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Investing in energy: price, security, and the transition to net zero

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See Appendix 1.

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Evidence is published online at <https://committees.parliament.uk/work/6535/uk-energy-supply-and-investment/publications/> and available for inspection at the Parliamentary Archives (020 7219 3074).

Q in footnotes refers to a question in oral evidence.

SUMMARY

The Government has committed in law to achieve net zero by 2050. It has stated that its target is to decarbonise the power system by 2035. This report examines some of the steps needed to meet these targets, particularly how the Government can mobilise the capital needed to ensure the transition is orderly and that energy supply is affordable and reliable. It also briefly sets out measures to mitigate the energy affordability crisis which started in 2021 and was then exacerbated in February 2022 when Russia invaded Ukraine.

Private investment is required to achieve net zero. However, there is a gap between the Government's ambitions and the practical policy that is needed to provide confidence and clear market signals to investors. The Government has set capacity targets for sources of low carbon power generation without explaining what balance of public and private investment is needed. The Government should set this out in broad terms and provide an assessment of relevant costs and savings.

The consequences of the Ukraine crisis have made the task of achieving net zero, while ensuring energy security and affordability, more complex. To help avoid a disorderly transition and to provide clarity to investors, the Government should publish a net zero delivery plan which takes account of energy security, making clear what decisions and operational actions are needed, and by when. Any such plan will need to incorporate the flexibility required by a three-decade, economy-wide transition.

The Russian invasion of Ukraine has created global energy supply and price issues. We recommend several measures which could make a significant difference to energy security and affordability over the next three to five years:

- High energy bills mean households may focus on energy usage and the Government should harness this public concern to speed up the pace of home insulation and other measures to improve energy efficiency. The Government should publish an energy demand reduction strategy and it should redouble its work with the financial sector to identify financing options for energy efficiency measures.
- Accelerating and increasing the deployment of renewable sources of energy can reduce the UK's dependency on volatile gas markets. While we acknowledge some local opposition, onshore wind is one of the cheapest and fastest ways to increase renewable energy generation. The Government should re-examine its ambitions for onshore wind and consider possibilities for promoting local acceptability where local communities can benefit from the additional energy generated.
- We support the Government in seeking to maintain existing energy generation in the short term, including coal-fired power stations where necessary, to reduce dependency on expensive gas imports.
- There is no agreement in place between the UK and its European partners to manage energy supply emergencies. The Government should urgently seek an agreement with its European partners on energy cooperation.

Most of the investment required for an orderly transition to net zero by 2050 is expected to be delivered by the private sector. We were told that there is a large amount of private capital available for investment once policy and financial

uncertainties are resolved. The Government can increase investor confidence by designing market models for low carbon technologies that make energy pricing more predictable. We recommend the Government:

- Set out a cost analysis for its target of 24GW of nuclear capacity compared to alternative options of providing similar baseload capacity. While we have heard that the Regulated Asset Base model could unlock private sector investment for nuclear, questions remain about the cost impact on consumers. The Government should ensure that plans for new nuclear power stations are as robust as possible, and credible in terms of costs and timing, and set out how it will protect energy bill payers in the event of cost overruns and construction delays.
- Provide more detail on the capacity, timeframes and expected costs of long-duration energy storage and develop an appropriate market model. We heard that a cap and floor model would be most effective.
- Outline market structures and mechanisms for blue and green hydrogen as soon as feasible, recognising that different applications of hydrogen might suit different market models.
- Design market models for carbon capture and storage so that investors are given greater confidence that there will be a long-term market.

While many low carbon technologies are low cost, many other technologies required for the energy transition are at an early stage in their development and not yet commercially viable. Some public financing will be needed to leverage private investment. The UK Infrastructure Bank should focus on financing innovative and potentially riskier projects with the aim of signalling to private investors that these projects are viable and have the potential to scale up in line with Government plans. We note, however, that the UK Infrastructure Bank has limited risk capital. It should focus on using its investments to manage, share and reduce risk to enable the private sector to invest where otherwise it would be difficult.

In the short term, Europe needs alternative sources of oil and gas to replace supply from Russia; and the UK will continue to require gas during the transition. Enabling more investment in North Sea production can help address this, although it will not provide a significant reduction in energy prices. Over the medium term the use of oil and gas needs to fall to align with the strategies on climate change. Any extension of oil and gas exploration or investment should focus on projects with short lead times and payback periods to limit the risk of stranded assets.

The UK may benefit from additional gas storage capacity which can also be made suitable for hydrogen storage. We welcome the Government and Centrica examining the case for reopening the Rough storage facility.

Given the urgency of the transition and the dangers of delay, we recommend the National Planning Policy Framework be revised. We recommend that energy security objectives be included along with the existing climate change objectives.

The planning process for nuclear reactors that are sited on locations of former nuclear reactors should be expedited. The Government should also encourage schemes to compensate residents for energy projects built in their areas.

We support proposals by Ofgem to increase anticipatory investment in grid capacity to unlock additional investment in renewables and to increase the UK's energy supply at greater speed, provided that the impact on consumer bills can be contained. One way to enable anticipatory investment is the Government and Ofgem's plan for a Future Systems Operator, which will have responsibilities across electricity and gas networks. The Future Systems Operator should be set up in a way that is operationally independent from Government. It is unclear about what role the appointments of Energy Networks Commissioner and the industry champions will have in relation to the Future Systems Operator.

The Government has introduced an Energy Profits Levy to help pay for financial support to domestic energy consumers. The Government should explain what effect the levy is expected to have on investment decisions in the North Sea and when it says that the levy could end when oil and gas prices are at "normal" levels, it should quantify what "normal" means. The Government's decision to announce a possible extension of the levy to electricity generators, before having assessed whether it is justified, may risk affecting investor confidence in renewables. The Government should set out whether it intends to move forward with a levy on electricity generators as soon as possible, to avoid damaging investor confidence further.

Extending carbon pricing could be an effective way to disincentivise holding carbon intensive assets and encourage investment in low carbon alternatives. The UK has some carbon pricing already through its Emissions Trading Scheme and taxes on fuel. The Government should set out whether it plans to extend carbon pricing to other greenhouse gas emitting activities and provide detail on pricing levels and timescales. This could provide more clarity to investors.

Since March 2021, the Bank of England has been required to consider the Government's commitment to decarbonisation when making policy. In April 2022 the Government asked the Bank and financial regulators to have regard to energy security as well. To provide clarity to the financial sector, the Financial Policy Committee, the Prudential Regulation Committee, and the Financial Conduct Authority should set out high-level principles on how they are interpreting the Chancellor's instruction on energy security as soon as possible.

Understanding climate risk and managing the transition to a low-carbon economy requires data and appropriate analytic approaches. The UK's largest companies, including financial institutions, are required to publish disclosures on their impact on the climate. HM Treasury and financial regulators will need to support businesses to make disclosures consistently and help them to gather quantitative data on their climate impact. This applies particularly to scope 3 emissions, which are indirect emissions that occur in the value chain of a reporting company, such as emissions from suppliers and customers and are especially difficult for companies to assess.

The Bank of England has conducted green stress tests to ascertain the level of exposure that financial institutions have to climate change risks. This did not result in changes to capital requirements to manage these risks. However, the quality of data and analytic approaches for assessing exposure is currently insufficient for regulators to reach reliable judgements on the appropriateness of capital requirements. This problem is exacerbated by a lack of clarity from the Government on energy needs during the transition and how sectors will be expected to adapt.

Green taxonomies can help define which infrastructure and technologies are “green”, which helps investors to judge the effect of their decisions on the environment. However, they can also be seriously misleading by giving the impression that projects are either green or brown. If poorly designed, green taxonomies risk driving capital to a narrow subset of existing options, which may stifle innovation and they can fail to take account of the process of transition towards new sets of activities. The Government should be mindful of this risk by avoiding a narrow interpretation of the taxonomy and ensure that guidance to investors reflects the fact that the transition to net zero may involve complex interlinkages between renewables and fossil fuels. The Government should also work with other jurisdictions’ authorities to ensure that the principles underpinning a UK taxonomy are consistent with taxonomies in other countries and regions.

The Government wishes to unlock more capital for net zero-aligned investment by reforming the Solvency II regulatory regime for insurance companies. The insurance industry has said such changes would release substantial capital, but insurers do not have an obligation to use any capital that is released for such purposes. The Government should explain how it can encourage capital to support the energy transition.

The EU has started to create the foundations for a Common Purchase Platform so that it can leverage its collective weight in negotiations with gas and hydrogen producers. While these plans are at an early stage, if the EU’s ambitions are realised, they may affect the UK’s energy supply. The Government should engage with the EU to increase the chance that the UK can benefit from working with the Platform if there is some advantage in doing so.

Increasing the UK’s reliance on renewable energy sources will create new dependencies on foreign countries, particularly in terms of manufacturing renewable technologies and accessing critical minerals which are used in the production of those technologies. The Government should work with allies to ensure that the UK does not become reliant on strategic competitors, notably China, for critical minerals needed for low-carbon technology, and identify what investment is needed to achieve this, similarly for key supply elements such as solar panels.

The Government’s critical minerals strategy, which is due to be published later in 2022, should examine supply chain vulnerabilities and policies to mitigate them. Ahead of its publication, the Government should engage with the financial and industrial sectors to assess the viability of preferential supply chains, the timeframes in which they could be created and how they might affect the cost of capital over time for developing renewable technologies.

Investing in energy: price, security, and the transition to net zero

CHAPTER 1: INTRODUCTION

Our inquiry

1. We launched this inquiry on 10 February 2022 and issued a call for evidence on long-term trends in the energy market and the private and public investment needed to fund the transition to net zero. The focus of this report is on measures to increase investment in the energy transition. However, as our inquiry progressed it was apparent that action was needed to address the short-term effects of the Ukrainian crisis on energy supply and therefore we also examine this significant issue briefly. We are grateful to all our witnesses and to our Specialist Adviser, Professor Richard Green.

Net zero and energy security

2. The Climate Change Act 2008 commits the UK to achieve net zero carbon emissions by 2050.¹ The Act also established the Climate Change Committee as an independent body to advise the Government on setting targets, among other things. In 2021, the Government legislated to bring the Climate Change Committee's Sixth Carbon Budget into law, which set a target of reducing emissions by 78% by 2035, compared with the 1990 level.²
3. The Government has set additional net zero targets in strategy papers. On 14 December 2020, the Government published an energy white paper, which included capacity targets for different sources of energy generation, including renewables.³ In October 2021, the Government published its *Net Zero Strategy*, which confirmed an objective to decarbonise the power system by 2035, subject to security of supply.⁴
4. The Government updated some of its targets after Russia invaded Ukraine in February 2022. As Russia has historically been a major oil and gas exporter to mainland Europe, the invasion caused significant concern over energy security. On 7 April 2022, the Government published the *British energy security strategy* ('the energy security strategy'), which increased capacity targets for low-carbon sources of energy, and introduced measures designed

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- 1 [Climate Change Act 2008](https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement). The commitment is known as 'net zero' because some emissions can remain if they are offset via removal from the atmosphere or via trading in carbon units. The net zero target supports commitments made by the UK under the 2016 Paris Agreement to keep global warming under two degrees centigrade. United Nations, 'The Paris Agreement': <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement> [accessed 14 July 2022]. The target in the Act as passed in 2008 was for an 80% reduction in emissions. This was amended in 2019 to provide for a 100% reduction, or net zero.
 - 2 Climate Change Committee, 'The Sixth Carbon Budget: The UK's path to Net Zero' (December 2020): <https://www.theccc.org.uk/publication/sixth-carbon-budget/> [accessed 29 June 2022]. The Act requires the Government to set five-yearly carbon budgets, 12 years in advance, from 2008 to 2050.
 - 3 Department for Business, Energy and Industrial Strategy, Energy, *Energy White Paper Powering our Net Zero Future powering our net zero future*, CP 337 (14 December 2020): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf [accessed 29 June 2022]
 - 4 Department for Business, Energy and Industrial Strategy, *Net Zero Strategy, Build Back Greener* (October 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf [accessed 29 June 2022]

to increase domestic oil and gas production to help maintain security of supply.⁵ Table 1 sets out the Government's new low-carbon capacity targets and compares them against its previous targets and the Climate Change Committee's assumed levels of capacity, as well as the UK's existing capacity.

Table 1: Low-carbon target capacities

Energy type	Energy security strategy target capacity	Previous Government target capacity	Climate Change Committee capacity assumption	Current operational capacity
Offshore wind and floating offshore wind	Up to 50GW, with up to 5GW floating offshore wind, by 2030	40GW with 1GW floating offshore wind by 2030	45GW by 2035	11.3GW
Onshore wind	No target	No target	35GW by 2035	14.5GW
Solar photovoltaic	Up to 70GW by 2035	No target	54GW by 2035	13.8GW
Hydrogen	Up to 10GW by 2035	5GW by 2030	Not set out	0GW
Nuclear	24GW by 2050	5GW by 2030	10GW by 2050	7GW

Source: House of Commons Library, 'Where will Britain's future energy supply come from?' (12 May 2022): <https://commonslibrary.parliament.uk/where-will-britains-future-energy-supply-come-from/> [accessed 14 July 2022]

5 Department for Business, Energy and Industrial Strategy, *British energy security strategy* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf [accessed 29 June 2022]

Box 1: Units of power

The power used by an electrical device is measured in watts (W). A typical kettle uses 3,000W, or 3 kilowatts (kW).

Electric power is a flow of energy. A kilowatt-hour is the energy transferred through a flow of one kilowatt that lasts one hour. An electric vehicle connected to a charger with a power of 7kW for an hour would therefore receive 7 kilowatt-hours (kWh) of energy—for two hours it would receive 14 kWh.

For larger amounts of energy:

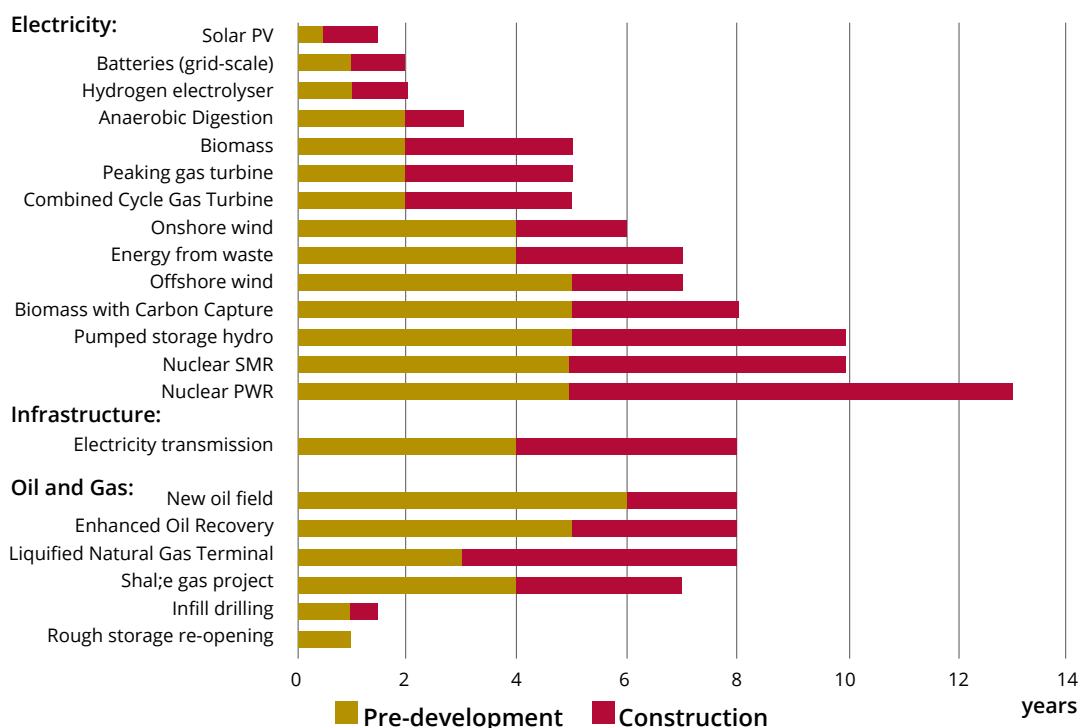
- megawatt-hours (MWh), with 1,000 kWh = 1 MWh;
- gigawatt-hours (GWh), with 1,000 MWh = 1 GWh; and
- Terawatt-hours, with 1,000 GWh = 1 TWh.

The UK’s total electricity demand in 2020 was 330TWh.

A typical gas-fired power station may have a capacity of between 500 MW and 1,200 MW; the nuclear station under construction at Hinkley Point C will have two reactors, each of 1,600 MW. A rooftop solar PV installation might have a capacity of 4 kW, and a utility-scale solar farm might have between 20 MW and 50 MW. The Hornsea 1 offshore wind farm has a capacity of 1.2 GW, with 174 turbines, each 190 metres tall with a capacity of 7 MW.

5. Sources of energy generation have different lead times for planning and construction before they can start producing energy, as displayed in Figure 1.

Figure 1: Timescales for energy investment



Sources: Written evidence from Professor Ann Muggerridge, Professor Adam Hawkes and Professor Richard Green, Imperial College London ([ESI0040](#))

Investment

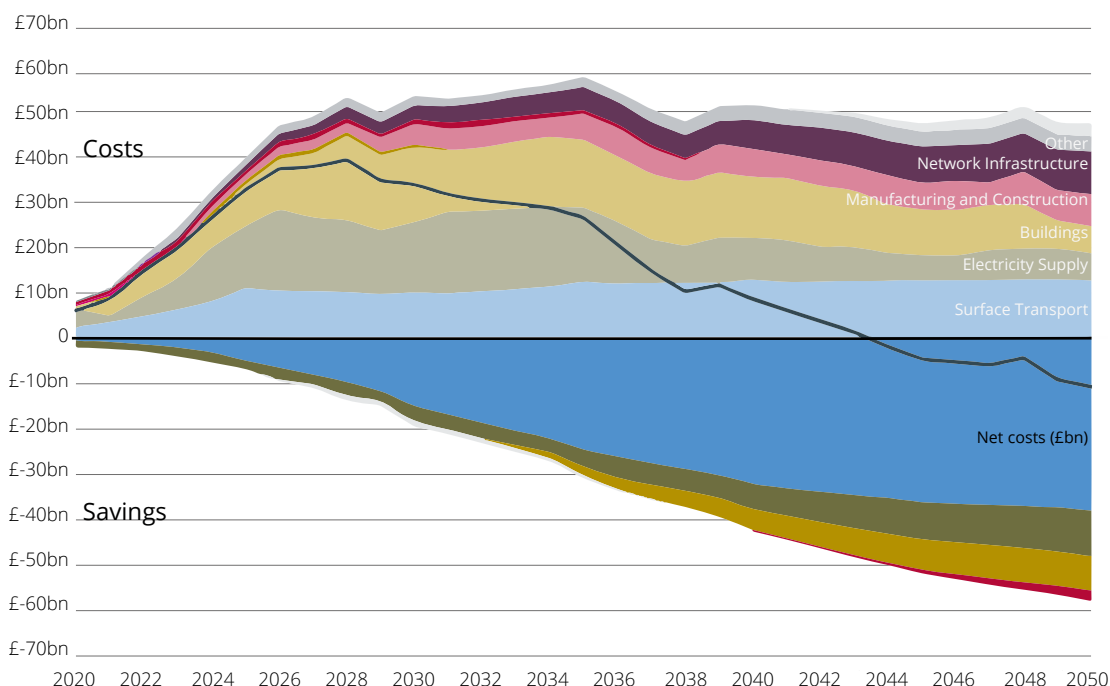
6. The Government’s net zero objectives will require substantial public and private sector investment. In the UK, there was around £10 billion of public and private investment in low-carbon projects in 2020, but the Climate Change Committee said investment will need to increase to around £50 billion annually by 2030. It explained that the largest increases are for low-carbon power capacity, retrofit of buildings and the added costs of batteries and infrastructure for electric vehicles. It concluded that the necessary increase in investment “can, and should, be delivered largely by the private sector.” While the Government has not set out how much of the cost of net zero it expects to come from public spending, the Climate Change Committee expects a doubling in annual public funding to £9–12 billion by 2030, depending on policy choices.⁶

7. Although a significant amount of up-front spending is necessary, the Climate Change Committee said extra investment (capital expenditure) will be offset by savings in day-to-day spending (operational expenditure)—see Figure 2. The Climate Change Committee said that over time, “these savings cancel out the investment costs entirely ... which means our central estimate for costs is now below 1% of GDP throughout the next 30 years.”⁷ There is a high degree of uncertainty surrounding all such figures and it is not clear how the Government’s ambitions, especially the higher levels of spending on nuclear, will affect assumptions on the cost of the transition.

