Tiverton BSP and Associated 33 kV Network

Network Development Report – South West

May 2024

Electricity Distribution

nationalgrid

Contents

Tiverton BSP and Associated 33 kV Network

1. Network Overview

Tiverton Bulk Supply Point (BSP) supplies a sparse area of 33 kV network, in Mid and part of East Devon. It is supplied from two 132/33 kV Grid Transformers (GTs) and feeds approximately 30,400 customers.

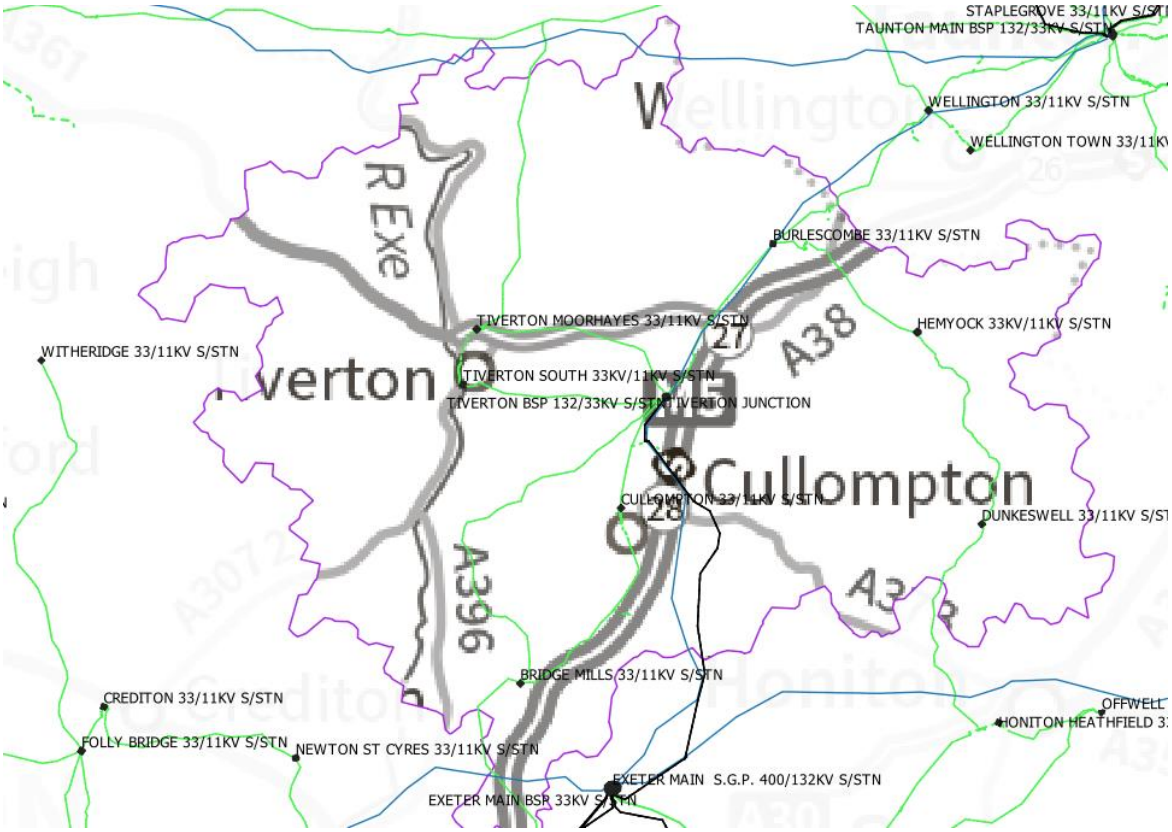

Figure 1.1 Tiverton BSP geographic network coverage

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 Tiverton 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 Tiverton BSP network is arranged as follows:

- Tiverton Junction is a two transformer Primary directly connected to the 33 kV busbar at Tiverton BSP as radial feeders.
- A 33 kV ring feeding primaries at Cullompton and Bridge Mills plus two 33 kV connected Solar Parks. At Bridge Mills there is a spurred circuit to Clyst Honiton (fed from Sowton BSP) with a normal open point at Bridge Mills.
- A 33 kV ring feeding primaries at Tiverton South & Tiverton Moorhayes with a Solar Park teed off a spurred circuit at Tiverton Moorhayes with a normal open point at the remote end (interconnecting with the Taunton BSP at Quartley)

- A 33 kV radial circuit feeding Burlescombe, Hemyock & Dunkeswell plus a Solar Park. A normal open point exists at Burlescombe on a circuit towards Wellington (providing interconnection with Taunton BSP). A Sequential Switching Scheme (SQC) scheme exists at Dunkeswell enabling the local demand to be transferred to the Exeter Main BSP network.

