

Green Alliance: power sector decarbonisation briefing

July 2021



Summary

- Green Alliance is calling on the UK government to commit to a fully decarbonised power sector by 2035, a vital step on the path to net zero by 2050, with the caveat that security of supply should be guaranteed with some unabated gas in use after that date in the event of a low wind or extremely cold winter.
- With COP26 just a few months away, the UK can show international leadership on climate change by committing to a decarbonised power sector and working with other countries to achieve this goal. President Joe Biden has already committed to clean power by 2035, the UK must demonstrate its commitment to a transatlantic green alliance.
- Modelling from the UK Climate Change Committee (CCC) highlights the importance of clean power to global net zero ambitions.
- As part of a green industrial revolution, clean power will continue to create jobs, particularly in the north of England and help to level up parts of the economy

Policy and energy system context

In its Balanced Net Zero Pathway in the [Sixth Carbon Budget](#), the Climate Change Committee found that, “it is possible to phase out unabated gas and build a power system with 75-90% share of variable renewable generation by 2050”. This is based on the assumption of electricity sector emissions falling rapidly from the mid 2020s, but for this to happen the CCC recommends that “the burning of unabated natural gas should be phased out entirely by 2035” while “the low-carbon share increases to 100% by 2035”.¹ In other words, the emerging consensus is that following the phase out of coal, clean power is the future of electricity, and a key step on the road to net zero.

The CCC has made it clear that reaching net zero emissions by 2050 requires a zero carbon electricity system long before that date as a consequence of the ever improving economics and performance of renewable electricity. It is imperative that the notion of carbon free electricity providing a foundation for economy wide decarbonisation becomes an explicit aim for the government.

¹ <https://www.theccc.org.uk/publication/sixth-carbon-budget/>

Zero carbon power is vital to meeting 2050 neutrality

The US, EU and UK energy scenarios all reveal that clean electricity in the 2030s is crucial if net zero is to be achieved in 2050. President Biden's executive order on Tackling the Climate Crisis at Home and Abroad includes the promise of a "carbon pollution-free electricity sector no later than 2035". With the US leading the way, rapid power sector decarbonisation is quickly becoming one of the key pillars of net zero strategies published by countries serious about leading the world in this fight.

The government has accepted the Sixth Carbon Budget which sets out the goal of cutting carbon emissions by 78 per cent by 2035 compared to 1990 levels. The budget provides four key steps to achieve this target. One of them revolves around energy systems, including the aspiration that "UK electricity production is zero carbon by 2035". Given the success of the UK in getting on track to end coal power by 2024 at the latest, power sector decarbonisation is the next logical step towards net zero.

Achieving a decarbonised power sector

Decarbonising the power grid is essential if government is to meet its target of a 78 per cent reduction in emissions by 2035 as well as net zero by 2050.

All three regions mentioned above agree that a rapid end to coal powered electricity, with large reductions coming before 2030, is necessary. The CCC is the only one to specifically recommend a phase out in unabated fossil gas, though the same target is implied by the US 2035 target. Only the EU leave more room for unabated gas.

The CCC makes the following recommendations:

1. Government should commit to phasing out unabated gas from the electricity sector by 2035.
2. Government should legislate to ensure new gas plants must be ready for CCS and/or hydrogen conversion.
3. Government should legislate to end any unabated new gas in 2030.

The CCC's projections require government to take a series of actions in the immediate future if a 2035 decarbonisation target is to be met. These steps would reduce the overall cost of decarbonisation, but require important decisions to be made around the role of CCS and hydrogen. The modelling in the Sixth Carbon Budget shows that it is possible to achieve net zero emissions by 2050 with minimal CCS, with the growth of renewable generation outperforming expectations in recent years.

