Whitley BSP

Network Development Report – East Midlands

May 2024

Electricity Distribution

nationalgrid

Contents

Whitley 33 kV

1. Network Overview

Whitley Bulk Supply Points (BSP) is fed from Coventry Grid Supply Point (GSP) in National Grid Electricity Distribution's (NGED's) East Midlands licence area. The BSP is supplied through a pair of 132 kV circuits, which carry on to feed Coventry South 132/11 kV.

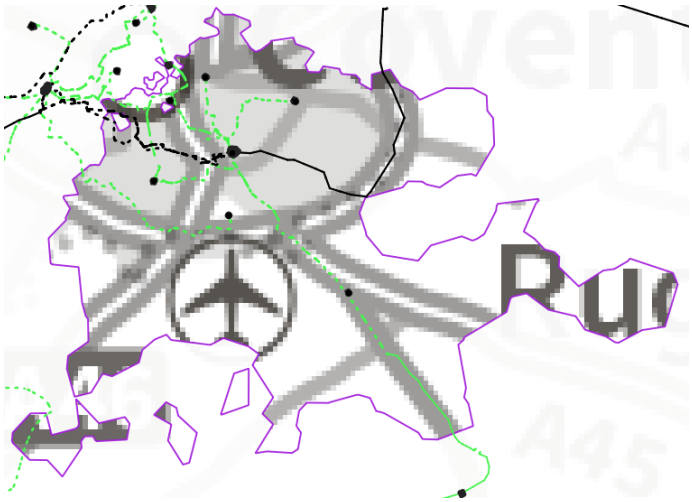

Figure 1.1 Whitley geographic network coverage

This report discusses all existing and future network constraints over a 0-10 year horizon identified on the Grid Transformers (GTs) at, and the 33 kV network supplied from Whitley 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

Whitley BSP is a two 90/117 MVA, 132/33 kV GT substation. The 33 kV busbar comprises two sections and is rated at 2000 A. Whitley BSP supplies six primary substations: Copsewood, Dillotford Avenue (T1), Gulson Road, London Road, Ryton, and Whitley. Whitley primary is located at the same site as the BSP and comprises two 33/11 kV transformers.

Copsewood and Ryton primaries are supplied from Whitley BSP via dedicated pairs of 33 kV circuits and 33/11 kV transformers. A 33 kV circuit from Ryton carries on to Warwick BSP via Princethorpe primary. Gulson Road and London Road primaries are supplied from Whitley BSP via dedicated pairs of 33 kV circuits and 33/6.6 kV transformers. A 33 kV circuit from London Road carries on to Coventry South BSP via Cox Street primary. Dillotford Avenue T1 is supplied from Whitley BSP, whereas T2 is supplied from Coventry South BSP. The 11 kV bus section circuit breaker at the primary substation is normally run open.

Whitley BSP is interconnected at 33 kV with Warwick BSP though Ryton primary, with Coventry South BSP through Dillotford Avenue primary, and with Coventry Central through London Road primary. There is also additional 33 kV interconnection with Coventry Central through Cox Street primary T1, normally open at Cox Street 33 kV.

