Briton Ferry and Tir John BSPs incl. associated 33 kV networks

Network Development Report – South Wales

May 2024

Electricity Distribution

nationalgrid

Contents

Briton Ferry & Tir John BSPs & Associated Networks

1. Network Overview

Briton Ferry and Tir John Bulk Supply Points (BSPs) supply areas of 33 kV network to the East of Swansea. Both BSPs are supplied by two 132/33 kV 90 MVA Grid Transformers (GTs) and fed via 132 kV circuits from Swansea North GSP. The associated 33 kV networks feed a mostly urban area supplying over 75,000 customers that includes the following 33/11 kV Primary substations:

- Briton Ferry BSP:
  - Briton Ferry, Commercial Street, Wern, Victoria Road and Ynys Street.
- Tir John BSP:
  - Gethin Street, Jersey Marine, Llandarcy, Strand, Swansea Waterfront and Upper Bank.

A large amount of distributed generation has connected to the 33 kV and 11 kV networks in recent times, more of which is proposing to connect in the near future, in a variety of different technology types. Briton Ferry also supplies a large industrial demand customer on the 33 kV network.

Briton Ferry BSP currently has a maximum demand of 78.39 MVA and under NGEDs DFES Best View scenario this is projected to rise to 96.60 MVA by the year 2034.

Tir John BSP currently has a maximum demand of 78.25 MVA and under NGEDs DFES Best View scenario this is projected to rise to 109.92 MVA by the year 2034.

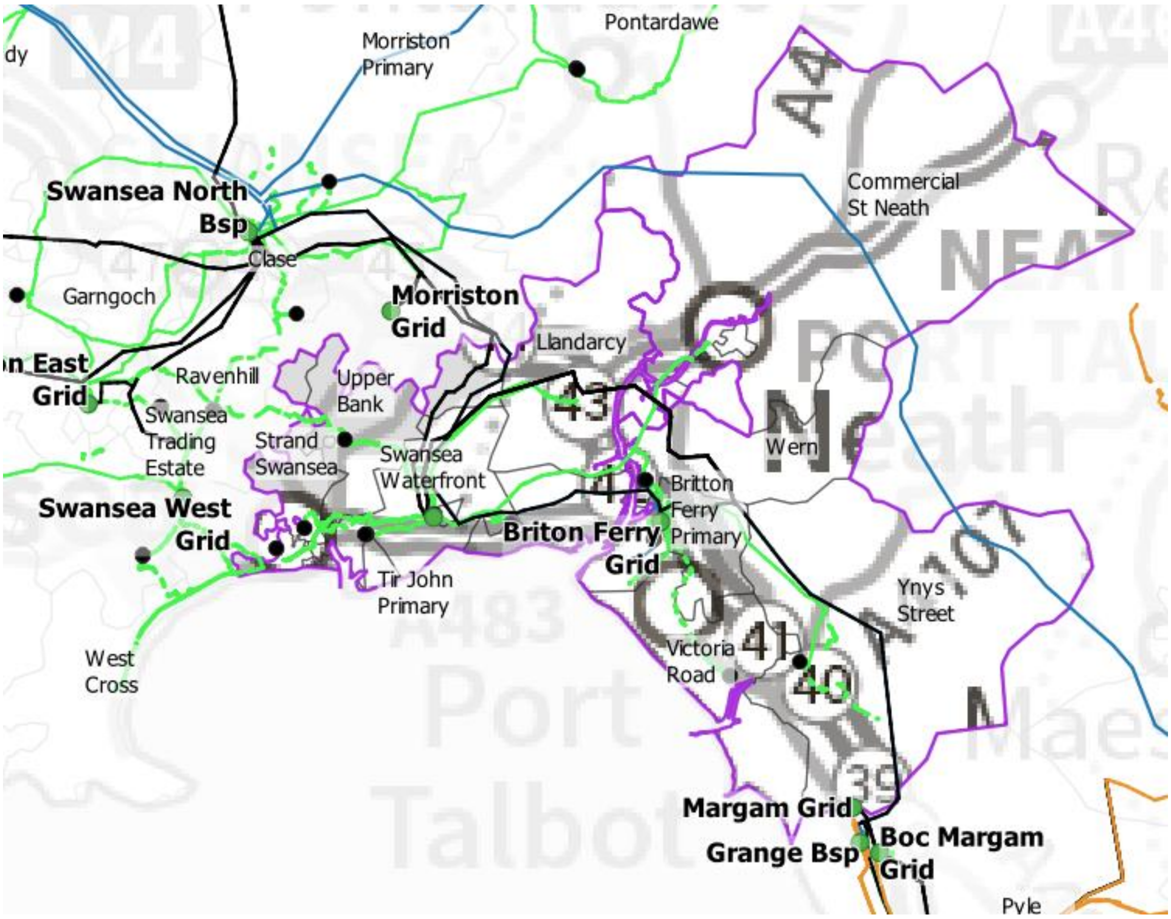

Figure 1.1 Briton Ferry and Tir John BSPs geographic network coverage

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, 132/33 kV transformers and 132 kV circuits which supply and are supplied by Briton Ferry and Tir John BSPs. 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. The two most onerous half-hours have been studied for each of the five representative days considered: Winter Peak Demand, Intermediate Warm Peak Demand, Intermediate Cool Peak Demand, Summer Peak Demand and Summer Peak Generation.

