Enderby GSP

Network Development Report – East Midlands

May 2024

Electricity Distribution

nationalgrid

Contents

Enderby 132 kV

1. Network Overview

Enderby Grid Supply Point (GSP) supplies six Bulk Supply Points (BSPs) in National Grid Electricity Distribution's (NGED's) East Midlands licence area in and around Leicester. These six BSPs are: Coalville, Hinckley, Leicester, Leicester East, Leicester North and Wigston.

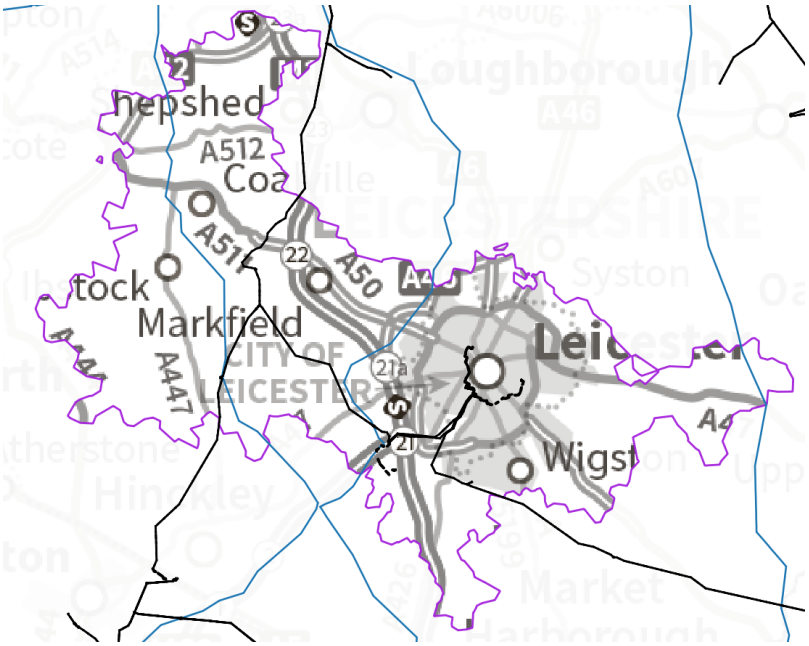

Figure 1.1 Enderby GSP geographic network coverage

This report discusses all existing and future network constraints over a 0-10 year horizon identified on the 132 kV network fed from Enderby GSP. 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

Leicester BSP is fed directly from Enderby GSP via two 132 kV dual circuits. Three dual circuits out of Leicester then feed Leicester East, Leicester North and Wigston BSPs, with the dual circuit supplying Wigston continuing on to Kibworth BSP (which is supplied from Grendon GSP). Each of these four BSPs have two 132/33 kV GTs, with Wigston also having two 132/11 kV GTs.

Another dual circuit out of Enderby GSP feeds Coalville BSP (which has three 132/33 kV GTs) and the two 132/11 kV GTs at Hinckley BSP. There are also two 132/33 kV GTs at Hinckley which are normally fed from Coventry GSP. A second dual circuit into Coalville BSP is from Ratcliffe GSP (which also supplies Loughborough BSP). Finally, Carlton Park BSP is supplied directly from Enderby via two 132 kV circuits.

Enderby is interconnected with three other GSPs at 132 kV via the aforementioned circuits to Coalville, Hinckley and Kibworth BSPs from Ratcliffe, Coventry and Grendon GSPs respectively. All of these points of interconnection are via normal open points at the three BSPs (Enderby is not run in parallel with any other GSPs).

Enderby itself has four 400/132 kV Super Grid Transformers (SGTs) feeding onto four 132 kV busbars. The site is run parallel under normal running arrangements, with SGT2 run on hot standby. An autoclose scheme is set to switch in SGT2 for faults, as described in the network operability modelling section below.

