Sowton BSP and Associated 33 kV Network

Network Development Report – South West

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Electricity Distribution

nationalgrid

Contents

Sowton BSP and Associated 33 kV Network

1. Network Overview

Sowton Bulk Supply Point (BSP) supplies a mixture of rural and urban sections of 33 kV network, covering parts of Exeter & East Devon. It is supplied from two 132/33 kV Grid Transformers (GTs) and feeds approximately 32,300 customers.

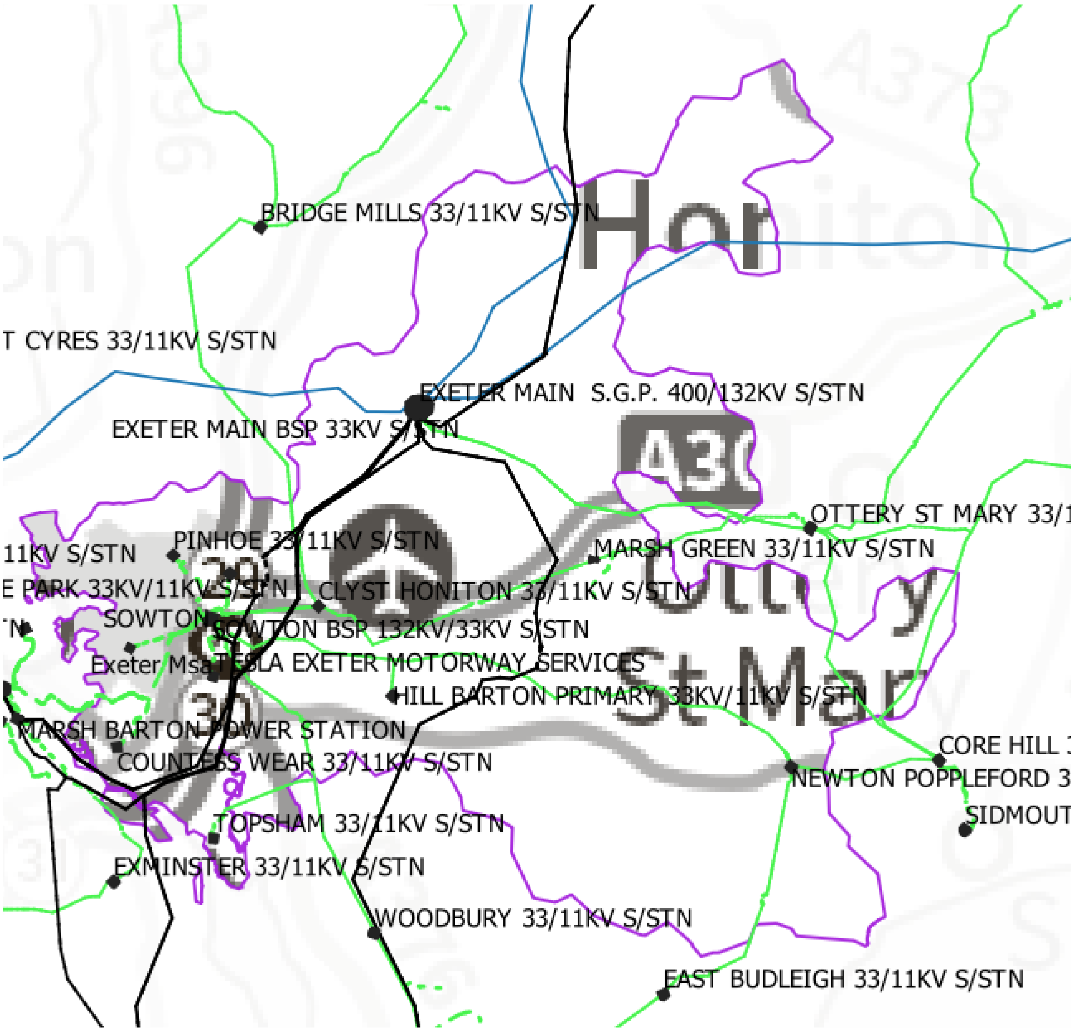

Figure 1.1 Sowton BSP geographic network coverage

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 Sowton 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 Sowton BSP network is arranged as follows:

- Sowton Primary substation is supplied via two separate transformer feeders.
- Exeter Science Park Primary substation is supplied via two separate transformer feeders with a 33 kV connection to Exeter Service Area double banked on one of the feeders.
- Heavitree Primary substation is supplied via two separate transformer feeders.
- Pinhoe Primary substation is supplied via two separate transformer feeders.
- Countess Wear Primary is fed via a single 33 kV circuit with interconnection to Exeter City BSP with a normal open point on circuit breaker 5L5 at Exeter City BSP.
- Topsham Primary substation is fed via a single 33 kV circuit with interconnection to Exmouth BSP at Woodbury. Normal open points exist on the 33 kV '1S0' bus-section and T1 11 kV circuit breakers at Woodbury.
- A single 33 kV circuit feeds Primaries at Hill Barton Business Park, Sidmouth Town and Core Hill. An 11 kV 'loose couple' exists at Sidmouth Town and Core Hill with the Exeter Main BSP 33 kV network. Interconnection with the Exmouth BSP 33 kV network exists at Newton Poppleford via normal open points on the 33 kV '1S0' bus-section and T1 11 kV circuit breakers.
- Clyst Honiton Primary is fed via two 33 kV circuits. The circuit feeding T1 has a tee-off to a 33 kV connected generator and has interconnection with the Tiverton BSP 33 kV network via a normal open point at Bridge Mills. The circuit feeding T2 also feeds T2 at Marsh Green with interconnection with the Exeter Main BSP 33 kV network via normal open points on the '1S0' 33 kV bus-section and the 11 kV bus-section circuit breakers.
- A modified running arrangement has been proposed to ensure P18 compliance following the connection of a 33 kV generator between Sowton BSP and Newton Poppleford. This involves installing a new 33 kV switchboard at Core Hill to replace the existing switchgear with the '1S0' bus-section run open along with the installation of 33 kV circuit breakers on both transformers at Sidmouth Town. The LV (11 kV) circuit breaker on T2 at Sidmouth Town will normally run open and result in a small transfer in demand from Sowton BSP to Exeter Main BSP. This proposed change has been taken into account in the following analysis of network constraints.

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 at Sowton BSP
- For an arranged outage of Sowton BSP 5L5 circuit (including Main 2 33 kV Busbar outage) Topsham is transferred to the Exmouth BSP network by closing the 1S0 33 kV bus-section circuit breaker at Woodbury.
- For an arranged outage of Sowton BSP 11L5, Countess Wear is transferred to the Exeter City BSP network by closing circuit breaker 5L5 at Exeter City BSP.

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:

- Sowton BSP 132/33 kV Grid Transformer overloads
- Core Hill 33/11 kV T1 & T2 overloads
- Topsham 33/11 kV T1 & T2 overloads
- Heavitree 33/11 kV T1 & T2 overloads
- Pinhoe 33/11 kV T1 & T2 overloads
- Clyst Honiton 33/11 kV T1 & T2 overloads
- Marsh Green 33/11 kV T2 overload
- Hill Barton 33/11 kV T1 overload
- Sowton to Clyst Honiton 33 kV circuit overloads

3. Network Constraint Details and Solution Options

3.1 Sowton BSP 132/33kV 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
Sowton GT1 overload	Sowton GT3 outage	None	Baseline	2028	2030	2032
Sowton GT3 overload	Sowton GT1 outage	None	Baseline	2028	2030	2032

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	✓	✓	✓	Viable
2	Transfer demand to Exeter Main BSP	✓	✓	✓	Viable
Operational Mitigation					
3	Establish a normal open point on the LV (11 kV) T2 CB at Sidmouth Town	✓	✓	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
4	Procure flexibility under Sowton 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

Capacity released for constraint(s) considered: 24 MVA (Winter cyclic) — Viable

Detailed description: Uprate the existing GTs at Sowton 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, Current Transformers (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. However, by 2032 there may be insufficient transformer capacity.