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.

- Open (Low Voltage) LV circuit breakers on transformers for arranged outages on the (High Voltage) HV side to avoid back energisation
- For 1S0 outage at Tiverton configure network as radial feeders by creating open points at Tiverton Junction (1T0), Tiverton South (2L3) & Bridge Mills (2L3)
- Dunkeswell 11 kV auto-changeover scheme to switch T1 on load for a fault resulting in the loss of supplies to T2.
- Close circuit breaker 1S0 at Dunkeswell for an arranged outage on the 33 kV network between Dunkeswell and Tiverton.
- For an outage between Hemyock & Dunkeswell configure Exeter Main network as radial feeds
- Burlescombe 11 kV auto-changeover scheme to switch T2 on load at Burlescombe for an outage resulting in loss of supply to T1
- Constrain generator output to zero at Ayshford Court Solar Park for a 33 kV busbar outage on Main 2 at Tiverton
- For 1S0 33 kV bus-section circuit breaker outage at either Tiverton Moorhayes or Tiverton South switch out one transformer T2 at each site to avoid backfeeds from 11 kV to 33 kV network
- For 1S0 33 kV bus-section circuit breaker outage at either Cullompton or Bridge Mills switch out one transformer (T1 at Cullompton & T2 at Bridge Mills) to avoid backfeeds from 11 kV to 33 kV network

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:

- Tiverton BSP 132/33 kV GT1 & GT2 overloads
- Dunkeswell T1 & T2 overload
- Tiverton BSP to Ayshford tee 33 kV circuit overload
- Ayshford Tee to Burlescombe 33 kV circuit overload
- Bridge Mills to Tiverton BSP 33 kV circuit overload
- Cullompton to Stoneshill Farm Tee 33 kV circuit overload
- Stoneshill Farm Tee to Tiverton BSP 33 kV circuit overload
- Tiverton BSP to Tiverton South 33 kV circuit overload
- Tiverton BSP to Tiverton Moorhayes 33 kV circuit overload
- Tiverton South T1 & T2 overloads
- Hemyock T2 overload

3. Network Constraint Details and Solution Options

3.1 Tiverton BSP 132/33 kV GT 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 winter peak demand.

Table 3.1.1 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
Tiverton GT1 overload	Tiverton GT2 fault	None	Baseline	Baseline	Baseline	2027
Tiverton GT 2 overload	Tiverton GT1 fault	None	Baseline	Baseline	Baseline	2027

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 Area Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	**Discounted**
Reinforcement					
1	Replace both GTs with 90 MVA units	✓	✓	✓	**Viable**
Operational Mitigation					
2	Transfer demand to other BSPs	-	-	-	**Discounted**
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Tiverton 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 – Replace both GTs with 90 MVA units

Capacity released for constraint(s) considered: 27.4 MVA

Viable

Detailed description: Replacement of both 132/33 kV grid transformers with 90 MVA units to accommodate baseline demands. By 2027 the 33 kV circuit breakers will need to be up-rated to 2000 A.

New limiting factor for constraint(s) considered: 72.4 MVA (1250 A 33 kV circuit breakers).

Option 2 – Transfer demand to other BSPs

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

Discounted

Detailed description: There is insufficient transfer capacity to other BSPs.

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

Option 3 – Procure flexibility under Tiverton 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 a Grid Transformer at Tiverton BSP. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to replace both 132/33 kV grid transformers with 90 MVA units at Tiverton BSP (Option1 & an approved project).

3.2 Dunkeswell 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 winter peak demand.

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
Dunkeswell T1 overload	Dunkeswell T2 fault	None	2027	2027	2027	2027
Dunkeswell T2 overload	Intact	None	2027	2027	2027	2027

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 3.2.2 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	Replace both transformers at Dunkeswell with larger units	✓	×	✓	Viable
Operational Mitigation					
2	Transfer demand to other BSPs	×	×	×	Discounted
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Dunkeswell 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 – Replace both transformers at Dunkeswell with larger units

Capacity released for constraint(s) considered: TBC. Viable

Detailed description: Replacement of both 33/11 kV transformers with larger 7.5/15 MVA units.

New limiting factor for constraint(s) considered: 33/11 kV transformer capacity at Dunkeswell

Option 2 – Transfer demand to other BSPs

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

Discounted

Detailed description: There is insufficient transfer capacity to other BSPs.

