Boston BSP

Network Development Report – East Midlands

May 2024

Electricity Distribution

nationalgrid

Contents

Boston 33 kV

1. Network Overview

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

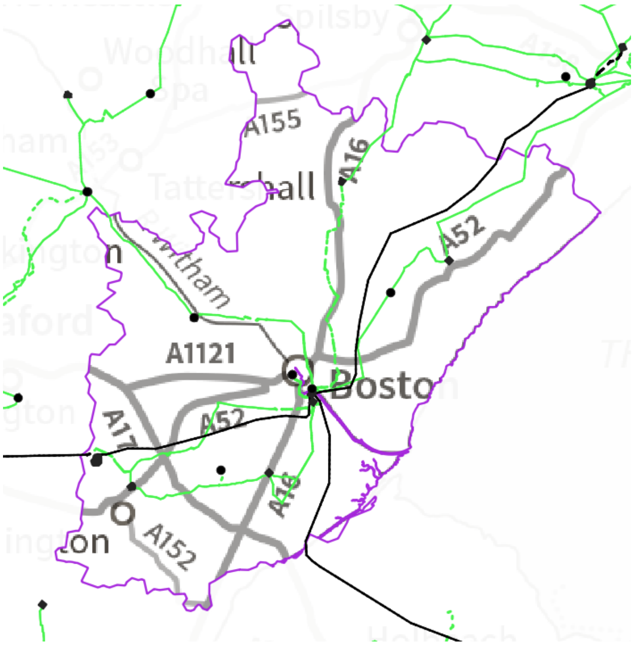

Figure 1.1 Boston geographic network coverage

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

Boston BSP has three 33 kV busbars fed by two 132/33 kV GTs both rated to 45/90/117 MVA. Boston BSP feeds eight primary substations: Donington, Kirton, Langrick, Marsh Lane, Mount Bridge, Sleaford Road, Stickney and Wrangle T1. All of the primaries fed from Boston have two 33/11 kV transformers, with the exceptions of Langrick and Stickney which are single transformer primaries. Marsh Lane, Kirton and Donington primaries form a 33 kV ring with three infeeds from Boston. The remaining primaries are all fed directly from Boston BSP. Langrick, Mount Bridge, Stickney and Wrangle T1 are all supplied by two tower routes (one dual circuit and one triple circuit). Boston BSP is interconnected with Skegness and Sleaford BSPs via normal open points at Wrangle/Stickney and Tattershall primaries respectively.

