Plymton BSP and Associated 33 kV Network

Network Development Report – South West

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Electricity Distribution

nationalgrid

Contents

Plympton BSP and Associated 33 kV Network

1. Network Overview

Plympton Bulk Supply Point (BSP) supplies a mixture of rural and urban sections of 33 kV network, in South West Devon. It is supplied from two 132/33 kV GTs and feeds approximately 25,600 customers.

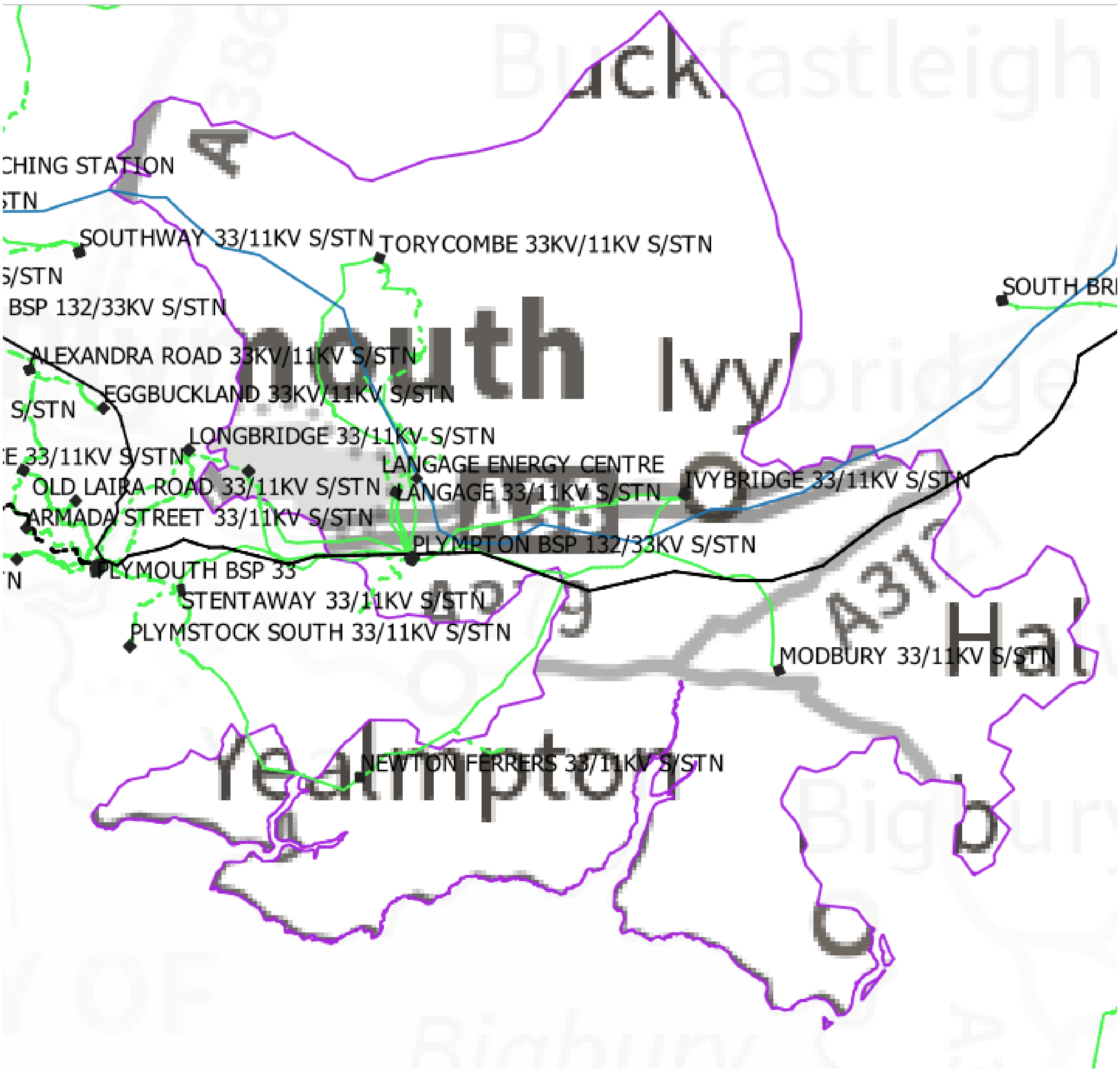

Figure 1.1 Plympton BSP geographic network coverage

This report discusses all existing and future network constraints over a 0-10 year horizon associated with the 33/11 kV transformers, 33 kV circuits and 132/33 kV transformers which supply Plympton BSP. This uses the methodology outlined in the Network Development Plan Methodology Report with Network Operability Modelling applied as outlined below.