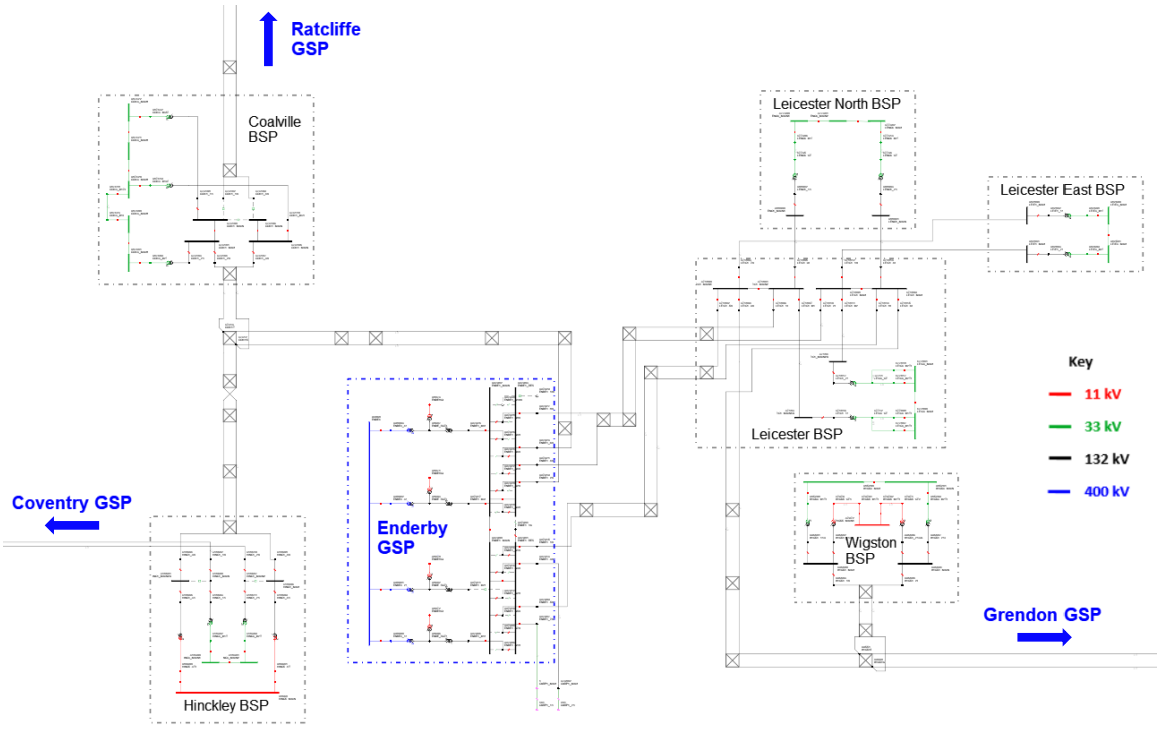

Figure 1.1.1 Enderby 132 kV network single line diagram

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.

- Arranged outages on the 132 kV busbars at Enderby GSP are modelled such that circuits are secured onto in service busbars.
- Coalville BSP and Hinckley 11 kV are transferred to Ratcliffe GSP for arranged outages on any of the SGTs at Enderby GSP.
- SGT2 is switched in at Enderby for arranged outages on any of the other SGTs (SGT1/3/4) to maintain a three solid running arrangement.
- For arranged outages on CB130 at Enderby, CB230 is also opened and disconnector 169 is closed (moving the site to a 2 + 2 section split). For arranged outages on CB230 the site is also put on this running arrangement (by opening CB130 and closing disconnector 169).
- For arranged outages on either 132 kV main busbar at Enderby, or CB120 between the two busbars, disconnector 169 is closed to maintain the three solid running arrangement of the site.
- An autoclose scheme is set up at Enderby to switch in SGT2 for a fault on any of the other SGTs (SGT1/3/4).
- The 33 kV and 11 kV networks downstream of the BSPs fed from Enderby GSP are split for arranged outages on the 33 kV bus sections (see relevant 33 kV network reports for more details).
- For the loss of an infeed to a transformer at any of the BSPs fed from Enderby GSP under arranged outages, the lower voltage side circuit breaker is opened to prevent back-energisation.

