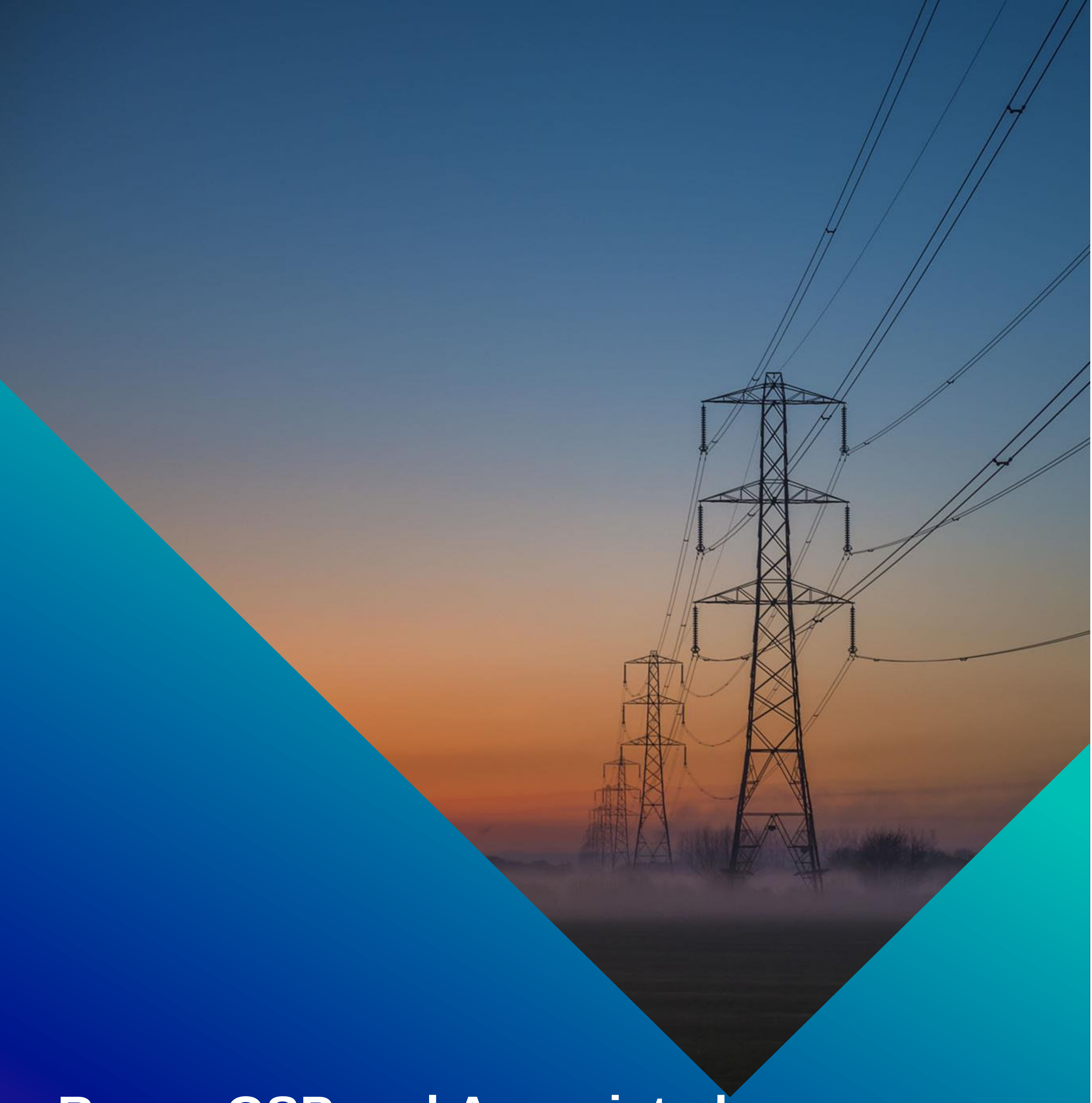

Rasau GSP and Associated 132 kV Network

Network Development Report – South Wales

May 2024

Electricity Distribution

nationalgrid

Contents

Rassau GSP and Associated 132 kV Network

1. Network Overview

Rassau Grid Supply Point (GSP) supplies a geographically large and mainly rural area of 132 kV and 66 kV network covering the north eastern region of the South Wales licence area. There are some pockets of higher demand, such as Abergavenny town and the Heads of the Valleys region. Notably this area includes a large swath of the Bannau Brycheiniog National Park (The Brecon Beacons) which carries significant concerns for the scope of permissible development.

Supplied from two 400/132 kV SGTs at Rassau GSP, the 132 kV and below networks supply approximately 145,000 customers.

