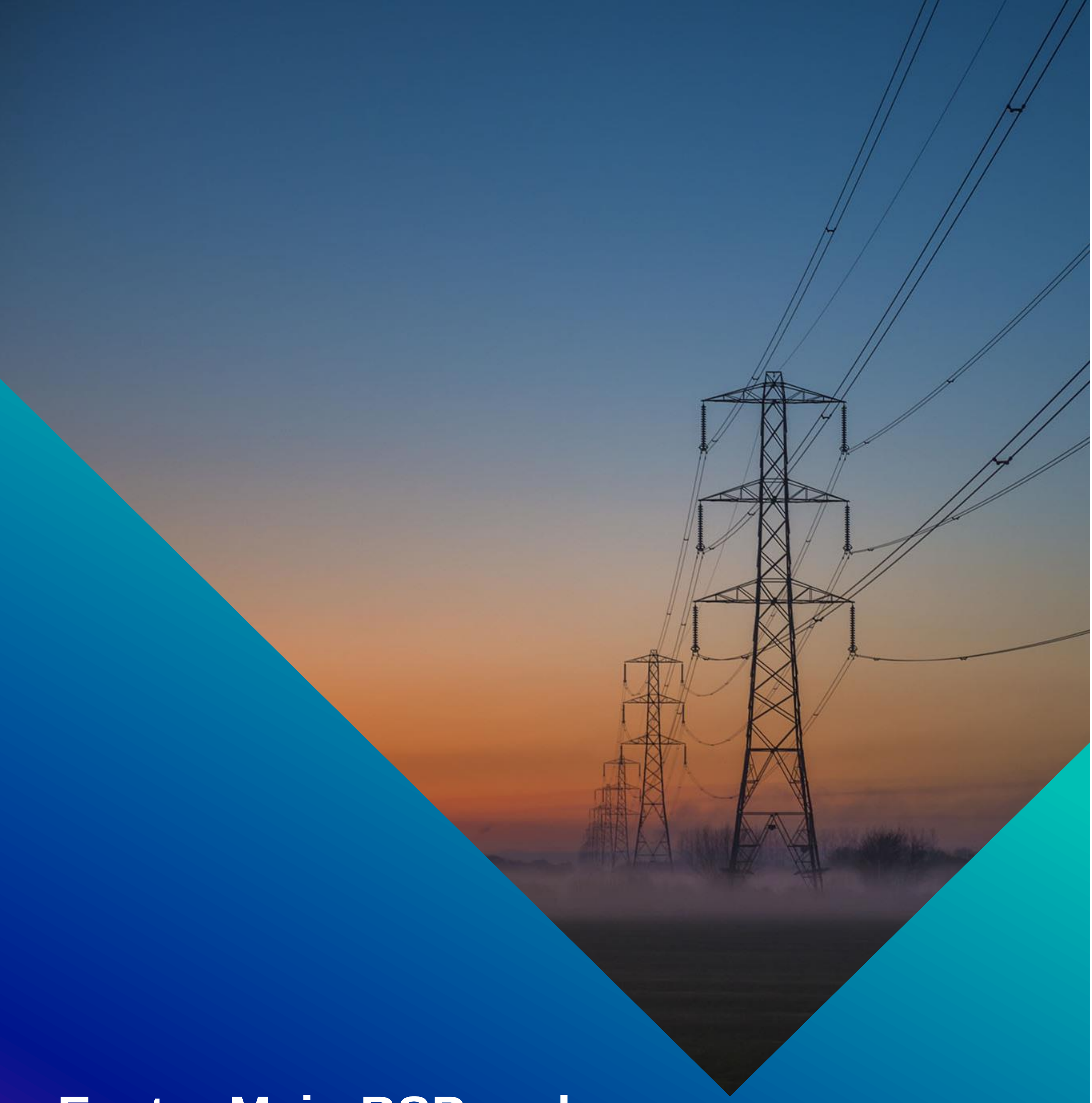

Exeter Main BSP and Associated 33 kV Network

Network Development Report – South West

May 2024

Electricity Distribution

nationalgrid

Contents

Exeter Main BSP and Associated 33 kV Network

1. Network Overview

Exeter Main Bulk Supply Point (BSP) supplies a sparse area of 33 kV network, east from the city of Exeter. It is supplied from two 132/33 kV GTs at Exeter Main which feed approximately 20,500 customers via a 33 kV busbar at Ottery St Mary (future BSP site), it also has two generators off one of the busbars.