Specific deployment targets for renewable technologies such as solar power, onshore wind, floating wind and green hydrogen would go a long way to reassuring the power sector of the feasibility of achieving a 2035 target. Although the Government have committed to a 2030 target, there is no such target for onshore wind or solar development, nor enabling policies to ensure the necessary development of those technologies can be achieved. In addition to ensuring the correct policy environment is created for gas, we need to ensure:

1. A 2030 target for onshore wind and 40GW target for solar is established, suggested by the Climate Change Committee, to ensure rapid and lowest cost electricity decarbonisation.

2. A supportive framework is established for the development of battery storage, including facilitation of the development of green hydrogen for longer-term inter-seasonal storage.
3. Progress is made in supporting increased flexibility and digitisation in the electricity system.

It is important to recognise the importance of the Climate Change Committee's analysis. In committing to a clean power target, the UK would be sending ambitious signals internationally while also pulling forward the necessary policy levers to increase the pace of renewables deployment and other necessary investment and enablers, bringing with it economic benefits and international investment. However, given the understandable concerns of some in the generation industry around security of supply, it is appropriate that a commitment to clean power comes with an in-practice caveat that guarantees security of supply using some retained unabated gas for a transitional period and for winters which do not generate sufficient wind power, particularly where there are extreme weathers and cold snaps. Given the current uncertainties on the deployment and costs of CCUS and H2 technologies, this will provide reassurance from both a cost and a carbon perspective. The CCC's analysis includes a security of supply caveat, opening the door for some unabated gas to remain in reserve after 2035 to account for unmet need.

Scenarios in the budget show huge increases in electricity generated by wind and solar power, which between them will become the primary source of electricity from 2030. The Balanced Pathway sees wind and solar power contributing 75-90 per cent of electricity supply, up from the 50-75 per cent in the CCC's 2019 net zero report. Committing to sector decarbonisation will help to encourage increased investment in renewables. Some in the power sector have expressed concern over security of supply in winters which do not yield enough wind power; it is imperative that government provides reassurance to the sector by unlocking finance and aligning policy to ensure that the infrastructure is in place to address these concerns.

Pathways to 2035 – what is needed to get there

The UK's electricity grid has decarbonised at a faster rate than other countries in the last decade, with emissions falling twice as quickly as in any other major economy.² The UK grid has more than halved its carbon intensity in that time. Policy interventions including carbon pricing, feed-in-tariffs and regulation have driven down carbon intensity.

However, data from the National Grid ESO tells us that the carbon intensity of electricity was approximately 5 per cent higher in the first four months of 2021 than it was in the first four of 2020; gas fired generation was 22 per cent higher.³ Although some individual days broke records for low carbon intensity, the grid as a whole was on average 20 per cent dirtier in April 2021 than in April 2020, with a carbon intensity of 200gCO₂/kWh.

Reversing this trend and capitalising on the momentum of the last decade to get to a zero carbon power sector is one of the most important challenges of the next decade: a decarbonised power sector is vital to the decarbonisation of road transport, buildings, heating and industry, the first steps in decarbonising the rest of the economy. Meeting a 2035 target in the power sector will be a significant challenge, and one that is surmountable only through significant policy and regulatory support as well as financing. Committing to a 2035 deadline

² https://www.drax.com/wp-content/uploads/2020/11/201126_Drax_20Q3_005.pdf

³ <https://www.edie.net/news/10/UK-s-electricity-grid-emissions-up-year-on-year--despite-net-zero-pledge/>

will not be enough; government must set out milestones along the way which will facilitate full decarbonisation. The government's impact assessment of the Sixth Carbon Budget finds that 'the portfolio of policies to deliver the budget level is unconfirmed at this stage'.⁴ A change of pace is urgently needed, and the following approaches are worthy of consideration:

Carbon pricing

The Sixth Carbon Budget finds that 'a strong carbon price could move unabated gas down the merit order, thus reducing its role in the generation mix'. Combined Cycle Gas Turbines (CCGTs) currently cost £50/MWh, excluding the cost of carbon, whereas a gas CCS plant is expected to cost around £85/MWh in 2025.⁵ Further CCC analysis suggests that a hydrogen plant would be even more expensive. As such, power sector decarbonisation is difficult without a carbon price. In light of this, its analysis finds that a carbon price of £125/tCO₂ in 2030 would bring the cost of a CCGT to £130/MWh, making it more expensive than CCS or hydrogen, marginalising the use of gas and incentivising renewable alternatives. In this scenario, the role of gas would be refined to meeting security of supply.