6 Climate Change Committee, ‘The Sixth Carbon Budget: The UK’s path to Net Zero’ (December 2020): <https://www.theccc.org.uk/publication/sixth-carbon-budget/> [accessed 29 June 2022]

7 *Ibid.* The Office for Budget Responsibility came to a similar conclusion in its 2021 *Fiscal risks report*: “Our scenario assumes that public spending meets around a quarter of [the cost of delivering net zero]. When combined with savings from more energy-efficient buildings and vehicles, the net cost to the state is £344 billion in real terms.” It said this figure represents an average on 0.4% of GDP a year when spread across three decades. See, Office for Budget Responsibility, *Fiscal risks report*, CP 453, (6 July 2021): https://obr.uk/docs/dlm_uploads/Fiscal_risks_report_July_2021.pdf [accessed 29 June 2022].

Figure 2: Capital expenditure and operational savings during the transition to net zero by 2050



Source: Institute for Government, ‘Paying for Net Zero’ (1 September 2021): <https://www.instituteforgovernment.org.uk/explainers/paying-net-zero> [accessed 29 June 2022] and Climate Change Committee, ‘The Sixth Carbon Budget - Dataset’ (9 December 2020): <https://www.theccc.org.uk/2021/02/01/the-numbers-behind-the-budget-six-ways-to-explore-the-sixth-carbon-budget-dataset/> [accessed 29 June 2022]

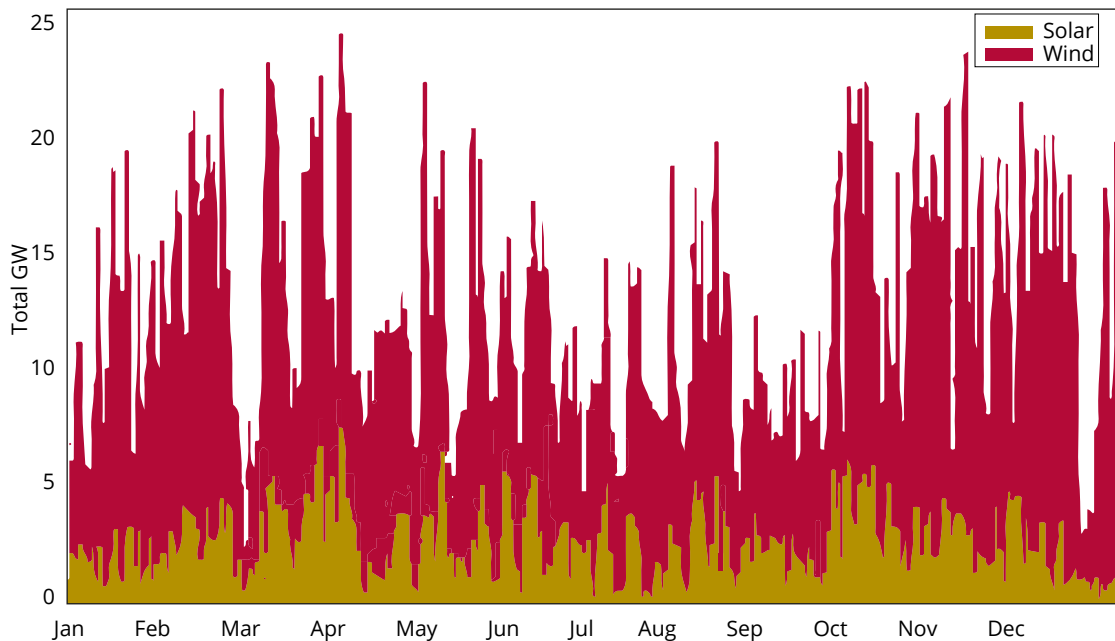
8. We heard there is a large amount of private capital available, and a willingness among investors, to finance net-zero energy projects provided there is sufficient clarity on policy and market models.⁸ Barriers to investment in planning and grid infrastructure will need to be overcome to enable a largescale and rapid rollout of low-carbon energy sources.

Intermittency

9. Energy security is the ability to generate sufficient energy to ensure that the economy and individuals can function at what is deemed an acceptable level without interruptions in supply.
10. One challenge for renewables is the intermittency, or variability, of their supply. If there is calm and cloudy weather, then levels of wind and solar energy generation fall, reducing supply. Figure 3 shows the extent of intermittency of wind and solar electricity generation in the UK over the course of a year. The scale of the problem increases as more renewable sources of energy are added to the grid.

8 [Q 17](#) (Paul Spence), [Q 156](#) (Simon Virley) and [Q 92](#) (Ed Northam)

Figure 3: Total power available from wind and solar in Great Britain in 2021



Source: Written evidence from the UK Energy Research Centre ([ESI0029](#))

11. The UK currently relies on gas as a flexible back up to renewables, along with its ageing nuclear estate as a stable baseload source of energy.⁹ In the future, a combination of technologies will likely be needed to manage an orderly transition to net zero while maintaining energy security. Solutions include using batteries to store surplus electricity for later use; hydro-electric pumps; producing hydrogen from surplus energy which can be stored and burned when needed; using interconnectors to other countries to import and export electricity depending on need; and employing flexible demand management, which involves using technology and price incentives to encourage efficient energy use. Increasing nuclear power can also mitigate the intermittency problem by providing consistent baseload energy.¹⁰ Short duration reductions in renewable energy production are being addressed already by battery storage, but batteries are less effective at managing longer duration storage. This is why a combination of emerging technologies will be required to address the longer-term intermittency problem.

Supply and affordability crisis

12. There are many routes to net zero, which makes precise costs of the transition difficult to forecast with precision. The costs will depend on the speed and trajectory of the transition, and how the Government responds to shocks along the way. These shocks include the current energy affordability crisis.
13. In 2021, global energy demand increased quickly as COVID-19 restrictions on economic activity were lifted. Reductions in coal and nuclear power in Europe increased demand for gas at the same time as importers in Asia and South America were intensifying competition for gas supplies. Low levels

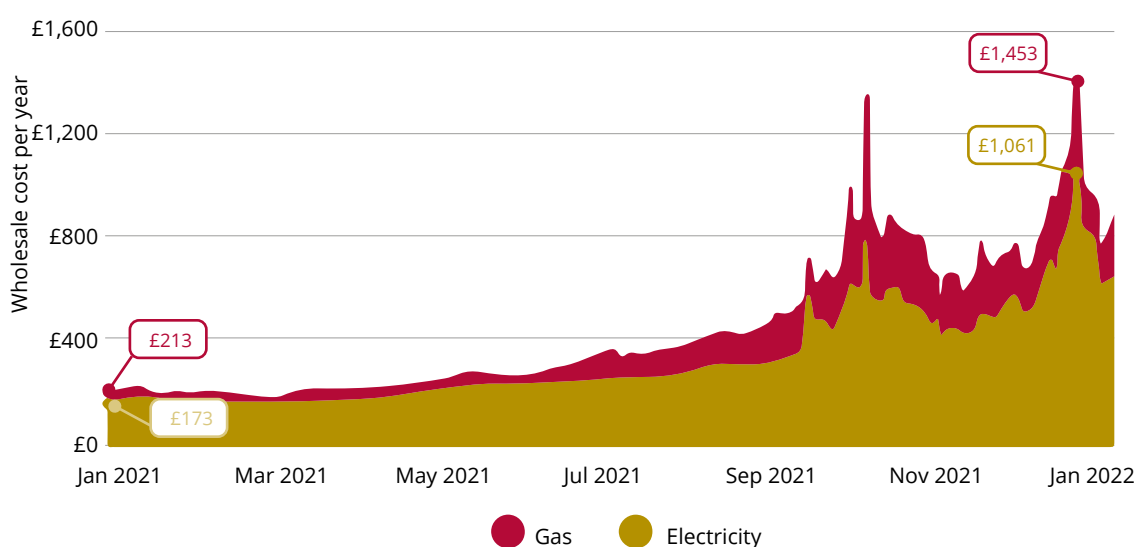
⁹ Written evidence from the UK Energy Research Centre ([ESI0029](#))

¹⁰ [Q 10](#) (Julian Critchlow)

of wind in parts of Europe increased the need to burn more gas in place of renewable sources of energy.¹¹

14. While demand for gas was rising, supply was constrained. In 2021, the availability of liquified natural gas (LNG) was reduced because of planned and unplanned outages in some exporting countries. Russia, a major oil and gas producer, prioritised domestic storage over additional exports to Europe, which itself had low levels of stored gas during the 2021–22 winter.¹² Figure 4 shows how gas and electricity prices increased together. Gas is used as a backup to renewables and hence gas prices set the marginal price of electricity which is reflected in wholesale electricity prices. Wholesale prices do not reflect the operating costs of other energy sources such as renewables which can be much lower than the marginal gas price.

Figure 4: Wholesale price of energy, January 2021–January 2022



Source: British Gas, ‘Energy market news’ (5 July 2022): <https://www.britishgas.co.uk/energy-price-news.html> [accessed 29 June 2022]

15. The mismatch between energy supply and demand was exacerbated when Russia invaded Ukraine on 24 February 2022. Many countries, including the UK, reduced imports of Russian oil and gas with the intention of restricting financial flows to the Kremlin. Russia has also reduced oil and gas exports to some European countries and there is concern that Russia will cut off oil and gas exports before certain countries have secured access to alternative sources of energy.¹³
16. The UK imports around 8% of its oil and less than 4% of its gas from Russia.¹⁴ The Government plans to stop importing Russian oil by the end of 2022 and it is exploring ways to reduce gas imports. The UK can partly

11 Energy Transitions Commission, *The drivers of the Winter 2021–2022 gas crisis* (May 2022): <https://www.energy-transitions.org/wp-content/uploads/2022/05/The-drivers-of-the-winter-2021-2022-gas-crisis.pdf> [accessed 29 June 2022]

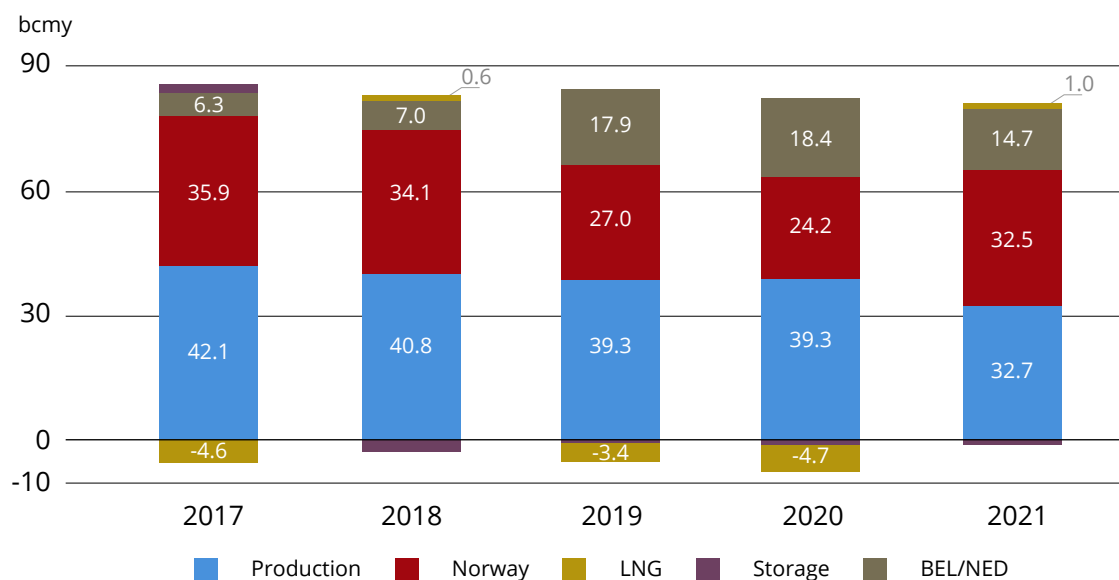
12 *Ibid.*

13 ‘IEA chief warns Europe to prepare for total shutdown of Russian gas exports’ *Financial Times* (22 June 2022): <https://www.ft.com/content/f7990162-395f-488e-9d23-13f3cce83e24> [accessed 29 June 2022]

14 HM Government, ‘UK to phase out Russian oil imports’ (8 March 2022): <https://www.gov.uk/government/news/uk-to-phase-out-russian-oil-imports> [accessed 29 June 2022]. The Government said it will work with companies through a new Taskforce on Oil to support them to find alternative supplies.

rely on domestic oil and gas production from the North Sea, although this has decreased in recent years.¹⁵ The UK imports a significant amount of gas from Europe via interconnectors and LNG from a range of other countries, as set out in Figure 5.¹⁶

Figure 5: UK natural gas supplies by source (billion cubic metres per year)



Source: Oxford Institute for Energy Studies, *The potential impact on the UK of a disruption in Russian gas supplies to Europe* (February 2022): <https://a9w7k6q9.stackpathcdn.com/wpcms/wp-content/uploads/2022/02/Insight-109-The-Potential-Impact-on-the-UK-of-a-Disruption-in-Russian-Gas-Supplies-to-Europe.pdf>. Data from Department for Business, Energy and Industrial Strategy, ‘Energy Trends: UK gas’ (last updated 30 June 2022): <https://www.gov.uk/government/statistics/gas-section-4-energy-trends> [accessed 30 June 2022].

Note that the net storage withdrawals in 2018–21 are associated with the withdrawal of cushion gas from the Rough storage facility, which formally closed in 2017. BEL/NED refers to the iUK Interconnector between the UK and Belgium (BEL) and the Bacton-Balgzand Line (BBL) interconnector between the UK and the Netherlands (NEL).

17. While the UK has access to diverse sources of supply of gas, pressure on supply in the European market could severely affect the UK in certain circumstances. The UK relies on the spot market for gas imports, and it has no long-term storage facilities. On 29 May 2022 it was reported that the Government was assessing the effect on the UK’s security of supply from a possible Russian decision to cut gas exports to Europe. The Government’s ‘reasonable worst-case scenario’ was reported to be that imports of LNG and piped gas from Norway could halve, and imports via pipeline interconnectors with Belgium and the Netherlands could cease because of competition for

15 Oxford Institute for Energy Studies, *The potential impact on the UK of a disruption in Russian gas supplies to Europe* (February 2022): <https://a9w7k6q9.stackpathcdn.com/wpcms/wp-content/uploads/2022/02/Insight-109-The-Potential-Impact-on-the-UK-of-a-Disruption-in-Russian-Gas-Supplies-to-Europe.pdf> [accessed 29 June 2022]

16 The UK also exports gas to Europe. According to the Office for National Statistics, exports of fuels to EU countries exceeded £3 billion in a month for the first time in March 2022 (£3.1 billion) since records began in 1997. Exports of fuels to the EU further increased in April 2022 to £3.6 billion. See, Office for National Statistics, ‘Trends in UK imports and exports of fuels’ (29 June 2022): <https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/articles/trendsinukimportsandexportsoffuels/2022-06-29> [accessed 6 July 2022]

supply in mainland Europe. The Government said this was just one in a range of scenarios for which it was contingency planning.¹⁷

18. Intense competition for gas supply is keeping energy bills high. Ofgem expects the energy price cap, which is designed to protect consumers from short-term changes in prices, to rise above £2,800 in October 2022—or higher if there is further disruption to gas supplies.¹⁸ While high prices may moderate somewhat, they are forecast to remain well above the prices in early 2021.¹⁹
19. **Decarbonising the UK’s energy system while ensuring that the UK’s energy supply is affordable and reliable is a highly complex challenge. Russia’s invasion of Ukraine has made the task more complex. No government can be expected to predict the future with accuracy, nor should a government seek to plan for every eventuality. Instead, the Government should address issues that undermine investor confidence and increase resilience in the energy system. The Government will need to:**
 - **Explain how the transition will be funded, including the balance of public and private investment;**
 - **Establish appropriate market mechanisms and incentives to encourage investment in low carbon technologies;**
 - **Review the planning system in England to ensure that the system, which already reflects climate change objectives, is updated to reflect energy security objectives;**
 - **Plan for the emerging international competition over renewable energy supply chains.**
20. **One challenge for the Government is to ensure that short-term measures to maintain security of supply are consistent with the Government’s net zero plans, and that this objective is well communicated to industry. While the Government should continue to address the impact of the immediate supply crisis, it should also act**

17 ‘Millions warned of power cuts this winter’ *The Times* (29 May 2022): <https://www.thetimes.co.uk/article/millions-warned-of-power-cuts-this-winter-b7gl2ckx9> [accessed 29 June 2022]

18 Oral evidence taken before the House of Commons Public Accounts Committee, 11 July 2022 (Session 2022–23), Q 56 (Jonathan Brearley). On 3 February 2022, the Chancellor of the Exchequer set out an initial package of financial support to help households with rising energy bills. See, HC Deb, 3 February 2022, [col 471](#). See also, HM Treasury, ‘Government support for energy bills and the cost of living : factsheets’ (3 February 2022): <https://www.gov.uk/government/publications/government-support-for-energy-bills-and-the-cost-of-living-factsheets> [accessed 29 June 2022]. The level of support was later judged to be insufficient, and the Chancellor announced a revised support package on 26 April 2022. This consisted of payments of between £400 and £1,200 to households depending on their circumstances. See HC Deb, 26 May 2022, [col 449](#) and HM Treasury, ‘Millions of most vulnerable households will receive £1,200 of help with cost of living’ (26 May 2022): <https://www.gov.uk/government/news/millions-of-most-vulnerable-households-will-receive-1200-of-help-with-cost-of-living> [accessed 29 June 2022]. We examine the levy in more detail in Chapter 3. The total value of this additional support in 2022–23 is £15.3 billion, although the overall cost of financial support to households is £21.3 billion as it converts £6 billion of earlier support from a loan to a grant. This extra spending will be partly supported by a new Energy Profits Levy on oil and gas companies, which the Government expects to raise £5 billion in its first year.

19 Cornwall-insight, ‘Cornwall Insight, GB Power Market Outlook to 2030’ (13 April 2022): <https://www.cornwall-insight.com/gb-power-market-outlook-to-2030/> [accessed 29 June 2022]. Cornwall insight said energy prices will be elevated because of high gas prices (which drive up the cost of power production) and because of closures of existing nuclear power plants and delays to the completion of the Hinkley C nuclear power station.

to encourage long-term investment to facilitate the transition to net zero, which should help to ensure more sustainable energy security and greater long-term price stability. In this report, we set out what needs to be done now to increase investment that will assist in carbon reduction and improve energy resilience.

CHAPTER 2: INVESTMENT AND ACTION IN THE SHORT TERM

Addressing the energy crisis

21. In this chapter we explore several measures—some in line with the Government’s plans and some in addition—which could make a significant difference to energy security and affordability over the next three to five years. These include improving home energy efficiency, accelerating the deployment of renewable energy, extending the life of power generators which are scheduled for retirement, and striking an agreement with European partners on energy security.

Home energy efficiency

22. Improving home energy efficiency is a long-standing goal and is needed for the net zero transition regardless of the energy price crisis. The UK’s housing stock is one of the oldest and least insulated in Europe.²⁰ The security strategy listed several existing policies on decarbonising buildings and improving energy efficiency:
- The Heat and Buildings Strategy, which sets out how the Government plans to decarbonise homes, and commercial, industrial and public sector buildings. It includes £3.9 billion of support over this parliament, including nearly £1.8 billion targeted at low-income households through the Home Upgrade Grant and the Social Housing Decarbonisation Fund.
 - The Energy Company Obligation (ECO), which has been extended from 2022 to 2026, with an increase in value from £640 million to £1 billion a year. Under the ECO, medium and larger energy suppliers fund the installation of energy efficiency measures in British households.
 - The phase out of new and replacement gas boilers by 2035.
 - A package of measures to increase deployment of heat pumps to 600,000 installations per year by 2028 and to expand heat networks through the Green Heat Networks Fund and designating heat network zones.
23. The Government said it is spending £6.6 billion in this parliament on decarbonising buildings.²¹ The 2019 Conservative Party Manifesto committed to spend “£9.2 billion on energy efficiency for homes, schools and hospitals.”²² The Climate Change Committee has estimated that

20 Climate Change Committee, *Annex 2: Heat in UK Buildings Today* (13 October 2016): <https://www.theccc.org.uk/wp-content/uploads/2017/01/Annex-2-Heat-in-UK-Buildings-Today-Committee-on-Climate-Change-October-2016.pdf> [accessed 29 June 2022]. Only around 15% of existing housing stock has been built since 1990.