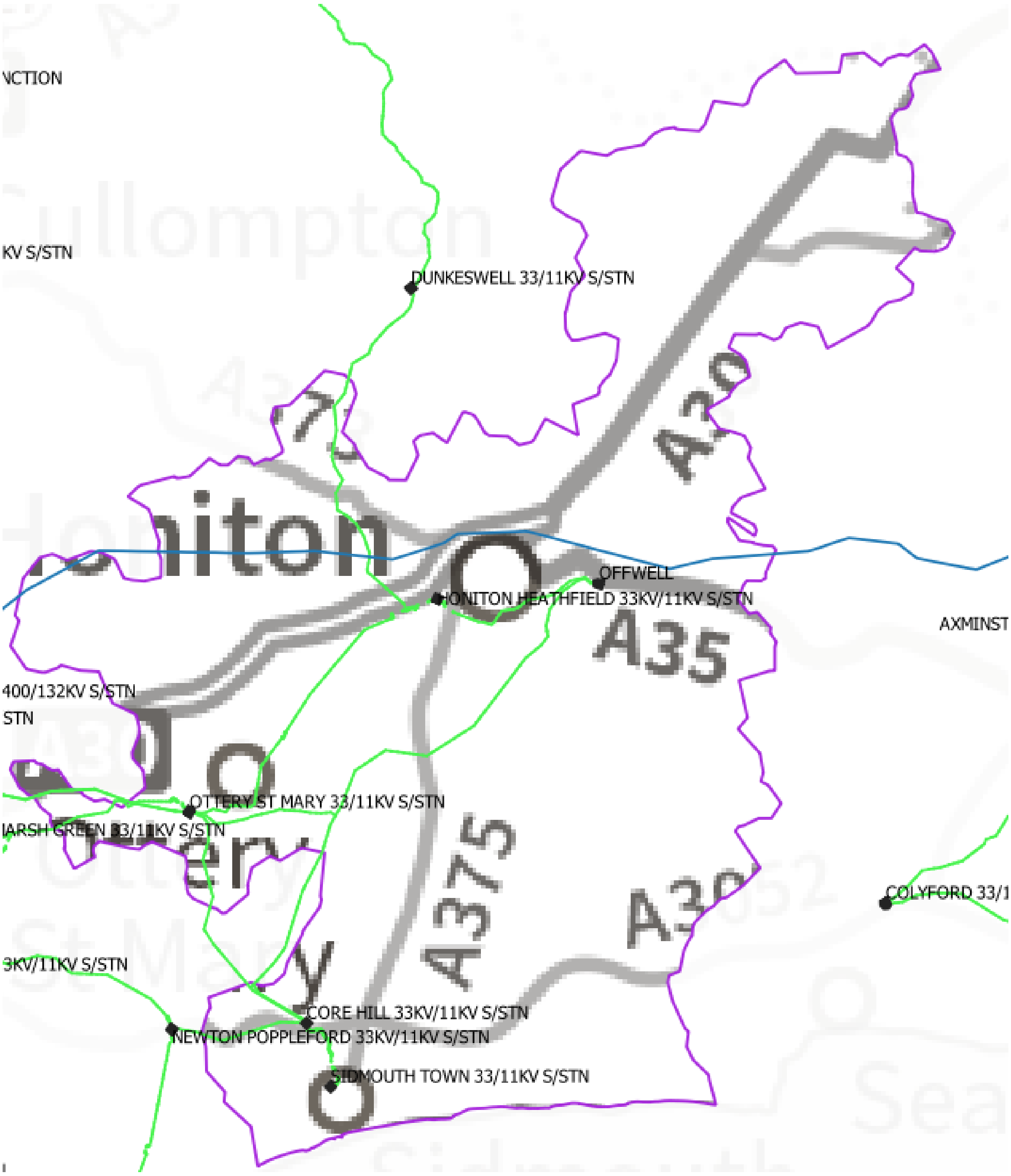

Figure 1.1 Exeter Main BSP geographic network coverage

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 Exeter Main

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 studies 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 Exeter Main BSP network is arranged as follows:

- Ottery St Mary Primary is connected directly onto the two busbars.
- Marsh Green Primary T1 is connected to the (Main 1) 33 kV Busbar at Ottery St Mary with a generator branched off the feed.
- The rest of the primaries are connected into rings with three infeeds from Ottery St Mary and one from Sowton BSP through Newton Poppleford:
    - The Southern part of the ring has Sidmouth Town and Core Hill Primary substations which loosely couple Exeter Main BSP and Sowton BSP.
    - The Northern part of the ring has Honiton Heathfield and Offwell Primary substations looped into it.
    - Off the Northern leg of the ring there is a connection to Dunkeswell Primary substation (normally fed from Tiverton BSP) that is normally open.

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 an outage on one of the 33/11 kV transformers (or circuits supplying the transformers) at Marsh Green the 11 kV bus-section circuit breaker is closed
- For an outage on the main 1 section of 33 kV Busbar at Honiton Heathfield, isolator 2L9 at Core Hill is run open
- For an outage on the Honiton tee the loose coupling arrangement between Sowton BSP and Exeter Main BSP is broken by opening the T1 LV (11 kV) circuit breaker at Sidmouth Town & Core Hill
- For an outage on the 1S0 33 kV bus-section circuit breaker at either Honiton Heathfield or Offwell,, T2 at Honiton Heathfield and T1 at Offwell are taken out of service by opening the respective LV (11 kV) transformer circuit breaker.
- For an outage on the infeed from Sowton BSP to Newton Poppleford/Core Hill/Sidmouth Town, the Exeter Main network is split by opening 1S0 (33 kV bus-section) at Exeter Main BSP and Ottery St Mary, T1 LV (11 kV) circuit breaker at Ottery St Mary and isolator 1L3 at Offwell.
- For an outage of the infeed from Sowton BSP to Sidmouth Town, the loose couple arrangement at Core Hill is removed by opening T1 LV (11 kV) circuit breaker at Core Hill
- For an outage of the infeed from Sowton BSP to Core Hill, the loose couple arrangement at Sidmouth Town is removed by opening T1 LV (11 kV) circuit breaker at Sidmouth Town
- For an outage between Ottery St Mary and Core Hill tee isolator 1L9 is opened (ZEF 57) to split the ring
- For an outage on the infeed from Sowton BSP to Newton Poppleford, the ring network is split into redial circuits by opening the T2 LV (11 kV) transformer circuit breakers at Core Hill & Sidmouth Town. In addition the 33 kV 1S0 bus-section circuits breakers at Honiton Heathfield and Offwell are opening along with T2 LV (11 kV) transformer circuit breakers at Honiton Heathfield and T1 LV (11 kV) transformer circuit breakers at Offwell.

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:

- Core Hill 33/11 kV transformer (T1) overload
- Offwell 33/11 kV transformer overload
- Honiton Heathfield 33/11 kV transformer overload
- Marsh Green 33/11 kV transformer overload
- Sidmouth Town T1 33/11 kV transformer overload
- Ottery St Mary to Honiton Heathfield 33 kV circuit overload
- Ottery St Mary to Core Hill/Offwell 33 kV circuit overloads
- Newton Poppleford to Core Hill 33 kV circuit overloads
- Exeter Main BSP to Ottery St Mary 33 kV circuit overloads

3. Network Constraint Details and Solution Options

3.1 Core Hill 33/11 kV Transformer T1 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 3.1.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First study year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Core Hill T1 overload	Newton Poppleford to Core Hill circuit or Core Hiil T2 fault	None	Baseline	Baseline	Baseline	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 ancillary ratings	✓	×	✓	Viable
2	Replace transformers 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 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 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 0 – No intervention

Capacity Released for constraint(s) considered: 0 MVA

Discounted

Detailed description: Doing nothing to mitigate the constraint would result in overloads for the conditions described above.

