UK Government

# RAF046/2425 Rapid Evidence Assessment - International Electricity Networks Research Best Practice

Department for Energy Security and Net Zero (2026)

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# Overview

*The Rapid Evidence Assessment was undertaken to understand international best practice and its applicability to GB.*

## Introduction

- **Project Overview:** On behalf of the DESNZ Electricity Networks Programme team, Deloitte conducted a rapid evidence assessment of international electricity transmission best practices between 17th February and 4th July 2025. The project comprised two phases: Phase 1 (17th February–14th March 2025) and Phase 2 (1st May – 4th July 2025).
- **Project Objective:** The purpose of this work was to identify examples of international best practice in electricity transmission network infrastructure deployment and to assess the potential applicability to Great Britain (GB).
- **Phase 1 (17th February – 14th March):** In Phase 1, an initial long-list of 40 potential international electricity transmission initiatives was compiled. These initiatives were reviewed, and four high-priority initiatives and four key markets were selected for analysis in Phase 2 based on criteria including applicability to the GB market, delivery status, scope, funding, and projected impact for Clean Power 2030.
- **This Report - Phase 2 (1st May - 4th July):** This phase involved eight weeks of desktop research and interviews to assess the applicability of the prioritised initiatives and markets to support Clean Power 2030 targets. Each initiative was evaluated for viability, feasibility, scalability, and deliverability. This report presents the executive findings of Phase 2.

## Scope of the work

- **Scope:** The work commissioned focused exclusively on electricity transmission best practices. Insights from other infrastructure assets (e.g., electricity distribution, interconnectors, hydrogen, and gas transmission / distribution) were excluded.
- **Focus:** The analysis prioritised completed projects and implemented policies, where available, capturing insights into their drivers, implementation details, impact, progress, key lessons learned, and applicability to GB.
- **Key areas of interest:** projects and initiatives that demonstrated success in 1. Accelerated delivery; 2. Reduced community opposition; 3. Streamlined planning and consenting; 4. Stimulated and scaled investment; and 5. Earlier grid connection dates were reviewed in Phase 1 and prioritised initiatives progressed in Phase 2.
- **Disclaimer:** This report does not endorse or recommend specific policies. It is for information purposes only.

# Summary Approach

## Phase 2 International Rapid Evidence Assessment

*Four initiatives and four key markets advanced to Phase 2 for in-depth analysis after a Phase 1 review of 40 initiatives for in-depth analysis.*

### Phase 1 output: Initiative prioritisation and market selection

- An initial long list of 40 potential international electricity transmission initiatives was compiled. This leveraged DESNZ's knowledge base, industry expertise, and was informed by frequent queries DESNZ receive.
- Key GB power sector stakeholders provided feedback and validation to ensure relevance to the GB context.
- The long-list was prioritised, resulting in seven high-priority initiatives. These initiatives were selected for further analysis and were associated with four key markets - Germany, Australia, Netherlands, and Belgium.
- Selection criteria included GB market applicability, project status, and scope alignment.
- Four initiatives (undergrounding, community funds, supply chain visibility and certainty, and financial incentives), along with the associated four selected markets, progressed to Phase 2.

### Phase 2 objectives: Initiative viability and market analysis

- **Objective 1:** Assess the suitability, feasibility, deliverability, and scalability of chosen initiatives within the GB context to contribute to the achievement of CP2030 targets.
- **Objective 2:** Conduct comparative analyses of selected markets to identify key success factors and contextual influences, informing the development of GB-specific strategies.

### Phase 2 approach: Initiative analysis - research, validation and engagement

- An understanding of each initiative was developed using three key approaches:
    - **In-depth Desktop Research:** Analysis of publicly available information, industry reports, and academic literature to identify GB-specific trends, challenges, and opportunities.
    - **International Stakeholder Validation:** DESNZ-led engagement with international electricity network teams to validate findings and gain crucial contextual insights.
    - **Broad Power Sector Engagement:** Input from 18 key power sector stakeholders, building on Phase 1's four participants.
- This combined approach provided a view of each initiative's potential within the GB electricity transmission sector.

# Summary of outputs from Phase 1

*Phase 1 used desktop research and workshops to identify and assess 40+ international electricity transmission initiatives, shortlisting four for detailed analysis to inform strategies for accelerating GB grid expansion.*

*Phase 1 also identified three key themes for accelerating GB grid deployment, highlighting four high-potential initiatives and recommending further research into these initiatives through stakeholder engagement and primary research.*

## Phase 1 - Initiative Research Objectives and Methodology

### Objectives

Phase 1 of the Rapid Evidence Assessment aimed to identify and analyse successful international electricity transmission initiatives to inform strategies for de-risking and accelerating grid expansion in GB.

The primary objective was to identify leading international practices, so that in Phase 2, an assessment of their applicability to the GB context could be conducted, focusing on tangible outcomes and key applicability criteria. This involved a two-pronged approach: firstly, a comprehensive market scan to identify relevant initiatives, and secondly, a rigorous assessment of those initiatives to determine their potential impact and feasibility within the GB energy landscape.

### Methodology

The methodology involved a multi-faceted approach combining desktop research with expert insights:

- Initial desktop research from sources including but not limited to CEER, ENTSO-E, drawing upon industry expert networks, and DESNZ's internal resources which generated a long list of 40 potential initiatives. These initiatives covered the supply chain, community funds, innovation to drive accelerated delivery, workforce, and planning and consenting improvements.
- This long list was then refined through a prioritisation workshop involving DESNZ representatives, power sector actors (NESO, Ofgem, SSEN Transmission, and SP Energy Networks, National Grid engaged in Phase 2), and international electricity transmission experts.
- The selection criteria prioritised initiatives frequently raised by DESNZ, those with high potential impact in GB, and those supported by reliable evidence.
- Based on these criteria, four initiatives were selected for in-depth analysis, and three additional initiatives were selected for further testing and validation.
- The selection process considered tangible outcomes (planning and consenting, supply chain and workforce, inward investments, community acceptance, grid connection.

timelines, and grid financing) and GB applicability criteria (market structure alignment, regulatory compatibility, geographical considerations, technical feasibility, and realistic implementation timelines).

- The selected initiatives were then subjected to in-depth analysis, considering factors such as cost, geography, technological complexity, and regulatory compatibility.

The research also incorporated initial validation and feedback from key GB power sector actors to ensure relevance and applicability. This iterative process ensured that the final selection of initiatives for detailed analysis reflected both international best practices and the specific challenges and opportunities within the GB context.

## Phase 1 – Outcomes

### Research themes

Phase 1 of the Rapid Evidence Assessment successfully delivered on its objectives, yielding several key insights relevant to accelerating electricity transmission network deployment in Great Britain. The research identified three overarching themes crucial for achieving faster and more efficient delivery:

- the importance of **direct community benefits** in mitigating opposition and accelerating project approvals.
- the significant role of **long-term certainty and visibility** in project pipelines in attracting investment and streamlining supply chains.
- the potential of **innovative delivery techniques and methods** to improve efficiency and reduce project timelines.

Four prioritised initiatives were selected in a workshop based on their points of interest and frequent mention in queries received by DESNZ, further refined by input from power sector actors.