1.1 Briton Ferry Network Topology

The Briton Ferry BSP network is arranged as follows:

- Briton Ferry 132/33 kV GT1 and GT2, both rated at 60/90 MVA, currently run in parallel supplying a two-section indoor 33 kV switchboard. The outgoing 132 kV circuits are supplied from Swansea North GSP.
- Outgoing 33 kV circuits from Briton Ferry BSP supply the following five 33/11 kV primary substations:
    - Commercial Street: Two 15/21 MVA primary transformer substation (T1 & T2)
    - Wern: Two 12/24 MVA primary transformer substation (T1 & T2)
    - Victoria Road: Two 12/24 MVA primary transformer substation (T1 & T2)
    - Ynys Street: Single 12/24 MVA primary transformer substation (T1)
    - Briton Ferry: Two 12/24 MVA primary transformers (T3 & T4) supplied by two 33 kV interplants from the same compound as Briton Ferry BSP
- Briton Ferry BSP provides connection to a 33 kV demand connected customer in addition to several 33 kV generation connections.
- Two 33 kV circuits from Tir John BSP tee into the Briton Ferry to Commercial Street 33 kV feeders. These circuits, which are normally run open at Jersey Marine, can provide 33 kV interconnection between Briton Ferry and Tir John BSPs under select operating conditions.
- Victoria Road and Ynys Street Primaries are interconnected through the 11 kV network.