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

Option 1 –Application of an increased transformer rating

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Uprate the existing Transformer 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 and conservator. 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: TBC

Option 2 – Replace transformers with larger units

Capacity Released for constraint(s) considered: TBC

Viable

Detailed description: Replace existing transformers with larger 7.5/15 MVA units.

New limiting factor for constraint(s) considered: TBC

Option 3 – Transfer demand to an adjoining Primary

Capacity Released for constraint(s) considered: TBC

Viable

Detailed description: Investigate possible 11 kV demand transfers from Core Hill to Sidmouth Town.

New limiting factor for constraint(s) considered: TBC

Option 4 – Procure flexibility under Core Hill at 132 kV or below

Flexibility service type: Generation turn up/demand turn down

Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads during any fault/outage resulting in a transformer at Core Hill being out of service. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to replace the transformers with larger units as part of an asset replacement scheme during 2024. (Option 2)

3.2 Offwell 33/11 kV transformers

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 3.2.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First Study year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Offwell T1 overload	Offwell T2 or Core Hill/Ottery St Mary cct outage	None	Baseline	2028	-	-
Offwell T2 overload	Offwell T1 or Honiton cct outage	None	2028	2028	-	-

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 Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Up-rate transformers	✓	×	✓	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	
Load Management Schemes					
-	*None Identified*	-	-	-	
Flexibility services					
2	Procure flexibility under Offwell at 11 kV or below	✓	×	✓	Viable

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 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 0 – No intervention

Capacity Released for constraint(s) considered: 0 MVA

Discounted

Detailed description: Doing nothing to mitigate the constraint would result in overloads for the conditions described above. .

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

Option 1 – Up-rate transformers

Capacity released for constraint(s) considered: 2.7 MVA

Viable

Detailed description: Investigate fitting forced cooling to transformers. Due to the age of the transformers being from 1961 and 1962 may not be appropriate to look at installing forced cooling. During asset replacement a thought should be given to replacing these transformers with 7.5/15 MVA units.

New limiting factor for constraint(s) considered: 14 MVA (transformer winter cyclic rating)

Option 2– Procure flexibility under Offwell 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 Offwell The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to reinforce transformers and replace with larger units when asset replacing Offwell transformers (Option 1). This solution appears to be adequate until after 2034 (best view scenario)

3.3 Honiton Heathfield 33/11 kV transformer 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 3.3.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First study year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Honiton Heathfield T1 overload	Honiton Heathfield T2 or Offwell cct outage	None	2032	2030	2032	-
Honiton Heathfield T2 overload	Honiton Heathfield T1 or Dunkeswell/ Ottery St Mary cct outage	None	2032	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 3.3.2 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	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 Honiton Heathfield 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 Distribution Network Options Assessment (DNOA) process.

Option 0 – No intervention

Capacity Released for constraint(s) considered: 0 MVA

Discounted

Detailed description: Doing nothing to mitigate the constraint would result in overloads for the conditions described above.

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

Option 1 – Review transformer ratings

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Overloads occur in 2030 and beyond. 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 transformers with larger units

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Replace both transformers with 12/24 MVA units

New limiting factor for constraint(s) considered: TBC

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

Solution Recommendation

It is recommended to review NGED's internal policy regarding transformer ratings (Option 1). Should this be insufficient it will become necessary to replace both transformers with 12/24 MVA units (Option 2).

3.4 Marsh Green 33/11 kV transformer 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 3.4.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First study year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Marsh Green T1 overload	Marsh Green T2/ Clyst Honiton cct 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 3.4.2 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	Review transformer ratings	✓	✓	✓	Viable
2	Replace transformers with larger units	✓	✓	×	Viable
Operational Mitigation					
-	*None identified*	-	-	-	Viable
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 0 – No intervention

Capacity Released for constraint(s) considered: 0 MVA

Discounted

Detailed description: Doing nothing to mitigate the constraint would result in overloads for the conditions described above. .