The UK Emissions Trading System (ETS) covers power generation already. In recent years, the effective carbon price the ETS yields has been supported by the carbon price support (currently £18/tCO₂e), which only power generators pay. [Work by ES Catapult](#) suggests that the electricity policy offering will need substantial strengthening and reform to allow for full sector decarbonisation by 2035.

The ability to tighten the price cap in the near term so that it yields a carbon price high enough to galvanise full sector decarbonisations is limited by the potential impact of a much tighter cap on other sectors covered by the ETS. Energy Systems Catapult has proposed an outcome based policy mandate such as a decarbonisation obligation to complement the UK ETS, internalising the decarbonisation imperative into the demand for electricity by suppliers and large off takers and therefore wholesale electricity prices, driving investment to decarbonise the power sector at a faster pace than the rest of the economy.⁶ This could come in the form of carbon intensity performance standards, obligations or targets, with the option of trading carbon credits to meet the obligation.

Security of supply, CCS and Hydrogen

The Sixth Carbon Budget's Balanced Pathway indicates that achieving the phase out of gas for a decarbonised power sector is contingent on security of supply. It states that the following will be required:

- Gas CCS 1GW/year between 2025 and 2035.
- Hydrogen GW/year between 2025 and 2029 and 3.5GW/year between 2030 and 2035.
- Rare gas use in the case of very cold winters, cold snaps and other extreme weathers.
- Deployment of 400 TWh of new low carbon generation, including 50 TWh of dispatchable and flexible low-carbon generation (e.g. gas CCS and hydrogen) to ensure security of supply.
- Ensure new gas plant are properly CCS and/or hydrogen ready as soon as possible and by 2025 at the latest.

⁴ https://www.legislation.gov.uk/ukia/2021/18/pdfs/ukia_20210018_en.pdf

⁵ <https://www.gov.uk/government/publications/beis-electricity-generation-costs-2020>

⁶ <https://es.catapult.org.uk/reports/rethinking-electricity-markets-the-case-for-emr-2/>

It states that ‘new gas plants will need to demonstrate their ability to store hydrogen on site and show their preparedness for using hydrogen blending or their ability to retrofit CCS. Proximity to planned hydrogen or CCS infrastructure should also be a key criterion applied to all new gas plants’. As such, it will be important for government to focus on developing the market for gas CCS and hydrogen in the 2020s, deploying low carbon generation and phasing out unabated gas. This will be a key part of any long-term strategy on market design for a fully decarbonised grid.

Offshore wind, floating wind, onshore wind and solar

The CCS is also clear that no single technology can deliver all the generation that is needed to meet new electricity demands, meaning that a range of zero carbon generation technologies will be needed, including onshore wind, solar and nuclear. Variable renewables will need to be urgently deployed at scale, including 40GW of installed offshored wind capacity by 2030 as per the promise of the 2019 Conservative manifesto.

Analysis by Aurora Energy suggests that reaching this target will require 30GW of capacity to be commissioned during the 2020s, three times as much as that installed during the 2010s. This would require one turbine to be installed every weekday during the decade as well as almost £50 billion in capital investment.⁷ Just under 10GW of offshore capacity has already been committed to come online during the 2020s; an additional 20GW will need to be found through the Contract for Difference scheme, of which 17GW is yet to receive full planning consent.

We are pleased that the Government’s offshore wind target has been accompanied with detailed policy developments and a series of milestones through which it can be achieved. However, 2035 cannot be achieved with offshore wind alone. Every scenario to achieve the Sixth Carbon Budget envisions a substantial increase in both onshore wind and solar over the next 15 years. However, there are currently no established targets for these technologies, nor enabling policy measures to ensure development continues at an appropriate pace.