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

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

Flexibility service type: Generation turn up/demand turn down

Discounted

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on the 33/11 kV transformers at Dunkeswell (for demand related constraints). However since the constraint in 2027 is for an intact peak summer generation condition the use of flexibility is unlikely to be feasible. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that both 33/11 kV transformers at Dunkeswell are replaced with 7.5/15 MVA units Option 1

3.3 Tiverton BSP to Ayshford Tee 33 kV circuit Overload

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 3.3.1 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
Tiverton BSP to Ayshford Tee 33 kV	Intact	None	2032	2032	2034	2027

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 3.3.2 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	Reconductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC)	✓	×	✓	Viable
Operational Mitigation					
-	*None identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
2	Procure flexibility under Burlescombe, Hemyock or Dunkeswell 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 – Reconductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC)

Capacity released for constraint(s) considered: 12.28 MVA — Viable

Detailed description: Re-conductor circuit with larger conductor (150 sq.mm Copper (Cu) or 200 sq.mm All Aluminium Alloy Conductor (AAAC)).

New limiting factor for constraint(s) considered: 537 A (Winter pre-fault conductor rating).

Option 2 – Procure flexibility under Burlescombe, Hemyock or Dunkeswell at 11 kV or below

Flexibility service type: Generation turn up/demand turn down

Discounted

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on the Tiverton BSP to Ayshford Tee 33 kV circuit during peak demand loading conditions. However, since the constraint in 2027 is for an intact peak summer generation condition the use of flexibility is unlikely to be feasible. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that the Tiverton BSP to Ayshford Tee 33 kV circuit is re-conductored with larger conductor (Option 1).

3.4 Burlescombe to Ayshford Tee 33 kV circuit Overload

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 3.4.1 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
Burlescombe to Ayshford Tee 33 kV	Intact	None	2032	2032	2034	2027

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 circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC)	✓	✓	✓	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
2	Procure flexibility under Burlescombe, Hemyock or Dunkeswell at 11kV or below	✓	×	✓	Discounted

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

Capacity released for constraint(s) considered: 6.74 MVA ↑ Viable

Detailed description: Re-conductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC).

New limiting factor for constraint(s) considered: 440 A (Current Transformer (CT) and protection limit)

Option 2 – Procure flexibility under Burlescombe, Hemyock or Dunkeswell at 11 kV or below

Flexibility service type: Generation turn up/demand turn down

Discounted

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on the Burlescombe to Ayshford Tee 33 kV circuit during peak demand loading conditions . However, since the constraint in 2027 is for an intact peak summer generation condition the use of flexibility is unlikely to be feasible The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that the Tiverton BSP to Ayshford Tee 33 kV circuit is re-conductored with larger conductor (Option 1).

3.5 Tiverton BSP to Bridge Mills 33 kV circuit Overload

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 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
Tiverton BSP to Bridge Mills 33 kV overload	Tiverton BSP to Cullompton 33 kV cct fault	None	2032	-	-	-

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
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
2	Procure flexibility under Bridge Mills or Cullompton 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: 2.57 MVA ↑ Viable

New limiting factor for constraint(s) considered: 440 A (CT limit).

Detailed description: Re-conductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC) and remove 395 Amp protection limit.

Option 2 – Procure flexibility under Bridge Mills or Cullompton 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 during an outage on the Tiverton BSP to Bridge Mills 33 kV circuit. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that the Tiverton BSP to Bridge Mills 33 kV circuit is re-conductored with larger conductor (Option 1).

3.6 Cullompton to Stoneshill Farm 33 kV circuit Overload

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 winter peak demand.

Table 3.6.1 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
Cullompton to Stoneshill Farm tee 33 kV	Tiverton BSP 2L5 to Bridge Mills 33 kV cct outage	None	2032	2032	2032	-

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 3.6.2 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
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
2	Procure flexibility under Bridge Mills or Cullompton at 11kV 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: 4.46 MVA ⬆ Viable

Detailed description: Re-conductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC) and remove 360 Amp protection limit.

New limiting factor for constraint(s) considered: 400 A (33 kV isolator).

Option 2 – Procure flexibility under Cullompton or Bridge Mills 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 Cullompton to Stoneshill Farm 33 kV circuit. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that the Cullompton to Stoneshill Farm 33 kV circuit is re-conductored with larger conductor along with removing the existing 360 Amp protection limit (Option 1).

3.7 Tiverton BSP to Stoneshill Farm 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 winter peak demand.

Table 3.7.1 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
Tiverton BSP to Stoneshill Farm Tee 33 kV	Tiverton BSP 2L5 to Bridge Mills 33 kV cct outage	None	2032	2032	2032	-

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 3.7.2 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
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
2	Procure flexibility under Bridge Mills or Cullompton 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: 6.74 MVA ↑ Viable

Detailed description: Re-conductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC) and remove 360 Amp protection limit.