New limiting factor for constraint(s) considered: 114 MVA (33 kV GT circuit breakers).

Option 2 – Transfer demand to Exeter Main BSP & new Cranbrook Primary

Capacity released for constraint(s) considered: Up to 30 MVA — Viable

Detailed description: Studies suggest that there will be insufficient transformer capacity at Sowton BSP by 2032 even if the full cyclic rating of the transformers may be achieved. It may be possible to defer further reinforcement at Sowton BSP by transferring demand to Exeter Main BSP. If a new Primary substation is established at Cranbrook connected to Exeter Main BSP future demand growth in the area may be accommodated without contributing to an overload at Sowton BSP. In addition it may be possible to transfer existing demand to the east of the M5 motorway to Exeter Main BSP by building additional 33 kV circuits.

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

Option 3 – Establish normal open point on T2 11 kV CB at Sidmouth Town

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

Detailed description: Establishing a normal open point on the LV (11kV) T2 circuit breaker at Sidmouth Town will defer the need to up-rate the grid transformers at Sowton BSP until 2025. This is part of a proposed project to connect a 33 kV generator and to comply with P18 (Network complexity requirements) and transfer the Sidmouth Town demand to Exeter Main BSP.

New limiting factor for constraint(s) considered: TBC

Option 4 – Procure flexibility under Sowton BSP at 33 kV or below

Viable

Flexibility service type: Generation turn up/demand turn down

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on a Grid Transformer at Sowton. 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 at Sowton BSP (Option 1) which may be deferred until 2025 by establishing a normal open point on T2 11 kV circuit breaker at Sidmouth Town (Option 3). The feasibility of a new Primary at Cranbrook and demand transfers to Exeter Main BSP should be investigated further (Option 2) to create additional network capacity in the area.

3.2 Core Hill 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 initially 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
Core Hill T2 overload	Core Hill T1 outage	None	Baseline	Baseline	2032	2034
Core Hill T2 overload	Sowton Main1 33 kV busbar fault	None	-	-	-	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	✓	×	✓	Discounted
2	Replace transformer with a larger unit	✓	✓	×	Viable
Operational Mitigation					
3	Establish a normal open point on the LV (11 kV) T1 CB at Core Hill	✓	✓	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
4	Procure flexibility under Core Hill 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: N/A — Discounted

Detailed description: Subject to further investigation it could be possible to increase the transformer rating with the installation of forced cooling. However, the transformers are more than 68 years old being built in 1956 which would probably be close to the end of life so extending rating with forced cooling may not actually add that much capacity.

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

Option 2 – Replace transformer with a larger unit

Capacity released for constraint(s) considered: 9 MVA

Viable

Detailed description: Replace transformer with a larger unit of 7.5/15 MVA unit.

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

Option 3 – Establish a normal open point on T1 11 kV CB at Core Hill

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

Viable

Detailed description: Following the connection of 33 kV generation and establishing a Normal Open Point (NOP) on T2 11 kV Circuit Breaker (CB) at Sidmouth Town overloads occur for the baseline condition in the event of a 33 kV busbar fault (Main 1) at Sowton. To avoid this it will become necessary to establish a NOP on T1 11 kV CB at Core Hill to prevent reverse powerflow through the 11 kV busbar at Core Hill.

Option 4– Procure flexibility under Core Hill at 11 kV or below

Flexibility service type: Demand turn down or generation turn up

Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on Core Hill transformer T2. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to establish a normal open point on T1 11 kV circuit breaker at Core Hill to prevent transformer overloads (Option 3) as part of the connection of generation at 33kV to one of the circuits. However, longer term there may need to be a need to replace the co-ordinate with asset replacement to replace current units with larger 7.5/15 MVA units.

