for the proposed scheme explaining the existing network arrangements, the load growth forecasts through the DFES and setting out the need for this project. This section of the EJP additionally describes the network studies undertaken, detailing the results which further justify the need of the proposed investment.

Section 6 provides an overview of the considered options and identifies the most appropriate option as the proposed solution to address the network issues. This section includes a table that summarises the net present value of all the options included in the Cost Benefit Analysis, the year in which each cost is incurred and the year in which each option would need to be triggered. Section 6 therefore summarises the results detailed in section 7 on the optioneering process and section 8 on the cost-benefit analysis of each option.

Section 7 provides an exhaustive list of the options considered through the optioneering process to establish the most economic and efficient solution. Each option is described in detail, with the EJP setting out the justification for the viable options taken forward to the Cost Benefit Analysis.

Section 8 details the CBA and provides comparative results of all the options considered within the CBA. It sets out the rationale and justification for the preferred solution. This section also describes how we have established the cost efficiency of the plan with reference to the unit costs that have been chosen.

Section 9 describes the deliverability of the plan for RIIO-ED2, and this proposed investment. It also addresses possible risks based on the required works, the proposed assets, and other surrounding factors, such as the procurement of additional construction space.

Section 10 addresses the strategic aspect of the investments and further needed actions to operating a congestion free grid until at least 2050.

Section 11 concludes the EJP and provides a summary of main conclusions and recommendations contained within this document. This includes the recommended preferred option, a summary of the costs and timeline of this option, a reasoning on the use of flexibility as well as key risk and delivering options.

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5 Background Information

5.1 Existing Network Arrangements

The Bemerton Meshed Network is a 33kV grid supplied from Salisbury Bulk Supply Point (BSP) which is located within Mannington GSP region of the Southern Electric Power Distribution (SEPD) license area. It supplies Bemerton (BEME), Homington (HOMI), Netherhampton (NETH), Petersfinger (PETF), Redlynch (RELY) and Salisbury Central (SALC). The Bemerton Meshed Network is further interconnected with various other circuits via Normally Open Points (NOPs) at Homington and Redlynch primaries. A simplified single line diagram (SLD) of the Bemerton ring is shown in Figure 1. Salisbury BSP receives back feed from Mannington BSP via the NOPs at Redlynch and Homington PSS, also from Shaftesbury BSP via a NOP on Teffont and from Melksham GSP via a NOP on Stapleford PSS.

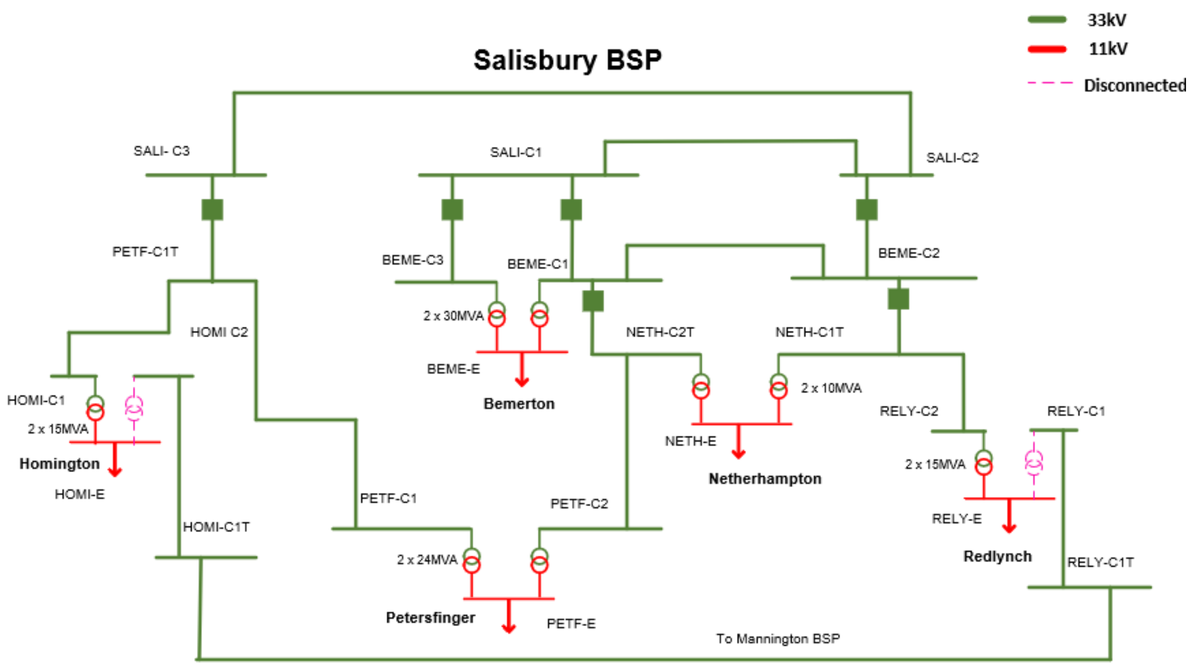

Figure 1 Bemerton Meshed Network simplified SLD

This grid consists of various lengths and sizes of overhead lines and underground cables. The total length and seasonal ratings of each of the circuits in the meshed network are given in Table 4. **The analysis in this EJP will only focus on the Bemerton Meshed Network as given in this table.** Stapleford and Teffont primaries under Salisbury BSP were not studied.

In this EJP, the major concerns were the circuits supplying Netherhampton, Petersfinger and Redlynch PSS. This is due to the increase in demand forecasted by DFES along with the recent acceptance of new connections.

Table 4 Bemerton Meshed Network feeder ratings

From	To	Winter rating [MVA]	S/A Rating [MVA]	Summer rating [MVA]	Length [km]
SALI-C2	BEME-C2	52.9	47.8	42.6	0.71
SALI-C1	BEME-C1	52.9	49.3	42.6	0.81
SALI-C1	BEME-C3	42.4	37.5	37.5	0.89

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SALI-C3	STAP-C	16.9	15.7	13.5	7.86
SALI-C3	BFPV-C1T	21.0	19.5	16.8	4.124
RELY-C1T	ROCK-C	30.7	28.5	24.6	0.03
HOMI-C1T	ROCK-C	30.7	28.5	24.6	2.82
HOMI-C1T	HOMI-C2	10.4	8.6	8.3	8.87
BEME-C1	NETH-C2T	15.8	14.7	12.7	2.46
BEME-C1	SALC-C1	28.7	25.4	24.4	3.21
BEME-C2	NETH-C1T	15.8	14.7	12.7	2.43
BEME-C2	SALC-C2	28.7	25.4	25.4	3.15
HOMI-C1	PETF-C1T	18.5	17.2	14.8	1.05
PETF-C1T	PETF-C1	21.0	19.5	16.8	5.21
PETF-C1T	BFPV-C1T	21.0	19.5	16.8	1.04
PETF-C2	NETH-C2T	15.8	14.7	12.7	5.69
NETH-C1T	RELY-C2	14.0	13.0	11.2	15.38

5.2 Load Forecast for Bemerton Meshed Network

To understand the future pathways for demand and generation on the Bemerton Meshed Network, SSEN has carried out extensive scenario studies documented in the DFES. The basis for this work is National Grid's Future Energy Scenarios (FES) 2022. This framework comprises of four potential pathways for the future (System Transformation, Consumer Transformation, Leading the way, and Falling Short). The variables for the four scenarios are driven by government policy, economics and consumer attitudes related to the speed of decarbonisation and the level of decentralisation of the energy industry. We have worked closely with our partner Regen to develop the forecasts between 2022 and 2050 through enhanced engagement with the local authorities, local enterprise partnerships (LEPs), devolved governments, community energy groups and other stakeholders. Based on the enhanced stakeholder engagement feedback, we have chosen Consumer Transformation as the baseline scenario for our investment because it is the most realistic one between the very ambitious Leading the Way and the Falling Short scenario.

Since Salisbury is a fast-developing area, there is a steady demand growth along with recent acceptances under the primaries. Figure 2 shows the winter demand projections in MVA at the six primaries in the Bemerton Meshed Network. There have been recent acceptances of 4.6MVA under Netherhampton PSS and 4MVA under Salisbury Central PSS.