### Prioritised initiatives

An in-depth analysis of four prioritised initiatives provided concrete examples of successful international practices and their potential applicability to the GB context:

- the strategic use of underground cables (innovative delivery techniques and methods)
- the Ventilus Community Fund (importance of direct community benefits)
- the TenneT ten-year plan (long-term certainty and visibility)
- financial incentives for cable testing (innovative delivery techniques and methods)

Each initiative offered valuable lessons, highlighting specific areas for improvement and potential adaptation within the GB regulatory and market landscape. For example, the TenneT plan demonstrated the benefits of long-term project visibility, while the financial incentives for cable testing showed how targeted incentives can accelerate delivery. The Ventilus Community Fund provided a model for proactive community engagement, and the analysis of underground cabling highlighted the need for a strategic, cost-benefit-driven approach. The assessment of three additional initiatives further enriched the findings, informing future research directions. However, they were not brought forward in Phase 2 based on the power sector actors' assessment of their potential impact in the GB context and the level of effort required for implementation.

**Further research for Phase 2**

Phase 1's findings, identifying key prioritised initiatives, provided a strong foundation for Phase 2. This next phase intended to focus on in-depth primary research, including expanded stakeholder interviews, to validate the initial assessment and assess the suitability, feasibility, deliverability, and scalability of these initiatives within the GB context.

## Long list of initiatives from Phase 1

| Country | Theme | Initiative name | Initiative description |
|---|---|---|---|
| Germany | Innovative delivery techniques and methods | Sued Link | A 700km 525kv HVDC connection with a 4GW capacity. The project is designed to transport energy from wind farms in northern Germany to commercial and population centres in the south. |
| Brazil | Innovative delivery techniques and methods | Use of helicopters in construction | The H225 is a heavy-lift helicopter that has recently demonstrated a use-case for the construction of power lines. The helicopter was used in mountainous terrain in Brazil to remove old pylons and install new transmission lines. The helicopter operated for 111 days installing 1841 sections of power lines. |
| Germany and USA | Innovative delivery techniques and methods | Modular Projects | Modular building involves constructing buildings or structures off-site in a factory setting, then transporting and assembling them on-site. |
| Germany | Innovative delivery techniques and methods | Ultranet | Ultranet is a 340-kilometer underground HVDC transmission line that connects the substation in the South to the substation in the North. It has a transmission capacity of 2 x 1,100 megawatts (MW). |

| Country | Theme | Initiative name | Initiative description |
|---|---|---|---|
| Spain | Innovative delivery techniques and methods | Spanish Grid Replacement Programme | A 4-year investment plan to upgrade the national electricity grid, comprising a total of 89 initiatives including integrating new renewables and developing national and international interconnectors. |
| Germany | Innovative delivery techniques and methods | Financial incentives to complete cable testing | A financial incentive is offered to suppliers that successfully complete PQQs for specific HVDC projects within a specific timeframe. |
| China | Innovative delivery techniques and methods | Ultra-High Voltage Cables | Mainland China is a global leader in High-Voltage Direct Current (HVDC) transmission, boasting the world's largest network and pioneering ultra-high voltage technologies to integrate renewable energy and enhance grid reliability across vast distances |
| Norway | Innovative delivery techniques and methods | Johan Sverdrup oil field | Johan Sverdrup oil field is supplied with HVDC transmission links that power the offshore oilfield development from the Onshore Grid, thereby bypassing the need for local generation and lowering CO2 emissions while ensuring field operations can run without the use of fossil fuels. |
| Denmark and Germany | Innovative delivery techniques and methods | Krieger's Flak | The first European hybrid system connecting three Offshore Wind farms and enabling transnational energy exchange, thereby contributing to energy supply security. The interconnector allows for greater energy sharing between countries. |
| Denmark and Germany | Innovative delivery techniques and methods | Bornholm Energy Island (Project CB7) | Follow on from Krieger's Flak which made hybrid interconnectors a reality. A collaboration with German TSO 50Hertz and Energinet (Denmark) will connect 3 GW of offshore wind farms to both the Danish and German markets through an energy island that will house large wind farms at sea far from the coast. |
| Germany | Innovative delivery techniques and methods | A-Nord HVDC Underground Power | The A-Nord project is a major energy infrastructure project in Germany involving the construction of a 550 km long underground high-voltage direct current (HVDC) transmission line. This line will connect offshore wind farms in the North Sea to the German mainland. |

| Country | Theme | Initiative name | Initiative description |
|---|---|---|---|
| Australia | Innovative delivery techniques and methods | Targeted Underground Power Program | Australia has various targeted underground power programs driven by state governments and utilities. It involves replacing overhead distribution poles and wires with underground infrastructure. Focus on selectively burying overhead power lines in areas where they pose the greatest risk or visual impact. |
| Denmark and Germany | Innovative delivery techniques and methods | North Sea Wind Power Hub - TritonLink | The North Sea Wind Power Hub aims to construct one or more artificial islands in the North Sea. The islands would act as central hubs for collecting and distributing massive amounts of offshore wind energy generated by interconnected wind farms. |
| USA | Innovative delivery techniques and methods | Brooklyn Clean Energy Hub Concept | The proposed Brooklyn Clean Energy Hub aims to supply 6 GW by 2027, connecting to the 345 kV system in New York City and will cost less than upgrading multiple existing interconnection points. |
| USA | Innovative delivery techniques and methods | United States Inflation Reduction Act (IRA) | The report mentions the IRA as a significant driver of clean energy investment. The IRA's focus on clean energy deployment and manufacturing is expected to contribute to decarbonization. Timeframes for specific technologies and potential delays are still unfolding as the IRA is implemented. |
| Finland | Innovative delivery techniques and methods | Fingrid | The Ridge Line is a planned 100km 400 kV connection is being planned to enable the increasing volume of electricity produced by wind power to be transmitted from the Central Finland to consumers in the south. |
| Greece | Innovative delivery techniques and methods | Cyclades Islands Interconnections Project | The Cyclades Islands Interconnections project will install over 300km of 150kv submarine cables with a capacity of 170 MW. The islands have historically locally generated their power using oil and gas and these interconnectors will enable them to decommission these local assets. |
| Denmark and Sweden | Innovative delivery techniques and methods | Reinvestment in Øresund (System 2) HVDC | This project involves reinvesting in the 400 kV Øresund connection between Zealand (Denmark) and southern Sweden. Corrosion has been identified across the connection, significantly increasing the chance of failure. New cabling is being installed. |