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:

- The GTs at Leicester BSP are non-standard units which are projected to be constrained for N-1 outages by 2034 (and significantly sooner if they need to be replaced with standard rating GTs).
- The GTs at Leicester East BSP are non-standard units which are projected to be constrained for N-1 outages by 2034 (and significantly sooner if they need to be replaced with standard rating GTs).
- For arranged or fault outages on either GT at Leicester North the remaining GT overloads for various seasons (by 2034 for all seasons).
- The 132/33 kV GTs at Wigston BSP are constrained for demand (with either side potentially overloading for the loss of the other GT or 132 kV infeed). In later years N-2 restoration of the site is also an important consideration as the group load approaches 100 MW.

2.2 Leicester BSP GT overloads

Constraint Overview

Generation **Demand**

The table below outlines the nature of the network constraints identified in the network analysis. The GTs at Leicester BSP are non-standard 60/120/156 MVA units. If either GT needed to be replaced following a serious fault it would likely need to be replaced with a standard 60/90/117 MVA unit. When assessing available capacity on the network this reduced rating is taken into account. With 60/90/117 MVA transformers at Leicester BSP overloads would be seen in intermediate cool in the baseline, in all seasons except summer by 2028 and for all seasons by 2034 (triggering intervention significantly sooner than indicated below).

This constraint is also exacerbated by arranged outages at Leicester East BSP which leads to additional demand being transferred into Leicester BSP. These N-2 outage constraints have been excluded as they can be managed operationally and do not affect the overall reinforcement strategy.

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
Leicester BSP GT overloads	Arranged or fault outage on either GT	None	-	2034	2034	-

Uncertainty under other Distribution Future Energy Scenarios: Under the lower growth scenarios (Falling Short and System Transformation) overloads would not be seen on the existing GTs at Leicester BSP (but as outlined above it would not be prudent to load the BSP to well beyond the ratings of standard GT units).

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 GTs at Leicester BSP.
2	Install a third GT at Leicester BSP.
Operational Mitigation	
3	Transfer demand out of Leicester BSP.
Flexibility Services	
4	Procure flexibility under Leicester BSP.

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 GTs at Leicester BSP

Discounted

Capacity released for constraint(s) considered: None

New limiting factor for constraint(s) considered: 33 kV switchgear capacity

Detailed description: The GTs at Leicester BSP are already rated higher than the highest rated units utilised by NGED as standard on the network. Due to this, not only is it not viable to uprate these GTs, but their full capacity cannot be utilised in case either needs to be replaced with a standard 60/90/117 MVA unit, as highlighted above. Even if the GTs at Leicester were uprated with custom built units (which would not be prudent), the capacity of the site would still be restricted by the capacity of the 33 kV switchgear.

Option 2 – Install a third GT at Leicester BSP

Viable

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

New limiting factor for constraint(s) considered: New GT ratings

Detailed description: To add capacity to Leicester BSP, a third GT would be required. The new GT would need to be a standard 60/90/117 MVA unit. The 33 kV switchgear at Leicester BSP would also need reconfiguring to create two separate boards, with an existing GT feeding onto each, and the new GT on a three panel board connected to both sides. This would allow the full capacity of the new GT to be utilised. This reinforcement would be expensive, but is likely the only viable way of adding significant capacity to Leicester BSP.

This reinforcement would not only resolve the GT constraint at Leicester BSP, it would also allow Leicester to support the other two BSPs in the Leicester group (both of which are also projected to be constrained as outlined in Section 2.3 and Section 2.4 of this report). This could be achieved through load transfers at 33 kV. Load transfers from Leicester East could be achieved relatively easily, as there are already 33 kV circuits to Highfields and Stoneygate primaries from Leicester BSP. Leicester North BSP would be harder to deload, but this could potentially be achieved by transferring demand via Leicester East (i.e. use the headroom freed up by the transfer of Highfields and/or Stoneygate primaries at Leicester East to accept Lero primary).

To fully release the capacity created by the installation of a third GT, the 132 kV circuits that make up the CN-route between Enderby and Leicester would also need to be reconductored (there is also an asset replacement driver for these works).