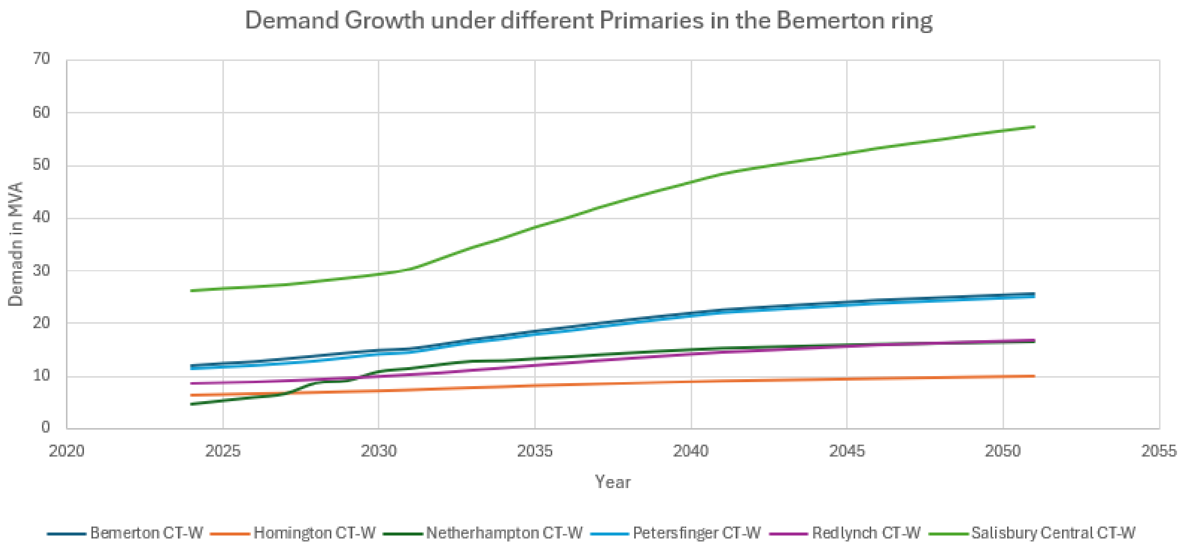

Figure 2 Demand growth under different Primary Substations in the Bemerton ring network

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[redacted] The remaining two Bemerton to NETH/PETF/RELY circuits rated at 15.8MVA (Winter) will supply three primary substations Petersfinger, Netherhampton and Redlynch. [redacted] Relevant sensitivity factors have been used in Figure 3 to account for the losses in the network and to replicate the N-1 scenario. [redacted]

One of the other highlighted issues in this EJP is the transformers at Netherhampton PSS. [redacted]

Further contingency studies and network thermal issues are detailed in Section 5.5.

[redacted]

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5.3 Existing Asset Conditions

In Table 5, the existing asset conditions are shown for the six main Primary Substations connected to the Bemerton Meshed Network. [redacted]

[redacted]

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[redacted]

5.4 Existing Operational issues

The 33kV dual Bemerton to Homington overhead line routes pass under the 132kV dual Mannington GSP to Salisbury BSP overhead line routes with two crossing points. Ensuring the 33kV lines can be safely maintained may require planned outages of the 132kV lines, which could impact the power supply to Salisbury BSP and all connected loads. T[redacted]
Coordinating maintenance schedules for both the 132kV and 33kV lines can be complex, requiring detailed planning to minimise disruptions and ensure safety.

5.5 Network Analysis Summary at Bemerton 33kV ring

The network analysis is performed for the supply area of the Salisbury BSP under Mannington GSP under consideration of the latest DFES forecast and new customer connections. During the network analysis, thermal constraints were identified on the 33kV circuits that need to be addressed by proposing reinforcements and un-meshing the Bemerton ring.

Netherhampton, Redlynch, Petersfinger PSS are supplied by 33kV circuits (mainly overhead lines) from Bemerton switching station. [redacted]

Scenario A:

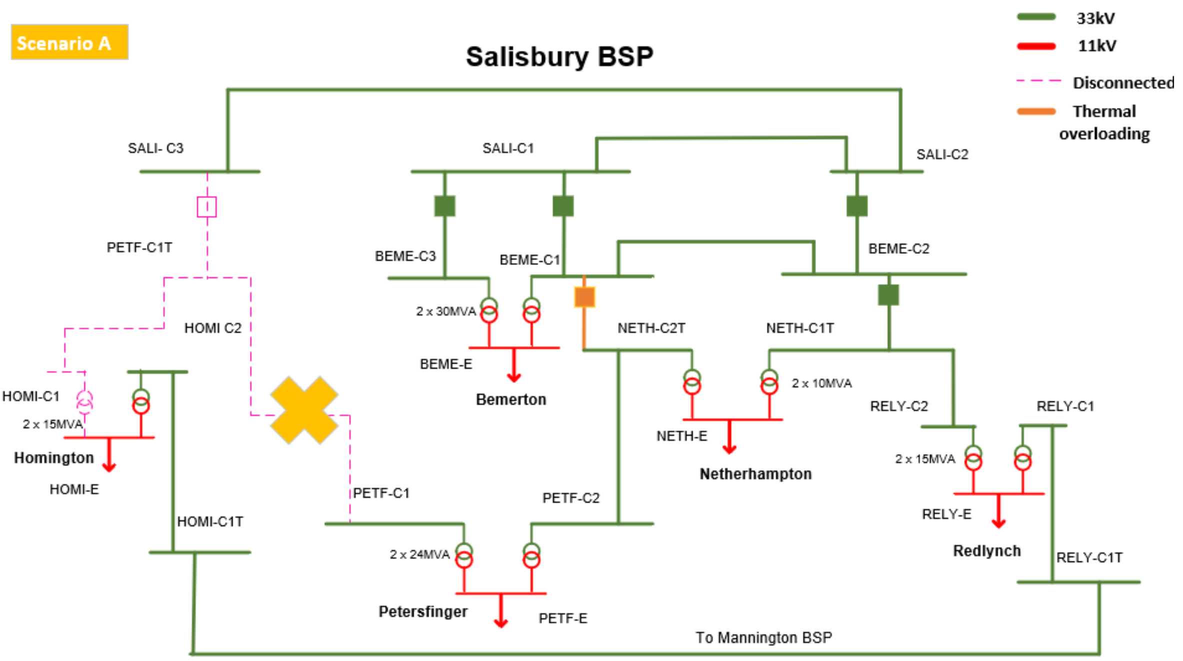

Figure 5 Scenario A N-1 scenario in the Bemerton ring

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As shown in Figure 5, Petersfinger is supplied by two 33kV circuits. [redacted] This could be resolved by isolating Petersfinger PSS or Netherhampton PSS from the meshed network. However, the reinforcement for 33kV circuit could take a minimum of 4 years to complete. Therefore, flexibility will be explored to manage the demand exceedance in the network until the reinforcement is complete and check if its economical to defer the reinforcement further.

[redacted]

With the above thermal issues discussed, the proposal will be to isolate the Petersfinger PSS out of the 33kV ring network so that the existing overhead line network can remain to supply Homington and Redlynch Primary Substations.