| Country | Theme | Initiative name | Initiative description |
|---|---|---|---|
| UK | Innovative delivery techniques and methods | EGL3 | Eastern Green Link 3 is a proposed High Voltage Direct Current (HVDC) subsea electricity cable. It aims to connect Scotland's growing renewable energy capacity to England, where electricity demand is higher. This helps transport clean energy across the UK grid. |
| Singapore | Innovative delivery techniques and methods | Smart grid initiatives | Singapore, facing land constraints and high energy demand, is investing heavily in smart grid technologies. Singapore's approach involves using data analytics and digitalization to optimize energy consumption, grid stability, and integrate distributed energy resources (DERs) like solar PV. |
| Belgium | Innovative delivery techniques and methods | Capacity Mapping | Capacity mapping in the energy sector refers to the process of assessing and forecasting the available capacity of electricity and gas infrastructure, including generation, transmission, and distribution systems. |
| UK | Innovative delivery techniques and methods | Caithness-Moray HVDC Link | Transmits power through undersea cables in the Moray Firth between Spittal in Caithness and Blackhillock in Moray and demonstrates the potential of a multi-terminal energy infrastructure asset. |
| UK | Innovative delivery techniques and methods | Shetland HVDC | Connects the Shetland Islands to the mainland Scottish power grid, thereby increasing energy reliability and supply security. |
| UK | Innovative delivery techniques and methods | Sofia Offshore Wind Farm HVDC Grid Connection | Projected to generate enough electricity to power 1.2 million UK homes, using an advanced HVDC transmission system to send power back to shore where it can be integrated into the National Grid. |
| Finland | Innovative delivery techniques and methods | Ridge Line | 450km, 400 kV double-circuit overhead line transmits renewable energy from the Kainuu region (surplus) to southern Finland (deficit). |
| Europe | Long-term certainty and visibility | Technology Standardisation | European TSOs have standardised cable requirements making it easier for suppliers to create in demand and supply cables reducing the manufacturing time |

| Country | Theme | Initiative name | Initiative description |
|---|---|---|---|
| Canada | Long-term certainty and visibility | Integrated Energy Plan | Canada has developed integrated energy plans at both the federal and provincial levels. These plans aim to address the challenge of balancing competing objectives, such as energy security, environmental sustainability, and economic growth. |
| Netherlands and Germany | Long-term certainty and visibility | TenneT | TenneT is a leading European electricity transmission system operator (TSO) responsible for the high-voltage grid in the Netherlands and large parts of Germany. The TenneT programme encompasses a vast array of projects. |
| USA | Long-term certainty and visibility | US – Department of Energy | In a move aimed at streamlining the permitting process for onshore electric transmission facilities, the Department of Energy has announced the finalisation of a new rule that promises significant improvements in Federal environmental reviews and permitting procedures to speed up integration of energy. |
| Canada | Long-term certainty and visibility | Feed in Tariffs | Feed-in tariff (FIT) program was a pioneering initiative in North America to incentivise renewable energy development. The FIT program offered guaranteed prices for electricity generated from renewable sources like solar, wind, biogas, and hydro. These prices were fixed for the duration of the contract. |
| Canada | Long-term certainty and visibility | TSO and DSO in Gas and Electricity | Canada's electricity and gas sectors are structured with distinct roles for Transmission System Operators (TSOs) and Distribution System Operators (DSOs), each with distinctive roles. |
| Canada | Long-term certainty and visibility | Tariff for Federation of High-Volume Consumer of Energy | The Federation of High-Volume Consumers of Energy (FHVCE) is an industry association representing large industrial energy users in Canada. The FHVCE advocates for policies that support competitive energy prices and reliable energy supply for its members. |
| France | Long-term certainty and visibility | Feed-in tariffs (FIT) & Feed-in premiums (FIP) | FIPs provide renewable energy producers with a premium payment on top of the market price for electricity. This premium is typically fixed for a set period, but the total revenue received by producers fluctuates with market prices. |

| Country | Theme | Initiative name | Initiative description |
|---|---|---|---|
| Europe | Long-term certainty and visibility | EU Green Deal Industry Plan | The EU Green Deal Industrial Plan aims to accelerate the green transition by making Europe the world leader in clean technologies, ensuring competitiveness and security of supply. |
| Germany and Netherlands | Long-term certainty and visibility | TenneT, Amprion, TransnetBW & 50Hertz | TenneT focuses on extensive procurement activities to support the development, construction, and maintenance of their respective high-voltage electricity transmission grids. |
| USA | Long-term certainty and visibility | Streamlined permitting and regulatory processes | In a move aimed at streamlining the permitting process for onshore electric transmission facilities, the Department of Energy announced, in April 2024, the finalisation of a new rule that promises improvements in Federal environmental reviews and permitting procedures to speed up integration of energy. |
| Australia | Long-term certainty and visibility | Australian Energy Market Commission (AEMC) | The AEMC has implemented three key initiatives to support earlier connection times, increase certainty and visibility for the supply chain and support implementation of initiatives. |
| Belgium | Direct community benefits | Ventilus | The Ventilus project aims to construct an 82km overhead and partially underground HVDC power line. It will connect a planned offshore wind farm hub in the North Sea to an onshore substation in Zeebrugge. |
| Canada | Direct community benefits | Regulator stakeholder engagement | Canada's indigenous community hold 51% of ownership and thus are crucial to obtaining approval and support for the building and commissioning infrastructure. Obtaining approvals currently is a lengthy process and Canada is looking for ways to streamline, such as involving communities as funding partners. |
| Canada | Direct community benefits | Local government involvement | Some Canadian local governments are proactively defining the need for new energy infrastructure, rather than simply reacting to utility proposals. This approach focusses on broader community priorities to ensure energy projects align with local values and long-term sustainability goals. |

# Rapid Research Output & Insights

## Phase 2 International Rapid Evidence Assessment

*Prioritised initiatives on their own, and within the timeframes, won't accelerate CP2030. Stakeholder input suggests an integrated Electricity Transmission strategy, combining industry practice, could achieve global energy leadership.*

### Phase 2 – Rapid Research Output and Insights

**Objective 1: Initiative viability and applicability**

This rapid evidence assessment evaluated four international initiatives – undergrounding, community funds, supply chain visibility, and financial incentives - for their applicability to accelerating GB's Clean Power 2030 targets. The assessment, which included desktop research and stakeholder interviews, found that none of these initiatives, in isolation, offer a direct solution for GB in the time to support deployment periods to meet 2030 targets. Specifically:

- **Undergrounding:** the German undergrounding mandate, while aiming to reduce community opposition, has resulted in significant cost increases and opposition from landowners.
- **Community funds:** Belgian community funds increased participation but did not eliminate opposition.
- **Supply chain visibility and certainty:** Germany's approach to supply chain visibility, while successful in stimulating investment, has not fully eliminated supply chain risks.
- **Financial incentives to accelerate delivery:** the use of financial incentives requires careful case-by-case evaluation.
- The initiatives of interest are implemented in GB to varying extents with none of the examples being the absolute right solution to address GB challenges and acceleration for delivery for 2030, but offers learnings for consideration with an opportunity to deliver a holistic network approach that will allow GB to leapfrog progress.

**Objective 2: Comparative Market Analysis and GB Strategy Development**

Comparative analysis of four key markets highlighted the complexities of direct replication, given their diverse structures and contexts, emphasising the need for a GB-specific approach.

- Germany presents the closest parallel due to similarities in the number of Transmission Operators (TOs), priorities, energy mix, and demographics. However, key differences exist, notably in the public ownership of TOs and topographical variations.

- The absence of network-wide solutions in the focus markets presents a unique opportunity for GB to develop an innovative, holistic approach to leapfrog existing challenges and establish global leadership in the energy transition.

