



REPORT

Upgrading the electricity transmission network

Department for Energy Security & Net Zero

Key facts

£70bn

amount of investment to upgrade and maintain the transmission network in Great Britain (the grid) that Ofgem considers may be required from 1 April 2025 to 31 March 2031 (in 2023-24 prices)

£1.9bn

amount paid in 2025-26, to electricity generators to either turn up or down their electricity to balance the grid. This helps manage thermal constraints on the grid and are known as thermal constraint costs (2024 prices)

£7.8bn

upper estimate of amount thermal constraint costs could reach in 2030 if grid upgrades are not accelerated

The Department for Energy Security & Net Zero's (DESNZ's) Clean Power target

- 73%** proportion of Great Britain's electricity generation that came from clean power in 2025
- 95%** proportion of Great Britain's electricity generation that DESNZ wants to come from clean power sources (primarily renewables and nuclear) by the end of 2030

Costs and benefit to consumers (2025-26 prices)

- £44** the amount a typical household paid towards building and maintaining the grid in 2025-26
- £104** the amount that Ofgem forecasts a typical household will pay towards building and maintaining the grid by 31 March 2031
- £30** Ofgem's estimate of the net saving to a typical household's 2030-31 energy bill compared to the constraint and wholesale costs that would occur if grid upgrades are not accelerated to complete by 31 March 2031

Project progress

- 80** number of grid upgrade projects identified by the National Energy System Operator (NESO) as necessary to meet Clean Power 2030
- 56** number of projects ongoing: 12 have been completed and 12 subsumed into newer projects
- 4** number of the 56 projects that are currently expected to be delivered after 2030
- 8** number of additional projects that NESO said would help lower constraint costs if they were accelerated. They have not yet been accelerated

Summary

1 This report focuses on the electricity transmission network in Great Britain (the grid). This is the highvoltage system of cables, overhead lines and substations that carries power from where it is generated to local distribution networks. These then supply homes and businesses. Consumers pay for all the costs of maintaining and upgrading the grid through their energy bills, at £44 for a typical household in 2025-26.

2 Much of the grid was built between the 1950s and 1970s. It was designed for large fossil fuel stations close to centres of demand. Large parts are now ageing. It is also poorly matched to how electricity is produced today. Renewable electricity is often generated far from where it is used, including offshore.

3 Three private companies, known as Transmission Owners, own and manage the grid. Three public bodies are responsible for overseeing the grid.

- The Department for Energy Security & Net Zero (DESNZ) is responsible for energy policy and the overall energy system.
- The Office of Gas and Electricity Markets (Ofgem) regulates and approves spending by the Transmission Owners.
- The National Energy System Operator (NESO) operates the electricity transmission system – balancing supply and demand across the grid. It also plans and advises DESNZ and Ofgem on the future energy system.

4 DESNZ has two targets for Great Britain to become a ‘clean energy superpower’. It wants to generate at least 95% of electricity from clean sources by 2030 (Clean Power 2030). It has also a legal requirement to decarbonise the economy by 2050 (Net Zero). These targets mean the network must carry more electricity, over longer distances, and at different times than in the past.

5 When the network cannot transport electricity efficiently, NESO intervenes to keep supply and demand in balance. It often pays generators, usually wind, to reduce output and pays others, usually gas, to increase output elsewhere. This helps manage the physical limits of the network. Some of these thermal ‘constraint costs’ are necessary in an efficient system. But high levels increase reliance on gas, carbon emissions and costs for consumers. Reducing them is a key aim of upgrading the grid.

6 This report examines DESNZ, Ofgem and NESO's:

- rationale for upgrading the transmission network (Part One);
- progress with the upgrade (Part Two); and
- oversight of the upgrade (Part Three).

7 DESNZ believes Clean Power 2030 will deliver wide benefits, such as decarbonisation and economic growth, but has not quantified these in an impact assessment. We have not assessed these benefits as part of this report.