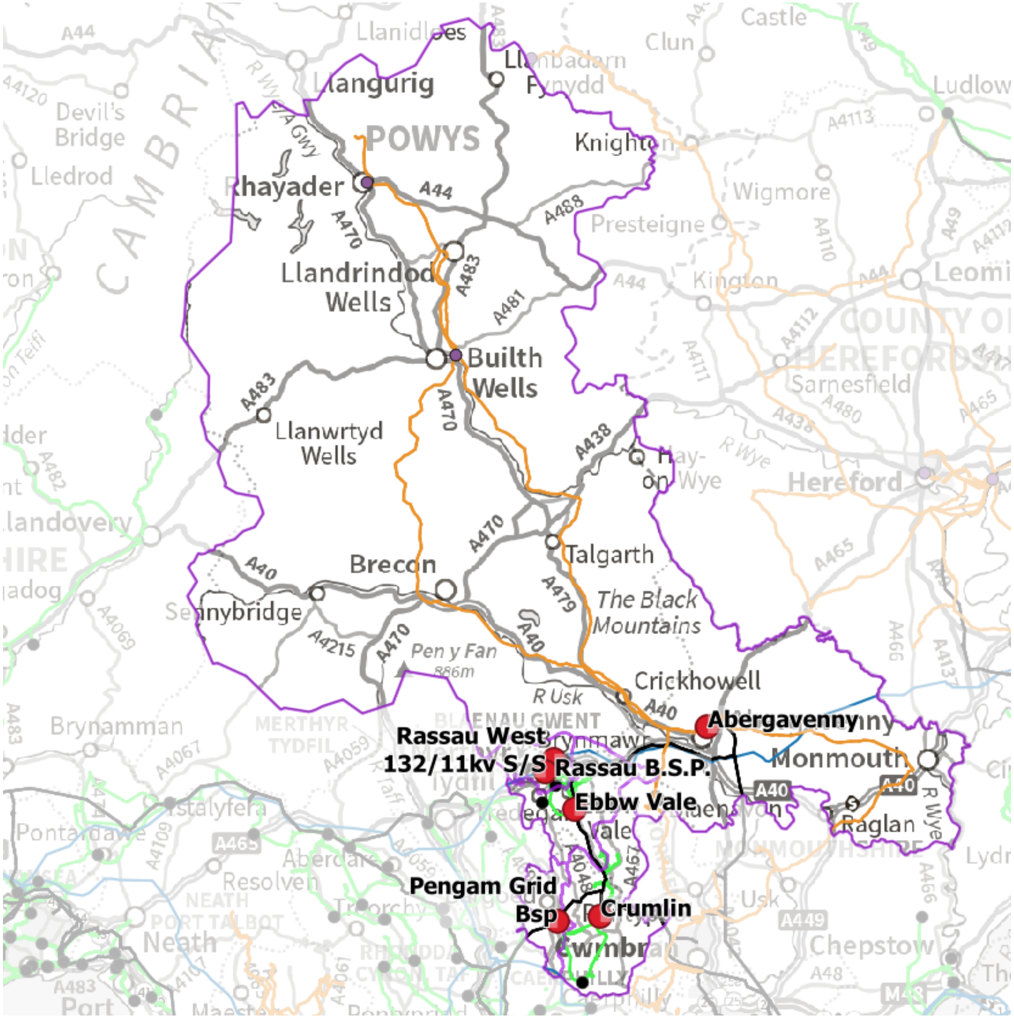

Figure 1.1 - Rassau GSP geographic network coverage

This report discusses all existing and future network constraints over a 0-10 year horizon associated with the SGT transformers, 132 kV circuits and Bulk Supply Point 132 kV transformers which are supplied by Uskmouth GSP. This uses the methodology outlined in the Network Development Plan Methodology Report with Network Operability Modelling applied as outlined below.

For the purposes of this analysis the NGED Best View Distribution Future Energy Scenario (DFES) has been used to study the years 2022 (baseline), 2028 and 2034, with consideration given to how proposals could change under the other scenarios. Five representative days have been studied across the four seasons: Winter Peak Demand, Intermediate Warm Peak Demand, Intermediate Cool Peak Demand, Summer Peak Demand and Summer Peak Generation.

1.1 Network Topology

The Rassau GSP network is arranged as follows:

- Rassau GSP is supplied from an on-site 400 kV two section ‘skeleton’ busbar owned by NGET, where the minimum required equipment to safely operate the SGTs has been deployed to the pattern of a double busbar. This arrangement permitted economic construction however it does limit the operability of the site. The 400 kV circuit between Walham GSP and Cilfynydd GSP is brought through the busbar, with one SGT on each side of a single 400 kV bus section breaker. The adjacent 400 kV Walham GSP to Pembroke GSP circuit is not brought into the site.
- Two Supergrid Transformers supply a 132 kV two section single busbar which is normally run solid.
- Two double circuit tower lines radiate into the Rassau GSP area, supplying a total of seven Bulk Supply Points (BSPs), plus a single circuit cable to a 132 kV generation customer.
- The AE/J Route circuits supply Abergavenny BSP, Pontypool North BSP and Panteg BSP which in turn together supply an interconnected 66 kV network covering a vast geographic area to the north of the GSP area. That interconnected network will be reported on separately however solutions to the issues within that group will have bearing on the development of this group.
- The AA/N Route circuits supply the Heads of the Valleys region including Rassau West BSP, Ebbw Vale BSP, Crumlin BSP and Pengam BSP.
- Both double circuit tower lines run on into the Uskmouth GSP area and can, to a greater or lesser extent depending on prevailing loads, be supplied from that GSP. The N Route also has connectivity to Upper Boat GSP via Pengam BSP however that is quite limited and rarely used in practice.