For the purposes of this analysis the NGED Best View Distribution Future Energy Scenario (DFES) has been used to study the years 2022 (baseline), 2028 and 2034, with consideration given to how proposals could change under the other scenarios. Five representative days have been studied across the four seasons: Winter Peak Demand, Intermediate Warm Peak Demand, Intermediate Cool Peak Demand, Summer Peak Demand and Summer Peak Generation.

1.1 Network Topology

The Plympton BSP network is arranged as follows:

- Langage Primary substation is supplied via two separate transformer feeders with a 33 kV generator connection teed off one of the circuits.
- Linketty Lane Primary substation is supplied via two separate transformer feeders with a 33 kV connection to Plymouth BSP via a normal open point on isolator 3L3 at Linketty Lane.
- A 33kV ring supplying Torycombe & two 33 kV demand customers, along with connections to one 33kV connected generator.
- A 33kV ring supplying Newton Ferrers, Modbury & Ivybridge Primary substations, a 33 kV IDNO (Sherford) and two 33 kV connected generators. Interconnection to Plymouth BSP exists via a normal open point on circuit breaker 3L5 at Stentaway.
- A 33kV circuit to a 33kV generator connection.

1.2 Network Operability Modelling

The following network automation and manual switching schemes have been modelled in the analysis of this area, aligning to how the network is currently operated, as well as proposed actions, to manage some constraints identified operationally.

- For an arranged outage of either grid transformer at Plympton, the normal open point at Linketty Lane is moved from 3L3 to circuit breaker 19 and CB 2L5 at Plympton, which is available for operation with telecontrol. This allows for quicker restoration of customers in the event of a fault where the network needs to be reconfigured.
- For an arranged outage Plympton 5L5 feeding Langage T2,circuit breaker 21 at Langage 33/11kV substation, is run open. This is to reduce the risk of through-flow for credible next faults on the network, where the 11 kV network at the primary becomes a link to the wider 33 kV network and could overload transformers.

2. Network Constraints and Solution Options

2.1 Summary of Network Constraints

The following constraints were identified for the Best View Scenario, for which mitigation options will be discussed:

- Plympton BSP 132/33 kV Grid Transformer overloads
- Langage 33/11 kV T1 & T2 overloads
- Linketty Lane 33/11 kV T1 & T2 overloads
- Sherford to Stentaway 33 kV circuit overload
- Plympton BSP to Sherford 33 kV circuit overload
- Plympton to Langage 33 kV circuit overloads
- Plympton to Torycombe 33 kV circuit overloads

3. Network Constraint Details and Solution Options

3.1 Plympton BSP 132/33 kV GT Overloads

Generation | Demand

Constraint Overview

The table below outlines the nature of the network constraints identified in the network analysis, with the worst overloads seen at winter peak demand.

Table 3.1.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First studied year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Plympton GT1 overload	Plympton GT2 fault	None	Baseline	Baseline	2028	2028
Plympton GT2 overload	Plympton GT1 fault	None	Baseline	Baseline	2028	2028

Uncertainty under other Distribution Future Energy Scenarios: As this constraint occurs under baseline, there is no uncertainty about future forecasts. There is a risk that demand reduces, however this is not forecast under any scenario so mitigation against this constraint is required.

Solution Options

A list of each of the options considered for this constraint is given in the table below.

Table 3.1.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Application of an increased rating following checks on ancillaries/CTs etc.	✓	✓	✓	Viable
2	Replace both GTs with 90 MVA units	✓	✓	×	Discounted
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Plympton BSP at 33 kV or below	✓	✓	✓	Viable

Solution Development

These options have been assessed on their technical viability and their likely cost-effectiveness pending a full cost benefit analysis (CBA). This CBA will be subsequently carried out by the Distribution Network Operator (DNO) to determine the optimal reinforcement solution, which will then be tested against market provided flexibility by the Distribution System Operator (DSO) as part of the Distribution Network Options Assessment (DNOA) process.