21 Department for Business, Energy and Industrial Strategy, *British energy security strategy* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf [accessed 29 June 2022]

22 Conservative and Unionist Party, *2019 Manifesto*: <https://www.conservatives.com/our-plan/conservative-party-manifesto-2019> [accessed 29 June 2022]

approximately £9 billion will need to be spent each year, from the late 2020s to 2050, to decarbonise homes.²³

24. Decarbonising homes broadly falls into two main initiatives: replacing gas boilers with heat pumps and insulating properties that have an energy efficiency rating below C on the energy performance certificate scale. The Heat and Buildings Strategy focuses on incentives for creating a market for heat pumps and better insulation over time. Most of the spending outlined in the Heat and Buildings Strategy is for social housing and public buildings rather than for homeowners. The Resolution Foundation, a think tank, said in a report that it would make more sense to prioritise home insulation over deploying heat pumps:

“Insulation is important for two reasons: first, improving the energy efficiency of the building stock will enable a smoother uptake of heat pumps, which work more efficiently and cheaply in better insulated buildings. Second, better insulation can help households make cost savings now through lower energy bills, with the current energy crisis bringing the poor thermal performance of British housing into sharp focus.”²⁴

25. Several witnesses told us that scaling up ambitions to insulate homes would be one of the most effective and sustainable ways of reducing energy bills in the short term, as this policy could be implemented this year and next, then enhanced over the medium term.²⁵ Simon Virley, Vice-Chair at KPMG, told us: “we could certainly make a significant dent in energy efficiency within a two-year timeframe”.²⁶ In February 2021, the Government set out how substantial savings can be realised from improving home energy efficiency, as set out in Figure 6.

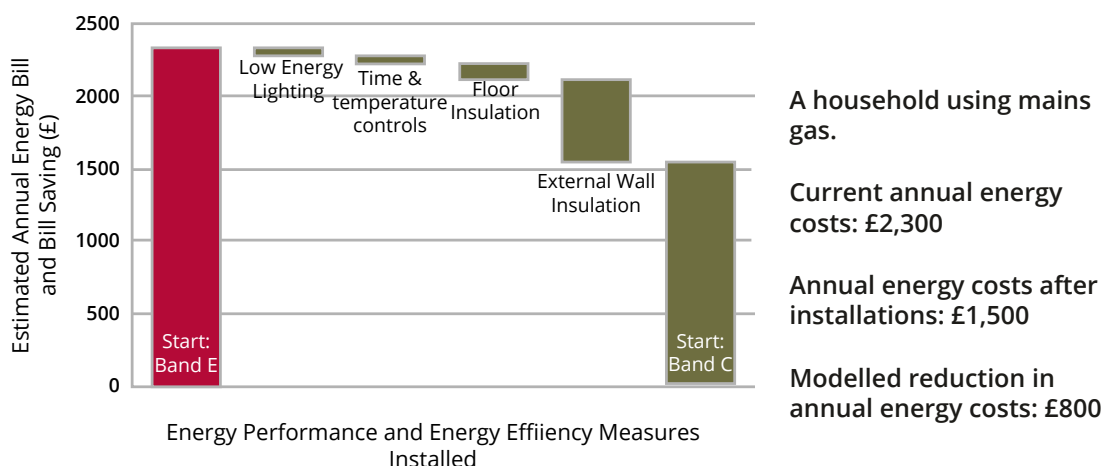
23 Climate Change Committee, ‘The Sixth Carbon Budget: The UK’s path to Net Zero’ (December 2020): <https://www.theccc.org.uk/publication/sixth-carbon-budget/> [accessed 29 June 2022]. Total investment costs are £360 billion to 2050, of which around £250 billion is for the programme of upgrading homes and £110 billion in public and commercial buildings. The Climate Change Committee said the total cost of decarbonisation per existing home is expected to be on average under £10,000.

24 Resolution Foundation, ‘Shrinking footprint’ (1 March 2022): <https://economy2030.resolutionfoundation.org/reports/shrinking-footprints/> [accessed 29 June 2022]

25 For example, written evidence from Positive Money (ESI0016).

26 Q 154 (Simon Virley)

Figure 6: Example of estimated savings achieved from moving from Band E to Band C, energy performance certificate



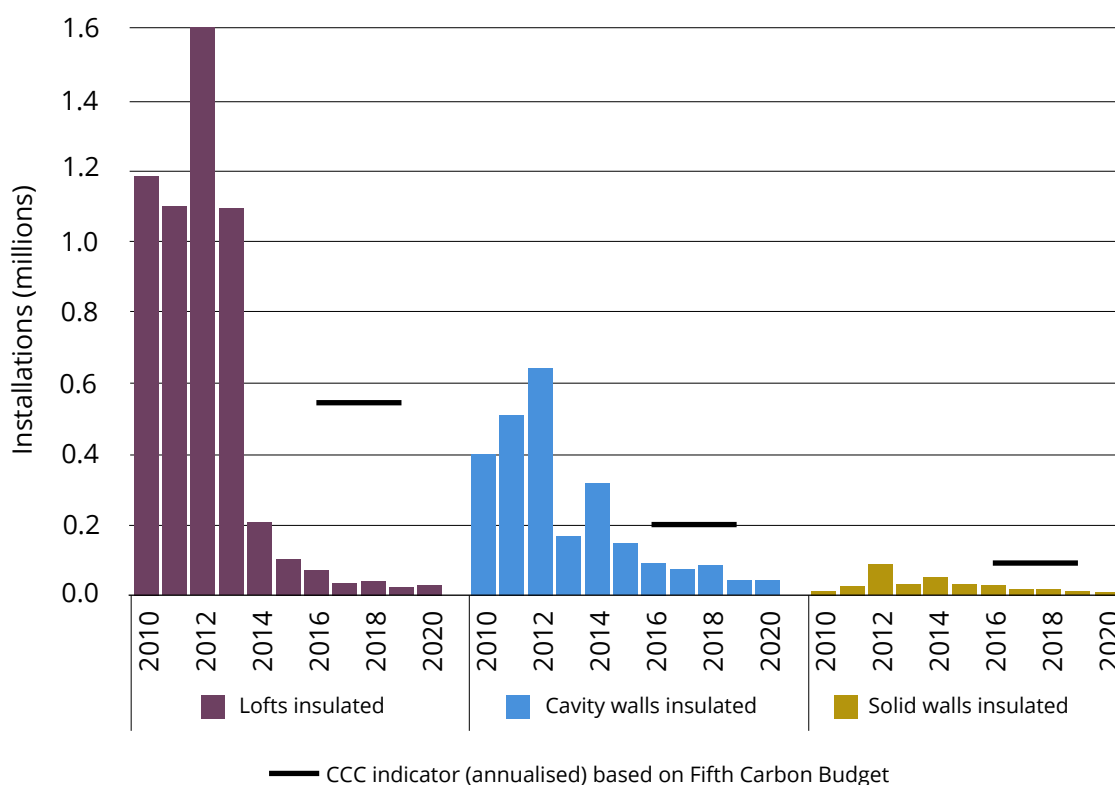
Source: Department for Business, Energy and Industrial Strategy, *Sustainable Warmth: Protecting Vulnerable Households in England*, CP 391 (February 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/960200/CCS207_CCS0221018682-001_CP_391_Sustainable_Warmth_Print.pdf [accessed 29 June 2022]

26. Home insulation rates are significantly below the peak rates achieved up to 2012, as shown in Figure 7. Simon Virley explained that more progress had not been made because of the “start/stop” approach to implementing policy. He said this had reduced investor confidence which would have otherwise enabled more cost-effective supply chains to develop.²⁷ In 2013, the Government cut support for insulation. Installations fell by around 90% and successive policies have failed to resurrect the industry.²⁸ The most recent support programme, the Green Homes Grant Voucher Scheme, closed for new applicants after six months, with only 47,500 homes receiving an upgrade, against a target of 600,000. The House of Commons Public Accounts Committee ascribed the failure to poor project design.²⁹

27 *Ibid.*

28 Energy & Climate Intelligence Unit (Dr Simon Cran-McGreehin), ‘Insulation and gas prices’ (24 January 2022): <https://eciu.net/analysis/briefings/heating/insulation-and-gas-prices> [accessed 29 June 2022]

29 Public Accounts Committee, *Green Homes Grant Voucher Scheme* (Twenty Seventh Report, Session 2021–22, HC 635)

Figure 7: Home insulation rates by measure and year

Source: Climate Change Committee, *Progress in reducing emissions: 2021 Report to Parliament (June 2021)*: <https://www.theccc.org.uk/wp-content/uploads/2021/06/Progress-in-reducing-emissions-2021-Report-to-Parliament.pdf> [accessed 29 June 2022]. Data from: DECC (2014) Data tables: Green Deal, ECO and Insulation Levels, up to March 2014, Green Deal, Energy Company Obligation (ECO) and Insulation Levels in Great; BEIS (2021) Household Energy Efficiency Statistics: Headline Tables; Climate Change Committee analysis. Notes: The CCC indicator shown represents the annualised rates of installation based on the Committee's 2015 advice on the Fifth Carbon Budget, which we judged to be a realistic and appropriate annualised installation rate at that time.

27. The UK Energy Research Centre recommended the publication of an energy demand reduction delivery plan to support the Government's net zero strategy and said, "without this systematic framework, we are likely to continue as at present with piecemeal, stop-start initiatives, which effect only incremental change, and which may have the perverse outcome of discouraging participation by businesses and households."³⁰
28. The Green Finance Institute told us that its Coalition for Energy Efficiency in Buildings had set out several "stimulus actions and reforms for the net zero building and retrofit sectors that could be used by Government to deliver emissions reductions in the UK". The following proposals were included:
- Energy efficient technology rebate system: similar to the US 'Cash for Clunkers' scheme, property owners are incentivised to upgrade inefficient or fossil fuel technologies (e.g. old windows, boilers) to efficient and clean ones through a government grant or voucher scheme.
 - Domestic energy efficiency salary sacrifice scheme: this would be comparable to the 'Ride to Work' scheme, where employees draw a

30 Written evidence from the UK Energy Research Centre ([ESI0029](#))

loan through their employer to invest into home energy improvements and repay the financing via gross salary contributions.

- Sliding Stamp Duty scale: a sliding scale of Stamp Duty designed to be fiscally neutral and linked to energy performance could drive demand for more energy efficient properties. This could be preceded by near term action in the form of a Stamp Duty rebate for the purchase of highly efficient properties.
 - Green Help-To-Buy (HTB) scheme: the current HTB scheme could be extended beyond new-build housing and repurposed to preferentially support first-time buyers to purchase an energy-efficient and resilient home, through minimum EPC criteria or government guarantees to support energy improvements once the property has been purchased.³¹
29. Asked why the Government had not set higher ambitions for home insulation installations in the security strategy, the Rt Hon. Greg Hands MP, the Energy Minister, told us: “we are moving quite quickly on energy efficiency ... 10% of homes were rated A to C in 2010, but the figure is now 43%.”³²
30. **High energy prices mean households are concerned about energy prices and may therefore focus more on energy usage. The Government can harness this public concern to speed up the pace of home insulation and other measures to improve home energy efficiency. Increasing the supply of installations should be driven by clear, long-term signals from the Government, and a commitment to working with the private sector. These measures require significant investment in both the near and longer-term. The Government’s British Energy Security Strategy does not sufficiently explain how such investment will be released.**
31. **We recommend that the Government publishes an energy demand reduction strategy. To strengthen public confidence, the Government should work with the financial sector to provide financing options and increase incentives for investment in energy efficiency measures. In addition, the Government needs to set clear signals so supply capacity can be increased along with steps to support the development of resilient supply chains and workforce skills. It should have a clear, practical delivery plan which learns from the failings of previous initiatives. The strategy should be published as soon as possible.**

Deployment of renewables: onshore wind

32. The Government has said that accelerating the deployment of renewable sources of energy can reduce the UK’s dependency on volatile gas markets.³³

31 Written evidence from the Green Finance Institute ([ESI0036](#)). For a full list proposals on stimulus and financing options see, GFI and Coalition for the Energy Efficiency of Buildings, ‘Stimulus actions for a greener and more resilient property sector’ (26 May 2020): <https://www.greenfinanceinstitute.co.uk/news-and-insights/report-stimulus-actions-for-a-greener-and-more-resilient-property-sector/> [accessed 29 June 2022]. The Green Finance Institute said the Coalition for Energy Efficiency in Buildings proposals were developed with financial institutions, business and consumer affairs groups.

32 [Q 248](#) (Greg Hands MP)

33 On 19 April 2022, the Secretary of State for Business, Energy and Industrial Strategy said, “Cheap renewables are our best defence against fluctuations in global gas prices.” See, HC Deb 19, April 2022, [col 75](#).

33. The energy security strategy increases the Government’s offshore wind target from 40GW to 50GW by 2030.³⁴ It sets out measures aimed at speeding up the offshore wind planning and development process, including by reducing planning consent time to one year from up to four years. The security strategy stated that the Government “expects” a fivefold increase in solar capacity by 2035 (current capacity is 14GW) and it doubled its ambition for hydrogen production to 10GW by 2030.³⁵
34. The UK Energy Research Centre said some renewable energy projects could come on stream in the next two to five years: “more onshore wind and solar could be brought forward, particularly schemes that already have planning permission.”³⁶ Aurora Energy Research has set out a scenario in which power sector gas consumption could be cut by almost 30% because of higher rates of energy generation from coal and renewables combined. This was based on rolling out onshore wind farms more rapidly.³⁷
35. The energy security strategy sets out almost no measures to increase the deployment of onshore wind, although we heard it is one of the cheapest and fastest ways to increase renewable energy generation. Zoisa North-Bond, Chief Executive of Octopus Energy Generation, said onshore wind can be developed without public subsidies.³⁸ She also said:
- “It currently takes probably four years to build small wind farms and three years to build solar farms. ... it only takes months to put [wind] turbines in the ground, particularly at small scale. We should be concentrating on building the things first that are the cheapest and the quickest to build”.³⁹
36. While the Government has set out planning and consenting reforms for offshore wind—which we heard are critical⁴⁰—it ruled out significant planning changes to support onshore wind development in England. There are separate planning policy frameworks in Scotland, Wales and Northern Ireland.
37. The security strategy said the Government “recognises the range of views on onshore wind” in England, and that it would consult on “local partnerships for a limited number of supportive communities who wish to host new onshore wind infrastructure in return for benefits, including lower energy bills.”⁴¹ Survey data published on 31 March 2022 by the Department for

34 This is expected to include 5GW of floating offshore wind.

35 Department for Business, Energy and Industrial Strategy, *British energy security strategy* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf [accessed 29 June 2022]

36 Written evidence from the UK Energy Research Centre ([ESI0029](#))

37 Aurora Energy Research, *Russia–Ukraine War: How is UK gas security affected* (28 March 2022): https://nkro22cl16pbxrpzy39bezk-wpengine.netdna-ssl.com/wp-content/uploads/2022/03/AuroraMar22_UK-and-the-Russia-Ukraine-War_public.pdf [accessed 29 June 2022]

38 [Q 194](#) (Zoisa North-Bond)

39 [Q 199](#) (Zoisa North-Bond)

40 [Q 154](#) (Simon Virley). We examine the role of the planning system in the next chapter.

41 Department for Business, Energy and Industrial Strategy, *British energy security strategy* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf [accessed 29 June 2022]

Business, Energy and Industrial Strategy found 80% of the public supported onshore wind development.⁴²

38. The Energy Minister told us: “There has not been any de-emphasis on, or neglect of, onshore wind ... we want more onshore wind in England where there is local community support for it.” He said there would be a consultation later in 2022 on creating local partnerships and providing compensatory incentives for people living near onshore wind farms.⁴³
39. **The British Energy Security Strategy sets out several ambitions for increasing the deployment of renewable energy, which we support. While we acknowledge some local opposition, onshore wind is one of the cheapest and fastest ways to increase renewable energy generation. We recommend the Government re-examines its ambitions for onshore wind when it publishes its consultation on creating local partnerships with communities living near energy infrastructure, later in 2022.**

Extending the life of generating plants

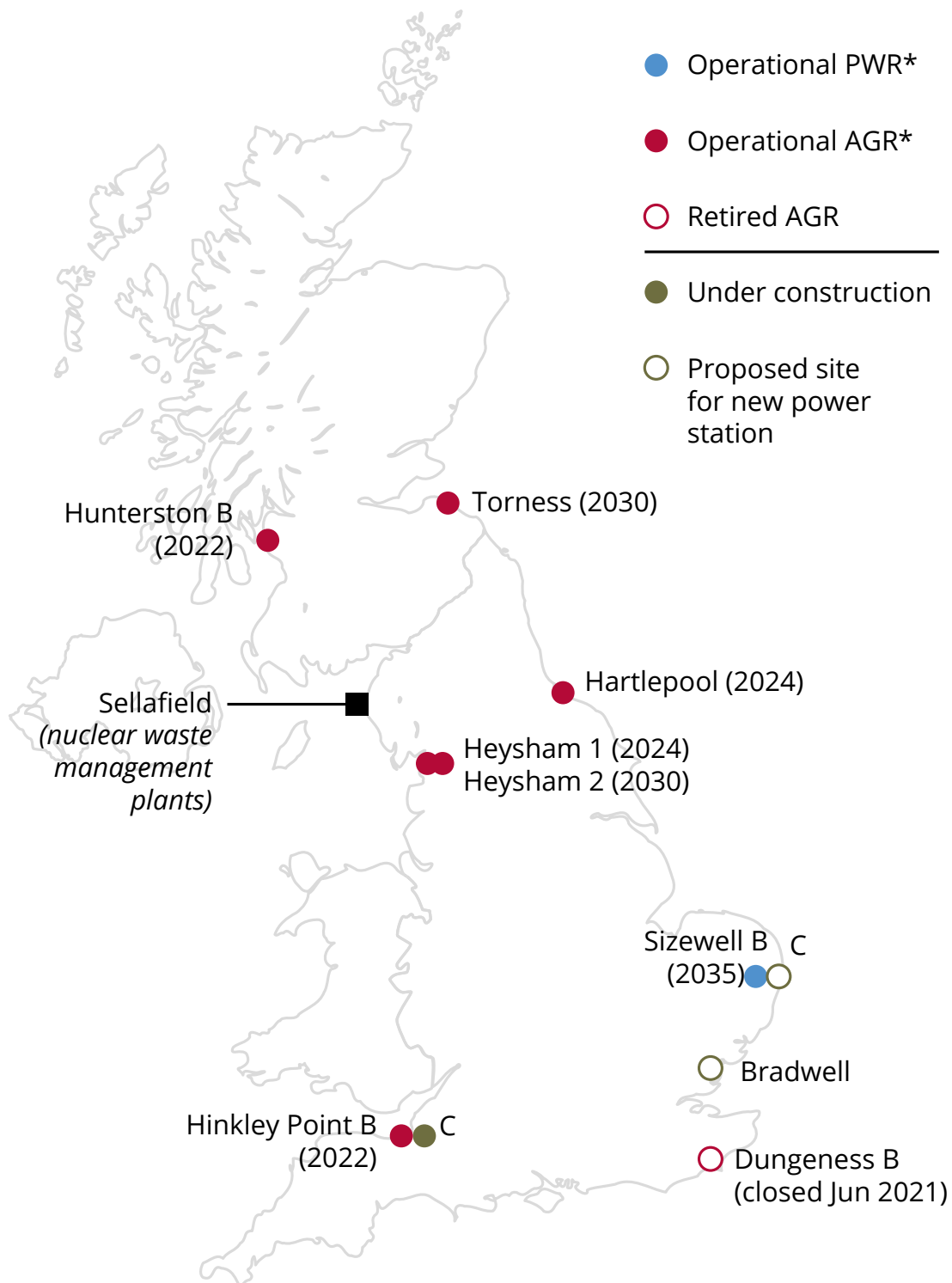
40. The UK has 15 operating nuclear reactors, generating approximately 20% of the UK’s electricity. These reactors are mostly due to retire by 2030. Only one nuclear reactor is currently under construction, Hinkley Point C in Somerset.⁴⁴ According to the Nuclear Industry Association “all but one of the current six nuclear power stations will cease operating by 2030 ... we will lose more than 5.2GW of power from the grid.”⁴⁵

42 Department for Business, Energy and Industrial Strategy, *BEIS Public Attitudes Tracker: Energy Infrastructure and Energy Sources* (Winter 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1064032/BEIS_PAT_Winter_2021_Energy_Infrastructure_and_Energy_Sources.pdf [accessed 29 June 2022]