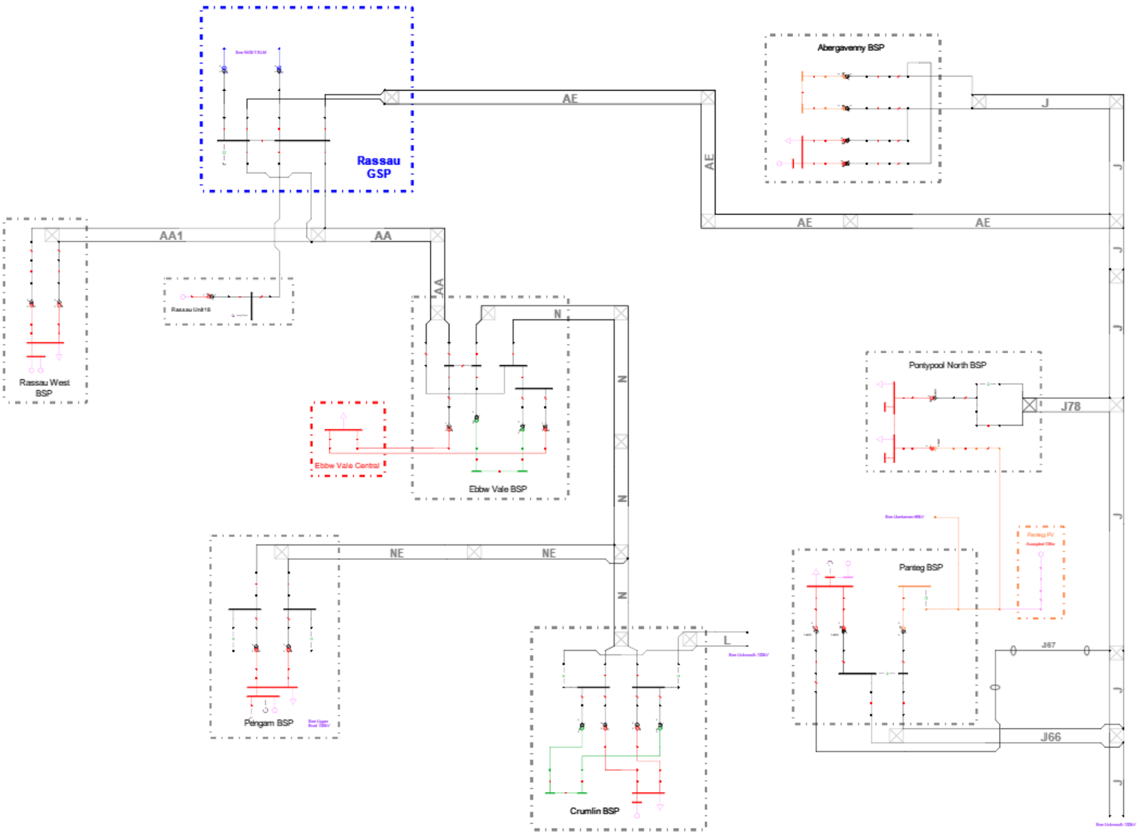

Figure 1.2 – Rassau GSP Single Line Diagram

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

- Due to interconnection between the adjacent circuits on many of the tower lines, through the respective BSPs Grid Transformers and their lower voltage bars which are normally run solid, there is a risk that power could flow into a circuit from the adjacent circuit on the tower if the source circuit breaker at the GSP had opened. To control this risk, many of the circuits on this network are equipped with intertripping protection which ensures that all ends of a circuit are cleared for faults detected by the source breakers at the GSP. These schemes are reasonably complex as depending on the state of the network at the instant of the fault occurs a different selection of breakers are required to operate.
- Some 132 kV arranged outages in this group require the transfer of BSPs into Uskmouth GSP, to avoid potential overloads or undesirable topologies for the faults that may follow. Crumlin BSP is commonly transferred, Ebbw Vale BSP and Panteg BSP are less commonly transferred.

2. Summary of Network Constraints

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

- Rassau GSP SGT Capacity
- Panteg BSP 132 kV bar rearrangement
- Pengam 132/11 kV second Primary Substation
- 132 kV cable sections on AA Route

3. Network Constraint Details and Solution Options

3.1 Rassau GSP SGT 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. The constraint is managed in the winter period by avoiding the arranged outage during this time.

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
Rassau SGT overload	A fault of the other SGT	None	2026	2026	2027	2029

Uncertainty under other Distribution Future Energy Scenarios: Due to the relatively short duration until this constraint, there is little divergence of timing in its emergence between scenarios. There is a significant contribution from the connection of a large Battery Energy Storage Site (BESS) and timing is currently dependant on their actions. If this connection was to lapse then two to three additional years could be expected before constraint is observed.

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	Install a third SGT	✓	✓	✓	Viable
2	Construct a new GSP	✓	✓	✓	Viable
Operational Mitigation					
3	Transfer demand at 132 kV	×	×	✓	Discounted
Load Management Schemes					
4	Post-fault transfers	×	×	✓	Discounted
Flexibility services					
5	Procure flexibility across the group	✓	✓	✓	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 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.