Option 1 – Application of an increased rating following checks on ancillaries

Viable

Capacity released for constraint(s) considered: 25.2 MVA (based on Current Transformer (CT) restriction)

Detailed description: Uprate the existing GTs at Plympton via use of cyclic ratings in accordance with British Standard 171/IEC60076 and NGED Standard Technique SD8C. This requires a capability assessment of all ancillaries, such as busbars, isolators, CTs, cables (including cabling within the substation), switchgear, tap changer, transformer bushings, conservator and earthing transformer. In addition, an assessment of the cyclic profile of the load is required to determine if transformer temperature and ageing is within acceptable limits.

New limiting factor for constraint(s) considered: 78 MVA (Winter cyclic rating of GTs).

Option 2 – Replace both GTs with 90 MVA units

Capacity Released for constraint(s) considered: 61.2 MVA (winter cyclic) Discounted

Detailed description: Replacement of both 132/33 kV grid transformers with 90 MVA units**.**

New limiting factor for constraint(s) considered: 114 MVA (2000 A transformer circuit breakers)

Option 3 – Procure flexibility under Plympton BSP at 33 kV or below

Flexibility service type: Generation turn up/demand turn down Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on the Grid Transformers at Plympton BSP. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to undertake an assessment using NGED Standard Technique SD8C to achieve the full rating of both Grid Transformers (Option 1).

3.2 Langage T1 & T2 Overloads

Constraint Overview

Generation Demand

The table below outlines the nature of the network constraints identified in the network analysis, with the worst overloads initially seen at summer peak generation.

Table 3.2.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Langage T1 overload	Plympton Main2 33 kV busbar fault	None	-	-	-	Baseline
Langage T2 overload	Plympton Main1 33 kV busbar fault	None	-	-	-	2025
Langage T1 overload	Plympton-Langage T2 circuit fault	None	-	2028	2028	-
Lanage T2 overload	Plympton-Langage T1 circuit fault	None	-	2028	2028	-

Uncertainty under other Distribution Future Energy Scenarios: As this constraint occurs under baseline, there is no uncertainty about future forecasts. There is a risk that demand reduces, however this is not forecast under any scenario so mitigation against this constraint is required.

Solution Options

A list of each of the options considered for this constraint is given in the table below.

Table 3.2.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Area Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Review transformer ratings	✓	×	✓	Viable
2	Replace transformers with larger units	✓	×	×	Viable
3	Add a 1S0 breaker	✓	×	×	Viable
Operational Mitigation					
4	Install an inter-tripping scheme	✓	×	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
5	Procure flexibility under Langage at 11 kV or below	✓	×	✓	Viable

Solution Development

These options have been assessed on their technical viability and their likely cost-effectiveness pending a full CBA. This CBA will be subsequently carried out by the DNO to determine the optimal reinforcement solution, which will then be tested against market provided flexibility by the DSO as part of the DNOA process.

Option 1 – Review transformer ratings

Capacity released for constraint(s) considered: Subject to review — **Viable**

Detailed description: Overloads are only for summer until 2028. It is therefore possible that this constraint could be delayed slightly by reviewing NGED's internal policy regarding transformer ratings, which does not currently distinguish between summer and intermediate cool ratings (which may be overly pessimistic). This solution is dependent on an internal review and would not be a long term solution.

New limiting factor for constraint(s) considered: Subject to review

Option 2 – Replace transformers with larger units

Capacity released for constraint(s) considered: TBC — **Viable**

Detailed description: Replace transformers with larger units (20/40 MVA).

New limiting factor for constraint(s) considered: TBC

Option 3 – Add a 1S0 breaker

Capacity released for constraint(s) considered: TBC — **Viable**

Detailed description: Add a 1S0 breaker at Langage to avoid reverse power flow through the 11 kV busbar.