# This Report

*This report summarises the assessment of four initiatives (undergrounding, community funds, supply chain, and financial incentives).*

**This Report**

- This Report sets out a summary the four initiatives that were prioritised.
- Each summary helps note why it was an area of interest to DESNZ, the driver of that initiative in its market context, what has been noted, its high-level impact, did it achieve its outcome, and strategic considerations for GB Applicability.

1. **Undergrounding**
    1.1. Undergrounding to reduce community opposition
    1.2. Undergrounding to mitigate climate risks

2. **Community Funds**
    2.1. Community funds to increase community benefits

3. **Supply Chain Visibility**
    3.1. Increase visibility and certainty in the supply chain

4. **Financial Incentives**
    4.1. Financial Incentives to Accelerate Supply Chain

## 1. Undergrounding

## 1.1 Undergrounding to reduce community concerns

**Market:** Germany

**Area of Interest:** 2015 Federal mandate to prioritise undergrounding for new HVDC lines

**DESNZ Area of Interest**

- In GB, significant investment in new electricity infrastructure (£40bn) is required over the next five years to support the transition to net zero, ensure security of supply, and accommodate rapid growth in renewable generation.
- To date, the primary technology used for high-voltage transmission has been overhead lines (~83%), which currently make up the majority of the existing GB transmission infrastructure[1].

[1] Genspark – Overview of Germany's HVDC Transmission Plan

- In the need for new transmission infrastructure and at a scale and pace that we have not faced in 50-60 years, there is a continued focus on stakeholder engagement and community acceptability.
- There can be community concerns regarding the development of new overhead transmission lines, with visual impact cited as a key issue. As an alternative, some individuals advocate for underground cables.
- In GB, the development and planning of major electricity network infrastructure projects is guided by legislative, regulatory and planning requirements, including the National Policy Statements for Energy (NPS EN-1, EN-3 and EN-5). The National Policy Statement EN-5 includes a starting presumption for overhead lines except in nationally designated landscapes, such as Areas of Outstanding Natural Beauty, where undergrounding is the starting presumption. The NPS EN-5 acknowledges that undergrounding can be considered where the benefits outweigh the impacts.
- Balancing technical feasibility, environmental considerations, cost, and public acceptability has become increasingly complex.
- DESNZ has been asked about Germany's approach to undergrounding, particularly the federal mandate that prioritises underground cables for all new high-voltage direct current (HVDC) transmission projects. This approach is the primary driver increasing acceptability for new developments whilst helping meet the country's decarbonisation targets.
- This desktop research has been undertaken to understand how Germany has implemented this approach, what outcomes it has achieved, and strategic considerations in the GB context.

**Driver**

- To expedite grid expansion and gain public acceptance, Germany mandated the prioritisation of underground cables for high-voltage direct current (HVDC) lines in December 2015[2].
- Germany plans to add 35 high-voltage direct current (HVDC) lines by 2045 to connect 70 GW of offshore wind power from the North Sea and Baltic Sea to the mainland[1].
- The Act amending legal provisions on grid construction, which entered into force in December 2015, stipulates rules regarding:
    - Priority for underground cables in federal planning for major electricity highways (new ultra HVDC transmission lines).
    - Pilot routes and specified criteria for alternating current (AC) underground cables.

**What has been the noted, high-level impact?**

- **Cost impact**: A recent note from the German regulator, the Federal Network Agency (BNetzA) has estimated that switching from undergrounding to overhead power lines for Germany's necessary grid expansion up to 2045 could save as much as €35 billion in investments[5,6] Individual projects costs, like SuedLink, have tripled following the mandate. The increase in cost is mostly passed onto consumers through grid fees[4].
- **Planning and approvals impact**: The aim of German government was to reduce community opposition and accelerate grid expansion. However, the mandate significantly extended planning and approval timelines. A key project SuedLink started in 2013 was expected to be completed in 2022 but was delayed due to the mandate. [2]The project is currently under construction and expected to be completed in 2028. The planning and approval process for SuedLink took seven years in total[6], a point validated by interviews with power sector actors.
- **Environmental impact:** The German regulator has recently reported high or very high environmental impacts for about a third of all major projects deploying underground cables, particularly affecting soil, groundwater, and ecosystems during installation[5].
- **Community impact:** The intention was to increase public acceptance, whilst it is not clear how success is measured by the German government, opposition from German Farmer's Association is calling for a reversal of the undergrounding mandate[9] due to significant disruption and damage to farmland, unlike overhead lines, which have a much lower impact on soil[11].
- Undergrounding is also expected to increase visual and landscape benefits and improve grid reliability, however there is limited available information documented on the impact in Germany.

**Has it achieved its outcome?**

- Germany's decision to mandate the undergrounding of HVDC electricity transmission projects was largely driven by public opposition to new overhead lines, particularly from local communities and environmental groups. While the policy was intended to improve public acceptance and accelerate project timelines, the expected benefits have been mixed.

**1. Public Opposition Has Declined - but Not Disappeared**

- The move to undergrounding has indeed reduced some of the public opposition tied to visual and environmental concerns, particularly in residential and scenic areas[3].
    - However, resistance still exists - especially from the farming community, where underground cables can disrupt land use, crop cycles, and soil structure[5].

**2. Speed of Delivery Has Not Significantly Improved**

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[1] Genspark – Overview of Germany's HVDC Transmission Plan
[3] Research Gate, 2016 [4] BMWE, 2025 [5] Cleanenergywire, 2024 [6] DW [7] Renewables Grid, [8] Renew Economy
[9] Clean Energy Wire, 2024 [10] Xpert Digital, 2024, [11] The IET, 2025, [13] Cleanenergywire, 2024 [14]The IET, 2025

- Despite the intention to accelerate project development through improved public acceptance, project timelines have not necessarily shortened. In fact, some undergrounding projects have experienced delays due to:
    - Complex planning and environmental approval procedures.
    - Technical challenges associated with land access and trenching.
    - Extensive compensation negotiations with landowners.
- The SuedLink project has been repeatedly delayed. Initial plans foresaw full commissioning by 2022; the revised target is now 2028[10].

**3. Financeability and Policy under Review**

- Mandating undergrounding has also substantially increased costs. Industry estimates suggest that underground HVDC lines are 4.5 times more expensive than overhead alternatives, primarily due to trenching, cable technology, and restoration requirements.
- Engagement with stakeholders close to the German energy and finance markets indicates growing concern about the long-term financeability of this approach. There is growing pressure to review or relax the mandate, particularly as Germany accelerates grid build-out to meet 2030 renewable targets.
- Germany's undergrounding mandate has partially met its policy objectives by improving public acceptance in visually sensitive areas. However, it has not eliminated community opposition, especially in rural and agricultural regions where land access remains a critical issue. Moreover, the strategy has not significantly accelerated project timelines and has led to sharp increases in infrastructure costs, raising concerns about long-term scalability and investment viability.
- As Germany enters a critical decade for energy transition, there are questions within the German market around whether the current approach to deciding whether to underground or build overhead lines achieves the right balance of cost, speed, and social acceptance.

