St Tudy BSP

Network Development Report – South West

May 2024

Electricity Distribution

nationalgrid

Contents

St Tudy BSP

1. Network Overview

St Tudy Bulk Supply Point (BSP) supplies a mix of rural and urban areas of 33 kV network, with the bulk of the demand centred in Bodmin town, Polzeath village and Wadebridge town to the North of Bodmin. It is supplied from two 132/33 kV (Grid Transformers) GTs at St Tudy BSP, fed via 132 kV circuits (K route) from Indian Queens GSP which runs in parallel with Alverdiscott (Grid Supply Point) GSP. St Tudy BSP supplies approximately 30,000 customers.

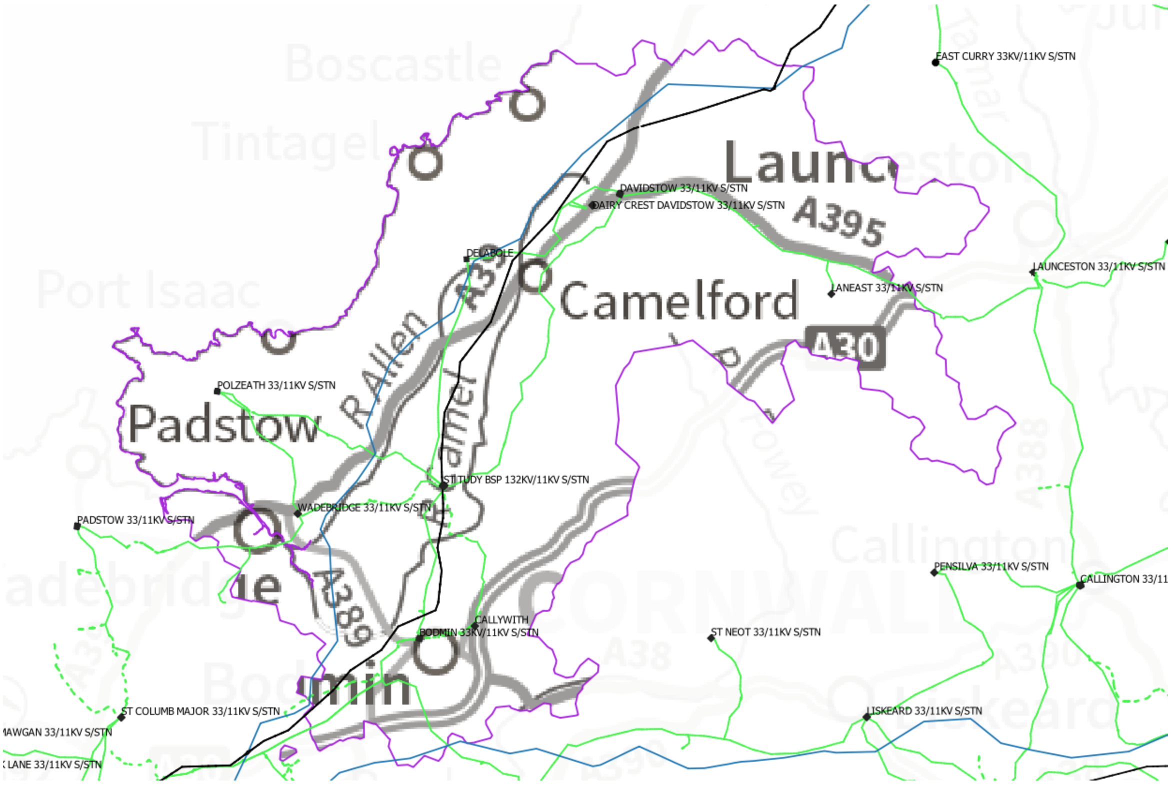

Figure 1.1 St Tudy BSP geographic network coverage

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 and 132/33 kV transformers which supply and are supplied by St Tudy 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

The St Tudy BSP network is arranged as follows:

- GT1 and GT2 currently supply St Tudy BSP which has a wraparound busbar Outer and Inner.
- St Tudy Primary supplied via two transformer feeders.
- A 33 kV ring supplying Polzeath and Wadebridge Primaries, along with connections to three 33 kV connected generators and normally open 33 kV interconnection with Fraddon BSP via Padstow.
- A 33 kV ring supplying Callywith and Bodmin Primaries, along with connections to three 33 kV connected generators and normally open 33 kV interconnection with Fraddon BSP via Treningle switching station.