Option 3 – Transfer demand out of Leicester BSP

Discounted

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

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

Detailed description: Transferring demand out of Leicester BSP at 33 kV could be used to help alleviate this constraint. The two BSPs which Leicester BSP is interconnected with at 33 kV are Leicester East and Leicester North. Both BSPs are projected to also be constrained (as noted in option 2 above), and would both be harder to reinforce than Leicester BSP. Transfers out of Leicester BSP are therefore unlikely to be capable of managing this constraint (transfers in the opposite direction are more likely as discussed above).

Option 4 – Procure flexibility under Leicester BSP

Viable

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

Detailed description: Flexibility services could be procured to alleviate the projected GT overloads seen for an outage on an infeed to Leicester North BSP. Reinforcement deferral would only be viable if flexibility could be used to alleviate constraints at all three BSPs in the Leicester group (as the reinforcement plan outlined above could potentially be used to support all three BSPs). The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

Installing three 60/90/117 MVA GTs at Leicester BSP is likely the optimal reinforcement solution for this constraint. Adding capacity to Leicester BSP could be used to support the entire Leicester group through demand transfers at 33 kV as described above. This reinforcement would also remove the non-standard GTs at Leicester BSP with standard units which are easier to maintain, operate and find replacements for, in case of serious faults.

2.3 Leicester East BSP GT overloads

Constraint Overview

Generation Demand

The table below outlines the nature of the network constraints identified in the network analysis. The GTs at Leicester East BSP are non-standard 60/120/156 MVA units. If either GT needed to be replaced following a serious fault it would likely need to be replaced with a standard 60/90/117 MVA unit. When assessing available capacity on the network this reduced rating is taken into account. With 60/90/117 MVA transformers at Leicester East BSP overloads would be seen in intermediate cool in the baseline, in all seasons except summer by 2028 and for all seasons by 2034 (triggering intervention significantly sooner than indicated below).

Table 2.3.1 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
Leicester East BSP GT overloads	Arranged or fault outage on either GT	None	-	2034	-	-

Uncertainty under other Distribution Future Energy Scenarios: Forecast demand growth at Leicester East for Leading the Way and Consumer Transformation would trigger overloads for other seasons, as well as the 33 kV switchgear at the BSP. As with Leicester, despite lower growth being seen under Falling Short and System Transformation intervention could still be triggered when considering the fact that the existing GTs are non-standard.

Solution Options

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

Table 2.3.2 solution options to solve constraint(s)

Option	Description
Reinforcement	
1	Uprate the GTs at Leicester East BSP.
2	Install a third GT at Leicester East BSP.
3	Build a new BSP.
Operational Mitigation	
4	Transfer demand out of Leicester East BSP.
Flexibility Services	
5	Procure flexibility under Leicester East BSP.

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 – Uprate the GTs at Leicester East BSP

Discounted

Capacity released for constraint(s) considered: None

New limiting factor for constraint(s) considered: 33 kV switchgear capacity

Detailed description: As with the GTs at Leicester BSP, the GTs at Leicester East BSP are already rated higher than the highest rated units utilised by NGED as standard on the network, and therefore cannot be uprated. The GTs at Leicester East may need to be replaced with standard 60/90/117 MVA units in the near future regardless, based on their condition, as the existing units are over 55 years old (so, as with Leicester, the effective capacity of the substation is 117 MVA).

Option 2 – Install a third GT at Leicester East BSP

Discounted

Capacity released for constraint(s) considered: None

New limiting factor for constraint(s) considered: Space constraints at Leicester East BSP

Detailed description: There is insufficient space at Leicester East BSP to accommodate a third GT along with all of the associated 132 kV and 33 kV switchgear. This reinforcement option has therefore been discounted.

Option 3 – Build a new BSP

Viable

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

New limiting factor for constraint(s) considered: Dependent on primaries transferred to the new BSP

Detailed description: If a new BSP were established to the north of Leicester, new 33 kV circuits could then be built to pick up some of the primaries supplied from Leicester East BSP, deloading it and alleviating this GT constraint. Which primaries could be transferred, and the amount of 33 kV circuit works required to facilitate this, would depend on the location of the new BSP. The most likely candidates for transfer include Thurmaston and Hamilton primaries.