Scenario B:

[redacted]

[redacted]

Isolating Petersfinger PSS alone (from Scenario A) still cannot resolve the thermal constraints as the 33kV overhead line supplying Netherhampton and Redlynch is also going to be heavily constrained. Therefore, Netherhampton is proposed to be isolated from the ring network too so that the existing overhead line can continue supply Redlynch PSS, which is geographically far from the Bemerton switching station. It's worth noting that the OHL distance between Bemerton to Redlynch is for

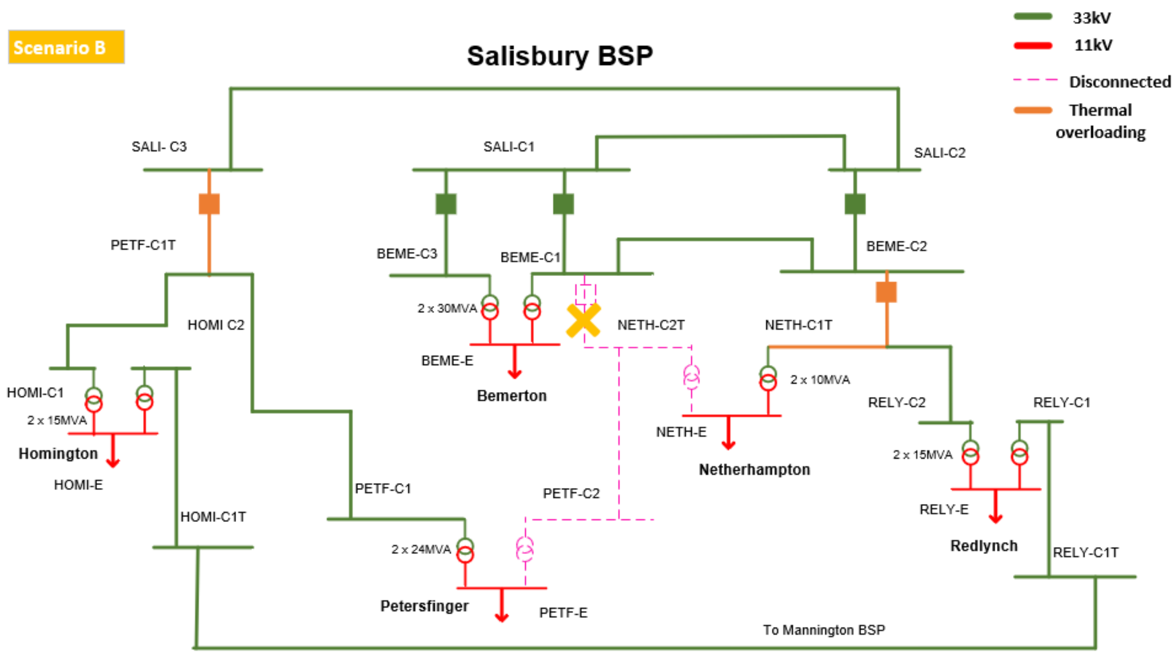

Figure 6 Scenario B of the N-1 scenario in the Bemerton ring

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approximately 17.7km and the OHL's thermal rating is only sufficient to support Redlynch PSS demand growth alone until late 2040s.

[redacted] This will resolve the thermal constraints in the ring network until 2050 at the earliest. The 33kV circuit reinforcements could take a minimum time frame of 4 years to complete. Hence, the use of flexibility to manage thermal constraints during this period is to be explored.

Until the proposed reinforcement works are completed, the N-1 thermal overloading issue can also be temporarily mitigated by transferring Redlynch PSS to Mannington BSP side via the existing 33kV NOP and switching the 11kV TX CBs (under ACO scheme). Once the full reinforcement work is completed, such temporary load transfer will not be necessary. Note that the Redlynch PSS cannot be permanently transferred to Mannington BSP network as the thermal issue will be passed onto Mannington 33kV meshed network which is more complicated itself at several contingency scenarios.

5.6 Regional Stakeholder Engagement and Whole systems analysis Summary

Salisbury Bulk Supply Point supplies Wiltshire, New Forest, and to a lesser extent Test Valley.

SSEN has strong working relationships with local authorities and other key stakeholders in the region. We have met with Wiltshire, Hampshire County, and Test Valley Borough Councils to discuss local area energy planning, tools to support efficient data exchange, and the potential to collaborate on projects in the near future. We engage with the South West Net Zero Hub, of which the Swindon and Wiltshire and Solent Local Enterprise Partnerships are members. We also have engaged with Community Energy South, who have partnered with Hampshire County Council to advance local renewable energy projects throughout the region. SSEN led the Solent Achieving Value from Efficiency (SAVE) Project from 2014 to 2019 in collaboration with the University of Southampton and other regional partners to trial energy efficiency measures that can help manage peak load. We have also met with the Partnership for South Hampshire to discuss network constraints in the area. This engagement has helped SSEN to stay informed about planning and development that will impact local communities' use of the network.

Wiltshire Council aims for the county to be carbon neutral by 2030. In support of this target, the Council recently launched its second round of the Solar Together group buying scheme to accelerate the rollout of solar PV, electric vehicle chargers, and battery storage across the area. They are also running a program to install 70 additional electric vehicle charge points across the county.

In its Carbon Mitigation Action Plan, Hampshire County Council details numerous steps it has planned to electrify various sectors of the local economy, including electric vehicle charge point trials, rollout of electric vehicles within its fleet, and installation of solar PV on depot buildings. The Council also organized a solar PV and battery storage group buying scheme for homeowners through Solar Together.

New Forest District Council has partnered with Community Energy South for a two-year initiative starting in 2023 to deliver community-owned renewable energy. Their Greener Housing Strategy lays out various means by which they are decarbonizing their housing stock, including through the provision of solar PV and heat pumps. Test Valley Borough Council was recently awarded funds through the UK Shared Prosperity Fund to support decarbonization projects in partnership with Community Energy South as well. Additionally, the Council has secured funding through the Public Sector Decarbonization Scheme to decarbonise heating in council-owned buildings.

5.7 Flexible Market Viability

To efficiently integrate new customers into the grid while accommodating anticipated load growth, flexibility can offer a cost-effective solution to defer or avoid grid reinforcements or manage the demand

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exceedance in the network while the reinforcements are completed. As the 33kV ring network and all the primaries under Salisbury BSP face a future capacity challenge, exploring the deferral of reinforcement through flexibility or using flexibility to manage the thermal constraints is necessary. This EJP outlines options to achieve this and assesses their economic viability using the Common Evaluation Method (CEM) tool.

Crucial for a postponement of the investment in assets is that sufficient flexibility is available within the market. Therefore, the availability of flexibility to cover the expected demand that would otherwise exceed the network capacity was assessed for Netherhampton and Petersfinger Primaries.

5.7.1 Viability for Petersfinger 33kV circuits

[redacted] However, the reinforcement of installing dual 33kV UG cables to Petersfinger will take a minimum time frame of 4 years (2025-2028). [redacted]

Flexibility is also considered to check if the reinforcement could be further deferred using the CEM tool. The flexibility requirement was compared to the flexibility availability within these years, as shown in table 6. The result suggest that there is enough flexiblity to manage the the thermal constraints and the reinforcement can be deferred for completion within 2029 financial year.

[redacted]

5.7.2 Viability for Netherhampton 33kV circuits

The identified thermal constraints on the 33kV circuit supplying Netherhampton and Redlynch might be deferred using flexibility. The optimal period for the deferral of the 33kV circuit was evaluated using the CEM tool. The flexibility requirement was compared to the flexibility availability within these years, as shown in table 7. The results suggest that sufficient flexibility is available and deferring the reinforcement by 1 year is feasible.

[redacted]

5.7.3 Viability for Netherhampton 33/11kV transformers

The demand under Netherhampton PSS exceeds its firm capacity by 2031, which might be deferred using flexibility. The optimal deferral period was evaluated using CEM tool. The flexibility requirement was compared to the flexibility availability within these years, as shown in table 8. The results suggest that sufficient flexibility is available and deferring the reinforcement 2 years is feasible.

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[redacted]

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5.8 Confidence Table

The confidence we have in the assumptions and input data for this EJP are described in Table 9.

Confidence Factor	Certainty	Comments
Load Forecast	High	High/medium confidence in the load forecast as the peak demand is seen to increase steadily, as per the DFES forecast.
Existing Asset Condition	High	[redacted]
[redacted]	[redacted]	[redacted]
Connections Activity	High	There are various new connection works planned and accepted under Salisbury BSP in a fast-developing area.
Regional Stakeholder engagement	High	The local authorities have recently updated their commitment to achieve the zero net goals. They have set out goals and funding to reach these goals in the next years, which is incorporated in the forecast of the local DFES.
Flexible market Viability	High	Flexibility has been assessed for the reinforcements under consideration. There is enough flexibility to manage the thermal constraints while the reinforcements are being completed and to defer the reinforcement where economical to do so.
Funding Position	Medium	The upgrade costs for the preferred solution are higher than previously anticipated. Hence a significant source of funding will be required in addition to the agreed Ofgem allowance.

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6 Summary of options considered.

6.1 Summary of Options

Table 10 represents a summary of all the options considered with their respective advantages and disadvantages, and whether it is progressed to CBA. A more detailed description of the options and analysis is provided in Section 7.

