Wigston BSP

Network Development Report – East Midlands

May 2024

Electricity Distribution

nationalgrid

Contents

Wigston 33 kV

1. Network Overview

Wigston Bulk Supply Point (BSP) is fed from Enderby Grid Supply Point (GSP) via a dual 132 kV circuit from Leicester BSP in National Grid Electricity Distribution's (NGED's) East Midlands licence area.

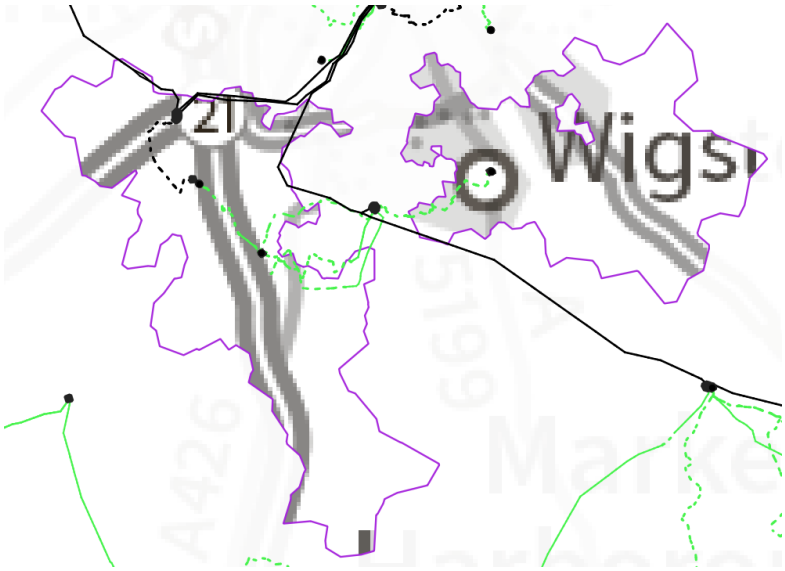

Figure 1.1 Wigston BSP geographic network coverage

This report discusses all existing and future network constraints over a 0-10 year horizon identified on the 33 kV network fed from Wigston 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

Wigston BSP has four 33 kV busbars fed by two 132/33 kV GTs. GT1 and GT2, which feed the main 1 and main 2 33 kV busbars respectively are rated to 30/60/78 MVA. Wigston BSP feeds three primary substations: Wigston Magna, Whetstone and a dedicated customer site. All of the primaries fed from Wigston have two 33/11 kV transformers and are fed via a circuit from each side of Wigston BSP (GT1 and GT2).