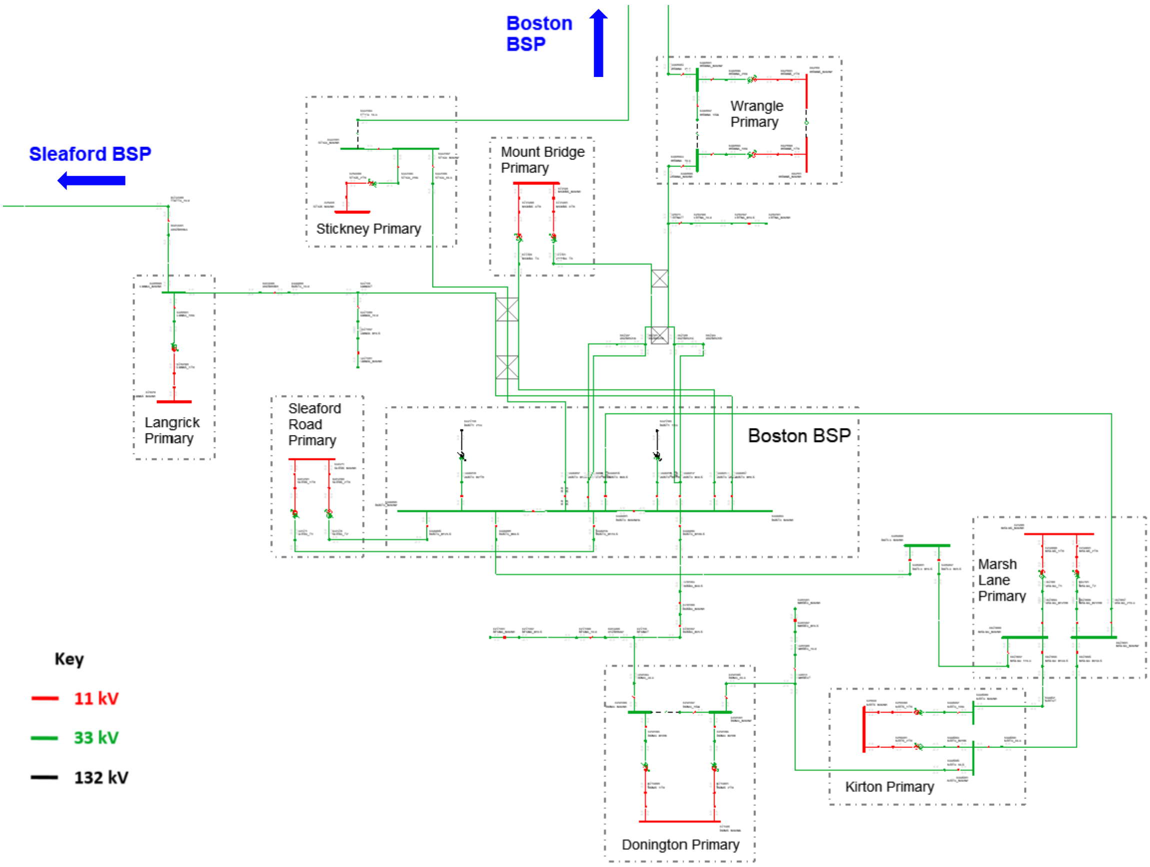

Figure 1.1.1 Boston 33 kV network single line diagram

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 Boston BSP under arranged outages, the lower voltage side circuit breaker is opened to prevent back-energisation.
- The 33 kV network downstream of Boston BSP is split for arranged outages on its 33 kV bus section breaker to prevent loose couples. This involves splitting Sleaford Road, Mount Bridge, Marsh Lane, Donington and Kirton primaries at 11 kV.
- For an arranged outage on the 33 kV infeed to Langrick, the primary is transferred into Sleaford BSP via Tattershall primary.
- For an arranged outage on the 33 kV infeed to (past the point at which the primary can be backfed at 33 kV), or the 33/11 kV transformer at Langrick primary, the load is backfed on the 11 kV network to Tattershall and Sleaford Road primaries. In future year studies Sleaford Road is split at 11 kV as required to prevent overloads for subsequent faults when backfeeding Langrick.
- For an arranged outage on the 33 kV infeed to Stickney, the primary is transferred into Skegness BSP.
- For an arranged outage on the 33 kV infeed to (past the point at which the primary can be backfed at 33 kV) or the 33/11 kV transformer at Stickney primary the load is backfed on the 11 kV network to Wrangle primary.
- For arranged outages on any of the 33 kV circuits to Marsh Lane, Kirton and Donington in future year studies they are split at 11 kV as required to prevent overloads for subsequent faults.

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 33/11 kV transformer at Stickney primary is constrained for both demand and generation under intact network conditions. Constraints have also been identified on the 11 kV network fed from Stickney.
- The 33/11 kV transformer at Langrick primary is constrained for demand under intact network conditions.
- For an arranged or fault outage on either infeed to Marsh Lane primary generation overloads are projected to occur from 2028 on the transformers at the site and the 33 kV circuits from Boston BSP.
- The 33 kV circuit between Boston BSP and Donington primary is constrained on generation for an outage at Donington (or the 33 kV circuit between Donington and Kirton).
- Both demand and generation constraints are projected on the GTs at Boston BSP for N-1 outages by 2028.