A number of the options discussed below involve works on the transmission network and will therefore require a modification application and discussions with National Grid Electricity Transmission (NGET) and National Grid ESO to ensure the optimal solution for the whole system (considering both the distribution and transmission systems) is taken forward.

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 Rassau GSP

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

Option 1 – Install a third SGT

Capacity Released for constraint(s) considered: Approximately 120+ MVA **Viable**

Detailed description: In addition to the background load growth there are several large new connections planned in the Rassau GSP area which may impact the solution which is chosen. This presented option is suggested as the overall solution based on the apparent connections, their individual reinforcement requirements and the estimated growth for the area. The following key drivers are being considered:

- A large demand customer is proposed in the vicinity of Rassau GSP which requires a secure 132 kV connection. As Rassau GSP 132 kV bar is physically constrained it would be difficult to extend with multiple new circuit breakers, consequently a nearby new 132 kV bar has been proposed to create the required points of connection for this customer.
- A large BESS customer has accepted a connection offer directly to a new 400 kV point of connection, separate to the existing Rassau site due to capacity issues. This is presumed to be close to the current Rassau GSP but onto the adjacent 400 kV Walham to Pembroke circuit. This will require a new SGT to supply a site circuit to their premises at 132 kV.
- Load growth in the Abergavenny/Panteg BSP group will require an additional 132 kV infeed north of the existing Abergavenny BSP (see Abergavenny and Panteg 66 kV report, Section 3.1), provision for this circuit should be maintained, alongside the load growth that is driving its requirement.
- More generally, growth across the whole GSP group must be considered, including two additional 132 kV customers prospectively connecting to existing or new 132 kV circuits.

The combined approach to meet all of these drivers would be to rearrange the proposed new assets and ensure that sufficient capacity is created for all:

- The proposed new 132 kV bar effectively instead becomes a third and fourth 132 kV bar section at Rassau GSP. Although little physical difference in the topology compared to treating the bars as tee-offs for the customer other than running the bus section closed, the protection of the bars and the integration with existing intertripping will need careful consideration.
- The proposed sole use SGT instead becomes a reinforcement SGT at a nearby “Rassau North GSP”, connecting to one of the new 132 kV bar sections.
- It is proposed that the circuit breakers which current supply the AE Route circuits into Abergavenny BSP will used to create the new 132 kV arrangement, the AE-Route circuit being moved up to the new bar sections. This is convenient as it creates an opportunity for an additional supply into the Abergavenny/Panteg group from the existing Rassau bars which are no longer the direct source of breakers which face that group.

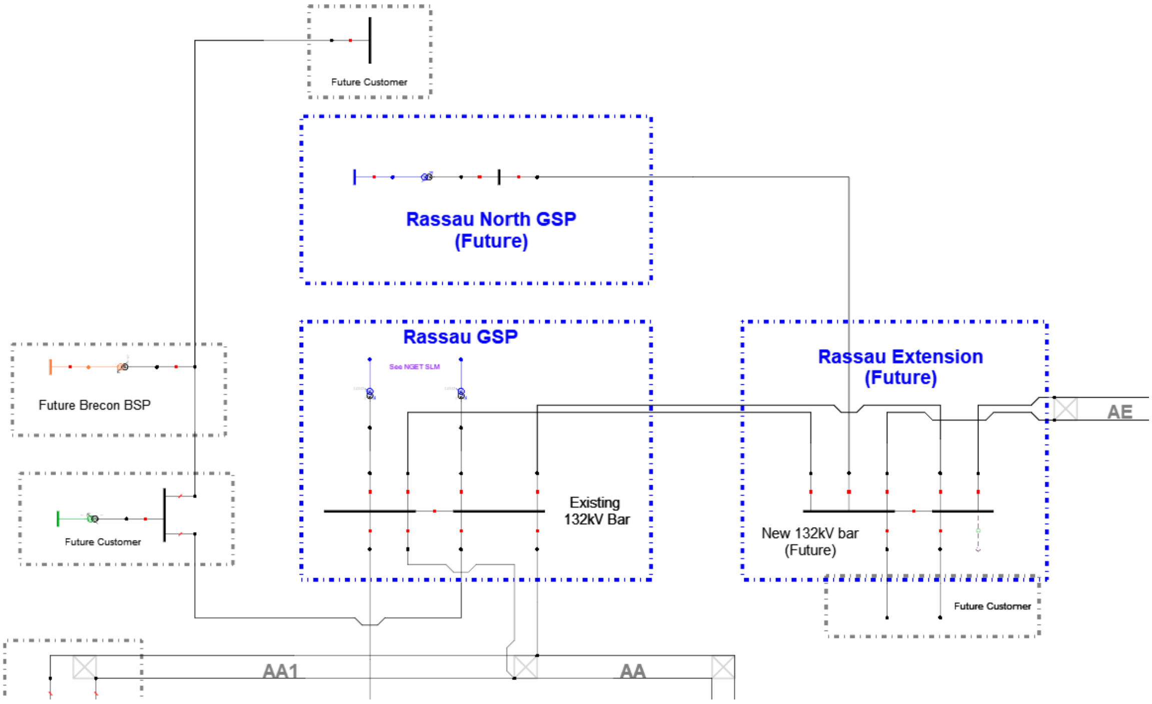

Figure 3.1 – Proposed 132 kV rearrangement

New limiting factor for constraint(s) considered: Under P2 at 300 MW the group will become Class E, requiring the capability to immediately restore 2/3rds of full Group Demand under SCO. It is assumed that normal maintenance will only be taken within an access window representing the period when group demand is less than 2/3rd of full Group Demand. Consequently you could presume a position where Full Group Demand is around 360 MVA, plus whatever load transfers are expected to be available under FCO. The limiting factor will be a combination of the remaining SGT's 240 MVA capacity during the SCO plus the assessed load transfers that were made for the relevant FCOs.