- A 33 kV ring supplying Davidstow, Delabole and Laneast Primaries, along with connections to a 33 kV connected generators and large demand customer, with normally open 33 kV interconnection with Pyworthy/North Tawton BSP group via Launceston.

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, as well as proposed actions, to manage some constraints identified operationally.

- For an arranged outage of either grid transformer at St Tudy, the normal open point at Treningle switching station is moved from isolator 4L3 to circuit breaker 2L5, which is available for operation with tele control. This allows for quicker restoration of customers in the event of a fault where the network needs to be reconfigured.
- Directional overcurrent (DOC) schemes are modelled on 33/11 kV transformer T2 at Wadebridge substation and on both 132/33 kV grid transformers at St Tudy BSP.
- The 33 kV busbar running arrangement at St Tudy is altered for a variety of circuit and busbar outages to maintain network integrity.
- Arranged outages of the 33 kV busbar at Davidstow result in the transfer of Laneast and a 33 kV wind farm onto the neighbouring Pyworthy/North Tawton BSP group.
- For arranged outages of the 1S0 circuit breakers at Callywith and Delabole primary substations, one of the primary transformers is run with the 11 kV circuit breaker open (i.e. on 'hot standby'). This is to reduce the risk of through-flow for credible next faults on the network, where the 11 kV network at the primary becomes a link to the wider 33 kV network and could overload transformers.
- Curtailment of 33 kV connected generators within the group are modelled are a variety of arranged outages, as outlined in customer connection agreements.

2. Summary of Network Constraints

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

- St Tudy GTs capacity
- St Tudy to Davidstow and Dairy Crest circuit capacity and low volts
- Laneast Single Transformer Primary backfeed capacity
- Bodmin and Callywith ring capacity
- Polzeath and Wadebridge ring capacity

3. Network Constraint Details and Solution Options

3.1 St Tudy GTs capacity

Generation | Demand

Constraint Overview

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

Table 3.1.1 constraint(s) and condition under which constraint occurs

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
St Tudy GT capacity	33 kV busbar fault	None	Baseline (2031 with cyclic ratings)	Baseline	2026	2027

Uncertainty under other Distribution Future Energy Scenarios: As this constraint occurs under baseline, there is no uncertainty about future forecasts. There is a risk that demand reduces, however this is not forecast under any scenario so mitigation against this constraint is definitely required.

Solution Options

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

Table 3.1.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Replace with larger 60/90 MVA transformers	✓	✓	×	Viable
2	Do remedial works to enable use of cyclic ratings	✓	✓	✓	Viable
3	Reinforcement to allow transfer of primaries onto other BSPs	✓	✓	×	Viable
Operational Mitigation					
4	Transfer demand to other BSPs	×	×	✓	Discounted
Load Management Schemes					
5	Post-fault transfers	×	×	×	Discounted
Flexibility services					
6	Procure flexibility at St Tudy BSP	✓	✓	✓	Viable

Solution Development

These options have been assessed on their technical viability and their likely cost-effectiveness pending a full cost benefit analysis (CBA). This CBA will be subsequently carried out by the Distribution Network Operator (DNO) to determine the optimal reinforcement solution, which will then be tested against market provided flexibility by the Distribution System Operator (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 overloads for the conditions described above. This would lead to an inability to meet the Security of Supply requirements of Engineering Recommendation P2 for St Tudy BSP.

