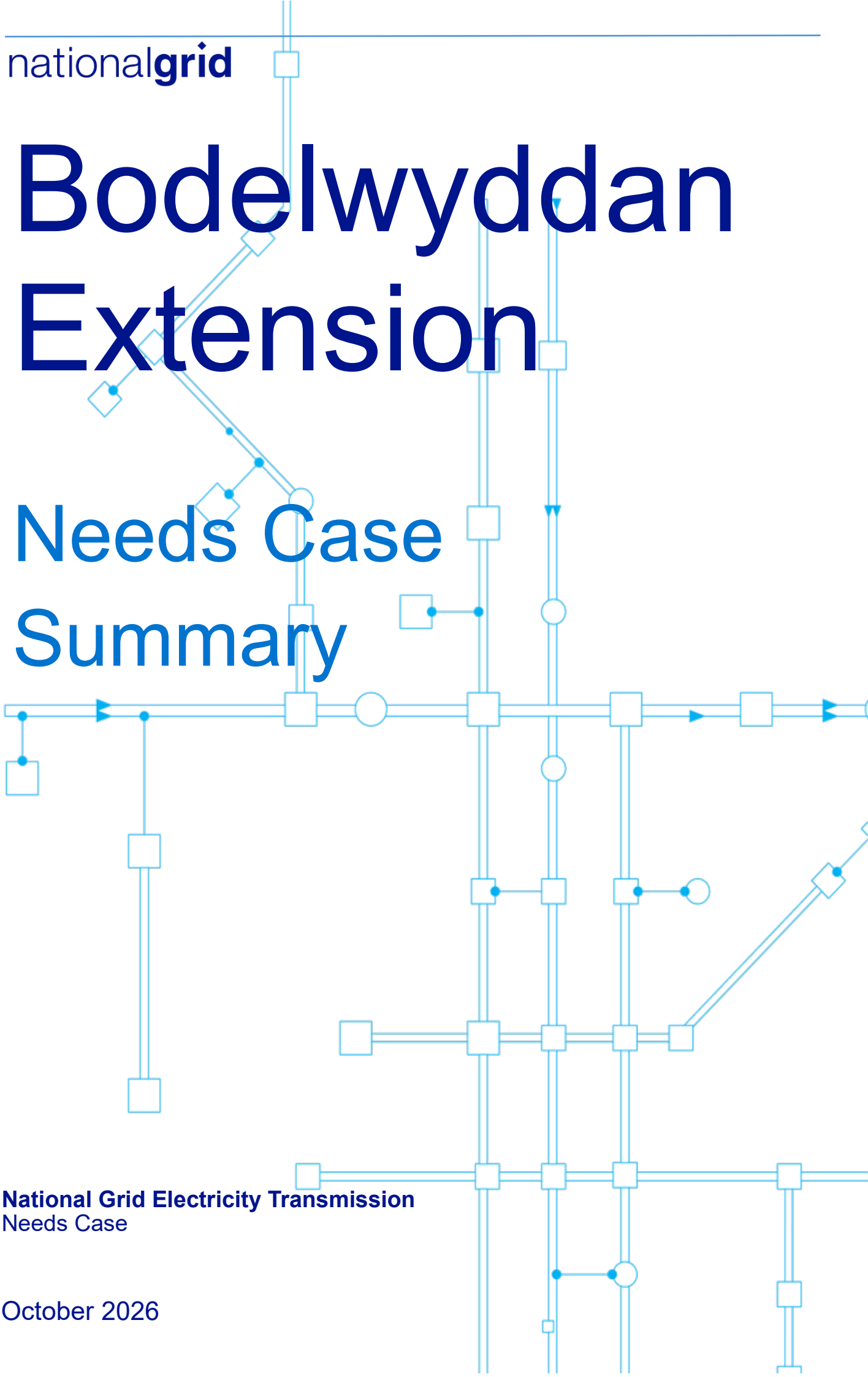
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Bodelwyddan Extension