43 [Q 260](#) (Greg Hands MP)

44 Investment Monitor, ‘A history of radioactive decay: Who really messed up the UK’s nuclear industry?’ (25 May 2022): <https://www.investmentmonitor.ai/sectors/energy/uk-nuclear-industry-blame-power-reactor> [accessed 4 July 2022]

45 Nuclear Industry Association ([ESI0007](#))

Figure 8: Location and retirement dates of UK nuclear plants

Source: 'Britain prepares for new wave of nuclear decommissioning' *Financial Times* 22 June 2021: <https://www.ft.com/content/0381e567-d088-4802-a2e4-e125c8099605> [accessed 29 June 2022]

41. The Government could explore extending the life of nuclear plants that are scheduled for closure, subject to safety requirements.⁴⁶ According to Aurora Energy Research, "in the medium-term, the lifetime of nuclear plants (Heysham 1 and Hartlepool) could be extended by 1-year, which could

result in 1bcm savings in 2024 and 2025”. Heysham 1 and Hartlepool are scheduled to close in 2024 but Aurora noted there were safety constraints which may prevent delaying decommissioning processes.⁴⁷

42. Coal-fired power stations generate around 2% of the UK electricity.⁴⁸ The Government wants to close all remaining coal plants by the end of 2024, with some stations scheduled to close in 2022.⁴⁹ We heard that the Government should extend the life of these power stations to reduce reliance on expensive natural gas. Michael Liebreich, Chairman and Chief Executive of Liebreich Associates, said this would be defensible: “I would be in favour of in a sense suspending our aspirations on climate in the very short term but not in the long term. The long-term security and climate play very nicely together but in the short term there might be contradictions.”⁵⁰ Dan Monzani, Managing Director, UK and Ireland at Aurora Energy Research, agreed: “Over the course of this year, we ought to be prepared to consider coal plants running more hours to use less gas. I do not see that as inconsistent with the long-term direction of travel.”⁵¹
43. On 18 May 2022, the Energy Minister, said in answer to a parliamentary question that the Government was exploring an extension to “the life of remaining coal-fired power stations to provide additional back up electricity this coming winter if needed”. He stressed that the Government remains committed to ending the use of coal power by October 2024.⁵² On 23 June 2022, the Secretary of State for Business, Energy and Industrial Strategy said the West Burton A coal power station, which was due for closure in September 2022, will remain open this winter. On 6 July 2022, Drax also agreed to extend the life of its coal-fired power station in North Yorkshire, if needed.⁵³ Negotiations with Britain’s only other remaining coal plant are ongoing.⁵⁴
44. **We support the Government in seeking to maintain existing energy generation in the short term, including coal-fired power stations where necessary, to reduce dependency on expensive gas imports. We welcome the Government’s continuing commitment to renewable energy in the longer term. Extending the life of nuclear power stations**

47 Aurora Energy Research, *Russia–Ukraine War: How is UK gas security affected* (28 March 2022): https://nkro22cl16pbxzrpzy39bezk-wpengine.netdna-ssl.com/wp-content/uploads/2022/03/AuroraMar22-UK-and-the-Russia-Ukraine-War_public.pdf [accessed 29 June 2022]. On 30 May 2022, it was reported that EDF had rejected enquiries from ministers about delaying the closure of Hinkley Point B in Somerset beyond its scheduled closure date of the end of July 2022. See, ‘EDF rules out extension of nuclear plant to secure UK winter supplies’ *Financial Times* (30 May 2022): <https://www.ft.com/content/17fdc088-962d-4a28-a60a-da23204375ab> [accessed 29 June 2022].

48 Department, for Business, Energy and Industrial Strategy, ‘End to coal power brought forward to October 2024’ (30 June 2021): <https://www.gov.uk/government/news/end-to-coal-power-brought-forward-to-october-2024> [accessed 29 June 2022]

49 ‘Coal-fired power stations could keep the lights on next winter’ *The Times* (28 April 2022): <https://www.thetimes.co.uk/article/coal-fired-power-stations-could-keep-the-lights-on-next-winter-6wh8pth69> [accessed 29 June 2022]

50 Q 120 (Michael Liebreich)

51 Q 80 (Dan Monzani)

52 Commons Written Answer, 167, Session 2022–23

53 Drax agrees to extend life of coal-fired power units over winter, *The Guardian* (6 July 2022): <https://www.theguardian.com/business/2022/jul/06/drax-agrees-to-extend-life-of-coal-fired-power-units-over-winter> [accessed 6 July 2022]

54 Business and Energy Secretary Kwasi Kwarteng, *Speech on The UK’s energy priorities: enhancing energy security and pathways to decarbonisation*, 23 June 2022: <https://www.gov.uk/government/speeches/the-uks-energy-priorities-enhancing-energy-security-and-pathways-to-decarbonisation> [accessed 29 June 2022]

over coal power stations where possible, and cost effective, would result in lower carbon emissions.

EU-UK energy cooperation on gas

45. The UK is embedded in the European gas market and is physically connected with continental Europe's gas network via two interconnectors which link to Belgium and the Netherlands. A third interconnector links to the island of Ireland, supplying both Northern Ireland and Ireland. Pipelines also bring Norwegian gas to the UK. Continental Europe also relies on the UK's LNG terminals to deliver gas imported as LNG via interconnectors. While the UK has greater capacity to import LNG than most EU members states, it has little gas storage capacity.
46. The trade in gas in Europe operates as a private market and gas flows between the UK and continental Europe according to supply and demand. For the UK to attract gas from Europe, traders must offer a price that is higher than the European benchmark and vice versa for gas to flow from the UK to Europe. The UK is also exposed to price competition on the global LNG spot market.⁵⁵
47. SSE plc told us that when the UK was an EU member state, interconnector flows between Great Britain and continental Europe were determined by an algorithm to ensure that gas flowed according to price differentials. However, following the UK's exit from the EU, gas trading between Great Britain and continental Europe is now conducted manually. New trading arrangements are currently being developed.⁵⁶
48. We heard that it was not clear what would happen if the EU decided to stop energy exports to non-EU countries to conserve gas supply, or if the UK decided to stop exporting gas to continental Europe. Professor Michael Bradshaw explained to us that Ireland, an EU member state, relies on UK gas infrastructure but nevertheless:
- “It may sound a trivial point, but it is not that long ago the French Government threatened to switch the power off to Guernsey because it had a squabble over fishing rights.”⁵⁷
49. On 29 May 2022, it was reported that the Government was assessing the effect on the UK's security of supply from a possible Russian decision to cut gas exports to Europe. The Government's 'reasonable worst-case scenario' was reported to have said that imports of LNG, and piped gas from Norway, could halve, and imports via pipeline interconnectors with Belgium and the Netherlands could cease because of more competition for supply in Europe. The Government said this was just one in a range of scenarios for which it was contingency planning.⁵⁸ It has also been reported that the UK has

55 The Progressive Post (Professor Michael Bradshaw), 'Europe's gas crisis requires a European solution' (15 June 2022): <https://progressivepost.eu/europes-gas-crisis-requires-a-european-solution/> [accessed 29 June 2022]

56 Written evidence from SSE plc ([ESI0039](#))

57 [Q 144](#) (Professor Michael Bradshaw)

58 'Millions warned of power cuts this winter', *The Times* (29 May 2022): <https://www.thetimes.co.uk/article/millions-warned-of-power-cuts-this-winter-b7gl2ckx9> [accessed 29 June 2022]

contingency plans to cut gas exports to Europe if there is a severe supply shortage.⁵⁹

50. When the UK was an EU member state it was bound by the 2017 EU Security of Supply Regulation, which aims to ensure a co-ordinated approach to the preparation and management of gas shortages in a crisis. We heard that now the UK is no longer a member of the EU, the full implications of its exit from the Single Energy Market are unclear and untested.⁶⁰ SSE plc said there is no UK-EU agreement for emergency situations affecting and electricity trade between Great Britain and the EU. It said the UK and EU should “put in place a comprehensive energy relationship outside of the EU-UK Trade and Cooperation Agreement (TCA) as a matter of urgency given the importance of energy to the European economy.”⁶¹
51. The UK-EU Trade and Cooperation Agreement, which sets out the UK-EU relationship, includes a provision which states that in the event of a crisis, the EU and UK should only activate non-market-based measures as a last resort. Furthermore, plans to address risks to the security of electricity or natural gas supply should not distort trade between the parties and should not endanger the security of supply of electricity or natural gas of the other party.⁶² In March 2022, the UK and EU agreed to strengthen cooperation on energy security under the agreement.⁶³
52. We heard that there would be significant mutual benefit from greater UK-EU cooperation on gas supply because the UK is integrated in the European market. The UK Energy Research Centre told us:
- “Current LNG import capacity into the EU is limited and poorly connected with the wider European market and the UK can help. The UK could assist the EU in accessing the additional 15bcm of LNG promised this year by President Biden on the 24 March. Since the UK has very little storage the interconnectors could flow gas into European storage. Those same interconnectors also provide the UK with access to European storage. So, there is a strong case for reciprocity and cooperation.”⁶⁴
53. The Energy Minister told us that “it is quite possible that we will be exporting gas to Europe later this year in order to help them with their situation”. He said the UK and the EU cooperated “well” on energy policy.⁶⁵ The UK has

59 ‘UK plans to cut pipelines to EU if Russia gas crisis intensifies’ *Financial Times* (29 June 2022): <https://www.ft.com/content/175ef927-efa2-439e-8ede-1dfc7edd23a6> [accessed 29 June 2022]. SSE plc set out the stages for responding to a Network Gas Supply Emergency, which could involve shutting off interconnectors. See, Written evidence from SSE plc ([ESI0039](#)) and National Grid, *Procedure for Network Gas Supply Emergency* (May 2021): <https://www.nationalgrid.com/gas-transmission/document/136281/download> [accessed 29 June 2022]

60 Written evidence from the UK Energy Research Centre ([ESI0029](#))

61 Written evidence from SSE plc ([ESI0039](#))

62 HM Government, *Trade and Cooperation Agreement*, CP 426 (April 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/982648/TS_8.2021_UK_EU_EAEC_Trade_and_Cooperation_Agreement.pdf [accessed 29 June 2022]

63 Specialised Committee on Energy, *Specialised Committee on Energy: Minute of the Meeting* (30 March 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1072790/sce-meeting-minutes-30-march-2022.pdf [accessed 29 June 2022]

64 Written evidence from the UK Energy Research Centre ([ESI0029](#))

65 [Q 254](#) (Greg Hands MP)

exported substantial amounts of gas in 2021 and 2022, particularly since the Russian invasion of Ukraine. Exports reached record levels in April 2022.⁶⁶

54. **While we welcome statements from ministers on UK–EU cooperation on energy security, we note reports of Government contingency planning for scenarios in which either the UK or EU cuts gas exports to the other party if there is a severe shortage. As one of the few countries in Europe with significant ability to import LNG and transport natural gas, the UK is playing an important role in supporting security of supply in Europe. In return, some EU countries have gas storage capacity from which the UK could benefit this winter. The Government should urgently seek an agreement with the EU and, if necessary, Norway on energy cooperation to manage possible shortages.**

⁶⁶ Office for National Statistics, ‘Trends in UK imports and exports of fuels’ (29 June 2022): <https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/articles/trendsimportsandexportsoffuels/2022-06-29> [accessed 6 July 2022]

CHAPTER 3: INCREASING INVESTMENT IN THE TRANSITION

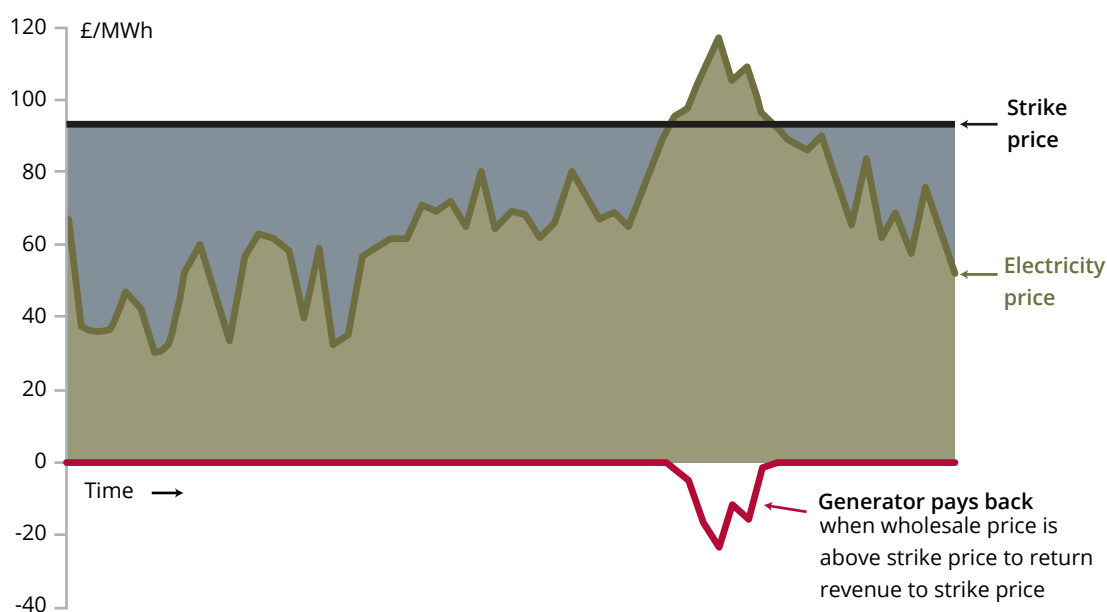
Market models

55. There are different routes to net zero and a range of technologies will be needed in the transition. However, there is uncertainty about the exact combination of technologies needed for our energy system and how much of a role each one will play. This is due to the uncertainty around pricing and technology learning curves—for example, it is difficult to predict if the cost of renewables or batteries will continue to fall—and there could be new technologies developed during the transition. While uncertainty remains, governments have had success in designing market models which have increased investor confidence to fund technologies that support the transition.

Contracts for Difference

56. Large-scale, low-carbon power infrastructure is supported through Contracts for Difference (CfDs). CfDs fix the prices received by low-carbon generators over several years, reducing the risks developers face from a fluctuating wholesale power price and ensuring that eligible technology receives a price for generated power that supports investment.
57. The fixed price is known as the strike price. A CfD is a contract between a low-carbon electricity generator and the Low Carbon Contracts Company (LCCC), a Government-owned company. Under CfDs, when the market price for electricity generated by a CfD generator is below the strike price in the contract, payments are made by the LCCC to the CfD generator to make up the difference. When the market price is above the strike price, the CfD generator pays LCCC the difference. This is shown in Figure 9. The payments, and repayments, paid and received by the LCCC for the CfD scheme are passed on to consumer electricity bills.

Figure 9: How CfDs work



58. CfDs are mostly decided at auctions, known as allocation rounds, to allow competition between technologies. The Government sets a budget in advance, then sealed bids of strike prices submitted by developers are accepted sequentially from the lowest to the highest until the budget is exceeded. All developments of the same technology and delivery year (i.e. when construction is completed) that successfully bid are paid the last submitted successful strike price bid; there are different prices for different technologies and delivery years.⁶⁷
59. CfD funding is set out in ‘pots’ which group the technologies that can compete:
- Pot 1 is ‘established technologies’ including onshore wind, solar photovoltaic, energy from waste with combined heat and power, hydro, landfill gas and sewage gas.
 - Pot 2 is ‘less established technologies’ including offshore wind, remote island wind, advanced conversion technologies, anaerobic digestion, dedicated biomass with combined heat and power, wave, tidal stream and geothermal.⁶⁸
60. Analysis from Carbon Brief, an environmental news website, found that costs have fallen from £167/megawatt hour (MWh) for offshore wind projects coming online in 2017 to £44/MWh for projects in 2023—a reduction of 74% over six years.⁶⁹ Costs are now so low that it is cheaper to build and run new offshore wind farms than to continue operating existing gas power stations, although the former requires a back-up source to deal with the intermittency problem. Contracts for the latest offshore-wind farms due to come online between 2023 and 2025 were secured at a price below the Government’s wholesale price projections, meaning that these projects are expected to save consumers money over their lifetime.⁷⁰ These figures do not include the cost of integrating and backing up the intermittent renewables on the grid, which has been estimated to cost an extra £10–25/ MWh in “systems costs”.⁷¹
61. The cost of building each MW of offshore wind capacity has fallen as the industry has gained experience and introduced new and larger turbine designs (which also capture the stronger winds at greater heights).⁷² Lord Turner of Ecchinswell told us, “as economists, we know about the theory of economy of scale and learning curve effects, but, in a sense, we have been continually surprised by how powerful [learning curve effects] are.”⁷³ In

67 House of Commons Library, *Support for low carbon power*, [Number 8891](#), 8 April 2020

68 *Ibid.*

69 Carbon Brief, ‘Record-low price for UK offshore wind cheaper than existing gas plants by 2023’ (20 September 2019): <https://www.carbonbrief.org/analysis-record-low-uk-offshore-wind-cheaper-than-existing-gas-plants-by-2023> [accessed 29 June 2022]

70 Imperial College London, ‘Offshore wind power now so cheap it could pay money back to consumers’ (27 July 2020): <https://www.imperial.ac.uk/news/200353/offshore-wind-power-cheap-could-money/> [accessed 6 July 2022]

71 UK Energy Research Centre, ‘Integrating renewables into electricity systems’ (2 November 2020): <https://ukerc.ac.uk/news/integrating-renewables-into-electricity-systems/> [accessed 29 June 2022] and Climate Change Committee, *Net Zero: Technical Annex* (2019): <https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-Technical-Annex-Integrating-variable-renewables.pdf> [accessed 29 June 2022]

72 Imperial College London, ‘Offshore wind power now so cheap it could pay money back to consumers’ (27 July 2020): <https://www.imperial.ac.uk/news/200353/offshore-wind-power-cheap-could-money/> [accessed 6 July 2022]

73 [Q 161](#) (Lord Turner of Ecchinswell)

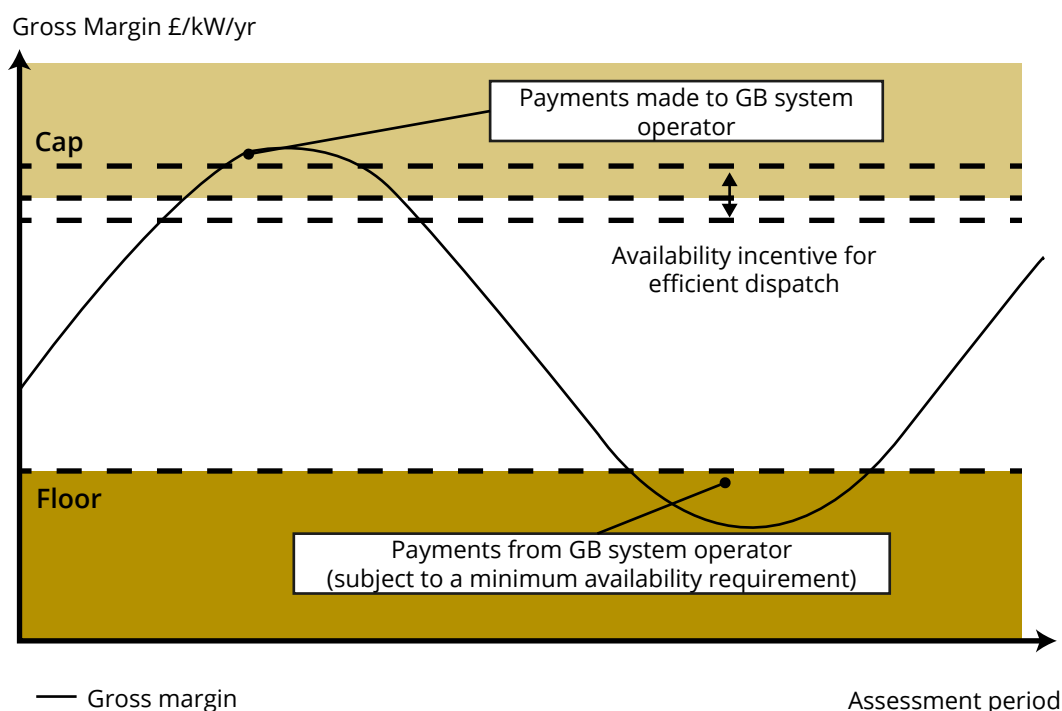
2010 there was 1.3GW offshore wind capacity in the UK, compared with 11.3GW in 2020—a 770% increase.⁷⁴ The CfD has reduced the price risk faced by generators, allowing them to borrow money more cheaply and further reducing their cost per MWh generated.