Short term ratings for the SGT might be useful to stretch the available capacity, assuming there are available load transfers to redistribute the load. Given that Uskmouth GSP, which represents the best possible transfers for Rassau, is also growing significantly during the assessed period the total availability for transfers will need to be routinely checked.

Option 2 - Construct a new GSP

Capacity released for constraint(s) considered: 240 MVA **Viable**

Detailed description: Some or more of the perquisites for Option 1 may not come to pass. This may be either due to customers not proceeding with their connections or growth being distributed differently to the assessed scenarios. The required reinforcement may need to follow a different strategy to economically avoid physical or electrical constraints.

An alternative reinforcement proposal for this network might be to construct a new GSP with two new SGTs on a new unconstrained site and transfer load towards this new site. A location near to the AE/J Route tee is proposed, which is also close to the Walham/Pembroke 400 kV route.

This would allow the complex Abergavenny/Panteg Group to be taken off of Rassau, reducing both the demand and the complexity of that group.

New limiting factor for constraint(s) considered: Capacity of the remaining SGT under various fault and arranged outages.

Option 3 – Transfer demand at 132 kV

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

Detailed description: During N-1 conditions at Rassau GSP, load is already transferred out of the group at 132 kV (typically Crumlin BSP and potentially Ebbw Vale BSP as well) and it would be possible to consider transferring more BSPs out of the group to adjacent groups on the interconnecting circuits. Unfortunately the adjacent groups have 132 kV circuit constraints (Upper Boar GSP) or SGT constraints (Uskmouth GSP) caused by large new connections which prevent effective load transfers away from Rassau. If these connections were to not proceed then this option may increase in viability in the future.

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: By utilising the short term ratings of the SGTs at Rassau it would be possible to consider holding an overload on the remaining SGT for a sufficient duration to enact a transfer, the issue remains where to transfer it to with the adjacent groups also being constrained. Depending on the timing and quantity of growth this option may be useful for periods in the future.

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

Option 5 – Procure flexibility across the group

Estimated Flexibility Required (MVA): 159+ MVA by 2034 (Best View) **Viable**

Detailed description: Flexibility services could be procured to alleviate projected overloads in the short term. This could defer reinforcement but due to the large quantity of flexibility required in the long term this may not be a viable permanent solution. Given the flexibility of the 132 kV network in transferring large tranches of load and the possibility that the timing in the deployment of large new connections might vary in both this and adjacent groups, it should be investigated what quantity of Flexibility Services might be available to call on.

Solution Recommendation

It is recommended to proceed with the contracted position of extending the 132 kV bar and installing an additional SGT at Rassau GSP. It may be beneficial to test the market for flexibility procurement potential as the site will exceed its capacity without their connection and a delay on our customer's part might delay the deployment of the reinforcement.

3.2 Panteg BSP 132 kV bar rearrangement

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 3.2.1 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
Abergavenny to Monmouth 66 kV circuit	Outage of Abergavenny to Blaenavon 66 kV circuit	Panteg GT3 fault	2027	2029	2029	2032
Abergavenny to Blaenavon 66 kV circuit	Outage of Abergavenny to Monmouth 66 kV circuit	Panteg GT3 fault	2031	2032	2033	2033

Uncertainty under other Distribution Future Energy Scenarios: Under Leading the Way scenario the constraint is forecast by 2025, under Consumer Transformation by 2026, under System Transformation by 2027 and under Falling Short by 2028.

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	Rearrange Panteg BSP to create a second 132 kV infeed	✓	✓	✓	**Viable**
2	Build a third 66 kV circuit between Abergavenny and Panteg BSPs	✓	×	×	**Discounted**
Operational Mitigation					
3	11 kV demand transfers to adjacent BSPs	×	×	×	**Discounted**
Load Management Schemes					
4	Post-fault transfers	×	×	×	**Discounted**
Flexibility services					
5	Procure flexibility for Panteg BSP	✓	✓	✓	**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 Panteg BSP.

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

Option 1 – Rearrange Panteg BSP to create a second 132 kV infeed

Capacity Released for constraint(s) considered: 40 MVA **Viable**

Detailed description: There are three useful in-feeds to the 66 kV network between Panteg and Abergavenny BSPs (The “Southern Ring”), the two 66 kV circuits out of Abergavenny and the 132/66 kV GT at Panteg. When two out of three of the in-feeds are unavailable then the remaining one must carry the full load. If this remaining in-feed is one of the 66 kV circuits from Abergavenny BSP then it will overload in the future.

