Exmouth BSP and Associated 33 kV Network

Network Development Report – South West

May 2024

Electricity Distribution

nationalgrid

Contents

Exmouth BSP and Associated 33 kV Network

1. Network Overview

Exmouth Bulk Supply Point (BSP) supplies a mixture of rural and urban sections of 33 kV network, in East Devon. It is supplied from two 132/33 kV Grid Transformers (GTs), which feed approximately 27,000 customers.

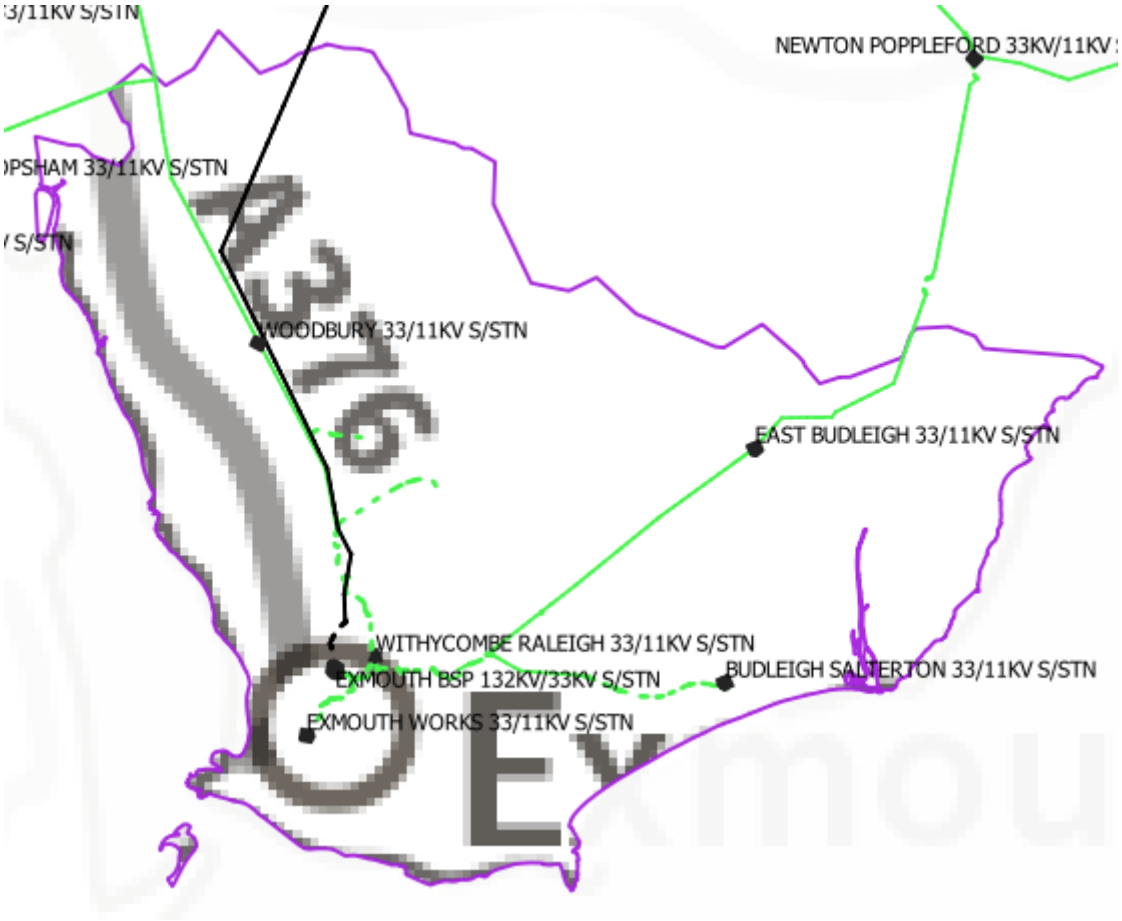

Figure 1.1 Exmouth BSP geographic network coverage

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 Exmouth 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 Exmouth BSP network is arranged as follows:

- Exmouth Works Primary substation is supplied via two separate 33 kV circuits as transformer feeders
- Withycombe Raleigh Primary substation is supplied via two separate 33 kV circuits as transformer feeders

- Woodbury Primary substation is supplied via a single 33 kV circuit along with two generator connections as tee-offs. At WoodburyT2 is on load and T1 on ‘hot standby’ connected to the Sowton BSP network.
- A single 33 kV circuit feeds Budleigh Salterton, East Budleigh and Netwon Poppleford along with a generator connection teed off the circuit. Budleigh Salterton and East Budleigh have a single 33/11 kV transformer, whereas at Newton Poppleford T2 is on load and T1 is on ‘hot standby’ and connected to the Sowton 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.

- An auto-changeover scheme exists at Woodbury substation to switch in transformer T1 in the event of a fault/outage on transformer T2 or the 33 kV circuit between Exmouth BSP and Woodbury.
- An auto-changeover scheme exists at Newton Poppleford substation to switch in transformer T1 in the event of a fault/outage on transformer T2 or the 33 kV circuit between Exmouth BSP and Newton Poppleford.

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:

- Exmouth BSP 132/33 kV GT overload
- Exmouth Works T1 & T2 overload

3. Network Constraint Details and Solution Options

3.1 Exmouth BSP 132/33 kV GT Overloads

Generation | Demand

Constraint Overview

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

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
Exmouth GT1 overload	Exmouth GT2 fault	None	-	-	-	2032
Exmouth GT 2 overload	Exmouth GT1 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 3.1.2 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**
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
2	Procure flexibility under Exmouth 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 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 – Application of an increased rating following checks on ancillaries

Capacity released for constraint(s) considered: 24 MVA

Viable

Detailed description: Uprate the existing GTs at Exmouth 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.

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

Option 2 – Procure flexibility under Exmouth BSP at 33 kV or below

Flexibility service type: Generation turn down

Viable

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

Solution Recommendation

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

3.2 Exmouth Works 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
Exmouth Works T1 overload	Exmouth Works T2 outage	None	2032	2034	-	-
Exmouth Works T2 overload	Exmouth Works T1 outage	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 3.2.2 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	Apply an increased ratings following checks on ancillaries	✓	×	✓	**Viable**
2	Reinforce with larger 12/24 MVA units	✓	✓	✓	**Viable**
Operational Mitigation					
-	*None Identified*	-	-	-	
Load Management Schemes					
-	*None Identified*	-	-	-	
Flexibility services					
3	Procure flexibility under Exmouth Works 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 – Application of an increased rating following checks on ancillaries

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

Detailed description: Uprate the existing transformers at Exmouth Works via use of cyclic ratings in accordance with British Standard 171/IEC60076 and NGED Standard Technique SD8C. This requires a capability assessment of all ancillaries, such as busbars, isolators, CTs, cables (including cabling within the substation), switchgear, tap changer, transformer bushings 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. It may be necessary to fit forced cooling (oil pumps/fans).

New limiting factor for constraint(s) considered: TBC

Option 2 – Reinforce with larger 12/24 MVA units

Capacity released for constraint(s) considered: 13 MVA

Viable

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

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

Option 3 – Procure flexibility under Exmouth Works 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 Exmouth Works. 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 Primary Transformers (Option 1) this may require adding pumps and fans which may not be appropriate for transformers that were commissioned in 1962 and 1963. When being asset replaced 12/24 MVA units should be used.

DSO | nationalgrid electricity distribution

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

Contains OS data © Crown copyright and database right 2024

© National Grid 2024