2.2 Stickney primary transformer overloads

Constraint Overview

Generation | Demand

The table below outlines the nature of the network constraints identified in the network analysis. Constraints have been identified on the 11 kV network fed from Stickney primary which are also present in the baseline, as well as at Wrangle primary when load from Stickney is backfed there.

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

Constraint	N-1 Condition	Subsequent N-2 Condition	First year constraint is observed in each season under Best View			
Demand			**Winter**	**Int Cool**	**Int Warm**	**Summer**
Stickney primary transformer overloads	None	None	Baseline	Baseline	Baseline	Baseline
Generation			**Summer**			
Stickney reverse power flow transformer overloads	None	None	Baseline			

Uncertainty under other Distribution Future Energy Scenarios: Relatively low demand growth is projected under all five scenarios. As this constraint is present in the baseline, regardless of the scenario some form of mitigation is required. Under the higher growth scenarios (Leading the Way and Consumer Transformation) ANM and flexibility procurement may not be capable of managing the constraint for as long (which would trigger reinforcement earlier).

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 transformer at Stickney primary.
2	Install a second transformer at Stickney primary.
Operational Mitigation	
3	Active Network Management.
Flexibility Services	
4	Procure flexibility under Stickney 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 transformer at Stickney primary

Discounted

Capacity released for constraint(s) considered: Minimal

New limiting factor for constraint(s) considered: 11 kV network

Detailed description: Replacing the transformer at Stickney primary with a 12/24 MVA unit would resolve both the demand and generation constraints on the existing transformer. It would not however help alleviate constraints which have also been identified on the 11 kV network (namely voltage issues on the long feeder circuits out of Stickney for various outage conditions).

Option 2 – Install a second transformer at Stickney primary

Viable

Capacity released for constraint(s) considered: 17 MVA

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

Detailed description: Installing a second transformer at Stickney primary rated to 12/24 MVA would alleviate the constraints on both the transformer at Stickney and on the downstream 11 kV network (as at present the most onerous outage conditions involve the loss of the infeed at Stickney). It would also remove the reliance on 11 kV backfeeds to Wrangle primary during outages.

There are already two 33 kV circuits to Stickney primary (one from Boston BSP which supplies the existing transformer and another from Skegness BSP). The 33 kV circuit from Skegness is rated high enough to support a 12/24 MVA transformer at Stickney, but has too many addresses under Engineering Recommendation P18. To add a second transformer at Stickney, two 33 kV sites would need to be unstitched with a new circuit from Skegness BSP. This would not require an excessive length of new 33 kV circuit, and would resolve an existing network complexity issue. It would also resolve overloads projected for this circuit as outlined in the Skegness 33 kV report. This reinforcement therefore has a number of investment drivers and will futureproof the network for Stickney and Spilsby primaries.

Once reinforcement works are complete, Stickney primary would need to be run split, in a similar way to Wrangle primary (to avoid creating a loose couple between two GSPs). Building a new 33 kV circuit from either Boston BSP or Skegness BSP would remove the need to run the site split and simplify the network's running arrangements, but would necessitate a significant length of circuit works (with Boston and Skegness BSPs being around 14 km and 17 km away from Stickney respectively). This high investment is not warranted, and as discussed above unstitching the circuit from Skegness has a number of additional benefits at a far lower cost.

Option 3 – Active Network Management

Viable

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

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

Detailed description: Any additional connections downstream of Stickney could be included in an Active Network Management (ANM) scheme. ANM schemes are used to manage constraints on over-committed networks. This option could help manage the generation constraint at Stickney, but not the demand constraint.

Option 4 – Procure flexibility under Stickney primary

Viable

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

Detailed description: Flexibility services could be procured on the network supplied from Stickney primary to alleviate the projected demand overloads seen on the transformers. Flexibility would not be suitable for managing the reverse power flow constraint projected at Stickney. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

In the short term, the use of ANM and/or flexibility services could potentially help manage this constraint. Beyond this the optimal reinforcement solution identified is to install a new 12/24 MVA transformer at Stickney primary, resolving constraints on both the existing transformer and the downstream 11 kV network. The second transformer would be fed from Skegness BSP, with the site run split. Some 33 kV circuit works would be required to resolve an existing network complexity issue to facilitate this.