New limiting factor for constraint(s) considered: N/A

Option 1 – Replace with larger 60/90 MVA transformers

Capacity Released for constraint(s) considered: 54 MVA — Viable

Detailed description: St Tudy Transformers are 36 year's old which means they could still have a decade or two worth of life.

St Tudy BSP is geographically isolated from Pyworthy (about 36 km away) and Fraddon (24 km away) which makes it difficult to have solid interconnection with other BSPs other than a single circuit to different BSPs. This explains why the option to replace the GTs with larger units could be considered in a couple of decades and has merit.

New limiting factor for constraint(s) considered: New transformer capacity.

Option 2 – Do remedial works to enable use of cyclic ratings

Capacity released for constraint(s) considered: 12 MVA Viable

Detailed description: Uprate the existing transformers via use of cyclic ratings in accordance with British Standard 171/IEC60076 and NGED Standard Technique SD8C. This requires a capability assessment of all ancillaries, such as busbars, isolators, Current Transformers (CTs), cables (including cabling within the substation), switchgear, tap changer, transformer bushings, conservator and earthing transformer. In addition, an assessment of the cyclic profile of the load is required to determine if transformer temperature and ageing is within acceptable limits.

New limiting factor for constraint(s) considered: Cyclic ratings.

Option 3 – Reinforcement to allow transfer of primaries onto other BSPs

Capacity Released for constraint(s) considered: Up to 6 MVA Viable

Detailed description: For this option we are assuming there will be a new BSP in Launceston which would allow for circuits between Laneast, Davidstow to be moved away from the BSP. This value increases to about 10 MW in the 2030s which should alleviate the GTs' constraints at St Tudy. It would still be recommended to go ahead with Option 2 and carry out any remedial works required

New limiting factor for constraint(s) considered: Transformer capacity.

Option 4 – Transfer demand to other BSPs

Capacity Released for constraint(s) considered: Up to 2 MVA Discounted

Detailed description: As described in option 1 currently St Tudy is geographically isolated which makes it very difficult to transfer primaries without reinforcement. There could be some very small 11kV transfers but would not be worth doing as it probably would create voltage issues on the 11 kV.

New limiting factor for constraint(s) considered: Current BSP demand.

Option 5 – Post-fault transfers

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

Detailed description: Post fault transfers cannot be utilised as the overload is beyond post-fault ratings meaning there is no window to reduce the load on the 33 kV circuits through load management.

ANM could be considered to solve the generation part of this constraint.

New limiting factor for constraint(s) considered: N/A

Option 6 – Procure flexibility at St Tudy BSP

Estimated Flexibility Required (MVA): 4 MVA+ Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads. This could defer reinforcement.

Solution Recommendation

It is recommended to assess the feasibility of using cyclic ratings for St Tudy GTs. Flexibility will need to be procured in the St Tudy network which should alleviate constraints at the time of peak.

The reinforcement suggested would be to uprate GTs to 60/90 MVA units to increase capacity in the area. In the future if Launceston becomes a BSP there could be some demand transferred that way. Network in the area should be built with that in mind.

3.2 St Tudy to Davidstow and Dairy Crest circuit capacity and low volts

Constraint Overview

Generation | Demand

The table below outlines the nature of the network constraints identified in the network analysis, with the worst overloads seen in the shoulder seasons.

Table 3.2.1 constraint(s) and condition under which constraint occurs

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
St Tudy 3L5 to Davidstow 3L5 circuit capacity	Arranged outage of Delabole 2L3 or Main 2 busbar	None	Baseline	Baseline	Baseline	2025
Dairy Crest to Davidstow circuit capacity	Arranged outage of Delabole 2L3 or Main 2 busbar	None	Baseline	Baseline	Baseline	2025
Delabole to Dairy Crest circuit capacity	Arranged outage of Davidstow 3L4 or loss of the Davidstow to St Tudy circuit	None				
St Tudy to Delabole circuit	Arranged outage of Davidstow 3L4 or loss of the Davidstow to St Tudy circuit	None	2031	2030	2030	2032
Low volts at customer sites	Reserve busbar fault at St Tudy BSP	None	2028	2028	2028	2028

Uncertainty under other Distribution Future Energy Scenarios: As this constraint occurs under baseline, there is no uncertainty about future forecasts. There is a risk that demand reduces, however this is not forecast under any scenario so mitigation against this constraint is definitely required.