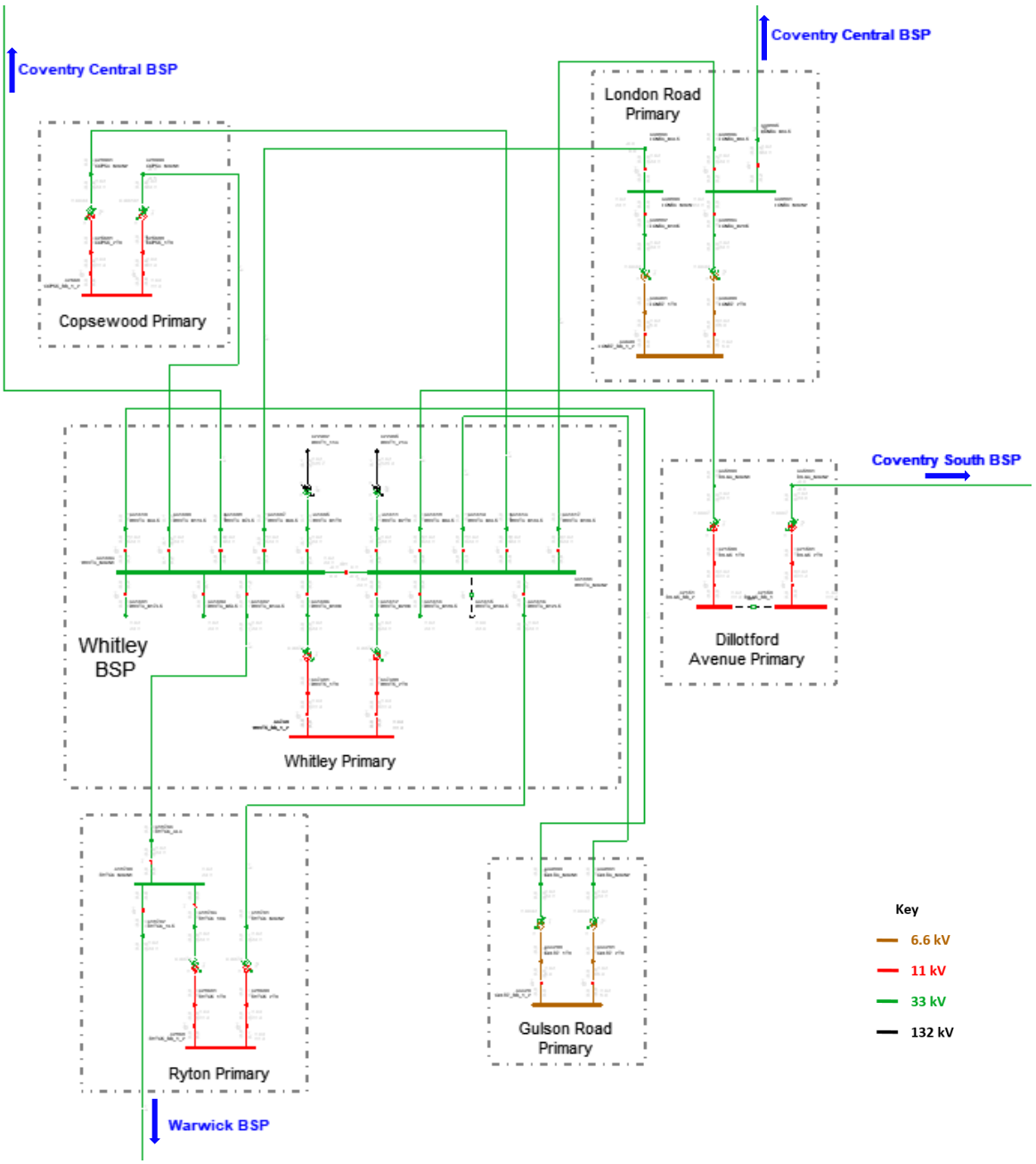

Figure 1.1.1 Whitley 33 kV network single line diagram

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.

- For arranged outages on either GT at Whitley, or their associated 132 kV infeeds, the lower voltage side circuit breaker is opened to prevent back-energisation.
- For arranged outages on the 33 kV bus section circuit breaker at Whitley BSP, the downstream network is split at 11 kV and 6.6 kV to prevent loose couples. This involves splitting Copsewood, Ryton, and Whitley primaries at 11 kV, and Gulson Road and London Road at 6.6 kV.
- For an arranged outage on an infeed to, or a transformer at Copsewood, Dillotford Avenue, Gulson Road, London Road, Ryton, and Whitley primaries, the lower voltage side circuit breaker is opened to prevent back-energisation.
- For arranged outages on a transformer at, or either infeed to Dillotford Avenue, the 11 kV bus section circuit breaker is closed to maintain security of supply.

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:

- Both GTs at Whitley BSP overload by 2028 for the loss of the other, or its associated infeed.

2.2 Whitley Grid Transformer overloads

Constraint Overview

Generation | Demand

The table below outlines the nature of the network constraints identified in the network analysis.

Table 2.2.1 constraint(s) and conditions under which constraint(s) occur

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
Whitley Grid Transformer overloads	Arranged or fault outage on the other 132 kV infeed or transformer	None	2034	2028	2028	2034
Whitley Grid Transformer overloads	Arranged outage on Dillotford Avenue T2, or its infeeds	Fault on a GT at Whitley BSP or its infeed	2034	2028	2028	2028
Whitley Grid Transformer overloads	Arranged outage on a GT at Whitley BSP or its infeed Arranged	Fault on Dillotford Avenue T2, or its infeeds	2028	2028	2028	2028

Uncertainty under other Distribution Future Energy Scenarios: The constraint is exacerbated more under the higher growth scenarios (Leading the Way and Consumer Transformation).