New limiting factor for constraint(s) considered: TBC

Option 4 – Install inter-tripping to trip generation for a 33 kV Busbar/circuit fault at Plympton BSP

Capacity released for constraint(s) considered: Subject to review — **Viable**

Detailed description: Install an intertripping scheme to trip sufficient generation in the event of a 33kV Busbar fault at Plympton BSP or 33kV circuit fault between Plympton & Langage.

New limiting factor for constraint(s) considered: Subject to review

Option 5 – Procure flexibility under Langage at 11 kV or below

Flexibility service type: Demand turn down/Generation turn up — **Viable**

Detailed description: Flexibility services could be procured to alleviate projected (demand related) overloads seen on the 33/11kV transformers at Langage. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that the transformer ratings are reviewed to overcome the future demand related overloads (Option 1) this may mean some remedial works of the Langage transformers. A 1S0 breaker should be considered alongside Option 1 which may stop reverse powerflow on the Lnagage transformers. Should this not be sufficient consideration should be given to installing larger transformers (Option 2). In addition to install inter-tripping to prevent overloads for peak summer generation conditions (Option 4).

3.3 Linketty Lane T1 & T2 overloads

Generation Demand

Constraint Overview

The table below outlines the nature of the network constraints identified in the network analysis, with the worst overloads seen at summer peak generation.

Table 3.3.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Linketty Lane T1 overload	Plympton Main 2 33 kV Busbar fault	None	-	-	-	Baseline
Linketty Lane T2 overload	Plympton Main1 33 kV Busbar fault	None	-	-	-	Baseline

Uncertainty under other Distribution Future Energy Scenarios: As this constraint occurs under baseline, there is no uncertainty about future forecasts. There is a risk that demand reduces, however this is not forecast under any scenario so mitigation against this constraint is required.

Solution Options

A list of each of the options considered for this constraint is given in the table below.

Table 3.3.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Area Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Uprate transformer reverse powerflow rating	✓	×	✓	Viable
Operational Mitigation					
2	Install an inter-tripping scheme	✓	×	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Linketty Lane at 11 kV or below	×	×	×	Discounted

Solution Development

These options have been assessed on their technical viability and their likely cost-effectiveness pending a full CBA. This CBA will be subsequently carried out by the DNO to determine the optimal reinforcement solution, which will then be tested against market provided flexibility by the DSO as part of the DNOA process.

Option 1 – Review transformer reverse powerflow rating

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Overloads are only for summer until 2028. It is therefore possible that this constraint could be delayed slightly by reviewing NGED's internal policy regarding transformer ratings, which does not currently distinguish between summer and intermediate cool ratings (which may be overly pessimistic). This solution is dependent on an internal review and would not be a long term solution.

New limiting factor for constraint(s) considered: TBC

Option 2 – Install inter-tripping to trip generation for a 33 kV Busbar fault at Plympton BSP

Capacity released for constraint(s) considered: N/A

Viable

Detailed description: Install an intertripping scheme to trip sufficient generation in the event of a 33 kV Busbar fault at Plympton BSP.

New limiting factor for constraint(s) considered: N/A

Option 3 – Procure flexibility under Linketty Lane at 11 kV or below

Flexibility service type: N/A

Discounted

Detailed description: Flexibility services still would not be procured to alleviate projected overloads seen on the 33/11 kV transformers at Linketty Lane. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

Option 1 is the preferred option and may require remedial works of the transformer. If insufficient Option 2 of installing the inter trip may be needed.

3.4 Sherford to Stentaway 33 kV circuit Overloads

Generation | **Demand**

Constraint Overview

The table below outlines the nature of the network constraints identified in the network analysis, with the worst overloads seen at intermediate warm peak demand.

Table 3.4.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Sherford to Stentaway 33 kV circuit	Plympton 33 kV Main 2 busbar	None	2025	2025	2025	-

Uncertainty under other Distribution Future Energy Scenarios: Constraints may be triggered earlier for higher growth scenarios

Solution Options

A list of each of the options considered for this constraint is given in the table below.

Table 3.4.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Area Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Reconductor relevant sections of circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC)	✓	×	✓	Viable
2	Build a new 33 kV circuit from Plympton BSP to Torr Quarry Tee	✓	×	✓	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Ivybridge, Modbury or Newton Ferrers at 11 kV or below	✓	×	✓	Viable

Solution Development

These options have been assessed on their technical viability and their likely cost-effectiveness pending a full CBA. This CBA will be subsequently carried out by the DNO to determine the optimal reinforcement solution, which will then be tested against market provided flexibility by the DSO as part of the DNOA process.