Solution Options

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

Table 3.2.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Reprofile existing 33 kV circuits to 75° C existing 33 kV circuits	✓	×	✓	Viable
2	Reconductor 33 kV circuits	✓	✓	✓	Viable
Operational Mitigation					
3	Transfer demand away from the ring	×	×	×	Discounted
Load Management Schemes					
4	Post-fault transfers	×	×	×	Discounted
Flexibility services					
5	Procure flexibility	✓	✓	✓	Viable

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 overloads for the conditions described above. This would lead to an inability to meet the Security of Supply requirements of Engineering Recommendation P2 for Delabole and Dairy Crest primary substations.

New limiting factor for constraint(s) considered: N/A

Option 1 – Reprofile existing 33 kV circuits to 75° C existing 33 kV circuits

Capacity Released for constraint(s) considered: 5 MVA **Viable**

Detailed description: Reprofiling the circuit will get 5 MVA more capacity out of the circuit. This may mean deferring the reinforcement by 5/6 years. This may be a sensible decision especially if there is a plan to build a BSP at Launceston to take some load away from St Tudy and this particular ring.

The section between Davidstow to St Tudy is about 17 km with a small section of cable and between Davidstow and Dairy Crest there is a section that is about 3 km long that would also need reprofiling, this section would be recommended to have it reconductored with larger conductor potentially 150 mm^2 All Aluminium Alloy Conductor (AAAC) or equivalent to match the other circuits, main reason being as the current circuits are 0.1 in^2 Hard Drawn Copper (HDC) which could not gain much from a reprofile. Protection and CTs should be assessed so they are not a constraint in this section.

The majority of the section between Dairy Crest and Delabole cannot be reprofiled due to the small conductor on it about 8 km. But the small 700 m section of 100mm^2 of HDC could be reprofiled to be able to operate at 75° C in the 2030s.

The 11 km section between St Tudy and Delabole that will need reprofiling in the 2030s. Protection and CTs should be assessed so they are not a constraint in this section.

New limiting factor for constraint(s) considered: Reprofiled circuit capacity.

Option 2 – Reconductor 33 kV circuits

Capacity released for constraint(s) considered: 12 MVA **Viable**

Detailed description: Reconductoring Davidstow to St Tudy 17 km circuit may not be necessary if Launceston BSP is built and Davidstow/Laneast get transferred away from the group. However, the 3 km section between Davidstow and Dairy Crest will need reconductoring to 150 mm^2 AAAC or equivalent.

The majority of the section between Dairy Crest and Delabole will need reconductoring with 150 mm^2 of AAAC or equivalent, about 8 km.

The 11 km section between St Tudy and Delabole could be reinforced with 200 mm^2 AAAC or equivalent, but may not be necessary if Launceston BSP is built. Protection and CTs should be assessed so they are not a constraint in this section.

New limiting factor for constraint(s) considered: Reconductored circuit capacity.

Option 3 – Transfer demand away from the ring

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

Detailed description: As the ring and radial feeds are in remote areas it makes it difficult to transfer demand away from the ring without causing low volts or other issues in the 11 kV without reinforcement.

New limiting factor for constraint(s) considered: N/A

Option 4 – Post-fault transfers

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

Detailed description: Post fault transfers cannot be utilised as the overload is beyond post-fault ratings meaning there is no window to reduce the load on the 33 kV circuits through load management.