A new BSP to the north of Leicester could also support Leicester North BSP as discussed in Section 2.4 of this report, as well as Willoughby BSP as discussed in the Ratcliffe 132 kV and Willoughby 33 kV reports. The biggest challenge in establishing a new BSP in this area would likely be supplying it at 132 kV. New 132 kV circuits from Enderby GSP would need to travel round the entirety of Leicester, which would make the scheme similarly expensive to building a new GSP. A new GSP in the area (which could then feed a new BSP without requiring extensive 132 kV circuit works) is considered as a possibility to support both Ratcliffe and Enderby GSPs, but this is early in the optioneering process and subject to discussions with National Grid ESO (NGESO) and National Grid Electricity Transmission (NGET).

Option 4 – Transfer demand out of Leicester East BSP

Viable

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

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

Detailed description: Transferring demand out of Leicester East BSP at 33 kV could be used to help alleviate this constraint. Both of the other BSPs in the Leicester group, which Leicester East is interconnected with, are also projected to be constrained as outlined in Section 2.2 and Section 2.4. If Leicester BSP is reinforced, significant demand could then be transferred over from Leicester East. There are already 33 kV circuits to both Stoneygate and Highfields primaries from Leicester BSP.

Option 5 – Procure flexibility under Leicester East BSP

Viable

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

Detailed description: Flexibility services could be procured to alleviate the projected GT overloads seen for an outage on an infeed to Leicester East BSP. This could be utilised in conjunction with the transfers discussed in option 4 above. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

The reinforcement of Leicester BSP as proposed in Section 2.2 of this report is likely the optimal reinforcement strategy for the Leicester group in the first instance, which would allow Stoneygate and/or Highfields primaries to be transferred out of Leicester East BSP. While this could be sufficient to manage this constraint in the short term, in the longer term further intervention will be required based on the current demand forecasts. The next step for adding capacity to the area would need to be a new BSP, which will be used to deload Leicester East and Leicester North, as the existing three BSPs could not be developed any further.

2.4 Leicester North BSP GT overloads

Constraint Overview

Generation **Demand**

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

Table 2.4.1 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
Leicester North BSP GT overloads	Arranged or fault outage on either GT	None	2034	Baseline	2028	2034

Uncertainty under other Distribution Future Energy Scenarios: As overloads are observed in the baseline, intervention is required regardless of scenario. This constraint is exacerbated most significantly under the Leading the Way and Consumer Transformation scenarios.

Solution Options

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

Table 2.4.2 solution options to solve constraint(s)

Option	Description
Reinforcement	
1	Reinforce Leicester North BSP.
2	Build a new BSP.
Operational Mitigation	
3	Transfer demand out of Leicester North BSP.
4	Review seasonal ratings.
Flexibility Services	
5	Procure flexibility under Leicester North BSP.

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 – Reinforce Leicester North BSP

Discounted

Capacity released for constraint(s) considered: None

New limiting factor for constraint(s) considered: Space constraints at Leicester North BSP

Detailed description: The GTs at Leicester North are already the highest rating utilised by NGED on the network and cannot be uprated any further. There is also insufficient space at the site to add a third GT and the associated 132 kV and 33 kV switchgear that would be required. Reinforcing Leicester North BSP has been discounted as there are no viable options to add significant capacity to the existing site.

Option 2 – Build a new BSP

Viable

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

New limiting factor for constraint(s) considered: Dependent on primaries transferred to the new BSP

Detailed description: With options for the existing Leicester North BSP site not viable, the only way to support the area on an enduring basis would be to build a new BSP. A BSP to the north of Leicester has been identified as having potential to support a number of areas of network, including Leicester East, as highlighted in Section 2.3 of this report, and Willoughby BSP, as discussed in the Ratcliffe 132 kV and Willoughby 33 kV reports. The significant challenges in achieving this option (and the large network benefits that would be provided) are outlined in Section 2.3.

As with Leicester East, the primaries which could be transferred out of Leicester North (and the lengths of 33 kV circuits required to achieve this) would be dependent on the location of the new BSP. Possible candidates for transfer include Birstall and Beaumont Leys (the northernmost of the primaries within the Leicester group). Even if Leicester North were not immediately directly deloaded by a new BSP, any headroom created at Leicester East could be used to support Leicester North.