Table 10 Summary of options for Bemerton reinforcements

Option	Brief description	Advantages	Disadvantages	CBA consideration and result
1. Do Nothing	Leave existing assets in their current state.	- No new assets needed and therefore no investment required.	- Does not address any of the raised issues. - Will not allow for new customer connections and put existing customers at risk. - Cannot achieve Net Zero.	This is not a viable option and hence not progressed to CBA
2. Option 5 + Flexibility **Preferred Option**	This option involves introducing flexibility to the reinforcement proposed in Option 5.	- Flexibility defers the thermal constraints on the network. - The whole NPV value is lower.	- Flexibility incurs additional cost. - Reinforcement is still needed after flexibility.	**Progressed to CBA**. [redacted] **Preferred Option**
3. Reinforce the ring network using Overhead lines	This option considers reinforcing the 33kV circuits [redacted] using Overhead lines to the maximum rating possible.	- Early investment can be cheaper in terms of material.	- [redacted] - Existing 33kV Poles need replacements along the 33kV OHL route, contains high risks and uncertainties due to land consents issues.	This is not a viable option and hence not progressed to CBA

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Option	Brief description	Advantages	Disadvantages	CBA consideration and result
			- Further network reinforcement by installing new UG cable will still be required before 2050.	
4. Isolate NETH PSS and add 33kV circuit to PETF PSS	The basis for these reinforcements is to isolate Netherhampton Primary and add one additional 33kV circuit to Petersfinger PSS.	- Cheaper early investment with single 33kV circuit to PETF PSS.	- [redacted]. It is not a long-term solution to support network capacity until 2050.	This is not a viable option and hence not progressed to CBA.
5. Isolate NETH and PETF PSS and upgrade NETH transformers.	This option considers isolating NETH and PETF PSS from the 33kV ring network by laying 4 x 33kV circuits from Salisbury BSP which ensures compliance in the network until 2050. This option also involves upgrading the NETH transformers to 15/30MVA and installing a 33kV GIS indoor switch room at SALI BSP.	- Ensures P2 compliance in the network at least until 2050. - Un-meshes the network by having dedicated circuits from Salisbury BSP to respective primaries.	- Adding dual circuits is expensive.	Progressed to CBA [redacted]

6.2 Options comparison table

As mentioned above, this EJP seeks a solution to the highlighted issues in the concerned network. The cost distribution over the years for each of the concerned network is detailed below.

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Table 11 Comparison of different options

Option		CBA Total results (Whole life NPV)	Summary of costs (£m)								
			2024	2025	2026	2027	2028	2029	2030	2031	2032
1	Do nothing	[redacted]									
2	Option 5 + Flexibility										
3	Reinforce the ring network using OHLs										
4	Isolate NETH PSS and add additional 33kV circuit to PETF PSS										
5	Isolate NETH and PETF PSS from the ring network + upgrade transformers at NETH PSS + 33kV GIS at SALI BSP.										

C0(a) costs for recommended Option as per ED2 submission adjusted for RPI to 20/21 Price Base detailed option analysis in Table 1252.

Table 125 Details of the preferred option

Recommended Option		Investment Driver	Total cost	C0(a) costs (£m)								
				2024	2025	2026	2027	2028	2029	2030	2031	2032
2.	Option 5 + Flexibility	CV1	[redacted]									
		CV2										
		CV3										
		V3										
		Flexibility										
		Total										

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7 Detailed option analysis

7.1 Option 1: Do Nothing

Estimated Cost: £N/A

[redacted]

[redacted] This translates into more customer minutes lost and therefore customer interruption costs. It also leads to an economic value loss of load and potentially reputational loss for SSEN. [redacted]

As this option [redacted], **this solution has been rejected and is not taken forward to the CBA.**

7.2 Option 2: Flexibility + Option 5

Option 2 explores the possibility to defer an investment into assets by using flexibility to get a financial benefit. This option is based on the investments from Option 5. Considering the DFES forecast, the 33kV UG circuits for NETH and PETF PSS will have to be laid by 2029 and the new transformers at NETH PSS will have to be installed by 2031. Therefore, an option of flexibility was explored to check the viability of using flexibility to defer the reinforcement or manage the thermal constraints before the completion of reinforcement. This evaluation is performed using Common Evaluation Methodology Tool (CEM).

7.2.1 Flexibility for Petersfinger 33kV circuits

[redacted] Therefore, it is proposed to add dual 33kV circuits to Petersfinger PSS directly from Salisbury BSP. The 33kV circuits take a minimum time frame of 4 years to complete (2025-2028), hence, flexibility is explored to manage the thermal constraints in 2027 and 2028 until the reinforcements are complete.

The level to which the network capacity is exceeded is shown in Table 13. This will happen if Petersfinger is not isolated from the ring network.

[redacted]

To handle the excess load in the given years, flexibility is required. The hours per day, the annual days in which this flexibility needs to occur, and the required flexibility volumes are shown in Table 14.

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Table 14 Flexibility Need – 33kV circuit Petersfinger

Scenario	2027	2028	2029	2030
Hours per Day	[redacted]			
Days per Year				
Utilisation Volumes [MWh]				

[redacted] The output of the CEM tooling for the optimal deferral period is shown in Figure 7.

[redacted]

The results of the CEM indicates that the optimal solution would be to defer the investment by one year to 2030. [redacted]

[redacted]

7.2.2 Flexibility for Netherhampton 33kV circuits

The recent acceptances and the DFES demand growth under NETH PSS have contributed to the thermal constraints on the 33kV circuit supplying Netherhampton and Redlynch PSS. To ensure P2 compliance and to allow future connections Netherhampton PSS is to be isolated from the ring network by adding dual 33kV circuits from Salisbury BSP to Netherhampton PSS. Thermal constraints begin to occur in 2028 and a temporary load transfer of Redlynch PSS from Salisbury BSP to Mannington BSP can be put in place temporarily to avoid N-1 thermal concern. However, the reinforcement work at Salisbury BSP network is still required to not shift thermal issues from Salisbury network to Mannington network.

Table 15 shows the network exceedance on the 33kV circuit if the reinforcements are not completed.

[redacted]

To handle the excess load in the given years, flexibility is required. The hours per day, the annual days in which this flexibility needs to occur, and the required flexibility volumes are shown in Table 16.

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Table 16 Flexibility Need – 33kV circuit– Netherhampton

Scenario	2029	2030
Hours per Day	[redacted]	
Days per Year		
Utilisation Volumes [MWh]		

[redacted]

The results of the CEM indicates that the optimal solution would be to defer the investment by one year to 2030. [redacted]

The flexibility viability analysis shows that the utilisation of flexibility is feasible.

[redacted]

7.2.2 Flexibility for Netherhampton Transformers

Netherhampton PSS is supplied by 2 x 10MVA 33/11kV transformers which has an N-1 firm capacity of 13MVA (in Winter). [redacted]
The level to which the network capacity is exceeded is shown in Table 17. This will occur if the new transformer is not installed.

[redacted]

To handle the excess load in the given years, flexibility is required. The hours per day, the annual days in which this flexibility needs to occur, and the required flexibility volumes are shown in Table 18.

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Table 18 Flexibility Need –Netherhampton transformers.

Scenario	2031	2032	2033
Hours per Day	[redacted]		
Days per Year			
Utilisation Volumes [MWh]			

[redacted]

The results of the CEM indicates that the optimal solution would be to defer the investment by two years to 2033. [redacted]

The flexibility viability analysis shows that the utilisation of flexibility is feasible.

7.3 Option 3: Reinforcing the meshed network using Overhead lines

[redacted] Therefore, reinforcement of the existing 33kV circuits is necessary. While reinforcing with overhead circuits using the highest possible ratings is an option, it presents several significant drawbacks.

Firstly, H poles can support overhead lines with a maximum rating of 44MVA, and tower lines can support up to 50MVA. However, these ratings are insufficient to ensure P2 compliance through 2050. This means that even with the highest rated overhead lines, the network will still face thermal constraints within the next few decades, necessitating further interventions.

Additionally, reinforcing with overhead lines requires the installation of new H poles and the strengthening of existing towers. This process is fraught with risks and uncertainties, particularly regarding land consents. Securing the necessary permissions for new poles and tower reinforcements can be time-consuming and contentious, potentially causing delays in project timelines. Given that this reinforcement is proposed to be completed within the next four years, any delays could significantly impact the timely delivery of customer connections.