2.3 Langrick primary transformer overloads

Constraint Overview

Generation | **Demand**

The table below outlines the nature of the network constraints identified in the network analysis. Overloads are also projected on the transformers at Sleaford Road primary when backfeeding Langrick, but these could be managed operationally by splitting at 11 kV.

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
Langrick primary transformer overloads	None	None	Baseline	Baseline	Baseline	2028

Uncertainty under other Distribution Future Energy Scenarios: As this constraint is present in the baseline, regardless of the scenario some form of mitigation is required. Up to 2028 demand growth is projected to be very low under every scenario. After 2028 demand growth is forecast to increase under the higher growth scenarios (Leading the Way, Consumer Transformation and to some extent System Transformation). Under Falling Short demand growth continues to be low up to 2034.

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 transformer at Langrick primary.
2	Install a second transformer and circuit to Langrick primary.
Operational Mitigation	
3	Transfer demand at 11 kV.
Flexibility Services	
4	Procure flexibility under Langrick primary.

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 transformer at Langrick primary

Viable

Capacity released for constraint(s) considered: Up to 8 MVA

New limiting factor for constraint(s) considered: 11 kV backfeed capacity

Detailed description: Uprating the transformer at Langrick primary to 12/24 MVA would alleviate this constraint, and would prepare the site for an eventual reinforcement to a two transformer site as discussed in option 2. Based on the low total demand for the site and the low growth forecast for the short to medium term, this reinforcement could likely be deferred through the use of 11 kV transfers and/or flexibility as outlined below.

Option 2 – Install a second transformer and circuit to Langrick primary

Viable

Capacity released for constraint(s) considered: 19 MVA

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

Detailed description: In the longer term, if demand growth in the area does materialise a second transformer could be installed at the site and a new 33 kV circuit built from Boston BSP. Creating a new infeed via Tattershall could also be explored, but this network is constrained as highlighted in the Grantham and Sleaford 33 kV report. This reinforcement would not be progressed in the short term, as the initial strategy would likely be simply uprating the existing transformer to a 12/24 MVA unit (which would be a lower cost, lower regret option to implement first and would lay the groundwork for this more permanent reinforcement).

Whether this option is progressed in the long term will be dependent on a number of factors. Firstly, it will only be required if the demand growth forecast for the area materialises. Secondly, whether adding this capacity at Langrick is a strategic choice will be dependent on the capacity and development of the 11 kV network in the area. This is due to the fact that the vast majority of the demand growth in the area is in and around Boston itself, so upgrading Sleaford Road primary may be more advantageous as it is far closer to the centre of load growth (and closer to Boston BSP itself so less 33 kV circuit would need to be built). Forecasts show that Sleaford Road is near its capacity by 2034, so upgrading the transformers there to 20/40 MVA units is likely to be the optimal choice for adding capacity to the area.

Option 3 – Transfer demand at 11 kV

Viable

Capacity released for constraint(s) considered: Dependent on 11 kV transfers

New limiting factor for constraint(s) considered: 11 kV network

Detailed description: Transferring demand away from Langrick at 11 kV (most likely to Sleaford Road primary) could be a more economical way of resolving this constraint (even if some 11 kV works are required to facilitate this). More in depth studies at 11 kV are required to assess both the short term options for load transfers, and where the most strategic location for adding capacity to the area is (as discussed in option 2 above).

Option 4 – Procure flexibility under Langrick 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 transformer at Langrick. This could be utilised in conjunction with the transfer of demand at 11 kV discussed in option 3 above. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

Demand at Langrick primary is only slightly over the nameplate rating of its transformer. It is therefore very likely that transfers at 11 kV, utilising higher ratings on the transformer and/or the use of flexibility services will be capable of managing this constraint, and given the low demand growth forecast for the area in the short to medium term this could be maintained for some time. These mitigations will provide time to assess how demand in the area develops and ensure there is a robust need case before reinforcing.