The obvious step would be to fill out Panteg BSP with an additional Grid Transformer however this is difficult at Panteg BSP due to a problematic topology. Grid parallels between adjacent GSPs through lower voltage networks are generally avoided beyond switching time as they are an operationally risky proposition and very difficult to protect adequately. The 66 kV is interconnected between Abergavenny BSP and Panteg BSP, this interconnection is required due to excessive load preventing the two circuits being run as a simple ring out of either substation. Pontypool North substation is supplied by two infeeds, one from the 132 kV between Rassau and Panteg; and another at 66 kV from a circuit that can either be fed from Llantarnam BSP or Panteg BSP.

Previous requirements to move load out of Rassau GSP has meant that Pontypool North 11 kV and Panteg 11 kV are currently fed out of Uskmouth GSP via placing the Normally Open Point (NOP) between Uskmouth and Rassau at Pontypool North 205. To avoid a grid parallel at Pontypool North the 66 kV connected T1 is connected to Llantarnam BSP which is fed from Uskmouth GSP rather than the closer Panteg BSP which is fed from Rassau GSP. This is effective for distributing the demand between the GSPs but it means that parts of the 132 kV at Panteg BSP are fed from Rassau GSP and other parts are fed from Uskmouth GSP.

To create a sufficiently separate in-feed for a second GT at Panteg and considering the physical constraints of the 132 kV incoming circuits, it will be necessary to move the whole of Panteg BSP 132 kV bar into Rassau GSP group by changing the NOPs, this will bring the Panteg 132/11 kV transformers and Pontypool North substation into Rassau GSP group also. This will likely require that a solution to the Rassau GSP SGT capacity issues described in Section 3.1 is a prerequisite of this option as it will accelerate the GSP level overloads.

It is proposed to rearrange the 132 kV bar into a two section single busbar. Each side fed from a 132 kV circuit out of Rassau GSP. Due to the physical arrangement of the 132 kV circuits and towers it may be more convenient to establish a jumper on the eastern side of tower J66 and turn the currently separated circuits into a single circuit so that you can use the J66 tee route’s southern side (feeding Panteg 132 Main 2) as a circuit connected to both Rassau and Uskmouth rather than only Uskmouth. This would leave the J66 tee Northern side 132 kV conductor as a stranded asset but this could be potentially be re-used in the future with additional switchgear at Panteg and further re-arrangement of the busbars.