3.3 Topsham 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 3.3.1 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
Topsham T2 overload	Intact	None	2028	2028	2030	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 3.3.2 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	Review transformer rating	✓	×	✓	Viable
2	Replace transformer with a larger unit	✓	✓	×	Viable
Operational Mitigation					
3	Transfer demand to adjoining Primary substation	✓	×	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
-	*None Identified*	-	-	-	-

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 rating

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Overloads do not occur 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 – Replace transformer with a larger unit

Capacity released for constraint(s) considered: 18 MVA **Viable**

Detailed description: Replace transformer with a larger unit (12/24 MVA).

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

Option 3 – Transfer demand to an adjoining Primary substation

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

Detailed description: Subject to further investigation transfer demand to an adjoining Primary substation.

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

Solution Recommendation

It is recommended that a review is undertaken of NGED's internal policy regarding transformer ratings (Option 1) and in addition to determine if any demand transfers to adjoining Primariy substations are possible (Option 3). If the combination of both these options is insufficient replacement of the existing transformer with a larger unit will become necessary (Option 2).

3.4 Heavitree 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 3.4.1 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
Heavitree T1 overload	Heavitree T2 outage	None	2030	2034	-	-
Heavitree T2 overload	Heavitree T1 outage	None	2030	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 3.4.2 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	Up-rate transformer	✓	×	✓	Viable
2	Replace transformers with larger units	✓	✓	×	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Heavitree at 11kV 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 – Up-rate transformer

Capacity released for constraint(s) considered: 4.2 MVA — Viable

Detailed description: Overloads do not occur until 2030. Subject to further investigation it may be possible to increase the transformer rating by the installation of forced cooling.

New limiting factor for constraint(s) considered: 18.2 MVA (winter cyclic)

Option 2 – Replace transformer with larger units

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

Detailed description: Replace both transformers with larger units (12/24 MVA).

New limiting factor for constraint(s) considered: TBC

Option 3– Procure flexibility under Heavitree 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 transformers at Heavitree. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to procure flexibility at Heavitree primary substation subject to a CBA.

In the longer term investigation of fitting forced cooling to both transformers at Heavitree (option 1) should be investigated.

3.5 Pinhoe 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 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
Pinhoe T1 overload	Pinhoe T2 outage	None	2030	2030	2032	-
Pinhoe T2 overload	Pinhoe T1 outage	None	2030	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 3.5.2 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	Up-rate transformer	✓	✓	✓	Viable
2	Establish a new 33/11 kV substation at Whipton	✓	✓	×	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under 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 – Up-rate transformer

Capacity released for constraint(s) considered: 4.2 MVA

Viable

Detailed description: Overloads do not occur until 2030. Subject to further investigation it may be possible to increase the transformer rating by the installation of forced cooling

New limiting factor for constraint(s) considered: 18.2 MVA (winter cyclic)

Option 2 – Establish a new 33/11 kV substation at Whipton

Capacity released for constraint(s) considered: 23 MVA **Viable**

Detailed description: Establish a new 33/11 kV substation at Whipton 11 kV switching station. This option is only likely to be cost effective if it enables the transfer of demand between Exeter City and Sowton BSPs as part of a larger project.

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

Option 3 – Procure flexibility under Pinhoe 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 a transformer at Pinhoe. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to investigate fitting forced cooling to both transformers at Pinhoe (Option 1)

3.6 Clyst Honiton 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 3.6.1 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
Clyst Honiton T1 overload	Clyst Honiton T2 outage	None	-	2032	2034	-
Clyst Honiton T2 overload	Clyst Honiton T1 outage	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 3.6.2 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	Review transformer ratings	✓	×	✓	Viable
2	Transfer demand to a new Primary substation at Cranbrook	✓	✓	✓	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Clyst Honiton 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: TBC

Viable

Detailed description: Overloads occur in 2032. 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 – Transfer demand to a new Primary substation at Cranbrook

Capacity released for constraint(s) considered: 23 MVA

Viable

Detailed description: Subject to further investigation accommodate the increase in demand on a new Primary substation at Cranbrook (connected to Exeter Main BSP).