Key findings

Upgrade rationale

8 DESNZ has allowed renewable electricity generation to expand faster than the grid, which has led to increased constraint costs. Successive governments' 'connect and manage' approach has allowed new generation projects to connect before the network was ready. As a result, thermal constraint costs have risen from £0.6 billion in 2018-19 to £1.9 billion in 2025-26 (in 2024 prices). The majority goes to generators to increase output at short notice. These are mainly gas power stations in England, with costs linked to global gas prices. The remainder goes to generators to reduce output. These are often wind farms in Scotland. Other countries have seen a similar rise in constraint costs due to limited grid capacity as their use of renewables has grown (paragraphs 1.7 to 1.15 and Figure 6).

9 Opportunities to upgrade the grid earlier were missed. In 2015, DESNZ adopted a more market-led approach to grid planning. Without an agreed spatial plan, DESNZ, Ofgem and the system operator lacked a shared view of future investment needs. As a result, Ofgem did not approve some proposed grid upgrades when they were first proposed. Some are now being approved at higher cost, at a time of intense global competition for labour and equipment (paragraphs 1.14 to 1.15 and Figure 7).

10 Constraint costs could reach £6.6 billion to £7.8 billion in 2030 if grid upgrades are not accelerated to match new generation as part of the Clean Power 2030 plan. In its November 2024 advice to DESNZ, NESO identified 88 grid projects for Clean Power 2030. Of these, it said: 77 were already due by 2030; that it was necessary to accelerate three existing projects to reduce constraint costs to £2.8 billion to £3.6 billion; and that it would be beneficial to accelerate eight projects to limit constraint costs to £1 billion to £1.9 billion. In contrast, it said that without any upgrade at all to the grid, constraint costs could reach £12.7 billion a year. These estimates all assume that all planned renewable generation is added to the grid under the Clean Power 2030 plan regardless of whether the grid is ready to accommodate it and are stated in 2024 prices (paragraph 1.18 and Figure 4).

11 Ofgem estimates that Transmission Owners will need to spend up to around £70 billion over 2025-2031 on grid upgrades, quadrupling the current rate of investment. This includes £62 billion specifically to increase the capacity of the grid. Annual spending on grid upgrades rose from £0.6 billion in 2010-11 to £2.5 billion in 2025-26. Ofgem has approved in principle annual investment to increase to over £11 billion a year between 2027-28 and 2030-31 (paragraphs 1.17 to 1.18 and Figure 8).

12 Ofgem estimates this investment will save consumers about £30 a year compared to the increased constraint costs if projects are not accelerated. Ofgem expects the £70 billion of investment to increase a typical household's annual network charge to £104 in 2030-31, £60 higher than 2025-26. However, the investment would support the acceleration of the three grid upgrades recommended by NESO, avoiding around £4 billion of constraint costs in 2030 and reducing dependence on gas. Ofgem estimates that these benefits would more than offset the higher network charges, leaving consumers around £30 a year better off than if the projects were not accelerated (paragraphs 1.19 to 1.20 and Figure 10).

13 NESO has recommended a total of around £89 billion of further investment in the grid beyond 2030. DESNZ expects electricity demand to more than double between 2024 and 2050 as more of the economy shifts from fossil fuels to electricity, including transport, heating and industry. It believes this will require further expansion of both generation and the transmission network. This investment will be subject to Ofgem's review in future price control periods (paragraph 1.23).

14 Faster and more predictable connections to the grid are also necessary to support economic growth. The number of projects waiting to connect has grown significantly. Delays are also increasing. The proportion of projects that received an offer of a connection at the time they wanted fell from around two-thirds (64%) in 2019-20, to around one-sixth (16%) in 2023-24. DESNZ, Ofgem and NESO are taking steps to reform the connections queue, including removing projects that were not progressing and prioritising those ready to deliver. They are now starting to focus on connecting demand from an increasing number of energy-intensive projects, such as data centres and new housing. Improving the speed and predictability of connections, and not just the queue, is important to ensure these projects can proceed and to support wider economic activity (paragraphs 2.26 to 2.32).