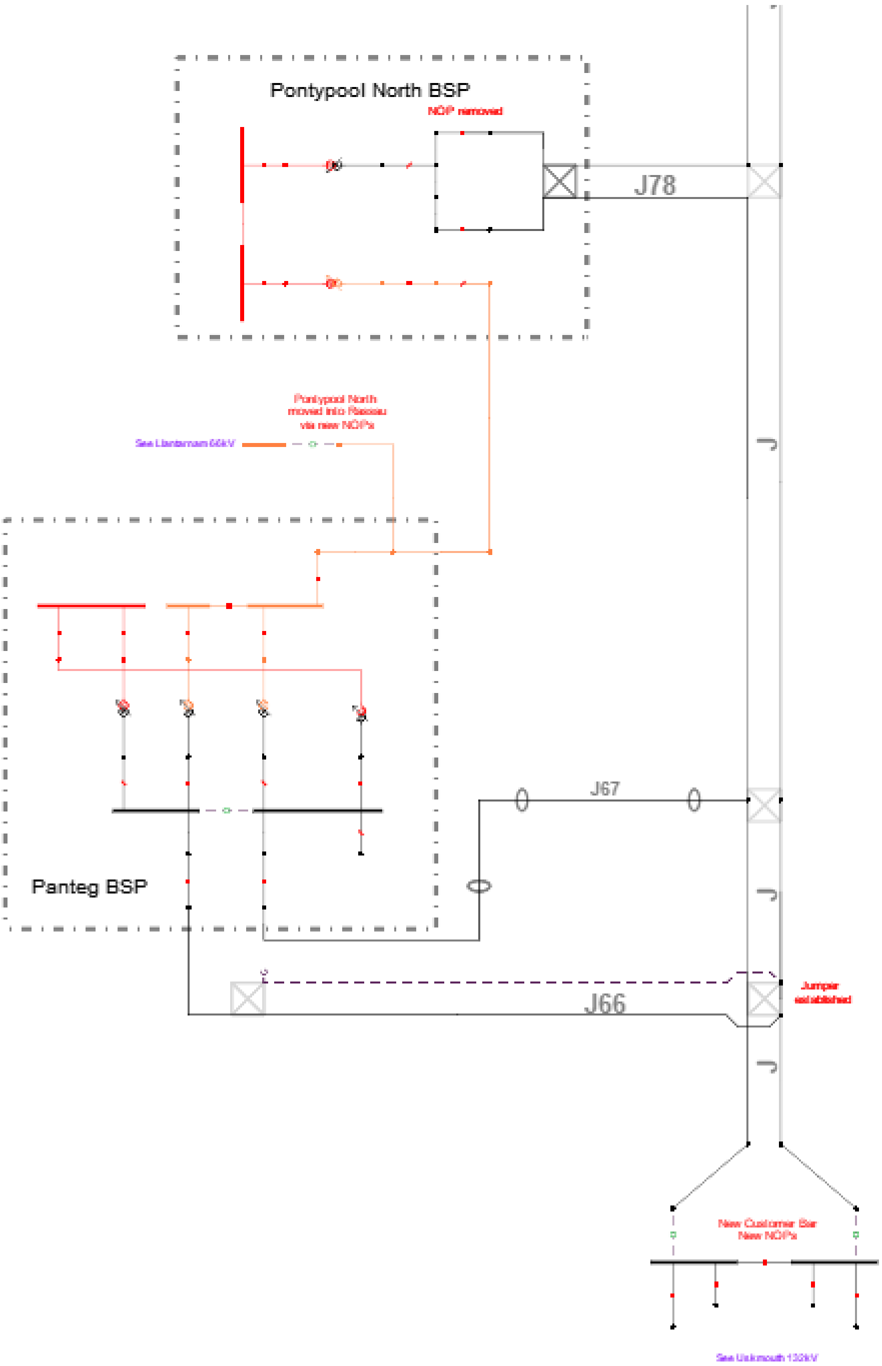

Figure 3.2 - Panteg BSP new network arrangement

Through these works it would now be possible to establish a second 132/66 kV GT at the site and supply the Panteg 66 kV bar more securely.

New limiting factor for constraint(s) considered: The next limitation will be dependent on the performance of the 66 kV circuits which will in turn depend on the distribution of the load that is connected. The maximum the two circuits could supply thermally is approximately 75 MVA before becoming overloaded.

Option 2 – Build a third 66 kV circuit between Abergavenny and Panteg BSPs

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

Detailed description: Instead of constructing a second GT at Panteg, an additional supply could be found at 66 kV from Abergavenny. Additional 66 kV bar sections would be required at both Abergavenny BSP and Panteg BSP to separate the three circuits between the sites adequately. The 66 kV route between the sites would be a minimum of 20 km long assuming a reasonably good route was possible, very probably a lot more. The difficultly consenting such a route makes this option unattractive.

Depending on the future development of this network it may be necessary to eventually split Panteg BSP from Abergavenny BSP. Whilst this option would be helpful in that future, the GT option would still be required to achieve it so the wider benefits of this option alone are debatable.

New limiting factor for constraint(s) considered: The rating of the lowest remaining circuit, currently around

Option 3 – 11 kV demand transfers to adjacent BSPs

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

Detailed description: Transfers which take load out of the group are quite limited in scope as the primary substations in question have limited interconnectivity with substations outside of the group. Whilst some smaller transfers are available which might be useful temporary measures they will not form an adequate long term solution. Care would need to be taken with any transfers that were used as some of the recipient substations are also constrained within this period and a transfer might exacerbate other issues.

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: The assets under constraint do not have an inadequate post-fault rating to provide a long term solution, however using them could be useful in the short term to provide a deferral to the deployment of a solution. There are synergies for deferring this work as the long term solution quite possibly requires GSP works before it is available.

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

Option 5 – Procure flexibility for Panteg BSP

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

Detailed description: Flexibility services could be procured at the Primaries supplied by Panteg BSP, they may be able to provide a deferral or a full solution at this site. Given the scope of the potential requirement a long term flexibility solution may be less likely.

Solution Recommendation

It is recommended to develop the 132 kV solution to this constraint as it is not a simple scheme. The timescales of the solution should be considered alongside the other works in this network, particularly the GSP works. If there are any scheduling issues then the use of flex or temporary load transfers should be considered to solve these difficulties.

3.3 Pengam 132/11 kV Second Primary Substation

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
Pengam Primary Transformer overload	Outage of the other transformer	n/a	2032	2031	2032	2034

Uncertainty under other Distribution Future Energy Scenarios: Under Leading the Way scenario the constraint is forecast by 2030, under Consumer Transformation by 2031, under System Transformation by 2031 and under Falling Short it is beyond the period of assessment.

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	Build a second 132/11 kV substation	✓	✓	✓	Viable
2	Build a 132/33 kV substation at Pengam and a 33/11 kV new primary elsewhere	✓	✓	×	Discounted
3	New 33/11 substation out of Crumlin BSP	✓	✓	✓	Viable
Operational Mitigation					
4	11 kV demand transfers to adjacent primaries	✓	×	✓	Viable
Load Management Schemes					
5	Post-fault transfers	×	×	×	Discounted
Flexibility services					
6	Procure flexibility for Pengam BSP	✓	✓	✓	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 Pengam BSP.

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

Option 1 – Build a second 132/11 kV substation

Capacity released for constraint(s) considered: 39 MVA Viable

Detailed description: Expanding the existing site with an additional set of 132/11 kV transformers should be possible, as there is plenty of space in the existing compound. Load could be transferred from the existing 11 kV bar onto a new 11 kV bar.

New limiting factor for constraint(s) considered: Rating of 15/30 MVA transformer, winter cyclic rating 39 MVA

Option 2 – Build a 132/33 kV substation

Capacity Released for constraint(s) considered: 78 MVA Discounted

Detailed description: If greater load growth was forecast or wider reinforcement considerations meant that a more substantial solution was required then a 132/33 kV substation could be established at Pengam BSP. A 33/11 kV substation would be required at a convenient remote location to actual provide the required 11 kV transfer capacity. Whilst discounted initially for not being cost effective this option might bear consideration if a review of the wider area (including parts of Crumlin BSP) showed that additional 33 kV sources would be beneficial as Pengam BSP would be easier to develop than a new site.