**Strategic considerations - GB Applicability (1/2)**

- As GB accelerates electricity grid upgrades to meet net-zero targets and decarbonisation milestones, the question of whether to mandate undergrounding of electricity cables - particularly transmission lines - as a strategic priority has gained renewed attention.
- Strategically shifting towards undergrounding as a default or prioritising it where feasible/possible, carries important implications, both positive and negative.

**1. System and Infrastructure Redesign**

- Undergrounding transmission infrastructure is technically complex and would significantly impact grid maintenance:

    - **System Maintenance**: Underground cables are difficult to repair, meaning redundancy through alternative power paths is important for maintaining supply continuity[15].
    - **Flow Considerations into Distribution:** Careful integration would be needed where transmission feeds into distribution - especially if the design approach for undergrounding diverges between the two systems.

**2. Cost Implications**

- According to bodies such as the Institution of Engineering and Technology (IET) and Mott MacDonald, underground cables are, on average, 4.5 times more expensive than overhead lines, and offshore HVDC solutions can be up to 11 times more costly[16].
- Financial Implications include:
    - Higher capital investment requirements for grid operators.
    - Increases in consumer energy bills if costs are passed on.
    - Increased strain on public funding or the need for market interventions to support strategic projects.

**Strategic considerations - GB Applicability (2/2)**

**3. Project Timelines and Delivery**

- A shift towards undergrounding could severely disrupt timelines already under pressure due to Clean Power 2030 and net-zero targets:
    - Delays on Existing Projects: Projects currently in design, consultation, or early construction phases may require re-evaluation or re-consenting if underground construction became mandatory. Any policy change would likely require revised environmental assessments and planning impact statements, complicating planning procedures. This would significantly impact GB's ability to achieve Clean Power 2030.
    - Impact Beyond 2030: Given the long lead times for underground infrastructure - including planning, permitting, and construction - delays to grid reinforcement projects could compromise progress toward legally binding climate goals.

**4. Stakeholder and Community Response**

- While undergrounding is often publicly perceived as more visually acceptable, and is already used in certain circumstances in GB, it carries trade-offs in terms of local disruption and resistance due to environmental and land use considerations:
    - **Levels of acceptability:** In urban or semi-urban areas, undergrounding may be welcomed due to aesthetics and limited green space. Many rural communities also prefer undergrounding; however, the German example suggests that

[15] Grid Deployment Office, 2024 [16] The IET, 2025

overhead lines may be preferable to some landowners as they are less invasive on arable land.

- **Agricultural and Landowner Opposition:** Underground construction involves long-term trenching, restricted land access, and disruption to farming operations - often for months or years. This could fuel greater resistance from rural communities compared to more familiar overhead developments. In Scotland, around 66% of land area is some form of agriculture based[17].
- **Public Understanding and Trust:** Any new mandate would require widespread public consultation and information campaigns to manage expectations and clarify distinctions between transmission and distribution infrastructure.

**5. Broader Policy Implications**

- Mandating undergrounding as a strategic priority in GB would represent a fundamental shift in infrastructure policy. While it could offer long-term visual, social, and land-use benefits, the short- and medium-term challenges are substantial.
- These trade-offs must be carefully weighed, especially as GB tries to balance visual preservation with energy system resilience and decarbonisation goals.
- A targeted approach, as already applied in areas of outstanding natural beauty and other sensitive locations, offers a pragmatic and balanced way forward. Continuing to explore technological innovation and cost recovery mechanisms could enable undergrounding in areas where the visual and social benefits clearly outweigh environmental and cost impacts, without the risks and delays of a universal mandate.

## 1.2 Undergrounding to mitigate climate risks

**Market:** Australia

**Area of interest:** Undergrounding in urban areas to reduce risk to extreme weather

**DESNZ Area of interest**

- According to the UK's Climate Change Committee, flood risk across many regions in GB is expected to grow significantly over the coming decades due to rising sea levels and more intense rainfall patterns[18].
- This poses a critical challenge for maintaining energy security, as flooding, extreme heat and extreme weather events can disrupt power distribution, damage equipment, and result in costly outages.
- Current energy infrastructure projects in GB often incorporate assessments of environmental risks relevant to their location and lifespan.

[17] Scotland Government, 2025 [18] Committee on Climate Change, 2023

- Overhead power lines are more vulnerable to damage from severe weather - such as high winds and falling trees - which can cause power outages and safety hazards. Underground cables, by contrast, are shielded from many of these environmental risks, though are harder to access for maintenance and repair, when required. Research from Australia, highlights that underground cabling significantly reduces outages caused by storms and improves overall grid reliability[19], provided the underground cabling avoids flood zones.
- Australia's approach is particularly noteworthy: in major cities and new residential or commercial developments, underground cabling is increasingly the norm, driven both by safety and visual amenity considerations, and more recently, by climate resilience.
- DESNZ has expressed interest in studying Australia's experience. By understanding how Australian urban planning integrates underground infrastructure to mitigate climate risks, DESNZ aims to inform GB's own policies on new developments, especially in vulnerable regions.

**Driver**

- Australia's electricity network remains predominantly overground (approximately 90%) with notable regional variations. For instance, Perth, Western Australia, has converted over 65% of its network to underground power, driven by local government programs.
- Ongoing initiatives reflect a broader shift towards underground cables in regions sensitive to extreme weather events and community visual amenities.
- Australia's primary safety concerns for undergrounding cables are:
    - **Protection Against Extreme Weather:** Underground cables are far less susceptible to outages and hazards from storms, high winds, or bushfires, increasing reliability and making neighbourhoods safer[20].
    - **Reduced Risk of Electrocution and Fires:** The absence of above-ground wires significantly lowers the risk of accidental contact during severe weather or vehicular collisions, mitigating electrocution and fire hazards[20].

**What has been the noted, high-level impact?**

- **Enhanced Safety:** Underground cables diminish risks associated with exposed lines, such as electrocution, fires, and injuries from fallen wires during storms or accidents.
- **Greater reliability:** Underground power networks experience fewer outages compared to overhead systems, especially in areas prone to extreme weather. Reduced frequency and duration of power outages contribute to greater network reliability.
- **Visual and landscape benefits:** Removing overhead lines improves the visual quality of rural and urban landscapes, which increases public support.
- **Cost implications:** Underground projects in Australia typically cost between 2–10 times more than overhead equivalents, contingent on voltage and local ground conditions.

[19] Energy Networks Australia, 2021 [20] How Engineering Works, 2025

Project costs are often shared between state governments, utilities, local councils, and property owners. The willingness to contribute to increased costs often differ between affluent, coastal communities and in city, less affluent communities, resulting in equity issues about the distribution of costs and externalities.

- **Complex Construction Logistics:** Underground lines require more intricate project management—dealing with excavation, existing utilities, soil types, and landowner negotiations.
- **Land and Environment:** While visual landscape impact is reduced, agricultural and ecological disruption from trenching and construction is a planning consideration, particularly for long rural stretches.