In contrast, using underground cables for reinforcement offers a more reliable and future-proof solution. Underground cables can provide higher capacity and are less vulnerable to weather-related disruptions and require less maintenance, ensuring a more stable and resilient network. By opting for underground cables, we can mitigate the risks associated with land consents, avoid delays, and ensure that the network remains compliant and capable of meeting future demand growth through 2050.Therefore, considering the limitations and risks of overhead line reconductoring, we propose using underground cables for the reinforcement of the Bemerton ring network to ensure timely, reliable, and long-term compliance with P2 standards.

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Since this option contains high risks and does not ensure P2 compliance until 2050, it is not progressed to CBA.

7.4 Option 4: Isolate Netherhampton PSS alone and add one circuit to Petersfinger PSS

[redacted] The 33kV circuit supplying Petersfinger - Netherhampton PSS and Netherhampton - Redlynch PSS breached its capacity due to the load growth and recent acceptance under Netherhampton PSS. Therefore, an option of adding an additional circuit (3rd circuit) to PETF PSS alongside the existing circuits is considered. This could release some capacity in the Bemerton ring network

This option considers adding two 33kV circuits to Netherhampton PSS, isolating NETH PSS from the meshed network and adding a 33kV circuit from Salisbury BSP to Petersfinger PSS (in addition to the existing 33kV circuits feeding Petersfinger PSS). This helps in relieving some capacity on the ring network in the short term. A 33kV busbar containing 7 x 33kV CBs will be required at Petersfinger PSS. However, [redacted] due to the demand growth under the BSP after this reinforcement. Feeding Petersfinger PSS with a mixture of overhead line and UG cable will cause load unbalance and potentially will trigger a 2nd UG cable in the future. Furthermore, having Petersfinger PSS in the ring network will overload the 33kV circuit from Salisbury to Homington - Petersfinger PSS under N-1 scenario and this will require significant reinforcement in the future.

Netherhampton PSS has 2 x 10MVA 33/11kV transformers with a firm capacity of 13MVA (Winter rating). [redacted]

[redacted]

[redacted]

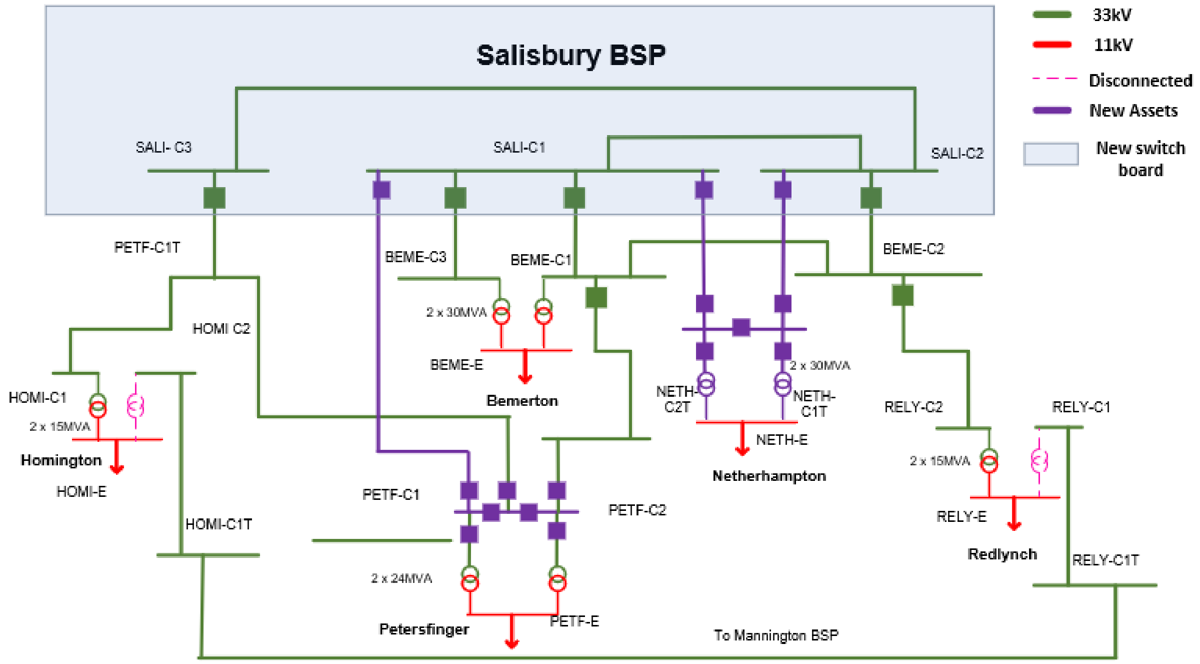

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Figure 10 Option 3 - Isolate NETH PSS and add additional circuit to PETF PSS

7.5 Option 5: Isolate Netherhampton and Petersfinger PSS from the ring

[redacted] As discussed in Section 7.4, adding an additional 33kV circuit to Petersfinger PSS does not solve the thermal constraint until 2050. Hence, this option considers isolating Netherhampton and Petersfinger PSS from the ring and connecting them directly to Salisbury BSP. This helps in relieving the constraints on the 33kV circuits at least until 2050.

The major reinforcements include adding dual 33kV cables to Petersfinger PSS and Netherhampton PSS separately and upgrade the transformers at Netherhampton PSS.

7.5.1 Petersfinger Primary

Petersfinger (PETF) PSS is supplied by two 33kV circuits. One of the 33kV circuits is from Bemerton switching station which supplies both Petersfinger and Netherhampton PSS. [redacted] To resolve this issue [redacted] Petersfinger PSS is proposed to be isolated from the ring network by adding dual 33kV UG cable from Salisbury BSP to Petersfinger PSS.

The 33kV circuit reinforcement takes a minimum time frame of 4 years, hence the reinforcements are planned to start from 2024/25 to 2027/28. [redacted]

After the completion of the dual 33kV circuits from Salisbury BSP to Petersfinger PSS, the existing 33kV overhead line upstream of Petersfinger PSS can be either dismantled or de-energised as the Petersfinger PSS will be supplied by the new dual 33kV circuits.

A 33kV switchboard has been proposed for protection and operational purposes. The switchboard can allow both the transformers to continue operating when one of the upstream 33kV circuits is off. According to the geographical view of PETF PSS (Figure 11), sufficient space is available within the existing substation compound for the construction of an indoor 33kV switch room with 5 x 33kV GIS ID CBs. The SLD for Pertersfinger PSS after reinforcement is shown in Figure 12. The existing 11kV CBs at PETF PSS are sufficiently rated to meet the demand and do not need to be replaced at least until 2044.

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Figure 11 Aerial view of Petersfinger PSS

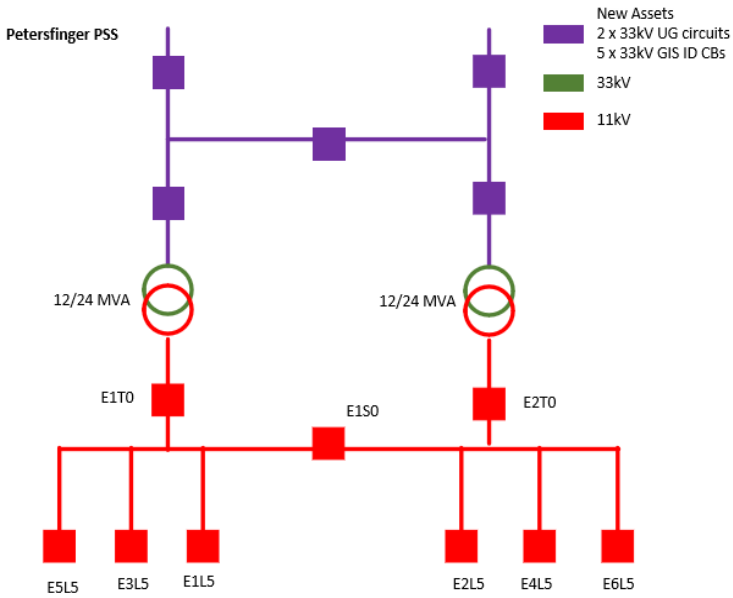

Figure 12 SLD at Petersfinger PSS after 33kV reinforcement

The proposed cable route from Salisbury BSP to PETF PSS is shown in Figure 13. The proposed cable route is partially along the same cable route path for the new 33kV UG cables for Netherhampton PSS. Cable routes survey and traffic management can be done together for the 2 x dual UG cable circuits to minimise the impact and civil work costs. Please note that the proposed route is subject to change during detailed design and delivery stage and this can incur higher/lower cost than estimated. Once the cable reinforcements are completed, the existing 33kV OHLs from Bemerton to PETF PSS and the 33kV OHL from SALI-HOMI TEE to PET PSS can be either dismantled or de-energised as shown in Figure 19.