If reinforcement is eventually triggered, uprating the transformer at Langrick to 12/24 MVA would be a relatively low cost and low regret option. Only if all other options have been exhausted would installing a second transformer and 33 kV infeed be triggered, as it is by far the highest cost option (and may not be the most strategic choice as the majority of the load growth in the area is in Boston itself).

2.4 Marsh Lane primary transformer and circuit 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 under Best View
			Summer (generation)
Marsh Lane primary transformer reverse power flow overload	Arranged or fault outage on either infeed to Marsh Lane	None	2028
Boston BSP to Marsh Lane circuit overloads	Arranged or fault outage on either Boston to Marsh Lane circuit	None	2028
Boston BSP to Marsh Lane T1 circuit overload	None	None	2034

Uncertainty under other Distribution Future Energy Scenarios: Virtually identical growth in generation is forecast under all five scenarios, triggering overloads in 2028 in all cases.

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	Uprate both transformers at Marsh Lane primary.
2	Unstitch Marsh Lane primary.
Operational Mitigation	
3	Active Network Management.
Flexibility Services	
4	Procure flexibility under Marsh Lane primary.

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.

Option 1 – Uprate both transformers at Marsh Lane primary

Viable

Capacity released for constraint(s) considered: Up to 14 MVA

New limiting factor for constraint(s) considered: 33 kV circuit ratings

Detailed description: Uprating both 33/11 kV transformers at Marsh Lane primary to 20/40 MVA units would alleviate the projected overloads on the transformers at Marsh Lane. To fully resolve this constraint 33 kV circuit works will also be required as discussed in option 2 below.

Option 2 – Unstitch Marsh Lane primary

Viable

Capacity released for constraint(s) considered: The total export from Kirton, Donington and a number of 33 kV generators

New limiting factor for constraint(s) considered: Transformer reverse power flow ratings

Detailed description: In order to alleviate the projected 33 kV circuit constraint and allow the full reverse power flow capability of 20/40 MVA transformers to be utilised at Marsh Lane primary circuit works will be required. Marsh Lane is located in close proximity to Boston BSP, so at a relatively low cost new 33 kV cables could be laid to the site (as well as to nearby 33 kV customer sites). Recent works at Boston BSP have created the option to expand the 33 kV board to feed new circuits, which will facilitate this option. By unstitching these sites, Marsh Lane and Kirton will both have two 33 kV infeeds. If a new 33 kV circuit is eventually taken to Donington primary (which is discussed as an option in Section 2.5 of this report) it would leave all three primaries to the south of Boston supplied by dedicated 33 kV infeeds. This would create a simplified and futureproof network which is easier to operate and suitable to accommodate long term load growth in the area.

Option 3 – Active Network Management

Viable

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

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

Detailed description: Any additional connections at Marsh Lane 11 kV could be included in an Active Network Management (ANM) scheme. ANM schemes are used to manage constraints on over-committed networks.

Option 4 – Procure flexibility under Marsh Lane primary

Discounted

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

Detailed description: Flexibility is not suitable to manage this constraint as it is generation driven. Managing generation constraints using flexibility procurement is technically feasible, but NGED's internal tools and processes for calculating flexibility requirements for generation constraints are still in development.

Solution Recommendation

Replacing the transformers at Marsh Lane primary with 20/40 MVA units would resolve part of this constraint, with 33 kV circuit works being required to deal with the other part. Unstitching and simplifying this section of network will also confer a number of network benefits as discussed in the descriptions above.

2.5 Boston BSP to Donington primary 33 kV circuit 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 under Best View
			Summer (generation)
Boston BSP to Donington T1 circuit overload	Kirton to Donington 33 kV circuit arranged or fault outage	None	Baseline

Uncertainty under other Distribution Future Energy Scenarios: As this constraint is present in the baseline it will require intervention regardless of the forecasts for each scenario.