Furthermore, the Government should be clear that floating wind development will grow substantially after 2030. The government can do so by committing to a 16-20GW target for floating wind development by 2040 and ensuring that the necessary investment is made in port infrastructure to enable future development at this level.

Though the challenges are substantial both in terms of rapidly increasing the pace of phasing out gas and the finance that will need to be unlocked, the economic and political benefits of a 2035 decarbonisation target are greater.

A chance for the UK to lead the way

The announcement of the UK coal phase out in 2015 was a perfect illustration of the connection between climate leadership and economic success. It has ushered in a new generation of low cost renewable energy technologies and diversified electricity supply and brought investment to the UK’s network infrastructure. Clean power will bring with it prosperity and jobs, levelling up regions of the UK and helping to power new fleets of electric vehicles, home heat pumps and green hydrogen production.

⁷ <https://auroraer.com/media/reaching-40gw-offshore-wind/>

President Biden's commitment to a decarbonised power sector is uniquely ambitious. Through hosting COP26, the UK has an opportunity to demonstrate leadership on the global stage, standing alongside the US by committing to the decarbonisation of the power sector by 2035, a target which is well within our grasp. Furthermore, this commitment would place the UK's targets far beyond those of the EU, helping to cement our relationship with the Biden administration.

In the aftermath of the US summit in April and in advance of COP26, there is a perfect moment for the UK to demonstrate real international leadership. Its presidency of both COP26 and G7 provide a perfect platform for the government to forge a consensus with the Biden administration, the EU and other major actors that the time to extend the benchmark from coal to all fossil fuels is now. There is currently a credibility gap between mid-century net zero targets and nearer term power sector plans. Such a commitment would close this gap, and provide a major boost to the transatlantic green alliance in light of President Biden's clean power plans. To have it place a commitment to the end of unabated gas three years before Germany's 2038 coal phase out target will only emphasise the UK's leadership on climate change.

Given both the long timescales involved in overhauling electricity infrastructure and the presidencies it holds in this crucial year, acting in advance of COP26 makes perfect sense. The direction of travel is already trending towards reductions in coal generation by 2030 followed by substantial reductions in fossil gas.

Domestically, power sector decarbonisation is well-placed to play a pivotal role in a green industrial revolution, fuelling the creation of jobs. Onward has found that the UK's transition to low carbon and renewable energy sources could create 1.7 million jobs, with half of these coming in the north, midlands and Scotland.⁸ The report, '[Getting to Zero](#)', finds that between 900,000 and 1.3 million jobs could be created in low carbon heating and energy efficiency, with a further 367,000 in electric vehicles and 36,000 in low carbon power. The effect of this decarbonisation, it concludes, could generate over £330 billion in additional economic value by 2030. Furthermore, the economic and job creation benefits of solar and wind power are well documented. With benefits at home for jobs and abroad in diplomatic terms, the government has the opportunity to make a commitment now which shows it is serious about leading the way on climate change. The UK's access to coastal areas suitable for offshore wind development provides energy security, cuts electricity costs, and reduces our dependence on imported fuels. Committing to a decarbonised power sector makes a future in which the UK exports clean energy technologies a reality. Renewable energy is one of the fastest-growing sources of employment in the UK, bringing with it jobs and economic benefits which align perfectly with the government's ambition to 'level up' the UK, particular areas bordering the North Sea. The offshore wind industry alone is set to employ 69,000 people in the UK by 2026, and secure £10bn of inward investment each year.

Committing to a decarbonised power sector by 2035 brings numerous benefits to the UK: it creates jobs, it attracts investment, it levels up parts of the country, and it cements the UK's standing as an international leader. COP26 provides a platform for the UK to make this announcement and lead the way in delivering net zero by 2050.

⁸ <https://www.ukonward.com/wp-content/uploads/2021/01/Net-Zero-.pdf>

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