- 62. Ed Northam suggested that the fall in costs for offshore wind was also due to the clarity that the CfDs provide investors on future prices: “It is a policy that has proven to be quite flexible and predictable. There is a framework there which investors can look at and say, “That’s clear and we understand how it’s going to be. It’s going to have longevity, so I can now make long-term investment decisions”.”⁷⁵

Cap and Floor model

- 63. The cap and floor model reduces pricing uncertainty for investors by setting an upper and lower threshold (the cap and the floor), and if the return on the storage unit falls below the floor, the regulator pays the generator, but if the return on the storage unit exceeds the cap the generator pays the regulator.⁷⁶ The cap and floor model has been used to finance interconnector links between UK and other countries enabling the trade of energy.⁷⁷ Figure 10 illustrates how a cap and floor model works.

Figure 10: Cap and floor mechanism



Source: Aurora, ‘Long Duration Energy Storage’ (17 February 2022): <https://auroraer.com/media/long-duration-electricity-storage-in-gb/> [accessed 1 July 2022]

74 Department for Business, Energy and Industrial Strategy, *EnergyTrends* (March 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1064799/Energy_Trends_March_2022.pdf [accessed 1 July 2022]

75 Q 105 (Ed Northam)

76 Ofgem, *Cap and floor regime: unlocking investment in electricity interconnectors* (May 2016): https://www.ofgem.gov.uk/sites/default/files/docs/2016/05/cap_and_floor_brochure.pdf [accessed 1 July 2022]

77 *Ibid.*

Regulated Asset Base model

64. A Regulated Asset Base model aims to bring down the cost of financing by transferring the investment risk to consumers and spreads the cost over a longer period. It reduces the overall cost to investors by sharing risk with bill payers. Under the CfD, the developer does not make a return on investment until the plant is operating.⁷⁸
65. Under a RAB model a company receives a licence from a regulator to charge on the basis of agreed capital expenditure and cost of capital. This becomes an agreed amount of revenue which is charged to energy companies which will then include that cost within their charges to consumers. In effect, this lowers the overall cost of capital to investors, but increases the short-term bills of consumers during the construction.⁷⁹

Market models and low carbon technologies*Long-duration energy storage*

66. Long-duration energy storage allows surplus electricity to be converted into energy which can be used when there is a shortfall. The Department for Business, Energy and Industrial Strategy described it as a possible solution to the renewable intermittency problem.⁸⁰ Aurora Energy Research defined Long Duration Energy Storage as “storage technologies able to respond to supply and demand variations caused by daily peaks, weather events and seasonal patterns ... Long Duration Energy Storage technologies are able to provide energy for over 4 hours”.⁸¹
67. The UK Energy Research Centre outlined the storage technologies required for short, medium and long duration storage:
- “batteries for fast discharging of modest amounts of energy to help stabilise the electricity system in the seconds following a disturbance; pumped hydro storage for smoothing out daily variations in residual demand; or geological stores of hydrogen manufactured from electrolysis to help manage annual variations.”⁸²
68. The UK Energy Research Council told us that since the Government plans to increase the share of renewables on the grid, for example when increasing offshore wind from 10GW to 50GW by 2030, there is an urgent need to assess more precisely what capacity of different flexible storage options is required and under what circumstances.⁸³
69. We heard that short-duration storage (under four hours) is developing well without Government support. However, to reach the capacity needed to support the growing number of intermittent renewables on the grid, action

78 *Ibid.*

79 Department for Business, Energy and Industrial Strategy, ‘Future funding for nuclear plants’ (October 2021): <https://www.gov.uk/government/news/future-funding-for-nuclear-plants> [accessed 1 July 2022]

80 Department for Business, Energy and Industrial Strategy, *Facilitating the deployment of large-scale and long-duration electricity storage: call for evidence* (July 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003841/large-scale-long-duration-electricity-storage-cfe.pdf [accessed 1 July 2022]

81 Aurora, ‘Long Duration Energy Storage’ (17 February 2022): <https://auroraer.com/media/long-duration-electricity-storage-in-gb/> [accessed 1 July 2022]

82 Written evidence from UK Energy Research Centre ([ESI0029](#))

83 *Ibid.*

by the Government is needed to increase investor confidence in long duration storage.⁸⁴

70. An Aurora report estimated that, “up to 24 GW of Long Duration Electricity Storage—equivalent to eight times the current installed capacity—could be needed to integrate wind power into a secure Net Zero electricity system”.⁸⁵ National Grid Energy Systems Operator told us, “Discussions with our storage stakeholders indicate that the market signals to justify investment in long duration energy storage are not strong enough, yet the costs of large storage projects are high and future revenues are too uncertain.”⁸⁶
71. The Department for Business, Energy and Industrial Strategy’s call for evidence on business models for long duration energy storage closed in September 2021. It said:
- “A combination of factors including high capital costs, long lead times and, in some cases, lack of track record associated with particularly novel technologies, alongside a lack of forecastable revenue streams underpins a financing challenge. As a result, large-scale, long-duration storage is not currently attracting enough investment and is not being built at the scale that may be needed to support the transition to a greener economy”.⁸⁷
72. The department has not announced a market model for long duration energy storage. In the energy security strategy, the Government outlined an ambition to “develop appropriate policy to enable investment in long-duration energy storage by 2024.”⁸⁸ SSE plc said decisions were needed sooner to ensure that there was sufficient capacity for long duration energy storage to store the surplus electricity produced by the growing number of renewable energy generators that will be on the grid by 2030.⁸⁹
73. One model that has been proposed as an effective market incentive for long duration storage is the cap and floor model.⁹⁰ SSE plc explained why a cap and floor mechanism for long duration energy storage would be more suitable than alternative market models:

“long duration storage options like hydro pumped storage and hydrogen storage have steep upfront costs and long lifetimes, meaning current market mechanisms to support new build such as the Capacity Market (CM)⁹¹ and Contracts for Difference (CfD) will not provide the correct level and structure of payments to unlock investment ... These existing

84 Q 97 (Ed Northam)

85 Aurora, ‘Long Duration Energy Storage’ (17 February 2022): <https://auroraer.com/media/long-duration-electricity-storage-in-gb/> [accessed 1 July 2022]

86 Written evidence from National Grid Energy Systems Operator (ESI0032)

87 Department for Business, Energy and Industrial Strategy, *Facilitating the deployment of large-scale and long-duration electricity storage: call for evidence* (July 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003841/large-scale-long-duration-electricity-storage-cfe.pdf [accessed 1 July 2022]

88 Department for Business, Energy and Industrial Strategy, ‘British energy security strategy’ (7 April 2022): <https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy> [accessed 29 June 2022]

89 Written evidence from SSE plc (ESI0035)

90 Written evidence from SSE plc (ESI0035) and Aurora, ‘Long Duration Energy Storage’ (17 February 2022): <https://auroraer.com/media/long-duration-electricity-storage-in-gb/> [accessed 1 July 2022]

91 The capacity market is the current market model for storage. It involves payments to energy suppliers for having extra reliable capacity in addition to their normal electricity supply to ensure there is back up supply when needed

support mechanisms are also designed for different purposes—hydrogen electrolysis and hydrogen storage do not provide system security (as defined in the CM), and do not directly provide electricity (as the CfD contracts are structured to incentivise).⁹²

74. Matt Harper, Chief Commercial Officer at Invinity Energy Systems, told us: “The cap and floor mechanism is a good way of deploying some of these technologies, especially in the early stages ... The model puts a minimum level of return on these projects so that they are investable in the short term while the markets themselves are stabilising and maturing”.⁹³
75. The Rt Hon. Greg Hands MP, the Energy Minister, said, “we are not prescriptive about an economic model at the moment”. He said that his department was due to publish its response to the call for evidence on long duration energy storage in summer 2022.⁹⁴
76. **While we welcome the Government’s clear and ambitious targets for many renewable technologies, it should set out now the policy detail on how these targets will be met. The Government should provide more detail on the capacity, timeframes and expected costs of long-duration energy storage. It should also quickly develop a market model for long-duration energy storage. The view among witnesses was that a cap and floor model would be most effective.**

Hydrogen

77. The Government’s Green Hydrogen Strategy, published in August 2021, set out an ambition to attract investment in 5GW of hydrogen production by 2030, which would mostly power heavy industry and transport, and heat up to 70,000 homes.⁹⁵ The Government’s April 2022 energy security strategy doubled this target, aiming for “up to 10GW of low carbon hydrogen production capacity by 2030, subject to affordability and value for money.” It said at least half of this would be electrolytic hydrogen [also known as green hydrogen].⁹⁶ The Government’s hydrogen strategy has been called a “twin track” approach because it supports both green and blue hydrogen, in contrast to other countries’ plans, like Germany and France which focus on green hydrogen.⁹⁷
78. Blue hydrogen is produced from natural gas to form hydrogen. The process emits carbon as a by-product and carbon capture and storage is used to trap these emissions. Green hydrogen is produced by using renewable electricity to power an electrolyser that splits the hydrogen from water molecules. This process produces pure hydrogen, with no harmful by-products.⁹⁸

92 Written evidence from SSE plc ([ESI0035](#))

93 [Q 212](#) (Matt Harper)

94 [Q 261](#) (Greg Hands MP)

95 Department for Business, Energy and Industrial Strategy, *UK Hydrogen Strategy*, CP 475 (17 August 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011283/UK-Hydrogen-Strategy_web.pdf [accessed 1 July 2022]

96 Department for Business, Energy and Industrial Strategy, *British energy security strategy* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf [accessed 29 June 2022]

97 Engineering & Technology, ‘UK plans ‘twin track’ subsidies for blue and green hydrogen’ (17 August 2022): <https://eandt.theiet.org/content/articles/2021/08/uk-plans-twin-track-subsidies-for-blue-and-green-hydrogen/> [accessed 1 July 2022]

98 National Grid, ‘What is Hydrogen?’: <https://www.nationalgrid.com/stories/energy-explained/what-is-hydrogen> [accessed 1 July 2022]

79. Marco Alvera, author of *The Hydrogen Revolution*, supported the Government's twin-track approach to developing blue and green hydrogen because of the UK's geology and existing strengths in oil and gas which can be transferred to producing both types of hydrogen. He said, "you can store 100% hydrogen in the existing depleted gas reservoirs... in the North Sea, a lot of beautiful reservoirs... can be converted into hydrogen storage very cheaply."⁹⁹
80. Hydrogen has several possible applications. Witnesses were uncertain about the extent it would be used in heating and transport, but there was a consensus that hydrogen would be used in hard to abate industries and as long-duration storage to back up intermittent renewables.¹⁰⁰ Marco Alvera said:
- "The main use and the first use will be for heavy industry, those hard-to-abate sectors that are now running on coal or natural gas, which need very high temperatures. There is no debate right now that certain sectors like steel, where you are reducing iron ore, or certain cements or certain heavy transport like shipping, will be using hydrogen."¹⁰¹
81. He said that there would probably be a role for hydrogen in heating and passenger transport, but it was unclear how much of a role compared to electricity. He said it depended how much progress was made with reducing hydrogen costs compared to batteries and heat pumps.¹⁰² The Government is facilitating trials to test whether the gas grid can be converted to use hydrogen as part of the supply for heating homes.¹⁰³ Marco Alvera said that blending hydrogen into the gas grid would be "a great way to create immediate demand".¹⁰⁴
82. Lord Turner of Ecchinswell, Chair of the Energy Transitions Commission, told us there is a "major role" for hydrogen when the UK has surplus energy from wind, solar and nuclear sources. He said, "we would make large amounts of hydrogen, store it, and then take it back to electricity by burning it in gas turbines." He said existing gas turbines could be retrofitted to burn methane or hydrogen".¹⁰⁵
83. According to a 2020 report by the International Renewable Energy Agency, the largest single cost component for green hydrogen production is the cost of the renewable electricity that is needed to power the electrolyser unit. However, low electricity cost is not enough by itself for competitive green hydrogen production; reductions in the cost of electrolysis facilities are also needed.¹⁰⁶
84. The Government's energy security strategy included an ambition to design new market models for hydrogen storage by 2025, but this might be too slow to provide sufficient long duration storage to back up the growing capacity of renewables needed to decarbonise the grid by 2035. SSE plc told

99 [Q 214](#) (Marco Alvera)

100 [Q 93](#) (Ed Northam), [Q 163](#) (Lord Turner of Ecchinswell) and [Q 210](#) (Marco Alvera)

101 [Q 210](#) (Marco Alvera)

102 *Ibid.*

103 Department for Business, Energy and Industrial Strategy, 'Hydrogen for heat: facilitating a grid conversion hydrogen heating trial' (August 2021): <https://www.gov.uk/government/consultations/hydrogen-for-heat-facilitating-a-grid-conversion-hydrogen-heating-trial> [accessed 6 July 2022]

104 [Q 212](#) (Marco Alvera)

105 [Q 163](#) (Lord Turner of Ecchinswell)

106 International Renewable Energy Agency, 'Green hydrogen cost reduction' (December 2020): <https://www.irena.org/publications/2020/Dec/Green-hydrogen-cost-reduction> [accessed 1 July 2022]

us that there is no support framework or market model being proposed by the Government for hydrogen storage and given the long lead times involved in developing a storage asset, the Government needs to ensure a business model is in place “to support the early, strategic deployment of hydrogen storage capacity from the late 2020s.”¹⁰⁷

85. Catharina Hillenbrand von der Neyen, Head of Research at Carbon Tracker, said investment in hydrogen could be encouraged by using a CfD model. She envisaged the strike price of hydrogen would come down as the capacity of hydrogen in the energy system was increased. It would benefit from similar efficiency improvements as wind turbines.¹⁰⁸ Martin Pibworth, Chief Commercial Officer at SSE plc, said “some kind of CfD for a hydrogen generation plant might be a credible instrument. It is an instrument that clearly government and industry are very familiar with.”¹⁰⁹ Simon Virley said: “Most of my clients have been eagerly awaiting the details of the CfD model—what levels of support will be provided, what the reserve price will be, what the reference price will be, how they will deal with volume risk”.¹¹⁰
86. The Rt Hon. Greg Hands MP, the Energy Minister, told us, “The Energy Security Bill will contain the hydrogen investment plan, and the hydrogen business model will come after that”.¹¹¹ He suggested that it was too soon to provide detail on the market model and said that hydrogen was still at a “high-level policy” stage in its development.¹¹²
87. **We welcome the Government’s ambition to increase hydrogen production. We support developing both green and blue hydrogen; the evidence suggests this builds on the UK’s industrial and geological strengths in offshore wind and gas reservoirs. We recommend that the Government outlines market structures and mechanisms for hydrogen as soon as feasible.**

Carbon capture and storage

88. Carbon capture and storage (CCS) is an important technology for managing the transition to net zero.¹¹³ CCS involves capturing carbon dioxide emissions from industrial processes, such as steel and cement production, or from burning fossil fuels in power generation. The carbon is transported from where it was produced, via ship or pipeline, and stored underground in geological formations.¹¹⁴ CCS technology allows for some fossil fuels to be burned even in a net zero scenario, as the CCS can negate the emissions. The Government has published a CCS Roadmap which includes the target of delivering four CCS “low carbon industrial clusters” by 2030.¹¹⁵

107 Written evidence from SSE plc ([ESI0035](#))

108 [Q 32](#) (Catharina Hillenbrand von der Neyen)

109 [Q 205](#) (Martin Pibworth)

110 [Q 156](#) (Simon Virley)

111 [Q 262](#) (Greg Hands MP) The bill was announced in the Queen’s speech on 10 May 2022.

112 *Ibid.*

113 The Climate Change Committee has said “CCS is essential to achieving Net Zero, at lowest cost, in the UK”. Climate Change Committee, ‘The Sixth Carbon Budget: The UK’s path to Net Zero’ (December 2020): <https://www.theccc.org.uk/publication/sixth-carbon-budget/> [accessed 29 June 2022]

114 National Grid, ‘What is Carbon Capture and Storage’: <https://www.nationalgrid.com/stories/energy-explained/what-is-ccs-how-does-it-work> [accessed 1 July 2022]

115 Department for Business, Energy and Industrial Strategy, ‘Carbon capture, usage and storage (CCUS): investor roadmap’ (April 2022): <https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-investor-roadmap> [accessed 1 July 2022]

89. According to Professor Sir Dieter Helm, Professor of Economic Policy at Oxford University, the best option for maintaining affordability and stability of supply during the transition is to continue using gas, but in a way that is “almost completely backed up by CCS if it is to be net zero-compliant.”¹¹⁶ He argued that the Government’s support for CCS has been inadequate: “We have no regulatory regime for offshore CCS; we have no agreement about integrating the pipelines; we have no agreement about how the pricing will be done.”¹¹⁷ SSE plc said: “whilst we welcome the Government’s ambition on CCS, a Government commitment to five power-CCS projects this decade is deliverable with SSE’s projects potentially online by 2027.”
90. Some witnesses were more sceptical about the role of CCS, especially when used in conjunction with gas. Ian Simm, founder and CEO of Impax Asset Management, told us: “the complexities of getting the project finance sorted out has proven to be intractable for almost all [CCS] projects”.¹¹⁸ Michael Liebreich agreed: “to capture the CO₂ from generation is a non-starter because we are going into a world where the gas that we are going to need is intermittent. It is there as back-up.”¹¹⁹ He suggested that it would be too costly to have CCS used only occasionally when there is low wind and sun.
91. Lord Turner of Ecchinswell agreed that CCS might prove too expensive to rely on as gas is used less.¹²⁰ Nevertheless, he regarded the role of carbon capture and storage as “small but still vital”, adding: “we may need CCS to get negative emissions mid-century, because we may not be able to get all the way to net zero within the system itself. We also need it for cement.” This is because there are still some sectors that are too difficult to decarbonise, and CCS will be required to negate any residual emissions.
92. Witnesses suggested that, if the role of CCS is small, it will be challenging to attract investment without Government support. Ed Northam said: “carbon capture needs government support. I actually wonder if it is not better sitting in a Regulated Asset Base model.”¹²¹
93. Julian Critchlow, a former Director-General of Energy Transformation and Clean Growth at the Department for Business, Energy and Industrial Strategy, told us: “we need to create a carbon price for carbon capture and storage to allow people to buy that service ... That business model does not exist today.”¹²²
94. **Carbon capture and storage is expected to play a small, but valuable, long-term role in the transition to net zero. The limited scale means that there is likely to be little appetite for the private sector to invest in it without a stable and enduring commitment from Government to support it. The Government should therefore play a role in setting up clusters and in designing market models as soon as feasible so that investors are given greater confidence that there will be a long-term market for carbon capture and storage.**

116 Professor Sir Dieter Helm, ‘The first net zero energy crisis: someone has to pay’ (7 January 2022): <http://www.dieterhelm.co.uk/energy/energy/the-first-net-zero-energy-crisis-someone-has-to-pay-2/> [accessed 1 July 2022]

117 [Q 59](#) (Professor Sir Dieter Helm)

118 [Q 132](#) (Ian Simm)

119 [Q 132](#) (Michael Liebreich)

120 [Q 166](#) (Lord Turner of Ecchinswell)

121 [Q 104](#) (Ed Northam)

122 [Q 12](#) (Julian Critchlow)

Nuclear energy

95. The Government’s energy security strategy included an ambition to generate 24GW from nuclear power by 2050, up from 7GW in 2022. This will require significant investment.¹²³ On 19 April 2022, the Prime Minister told the House of Commons “in the country that split the atom—we will build a new reactor not every decade, but every year.”¹²⁴ However, the Energy Minister told us that the Government’s policy was not to build a reactor every year, but to make “a decision on eight further reactors before the end of this decade.”¹²⁵
96. The Climate Change Committee assumed 5–10GW from nuclear in each of their scenarios.¹²⁶ Some witnesses doubted that the extra nuclear capacity proposed by the Government was justified from a cost perspective. The Nuclear Consulting Group, an academic research organisation, told us “new nuclear construction is significantly more expensive than renewable energy, even taking into account the cost of grid management tools such as energy storage—and therefore new nuclear is dependent on very large public subsidy”.¹²⁷ Lord Turner of Ecchinswell said that unless the costs of nuclear fell significantly lower it would be cheaper to have a higher share of renewables, storage and flexible back-up technologies.¹²⁸
97. The UK has faced challenges in financing nuclear projects. Tom Greatrex, Chief Executive of the Nuclear Industry Association, told us that “a number of projects ... have not got to fruition because of the cost of capital and financing issues.”¹²⁹ Some companies have withdrawn from, or suspended, proposed projects.¹³⁰ For example, in 2020 Hitachi cancelled a proposed new plant at Wylfa in Wales. It explained it had not been able to reach an agreement with the Government on funding.¹³¹
98. Hinkley Point C was financed with a CfD model at a strike price of £89.50 per MWh.¹³² When the strike price was agreed with EDF in 2012, it was cheaper than the equivalent for new offshore wind. Seven years later the third CfD round for offshore wind cleared at roughly £40/MWh, which is cheaper even when adding systems costs of £10-25/MWh to account for intermittency, but Hinkley Point C is still several years from being completed.¹³³

123 Department for Business, Energy and Industrial Strategy, *British energy security strategy* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf [accessed 29 June 2022]

124 HC Deb 19 April 2022, [col 49](#)

125 [Q 258](#) (Greg Hands MP)

126 Climate Change Committee, ‘The Sixth Carbon Budget: The UK’s path to Net Zero’ (December 2020): <https://www.theccc.org.uk/publication/sixth-carbon-budget/> [accessed 29 June 2022]

127 Written evidence from the Nuclear Consulting Group ([ESI0033](#))

128 [Q 161](#) (Lord Turner of Ecchinswell)

129 [Q 170](#) (Tom Greatrex)

130 House of Lords Library, ‘Nuclear Power in the UK’ (December 2021): <https://lordslibrary.parliament.uk/nuclear-power-in-the-uk/> [accessed 1 July 2022]

131 *Ibid.*

132 Investment Monitor, ‘A history of radioactive decay: Who really messed up the UK’s nuclear industry?’ (25 May 2022): <https://www.investmentmonitor.ai/sectors/energy/uk-nuclear-industry-blame-power-reactor> [accessed 1 July 2022] This price assumes that Sizewell C goes ahead; otherwise, the price would be £92.50/MWh.