New limiting factor for constraint(s) considered: 440 A (CT limit).

Option 2 – Procure flexibility under Bridge Mills or Cullompton at 11kV 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 Tiverton BSP to Stoneshill Farm circuit. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that the Tiverton BSP to Stoneshill Farm 33 kV circuit is reconductored with larger conductor along with removing the existing 360 Amp protection limit (Option 1).

3.8 Tiverton BSP to Tiverton South 33 kV circuit Overload

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 winter peak demand.

Table 3.8.1 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
Tiverton BSP to Tiverton South 33 kV cct overload	Tiverton BSP to Tiverton Moorhayes 33 kV cct outage	None	2030	2030	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 3.8.2 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
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
2	Procure flexibility under Tiverton South or Tiverton Moorhayes 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: 9.26 MVA ⬆ Viable

Detailed description: Re-conductor circuit with larger conductor (150 sq.mm Cu or 200 sq.mm AAAC) and remove the 440 A CT limit by replacing CTs.

New limiting factor for constraint(s) considered: 560 A (Protection limit)

Option 2 – Procure flexibility under Tiverton South or Tiverton Moorhayes at 11 kV or below

Flexibility service type: Generation turn up/demand turn down

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

Solution Recommendation

It is recommended that the Tiverton BSP to Tiverton South 33 kV circuit is reconductored with larger conductor along with removing the existing 440 Amp CT limit (Option 1)

3.9 Tiverton BSP to Tiverton Moorhayes 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 winter peak demand.

Table 3.9.1 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
Tiverton BSP to Tiverton Moorhayes 33 kV	Tiverton BSP to Tiverton South 33 kV cct outage	None	2030	2032	-	-

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 3.9.2 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	Remove 440 A CT limitation	✓	✓	✓	**Viable**
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
2	Procure flexibility under Tiverton South or Tiverton Moorhayes 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 – Remove 440 A CT limitation

Capacity released for constraint(s) considered: 5.31 MVA

Viable

Detailed description: Remove 440 Amp CT limitation

New limiting factor for constraint(s) considered: 533 A (Overhead conductor rating)

Option 2 – Procure flexibility under Tiverton South or Tiverton Moorhayes at 11 kV or below

Flexibility service type: Generation turn up/demand turn down

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

Solution Recommendation

It is recommended that the 440 A existing CT limit is removed from the Tiverton BSP to Tiverton Moorhayes 33 kV circuit by replacing the CTs (Option 1).

3.10 Tiverton South 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 initially at intermediate cool peak demand.

Table 3.10.1 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
Tiverton South T1 overload	Tiverton South T2 fault	None		2032	2034	
Tiverton South T2 overload	Tiverton South T1 fault	None		2032	2034	

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 3.10.2 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 transformer with larger units	✓	✓	×	Viable
Operational Mitigation					
3	Transfer demand to an adjoining Primary	✓	×	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
4	Procure flexibility under Tiverton South at 11kV 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: Dependant on review

Viable

Detailed description: Overloads are only seen in 2032 for intermediate cool. 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: Dependant on review

Option 2 – Replace both transformers with larger units

Capacity released for constraint(s) considered: 11 MVA

Viable

Detailed description: Replacement of both transformers with 20/24MVA units

New limiting factor for constraint(s) considered: New transformer ratings.

Option 3 – Transfer demand to an adjoining Primary

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Investigate transfer of demand to Tiverton Moorhayes primary.

New limiting factor for constraint(s) considered: TBC

Option 4 – Procure flexibility under Tiverton South 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 seen on a transformer at Tiverton South. 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 (Option 1) along with investigating the feasibility of demand transfers to Tiverton Moorhayes Primary (Option 3).

3.11 Hemyock T2 Overload

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 3.11.1 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
Hemyock T2 overload	Intact	None	-	-	-	2034

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 3.11.2 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
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Hemyock 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: Dependant on review

Viable

Detailed description: Overloads are only seen in 2034 for peak summer generation. 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: Dependant on review

Option 2 – Replace both transformers with larger units

Capacity released for constraint(s) considered: 18 MVA

Viable

Detailed description: Replacement of current transformer and add additional transformer with 12/24 MVA units this is due to Hemyock.

New limiting factor for constraint(s) considered: New transformer capacity.

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

Flexibility service type: Generation turn down/demand turn up

Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads during peak generation conditions. 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 (Option 1). Should this be insufficient it will be necessary to replace the transformer with a large unit (Option 2).

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