**Has it achieved its outcome?**

- Australia has made substantial progress with undergrounding power cables in certain regions - particularly in urban areas and newer developments - but the achievement of outcomes is mixed, depending on the goals considered (e.g., reliability, cost, environmental impact, and public acceptance).
    - **Urban conversion:** Programs like Western Australia's State Underground Power Program have converted over 100,000 properties to underground power at the distribution level, reflecting a significant shift in major metro areas such as Perth and Adelaide. New developments in most states now have legislative requirements for underground cabling as standard[21,22].
    - **Reduced risk due to extreme weather:** Undergrounding has improved visual amenity, reduced storm-related outages, and cut bushfire risks associated with overhead lines in many communities.
    - **Community support:** Surveys show substantial community support for completed and ongoing undergrounding projects, though attitudes towards cost-sharing vary between communities. For instance, the Nedlands project (part of the State Underground Power Programme, which replaces overhead lines with underground cables) in WA reports majority (70%) of residents favoured undergrounding power despite higher costs[23], reflecting greater acceptance in some areas.
    - **Higher costs:** The cost of undergrounding existing networks remains high - making large-scale, system-wide conversion economically unfeasible in many locations. Independent reviews indicate that the quantifiable costs often exceed direct financial benefits, especially for widespread retrofits.
    - **Technical and Environmental Limitations:** For very long or high-voltage routes, engineering challenges (e.g., cable charging currents) and even negative environmental impacts on agricultural land may arise, resulting in a mix used of overground and underground cables.

[21] WA Government, 2025 [22] Western Power, 2025 [23] Your Voice, 2025

**Strategic considerations – GB Applicability**

- GB faces challenges like those in Australia regarding the reliability, safety, and public acceptance of its electricity network infrastructure. Australia's shift towards undergrounding power lines, is aimed at mitigating community opposition, enhancing safety, and improving reliability. However, any such adoption must carefully consider local conditions, costs, and long-term planning implications.
- The strategic considerations highlighted in the German case study, (where undergrounding was mandated nationwide) are also relevant to GB, as they highlight regulatory, cost, and planning challenges that may be less pronounced in Australia's more targeted, region-specific approach.

These could potentially include:

- **Policy Reform:** Prioritising undergrounding would require substantial changes to GB's regulatory and policy framework. This includes amending the National Policy Statement (NPS) and Electricity Transmission Network Development Plan (ETDP) to provide clear guidance on when undergrounding is appropriate, ensuring consistent application and greater alignment with devolved nations.
- **Project Integration**: Project design must ensure seamless integration with existing system and distribution networks.
- **Increased Costs:** As noted by organisations such as the Institution of Engineering and Technology (IET) and Mott MacDonald, undergrounding transmission lines typically costs five to ten times more than overhead lines.
- **Project Timelines:** The impact on existing and future projects (beyond 2030) must be assessed, particularly concerning land use rights and permits. The already strained planning and approval process in GB could be further burdened.
    - **Stakeholder and Community Engagement** is already used in certain circumstances in GB; it presents trade-offs regarding local disruption and potential resistance:
    - **Levels of acceptability**: Undergrounding may be welcomed due to aesthetics and limited green space. Many rural communities also prefer undergrounding, however the Australian example also suggests that overhead lines may be preferable to some landowners as they are less invasive on arable land **management:** While undergrounding is often perceived as more visually pleasing, Furthermore, the risk of inequitable outcomes experienced in Australia must be considered.
    - **Agricultural and Landowner Concerns**: The extensive trenching and restricted land access associated with underground construction can disrupt farming operations for months or years, potentially leading to greater resistance from rural communities than with overhead lines. This is particularly pertinent in Scotland, where 66% of the land is used for agriculture.

- **Public Awareness and Trust:** Any new mandate for undergrounding would require comprehensive public engagement and information campaigns to manage expectations and clarify the difference in policies between transmission and distribution, i.e. if Wales mandate undergrounding of distribution lines, public awareness should be sufficient to explain why the same policy cannot be applied to transmission infrastructure.

## 2. Community Funds

### 2.1 Community funds to increase community benefits

**Market**: Belgium

**Area of interest:** Innovative practices to increase community participation

**DESNZ Area of interest**

- Community funds have emerged as a central mechanism for ensuring that communities affected by major infrastructure - especially energy transmission and renewable energy projects - receive tangible benefits.
- In GB, DESNZ has released clear guidance on the establishment, administration, and aims of such community funds, responding to the urgent need for inclusive, transparent, and impactful community participation during major infrastructure development.
- DESNZ's guidance is founded on several core principles including community-led initiatives, early and ongoing engagement, capacity support, flexibility and transparency and long-term legacy with three main models for distributing community benefits: 1) community grant schemes, 2) direct investment and 3) bill discount schemes.
- A recurring challenge is that while affected communities are engaged during project development, genuine participation can be low.
- DESNZ's interest in the Belgian community fund that has seen positive engagement from communities is to understand the key drivers and whether there are lessons to inform similar initiatives, fostering greater community support and collaboration in GB's energy sector.

**Driver**

- The Belgian transmission system operator (TSO), Elia Group, has adopted an innovative model that incorporates community funds directly into their network tariffs: impacted communities receive transparent and proportional compensation based on proximity, line voltage, and property value. This thereby embeds financial provisions for community engagement into the core of project planning. This extends to all of their infrastructure projects, including overhead and underground developments, as well as adjacent renewable energy projects[1].
- The community funds were set up to promote local ownership and participation.

- These community funds aim to foster active local participation, making a clear distinction between direct participation (such as stakeholder dialogue and local co-development meetings) and indirect participation (including information campaigns and consultation processes).
- This nuanced approach ensures that engagement levels are tailored appropriately to the interests and influence of various community actors.
- A notable feature in Belgium is the use of these community funds to address and mitigate the visual impacts of new overhead high-voltage lines. For example, grants are made available for projects that enhance the landscape or local environment, thus partially offsetting the impact of infrastructure projects[24].

**What has been the noted, high-level impact?**

- **Increased Community Participation:** Community participation has increased with community funds, evidenced by increased membership by local communities with energy cooperatives like Ecopower and ZuidtrAnt to hold shares, participate in annual general meetings and vote on important issues to influence project outcomes.
- **Limited impact on Community Opposition:** However, while the integration of community funds and participatory approaches has successfully increased the levels of local engagement, it has not entirely quelled community opposition - as witnessed in major projects like Boucle du Hainaut and Ventilus. In both cases, sustained resistance, particularly against overhead line designs, has persisted. Evidence suggests that this opposition often originates from a small yet vocal segment of the affected communities[25].

**Has it achieved its outcome?**

- Belgian community funds have demonstrably achieved many of their principal outcomes, in renewable deployment, social inclusion, and environmental gains, though challenges persist, particularly in overcoming community opposition to infrastructure and reaching scalability in every region.
    - **Local participation:** Belgian community funds have enabled joint citizen ownership and direct investment in local renewables. In regions such as Limburg and West-Vlaanderen, targets set for citizen participation in green energy, like minimum 20 - 35% ownership in community wind projects, have been met in several cases, although scaling beyond this remains difficult[26].
    - **Social inclusion:** Award-winning initiatives like “Community Energy for Social Housing” in Mechelen showcase the success of community funds in reaching vulnerable households where €1 million citizen-contributed investment equipped

[24] Elia Group [25] Federal Planning Bureau of Belgium, 2023 [26] ComRes,2021, [27] LifeTandems, 2025, [28] SkyNews, 2025

200 social housing units with solar panels resulting in clean energy at below-market rates and significant $CO_2$ savings, directly helping low-income residents[27].