Option 3 – Transfer demand out of Leicester North BSP

Viable

Capacity released for constraint(s) considered: The demand of Lero primary

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

Detailed description: As discussed in Section 2.2 and Section 2.3 of this report, if Leicester BSP is reinforced it could allow demand to be transferred out of Leicester East BSP. The headroom freed up by this could then be utilised to allow Lero primary to be transferred over to Leicester East BSP. A full load flow study is required to ensure this would not create any 33 kV circuit constraints (but even if it did, the circuits to the Lero tee are short enough that they could likely be uprated at a relatively low cost).

One other option for transferring demand to Leicester BSP directly is creating a normal open point at Hockley Farm Road, but this is unlikely to be achievable without compromising security of supply. Building new 33 kV circuits to Hockley Farm Road would require significant lengths of new 33 kV circuit (so would only be reconsidered if all other options for deloading Leicester North BSP were exhausted).

Transfers at 11 kV (or 6.6 kV) between the primaries in the Leicester group could potentially be a viable way of deloading Leicester North BSP, as the secondary network within Leicester is very dense. Full 11 kV / 6.6 kV studies would be required to assess this option, and any transfers are unlikely to be of sufficient magnitude to support Leicester North in the long term. As some of the secondary network in Leicester is 6.6 kV (mostly on the eastern side) this could hamper attempts to transfer demand from 33/11 kV primaries (although the possibility of, at some point, uprating the 6.6 kV network within Leicester to 11 kV is discussed in the Leicester Group 33 kV report, with the overall benefits of uprating to 11 kV further expounded upon in the NDP Introduction and Methodology). Any transfers at 11 kV or 6.6 kV would also have implications for the headroom at individual primaries.

Option 4 – Review seasonal ratings

Viable

Capacity released for constraint(s) considered: Dependent on review

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

Detailed description: Overloads are only seen in the baseline for intermediate cool, and in 2028 only for intermediate cool or intermediate warm. 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 or intermediate warm ratings (which may be overly pessimistic). This solution is dependent on an internal review and would not be a long term solution.

Option 5 – Procure flexibility under Leicester North BSP

Viable

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

Detailed description: Flexibility services could be procured to alleviate the projected GT overloads seen for an outage on an infeed to Leicester North BSP. This could be utilised in conjunction with the operational mitigation discussed in options 3 and 4 above. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

Some combination of demand transfers, a review of seasonal transformer ratings and flexibility procurement could be used in the short to medium term to manage the constraint on the GTs at Leicester North BSP. The reinforcement of Leicester BSP proposed in Section 2.2 of this report would also be required to support the Leicester group (and Leicester North BSP in particular by facilitating demand transfers). Beyond this, a new BSP is one of the only viable options to create enough capacity in the area to support Leicester North in the long term (based on the high demand forecasts). The network benefits of establishing a new BSP, as well as the significant hurdles which would need to be overcome, are discussed above.

2.5 Wigston BSP GT overloads

Constraint Overview

Generation **Demand**

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

Table 2.5.1 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 BSP GT overloads	Arranged or fault outage on either GT or its infeed	None	2028	Baseline	Baseline	2028

Uncertainty under other Distribution Future Energy Scenarios: As overloads are observed in the baseline intervention is required regardless of scenario. This constraint is exacerbated most significantly under the Leading the Way and Consumer Transformation scenarios.

Solution Options

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

Table 2.5.2 solution options to solve constraint(s)

Option	Description
Reinforcement	
1	Uprate the 132/33 kV GTs at Wigston BSP.
2	Install a third 132/33 kV GT at Wigston BSP.
Operational Mitigation	
3	Review seasonal ratings.
4	Transfer demand to Wigston 11 kV.
Flexibility Services	
5	Procure flexibility under Wigston BSP.

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 – Uprate the 132/33 kV GTs at Wigston BSP

Viable

Capacity released for constraint(s) considered: Dependent on demand growth at Wigston 11 kV

New limiting factor for constraint(s) considered: N-2 restoration capacity

Detailed description: Uprating the GTs at Wigston BSP to 60/90/117 MVA units would release significant capacity and resolve this constraint. It would also confer an asset condition benefit, as the existing units are almost 60 years old.