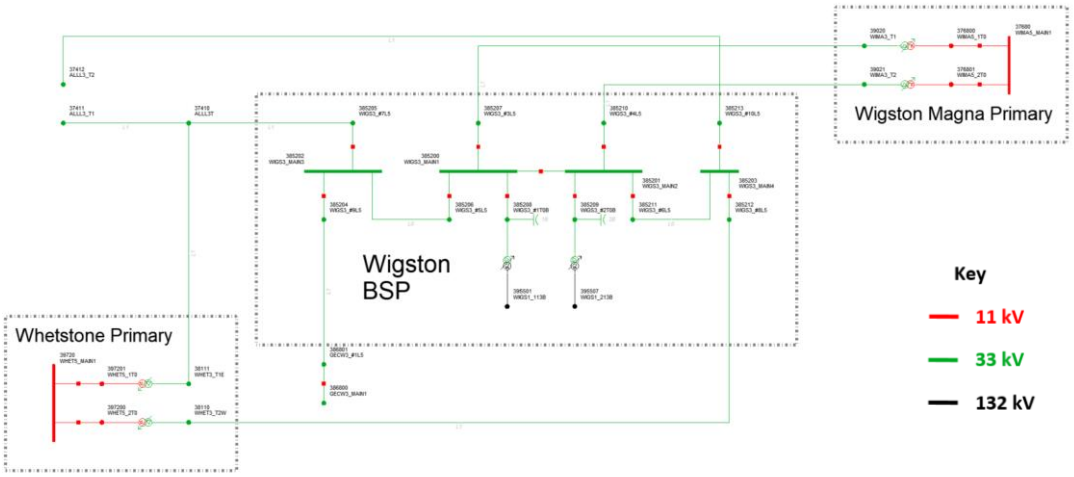

Figure 1.1.1 Wigston 33 kV network single line diagram

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 the loss of an infeed to a transformer at any of the primaries fed from Wigston BSP under arranged outages, the lower voltage side circuit breaker is opened to prevent back-energisation.
- The 33 kV network downstream of Wigston BSP is split for arranged outages on its 33 kV bus section breaker to prevent loose couples. This involves splitting Wigston Magna and Whetstone primaries (as well as the customer site) at 11 kV.

2. Network Constraints and Solution Options

2.1 Summary of Network Constraint

The following constraint has been identified for the Best View Scenario, for which mitigation options will be discussed:

- For an arranged or fault outage on either infeed to Wigston Magna primary the remaining transformer at the site is projected to overload in 2028.

2.2 Wigston Magna primary 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
Wigston Magna T1 or T2 overload	Arranged or fault outage on either transformer or circuit to Wigston Magna primary	None	2034	2034	2034	2034

Uncertainty under other Distribution Future Energy Scenarios: This constraint is further exacerbated under the higher growth scenarios (Leading the Way and Consumer Transformation). Overloads are projected by 2034 for all scenarios except Falling Short.

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)

Option	Description
Reinforcement	
1	Uprate the transformers at Wigston Magna primary.
2	Install a third transformer at Wigston Magna primary.
3	Build a new primary substation.
Flexibility Services	
4	Procure flexibility under Wigston Magna primary.

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 transformers at Wigston Magna primary

Discounted

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

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

Detailed description: Uprating the two 33/11 kV transformers at Wigston Magna primary would alleviate this constraint. This option is not viable as the transformers 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 transformer at Wigston Magna primary

Discounted

Capacity released for constraint(s) considered: Minimal

New limiting factor for constraint(s) considered: Rating of the existing transformers

Detailed description: A third transformer could be installed at Wigston Magna primary rated to 20/40 MVA. This would however necessitate a third 33 kV circuit to be built from Wigston BSP. This option has been discounted for a number of reasons:

- A third infeed would need to be fed from Wigston (being the nearest BSP). However, two feeders could not be fed from the same bar as for a busbar arranged/fault outage two infeeds to Wigston Magna would be lost. Also, the problem of a loose couple would be created if Wigston Magna primary T3 were to be fed from any other BSP (e.g. Leicester).
- A three transformer primary site would present additional network operability issues (such as needing to split the 11 kV network for an arranged outage on any transformer/circuit).

Option 3 – Build a new primary substation

Viable

Capacity released for constraint(s) considered: 40 MVA or 23 MVA

New limiting factor for constraint(s) considered: Total primary capacity of Wigston Magna and the new substation

Detailed description: Due to the high level of growth seen at Wigston Magna a new primary substation may be required. The location of the new primary would be determined by where in the area this demand develops the fastest.

A new primary at or near the existing Wigston BSP would require the least investment in 33 kV circuits. 20/40 MVA units would be the better strategic choice for transformers at the new primary, as that would provide sufficient capacity for the growth in the area forecast up to at least 2050.

Option 4 – Procure flexibility under Wigston Magna primary

Viable

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

Detailed description: Flexibility services could be procured to alleviate the projected overloads seen on the primary transformers at Wigston Magna. The viability of utilising flexibility will be further investigated as part of the DNOA process (but may not be a long term solution due to the high levels of growth seen in the forecasts).

Solution Recommendation

Wigston Magna primary has recently been reinforced with 20/40 MVA transformers, increasing its capacity significantly. However, due to the high growth forecast the area further intervention may be required. Building a new primary substation with two 20/40 MVA transformers would add the demand capacity required to accommodate the growth forecast up to 2050. The demand on the network supplied from Wigston Magna primary will be monitored to assess the need for a new primary (and its optimal location) as load materialises.

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