New limiting factor for constraint(s) considered: N/A

Option 5 – Procure flexibility

Estimated Flexibility Required (MVA): 1 MVA+ Viable

Detailed description: Flexibility services could be procured at Delabole or Dairy Crest to alleviate projected overloads.

Solution Recommendation

It may be possible to procure flexibility at Delabole or Dairy Crest Primary substation to defer the reinforcement requirements, subject to a cost benefit analysis confirmation through the DNOA process.

However, longer term reprofiling the 17 km section between Davidstow/St Tudy and reconductor the 3 km section between Dairy Crest/Davidstow with 150 mm^2 AAAC or equivalent.

In the 2030s the circuit between Delabole and Dairy Crest will need to have some of it reprofiled (the 100 mm^2 HDC 700 m section) and reconductored with 150 mm^2 AAAC or equivalent the remaining 8 km section. St Tudy to Delabole will need to be reprofiled to operate at 75° C.

3.3 Laneast Single Transformer Primary backfeed capacity

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 demand.

Table 3.3.1 constraint(s) and condition under which constraint occurs

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
Laneast Backfeed capacity 3.4 MVA	Loss of the primary transformer	None	2025	2025	2025	2025

Uncertainty under other Distribution Future Energy Scenarios: Under Leading the Way Scenario, this constraint is predicted to arise in the Baseline and under falling short it is predicted to arise in 2025.

Solution Options

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

Table 3.3.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Reinforce 11 kV backfeed	✓	✓	✓	Viable
2	Add second primary transformer with view of adding second 33 kV circuit (15 km)	✓	✓	×	Viable
3	Add second primary transformer ringed in the Laneast circuit	✓	✓	✓	Viable
Operational Mitigation					
4	Transfer demand to other primaries	×	×	✓	Discounted
Load Management Schemes					
5	Post-fault transfers	×	×	×	Discounted
Flexibility services					
6	Procure flexibility	×	✓	✓	Discounted

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 0 – No Intervention

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

Detailed description: Doing nothing to mitigate the constraint would result in overloads for the conditions described above. This would lead to an inability to meet the Security of Supply requirements of Engineering Recommendation P2 for Laneast primary.

New limiting factor for constraint(s) considered: N/A

Option 1 – Reinforce 11 kV backfeed

Capacity Released for constraint(s) considered: 1.6 MVA **Viable**

Detailed description: 11 kV backfeeds to Davidstow and to Launceston would need to be reinforced to allow it to match with the transformer capacity. These could be extensive works but according to the Best View it could take us to 2029 and if cyclic ratings are applied and backfeed capacity extended further it could even go into the 2030s.

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

Option 2 – Add second primary transformer with view of adding second 33 kV circuit

Capacity released for constraint(s) considered: 9 MVA **Viable**

Detailed description: This option includes a second 7.5/15 MVA transformer it also add a second 33 kV circuit that will supply both East Curry (this could run on an auto changeover so less of a priority) and Laneast, but the Laneast part would be about 15 km long. This option assumes that Launceston BSP will get built. Figure 2 shows the proposed circuits for when Launceston becomes a BSP.

New limiting factor for constraint(s) considered: New circuit and transformer capacity.

Option 3 – Add second primary transformer ringed in the Laneast circuit

Capacity Released for constraint(s) considered: 9 MVA **Viable**

Detailed description: Ringing a transformer to Laneast would work initially, the problem would be if Davidstow becomes an autochangeover site and it becomes difficult to have two sites in a row with autochangeovers. This could be the first option before considering a circuit with considerations being made to keep the option open for a future circuit.

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

Option 4 – Transfer demand to other primaries

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

Detailed description: Not possible without 11 kV reinforcement in Option 1 due to geographical isolation.

New limiting factor for constraint(s) considered: Current BSP demand.

Option 5 – Post-fault transfers

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

Detailed description: Post fault transfers cannot be utilised as the overload is beyond post-fault ratings meaning there is no window to reduce the load on the 33 kV circuits through load management.