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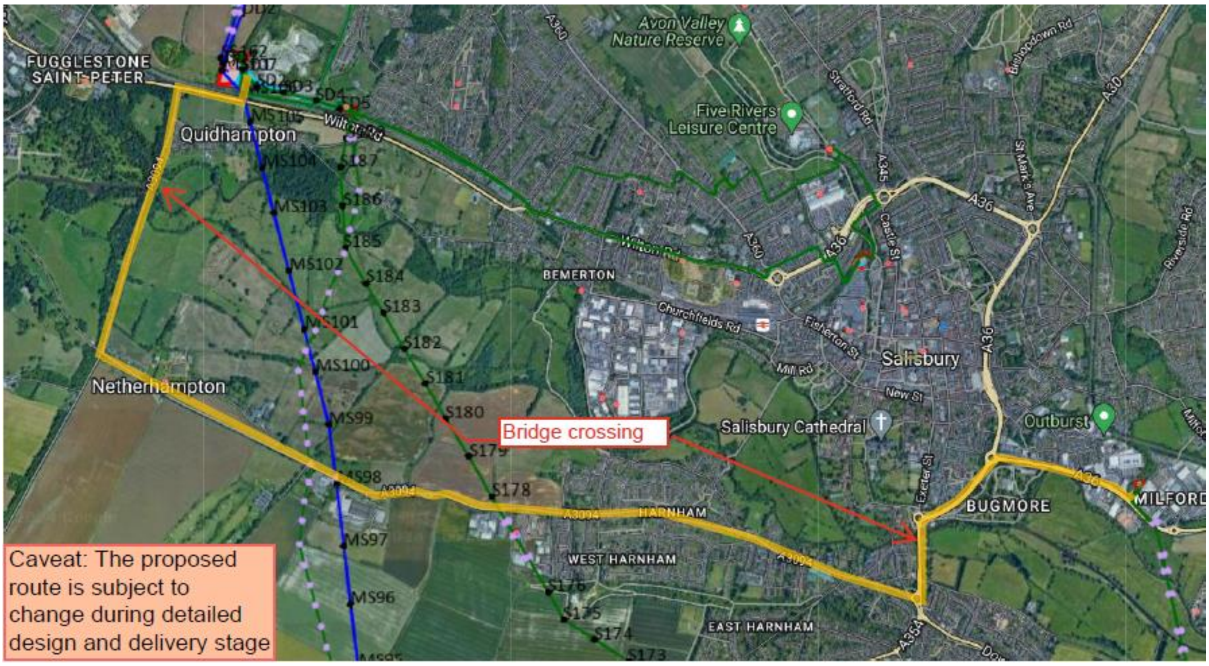

Figure 11 Proposed cable route from SALI BSP to PETF PSS

The assets required for this reinforcement and their cost is listed in Table 19.

Table 19 Assets required for PETF 33kV circuit reinforcement

Asset	Units	Unit Rate (£m)	Cost (£m)
Petersfinger 33kV work			
33kV UG (Non-Pressurised)	[redacted]		
33kV GIS ID CBs			
Land + Switch room building cost			
Bridge crossing			
Total			

7.5.2 Netherhampton Primary

Netherhampton (NETH) PSS is supplied by two 33kV OHL circuits from Bemerton switching station with Winter rating of 15.8MVA. [redacted]

To ensure P2 compliance until 2050, Netherhampton is to be isolated from the ring network and is to be supplied by dual 33kV UG cables (2x 4.3kms) directly from Salisbury BSP. Redlynch PSS will be continued to be supplied by the 33kV Overhead line from NETH PSS TEE. The proposed route for the UG cable from Salisbury BSP to Netherhampton PSS is shown in Figure 14. Please note that the proposed route is subject to change during detailed design and delivery stage. Once the reinforcements

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are completed, the existing 33kV OHLs to Netherhampton from Bemerton switching station can be dismantled or de-energised (Figure 19).

Additionally, it is proposed to install a 33kV GIS switch board at Netherhampton PSS for protection and operational purposes by 2028. The switch board can allow both the transformers to operate when one of the upstream 33kV circuits is off. The geographical view of Netherhampton PSS is shown in Figure 15. A site survey is required to check if the site is to be expanded to accommodate the 33kV switch room.

Figure 12 Proposed Cable route from SALI BSP to NETH PSS

NETH PSS is supplied by 2 x 10MVA 33/11kV transformers. The N-1 firm capacity for these transformers is 13MVA (1.3 times 10MVA for Winter). [redacted]

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The overview of the proposed reinforcements at Netherhampton PSS is shown in Figure 16.

Figure 15 Aerial view of Netherhampton PSS

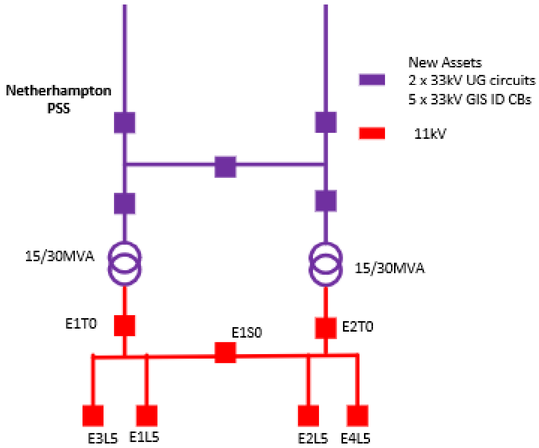

Figure 16 SLD of the proposed reinforcements at Netherhampton PSS

The assets required for this reinforcement and their cost is listed in Table 20.

Table 20 Assets required for reinforcements at Netherhampton

Asset	Units	Unit Rate (£m)	Cost (£m)
Netherhampton 33kV work			
33kV UG (Non-Pressurised)	[redacted]		
33kV GIS ID CBs			
Land + Switch room building cost			
Bridge crossing			
Netherhampton Transformers			
33kV 15/30MVA transformers	[redacted]		
Total			

7.5.3 Salisbury BSP

Due to increase in new connections at Salisbury BSP and thermal reinforcements proposed in this EJP (four additional UG circuits from Netherhampton and Petersfinger PSS to be terminated at Salisbury BSP), the 33kV busbar needs to be expanded at Salisbury BSP. To prevent future space constraints at the existing BSP compound and to enable future connections at Salisbury, an indoor GIS 33kV switch room is proposed.

Therefore, a double busbar 33kV GIS indoor switch room with 20 x 33kV GIS ID CBs has been proposed. Figure 17 shows the design of the gas-insulated switching board in Salisbury BSP.