SLM 921
Briton Ferry

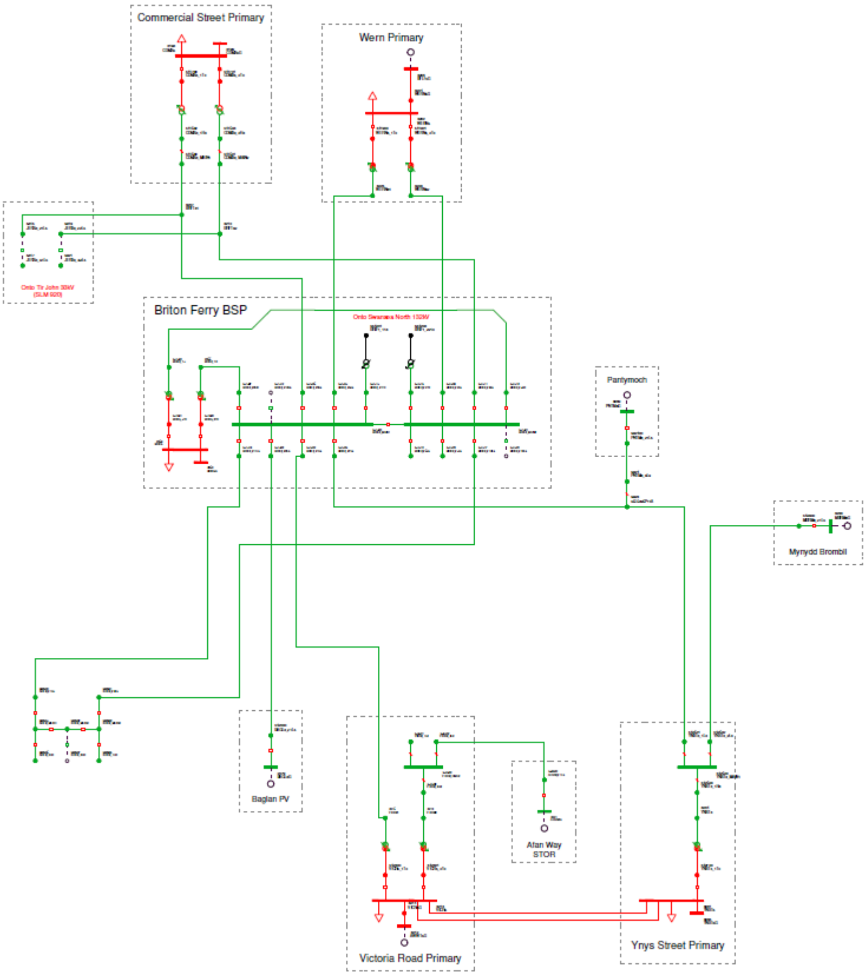

Figure 1.1.1 Briton Ferry 132/33 kV BSP network single line diagram

1.2 Briton Ferry 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 an arranged outage of either GT1 or GT2 at Briton Ferry BSP, the 33 kV normally open points at Jersey Marine can be moved to 8L5 and 9L5 at Briton Ferry BSP. This allows Commercial Street to be supplied from Tir John, de-loading Briton Ferry in the process.
- Due to the 33 kV interconnection afforded between both BSPs, in a similar manner, for an arranged outage of either GT1 or GT2 at Tir John BSP, the 33 kV normally open points at Jersey Marine can be moved to 2L5 and 9L5 at Tir John BSP. This allows Jersey Marine to be supplied from Briton Ferry, de-loading Tir John in the process.
- Post fault switching may also lead to either Commercial Street or Jersey Marine being supplied by the neighbouring BSP depending on the GT that has faulted.
- For the loss of an infeed to a transformer at any of the primaries fed from Briton Ferry BSP under arranged outages, the lower voltage side circuit breaker is opened to prevent back-energisation.
- For any outage impacting the 33 kV circuit between Briton Ferry and Ynys Street or for the outage of Ynys Street 33/11 kV T1, the load at the Primary can be backfed via the 11 kV network to Victoria Road Primary.
- Curtailment of all connected load management schemes within the group are modelled at a variety of outage conditions, as outlined in customer connection agreements.
- Various winter arranged outages not permitted due to SCO overloads.
- Various SCO overloads solved by network reconfiguration for arranged outages.

1.3 Tir John Network Topology

The Tir John BSP network is arranged as follows:

- Tir John 132/33 kV GT1 and GT2, both rated at 60/90 MVA, currently run in parallel supplying a two-section indoor 33 kV switchboard. The outgoing 132 kV circuits are supplied from Swansea North GSP.
- Outgoing 33 kV circuits from Tir John BSP supply the following five 33/11 kV primary substations:
    - Gethin Street: Two 12/24 MVA primary transformer substation (T1 & T2)
    - Jersey Marine: Two 12/24 MVA primary transformer substation (T1 & T2)
    - Llandarcy: Two 12/24 MVA primary transformer substation (T1 & T2)
    - Strand: Two 11.5/23 MVA primary transformer substation (T1 & T2)
    - Swansea Waterfront: Two 20/40 MVA primary transformer substation (T1 & T2)
    - Upper Bank: Two primary transformer substation

      T1 (11.5/23 MVA) and T2 (12/24 MVA)
    - Tir John: Two 7.5/15 MVA primary transformers (T3 & T4) supplied by two 33 kV interplants from the same compound as Tir John BSP
- Two 33 kV circuits from Tir John BSP tee into the Briton Ferry to Commercial Street 33 kV feeders. These circuits, which are normally run open at Jersey Marine, can provide 33 kV interconnection between Briton Ferry and Tir John BSPs under select operating conditions.
- A 33 kV interconnection to Ravenhill Primary is tee'd into the Upper Bank T1 to Tir John 33 kV feeder. This circuit, which is normally run open at Ravenhill, can provide 33 kV interconnection between Swansea West, Swansea North and Tir John BSPs under select operating conditions.