New limiting factor for constraint(s) considered: Rating of typical 132/33 GT, winter cyclic rating of a 30/60 MVA unit is 78 MVA

Option 3 – New 33/11 substation out of Crumlin BSP

Capacity Released for constraint(s) considered: 23 MVA Viable

Detailed description: Crumlin BSP is approximately 4.3 km away and could plausibly be extended at 33 kV to provide infeeds for a new 33/11 kV substation at a convenient location between the two. Whilst in the first instance this option will not compare well with Option 1 due to the additional linear assets that are required it may gain worth when also considering constraints in Crumlin BSP, see Section 3.1 of that report.

If suitably located the new 33/11 kV substation that is formed could subsequently be transferred to a future 132/33 kV substation at Pengam BSP that wasn't blocked by installing the second 132/11 transformer pair there. The 33 kV circuits constructed for this option would then be freed and could be used to achieve a load transfers back out of Crumlin if required.

New limiting factor for constraint(s) considered: Rating of the 33/11 kV transformers, the winter cyclic rating of a typical 11.5/23 MVA unit is 23 MVA.

Option 4 – 11 kV demand transfers to adjacent primaries

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

Detailed description: 11 kV transfers are plausible, particularly towards Pontllanfraith primary substation. However (See Crumlin BSP Report section 3.1) that substation may be constrained at the time. Any proposed transfer should be carefully considered to avoid causing new constraints.

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

Option 5 – Post-fault transfers

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

Detailed description: The assets under constraint have an inadequate post-fault rating to provide a long term solution, however using them could be useful in the short term to provide a deferral to the deployment of a solution.

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

Option 6 – Procure flexibility for Pengam BSP

Estimated Flexibility Required (MVA): 6 MVA+ by 2034

Viable

Detailed description: Flexibility services could be procured at Pengam to allow flexibility with the scheduling of these complex works.

Solution Recommendation

It is recommended to eventually pursue a new substation somewhere in this area (Refer to Cumlin BSP report Section 3.1), a simple 132/11 proposal would be the simplest scheme but a new 33/11 kV site at Pengam would provide wider benefit into Crumlin BSP. If there is sufficient load growth forecast then it may be strategically recommendable to leave space at Pengam for stronger future development and pursue a different option now. Flexibility and managing the overall distribution of 11 kV load between the group of substations in the area covered by this constraint would be of useful for deferring the work.

3.4 132 kV cable sections on AA Route

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 3.4.1 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
132 kV cable section between Rassau 205 or Rassau 505 and tower AA1	Fault or outage of the opposite circuit	None	2034	2034	N/A	N/A

Uncertainty under other Distribution Future Energy Scenarios: Under the Consumer Transformation scenario the constraint is forecast by 2033, under Leading the Way by 2034 and under Falling Short and System Transformation it is beyond the period of assessment.

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	Overlay the 132 kV cable sections	✓	✓	✓	Viable
Operational Mitigation					
2	132 kV demand transfers to adjacent GSPs	✓	×	✓	Viable
Load Management Schemes					
3	Post-fault transfers	×	×	×	Discounted
Flexibility services					
4	Procure flexibility for Newport East	✓	✓	✓	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 could impact the network integrity of both this group and the adjacent Uskmouth group.

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

Option 1 – Overlay the 132 kV cable sections

Capacity Released for constraint(s) considered: 30 MVA

Viable

Detailed description: The 132 kV cable sections in question are short and are routed entirely within land that NGED controls at Rassau GSP. The best option would likely be to simply replace the assets. Coincidently the cables are prospectively being diverted to enable 132 kV customer connections before the overload is due to occur.

New limiting factor for constraint(s) considered: AA-Route's thermal capacity is the next lowest denominator at 174 MVA

Option 2 – 132 kV demand transfers to adjacent GSPs

Capacity released for constraint(s) considered: 0 MVA

Viable

Detailed description: A 132 kV demand transfer would likely require Crumlin BSP to be transferred into the adjacent Uskmouth GSP. This would need to be considered carefully as the receiving network is also constrained for demand growth in this timescale.

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

Option 3 – Post-fault transfers

Capacity Released for constraint(s) considered: 0 MVA

Discounted

Detailed description: As with option 2, the difficulty is ensuring the receiving substation has adequate capacity to receive the prospective load transfer, Uskmouth GSP is already constrained due to large 132 kV connections onto that network.

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

Option 4 – Procure flexibility for AA Route BSPs BSP

Estimated Flexibility Required (MVA): 6 MVA+ by 2034

Viable

Detailed description: Flexibility services could be procured at any of the following sites in order to resolve this constraint:

- Rassau West BSP
- Ebbw Vale BSPs
- Pengam BSP
- Crumlin BSP

Solution Recommendation

As a customer connection offer is prospectively providing a position where solving the issue would be elementary, this is the recommended solution. Should the customer not proceed then the two GSP groups should be reviewed to determine if a 132 kV load transfer is practical at that time, if it is not then the reinforcement can be undertaken on its own merit.

DSO | nationalgrid electricity distribution

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