New limiting factor for constraint(s) considered: N/A

Option 6 – Procure flexibility

Estimated Flexibility Required (MVA): 1 MVA+ Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads. This could defer reinforcement.

Solution Recommendation

It may be possible to procure flexibility at Laneast Primary substation to defer the reinforcement requirements, subject to a cost benefit analysis confirmation through the DNOA process.

It is recommended to consider reinforcing the 11 kV if possible with stronger backfeeds. Option 3 of ringing in a new 7.5/15MVA transformer should then be the next option which should be made in a way to allow a new 33kV circuit as the one in Figure 2.

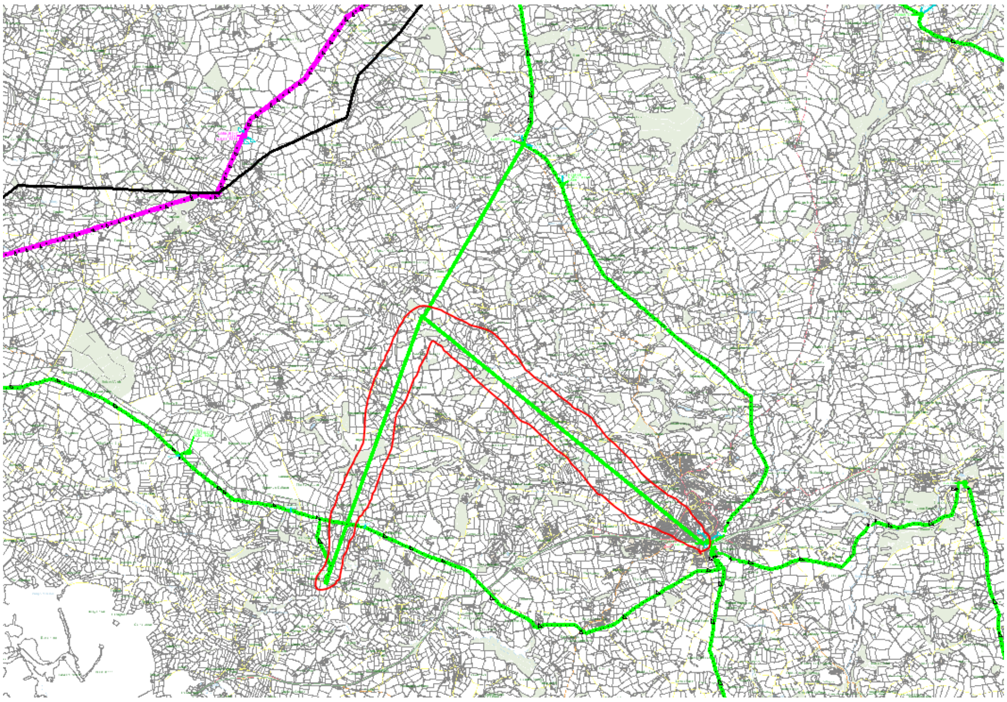

Figure 2 - Proposed new 33 kV circuit to Laneast Primary, it also includes the new section to East Curry that would bee needed in the 2030s

3.4 Bodmin and Callywith ring capacity

Generation Demand

Constraint Overview

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

Table 3.4.1 constraint(s) and condition under which constraint occurs

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
Bodmin Transformer Capacity	Loss of the primary transformer	None	2025	2025	2025	2025
St Tudy to Bodmin circuit capacity	Loss of Callywith to St Tudy Circuit	None	2034	2034	2035	2040
St Tudy to Callywith circuit capacity	Loss of St Tudy to Bodmin circuit	None	2034	2034	2035	2040 (demand) 2034 (generati on)

Uncertainty under other Distribution Future Energy Scenarios: Under Leading the Way Scenario, this constraint is predicted to arise in the Baseline and under falling short it is predicted to arise in 2025.