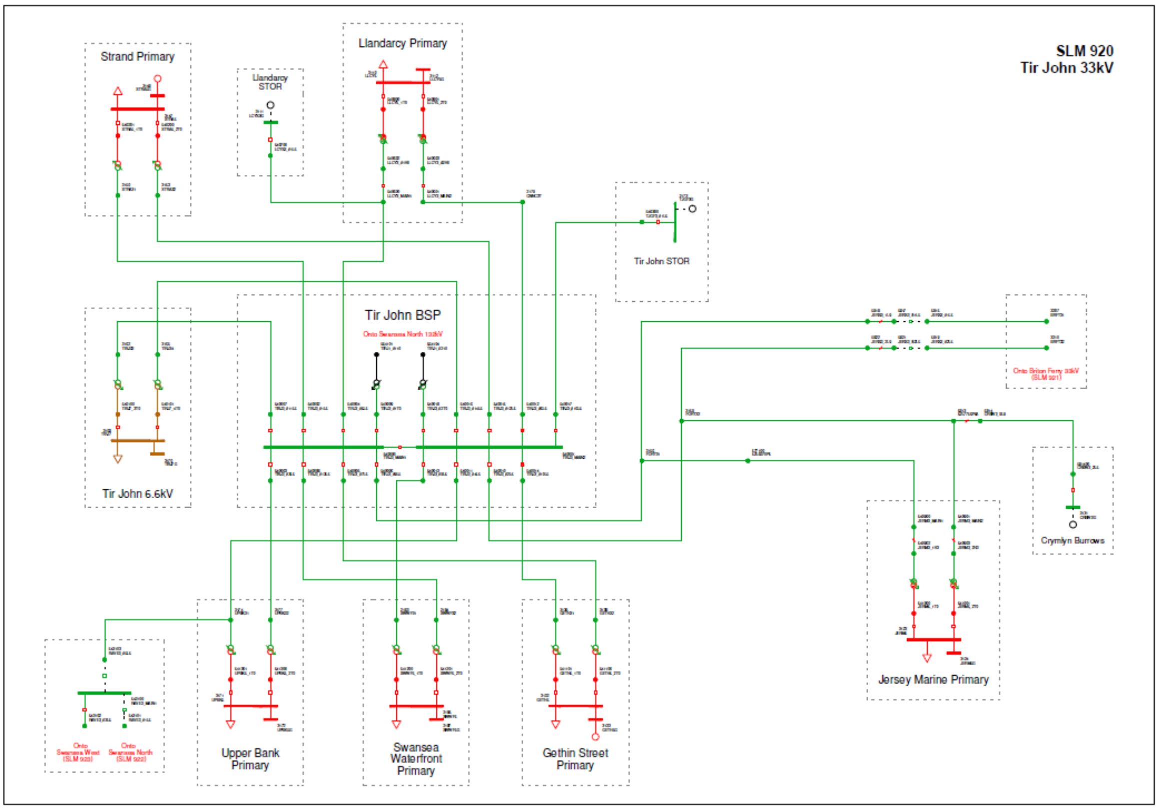

Figure 1.3.1 Tir John 132/33 kV BSP network single line diagram

1.4 Tir John 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 an arranged outage of either GT1 or GT2 at Tir John BSP, the 33 kV normally open points at Jersey Marine can be moved to 2L5 and 9L5 at Tir John BSP. This allows Jersey Marine to be fed from Briton Ferry, de-loading Tir John in the process.
- Due to the 33 kV interconnection afforded between both BSPs, in a similar manner, for an arranged outage of either GT1 or GT2 at Briton Ferry BSP, the 33 kV normally open points at Jersey Marine can be moved to 8L5 and 9L5 at Briton Ferry BSP. This allows Commercial Street to be fed from Tir John, de-loading Briton Ferry in the process.
- The 33 kV circuit to Ravenhill Primary that can provide interconnection between Swansea West, Swansea North and Tir John BSPs is primarily utilised to support either BSP following SCO outage conditions.
- Post fault switching may also lead to either Commercial Street or Jersey Marine being supplied by the neighbouring BSP depending on the GT that has faulted.
- For the loss of an infeed to a transformer at any of the primaries fed from Tir John BSP under arranged outages, the lower voltage side circuit breaker is opened to prevent back-energisation.
- Curtailment of all connected load management schemes within the group are modelled at a variety of outage conditions, as outlined in customer connection agreements.
- Various winter arranged outages not permitted due to SCO overloads.
- Various SCO overloads solved by network reconfiguration for arranged outages.

2. Summary of Network Constraints

The following constraints were identified for the Best View Scenario, for which mitigation options will be discussed:

- Briton Ferry 33 kV Constraints:
  - Briton Ferry Grid Transformer Capacity
  - Briton Ferry to Victoria Road 33 kV Circuit Overload
- Tir John 33 kV Constraints:
  - Thermal overloads due to the amount of hydrogen electrolysis forecast to connect to this network up to 2034
- Combined Reinforcement Strategy

3. EHV Reinforcement Schemes Progressing

The following list contains the EHV reinforcement schemes that are currently in active development in this area to overcome a number of constraints facing the network, these include:

- Briton Ferry BSP:
  - Installation of a new 33/11 kV primary transformer (T2) at Ynys Street, to be rated at 12/24 MVA.
  - Installation of a second 33 kV circuit from Briton Ferry BSP to Ynys Street. Approximately 7 km of 185mm^2 copper EPR cable is expected to be installed.
  - Following these works, the normally closed 11 kV interconnectors between Ynys St and Victoria Road are expected to be opened.

4. Network Constraint Details and Solution Options

4.1 Briton Ferry 33 kV Group

The table below summarises the scale of the background load growth forecast to connect to the Briton Ferry 33 kV network up to 2034 under NGEDs DFES Best View scenario.

Table 4.1.1 Maximum demand forecast to connect to the Briton Ferry 33 kV network

DFES Scenario	Demand		
	Baseline	2028	2034
Best View	78.39 MW	91.72 MW	96.60 MW

Table 4.1.2 Maximum generation forecast to connect to the Briton Ferry 33 kV network

DFES Scenario	Generation		
	Baseline	2028	2034
Best View	65.42 MW	71.37 MW	91.16 MW

With several new developments proposed to connect within the group at 11 kV and at 33 kV in the near future, the demand and generation forecast is expected to increase. However, this will vary depending if such developments materialise.

This group becomes vulnerable to outage conditions throughout the 0-10 year horizon period as a result of the load growth projections. These limitations are highlighted below.

4.2 Briton Ferry 132/33 kV Grid Transformer Capacity

For a first circuit outage which results in the loss of either Briton Ferry 132/33 kV GT (GT1 or GT2), the remaining GT in service is predicated to exceed its rating by the end of this assessment period.