Upgrade progress

15 Many of the 88 grid upgrades are at risk of not being completed when needed.

Transmission Owners have already completed 12 and a further 12 have been subsumed into newer projects. Most of the 64 remaining projects are at an early stage of development, and are not expected to be connected by the dates NESO originally said would be optimal for keeping constraint costs down between now and 2030. Many also face significant risks to the delivery of their current forecast delivery date. There has been no significant acceleration of the three projects that NESO recommended in 2024 be accelerated to reduce constraint costs. One further project has been delayed beyond 2030. We found limited public transparency on the cost, progress and status of the portfolio of projects (paragraphs 2.2 to 2.5 and 2.9, and Figures 11 and 12).

16 NESO does not know the full financial impact on consumers of delivering grid upgrade projects after they are needed.

NESO estimates that potential delays to what it considers to be the seven most critical projects could add up to £6.7 billion a year in constraint costs if they are not delivered when needed. NESO does not know the financial impacts of delivering the other projects after they are needed, which makes it difficult to prioritise between projects. NESO told us it does not recalculate constraint costs for each delay because of the resources that this would require, and because it judged that updated estimates were not necessary to support planning decisions (paragraph 2.6).

Managing delivery risks

17 DESNZ, Ofgem and NESO are working to speed up the delivery of grid upgrade projects.

DESNZ's appointed Electricity Networks Commissioner made recommendations in 2023 on how to reduce delivery times for new transmission infrastructure from 12–14 years to around seven. DESNZ has 10 workstreams which address the issues raised. It currently rates half as 'red' or 'amber-red'. Among the most important and challenging areas identified by DESNZ are (paragraphs 2.10 to 2.25 and Figure 14):

- **Planning, consenting and community acceptability:** DESNZ's consultation respondents reported that delays in securing agreement for land on which to build infrastructure can add up to three years to project timetables. More than half the projects have yet to start. DESNZ has announced reforms intended to streamline and reduce delays from securing consent, land access and rights. It also has a workstream intended to make sure local communities benefit from the upgrade to the grid.

- **System access:** Transmission Owners need planned outages to upgrade, facilitate new connections, and maintain the network. These can be cancelled or rescheduled at short notice. In 2025-26, two-thirds (15,300) of the total number of applications for system access via network outages (23,400) that NESO worked on had to be cancelled or rearranged, due to changes to the outage plan by either NESO or the Transmission Owner. In spring 2026, DESNZ made proposals to improve the planning for system access.
- **Supply chain constraints:** Demand for materials is exceeding supply, increasing costs and extending delivery times. These pressures are being seen internationally, adding to competition for equipment. Ofgem has begun to allow Transmission Owners to procure some materials in advance of planning consent to reduce delays.
- **Skills constraints:** A shortage of skilled workers needed to build and maintain the network affects the pace of delivery. DESNZ plans to address this through, for example, an industry-led sector growth plan, expected in autumn 2026.

Upgrade oversight

18 The chosen upgrades reflect the projects NESO considered would best deliver Clean Power 2030 within the time available, rather than the outcome of a whole-system assessment of alternatives. Grid upgrades are funded through electricity bills rather than public expenditure and are not supported by a full business case, options appraisal, or assessment of overall value for money. Instead, DESNZ has supported new renewable generation, NESO has recommended the grid upgrades needed to support it, and Ofgem has approved investment largely by reference to reducing constraint costs. Most of the recommended grid upgrades were chosen because they were already in development. In the absence of an integrated spatial plan or whole-system appraisal, the government has not demonstrated that these projects represent the best way of achieving its objectives (paragraphs 3.4 and 3.5).

19 DESNZ has improved government oversight of grid upgrades. It established the Electricity Networks Programme (ENP) to oversee grid upgrades. The ENP brings together DESNZ, Ofgem, NESO and industry representatives to oversee 10 policy workstreams, monitor project delivery and manage strategic risks. The ENP Board has improved coordination and helped address system-wide risks across the programmes and 64 projects. It shares information with the Clean Power Unit, which oversees progress towards Clean Power 2030 and works to help unblock barriers to delivery of key grid upgrades. The board has started to operate as a portfolio management function, but there is scope to do more (paragraphs 3.2 and 3.3).