133 Sources for intermittency costs as follows: UK Energy Research Centre, Integrating renewables into electricity systems (2 November 2020): <https://ukerc.ac.uk/news/integrating-renewables-into-electricity-systems/>, [accessed 29 June 2022]. The strike prices for Hinkley and offshore wind are both in 2012 prices (they would both be higher in today’s prices). Climate Change Committee, *Net Zero - Technical Annex*: <https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-Technical-Annex-Integrating-variable-renewables.pdf> [accessed 15 July 2022]

99. The Nuclear Energy (Financing) Act 2022 will allow the Regulated Asset Base (RAB) model to be used to fund new nuclear.¹³⁴ The RAB model, which has been used to finance water, gas and electricity infrastructure, aims to bring down the cost of financing by sharing the investment risk with consumers.¹³⁵
100. The Government said financing nuclear projects via a RAB model would reduce the present value of cost of building and financing by at least £30 billion for each new build compared with a CfD.¹³⁶ Tom Samson, CEO of Rolls-Royce SMR, estimated costs between £40–75/MWh and explained how the overall cost to the consumer would be lower than previous nuclear projects:
- “[the RAB] allows the consumers to fund the build during the construction phase, so you are not having to finance interest to the consumer during construction. The ultimate cost to the consumer relative to another funding model is lower.”¹³⁷
101. The Government said that the RAB model would increase the electricity bills of consumers by £1 a month during the construction of each nuclear project.¹³⁸ Stop Sizewell C, a campaign group, said that this figure was based on the most optimistic scenario in the Nuclear Energy (Financing) Act’s impact assessment and that medium and worst-case scenarios could be much higher.¹³⁹ The Nuclear Consulting Group told us: “The RAB is subject to considerable uncertainty ... and electricity consumers would carry a very great fiscal burden, especially if construction costs and time-lines over-run.”¹⁴⁰
102. Tom Samson welcomed the RAB model for nuclear but suggested that CfDs would also be a good model for small modular reactors. Small modular reactors are advanced nuclear reactors with a power capacity of up to 300MW per unit, which is about one-third of the generating capacity of traditional nuclear power reactors.¹⁴¹ Tom Samson said:
- “We want to work with the one that allows us to come to market most quickly. If that is the RAB, we will pursue the RAB ... There is a huge amount of interest and appetite from financial institutions to invest in the RAB ... but equally, if the Government want us to focus on a CfD model we can do that as well”.¹⁴²
103. The Energy Minister told us: “The overall cost of a nuclear power plant with the RAB model will be significantly cheaper to deliver than using a CfD.”¹⁴³

134 [Nuclear Financing Act 2022](#)

135 Department for Business, Energy and Industrial Strategy, ‘Future funding for nuclear plants’ (October 2021): <https://www.gov.uk/government/news/future-funding-for-nuclear-plants> [accessed 1 July 2022]

136 *Ibid.*

137 [Q 170](#) (Tom Samson)

138 Department for Business, Energy and Industrial Strategy, *New finance model to cut cost of new nuclear power stations* (26 October 2021): <https://www.gov.uk/government/news/new-finance-model-to-cut-cost-of-new-nuclear-power-stations> [accessed 1 July 2022]

139 ‘UK must ‘come clean’ on cost of nuclear to consumers, says infrastructure chief’, *Financial Times* (23 May 2022): <https://www.ft.com/content/945d8b79-ba82-4ebc-894e-73eec3892e46> [accessed 1 July 2022]

140 Written evidence from the Nuclear Consulting Group ([ESI0033](#))

141 International Atomic Energy Agency, ‘What are Small Modular Reactors (SMRs)?’: <https://www.iaea.org/newscenter/news/what-are-small-modular-reactors-smrs> [accessed 01 July 2022]

142 [Q 175](#) (Tom Samson)

143 [Q 258](#) (Greg Hands MP)

The Department for Business Energy and Industrial Strategy started a consultation on 14 June 2022, which closes on 9 August 2022, about the detail of implementing revenue regulations for the RAB model.¹⁴⁴

104. **There have been conflicting statements from ministers about whether the Government intends to start the construction process for one nuclear reactor each year so that up to eight are in development at the same time or intends a different sequencing. This is especially important if a RAB model of financing is used because of the costs that would fall on consumer bills, including those of the poorest, during construction. The Government should set out its delivery plan and construction timetable for nuclear reactors. It should also clarify what impact delivering multiple projects simultaneously could have on consumer bills.**
105. **The Government should explain why it is aiming for a target of 24GW to be supplied by nuclear by 2050 when this is over double the capacity assumed by the Climate Change Committee. The Government should set out its cost analysis of 24GW of nuclear capacity compared to alternative options of providing baseload capacity.**
106. **While we have heard that the Regulated Asset Base model could unlock private sector investment for nuclear, questions remain about the cost impact on consumers. The Government should ensure that plans for new nuclear power stations are as robust as possible, and credible in terms of cost and timing, and the Government should set out how it will protect energy bill payers in the event of cost overruns and construction delays.**

UK Infrastructure Bank and net zero

107. The UK Infrastructure Bank (UKIB) was launched in June 2021, with the objective of financing economic infrastructure that will help to tackle climate change and support regional and local economic growth.¹⁴⁵ It will be put on a statutory footing by the UK Infrastructure Bank Bill [HL], which was introduced on 11 May 2022. On 18 March 2022, the Chancellor wrote to John Flint, Chief Executive of the UKIB, to ask the bank to “prioritise opportunities that align with the Government’s renewed focus on energy security.”¹⁴⁶ The Bank has £22 billion of financing capacity to deploy: £8 billion in debt and equity, £10 billion in guarantees and £4 billion for Local Authority lending. Partnering with the private sector and local government, it aims to fully commit its £22 billion balance sheet over the next five to eight years.¹⁴⁷

144 Department for Business, Energy and Industrial Strategy, ‘Revenue stream for the nuclear regulated asset base (RAB) model’ (June 2022): <https://www.gov.uk/government/consultations/revenue-stream-for-the-nuclear-regulated-asset-base-rab-model> [accessed 6 July 2022]

145 HM Treasury, *UK Infrastructure Bank: Policy Design* (3 March 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/966131/UKIB_Policy_Design.pdf [accessed 29 June 2022]

146 HM Treasury, ‘Strategic steer to the UK Infrastructure Bank’ (18 March 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1061776/Strategic_steer_to_the_UK_Infrastructure_Bank_180322.pdf [accessed 29 June 2022]. The Chancellor said examples of relevant opportunities may include “helping to bring forward low carbon energy projects that accelerate the UK’s transition to clean energy and improve the energy efficiency of buildings and homes.”

147 HM Treasury, *UK Infrastructure Bank: Policy Design* (3 March 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/966131/UKIB_Policy_Design.pdf [accessed 29 June 2022]

108. On 23 June 2022, the UKIB published its first strategic plan. It said it has five priority areas for investment set by HM Treasury: clean energy, transport, digital, waste and water. It explained that it would not invest in each of these areas equally: “We expect clean energy will be the largest sector in our portfolio, reflecting its importance to the UK’s net zero and energy security ambitions. The remainder of our portfolio will be more heavily weighted towards transport and digital.”¹⁴⁸
109. Positive Money said the UKIB could be “mission-critical to delivering renewable energy infrastructure as well as efficiency measures such as retrofits”. It said the Government should commit to “significantly increasing UKIB’s paid-in capital.”¹⁴⁹
110. Ed Northam, Head of Green Investment Group—Europe & UK at Macquarie Group, questioned the need for the UKIB: “all the capital you need is available in the market and can be mobilised”. He said the Government should focus on setting the market “enablers” that are needed to fund the transition to net zero.¹⁵⁰
111. We asked John Flint why the UKIB was needed when there was private capital waiting to invest in sustainable projects. He replied that there was “plenty of evidence” that private markets were not mobilising quickly enough to support the transition to net zero and that there was a role for “public money to be deployed in pursuit of market gaps and problems that the private markets, on their own, cannot solve.”¹⁵¹ It was “inevitable” that the UKIB would invest in nascent technologies as it was “implausible that current technologies are going to get us to net zero.”¹⁵²
112. The then Economic Secretary told us that the UKIB would “crowd in” private money but it was for the bank “to make that judgment about what sort of risk profile to adopt, how to view certain technologies and how to maximise the input from private sector partnerships.” He explained that the bank should make a profit over time but “the exact profile of its investments and the calibration of risk will also depend on how it partners with private providers of capital.”¹⁵³
113. **As there is evidence of substantial private sector-interest in investing in sustainable projects, the UK Infrastructure Bank should ensure that it adds value by focusing investment on innovative and potentially riskier projects with the aim of attracting and enabling additional private-sector funding. It should focus on using its investments to manage, share and reduce risk to enable the private sector to invest where otherwise it would be difficult. We note, however, that the UKIB has limited risk capital.**

148 UK Infrastructure Bank, *Strategic Plan* (23 June 2022): https://www.ukib.org.uk/sites/default/files/2022-06/UKIB%20Strategic%20Plan%202022%20-%20Full_1.pdf [accessed 29 June 2022]

149 Written evidence from Positive Money ([ESI0016](#))

150 [Q 104](#) (Ed Northam)

151 [Q 239](#) (John Flint)

152 [Q 242](#) (John Flint)

153 [Q 280](#) (John Glen MP)

Oil and gas

114. According to the Government, oil and gas will continue to play an important role as the UK transitions to a low carbon economy.¹⁵⁴ The UK is likely to consume a quarter of the natural gas as it does today while meeting the net zero target in 2050.¹⁵⁵ Over 85% of households rely on gas for heating and it remains an important raw material and source of heating in industrial processes. It will also be used in the production of blue hydrogen.¹⁵⁶
115. In 2021, Offshore Energy UK, the industry body for North Sea energy production, said investment levels in the North Sea are generally in decline and the contraction in investment after the COVID-19 pandemic and the collapse in the oil price has been “larger than that seen across the sector globally.”¹⁵⁷ This is against a backdrop of rising demand for oil and gas globally, driven by demand in emerging markets and developing economies.
116. To end their energy dependency on Russia, European countries are seeking alternative sources of oil and gas. Jason Bordoff, co-founding Dean of the Columbia Climate School, explained that even before the Russian invasion of Ukraine there were concerns over underinvestment in oil and gas to meet energy demand.¹⁵⁸ He said that new investment was needed elsewhere to replace Russian oil and gas supplies, and that “the North Sea can be one of those places.”¹⁵⁹
117. However, as the UK deploys more low carbon and renewable sources of energy, new investment in oil and gas infrastructure risks investors being left with stranded assets. The International Energy Agency (IEA) has defined stranded assets as:
- “investments which have already been made but which, at some time prior to the end of their economic life (as assumed at the investment decision point), are no longer able to earn an economic return, as a result of changes in the market and regulatory environment brought about by climate policy.”¹⁶⁰
118. In May 2021, the IEA set out a net zero transition scenario under which no new oil and gas fields would need to be approved beyond 2021 to meet energy demand.¹⁶¹ Christophe McGlade, Head of the Energy Supply Unit at the IEA, told us that this scenario assumed the world would start to act aggressively on climate change from 1 January 2022:

154 Department for Business, Energy and Industrial Strategy, *Net Zero Strategy, Build Back Greener* (October 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf [accessed 29 June 2022]

155 Department for Business, Energy and Industrial Strategy, *British energy security strategy* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf [accessed 29 June 2022]

156 Written evidence from the UK Energy Research Centre ([ESI0029](#))

157 Offshore Energy UK, *Economic Report 2021*: <https://oeuk.org.uk/wp-content/uploads/2021/08/OGUK-Economic-Report-2021.pdf> [accessed 29 June 2022]

158 [Q 223](#) (Jason Bordoff)

159 *Ibid.*

160 IEA, *Redrawing the energy climate map* (June 2013): https://iea.blob.core.windows.net/assets/417cd627-fda9-470e-9380-1203a5315deb/WEO_Special_Report_2013_Redrawing_the_Energy_Climate_Map.pdf [accessed 29 June 2022]

161 IEA, *Net Zero by 2050* (17 May 2021): https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroBy2050-ARoadmapfortheGlobalEnergySector_CORR.pdf [accessed 29 June 2022]

“In... a scenario where we take action on climate change, we would have a surge in clean energy policies, which leads to a surge in investment in clean energy technologies, and that brings down fossil fuel demand, and brings down emissions in line with net zero in 2050 globally. If you have that decline in demand, you can satisfy that with supplies from existing oil and gas fields, so you do not require investment in new fields.”¹⁶²

119. The Government’s energy security strategy stated that another licensing round for North Sea oil and gas projects will be launched in autumn 2022, and that “this will mean more domestic gas on the grid sooner.” The strategy added that the Government will introduce ways to accelerate the development of new projects, but new licensing rounds will take place only if projects can pass a ‘climate compatibility checkpoint’ which will assess whether production is aligned with net zero. Details of how this checkpoint will work have not been announced, although a consultation has been published.¹⁶³
120. Witnesses said the world is deviating further from the IEA’s net zero scenario. Mark Carney, UN Special Envoy for Climate Action and Finance, said that after the Russian invasion of Ukraine, there is a “scramble ... for bridging supplies” of oil and gas until sufficient low-carbon alternatives are available. He added, “relative to the IEA’s scenario, some additional investment [in new oil and gas projects] will be required.” It would be crucial to ensure that new investment “is consistent with the transition and the objectives that are marked in law, such as the 1.5 degrees objective.”¹⁶⁴
121. On 13 May 2022, Dr Fatih Birol, Executive Director of the IEA, said in a speech that Russia’s invasion of Ukraine had brought major disruptions to the global energy system: “it is clear to us that any immediate shortfalls in fossil fuel production from Russia will need to be replaced by production elsewhere—even in a world working towards net zero emissions by 2050.” He said: “Nobody should imagine that Russia’s invasion can justify a wave of new large-scale fossil fuel infrastructure in a world that wants to limit global warming to 1.5°C.” He said the most suitable projects were those with “short lead times and quick payback periods”, such as “extending production from existing fields and making use of natural gas that is currently flared and vented.”¹⁶⁵
122. We heard new oil and gas development in the North Sea would help support the UK’s security of supply but was unlikely to reduce energy prices significantly. Dan Monzani, Managing Director, UK and Ireland at Aurora Energy Research, said: “if you introduce new supply, for example, in the North Sea, it will be at the market price. It will not lower our price.”¹⁶⁶
123. As to whether such investment might create stranded assets, Jason Bordoff described the possibility as a “market failure” and said government intervention might be needed to support investment in certain “transition

162 [Q 30](#) (Christophe McGlade)

163 Department for Business, Energy and Industrial Strategy, *British energy security strategy* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf [accessed 29 June 2022]. See also, written evidence from the Department for Business, Energy and Industrial Strategy ([ESI0031](#))

164 [Q 179](#) (Mark Carney)

165 IEA, ‘What does the current global energy crisis mean for energy investment?’ (13 May 2022): <https://www.iea.org/commentaries/what-does-the-current-global-energy-crisis-mean-for-energy-investment> [accessed 29 June 2022]

166 [Q 79](#) (Dan Monzani)

assets”. He explained that even before the Russian invasion of Ukraine there were concerns over underinvestment in oil and gas to meet energy demand. He said:

“the question is whether government policy needs to respond ... by preferencing projects that have shorter payback periods, or potentially taking steps to lower the cost of capital so that [investors] get paid back in a shorter period, followed maybe by an agreement to retire them sooner than would otherwise be the case”.¹⁶⁷

124. Mark Carney told us that without proper policy frameworks, financial institutions will decide to avoid financing fossil fuel production even though this financing may be needed for an orderly transition. He said common standards were needed for sectoral transition plans, which is the role of the Transition Plan Taskforce, chaired by the Economic Secretary, and ‘sectoral pathways’ should be designed for oil and gas and other high-emitting industries that are consistent with the transition. Finally, he said a more detailed net zero energy strategy is needed.¹⁶⁸
125. The Energy Minister argued that it made “financial sense” to continue to invest in North Sea oil and gas and that domestic production generated lower carbon emissions than imported hydrocarbons. However, the Minister was unable to set out a timeframe for when any new investment would lead to more production,¹⁶⁹ although he explained that some additional investment in 2022 might lead to more production from existing oil and gas fields in the short term.¹⁷⁰
126. We asked John Glen MP, the then Economic Secretary to the Treasury, about the IEA’s net zero transition scenario and whether it was HM Treasury’s view that financial institutions should invest in North Sea oil and gas extraction if producers have robust transition plans. He replied, “that is broadly the view, yes. We need to be pragmatic about the fact that we need a transition.”¹⁷¹ He said the UK had made good progress on assessing the risk of stranded assets but there “is not a single intervention that one Government can make” and set out measures the Government and regulators were taking, including climate stress testing, and introducing requirements for disclosures on climate impact by companies.¹⁷²
127. **In the short term, Europe needs alternative sources of oil and gas to replace supply from Russia. Moreover, the UK will continue to require gas during the transition. Enabling more investment in North Sea production can help address this, although it will not provide a significant reduction in energy prices over the next few winters. Over the medium term, the use of oil and gas needs to fall to align with the strategies on climate change. Any extension of oil and gas exploration or investment should focus on projects with short lead times and payback periods to limit the risk of stranded assets. There is uncertainty over how the risk of creating stranded assets will be managed. The Climate Compatibility Checkpoint should ensure**

167 [Q 223](#) (Jason Bordoff)

168 [Q 186](#) (Mark Carney)

169 [Q 248](#) (Greg Hands MP)

170 [Q 252](#) (Greg Hands MP)

171 [Q 272](#) (John Glen MP)

172 [Q 274](#) (John Glen MP). Climate impact disclosures and climate stress testing are explored in more detail in chapter four.

that additional investment in oil and gas is focused on production that reflects the UK’s diminishing but continued demand for gas during the transition and not enable substantial levels of long-term production that conflicts with net zero objectives.