Constraint Overview

Generation Demand

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

Table 4.2.1 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
Briton Ferry GT1 or GT2 overload	Fault to either GT/ 132 kV circuit	None	N/A	N/A	N/A	2034

Solution Options

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

Table 4.2.2 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	Uprate GTs by use of cyclic ratings	✓	✓	✓	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
2	Active Network Management schemes	✓	✓	✓	Viable
Flexibility services					
-	*None Identified*	-	-	-	-

Uncertainty under other Distribution Future Energy Scenarios: This constraint is not an issue under the current baseline scenario. Based on the DFES projections and expected energisation dates of new connections, constraints are observed from 2030 under Leading the Way. Under Consumer Transformation and Best View, constraints appear from 2032 and 2034 respectively.

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 0 – No Intervention

Capacity Released for constraint(s) considered: 0 MVA — Discounted

Detailed description: Doing nothing to mitigate the constraint would result in GT overloads for the conditions described above. Therefore, not intervening would cause problems with system integrity (overloads) and would risk damaging the transformers.

Existing limiting factor for constraint(s) considered:

Existing Briton Ferry 90 MVA GT Rating

Option 1 – Uprate Briton Ferry GTs by use of cyclic ratings

Capacity Released for constraint(s) considered: Viable

27 MVA (winter cyclic increase) and 9 MVA (summer cyclic increase)

Detailed description: Uprating the existing GTs by use of cyclic ratings in accordance with British Standard 171/IEC60076 and NGED Standard Technique SD8C will provide additional capacity for the network. This requires a capability assessment of all transformer ancillaries. In addition, an assessment of the cyclic profile of the load will be required to determine if transformer temperature and ageing is within acceptable limits.

These works can increase the winter cyclic rating to 117 MVA and summer cyclic to 99 MVA if the assessment permits the use of cyclic ratings. Given the load growth across the area during this 0-10 year horizon, the use of cyclic ratings will alleviate the constraints observed up to 2034.

By 2034, generation growth could rise up to 117.02 MW taking proposed developments into account. This figure will reduce to 96.35 MW under FCO conditions for the loss of either GT, based on the export reduction facing particular load management schemes. However, with only a slight increase in the summer cyclic rating, this option would likely only defer a permanent solution, particularly in the years beyond this assessed period.

New limiting factor for constraint(s) considered:

Briton Ferry GT1/GT2 with a 117 MVA (winter cyclic) and 99 MVA (summer cyclic) rating.

Option 2 – Active Network Management schemes

Capacity Released for constraint(s) considered: Dependent on ANM scheme Viable

Detailed description: Any additional connections into this group may be included in an Active Network Management (ANM) scheme, which could also be utilised to manage constraints on over-committed networks.

New limiting factor for constraint(s) considered:

Existing Briton Ferry 90 MVA GT rating

Solution Recommendation

It is recommended that an assessment of cyclic ratings should be carried out alongside an internal review of the transformer seasonal ratings, to help address the overloads observed at Briton Ferry BSP. This alleviates the projected overloads observed across this assessed period.

Following this and in-line with the generation growth observed, consideration should be given to introducing a DANM scheme, notably towards the end of this period of assessment and beyond to manage the power flow through the associated GTs.

In view of the increases in demand and generation forecast across both Briton Ferry and Tir John groups, please see Network Constraint 4.7 for an alternative reinforcement strategy associated to both BSPs.

4.3 Briton Ferry to Victoria Road T2 33 kV Circuit Overload

Constraint Overview

Generation Demand

For a first circuit fault which results in the loss of the Briton Ferry to Victoria Road T1 33 kV circuit, or for a Victoria Road T1 fault, the 33 kV circuit between Briton Ferry and Victoria Road T2 33 kV circuit begins to overload in-line with the generation growth projected.

An EHV reinforcement scheme to install a second 33 kV circuit from Briton Ferry to Ynys Street alongside a new 33/11 kV transformer at Ynys Street (T2) is currently in active development and it is expected to be completed by 2025/26. Once complete, the normally closed 11 kV interconnectors between Ynys Street and Victoria Road are expected to be opened.

A steady increase in distributed generation is expected to connect to Victoria Road throughout this period of assessment. By 2028, it is projected that 5.3 MW will connect to the primary. By 2034, this figure is expected to rise to 8.3 MW.

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

Table 4.3.1 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
Briton Ferry to Victoria Road T2 33 kV circuit overload	Briton Ferry to Victoria Road T1 33 kV circuit fault or Victoria Road T1 fault	None	N/A	N/A	N/A	2028

Solution Options

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

Table 4.3.2 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	Overlay the limiting sections of the Briton Ferry to Victoria Road T2 33 kV circuit	✓	✓	✓	Viable
2	Reconfigure the 33 kV arrangement at Victoria Road by installing a dedicated 33 kV circuit from Afan Way to Briton Ferry	✓	×	×	Discounted
Operational Mitigation					
3	Transfer generation to nearby primaries	×	✓	✓	Discounted
Load Management Schemes					
-	*None Identified*	-	-	-	-
Flexibility services					
-	*None Identified*	-	-	-	-

Uncertainty under other Distribution Future Energy Scenarios: This constraint is not an issue under the current baseline scenario. It first becomes present by 2028 under Leading the Way and Best View. Under Consumer Transformation and System Transformation, the constraint is not observed until 2029 and 2034 respectively.