- While accountability for individual projects rests with the Transmission Owners, no single person is accountable for delivery of the portfolio as a whole.
- The ENP Board has limited oversight of the portfolio. It tracks progress on individual projects but there is scope to strengthen how it monitors whether the portfolio remains on track to deliver its intended benefits, or prioritise projects and resources across the programme.
- Transmission Owners provide information on projects on a voluntary basis.
- Both the ENP Board and the Clean Power Unit have limited formal powers and therefore rely on influence to drive action across organisations and government.

20 Ofgem has adapted its regulatory approach to support rapid expansion of the grid, reducing its emphasis on detailed scrutiny of construction costs.

Ofgem's historical approach was designed for a relatively stable asset base. It is now being applied to a period of unprecedented growth in network investment. The increased volume, pace and complexity of approvals place pressure on Ofgem's capacity. This requires faster and more flexible decision-making. For its price control regime for April 2026 to March 2031, Ofgem aims to (paragraphs 3.7 to 3.17):

- **Approve project funding in phases:** Many projects are at too early a stage to provide all the funding for the five-year price control period upfront. Ofgem has therefore approved projects in principle, with upfront funding of £17.7 billion out of the total £70 billion investment that Ofgem considers may be required from 1 April 2025 to 31 March 2031. Ofgem will make its final decisions through staged phases.
- **Focus on faster approvals over detailed scrutiny:** The phased approach still requires Ofgem to scrutinise project costs and risks over time. Volatile prices and the bespoke nature of many projects reduce Ofgem's ability to rely on benchmarks, requiring it to make broader judgements about whether Transmission Owners are managing and procuring projects efficiently. This places greater demands on Ofgem's capacity. However, any delays could increase constraint costs for consumers. It has therefore changed its risk appetite to prioritise faster funding decisions, where possible, over more detailed scrutiny of project costs and risks.
- **Reduce duplication with NESO's assessment of need:** Ofgem introduced a streamlined project approval process in 2022, the Accelerated Strategic Transmission Investment (ASTI) framework. This seeks to reduce duplication in its project approval with NESO's assessment of strategic need. Twenty-six of the 88 projects use this process.
- **Place increased reliance on incentives:** Ofgem's current price control relies on incentive payments and penalties for Transmission Owners to control costs and deliver upgrades on time. However, these reward delivery ahead of regulatory target dates, which are often later than NESO's assessment of when projects would be optimally delivered.

21 DESNZ and Ofgem are considering wider reforms, but these will not significantly affect the delivery of current projects to support Clean Power 2030.

These reforms are intended to make sure generation, demand and the grid are developed in a more coordinated way. Key elements include the following (paragraphs 3.18 and 3.19).

- **The Strategic Spatial Energy Plan (SSEP):** NESO will set out a long-term plan for the type, location and timing of energy infrastructure between 2030 and 2050. This is intended to differ from the current regime, where network upgrades respond to generation decisions by planning the whole energy system together. NESO plans to publish its plan in 2027, subject to approval by the Secretary of State for Energy Security and Net Zero. It then intends to publish a Centralised Strategic Network Plan (CSNP) in 2028 to set out the required grid infrastructure investment required to support the SSEP.
- **The Reformed National Pricing:** DESNZ's April 2026 delivery plan has three broad aims: to encourage new generators to locate in areas aligned to the SSEP, through changes to network charges and connection arrangements; to reduce the need for constraint payments through better use of network capacity, storage and flexibility; and to reduce balancing costs through reforms to the way NESO manages the grid.
- **Competition:** Ofgem intends to open future connections and upgrade projects to new entrants to reduce costs, an approach it has not yet applied to the Clean Power 2030 projects. NESO is assessing which future projects are suitable for competition.

Conclusion

22 DESNZ views upgrading the electricity transmission network as necessary to support Clean Power 2030, longer-term net zero objectives, and economic growth. Its case for action arises largely from the need for the grid to catch up with the growth in renewable generation and limit rising constraint costs borne by consumers.