- Despite the successes, not every goal has been met with ongoing challenges in the following areas persisting:
    - **Reducing community opposition:** Efforts to substantially reduce opposition to overhead transmission lines have not been universally successful, often facing determined minority resistance[28].
    - **Scaling pilot initiatives:** Increasing citizen participation is easier for smaller PV projects than for large-scale projects. Some localities and segments remain harder to reach, especially in scaling up investment targets or social inclusion goals beyond pilot projects.

**Strategic considerations – GB Applicability**

- While GB's processes already involve community consultation, there's a crucial opportunity to deepen this engagement and broaden the impact of community funds. These initiatives include:
    - **Consultation to Participation:** Belgium's model emphasizes active community participation rather than passive consultation. This subtle but powerful shift encourages communities to take ownership in decision-making, fostering trust and stronger local partnerships. GB's existing community fund guidance already embeds this co-collaborative approach, placing strong emphasis on developers working with communities throughout the lifetime of a project to ensure funding reflects local needs and priorities. Building on this, GB could continue strengthening early engagement and co-creation principles to further align with international best practice.
    - **Delivering Tangible, Long-Term Benefits:** The Belgian process seeks to provide diverse, tangible benefits—such as local infrastructure improvements, skills training, and community projects—that resonate with local priorities. GB should strategically ensure funds are leveraged not as a form of compensation, but as a means of recognising and valuing the role played by local communities, while also creating sustainable social and economic benefits for impacted areas and communities. also to create sustainable social and economic value for impacted communities.
    - **Strategic engagement:** A key strength in Belgium's approach is the continuous and strategic involvement of regional energy authorities, project developers, and community organizations from the earliest stages (planning and design) through to delivery and operation. For GB, this means fostering stronger collaboration between the National Electricity System Operator (NESO), Transmission Operators (TOs), and relevant energy bodies to ensure community voices influence decisions throughout the project lifecycle.
    - **Impact evaluation and adaptive measurement:** Building in mechanisms for ongoing evaluation of community fund effectiveness and visual impact mitigation

allows for adaptive management, refining approaches based on community feedback and changing circumstances—an area where the Belgian model shows advanced practice that GB could emulate at an industry level.

- GB stands to benefit significantly by evolving from consultation to inclusive participation, broadening benefits beyond finances, ensuring strategic stakeholder collaboration, and embracing adaptive, impact-driven management—strategies well demonstrated by the Belgian experience.

# 3. Supply Chain Visibility

## 3.1 Increase visibility and certainty in the supply chain

**Market**: Germany, Netherlands

**Area of interest:** Secure supply chain in global, scarce market

**DESNZ Area of interest**

- As countries around the world seek to expand their electricity grids, unprecedented pressure has been placed on global supply chains. High Voltage Direct Current (HVDC) equipment, critical for integrating renewable energy into the grid, is in particularly high demand, resulting in shortages, bottlenecks, and fierce global competition for skilled workers and cutting-edge technology.
- Securing the entire supply chain is mission-critical for achieving the GB's ambitions under the CP2030 framework. Without robust, resilient supply chains, timely project delivery and future expansion are jeopardized, risking both economic growth and climate commitments.
- Suppliers frequently emphasise that visibility and long-term certainty from government and market planners are essential. Clear, credible forward signals (such as pipeline plans, volume needs, and policy consistency) help manufacturers and investors justify major investments in new capacity, facilities, and workforce training programs. Increased certainty reduces risk and strengthens the business case for inward investment into GB.
- The German approach stands out as best-in-class. Germany's public ten-year network development plans have set the global benchmark, catalysing large-scale investment and attracting premier supply-chain players by offering a well-communicated, stable market outlook.
- DESNZ is interested in this initiative because of its commitment to advancing the strategic direction of net zero by fostering transparency, long term-planning and collaboration with global suppliers. This aligns with current GB activity, such as the Growth Plan announced in the UK's 2025 Industrial Strategy, which sets out measures to strengthen domestic supply chain capability and support critical energy infrastructure.

**Driver**

- As Germany's state-owned Transmission System Operator (TO), TenneT played a pivotal role in strengthening the country's energy transition by strategically de-risking the supply chain through forward planning and enhanced supplier engagement.
- TenneT developed and published a ten-year pipeline of projects, laying out with clarity the long-term demand for critical grid infrastructure - particularly HVDC systems essential for connecting offshore wind and integrating renewables[29].
- This demand visibility gave suppliers confidence to scale up, align production timelines, and plan capital investment.
- TenneT entered into framework agreements with key suppliers for anticipated volumes of equipment and services over the decade[30].

**What has been the noted, high-level impact?**

- TenneT's ten-year planning approach substantially increased supply chain visibility. By publishing clear, long-term project pipelines and launching large-scale tenders, suppliers could anticipate demand, align investments, and plan workforce and materials accordingly. This level of transparency set a benchmark in Europe and gave the supply chain confidence in market stability.
- **Increased visibility and certainty:** The introduction of a ten-year plan and the signing of framework agreements gave suppliers demand visibility which gave supplier the confidence to scale up, align production timelines, and plan capital investment. Furthermore, the framework agreements created a degree of certainty, reducing commercial and planning risk for suppliers and sub-suppliers[31].
- **Certainty constraints:** While TenneT's framework agreements and planning brought certainty to suppliers - in terms of expected order volumes and timelines - there were still constraints, suggesting that the supply chain was not fully secured. Although framework deals and tenders lowered commercial risk, global supply chain strains, skills shortages, and geopolitical uncertainty meant risks (such as delivery delays and input costs) remain. TenneT's own reports highlight persisting procurement, workforce, and resource bottlenecks even as investments accelerated.
- **Inward investment:** TenneT's approach triggered inward investment[33], including:
    - Major manufacturing players (e.g., GE, Siemens Energy) established or expanded facilities in Germany, incentivised by reliable, multi-year order books and the clear demand outlook.
    - The 2GW HVDC program alone resulted in multi-billion Euro contracts - these were cited as directly enabling factory expansions, jobs, and local supply chain development in Germany.
    - Framework agreements often required and encouraged onshore manufacturing and technology transfer, further anchoring value in Germany.

[29] Renewables Now, 2023
[30] TenneT, 2023 [31] TenneT, 2023 [32] TenneT, 2025, [33] TenneT, 2024, [34] Siemens Energy, 2024

- **Supply Chain Partnerships:** TenneT's procurement approach and long-term vision catalysed supplier partnerships, innovation (like circular economy initiatives), and made it easier for manufacturers to invest with confidence[34].
- TenneT's approach has been broadly successful in boosting visibility, partially mitigating uncertainty, and actively driving inward investment in HVDC and grid supply chains in Germany. However, it did not eliminate all risks or create guaranteed supply - challenges around workforce, materials, and delivery remain, and full certainty relies on multiple external factors outside TenneT's direct control.