Needs Case Summary



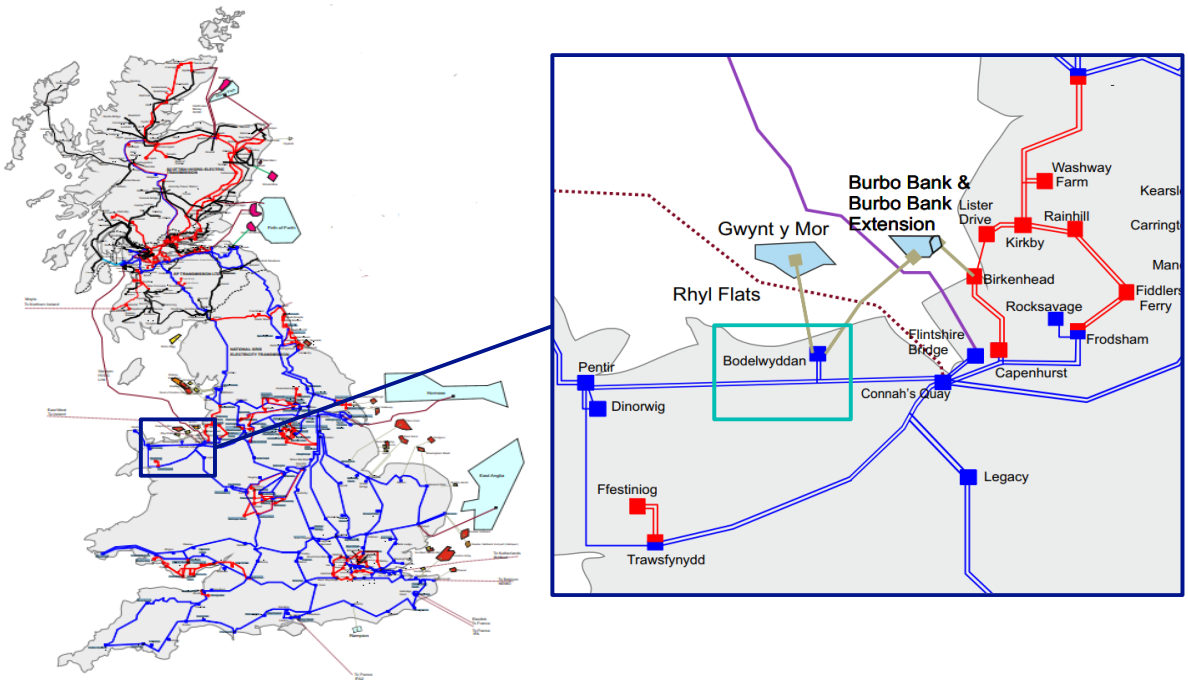
National Grid Electricity Transmission
Needs Case

October 2026

1. Background

Bodelwyddan Extension is a generation-driven connection project in North Wales. It will extend the existing Bodelwyddan 400kV substation with a new SF_6-free gas-insulated switchgear (GIS) hall and replace the existing tee'd overhead line arrangement with a double turn-in, enabling the connection of customers.

Figure 1: Proposed location of investment on our network



*Key: **Red** = 275kV assets, **Blue** = 400kV assets. Investment location shown in **green** box.*

This Needs Case is being submitted as part of the RIIO-ET3 Load Re-opener (LR) mechanism under Special Condition 3.18 (Load Re-opener and Price Control Deliverable) of the Electricity Transmission Licence Conditions. Following Ofgem's Draft Determinations, the project is progressing via Track 3. This submission seeks Ofgem's approval of the project's needs case, our optioneering assessment and our preferred solution. The project's eligibility for the Load Re-opener and associated Pre-Construction Funding (PCF) was addressed through the earlier Eligibility Letter process and is not sought through this submission.

2. Investment Drivers

The primary driver is customer connection requests at Bodelwyddan substation. This includes customers that are designated as Gate 2 Phase 1 connections as part of Connections Reform.[1] Asset health is not a key driver. The investment enables CP2030-critical generation capacity, directly supporting the UK Governments' Clean Power 2030 strategy. For this reason, the timely delivery of these connections has been considered critical in our optioneering.

[1] The customer connection pipeline has been refined through Connections Reform. As part of this process, projects that did not meet the required progression criteria were reassigned to Gate 1, removing less mature projects from the near-term connection background. The remaining projects (Gate 2, which is split into Phases 1 and 2) therefore represent the current view of the most credible and deliverable customer connections.

3. Options

We undertook a structured, multi-factor optioneering process to identify a proportionate and deliverable solution in the interests of consumers. We first identified **13 longlist options** within five strategic option categories: do nothing, market-based, non-transmission whole-system, making use of existing substations, and building a new substation.

From the longlist, we **shortlisted options E-1, D-6 and D-7** following a high-level assessment against balanced scorecard criteria (see table, below). Options A–C were rejected because they cannot deliver compliant physical connections. Other options were discounted because they could not provide a compliant connection using the existing circuit arrangement, relied on new SF_6 equipment, catered for only a subset of the customers, conflicted with planned customer developments, or had no viable customer cable route.

Table 1: Summary of longlist options assessment

Option	Details	Shortlist?	Preferred?
A	Do nothing counterfactual	No – cannot deliver compliant physical connection	
B	Market-based solution	No – cannot deliver compliant physical connection	
C	Non-transmission, whole systems solutions	No – cannot deliver compliant physical connection	
D-1	Extension of Bodelwyddan substation to the west, retaining the existing circuit arrangement	No – insufficient capacity on the existing section for a compliant connection	
D-2	New GIS extension to the west and reconfiguration of the existing 4ZB connection	No – requires new SF_6 equipment and caters for only a subset of the customers	
D-3	New GIS extension to the west and three new overhead line circuits	No – requires new SF_6 equipment and caters for only a subset of the customers	
D-4	New GIS extension to the west and two new overhead line circuits	No – requires new SF_6 equipment and caters for only a subset of the customers	
D-5	New detached GIS substation to the west	No – conflicts with a planned customer battery storage development	
D-6	Offline SF_6-free GIS hall adjacent to existing site	✓	✓
D-7	Offline SF_6-free GIS hall and single-bay extension of existing GIS hall	✓	
D-8	Offline SF_6-free GIS substation and repurposing of existing feeder bay	No – no viable customer cable route out of the substation	
E-1	New AIS substation at Bodelwyddan	✓	
E-2	New remote AIS substation near Bodelwyddan	No – conflicts with customers' approved consents and retains the tee'd arrangement	

4. Qualitative Trade-offs Between the Shortlisted Options

The table below sets out how the three shortlisted options compare against the balanced scorecard criteria used in our qualitative assessment.