23 Value for money now depends on delivery. Delivering all the grid upgrades by 2030 will be very challenging. There remain significant planning, supply chain and system access risks and some of the projects are already forecast for delivery after 2030. This means some new generation is likely to connect before necessary grid upgrades are complete. It is important to minimise this gap, as delays will increase project and constraint costs and postpone the benefit of achieving clean power.

24 DESNZ, Ofgem and NESO have taken steps to accelerate approvals, enable earlier investment, and join up their oversight. The upgrades represent a significant shift from historical regulatory approaches and will test systems not designed for delivery at this pace and scale. Delivering upgrades at lowest cost to consumers will require stronger oversight of delivery, transparent monitoring of progress, and sufficient regulatory capability to scrutinise costs and the operation of incentives.

Recommendations

25 DESNZ, Ofgem and NESO have plans in place to improve spatial planning and coordination of generation, grid capacity and demand. These will not have an impact until after 2030. In the meantime, to improve their oversight and alignment of grid upgrades in the run up to delivery of the Clean Power 2030 target, they should:

- a strengthen the grid upgrades portfolio management function.** While grid projects are delivered by privately owned and regulated companies, DESNZ has established a portfolio management function because delivery depends on coordinated action across government, the regulator and industry. To make best use of this function, DESNZ, Ofgem and NESO should:
 - **develop a single, consistent view of portfolio performance,** including agreed definitions of project milestones and progress, common reporting across organisations, and a clear assessment of whether the portfolio remains on track to deliver Clean Power 2030;
 - **assess and prioritise projects according to their impact,** including developing a better understanding of the consequences of delays for constraint costs, the connection of new generation and future demand. NESO should support this through more transparent and regular forecasts of constraint costs;
 - **identify the projects and risks that present the greatest threat to achieving Clean Power 2030** and establish clear routes for escalation and intervention where project risks exceed agreed tolerances; and
 - **identify the interventions available to address the most significant delivery risks and barriers,** and assign clear responsibility for taking action to DESNZ, Ofgem, NESO, Transmission Owners or other stakeholders, as appropriate.
- b publish regular updates on the cost, timetable and delivery status of grid projects.** This may require either changes to licensing or voluntary agreement from the Transmission Owners. Greater transparency would improve accountability to Parliament and consumers and provide a clearer picture of progress towards Clean Power 2030. This would strengthen the Transmission Owners' incentives for delivery of projects by combining existing financial incentives with greater public accountability for project performance.
- c review options for Clean Power 2030 generation projects expected to connect to the grid before sufficient network capacity is available.** Connecting these projects may result in substantial constraint costs, but delaying them could unpick existing agreements and increase investment risk (with potential knock-on impacts for future investments). DESNZ should assess the available options and these broader trade-offs to ensure its chosen approach is value for money and in the best interests of consumers and the energy system.

- d review whether the Security and Quality of Supply Standard strikes the right balance between maintaining system reliability and allowing network upgrades to be completed more quickly.** DESNZ, Ofgem and NESO should provide advice to ministers on the trade-offs between resilience, cost and speed of delivery so ministers can decide their tolerance of risk.

26 The number of approvals expected up to 2030, combined with the need to support timely project delivery, places greater demands on Ofgem's regulatory capacity. Ofgem should:

- e assess the effectiveness of its regulatory approach in protecting consumers while supporting rapid delivery of network upgrades.** Ofgem should compare actual project costs and delivery of projects under the current price control framework and identify any evidence of systematic bias in cost estimates. It should publish a full evaluation of the current price control framework and use this to strengthen future price controls and determine whether additional consumer protections are required.

27 To strengthen decision-making for future network investment after 2030, and demonstrate that the chosen projects are optimal, DESNZ, Ofgem, and NESO should:

- f consider and set out the economic, social, resilience, security and environmental costs and benefits** when:

- NESO explains why the pathways set out in its proposed Strategic Spatial Energy Plan provide the best mix of projects;
- DESNZ advises ministers on which pathway to choose, informed by NESO's modelling; and
- Ofgem makes decisions about specific projects and future price control periods.