Gas storage

128. The UK has little storage capacity for gas. The Rough storage facility, owned by Centrica, the parent company of British Gas, provided 70% of the UK gas storage capacity for more than 30 years before it shut in 2017 following the Government’s decision to accept Centrica’s request to close the facility in view of the possible call on public funds if it were kept open and refurbished. In June 2022 it was reported that Centrica had applied to the North Sea Transition Authority to reopen the Rough storage facility. Centrica said it was in “exploratory discussions” with the Government about the role that the facility could play in the short or medium term in storing gas to support energy security.¹⁷³
129. Witnesses had mixed views on the role of new gas storage to help manage price spikes in wholesale markets. Professor Michael Bradshaw, Professor of Global Energy at the University of Warwick, said it was “too late ... to consider that as part of the solution” to the current geopolitical and affordability crises.¹⁷⁴
130. Dr Jack Sharples, Research Fellow at the Oxford Institute for Energy Studies, stressed the UK’s place in the wider European gas market. He said while the UK has no substantial gas storage capacity, the UK makes “extensive” use of gas storage in other European countries via interconnector pipelines with the Netherlands and Belgium. He explained that, in the summer, the UK and Norway tend to export gas to the continent where it is used or injected into storage; in the winter, it is exported back to the UK: “it is market dynamics, supply and demand balances and pricing signals that tell the market where that gas needs to move to.”¹⁷⁵
131. Dan Monzani, Managing Director, UK and Ireland at Aurora Energy Research, said that it would be “eye wateringly expensive” to fill up storage while gas prices are so high and that it is unclear there was enough confidence on a return for private investors: “I think it will probably require government intervention at a European level”.¹⁷⁶
132. Jason Bordoff thought the UK should invest in additional storage. He said it would make sense to ensure that any additional capacity “is hydrogen-ready and can be used for other fuels.”¹⁷⁷
133. The Energy Minister told us that a high level of gas storage capacity was needed in Europe to ensure security of supply but this was not the case in the UK because it can rely on domestic production and imports from Norway. He told us that the UK was cooperating with the European Commission and

173 ‘Centrica applies to reopen Britain’s biggest gas storage site’ *Financial Times* (9 June 2022): <https://www.ft.com/content/950c866f-434e-4ecd-8cb3-b83f0ecba58c> [accessed 29 June 2022]. The North Sea Transition Authority was called the Oil and Gas Authority until March 2022. North Sea Transition Authority, ‘Applications for Gas Storage Licences’ (8 June 2022): <https://www.nstauthority.co.uk/news-publications/news/2022/applications-for-gas-storage-licences/> [accessed 29 June 2022]

174 [Q 143](#) (Professor Michael Bradshaw)

175 [Q 144](#) (Dr Jack Sharples)

176 [Q 87](#) (Dan Monzani)

177 [Q 225](#) (Jason Bordoff)

EU member states, and it was “quite possible” that the UK would export gas to mainland Europe this year to support their supply resilience.¹⁷⁸

134. **The UK may benefit from additional gas storage capacity which can also be made suitable for hydrogen storage. We welcome the Government and Centrica examining the case for reopening the Rough storage facility. Additional storage could provide more resilience against supply bottlenecks and would provide more security were agreements to import energy from mainland Europe to break down. The Government should examine the case for opening other storage sites which could be adapted for hydrogen.**

Implementation

Planning

135. Planning constraints, and uncertainty in the planning process, are one of the most significant barriers to new investment in low carbon energy infrastructure in the timeframe required by the Government’s plans.¹⁷⁹
136. There is a substantial number of offshore wind projects that have received planning permission but have not yet moved to the construction phase. The UK Energy Research Centre told us:
- “11.8GW of offshore wind capacity had been built in UK waters by the end of 2021. An additional 21.1GW of offshore wind is currently in the development pipeline. This comprises: 2.4GW under construction, 15.8GW with consents approved and 2.9GW awaiting consents.”¹⁸⁰
137. Balance Power, a renewable energy company, told us that “only 40% of applications for renewable energy and battery storage projects were approved by local councils.”¹⁸¹
138. We heard that one way to increase public support for new energy projects was to compensate local communities with lower energy bills. Stephen Smith, Head of Group Strategy, Market Fundamentals and Internal Consulting at National Grid, said: “there are interesting things going on with onshore wind, whereby companies are coming up with schemes where local communities benefit directly through lower energy bills; they seem to be proving wildly popular.”¹⁸²
139. One option for reducing the planning process for nuclear would be to fast track the planning process for nuclear projects at locations that have previously hosted a nuclear reactor. Rolls-Royce SMR told us that “a lengthy multiyear planning process to build a small modular reactor on a site that has had a nuclear asset for the past 50 years is not necessary. The Government should consider accelerating the process for sites such as Trawsfynydd, Anglesey and West Cumbria.”¹⁸³ Tom Samson, CEO, Rolls-Royce SMR, said:

“Those communities that have hosted a nuclear asset for the last five or six decades ... are very comfortable and familiar with what that

178 [Q 253](#) (Greg Hands MP)

179 [Q 92](#) (Ed Northam)

180 Written evidence from UK Energy Research Centre ([ESI0029](#))

181 Written evidence from Balance Power ([ESI0008](#))

182 [Q 156](#) (Stephen Smith). See also, [Q 156](#) (Simon Virley).

183 Written evidence Roll Royce ([ESI0021](#))

technology means, its safety and the economic benefits ... They are the strongest advocates in this country for bringing nuclear power into those communities.”¹⁸⁴

140. When deploying new nuclear power generation, we heard that it could take up to 10 years for the planning phase to complete with a further 10 years for construction. Tom Greatrex, Chief Executive of the Nuclear Industry Association, said “the sense of urgency that people feel about net zero ... is not always shared in the regulatory processes, hence the time taken.” He called for a “net zero duty” to be upheld by the regulator to shorten the time it takes to gain planning permission, while maintaining the integrity of the process.¹⁸⁵
141. National Grid told us that planning is a barrier to delivering infrastructure necessary to support renewables: “without considerable refresh, current planning policy has the potential to act as a barrier to infrastructure investment at pace.” It recommended revising the National Policy Statements, which set out the Government’s policy for the delivery of energy infrastructure and provide the legal framework for planning decisions. It said they should be revised to make the Government’s commitment to net zero “more explicit and to provide a clear and unambiguous direction to the Secretary of State to prioritise the importance of climate change”.¹⁸⁶
142. Zoisa North-Bond told us that the effect of the National Planning Policy Framework is that onshore wind is at a disadvantage over solar power or other projects. Under the National Planning Policy Framework wind turbines can be considered acceptable only if, after consultation, it can be demonstrated that the planning impacts identified by the affected local community have been fully addressed and the proposal has their backing. This is a higher hurdle than other energy projects must clear.¹⁸⁷ Planning is a devolved matter; Scotland, Wales and Northern Ireland have separate planning policy frameworks.
143. National Grid Energy Systems Operator told us that planning is a barrier to installing transmission infrastructure. It said, “the Government should continue to focus on reforms to the National Planning Statement that speed up delivery of onshore transmission.”¹⁸⁸
144. **Balancing national policy with local preferences is challenging but the planning process takes too long for renewables, nuclear and the transmission network.**
145. **We recommend that the Government encourages schemes to compensate residents for energy projects built in their areas. This already happens for certain onshore wind projects but should be extended to other forms of low-carbon generation, or grid infrastructure.**

184 [Q 169](#) (Tom Samon)

185 [Q 173](#) (Tom Greatrex)

186 Written evidence from National Grid ([ESI0026](#))

187 [Q 199](#) (Zoisa North-Bond). See also Regen, ‘Onshore wind in England - a chink of light?’ (29 April 2022): <https://www.regen.co.uk/onshore-wind-in-england-a-chink-of-light/> [accessed 7 July 2022]

188 Written evidence from National Grid Energy Systems Operator ([ESI0032](#))

146. **We recommend that energy security objectives be included in the National Planning Policy Framework alongside the existing climate change objectives.**
147. **We also recommend that the planning process be expedited for nuclear reactors that are sited on locations of former nuclear reactors, while maintaining high health and safety standards.**¹⁸⁹

Grid investment

148. The grid network does not have capacity to support the deployment of renewables at sufficient pace. Renewable energy developers face delays of up to a decade to connect new capacity to the electricity grid, threatening the Government’s pledge to shift away from fossil fuels.¹⁹⁰ Grid constraints mean that the National Grid Energy Systems Operator must pay generators to switch off when there is a surplus of power supply “to maintain system stability and manage the flows on the network”.¹⁹¹ In 2021, 2.3TWh of potential output was lost and National Grid Energy Systems Operator paid £143 million to compensate the generators affected.¹⁹²
149. Witnesses suggested that investment in grid infrastructure has been reactive rather than anticipatory of changes to the electricity supply. This means the grid transmission network has not increased capacity at the same rate as renewable energy projects. Stephen Smith told us that Ofgem should enable energy companies to “start investing in networks ahead of need”.¹⁹³ A March 2022 House of Lords Industry and Regulators Committee report stated:
- “We received numerous pieces of evidence, particularly from network companies, arguing that Ofgem is overly cautious when allowing ‘anticipatory’ investment in energy networks that may be needed to enable the transition, especially given the forecast increase in demand for electricity with the electrification of heat and transport, but for which there is not a direct and immediate need now.”¹⁹⁴
150. RWE, a renewable energy company, told us, “connecting new renewable generation projects to the networks has been the single biggest issue impacting on the delivery of wind energy projects”. It argued that Ofgem’s remit should be adjusted to allow increased anticipatory investment in grid networks:
- “Ofgem’s remit with regards to net zero is restrictive and does not enable the regulator to facilitate the level of anticipatory investment required.” This in turn is causing delays to the granting of grid connections, and consequently the development of projects. Clear guidance to Ofgem in

189 Health and Safety standards are covered by the Office for Nuclear Regulation rather than the planning system.

190 ‘Renewables projects face 10-year wait to connect to electricity grid’, *Financial Times* (8 May 2022): <https://www.ft.com/content/7c674f56-9028-48a3-8cbf-c1c8b10868ba> [accessed 29 June 2022]

191 National Grid Energy Systems Operator, ‘What are constraint payments?’: <https://www.nationalgrideso.com/electricity-explained/how-do-we-balance-grid/what-are-constraints-payments> [accessed 7 July 2022]

192 Renewable Energy Foundation, ‘Balancing Mechanism Wind Farm Constraint Payments’: <https://www.ref.org.uk/constraints/indextotals.php> [accessed 7 July 2022]

193 [Q 155](#) Stephen Smith

194 Industry and Regulators Committee, *The net zero transformation: delivery, regulation and the consumer*, (1st Report, Session 2021–22, HL Paper 162)

this regard, in the form of an enhanced or changed remit that explicitly includes a responsibility to drive net zero would be useful.”¹⁹⁵

151. On 29 June 2022, Ofgem announced a plan to enable investment of £21 billion in grid infrastructure over 5 years.¹⁹⁶ Ofgem are also carrying out a consultation on how to improve anticipatory investment and it will publish a response by the end of 2022.¹⁹⁷ Ofgem regulate price controls with network companies which determine the levels of investment in the network, company returns and the amount that the companies can charge for operating their networks.¹⁹⁸
152. Martin Pibworth, Chief Commercial Officer, SSE plc, told us: “I would also very strongly advocate for transmission investment ... If we know that there are 25 gigawatts of potential offshore wind in Scotland, we should be thinking now about how we build the wires to transport and then transmit that to the demand centres.”¹⁹⁹
153. **Insufficient investment in the transmission network, is delaying the deployment of renewable projects. We support proposals by Ofgem to improve anticipatory investment and deliver sufficient investment in grid capacity to unlock additional investment in renewables and to increase the UK’s energy supply at greater speed provided that the impact on consumer bills can be contained.**

Role of the Future Systems Operator

154. We heard the UK’s energy regulatory architecture needs reform to enable sufficient investment in the grid and for the transition to net zero. In 2021, the Department for Business, Energy and Industrial Strategy and Ofgem held a joint consultation on a Future Systems Operator. The Government and Ofgem have defined the Future Systems Operator as, “an expert, impartial body with responsibilities across electricity and gas, to drive progress towards net zero while maintaining security and minimising costs.”²⁰⁰ The Government’s response to the consultation said, “[the energy transition] requires a shift to a more ‘whole system’ approach, coordinating the ever more integrated electricity and gas systems, both onshore and offshore, while

195 Written evidence from RWE ([ESI0038](#))

196 Ofgem, ‘Ofgem reveals landmark five-year programme to deliver reliable sustainable energy at lowest cost to consumers’ (29 June 2022): <https://www.ofgem.gov.uk/publications/ofgem-reveals-landmark-five-year-programme-deliver-reliable-sustainable-energy-lowest-cost-consumers> [accessed 7 July 2022]

197 Ofgem, ‘Consultation on our Minded-to Decision on Anticipatory Investment and Implementation of Policy Changes’ (April 2022): <https://www.ofgem.gov.uk/publications/offshore-coordination-early-opportunities-consultation-our-minded-decision-anticipatory-investment-and-implementation-policy-changes> [accessed 7 July 2022]

198 Ofgem, ‘Network price controls 2021–2028 (RIIO-2)’: <https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/network-price-controls-2021-2028-riio-2> [accessed 6 July 2022]

199 [Q 201](#) (Martin Pibworth)

200 Department for Business, Energy and Industrial Strategy, ‘Joint Statement on the Future System Operator’ (6 April 2022): <https://www.gov.uk/government/consultations/proposals-for-a-future-system-operator-role/outcome/joint-statement-on-the-future-system-operator> [accessed 29 June 2022] The Future Systems Operator would cover Great Britain (England, Scotland and Wales, but not Northern Ireland) since Northern Ireland has a separate electricity regulator and systems operator.

looking ahead to the emerging markets of hydrogen and Carbon Capture and Storage”.²⁰¹

155. National Grid Energy Systems Operator agreed that “the Future Systems Operator will have a statutory supporting duty to consider whole system impacts”.²⁰² It added that “it is expected that heat and transport decarbonisation would be part of its responsibilities in system forecasting, strategic network planning and when advising government or Ofgem.”²⁰³
156. The House of Lords Industry and Regulators Committee, in its March 2022 report, called for a “Transformation Taskforce” that reports directly to the Prime Minister, to coordinate strategic planning and delivery of the net zero energy transition. The report welcomed Government and Ofgem’s proposals for an independent Future Systems Operator responsible for the planning and design of the decarbonised energy system, but said the Future Systems Operator will need to be given clear direction by a Transformation Taskforce, to ensure technical experts are not being asked to make political decisions.²⁰⁴
157. Simon Virley supported the introduction of an independent Future Systems Operator. He said:
- “there are two changes that are needed if we are to get our regulatory system fit for delivering net zero at least cost: first, to align Ofgem’s duties to deliver net zero at least cost to consumers while keeping the lights on; and, second, give the system operator in its independent form, the responsibility for developing that national plan for transmission.”²⁰⁵
158. Akshay Kaul, Networks Director at Ofgem, told us that the Future Systems Operator will evolve out of the National Grid Energy Systems Operator (ESO). He said: “the big change in their remit, as they become the future system operator, is to become a kind of system architect—to plan for the development of the energy system in gas as well as electricity and identify the major strategic investments that need to be made across the piece.” His main recommendation was that the Future Systems Operator should be guided by Government policy, but operationally independent so that it could give “genuinely independent expert advice to Government and Ofgem”.²⁰⁶
159. On 6 July 2022 the Government announced the appointment of a new Electricity Networks Commissioner with a remit to “to accelerate the delivery of crucial electricity network infrastructure”.²⁰⁷ It also announced the appointment of an industry advisor for Great British Nuclear and an Offshore Wind Champion.

201 Department for Business, Energy and Industrial Strategy and Ofgem, *Future Systems Operator Government and Ofgem’s response to consultation* (April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1066720/future-system-operator-consultation-govt-response.pdf [July 2022]

202 Written evidence from National Grid ESO ([ESI0032](#))

203 *Ibid.*

204 Industry and Regulators Committee, *The net zero transformation: delivery, regulation and the consumer* (1st Report, Session 2021–22, HL Paper 162)

205 [Q 155](#) (Simon Virley)

206 [Q 268](#) (Akshay Kaul)

207 Department for Business, Energy and Industrial Strategy, ‘New Electricity Networks Commissioner appointed to help ensure home-grown energy for Britain’ (6 July 2022) <https://www.gov.uk/government/news/new-electricity-networks-commissioner-appointed-to-help-ensure-home-grown-energy-for-britain> [accessed 13 July 2022]

160. **The Future Systems Operator will have a key role in encouraging anticipatory investment to remove barriers in the grid transmission network and to enable a growing capacity of renewables to connect to the grid. We recommend that the Future Systems Operator be set up in a way that is operationally independent from Government. It should be set up promptly since decisions are needed in the short term to ensure that the grid is capable of transmitting the increased electricity supply needed for the net zero energy transition.**
161. **The Government should set out clearly what the Future Systems Operator’s relationship will be with BEIS, Treasury, Ofgem and the recently appointed Electricity Networks Commissioner. It is unclear what role the new Energy Networks Commissioner and industry champions will have in relation to the Future Systems Operator, especially since the Future Systems Operator is intended by the Government to take a ‘whole system approach’. Although the Future Systems Operator should be operationally independent, the Government should be responsible for setting its overall policy remit.**

Taxation system

Energy Profits Levy

162. On 26 May 2022, the Chancellor of the Exchequer announced an ‘Energy Profits Levy’: a new 25% surcharge on “extraordinary” profits earned by oil and gas companies. The Government said oil and gas prices had risen substantially, “with oil prices nearly doubling since early last year, and gas prices more than doubling” which had resulted in significant increases in profits.
163. The levy includes a ‘super-deduction’ relief to encourage oil and gas companies to reinvest profits in the UK. This 80% investment allowance will mean businesses will receive a 91p tax saving for every £1 they invest. The Chancellor said a sunset clause would be included in the implementing legislation to end the levy when oil and gas prices return to historically more “normal” levels or by December 2025.²⁰⁸
164. The levy has been criticised for not providing tax relief for investment in renewable energy infrastructure. It has also been criticised by the oil and gas industry for creating uncertainty around investment. For example, a spokesperson from Shell said: “the levy creates uncertainty about the investment climate for North Sea oil and gas for the coming years... and, longer term, the proposed tax reliefs for investment don’t extend to the renewable energy system we want to drive forward in the UK and invest in very substantially.”²⁰⁹

208 HC Deb, 26 May 2022, [col 451](#). Also see, HM Treasury, *Energy Profits Levy Factsheet* (26 May 2022): <https://www.gov.uk/government/publications/cost-of-living-support/energy-profits-levy-factsheet-26-may-2022> [accessed 29 June 2022]. According to HM Treasury, before the Energy Profits Levy was introduced, the oil and gas sector paid a 40% headline rate tax on profits consisting of 30% Ring Fence Corporation Tax and 10% Supplementary Charge. The Energy Profits Levy is an additional 25% tax on UK oil and gas profits on top of the existing 40% headline rate of tax, taking the combined rate of tax on profits to 65%.