Table 2: Qualitative trade-offs between the shortlisted options

Criteria	Option E-1: New AIS substation	Option D-6: SF_6-free GIS hall	Option D-7: SF_6-free GIS hall + single-bay extension
Engineering	**Strong benefit.** Delivers against the project drivers. The new substation would be built offline, avoiding disruption to the operation of the existing site.	**Strong benefit.** Delivers against the project drivers. Built offline, minimising disruption to operational assets, and the double turn-in meets thermal, resilience and future export needs.	**Strong benefit.** Delivers against the project drivers. The second-stage GIS hall would be built offline, and the double turn-in meets thermal, resilience and future export needs.
Environmental	**Neutral.** Avoids new SF_6 equipment, but an AIS substation needs a much larger footprint than GIS, increasing land impact.	**Benefit.** All new equipment is SF_6-free and it avoids extending the existing SF_6 GIS hall. Its compact GIS footprint reduces land impact compared with E-1.	**Detractor.** The first-stage extension of the existing hall would need SF_6 equipment, as there is insufficient space for SF_6-free technology. Mixing the two technologies could also create interface challenges.
Deliverability	**Strong detractor.** The larger footprint conflicts with some customers' approved consents and raises compulsory purchase risk. Earliest first site access is estimated to be 2035, too late for the CP2030-critical customers.	**Strong benefit.** Delivers connections in line with customer connection dates, supporting CP2030, and is consistent with arrangements agreed with customers to manage project interactions.	**Strong benefit.** Delivers connections in line with customer connection dates, supporting CP2030, and is consistent with arrangements agreed with customers to manage project interactions.
Economic / consumer value	**Detractor.** Lower upfront equipment cost, but requires a gas main diversion and land costs estimated to be around 50% higher than the GIS options.	**Neutral.** Requires a shorter gas main diversion. Allows a single outage strategy and avoids complex works near live circuits.	**Neutral.** Also requires a gas main diversion, but needs a two-stage outage and commissioning strategy.
Consenting / stakeholder	**Detractor.** Conflicts with planned developments, including customers whose approved consents assume an extended GIS solution. Landowner support varies and local concerns about cumulative impacts have been raised.	**Benefit.** Land to the west of the site has a clearer planning pathway and better land availability, and the option aligns with planned customer schemes. Land rights are still needed from three landowners.	**Benefit.** Shares the clearer planning pathway of the western site and aligns with planned customer schemes. Land rights are still needed from three landowners.

5. Quantitative Trade-offs Between the Shortlisted Options

The table below expresses the position of the different shortlisted options relative to Option D-6. The cost-book estimates reflect our view at the time of optioneering and allow a like-for-like comparison of the shortlisted options. To ensure we can maintain a competitive tender process and in turn protect consumer value, we have only provided cost ratios.

Table 3: Quantitative trade-offs between the shortlisted options

Measure	Option E-1	Option D-6	Option D-7
Cost-book estimate*	0.98	1	1.13
Total capital cost over the 50-year appraisal period, including replacement*	0.98	1	1.13
Net present value (cost)*	0.94	1	1.08

Undiscounted carbon costs (construction and gas leakage)*†	0.36	1	0.72
Useful economic life	1	1	1

**Lower is better. †Transmission losses were not monetised in the cost benefit analysis.*

Option E-1 is the most economical on the initial cost-book estimate (around 2% lower than D-6) and has the most favourable NPV (around 6% lower net cost), reflecting the lower upfront cost of AIS equipment. Option D-7 is around 13% more expensive than D-6 on both initial and whole-life cost. Option D-6 carries the highest monetised construction carbon and gas leakage costs in the cost benefit analysis. As the analysis notes, these results are subject to deliverability, consenting, land, outage and risk considerations; on those grounds, the cost advantage of E-1 is outweighed by its programme risk and its conflicts with customers' approved developments.

6. Preferred Solution

Based on a qualitative and quantitative assessment of the shortlisted options, **Option D-6 is the preferred option** because:

- The alternative GIS Option D-7 extends the existing SF_6 GIS hall, leading to an increased risk of **SF_6 emissions**. Preferred Option D-6 avoids building new SF_6 equipment.
- AIS Option E-1 would require approximately five times the land area of a GIS site, which would create significant **conflicts with other planned developments in the area**.
- AIS Option E-1 is associated with **substantial cost and programme risk**. Consequently, this option would not support CP2030 targets.