Solution Options

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

Table 3.4.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Replace Callywith Transformers with larger units	✓	✓	✓	Viable
2	Build new primary	✓	✓	×	Discounted
3	Reprofile circuits to the ring	✓	✓	✓	Viable
Operational Mitigation					
4	Transfer demand to other primaries	✓	✓	✓	Viable
Load Management Schemes					
5	Post-fault transfers	×	×	×	Discounted
Flexibility services					
6	Procure flexibility	✓	✓	✓	Viable

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 overloads for the conditions described above. This would lead to an inability to meet the Security of Supply requirements of Engineering Recommendation P2 for Bodmin and Callywith primaries.

New limiting factor for constraint(s) considered: N/A

Option 1 – Replace Callywith Transformers with larger units

Capacity Released for constraint(s) considered: 9 MVA — Viable

Detailed description: Callywith and Bodmin are two primaries that feed Bodmin which means the load would be shared. However, there is a primary being built relatively close that could help deload Bodmin too.

New limiting factor for constraint(s) considered: New Transformer Capacity.

Option 2 – Build new primary

Capacity released for constraint(s) considered: 23 MVA — Discounted

Detailed description: Building a new primary is the most expensive solution which is not needed in the area for the next ten years.

New limiting factor for constraint(s) considered: New circuits and transformer capacity.

Option 3 – Reprofile circuits to the ring

Capacity Released for constraint(s) considered: 8 MVA

Viable

Detailed description: Reprofiling both legs of the circuit to be able to operate at 75° C will improve the ratings of the circuits and will allow the capacity of the ring to be enough for the next ten years. Both legs are about 8 km each.

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

Option 4 – Transfer demand to other primaries

Capacity Released for constraint(s) considered: 0 MVA

Viable

Detailed description: As there is a primary currently being built close to Bodmin there is a chance to transfer demand to it, possibly with some 11 kV reinforcement. Growth allocated to Bodmin could naturally connect to this new primary.

New limiting factor for constraint(s) considered: Current BSP demands and primary demands.

Option 5 – Post-fault transfers

Capacity Released for constraint(s) considered: 0 MVA

Discounted

Detailed description: Post fault transfers cannot be utilised as the overload is beyond post-fault ratings meaning there is no window to reduce the load on the 33 kV circuits through load management.

New limiting factor for constraint(s) considered: N/A

Option 6 – Procure flexibility

Estimated Flexibility Required (MVA): 1 MVA+

Viable

Detailed description: Flexibility services could be procured to alleviate projected overloads. This could defer reinforcement.

Solution Recommendation

It may be possible to procure flexibility at Bodmin and Callywith Primary substation to defer the reinforcement requirements, subject to a cost benefit analysis confirmation through the DNOA process. For generation issues ANM could be used to prevent any overloads on the Callywith/St Tudy side of the ring.

It is recommended to consider reprofiling the circuits between Bodmin/St Tudy and Callywith/St Tudy. This extra capacity would be enough to take the network past 2034. If primary capacity becomes an issue in the area Callywith primary could take larger 12/24 MVA units. With the new primary currently being built on the Fraddon side, it could mean that the need for reinforcement in this area is deferred even further.

3.5 Polzeath and Wadebridge ring capacity

Generation | Demand

Constraint Overview

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

Table 3.5.1 constraint(s) and condition under which constraint occurs

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
St Tudy to Wadebridge 33kV generator circuit capacity	Loss of Polzeath to St Tudy Circuit	None	2034	2034	2035	2040 Baseline (Generation)
St Tudy to Polzeath circuit capacity	Loss of Wadebridge to St Tudy Circuit	None	2034	2034	2035	2040 Baseline (Generation)
St Tudy to Wadebridge after 33kV generator circuit capacity	Loss of one of the legs of the ring	None	-	-	-	2028
Polzeath to Wadebridge circuit capacity	Loss of one of the legs of the ring	None	-	-	-	2028

Uncertainty under other Distribution Future Energy Scenarios: Under Leading the Way Scenario, this constraint is predicted to arise in the Baseline up to 2030 and under falling short it is predicted to arise in 2025 up to 2040.