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

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 – Replace transformers with larger units

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Replace both transformers with 7.5/15 MVA units

New limiting factor for constraint(s) considered: TBC

Option 3 – Procure flexibility under Marsh Green at 11kV or below

Flexibility service type: Generation turn down/demand turn up

Viable

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

Solution Recommendation

It is recommended to replace the transformers with larger 7.5/15 MVA units as part of an asset replacement scheme during 2024. (Option 2)

3.5 Sidmouth Town T1 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 cool peak demand.

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

Constraint	N-1 Condition	Subsequent N-2 Condition	First study year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Sidmouth Town T1 overload	Sidmouth Town T2/Core Hill cct outage	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 3.5.2 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	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 Sidmouth Town 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 0 – No intervention

Capacity Released for constraint(s) considered: 0 MVA

Discounted

Detailed description: Doing nothing to mitigate the constraint would result in overloads for the conditions described above. .

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

Option 1 – Review transformer ratings

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Overloads occur in 2034. 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 transformers with larger units

Capacity released for constraint(s) considered: TBC

Viable

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

New limiting factor for constraint(s) considered: TBC

Option 3 – Procure flexibility under Sidmouth Town at 11kV

Flexibility service type: Generation turn up/demand turn down

Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads seen on T1 at Sidmouth Town being out of service. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to replace the transformers with larger units as part of an asset replacement scheme during 2024 (Option 2)

3.6 Ottery St Mary to Honiton Heathfield 33 kV circuit 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 winter peak demand.

Table 3.6.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First study year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Ottery St Mary 5L5 to Honiton Tee 33 kV cct overload	Ottery St Mary Main2 33 kV Busbar fault	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 Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Reconductor circuit with larger conductor (150sq.mm Cu or 200sq.mm AAAC)	✓	✓	×	Viable
Operational Mitigation					
2	Remove 11 kV loose couple at Core Hill	✓	✓	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	
Flexibility services					
3	Procure flexibility under Honiton Heathfield or Offwell 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

Capacity released for constraint(s) considered: 4.3 MVA — Viable

Detailed description: Reconductor the overloaded sections of the circuit (100 sq.mm ACSR) with either 150 sq.mm Cu or 200 sq.mm AAAC.

New limiting factor for constraint(s) considered: 398 A (Overhead line rating 0.15 sq.in Cu).

Option 2 –Remove the 11 kV loose couple at Core Hill

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

Detailed description: Removal of the 11kV loose couple at Core Hill by running with T1 on hot-standby (normal open point on LV 11kV circuit breaker on T1) will transfer the Core Hill demand to the Sowton BSP network and reduce loadings on this circuit to an acceptable level.

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

Option 3 – Procure flexibility under Honiton Heathfield and Offwell 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 Ottery St Mary to Honiton Heathfield 33 kV circuit. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to remove the existing 11 kV loose couple at Core Hill which will transfer all of the Core Hill demand to Sowton BSP (Option 2).

3.7 Ottery St Mary to Core Hill/Offwell 33kV 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 cool peak demand.

Table 3.7.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First study year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Ottery St Mary 2L5 to Honiton Tee 33kV cct overload	Ottery St Mary 5L5 to Honiton Heathfield/ Dunkeswell 33kV circuit fault	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 3.7.2 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	Reconductor circuit with larger conductor (150sq.mm Cu or 200sq.mm Al Alloy)	✓	✓	×	Viable
Operational Mitigation					
2	Remove 11kV loose couple at Core Hill	✓	✓	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Honiton Heathfield or Offwell 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 – Reconductor circuit with larger conductor

Capacity released for constraint(s) considered: 0.7 MVA — **Viable**

Detailed description: Reconductor the overloaded sections of the circuit (0.15 sq.in Cu) with either 150 sq.mm Cu or 200 sq.mm Al Alloy.

New limiting factor for constraint(s) considered: 440 A (CT limit) 641 A (overhead line)

Option 2 –Remove the 11kV loose couple at Core Hill

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

Detailed description: Removal of the 11kV loose couple at Core Hill by running with T1 on hot-standby (normal open point on LV 11kV circuit breaker on T1) will transfer the Core Hill demand to the Sowton BSP network and reduce loadings on this circuit to an acceptable level.