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 0 – No Intervention

Capacity Released for constraint(s) considered: 0 MVA — **Discounted**

Detailed description: Doing nothing to mitigate the constraint would result in thermal overloads for the conditions described above.

Existing limiting factor for constraint(s) considered:

Briton Ferry to Victoria Road T2 33 kV circuit: 19.3 MVA (summer cyclic)

Option 1 – Overlay the limiting sections of the Briton Ferry to Victoria Road T2 33 kV circuit

Capacity Released for constraint(s) considered: 11.6 MVA — **Viable**

Detailed description: The Briton Ferry to Victoria Road T2 33 kV circuit rating is expected to be reached by 2028 under summer peak generation conditions.

To alleviate this 33 kV circuit overload, it would be proposed to overlay approximately 3.4 km of the limiting underground cable sections to 200mm^2 copper cable or similar.

New limiting factor for constraint(s) considered:

Briton Ferry to Victoria Road T2 33 kV circuit: 30.9 MVA (summer cyclic)

Option 2 – Reconfigure the 33 kV arrangement at Victoria Road by installing a dedicated 33 kV circuit from the nearby generation connected customer to Briton Ferry BSP

Capacity Released for constraint(s) considered: 19.3 MVA — **Discounted**

Detailed description: Installing a dedicated 5 km 33 kV circuit from the nearby generation connected customer to Briton Ferry BSP would alleviate the constraints identified on the Briton Ferry to Victoria Road T2 33 kV circuit.

Reconfiguring the existing 33 kV arrangement at Victoria Road in such a manner would release considerable capacity for future growth at Victoria Road with Afan Way being supplied directly from Briton Ferry BSP.

However, this option has been discounted based on the overall network benefit it would provide and is unlikely to be viewed as a cost-effective solution.

New limiting factor for constraint(s) considered:

Briton Ferry to Victoria Road T2 33 kV circuit: 19.3 MVA (summer cyclic)

Option 3 – Transfer generation to nearby primaries

Capacity Released for constraint(s) considered: 8 MVA by 2034 **Discounted**

Detailed description: The normally closed 11 kV interconnectors between Ynys St and Victoria Road are expected to be opened following the completion of the EHV reinforcement scheme. It is expected that these interconnectors can be closed into service to restore load from either primary depending on a particular outage.

To release additional capacity, new 11 kV circuits may be installed (or existing circuits reinforced) to provide greater interconnectivity towards nearby primaries.

The 11 kV interconnection has not been studied in detail, further analysis of the 11 kV network between Victoria Road and Ynys Street would be required to fully analyse any potential transfer capability. However 8 MVA of generation would need to be transferred away from Victoria Road to Ynys Street permanently to alleviate the constraints observed across this assessed period.

Given the generation growth forecast across Victoria Road and Ynys Street up to 2034, it is unlikely that 8 MVA could be transferred permanently without prompting additional reinforcement, restricting the level of capacity that could be transferred.

New limiting factor for constraint(s) considered:

Briton Ferry to Victoria Road T2 33 kV circuit: 19.3 MVA (summer cyclic)

Solution Recommendation

It is recommended that a technical review of overlaying the limiting 33 kV circuit sections between Briton Ferry and Victoria Road T2 is carried out (Option 1). This proposal is likely to be the most cost effective option to overcome the projected overloads on the Briton Ferry to Victoria Road T2 33 kV circuit.

4.4 Tir John 33 kV Group

The table below summarises the scale of the background load growth forecast to connect to the Tir John 33 kV network up to 2034 under NGEDs DFES Best View scenario.

Table 4.4.1 Maximum demand forecast to connect to the Tir John 33 kV network

DFES Scenario	Demand		
	Baseline	**2028**	**2034**
Best View	78.25 MW	95.90 MW	109.92 MW

Table 4.4.2 Maximum generation forecast to connect to the Tir John 33 kV network

DFES Scenario	Demand		
	Baseline	**2028**	**2034**
Best View	64.55 MW	67.09 MW	81.82 MW

With several new developments proposed to connect within the group at 11 kV and at 33 kV in the near future, the demand and generation forecast is expected to increase. However, this will vary depending if such developments materialise.

4.5 Tir John 132/33 kV Grid Transformer Capacity

For a first circuit outage which results in the loss of either Tir John 132/33 kV GT (GT1 or GT2), the remaining GT in service will overload towards the end of this assessment period.

Overloads are also observed under SCO conditions when an arranged outage of Briton Ferry GT1/GT2 is followed by a fault to Tir John GT1/GT2. Commercial Street Primary can be transferred across onto Tir John following an arranged FCO at Briton Ferry and as such a subsequent SCO fault at Tir John can lead to the remaining GT in service to supply an extended group.

These SCO overloads can be deferred by a number of years if operational outage windows can be restricted to intermediate warm and summer demand periods only.