Even with the existing GTs uprated, Wigston BSP would still be limited by the ability to restore demand for an N-2 outage. As there is no 33 kV interconnection out of Wigston BSP, this restoration capacity is minimal, so once the total group demand for the site exceeds 100 MW, it would become non-compliant with Engineering Recommendation P2 without further intervention. The total capacity for Wigston, including both the 132/11 kV GTs and the 132/33 kV GTs, is therefore 100 MW (plus a possible small amount of demand which could be restored at 11 kV). The group demand of Wigston BSP is forecast to be slightly over this figure by 2034.

N-2 restoration capacity could be added to the site in two ways. Firstly, new 33 kV circuits could be built to add interconnection to Wigston BSP from other nearby BSPs (such as Leicester). Secondly, the BSP could be looped into the nearby dual 132 kV circuit (allowing Wigston to be restored via Grendon GSP for the loss of the two circuits from Leicester). The N-2 restoration of Wigston BSP would be supported if a new GSP were built to the north of Grendon (as discussed in the Grendon 132 kV report). The second option is likely the more strategic choice, providing N-2 restoration capacity on an enduring basis to support growth in the area (and the 132 kV circuits from the tee point to Wigston are only around 300 m in length).

As demand at Wigston continues to increase, the capacity of the 132/33 kV GTs would still be restricted to 100 MW (as the new most onerous N-2 constraint would be the loss of these two GTs). At this point, if 11 kV transfers to the 132/11 kV GTs proved insufficient to maintain N-2 compliance, 33 kV interconnection may then need to be established. Based on current demand forecasts, this will not be an issue for some time, but should be considered for any 33 kV developments in the area, to ensure any opportunity to economically add interconnection is seized.

Option 2 – Install a third 132/33 kV GT at Wigston BSP

Discounted

Capacity released for constraint(s) considered: Dependent on demand growth at Wigston 11 kV

New limiting factor for constraint(s) considered: N-2 restoration capacity

Detailed description: Adding a third GT to Wigston BSP would not be a strategic choice to add capacity and resolve this constraint in the first instance. This is due to the fact that based on the age and condition of the existing GTs, they would need to be replaced in the near future regardless (as mentioned in option 1 above). This option would also not add any more capacity than option 1 initially as the site would still be limited by its N-2 restoration capacity.

Option 3 – Review seasonal ratings

Viable

Capacity released for constraint(s) considered: Dependent on review

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

Detailed description: Overloads are only seen in the baseline for intermediate cool and intermediate warm. 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 or intermediate warm ratings (which may be overly pessimistic). This solution is dependent on an internal review and would not be a long term solution.

Option 4 – Transfer demand to Wigston 11 kV

Viable

Capacity released for constraint(s) considered: Dependent on demand transferred

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

Detailed description: Some demand could potentially be transferred to Wigston 11 kV to deload the 132/33 kV GTs at Wigston BSP. A full 11 kV study would be required to determine the feasibility of this option, but regardless this option is likely not suitable to defer reinforcement of the 132/33 kV GTs beyond the short term. This is due to both the fact that the 132/11 kV GTs at Wigston are also projected to be low on capacity by 2034 and the aforementioned age/condition of the existing 132/33 kV GTs at Wigston BSP.

Option 5 – Procure flexibility under Wigston BSP

Viable

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

Detailed description: Flexibility services could be procured to alleviate the projected GT overloads seen for an outage on an infeed to Wigston BSP. This could be utilised in conjunction with the operational mitigation discussed in options 3 and 4 above. Flexibility would not however provide any benefit for the condition of the existing GTs. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

Uprating the 132/33 kV GTs at Wigston BSP is the clear optimal reinforcement strategy in the first instance to resolve this constraint. This will add significant capacity to the area and confer an asset condition benefit. Possible operational mitigation strategies are discussed but are unlikely to be suitable to manage this constraint beyond the short term. Post reinforcement of the 132/33 kV GTs at Wigston BSP the new limiting factor for the site would become N-2 restoration capacity of the site (further intervention will be required to resolve this).

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