Option 1 – Reconductor relevant sections of circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC)

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Re-conductor the relevant sections of 33 kV circuit with larger conductor (150 sq.mm Cu or 200 AAAC)

New limiting factor for constraint(s) considered: 150 sq.mm Cu conductor or equivalent.

Option 2 – Build a new 33 kV circuit from Plympton BSP to Torr Quarry Tee

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Build a new 33 kV circuit from Plympton BSP (Main 2 busbar) to Torr Quarry Tee to provide additional circuit capacity and prevent the loss of 2 out of 3 circuits in the event of a 33 kV Busbar fault at Plympton BSP. Also move either Plympton BSP 3L5 or 11L5 to Main 1 33 kV busbar.

New limiting factor for constraint(s) considered: 150 sq.mm Cu conductor or equivalent.

Option 3 – Procure flexibility under Ivybridge, Modbury or Newton Ferrers at 11 kV or below

Flexibility service type: Generation turn up/demand turn down

Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on the Sherford to Stentaway 33 kV circuit. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to build a new 33 kV circuit from Plympton BSP to Torr Quarry Tee (committed reinforcement project) to re-configure the network to prevent the outage of 2 out of 3 circuits during 33 kV busbar outages (Option 2).

3.5 Plympton BSP to Sherford 33 kV circuit Overloads

Generation | **Demand**

Constraint Overview

The table below outlines the nature of the network constraints identified in the network analysis, with the worst overloads seen at winter peak demand.

Table 3.5.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Plympton BSP to Sherford 33 kV	Plympton 33 kV Main 2 busbar	None	2030	-	-	-

Uncertainty under other Distribution Future Energy Scenarios: Constraints may be triggered earlier for higher growth scenarios

Solution Options

A list of each of the options considered for this constraint is given in the table below.

Table 3.5.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Area Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Reconductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC)	✓	✓	✓	Viable
2	Build a new 33 kV circuit from Plympton BSP to Torr Quarry Tee	✓	✓	✓	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Ivybridge, Modbury or Newton Ferrers at 11 kV or below	✓	×	✓	Viable

Solution Development

These options have been assessed on their technical viability and their likely cost-effectiveness pending a full CBA. This CBA will be subsequently carried out by the DNO to determine the optimal reinforcement solution, which will then be tested against market provided flexibility by the DSO as part of the DNOA process.

Option 1 – Reconductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC)

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Re-conductor the relevant sections of 33 kV circuit with larger conductor (150 sq.mm Cu or 200 Al. Alloy)

New limiting factor for constraint(s) considered: 150 sq.mm Cu conductor or equivalent.

Option 2– Build a new 33 kV circuit from Plympton BSP to Torr Quarry Tee

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Build a new 33 kV circuit from Plympton BSP to Torr Quarry Tee to provide additional circuit capacity and prevent the loss of 2 out of 3 circuits in the event of a 33 kV Busbar fault at Plympton BSP. Also move either Plympton BSP 3L5 or 11L5 to Main 1 33 kV busbar.

New limiting factor for constraint(s) considered: 150 sq.mm Cu conductor or equivalent.

Option 3 – Procure flexibility under Ivybridge, Modbury or Newton Ferrers at 11 kV or below

Flexibility service type: Generation turn up/demand turn down

Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on the Plympton BSP to Sherford 33 kV circuit. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to build a new 33 kV circuit from Plympton BSP to Torr Quarry Tee (committed reinforcement project) to re-configure the network to prevent the outage of 2 out of 3 circuits during 33 kV busbar outages (Option 2).

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3.6 Plympton BSP to Langage 33 kV circuit Overloads

Generation Demand

Constraint Overview

The table below outlines the nature of the network constraints identified in the network analysis, with the worst overloads seen at summer peak generation.