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

Option 3 – Procure flexibility under Honiton Heathfield and Offwell at 11kV 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 Ottery St Mary to Core Hill/Offwell 33kV circuit. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended to remove the existing 11kV loose couple at Core Hill which will transfer all of the Core Hill demand to Sowton BSP (Option 2).

3.8 Newton Poppleford to Core Hill 33kV 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 cool peak demand.

Table 3.8.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First study year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Newton Poppleford 3L5 to Core Hill 33kV cct overload	Ottery St Mary Main 1 33kV busbar outage	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 3.8.2 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	Reconductor circuit with larger conductor (150sq.mm Cu or 200sq.mm Al Alloy)	✓	✓	×	Viable
Operational Mitigation					
2	Swap feeders 4L5 & 7L5 at Ottery St Mary	✓	✓	✓	Viable
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Core Hill or Sidmouth Town 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 – Reconductor circuit with larger conductor

Capacity released for constraint(s) considered: 4.8 MVA Viable

Detailed description: Reconductor the overloaded sections of the circuit (0.15 sq.in Cu) with either 150 sq.mm Cu or 200 sq.mm Al Alloy.

New limiting factor for constraint(s) considered: 400 A (protection limit) 641 A (overhead line)

Option 2 –Swap feeders 4L5 & 7L5 at Ottery St Mary

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

Detailed description: This overload is due to an arranged outage putting the combined Core Hill and Sidmouth Town demand onto this circuit fed from Sowton BSP. Swapping feeders 4L5 & 7L5 at Ottery St Mary would prevent the need to supply both Core hill and Sidmouth Town from the same circuit for this outage (at present both Core hill circuits are connected to the same section of 33kV Busbar at Ottery St Mary).

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

Option 3 – Procure flexibility under Core Hill and Sidmouth Town at 11kV 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 Newton Poppleford to Core Hill 33kV circuit. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that feeders 4L5 and 7L5 are swapped at Ottery St Mary to prevent an overload on this circuit (Option 2).

3.9 Exeter Main BSP to Ottery St Mary 33kV 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 cool peak demand.

Table 3.9.1 constraint(s) and condition under which constraint occurs

Constraint	N-1 Condition	Subsequent N-2 Condition	First study year constraint is observed in each season under Best View			
			Winter	Int Cool	Int Warm	Summer
Exeter Main BSP 1L5 to Ottery St Mary 3L5 cct overload	Exeter Main BSP 2L5 to Ottery St Mary 6L5 fault	None		2034		
Exeter Main BSP 2L5 to Ottery St Mary 6L5 cct overload	Exeter Main BSP 1L5 to Ottery St Mary 3L5 fault	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 3.9.2 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	Remove existing 660 Amp CT limitation	✓	×	✓	Viable
2	Establish a new BSP at Ottery St Mary	✓	✓	×	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
3	Procure flexibility under Exeter Main BSP at 33kV 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 – Remove CT limitation

Capacity released for constraint(s) considered: 3.4 MVA

Viable

Detailed description: Remove the existing 660A CT limitation.

New limiting factor for constraint(s) considered: 720 A (protection limit) 800 A (isolator)

Option 2 – Establish a new BSP at Ottery St Mary

Capacity released for constraint(s) considered: TBC

Viable

Detailed description: Establish a new BSP (132/33kV substation) at Ottery St Mary which will be connected to the existing 132kV construction dual circuit tower line (currently energised at 33kV from Exeter Main BSP). This option will be required once the capacity of the 33kV circuits between Exeter Main BSP and Ottery St Mary is exceeded (48.5 MVA line rating) or further grid transformer capacity is required at Exeter Main BSP.

New limiting factor for constraint(s) considered: TBC

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

Flexibility service type: Generation turn up/demand turn down

Detailed description: Flexibility services could be procured to alleviate projected overloads during any fault/outage resulting in an arranged outage of Main 1 section of 33kV Busbar at Ottery St Mary. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

It is recommended that the 660A limitation on the CTs associated with both 33kV circuits between Exeter Main BSP and Ottery St Mary be removed (Option 1). This appears to be adequate based upon the 2034 Best view scenario. However should there be addition demand growth on Exeter Main BSP the need for a new BSP at Ottery St Mary may be brought forward.

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