Constraint Overview

Generation | **Demand**

The table below outlines the nature of the network constraints identified in the network analysis, with the worst overloads seen at winter peak and intermediate cool demands.

Table 4.5.1 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
Tir John GT1 or GT2 overload	Fault to either GT/ 132 kV circuit	None	2033	2033	N/A	N/A
Tir John GT1 or GT2 overload	Arranged Briton Ferry GT outage	Tir John GT fault	2028	2028	2032	2034

Solution Options

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

Table 4.5.2 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	Uprate GTs by use of cyclic ratings	✓	✓	✓	Viable
Operational Mitigation					
-	*None Identified*	-	-	-	-
Load Management Schemes					
2	Active Network Management schemes	×	✓	✓	Viable
Flexibility services					
3	Procure flexibility at Tir John BSP	×	✓	✓	Viable

Uncertainty under other Distribution Future Energy Scenarios: This constraint is not an issue under the current baseline scenario. Based on the DFES projections and expected energisation dates for several new connections, constraints are observed from 2028 under Leading the Way, Best View and Consumer Transformation. Under System Transformation and Falling Short, constraints are not observed until 2030 and 2034 respectively.

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 0 – No Intervention

Capacity Released for constraint(s) considered: 0 MVA **Discounted**

Detailed description: Doing nothing to mitigate the constraint would result in GT overloads for the conditions described above. Therefore, not intervening would cause problems with system integrity (overloads) and would risk damaging the transformers.

Existing limiting factor for constraint(s) considered:

Existing Tir John 90 MVA GT Rating

Option 1 – Uprate Tir John GTs by use of cyclic ratings

Capacity Released for constraint(s) considered: **Viable**

27 MVA (winter cyclic increase) and 9 MVA (summer cyclic increase)

Detailed description: Uprating the existing GTs by use of cyclic ratings in accordance with British Standard 171/IEC60076 and NGED Standard Technique SD8C will provide additional capacity for the network. This requires a capability assessment of all transformer ancillaries. In addition, an assessment of the cyclic profile of the load will be required to determine if transformer temperature and ageing is within acceptable limits.

These works can increase the winter cyclic rating to 117 MVA and summer cyclic to 99 MVA if the assessment permits the use of cyclic ratings. Given the load growth across the area during this 0-10 year horizon, the use of cyclic ratings will alleviate the constraints observed under FCO conditions.

Under the existing arrangement, SCO overloads can be deferred until 2032 if operational outage windows can be restricted to intermediate warm and summer demand periods only.

It is suggested that a review of the load share across the Tir John and Briton Ferry 33 kV groups is carried out. Due to a higher group demand forecast in Tir John, if Commercial Street Primary can remain in the Briton Ferry 33 kV group under arranged GT outage conditions then (with these increased cyclic ratings) Tir John GT overloads can be alleviated up to 2034.

However, this option would likely only defer a permanent solution, particularly in the years beyond this period of assessment.

New limiting factor for constraint(s) considered:

Tir John GT1/GT2 with a 117 MVA (winter cyclic) and 99 MVA (summer cyclic) rating.

Option 2 – Active Network Management schemes

Capacity Released for constraint(s) considered: Dependent on ANM scheme **Viable**

Detailed description: Any additional connections into this group may be included in an Active Network Management (ANM) scheme, which could also be utilised to manage constraints on over-committed networks.

New limiting factor for constraint(s) considered:

Existing Tir John 90 MVA GT rating

Option 5 – Procure flexibility at Tir John BSP

Estimated Flexibility Required (MVA): 20+ MVA by 2034 (Best View) **Viable**

Detailed description: Flexibility services could be procured throughout the Tir John 33 kV network to help alleviate the projected overloads. It is highly unlikely that sufficient flexibility could be procured as a long-term solution. The amount required will continue to grow as demand grows meaning this would likely only defer the reinforcement and may not be a viable permanent solution.

The viability of utilising flexibility will be further considered as part of the DNOA process.

Solution Recommendation

It is recommended to firstly consider flexibility as an option to gauge the level of procurement available within the area, subject to a cost benefit analysis and confirmation through the DNOA process.

Following this and in-line with the load growth forecast, it is recommended that an assessment of cyclic ratings should be carried out alongside an internal review of the transformer seasonal ratings, to help address the overloads observed at Tir John BSP. This alleviates the constraints observed across this assessed period and ensures compliance with P2/8.

In view of the increases in demand and generation forecast across both Briton Ferry and Tir John groups, please see Network Constraint 4.7 for an alternative reinforcement strategy associated to both BSPs.

4.5 Tir John 33 kV Hydrogen Electrolysis

Constraint Overview

The table below summarises the scale of the hydrogen electrolysis forecast to connect to the Tir John 33 kV network up to 2034. The constraints this could cause and the network reinforcement required to mitigate against them will be dependent on the geographic locations of the connecting electrolysers and their sizes.