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 33 kV circuit to Donington primary.
2	Unstitch Donington primary.
Operational Mitigation	
3	Active Network Management.
Flexibility Services	
4	Procure flexibility under Donington primary.

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.

Option 1 – Uprate the 33 kV circuit to Donington primary

Discounted

Capacity released for constraint(s) considered: Dependent on new rating

New limiting factor for constraint(s) considered: New 33 kV circuit rating

Detailed description: Uprating the 33 kV circuit to Donington primary is one option for resolving this constraint. While it is technically viable, it does not confer the additional network benefits that unstitching the primary from the other sites on this circuit does as proposed in option 2 below.

This option has therefore been discounted, as it would require a similar length of circuit works overall (as the majority of the existing circuit is a similar rating and would therefore all need uprating to free up significant capacity).

Option 2 – Unstitch Donington primary

Viable

Capacity released for constraint(s) considered: The export of a number of 33 kV generators

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

Detailed description: The 33 kV circuit from Boston BSP to Donington primary is shared with a number of 33 kV generators. Building dedicated 33 kV circuits to these sites would take them off the existing circuit, freeing up significant generation capacity at Donington itself. These circuits could then also be used in the future to create a second direct feed from Boston to Donington (fully unstitching Donington from Kirton and Marsh Lane and simplifying the overall network considerably as noted in Section 2.4 of this report). Recent works at Boston have opened up the option of creating new 33 kV circuits out of the BSP, facilitating this option.

Option 3 – Active Network Management

Viable

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

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

Detailed description: Any additional connections at Donington 11 kV could be included in an Active Network Management (ANM) scheme. ANM schemes are used to manage constraints on over-committed networks.

Option 4 – Procure flexibility under Donington primary

Discounted

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

Detailed description: Flexibility is not suitable to manage this constraint as it is generation driven. Managing generation constraints using flexibility procurement is technically feasible, but NGED's internal tools and processes for calculating flexibility requirements for generation constraints are still in development.

Solution Recommendation

In the short term the use of ANM could potentially defer reinforcement. When reinforcement is triggered Donington could be unstitched from the 33 kV generators which currently share the circuit from Boston to T1. If this is eventually then used to create two dedicated direct circuits from Boston BSP to Donington primary this would also rationalise the overall network as noted above.

2.6 Boston BSP GT overloads

Constraint Overview

Generation | Demand

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

Table 2.6.1 constraint(s) and conditions under which constraint(s) occur

Constraint	N-1 Condition	Subsequent N-2 Condition	First year constraint is observed in each season under Best View			
Demand			**Winter**	**Int Cool**	**Int Warm**	**Summer**
Boston GT1 or GT2 overload	Fault or arranged outage on either GT at Boston	None	2034	2028	2034	2034
Generation			**Summer**			
Boston reverse power flow GT overload	Fault or arranged outage on either GT at Boston	None	2028			

Uncertainty under other Distribution Future Energy Scenarios: Under System Transformation demand overloads are not seen in winter or summer by 2034 (and under Falling Short demand overloads are not projected for any season by 2034). In contrast much higher demand growth is forecast for Leading the Way and Consumer Transformation. On the generation side growth is driven mainly by a number of large generators.

Solution Options

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

Table 2.6.2 solution options to solve constraint(s)

Option	Description
Reinforcement	
1	Uprate the GTs at Boston BSP.
2	Install a third 132/33 kV GT at Boston BSP.
3	Build a new 132/11 kV BSP.
Operational Mitigation	
4	Review seasonal ratings.
5	Active Network Management.
Flexibility Services	
6	Procure flexibility under Boston 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 Boston BSP

Discounted

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

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

Detailed description: Uprating the 132/33 kV GTs at Boston 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 GT at Boston BSP

Viable

Capacity released for constraint(s) considered: 80 MVA

New limiting factor for constraint(s) considered: Walpole to Boston 132 kV circuit capacity

Detailed description: A third GT could be installed at Boston to resolve both the demand and generation constraints forecast at the BSP. To allow the capacity of the new GT to be fully utilised, it would be set up such that it can feed onto either of two 33 kV boards (with an existing GT feeding onto each of those boards). This would allow each side to be loaded up to the full capacity of a GT, and the site to be easily split in half for arranged outages on any GT.