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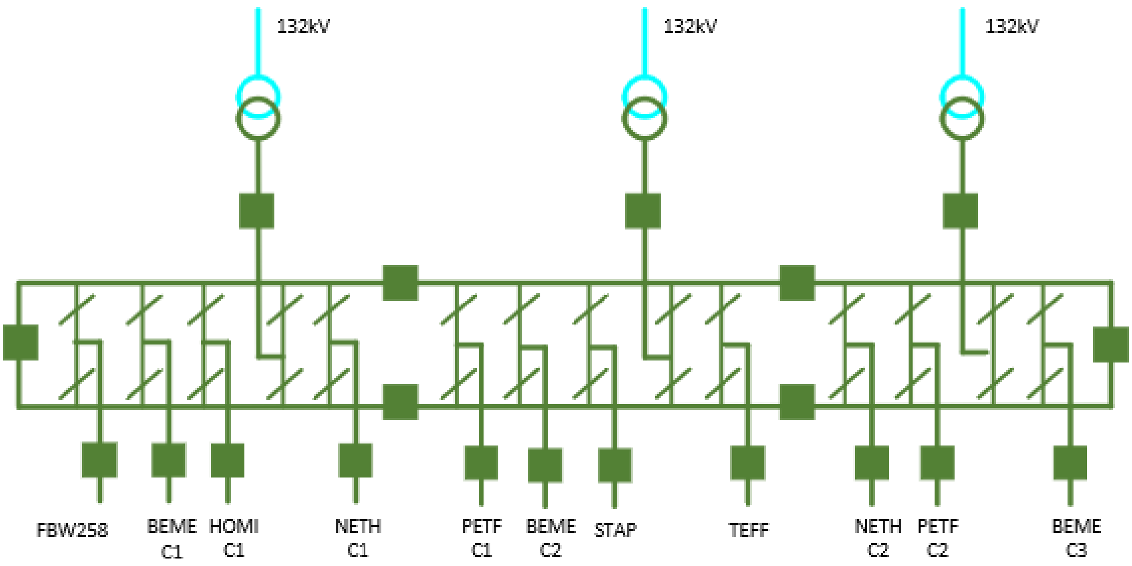

Figure 13 Proposed 33kV busbar design at Salisbury BSP

The assets required for this reinforcement and their cost is listed in Table 21.

Table 21 Assets required for reinforcements at Salisbury BSP

Asset	Units	Unit Rate (£m)	Cost (£m)
Salisbury 33kV GIS switch board			
33kV GIS ID CBs	[redacted]		
Land + Switch room building cost			
Total			

7.6 Overview of the Scope of Works for the preferred option:

Accounting for flexibility, the scope of works mentioned in the EJP can be completed in multiple phases as detailed below and given in Figure 18.

Phase 1: (2026-2029)

1. Petersfinger 33kV circuits:

- Addition of dual 33kV UG cables (2x7.84km) from Salisbury BSP to Petersfinger PSS.
- Install a 33kV GIS switch room (5 x 33kV GIS ID CBs) at Petersfinger PSS.
- Land, Bridge crossing and switch room building cost.
- Flexibility in 2027 and 2028 [redacted].
- Flexibility in 2029 for deferral of reinforcement.

2. Netherhampton 33kV circuits:

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- Addition of dual 33kV UG cables (2x4.32km) from Salisbury BSP to Netherhampton PSS.
- Install a 33kV GIS switch room (5 x 33kV GIS ID CBs) at Netherhampton PSS.
- Land, Bridge crossing and switch room building cost.
- Flexibility in 2029 for deferral of reinforcement.

3. Salisbury BSP:

- Install a new 33kV GIS indoor switch room at Salisbury BSP (20 x 33kV GIS ID CBs).
- Land and switch room building cost.

Phase 2: (2030-2032)

1. Netherhampton Transformers:

- Replace the existing 33/11kV transformers at NETH PSS to 2 x 33/11kV 15/30MVA transformers.
- Flexibility in 2031 and 2032 for deferral of reinforcement.

[redacted]. This is a temporary arrangement and is to be transferred back to Salisbury BSP network after the completion of reinforcement.

Once the reinforcements are completed, the existing 33kV OHLs supplying Netherhampton and Petersfinger PSS (yellow dashed lines) can be dismantled or de-energised as shown in Figure 19.

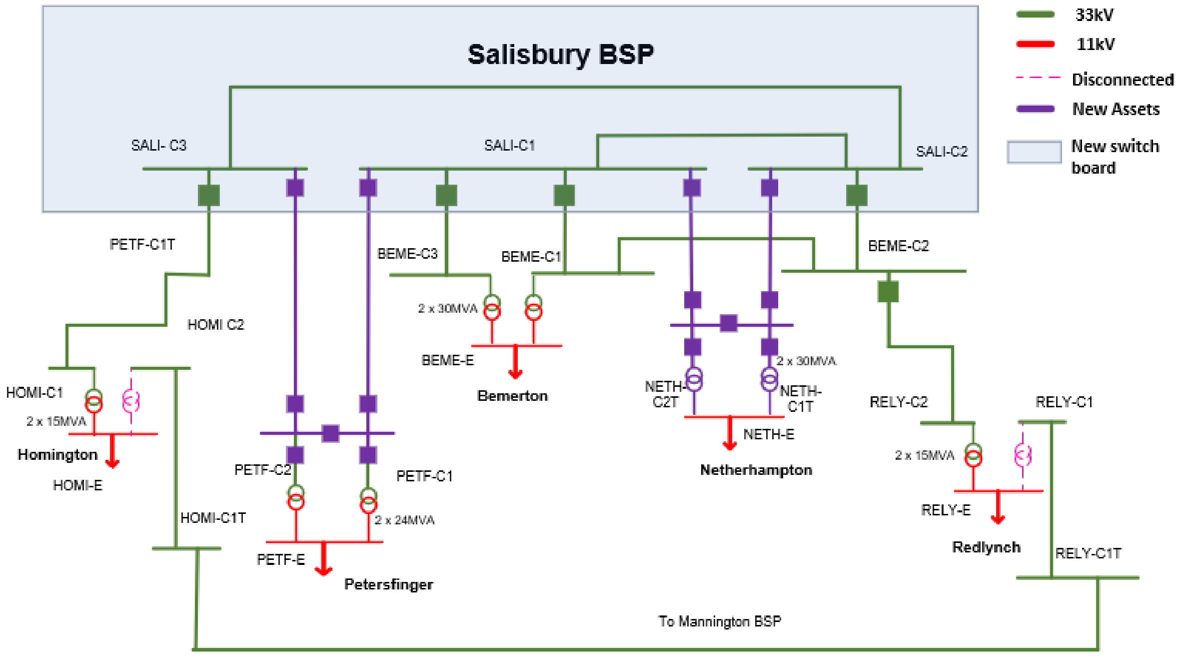

Figure 14 SLD of the Bemerton 33kV network overview after proposed reinforcements

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[redacted]

8 Cost Benefit Analysis (CBA)

8.1 CBA of investment options

The CBA is performed for Netherhampton and Petersfinger PSS under Salisbury BSP where a need for reinforcements was identified. The required assets for the reinforcements are described in the optioneering section. Therefore, only the costs are detailed in this section.

8.2 CBA Results

The results for the individual options progressed to the CBA are shown in Table 22. This includes the total investment as well as the Whole life NPV.

Table 22 CBA Results Summary

Option	Whole life NPV	Investment
Option 5 + Flexibility	[redacted]	
Option 5 Isolate NETH and PETF PSS from the ring network + NETH PSS transformer upgradation + 33kV GIS at SALI BSP.		

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9 Deliverability and Risk

The specific considerations for deliverability based on the scope of this EJP are detailed below:

- **Medium risk on cable installation** - The proposed new 33kV cable route from Salisbury to Petersfinger is partially along the same route as the Salisbury-Netherhampton route. This route avoids highways and town centres in majority. There are also two bridge crossings on the route and a tunnel crossing near Salisbury BSP. This could add delay to the work. Careful planning work will need to be carried out to secure suitable consents and the optimum route and ground conditions to construct the trench and lay the cable in a cost-effective manner. The proposed route is subject to change during detailed design and delivery stage.
- **Medium risk on 33kV switchgear installation** – There appears to be adequate space at Petersfinger and Netherhampton existing compound for the new 33kV indoor switchrooms. Salisbury BSP has some space next to the existing outdoor 33kV CBs but there are cables running through that space. Diversion of the existing 33kV UG cables might be required, or alternatively space for the 33kV GIS board is to be explored on the south side of the Salisbury BSP. A site survey is required to check the space constraints during the feasibility stage.
- **Medium risk on customer connection:** There is a new connection job (ETW206) triggered the 33kV reinforcements. However, the reinforcements were proposed as a minimum scheme to a concerned part of the network, but the wider 33kV network thermal issue was not considered. The reinforcements triggered by the connection job will be replaced by the reinforcements in this EJP. To avoid any delays in the energisation date of the customer, interim capacity has been proposed to the customer and a temporary load transfer of Redlynch PSS could also be done by transferring Redlynch PSS from Salisbury BSP to Mannington BSP to prevent thermal issue under N-1 scenario. Please note that this is a temporary arrangement and will not be required after the completion of reinforcements in 2028/29.