Table 4.5.1 Total hydrogen electrolysis forecast to connect to the Tir John 33 kV network

DFES Scenario	Demand			
	Baseline	**2025**	**2028**	**2034**
Best View	0 MW	12.40 MW	12.40 MW	15.14 MW
System Transformation	0 MW	9.40 MW	9.40 MW	11.55 MW
Leading the Way	0 MW	12.40 MW	12.40 MW	15.14 MW
Consumer Transformation	0 MW	1.08 MW	1.08 MW	3.02 MW
Falling Short	0 MW	0.25 MW	0.25 MW	0.25 MW

Uncertainty under other Distribution Future Energy Scenarios: As shown in the table above the Best View scenario is aligned to Leading the Way for this area, with lower hydrogen electrolysis forecast under System Transformation and significantly lower forecast under Consumer Transformation and Falling Short.

Solution Options

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

Option	Description
Reinforcement	
1	Uprate the existing primaries supplied from within the Tir John 33 kV network
2	Build a new primary substation

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 as part of the connections planning process.

Option 1 – Uprate the existing primaries supplied from the Tir John 33 kV network

Capacity released for constraint(s) considered: Viable

Dependent on the reinforcement strategy for each affected primary

Detailed description: If the forecast demand of hydrogen electrolysis is split among a high number of smaller electrolysers which are geographically dispersed within the area supplied within the Tir John 33 kV network, a single point of connection would not be practical or economical. If this is the case reinforcing the existing network would be the optimal reinforcement strategy.

New limiting factor for constraint(s) considered:

Existing Tir John 90 MVA GT rating

Option 2 – Build a new primary substation

Capacity released for constraint(s) considered: Up to 38 MVA

Viable

Detailed description: If the forecast demand from hydrogen electrolysis is made up of a smaller number of electrolysers which are located in close proximity to each other and not to any of the existing substations supplied from within the Tir John 33 kV network then building a new primary substation may be the optimal solution to accommodate this demand.

This option would create significant additional capacity which could be further utilised to deload some of the existing primaries and alleviate or push back some of the forecast constraints at each substation. The technical and economic feasibility of such transfers would be heavily dependent on both the location of the new primary and the capacity of the existing 11 kV network.

New limiting factor for constraint(s) considered:

Existing Tir John 90 MVA GT rating

Solution Recommendation

Options for accommodating the demand on the 33 kV and 11 kV networks include building a new primary or fortifying the existing primaries.

The optimal solution will be heavily dependent on the size and location of the electrolysers and will be considered in depth as part of NGED’s connections planning process (and in future NDP reports to consider the synergies with other constraints).

4.6 Combined Reinforcement Strategy (Briton Ferry and Tir John groups)

Generation | Demand

In view of the increases in demand and generation forecast for the Briton Ferry and Tir John groups, it is worth considering a wider reinforcement strategy to ensure that additional capacity is available to supply both networks up to the end of this assessed period and beyond. The use of cyclic ratings will ensure both BSPs have sufficient capacity up to 2034 which could be further assisted by the possible integration of DANM systems to manage the power flow through the associated GTs.

However, additional works are likely to be a requirement not long after the final year of assessment. Particularly with the group demand of both BSPs projected to rise above 100 MW, introducing SCO requirements for P2. At which point, within 3 hours it will be a requirement to restore the smaller of the Group Demand minus 100 MW or 1/3 of the Group Demand.

With limited 33 kV transfer capability, notably at Briton Ferry, the strategy below is aimed at ensuring compliance with P2/8 throughout the forecasted load growth period and beyond while releasing additional capacity for the network and alleviating the constraints facing new connections within the area.

Establish a new 132/33 kV BSP

Capacity Released for constraint(s) considered: 90 MVA Viable

Detailed description: Given the geographic area supplied and the distribution of future demand and generation growth in Briton Ferry and Tir John, it is proposed that consideration is given to establishing a new BSP in the area, to be located between both BSPs.

Consisting of two 132 kV feeders, two 132/33 kV transformers and a new 33 kV switchboard. This new BSP could pick up sufficient demand from Briton Ferry and Tir John such that all three BSPs remain below 100 MW demand in addition to transferring generation away to alleviate projected overloads.

One potential site for establishing a new BSP could be adjacent to the Cwrt Sart 11 kV RMU site location, where 132 kV, 33 kV and 11 kV circuits currently converge. This site is located approximately 3 km from Briton Ferry BSP and approximately 6 km from Tir John BSP.

Due to the nature of the surrounding 132 kV network, detailed network design will be required to assess this strategy of additional 132 kV infeeds into the network, including but not limited to:

- Running arrangements for outage management
- Protection and fault level studies
- P18 Compliance

As this reinforcement strategy is aimed towards the end of this assessment period, it is recommended that the projected demand and generation growth of this area is routinely assessed and reviewed to ensure that this proposal is deemed to be a credible outlook for this network group.

New limiting factor for constraint(s) considered:

Proposed BSP with 90 MVA GT Rating

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