This solution would create sufficient capacity for the load growth forecast at Boston up to 2050. There are however two issues with this reinforcement strategy:

- Firstly, space limitations at the site may not allow for a third GT (and the associated 132 kV and 33 kV switchgear required) to be installed. Detailed network design will be carried out ahead of any reinforcement at Boston to determine what can be achieved.
- Secondly, the majority of the demand growth forecast for Boston is located to the north of the Haven River, which presents a significant barrier to building new circuits from Boston BSP into the city centre. While no overloads have been identified up to 2034 on the existing circuits, to support long term growth in the area new circuits may need to be built (which could be expensive, requiring lengthy diversions to reach a suitable river crossing).

Option 3 – Build a new 132/11 kV BSP

Viable

Capacity released for constraint(s) considered: Up to 78 MVA

New limiting factor for constraint(s) considered: 11 kV transfer capacity and generation capacity

Detailed description: If a new BSP were built in the area with two 132/11 kV GTs, it could be used to deload the existing Boston BSP and alleviate this constraint. This option could be advantageous as the majority of the load growth in the area is concentrated within Boston itself.

A new BSP to the south of Boston would be of limited benefit, as of the three primaries to the south of the river only one could be significantly deloaded (Marsh Lane) with the other two (Kirton and Donington) being too far away to transfer any significant load to a new site.

A new BSP to the north of Boston, in contrast, could allow Mount Bridge and Sleaford Road primaries to be deloaded. These two sites are forecast to see the highest demand growth among the primaries fed from Boston BSP, and are both projected to be constrained by 2040.

There are two major challenges in achieving this reinforcement option:

- A new site would need to be located, which could be difficult and costly (as would building new 132 kV circuits to feed the new BSP via Boston).
- There are two 132 kV dual circuits to Boston BSP, one from Walpole GSP which supplies it under normal running arrangements and one from Bicker Fen GSP which continues on to supply Skegness BSP. Neither of these dual circuits have the available addresses to supply a new BSP, so to build one existing sites would need to be unstitched (which could be very expensive).

One final drawback of this option is that it would not be as advantageous on the generation side, as a large portion of the generation downstream of Boston BSP is connected at 33 kV (and as such could not be easily transferred to a 132/11 kV site).

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: Demand overloads are only seen in 2028 for intermediate cool. It is therefore possible that the demand 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 (as by 2034 overloads are projected for all four seasons).

Option 5 – Active Network Management

Viable

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

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

Detailed description: Any additional connections downstream of Boston BSP would be included in an Active Network Management (ANM) scheme. ANM schemes are used to manage constraints on over-committed networks. This option could help manage the projected generation constraint at Boston, but not the projected demand constraint.

Option 6 – Procure flexibility under Boston BSP

Viable

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

Detailed description: Flexibility services could be procured on the network supplied from Boston BSP to alleviate the projected demand overloads seen on the GTs. Flexibility would not be suitable for managing the reverse power flow constraint projected at Boston. The viability of utilising flexibility will be further investigated as part of the DNOA process.

Solution Recommendation

In the short term, the use of ANM and/or flexibility services could potentially help manage this constraint. However, the high load growth forecast will at some point necessitate reinforcement. The two reinforcement strategies considered both have significant hurdles to overcome, so further design work is required to determine what can be achieved at the existing site or whether a suitable new site can be identified (to either add a third 132/33 kV GT at Boston BSP or build a new BSP with two 132/11 kV GTs).

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