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

Option3 – Procure flexibility under Clyst Honiton at 11 kV or below

Flexibility service type: Demand turn down or generation turn up

Viable

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

Solution Recommendation

It is recommended that a review is undertaken of NGED’s internal policy regarding transformer ratings (Option 1). In addition to further investigate the establishment of a new Primary substation at Cranbrook to cater for additional demand growth in the area (Option 2).

3.7 Marsh Green 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 3.7.1 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
Marsh Green T2 overload	Ottery St Mary 33 kV Main 1 busbar outage	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 3.7.2 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	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 Marsh Green 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: TBC

Viable

New limiting factor for constraint(s) considered: TBC

Detailed description: Overloads occur in 2032. 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.

Option 2 – Replace transformers with larger units

Capacity released for constraint(s) considered: 7.75 MVA Viable

Detailed description: Replace both transformers with larger units (7.5/15 MVA).

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

Option 2 – Procure flexibility under Marsh Green 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 transformer T2 at Marsh Green. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that a review is undertaken of NGED's internal policy regarding transformer ratings (Option 1).

3.8 Hill Barton T1 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 3.8.1 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
Hill Barton T1 overload	Intact	None	-	-	-	2028

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	Review transformer ratings	✓	×	✓	Viable
2	Install a 2nd transformer	✓	✓	×	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
-	*None Identified*	-	-	-	-

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: TBC Viable

Detailed description: Overloads occur in 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 a 2nd 33/11 kV transformer

Capacity released for constraint(s) considered: TBC Viable

Detailed description: Install a 2nd 33/11 kV transformer and if necessary an additional 33 kV circuit.

New limiting factor for constraint(s) considered: TBC

Solution Recommendation

It is recommended that a review is undertaken of NGED's internal policy regarding transformer ratings (Option 1).

3.9 Sowton BSP to Clyst Honiton 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
Sowton BSP 7L5 to Clyst Honiton 33 kV overload	Sowton BSP 12L5 to Clyst Honiton 33 kV cct outage	None	2030	2032	2032	2034
Sowton BSP 12L5 to Clyst Honiton 33 kV overload	Sowton BSP 7L5 to Clyst Honiton 33 kV ccit outage	None	2030	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 3.9.2 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	Bunch the existing dual circuit overhead line and lay a new 33 kV cable circuit	✓	×	✓	Viable
Operational Mitigation					
2	Transfer demand to a new Primary at Cranbrook	✓	✓	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Clyst Honiton 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 – Bunch existing 33 kV and lay a new 33 kV cable circuit

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Bunch the two existing 33 kV circuits (dual circuit wood pole construction) and lay a new 33 kV cable circuit between Sowton BSP and Clyst Honiton. This will create two 33 kV circuits of higher capacity.

New limiting factor for constraint(s) considered: TBC

Option 2 – Transfer demand to a new Primary at Cranbrook

Capacity released for constraint(s) considered: 23 MVA

Viable

Detailed description: Subject to further investigation accommodate the increase in demand on a new Primary substation at Cranbrook (connected to Exeter Main BSP).

New limiting factor for constraint(s) considered: New primary capacity

Option 3 – Procure flexibility under Clyst Honiton at 11 kV or below

Flexibility service type: Demand turn down or generation turn up

Viable

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

Solution Recommendation

It is recommended to further investigate the establishment of a new Primary at Cranbrook and the wider network benefits (Option 2)

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DSO | nationalgrid electricity distribution

Registered Office: Avonbank, Feeder Road, Bristol BS2 0TB
nationalgrid.co.uk