10 Outlook to 2050

The solution proposed will ensure the network to be P2 compliant until 2050 for Petersfinger and Netherhampton primaries and the meshed 33kV network discussed in this EJP. However, the actual load growth under Bemerton PSS and Salisbury Central PSS will need to be monitored closely to prevent the circuit from overloading. Potential reinforcement could involve upgrading the 33kV circuits from Salisbury BSP to Bemerton PSS network or Bemerton PSS to Salisbury Central PSS. Bemerton PSS is also serving as a 33kV switching station, however its location is restricted for future expansion and access to Bemerton is also limited due to its surroundings. The 33kV OHL supplying Redlynch has low rating and hence require observation of thermal constraints under intact condition after 2035.

Therefore, SSEN will revisit the network at the end of ED2 period or early ED3 period to propose any necessary reinforcements works based on demand growth and future DFES data.

11 Conclusion and Recommendation

This Engineering Justification Paper (EJP) underscores the necessity for load-related investment at Salisbury BSP 33kV during the ED2 and ED3 price control periods. This investment is essential to comply with P2/8 standards due to the significant forecasted demand increase and its impact on existing customers, as well as the need for new connections to Netherhampton and Petersfinger Primaries.

We evaluated four investment options and identified the preferred solution: separating Netherhampton and Petersfinger from the meshed network by adding two new feeders directly from the BSP. This approach proved economical, allowing reinforcements to be deferred through flexibility (Option 2).

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Our plan also considers the efficient and future-proof use of the Salisbury BSP compound by transforming the 33kV outdoor switchgear into an indoor configuration. With the growing requirement from new connections and requirements in network upgrading works, it is valuable to provide a robust 33kV indoor busbar system with less land space occupied within the Salisbury BSP compound. The released land space can potentially also facilitate any future works for upgrading 132kV assets at Salisbury BSP.

The proposed [redacted] completion targeted in early/mid ED3 period to mitigate the risk of thermal overload and ensure network compliance.

12 Revision History

No	Overview of Amendments	Previous Document	Revision	Authorisation
01				
02				

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Appendix A Definitions and Abbreviations

Table 6 Definitions and Abbreviations

Acronym	Definition
AIS	Air-insulated Switchgear
ASCR	Aluminium Conductor Steel Reinforced
BSP	Bulk Supply Point
CBA	Cost Benefit Analysis
CBRM	Condition Based Risk Management
CEM	Common Evaluation Methodology
CI	Customer Interruptions
CML	Customer Minutes Lost
CT	Consumer Transformation
DFES	Distribution Future Energy Scenarios
DNO	Distribution Network Operator
EJP	Engineering Justification Paper
ESA	Electricity Supply Area
EV	Electric Vehicle
FCO	First Circuit Outage
FES	Future Energy Scenarios
GIS	Geographic Information System
GM	Ground Mounted
GSP	Grid Supply Point
HI	Health Index
IDP	Investment Decision Pack
LCT	Low Carbon Technology
LEP	Local Enterprise Partnership
LI	Load Index
LRE	Load Related Expenditure
LW	Leading the Way
NPV	Net Present Value
OHL	Overhead Line
PM	Pole Mounted
PV	Photovoltaics
RSN	Relevant Section of Network
SCO	Second Circuit Outage
SSEN	Scottish and Southern Electricity Network
SP	Steady Progression
ST	System Transformation
XLPE	Cross-linked Polyethylene

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Appendix B Fault level analysis results

[redacted]

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[redacted]

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[redacted]

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[redacted]

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Appendix C Flexibility Viability results form

[redacted]

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[redacted]

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[redacted]

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Appendix D SENSITIVTY ANALYSIS for Bemerton 33kV ring network

For each investment proposed in this EJP, we have reviewed the annual max demand figures under all DFES scenarios out to 2050. Based on this assessment, we will place this investment into one of the categories from Table D-1.

Table D-1:

Category	Description	Applies to this EJP?
A	Schemes where the chosen investment size is large enough to meet peak demand/generation under all net zero compliant scenarios to 2050	
B	Schemes where we would require further future reinforcement of the particular asset(s) being proposed under a more aggressive scenario to 2050	
C	Schemes where the proposed investment is not required under any scenario to 2050 (if any)	
D	Schemes where investment can be deferred until a later date under some scenarios i.e. ST scenario indicates no investment needed until 2030	✓

Justification for categorisation:

[redacted]. Considering the demand forecast through 2050, the most effective reinforcement option has been proposed. This solution is designed to remain future proof until 2050, although it necessitates additional reinforcements in other parts of the network. As such, careful consideration has been taken when carrying out the sensitivity analysis for this work, to ultimately classify this EJP as a category D project.

The sensitivity analysis for all constraints will be split and presented in individual sections. Each section will display a graph highlighting the load growth of the network from the four different Distribution Future Energy Scenarios, alongside the pre and post reinforcement constraint point of the relevant assets. This allows us to understand whether the proposed solution is compatible with the present/future network under any scenario. For reference, the four scenarios studied are Customer Transformation (CT), Leading the Way (LW), Falling Short (FS) and System Transformation (ST).

A summary of the network constrains, their categorisation and the relevant justification can be seen in Table D-2.

Table D-2:

Constraint	Category	Justification
Petersfinger 33kV circuits	D	The proposed reinforcement can be deferred by a year under ST/FS scenarios.
Netherhampton 33kV circuits	D	The proposed reinforcement can be deferred by a year under ST/FS scenarios.

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Netherhampton 33/11kV transformers	D	The proposed reinforcement can be deferred by 5 and 6 years under ST and FS scenarios respectively.

Petersfinger 33kV circuits:

Currently, Petersfinger PSS is supplied by two 33kV circuits (as detailed in Section 5.5 in the Bemerton EJP). One of the 33kV circuit supplies Netherhampton and Petersfinger PSS while the other 33kV circuit supplies Petersfinger and Homington PSS. [redacted] Relevant sensitivity factor has been used to represent the network arrangements. From Figure 1, the reinforcement can be deferred by a year to 2028 under FS and ST scenario. Hence this scope of work is categorised as D.

The proposed works in the EJP (dual 33kV circuits from Salisbury BSP to Petersfinger PSS) aims to remove Petersfinger PSS from the meshed network and have dedicated 33kV circuits feeding Petersfinger PSS alone directly from Salisbury BSP. The peak demand of Petersfinger PSS and the future capacity of the dual 33kV circuits (45MVA Winter) is shown in Figure 2. The new capacity is future proof until 2050.

[redacted]

[redacted]

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Netherhampton 33kV circuits:

Netherhampton is supplied by two 33kV circuits (as detailed in Section 5.5 in the Bemerton EJP). One of the 33kV circuit supplies Netherhampton and Petersfinger as mentioned above and the other 33kV circuit supplies Netherhampton and Redlynch PSS. [redacted] Figure 3 shows the peak demand growth under Netherhampton and Redlynch with the existing capacity of the 33kV circuit (15.8MVA Winter). Relevant sensitivity factors have been applied to represent the demand in the ring network in the figure. If FS and ST scenario comes to pass, the reinforcement can be deferred by a year to 2030 as seen in Figure 3. Hence this option is categorised as D, since the scheme can be deferred by 1 year under FS and ST scenario.

The proposed works aims to remove Netherhampton PSS from the ring network and have new 33kV dual circuits supplying Netherhampton alone directly from Salisbury BSP. The peak demand of Netherhampton PSS along with the future capacity of the 33kV circuits (45MVA Winter) is shown in Figure 4.

[redacted]

[redacted]

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Netherhampton Primary Transformer replacement:

The current firm capacity at Netherhampton Primary is 13MVA which is the winter rating of transformers at Netherhampton Primary. [redacted] Hence, this scheme can be categorised as D, since it can be deferred by 5 and 6 years under ST and FS respectively.

This EJP proposes replacement of existing 10MVA transformers with 2 x 15/30MVA transformers. Hence, the new firm capacity at Netherhampton PSS will be 30MVA. As shown in Figure 5, the new capacity is future proof under all scenarios until 2050.

[redacted]

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