Solution Options

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

Table 3.5.2 solution options to solve constraint(s)

Solution Options	Description	Solves Constraint	Wider Benefit	Potential to be cost effective	Viable or Discounted
0	No Intervention	×	×	×	Discounted
Reinforcement					
1	Reconductor some of the sections of the above circuits	✓	✓	✓	Viable
2	Build new circuits	✓	✓	✓	Viable
3	Reprofile circuits to the ring	×	✓	✓	Discounted
Operational Mitigation					
4	Transfer demand to other primaries	✓	✓	✓	Viable
Load Management Schemes					
5	ANM	✓	✓	✓	Viable
Flexibility services					
6	Procure flexibility	✓	✓	✓	Discounted

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 overloads for the conditions described above. This would lead to an inability to meet the Security of Supply requirements of Engineering Recommendation P2 for Polzeath and Wadebridge primaries.

New limiting factor for constraint(s) considered: N/A

Option 1 – Reconductor some of the sections of the above circuits

Capacity Released for constraint(s) considered: 9 MVA **Viable**

Detailed description: The circuits between St Tudy and Wadebridge or Polzeath have certain sections that are 0.1 or 70 mm^2 HDC which will need to be replace with 150 mm^2 AAAC or equivalent. This would be about 2 km of smaller sections between St Tudy and Wadebridge and 11 km on the Polzeath to St Tudy side. CTs and protection limitations would need to be assessed and removed if needed. In the process if circuits are reprofiled it should give enough capacity to last until 2050 with Best View predicted growth.

New limiting factor for constraint(s) considered: New Circuit Capacity.

Option 2 – Build new circuits

Capacity released for constraint(s) considered: 23 MVA **Viable**

Detailed description: This option would only be needed if load growth happens to materialise faster and stronger than predicted. There should be a CBA between this option and Option 2.

A 7.2 km between Wadebridge to St Tudy BSP, if this is at least 200 mm^2 AAAC it would be able to support the ring better.

New limiting factor for constraint(s) considered: New circuits capacity.

Option 3 – Reprofile circuits to the ring

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

Detailed description: Reprofiling these circuits is not possible due to circuits being too small to actually attempt running them at higher temeperatures.

New limiting factor for constraint(s) considered: New circuit capacity.

Option 4 – Transfer demand to other primaries

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

Detailed description: Transferring demand will mean that 11 kV reinforcement may be needed in the area between Wadebridge and St Tudy primaries. St Tudy is able to accept some of the demand predicted to appear in the ring.

New limiting factor for constraint(s) considered: Current primary demands.

Option 5 – ANM

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

Detailed description: For the generation constraints ANM could be considered as a way to defer reinforcement caused by generation.

New limiting factor for constraint(s) considered: N/A

Option 6 – Procure flexibility

Estimated Flexibility Required (MVA): 1 MVA+ **Viable**

Detailed description: Flexibility services could be procured to alleviate projected overloads. This could defer reinforcement.

Solution Recommendation

It may be possible to procure flexibility at Polzeath and Wadebridge Primary substation to defer the reinforcement requirements, subject to a cost benefit analysis confirmation through the DNOA process. For generation issues ANM could be used to prevent any overloads on the ring.

It is recommended to consider 11 kV reinforcement and transfer some demand to St Tudy from the Polzeath/Wadebridge ring. If that is not enough a CBA between reconductoring the circuits between Wadebridge/St Tudy and Polzeath/St Tudy with 200 mm^2 AAAC 75° C and building a new circuit between Wadebridge and St Tudy BSP, a CT and protection assessment would also need to be carried out. This extra capacity would be enough to take the network past 2034.

DSO | nationalgrid electricity distribution

Registered Office: Avonbank, Feeder Road, Bristol BS2 0TB
nationalgrid.co.uk