Solution Options

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

Table 2.2.2 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	Uprate the 132/33 kV grid transformers	×	×	×	**Discounted**
2	Install a third 132/33 kV grid transformer	✓	×	✓	**Viable**
3	Install two 132/11 kV grid transformers	✓	✓	✓	**Viable**
Operational Mitigation					
4	Transfer demand out of the BSP	✓	×	✓	**Viable**
Flexibility services					
5	Procure flexibility under Whitley BSP	✓	×	✓	**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 – Uprate the 132/33 kV grid transformers

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

Discounted

New limiting factor for constraint(s) considered: As before

Detailed description: Uprating the 132/33 kV GTs at Whitley BSP would alleviate this constraint. This option is not viable as the GTs are already the highest rating NGED uses on the network as standard. Utilising non-standard equipment creates a number of issues, such as finding replacements if serious faults occur.

Option 2 – Install a third 132/33 kV grid transformer

Capacity released for constraint(s) considered: Up to 114 MVA

Viable

New limiting factor for constraint(s) considered: The 132 kV circuits supplying Whitley BSP

Detailed description: Installing a third GT at Whitley BSP rated to match the existing two GTs would create significant additional capacity and resolve this constraint. This would require installing a third 33 kV busbar at Whitley BSP (which would create additional 33 kV feeder capacity). This third GT could either be fed by a third 132 kV circuit from Coventry GSP or using a cross-bay setup.

A third 132 kV circuit from Coventry GSP would necessitate approximately 13 km of circuit works (subject to detailed route investigation and land rights), making it the much more expensive option. There are also space constraints at Coventry GSP for new 132 kV bays. However, it may be required if space constraints within Whitley BSP doesn't allow for a full 132 kV cross-bay arrangement with sufficient clearances.

Option 3 – Install two 132/11 kV grid transformers

Capacity released for constraint(s) considered: The 11 kV demand at Whitley primary

Viable

New limiting factor for constraint(s) considered: As before

Detailed description: In this option two 132/11 kV GTs would be installed at Whitley BSP, replacing the existing primary transformers. This would remove the 11 kV load at Whitley from the 132/33 kV GTs and alleviate this constraint at least up to 2034. Additionally, given the proximity of primary substations fed from Whitley to the BSP, more demand could be transferred into the new 132/11 kV transformer as the need occurs over time, which will also support with off-loading these primary substations. One of the potential challenges for this option is space within Whitley BSP compound; however, a detailed survey and design will be able to determine its suitability.

Option 4 – Transfer demand out of the BSP

Capacity released for constraint(s) considered: Depending on transfers

Viable

New limiting factor for constraint(s) considered: As before

Detailed description: Whitley BSP is interconnected with Coventry South, Central and Warwick BSPs. Given that Warwick BSP is over 13 km away, and most primary substations supplied from Whitley BSP are in the Coventry central geographical area, transfers into Warwick have been discounted as they would require very long circuits.

Whitley, Coventry Central and Coventry South cover the network in and around Coventry centre and interconnect in close proximity on 33 kV and 11 kV. Further analysis will be undertaken to determine if primary substations can be moved around these three BSPs whist maintaining all sites within capacity and minimising the installation of new 33 kV circuits. Currently, any 33 kV transfer would require 33 kV circuit works, in order to have two 33 kV circuits from a different BSP. The cost of these transfers, alongside any reinforcement works that may be required at the relevant Coventry BSP, will be used in the CBA across all sites. Further details on the constraints in the Coventry BSPs can be found in the Coventry Group report.

Option 5 – Procure flexibility under Whitley BSP

Viable

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

Detailed description: Flexibility services could be procured to alleviate the projected overloads on the 132/33 kV transformers at Whitley BSP. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

The recommended, long term solution that benefits the BSP, but can also support local primaries in the future, is to install 132/11 kV transformers at Whitley BSP. Additional 132 kV equipment will be required to accommodate the new GTs, and sufficient space within the compound.

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