**Strategic considerations-GB applicability**

**Long-Term Supplier Engagement**: Like TenneT, GB TOs must secure capacity, particularly for HVDC cables and transformers, which face global bottlenecks and have managed to do this for cables through to 2029 and in some case 2033. Securing the supply chain for projects often happens 3-4 years ahead of construction, resulting in CP2030 having mostly secured supply chain.

- **RIIO Price Control Limitations:** GB's five-year RIIO cycle offers limited long-term visibility compared to the 10-year planning horizon of TenneT. This affects investor confidence and supply chain engagement, as the certainty for years 6 – 10 is limited. There is strong stakeholder expectation that NESO's strategic planning will address this gap by providing longer-term demand forecasts and clear investment signals beyond the current RIIO period.
- **Existing mechanisms:** New Ofgem mechanisms (e.g., the Advance Procurement Mechanism (APM) and early construction funding (ECF) allow TOs to contract earlier and at scale. However, these are still being refined and must balance consumer risk, administrative burden, and delivery pace.
- **Strategic Network Planning Coordination:** The Centralised Strategic Network Plan (CSNP) is being developed to provide whole system, cross-vector, and cross-regional planning. This aims to address GB's historical lack of long-term network visibility and facilitate more joined-up investment with greater national oversight, critically providing a 25-year horizon, on a three-year cycle.
- **Ownership and Procurement Model:** Unlike TenneT, the GB TOs are privately owned, of which there are different business and commercial models, which impacts risk appetite, procurement flexibility, and the ability to act at UK plc level. In addition, different procurement regulations across Scotland, England, and Wales affect the strategic procurement approach and regulations that must be met. In addition, the Procurement Act 2023 does not eliminate EU-derived rules, meaning GB must still comply with certain retained EU procurement requirements, which can add complexity and lengthen timelines.
- **Political Certainty and Cross-Government Coordination:** Achieving the transformation at GB scale requires robust and aligned policy support from national and devolved governments, particularly to manage spatial planning, environmental, and resilience obligations.

- **Connections Queue Management:** GB faces a massive backlog in grid connection applications, with a connections queue that currently contains more electricity generation and storage than will be needed to power Britain by 2050. Reform is underway in GB to move from a “first ready, first connected” model to one based on strategic need is essential to mirror the TenneT approach and achieve national targets.
- **Workforce expansion:** Major investment programmes (as seen in TenneT's model) require rapid scaling of skilled labour - not just within TOs but across the entire contractor and supplier ecosystem. Labour shortages risk project delays and higher costs.

# 4. Financial Incentives

## 4.1 Financial incentives to accelerate supply chain

**Market:** Germany

**Area of interest:** Mechanism to accelerate delivery for supply chain

**DESNZ Area of interest**

- Successful deployment of new technologies and market entrants who have been successful through framework agreements is crucial for meeting future network needs and long-term energy targets.
- Various mechanisms and incentives can be implemented by power sector stakeholders to expedite the delivery of critical equipment and mitigate risks associated with new market entrants and innovative technologies.
- While client-led supply chain incentives are not novel, they are expected to become a key market trend, offering suppliers the certainty and commercial de-risking they need.
- In contrast to GB, where each Transmission Owner (TO) employs its own processes and approaches for the same supplier, leading to inefficiencies, Germany's approach offers a potential solution.
- While specific incentive details remain confidential, anecdotal evidence suggests that an incentive-based model successfully expedited technical cable testing, de-risking both for the TO and Cable Supplier.
- The Dutch government is providing state guarantees to TenneT enabling it to secure favourable AAA-rated financing for its €90 billion ten-year investment plan. These are major financial commitments specifically targeting transmission infrastructure and serve as recognition that securing sustainable finance is vital to successfully delivering transmission projects.

**Driver**

- Confidential information notwithstanding, the primary driver was to ensure timely completion of crucial technical testing for a new technology, thereby de-risking delivery programmes[35].

**What has been the noted, high-level impact?**

- Industry insights suggest that the incentive-based approach successfully accelerated technical testing, leading to a significant reduction in project risk and improved overall portfolio performance. While specific quantitative data remains confidential, the qualitative impact is demonstrably positive[35].

**Strategic considerations - GB applicability (1/2)**

- **Common Incentive Mechanisms and Contextual Considerations:** Common incentive mechanisms include performance-based payments (linked to on-time delivery, budget adherence, safety, and quality), shared savings, early completion bonuses, and rewards for innovation. However, their effectiveness is highly context-dependent, requiring careful consideration of the specific project and regulatory environment.

**Strategic considerations - GB applicability (2/2)**

- **Need for a Standardised Approach:** The research suggests that a more transparent and standardised approach to designing and applying incentives in GB could improve efficiency and reduce inconsistencies across different TOs and projects.
- **Regulatory Landscape and Commercial Considerations:** A thorough examination of the regulatory landscape, delivery model, commercial approach, and contractual terms is crucial for determining the suitability of specific incentive schemes within the GB context.
- **Cost-Benefit Analysis and Risk Assessment:** Rigorous cost-benefit analysis and risk assessments are essential for designing and justifying incentive structures for transmission delivery partners in GB, ensuring that the incentives are both effective and financially sound.

# Conclusion

The Rapid Evidence Assessment Phase 2 examined international best practices in electricity transmission network deployment, focusing on four key initiatives: undergrounding, community funds, supply chain visibility, and financial incentives. The analysis, encompassing desktop research and extensive stakeholder engagement, reveals that while these initiatives offer valuable lessons, none provide a direct, readily replicable solution for achieving GB's Clean Power 2030 targets in isolation.

**Summary of key findings:**

**Undergrounding:** While reducing community opposition is a goal, the German experience highlights significant cost increases and persistent landowner concerns. Australia's more

[35] Confidential

targeted approach, focusing on climate resilience in urban areas, offers a potentially more viable model for GB, but careful consideration of costs and regional variations is crucial.

**Community Funds:** The Belgian model demonstrates increased community participation, but it hasn't eliminated opposition entirely. GB can learn from Belgium's approach to fostering active engagement and participation, and delivering tangible long-term benefits, but a nuanced strategy is needed to address the specific contexts of different communities.

**Supply Chain Visibility:** Germany's ten-year planning horizon, exemplified by TenneT, significantly improved supply chain certainty and attracted investment. GB can learn from this by improving long-term planning and enhancing collaboration with suppliers, but existing regulatory frameworks and procurement models need careful consideration.

**Financial Incentives:** While Germany's use of financial incentives to accelerate cable testing proved successful, a standardised and transparent approach is needed in GB to ensure effective and equitable application across different projects and TOs. The Dutch government is providing state guarantees to TenneT enabling it to secure favourable AAA-rated financing for its €90 billion ten-year investment plan. These are major financial commitments specifically targeting transmission infrastructure and serve as recognition that securing sustainable finance is vital to successfully delivering transmission projects.

The Rapid Evidence Assessment Phase 2 presents findings from a rapid evidence assessment of a limited number of initiatives. It is not intended to provide definitive or prioritised recommendations for implementation. Further work is required to assess the transferability and applicability of these findings to the GB context.

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