Table 3.67.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Plympton BSP to Langage T1 33 kV circuit	Plympton 33kV Main 2 busbar fault	None				2025
Plympton BSP to Langage T2/Newnham Farm 33 kV circuit	Plympton 33kV Main 1 busbar fault	None				2025

Uncertainty under other Distribution Future Energy Scenarios: Constraints may be triggered earlier for higher growth scenarios

Solution Options

A list of each of the options considered for this constraint is given in the table below.

Table 3.67.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Area Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Reconductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm Al Alloy)	✓	×	×	Viable
Operational Mitigation					
2	Install an intertripping scheme	✓	×	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Langage at 11 kV or below	✓	×	✓	Viable

Solution Development

These options have been assessed on their technical viability and their likely cost-effectiveness pending a full cost benefit analysis (CBA). This CBA will be subsequently carried out by the DNO to determine the optimal reinforcement solution, which will then be tested against market provided flexibility by the DSO as part of the Distribution Network Options Assessment (DNOA) process.

Option 1 – Reinforce existing 33 kV circuit

Capacity released for constraint(s) considered: 4 MVA

Viable

Detailed description: Re-conductor the existing circuits with larger conductor (150 sq.mm Cu or 200 sq.mm Al Alloy)

New limiting factor for constraint(s) considered: 23.1 MVA (Summer circuit rating)

Option 2 – Install inter-tripping to trip generation for a 33 kV Busbar/circuit fault at Plympton BSP

Capacity released for constraint(s) considered: Subject to review

Viable

Detailed description: Install an intertripping scheme to trip sufficient generation in the event of a 33 kV Busbar fault at Plympton BSP or 33 kV circuit fault between Plympton BSP and Langage.

New limiting factor for constraint(s) considered: Subject to review

Option3 – Procure flexibility under Langage at 11 kV or below

Flexibility service type: Generation turn down

Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on the 33 kV circuits between Plympton BSP and Langage. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to install an inter-tripping scheme to prevent overloads for peak summer generation conditions (Option 2).

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3.7 Plympton BSP to Torycombe 33 kV circuit Overloads

Constraint Overview

Generation Demand

The table below outlines the nature of the network constraints identified in the network analysis, with the worst overloads seen at summer peak generation.

Table 3.78.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Plympton BSP to Torycombe 33 kV	Plympton BSP to Hemerdon Mine or Hemerdon Mine to Torycombe 33 kV cct fault	None				Baseline
Plympton BSP to Hemerdon Mine and Torycombe 33 kV	Plympton BSP to Torycombe 33 kV circuit outage	None				Baseline

Uncertainty under other Distribution Future Energy Scenarios: As this constraint occurs under baseline, there is no uncertainty about future forecasts. There is a risk that demand reduces, however this is not forecast under any scenario so mitigation against this constraint is required.

Solution Options

A list of each of the options considered for this constraint is given in the table below.

Table 3.78.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Area Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Reconductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm Al Alloy)	✓	✓	✓	Viable
Operational Mitigation					
2	Install an inter-tripping scheme	✓	×	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Torycombe at 11 kV or below	✓	×	✓	Viable

Solution Development

These options have been assessed on their technical viability and their likely cost-effectiveness pending a full cost benefit analysis (CBA). This CBA will be subsequently carried out by the DNO to determine the optimal reinforcement solution, which will then be tested against market provided flexibility by the DSO as part of the Distribution Network Options Assessment (DNOA) process.

Option 1 – Reinforce existing 33 kV circuits

Capacity released for constraint(s) considered: 8.7 MVA **Viable**

Detailed description: Re-conductor the existing circuits with larger conductor (150 sq.mm Cu or 200 sq.mm Al Alloy)

New limiting factor for constraint(s) considered: 23.1 MVA (Summer circuit rating).

Option 2 – Install inter-tripping to trip generation for a 33 kV circuit fault

Capacity released for constraint(s) considered: Subject to review **Viable**

Detailed description: Install an intertripping scheme to trip sufficient generation in the event of a 33 kV circuit fault between Plympton BSP and Torycombe.

New limiting factor for constraint(s) considered: Subject to review

Option 3 – Procure flexibility under Torycombe at 11 kV or below

Flexibility service type: Generation turn down

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on either Plympton to Torycombe circuit. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to install an inter-tripping scheme to prevent overloads for peak summer generation conditions in the event of a circuit fault (Option 2).

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