209 ‘Shell says windfall tax threatens North Sea oil and gas investment’, *Guardian* (27 May 2022): <https://www.theguardian.com/business/2022/may/27/shell-windfall-tax-north-sea-oil-gas-investment> [accessed 29 June 2022]

165. While the levy does not apply to the electricity generation sector, the Chancellor said certain parts of it have seen extraordinary profits due to record gas prices. He said the Government would evaluate the scale of these profits and the appropriate steps to take.²¹⁰ Energy generators criticised the prospect of the Energy Profits Levy being extended to their sector. Energy UK said: “a windfall tax on generators could delay and raise the cost of ... investments—at the very time that we need to increase spending to meet the government’s own aims.” It said an extension of the Energy Profits Levy risked the collapse of more suppliers, which can be part of the same company as generators.²¹¹
166. The then Economic Secretary expected the Energy Profits Levy to increase investment but did not explain the foundation for this expectation. He said the Energy Profits Levy investment allowance “is available to support capital expenditure on decarbonisation of upstream activities, which could include electrification”.²¹²
167. **The Government has introduced an Energy Profits Levy to help pay for financial support to domestic energy consumers. It should explain what effect the levy is expected to have on investment decisions in the North Sea and when it says that the levy could end when oil and gas prices are at “normal” levels, it should quantify what “normal” means.**
168. **The Government’s decision to announce a possible extension of the levy to electricity generators, before having assessed whether it is justified, may risk affecting investor confidence in renewables. The Government should set out whether it intends to move forward with a levy on electricity generators as soon as possible, to avoid damaging investor confidence further.**

Carbon pricing

169. We heard that extending carbon pricing could encourage investment in the energy transition. Professor Sir Dieter Helm told us that more extensive carbon pricing will be required in the UK to make the environmental costs of a transaction or activity part of the decision-making for consumers and investors.²¹³ This would act as a disincentive for polluting activities, and implicitly encourage investment in low carbon alternatives. It aligns with the “polluter pays” principle.
170. The UK has implicit taxes on carbon such as diesel and petrol duties, and it has more explicit carbon pricing through its UK Emissions Trading Scheme (UKETS), a replacement for the European Union ETS.²¹⁴ Julian Critchlow said: “certainly one of the things that will have to change very much in this transition is the fiscal system that supports it”.²¹⁵ Mike Tholen, Head of

210 HM Treasury, ‘Energy Profits Levy Factsheet’ (26 May 2022): <https://www.gov.uk/government/publications/cost-of-living-support/energy-profits-levy-factsheet-26-may-2022> [accessed 29 June 2022]

211 ‘UK generators warn windfall tax threatens green investment’, *Financial Times* (8 June 2022): <https://www.ft.com/content/63c29b10-2aba-45d6-9c53-73f6ae15ebfc> [accessed 29 June 2022]

212 [Q 275](#) (John Glen MP)

213 [Q 65](#) (Professor Sir Dieter Helm)

214 ‘Carbon tax would be popular with UK voters poll suggests’, *The Guardian* (February 2021) <https://www.theguardian.com/environment/2021/feb/24/carbon-tax-would-be-popular-with-uk-voters-poll-suggests> [accessed July 2021]

215 [Q 12](#) (Julian Critchlow)

Sustainability at Offshore Energies UK, said that improved clarity in carbon pricing would help to reduce investor uncertainty during the transition. He said, “Norway used a carbon tax-like structure in its oil and gas industry, which led to it doing things more quickly and with more surety than we have done in the UK.”²¹⁶

171. **The Government should set out whether it plans to extend carbon pricing and provide detail on pricing levels and timescales. This could give more clarity to investors and could provide incentives to fund projects necessary for the transition.**

CHAPTER 4: FINANCIAL REGULATION

Bank of England regulators

172. Over the last decade, central banks have stepped up work on assessing and managing climate risk to the financial sector and exploring their roles in financing the transition to net zero.²¹⁷ On 3 March 2021, the Government formally gave the Bank of England responsibility for supporting its net zero policy, as part of the Bank’s secondary remit.²¹⁸
173. The Bank and financial regulators have been involved in several projects to improve their understanding of climate risk. These projects include setting out supervisory expectations for regulated companies, running a ‘green stress test’ to measure climate exposure, assessing the implications of net zero transition scenarios with international partners and supporting work on climate disclosures for certain companies.²¹⁹ As part of this work, the Bank has identified two main types of climate risk to the financial system:
- (1) **Physical risks:** arising from damage to property, land and other infrastructure as well as disruption to business supply chains and food systems. This could affect the soundness of financial institutions by reducing asset values and company profits, or through higher insurance losses.
 - (2) **Transition risks:** arising from the move to a net zero economy with changes in climate policy, technology and shifting consumer preferences. This could prompt a reassessment of the value of a large range of carbon-intensive assets and lead to higher costs of doing business. These could give rise to credit risk for lenders and market risk for insurers and investors.²²⁰
174. Since the publication of the Government’s *British Energy Security Strategy* on 7 April 2022, the Bank has been expected to have regard to supporting energy security as well as the Government’s net zero policy. The Chancellor instructed the Financial Policy Committee, which is responsible for the safety and stability of the financial system, to:
- “have regard to the Government’s energy security strategy and the important role that the financial system will play in supporting the

217 For example, in December 2017 eight central banks, including the Bank of England, and supervisors established the Network of Central Banks and Supervisors for Greening the Financial System. It currently has 114 members and 18 observers

218 HM Treasury, *Letter from the Chancellor to the Governor of the Bank of England* (3 March 2021): <https://www.bankofengland.co.uk/-/media/boe/files/letter/2021/march/fpc-remit-and-recommendations-letter-2021.pdf> [accessed 29 June 2022]. The Chancellor said, “Consistent with its objectives, the [Financial Policy] Committee should continue to act with a view to building the resilience of the UK financial system to the risks from climate change and support the government’s ambition of a greener industry, using innovation and finance to protect our environment and tackle climate change.”

219 For more information on this work, see Bank of England, ‘Climate Change’: <https://www.bankofengland.co.uk/climate-change> [accessed 29 June 2022]

220 Elisabeth Stheeman, *Speech on why macroprudential policy needs to tackle financial stability risks from climate change*, 3 May 2022: <https://www.bankofengland.co.uk/speech/2022/april/elisabeth-stheeman-speech-at-queen-university> [accessed 29 June 2022]

UK’s energy security—including through investment in transitional hydrocarbons like gas—as part of the UK’s pathway to net zero.”²²¹

The Chancellor sent similar letters to the Prudential Regulatory Committee, which oversees policy for the Prudential Regulation Authority, and the Financial Conduct Authority, which regulates the conduct of financial services firms.²²²

175. The Bank of England has highlighted the risks of curbing finance for, and investment in, carbon-intensive industries too soon. For example, on 7 April 2022 Sarah Breeden, Executive Director for Financial Stability Strategy and Risk at the Bank of England, delivered a speech which explained some of the main risks that the Bank envisages for the financial sector from net zero policies, including:

- The potential for financing of emissions-intensive activities to migrate outside the regulated banking sector, leading to less transparency in these activities. It could deprive firms that need to adapt most to the transition access to affordable finance.
- Rapid changes in the prices of green and emissions-intensive assets could lead to market instability. This could result from ‘green asset bubbles’ or sudden collapses in emissions-intensive asset prices.
- Prematurely restricting finance to certain carbon-intensive products or services before sustainable replacements become available.

176. In her speech Sarah Breeden concluded: “an effective transition requires the efficient allocation of capital to assets that are both green now and those that need greening, and the responsible retirement—over time—of assets which are not compatible with a net zero outcome.” She explained that more detail on the Government’s climate policies was needed, as was more transparency on firms’ approaches to managing climate risks.²²³

177. In a May 2022 speech Sam Woods, Deputy Governor for Prudential Regulation, said that while the UK’s energy system was in the process of deploying more renewables and energy efficiency measures:

“banks and insurers need to provide finance to more carbon-intensive sectors of the economy, precisely in order to allow them to invest in the transition. Cutting off finance to these corporates too quickly could

221 HM Treasury, *Letter from the Chancellor of the Exchequer to the Governor of the Bank of England* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1067016/Recommendations_for_the_Financial_Policy_Committee_April_2022_final.pdf [accessed 29 June 2022]

222 HM Treasury, *Recommendations for the Prudential Regulation Committee* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1067015/Recommendations_for_the_Prudential_Regulation_Committee_April_2022_final.pdf [accessed 29 June 2022] and HM Treasury, *Recommendations for the Financial Conduct Authority* (7 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1067014/Recommendations_for_the_Financial_Conduct_Authority_April_2022_final.pdf [accessed 29 June 2022]

223 Sarah Breeden, *Speech on balancing on the net-zero tightrope*, 7 April 2022: <https://www.bankofengland.co.uk/speech/2022/april/sarah-breeden-thecityuk-international-conference> [accessed 29 June 2022]

prove counterproductive, and have wide-ranging macroeconomic and societal consequences, including through elevated energy prices”.²²⁴

178. While the Bank of England has made clear its awareness of these transition risks, it is less clear how it is including these perspectives in its policymaking. On 17 May 2022, Sarah Breeden told us that the Bank of England was still considering the Chancellor’s 7 April letter, in which he instructed the Bank to have regard to energy security. She said that ‘have regard’ letters are not necessarily designed to drive specific actions but set out factors that should be considered when making policy.²²⁵ On 5 July 2022, the Bank of England said it would “provide a formal written response to the recommendation when appropriate, in the usual way, as part of its response to the annual remit and recommendations letter.”²²⁶
179. **We note the Chancellor’s decision to balance the Bank of England’s remit to support the transition to net zero with a requirement to have regard to its policies on energy security. Net zero and energy security are compatible objectives and well-designed supervisory policy can support their alignment. We recommend that the Financial Policy Committee, the Prudential Regulation Committee and the Financial Conduct Authority set out, at the earliest opportunity, high-level principles on how they are interpreting the Chancellor’s instruction on energy security.**

Taskforce on Climate-related Financial Disclosures

180. The Taskforce on Climate-related Financial Disclosures (TCFD) was created by the Financial Stability Board in 2015²²⁷ with the objective of improving organisations’ public disclosures on climate impact. The TCFD believes better-quality disclosures will help investors to direct capital to more sustainable projects and business models. In June 2017, the TCFD published recommendations structured around four thematic areas: governance, strategy, risk management, and metrics and targets, alongside 11 recommended disclosures.²²⁸
181. The UK was the first G20 country to make TCFD-aligned disclosures mandatory for certain companies.²²⁹ Since 6 April 2022, over 1,300 of

224 Sam Woods, *Speech on climate capital*, (24 May 2022): <https://www.bankofengland.co.uk/speech/2022/may/sam-woods-speech-on-the-results-of-the-climate-bes-exercise-on-financial-risks-from-climate-change> [accessed 29 June 2022]

225 Q 232 (Sarah Breeden)

226 Bank of England, *Financial Policy Summary and record of the Financial Policy Committee meeting on 16 June 2022* (5 July 2022): <https://www.bankofengland.co.uk/-/media/boe/files/financial-policy-summary-and-record/2022/fps-and-record-july-2022.pdf> [accessed 7 July 2022]

227 Financial Stability Board, ‘FSB to establish Task Force on Climate-related Financial Disclosures’ (4 December 2015): <https://assets.bbhub.io/company/sites/60/2015/12/12-4-2015-Climate-change-task-force-press-release.pdf> [accessed 29 June 2022]. The Financial Stability Board is an international body that monitors and makes recommendations about the global financial system. It was established after the G20 London summit in April 2009 as a successor to the Financial Stability Forum.

228 Task Force on Climate-related Financial Disclosures, *Final Report Recommendations of the Taskforce on Climate-related Financial Disclosures* (June 2017): <https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf> [accessed 29 June 2022]

229 The Government’s July 2019 *Green Finance Strategy* included measures to prioritise environmental considerations in financial decision making, for example through stricter requirements on disclosing exposures to climate change risk. It also set out plans to encourage green investment and enhance the UK’s role as a centre for green finance. See, HM Government, *Green Finance Strategy* (2 July 2019): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820284/190716_BEIS_Green_Finance_Strategy_Accessible_Final.pdf [accessed 29 June 2022].

the largest UK-registered companies and financial institutions have been required to publish disclosures, including many of the UK's largest traded companies, banks and insurers, as well as private companies with over 500 employees and £500 million in turnover.²³⁰

182. Ian Simm, founder and CEO, Impax Asset Management, told us that TCFD-aligned disclosures helped capital to flow towards sustainable investment opportunities “and away from where significant, unacceptable risk lies”. He said disclosures helped to ensure that regulators could “stay out of the divestment [from fossil fuels] debate and let the market decide.”²³¹
183. Mike Zehetmayr, Financial Services Sustainable Finance Data and Technology Leader at EY, said that TCFD-aligned disclosures could help generate data from the private sector which will be needed by institutions to manage the transition to net zero and which were currently missing: “one of the key lessons that we have learned from the first implementation of disclosures for the European green taxonomy is that the data [do] not exist. Where [they do they are] poor quality, and in many cases, ... qualitative rather than quantitative.”²³²
184. Positive Money, a think tank, was sceptical that it was possible to disclose reliable and accurate data on climate impact and thought that the Government was relying too much on voluntary efforts by the private sector to manage the transition. It said the belief that markets are efficient and can self-regulate was a false assumption.²³³
185. Sonja Gibbs, Managing Director and Head of Sustainable Finance at the Institute of International Finance, told us that “patchy data [are] better than no data; we have to start somewhere.” She highlighted “the huge array of data and service providers that are putting their heads together about ways to overcome these data gaps, including through some very sophisticated financial technologies.”²³⁴ Mike Zehetmayr agreed:
- “over the last two years I have had a team who have been monitoring the third-party ratings and data market. Some 18 months ago, we were probably tracking about 40 providers. We are now tracking in excess of 110. There is a recognition in the market that there are gaps in the data, and there are traditional data providers that are using their extensive capabilities to outsource that data.”²³⁵
186. Mark Carney said the biggest challenge for developing useful disclosures was around collecting data for scope 3 emissions. Scope 3 refers to indirect emissions that occur in the value chain of a reporting company, such as emissions from suppliers and customers. They could include emissions from the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity,

230 HM Government, ‘UK to enshrine mandatory climate disclosures for largest companies in law’ (29 October 2021): <https://www.gov.uk/government/news/uk-to-enshrine-mandatory-climate-disclosures-for-largest-companies-in-law> [accessed 29 June 2022]

231 [Q 122](#) (Ian Simm)

232 [Q 147](#) (Mike Zehetmayr)

233 Written evidence from Positive Money ([ESI0016](#))

234 [Q 151](#) (Sonja Gibbs)

235 [Q 151](#) (Mike Zehetmayr)

electricity-related activities, outsourced activities and waste disposal.²³⁶ He said the Transition Plan Taskforce was supporting companies to gather these data.²³⁷ But it is far from clear how companies can assess scope 3 emissions.

187. The Government said in its 2021 Green Finance Roadmap that it plans to build on TSFD-aligned disclosures with new Sustainability Disclosure Requirements (SDRs). SDRs will broaden UK sustainability reporting, which currently focuses on climate-related risks, to cover a wider range of issues. They will also require companies to report on the climate impact under the proposed green taxonomy.²³⁸
188. **Understanding climate risk and managing the transition to a lower-carbon economy requires data and appropriate analytic approaches, which disclosures will help to accumulate. HM Treasury and financial regulators will need to support businesses to make disclosures consistently. Businesses will need support on how to identify quantitative data on their climate impact, particularly in relation to scope 3 emissions which are especially difficult for companies to assess.**

Green stress tests

189. The Bank of England's Financial Policy Committee and Prudential Regulation Committee have jointly undertaken a 'Climate Biennial Exploratory Scenario exercise', or 'green stress test' to assess the resiliency of the financial system in three climate policy scenarios:
- (1) **Early-action scenario:** climate policy is ambitious from the beginning. Global carbon dioxide emissions are reduced to net zero by around 2050 and global warming is successfully limited to 1.8°C, falling to around 1.5°C by the end of the century.
 - (2) **Late-action scenario:** the transition to a net zero economy is delayed by a decade. Policy measures are then more sudden and disorderly because of the delay. Global warming is limited to 1.8°C by 2050 but remains at this level at the end of the century.
 - (3) **No additional action scenario:** an absence of transition policies leads to a growing concentration of greenhouse gas emissions and global temperature continues to increase, reaching 3.3°C by 2050.²³⁹
190. Witnesses had different views on whether climate stress tests were useful. Mark Carney, UN Special Envoy for Climate Action and Finance and a former Governor of the Bank of England, told us that such tests enabled

236 Task Force on Climate-related Financial Disclosures, *Final Report Recommendations of the Taskforce on Climate-related Financial Disclosures* (June 2017): <https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf> [accessed 29 June 2022]. See also, Q 184 (Mark Carney).

237 Q 184 (Mark Carney)

238 HM Treasury, *Greening Finance: A Roadmap to Sustainable Investing* (18 October 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1031805/CCS0821102722-006_Green_Finance_Paper_2021_v6_Web_Accessible.pdf [accessed 29 June 2022]

239 Bank of England, 'Results of the 2021 Climate Biennial Exploratory Scenario' (24 May 2022): <https://www.bankofengland.co.uk/news/2022/may/boe-publishes-results-of-the-2021-biennial-exploratory-scenario-financial-risks-from-climate-change> [accessed 29 June 2022]. In the exercise, the Bank of England's estimates of financial sector losses assumed the balance sheets of banks and insurers would stay the same over the scenario time horizons, remaining as they were at the end of 2020. The Bank acknowledged that in practice banks and insurers would likely respond to climate risks over time, which would reduce losses.

a “disciplined, rigorous approach” to assessing risk.²⁴⁰ Professor Sir Dieter Helm, Professor of Economic Policy at University of Oxford, said such tests could be useful but he thought there were more significant risks to the financial sector than climate change over the next 10–15 years.²⁴¹ Michael Liebreich, Chairman and Chief Executive of Liebreich Associates, explained that there was a high level of uncertainty over which climate scenarios were realistic and central banks risked using “absurd” or “extreme” scenarios in their tests.²⁴²

191. The results of the Climate Biennial Exploratory Scenario were published on 24 May 2022. The Bank found that climate risk exposures will become a “persistent drag” on the profitability of banks and insurers. Overall loss rates were estimated to be 10–15% on average, annually.²⁴³ In a speech delivered on the same day as the results were published, Sam Woods gave his view on their significance:

“By themselves, these are not the kinds of losses that would make me question the stability of the system, and they suggest that the financial sector has the capacity to support the economy through the transition. But any positive message needs to be taken with a major pinch of salt: both because there is a lot of uncertainty in these projections and because this drag on profitability will leave the sector more vulnerable to other, future shocks.”²⁴⁴

192. One of the goals of traditional stress tests is to assess whether financial institutions have sufficient capital to manage their exposure to risks. Regulators can set capital requirements to ensure firms have enough resources to help absorb financial losses over time, and which are designed to make the financial system resilient and protect depositors and policyholders.
193. Many central banks and regulators, including those in the UK, are assessing the role of capital requirements in managing climate risk. In October 2021, the Bank’s Prudential Regulation Authority published a consultation on whether to introduce changes to banks’ capital buffers to manage the impact of climate change; it will publish its findings by the end of 2022. The consultation said that the current capital framework covers climate-related financial risks but there are gaps which require research to see if further action is required. It added that capital framework is not the right tool to address the causes of climate change, but it could provide resilience against the consequences of climate change.²⁴⁵
194. Some witnesses told us that capital requirements were not appropriate to manage the climate transition. Sonja Gibbs said capital requirements that penalise more carbon-intensive investments and support more sustainable investment were “blunt tools” which would make it difficult to mobilise

240 Q 188 (Mark Carney)

241 Q 65 (Professor Sir Dieter Helm)

242 Q 128 (Michael Liebreich)

243 Bank of England, ‘Results of the 2021 Climate Biennial Exploratory Scenario’ (24 May 2022): <https://www.bankofengland.co.uk/news/2022/may/boe-publishes-results-of-the-2021-biennial-exploratory-scenario-financial-risks-from-climate-change> [accessed 29 June 2022]

244 Sam Woods, *Speech on climate capital*, 24 May 2022: <https://www.bankofengland.co.uk/speech/2022/may/sam-woods-speech-on-the-results-of-the-climate-bes-exercise-on-financial-risks-from-climate-change> [accessed 29 June 2022]

245 PRA, *Climate-related financial risk management and the role of capital requirements* (28 October 2021): <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/publication/2021/october/climate-change-adaptation-report-2021.pdf> [accessed 29 June 2022]

capital needed for the transition.²⁴⁶ Mark Carney told us that additional capital requirements may be necessary when there is greater certainty over what risks existed for the financial sector but did not think that certainty was present in the UK.²⁴⁷

195. The Climate Biennial Exploratory Scenario was not used to set additional capital requirements on the financial sector. Nevertheless, Sarah Breeden explained that the exercise would inform the Bank’s next steps in assessing climate risk management, including “whether additional capital is required”. Additional capital requirements were a “logical step, but there is some hard work to do before we jump to a logical step.”²⁴⁸
196. Sarah Breeden told us that the quality of the available data was not sufficient to judge how exposed the real economy is to climate risks. It made sense to “time [the Bank of England’s] further work in the light of getting better data”²⁴⁹ as it was currently “somewhere between hard and impossible” to identify which assets might be at risk from the transition without clear climate policy from Government: “As we have seen with energy security policy, as events change, transition pathways have to change ... you have to be prepared to adjust them as the transition adjusts.”²⁵⁰ Sarah Breeden also told us that the financial sector will be most able to support the transition “where there is clarity and sufficient detail over the future path of policy.” She said this was a challenge for all governments around the world and not just the UK Government.²⁵¹
197. In his May 2022 speech on the Climate Biennial Exploratory Scenario results, Sam Woods said that, while a drag on profitability would be “nasty” for the financial sector, a “fundamental recalibration of capital requirements” was unlikely to be needed so long as profits remained sufficient to protect capital buffers. However, higher capital requirements could be necessary if climate change made the “the distribution of future shocks” more severe, and further work was needed to assess whether sufficient capital was being held in the most climate-exposed parts of the financial system, even if the aggregate level of capital in the system was adequate.²⁵²
198. **The quality of data and analytic approaches for assessing climate risks, especially transition risks, are insufficient for regulators to reach judgements on increasing capital requirements on the financial sector. The weakness of the data is exacerbated by a lack of clarity from the Government on energy needs during the transition and how sectors will be expected to adapt.**

Green taxonomy

199. In a statement on 9 November 2020, the Chancellor set out plans to introduce a “green taxonomy”. This would define what “green” means to support companies and investors to understand better the effect of their

246 [Q 151](#) (Sonja Gibbs)

247 [Q 190](#) (Mark Carney)

248 [Q 233](#) (Sarah Breeden)

249 [Q 233](#) (Sarah Breeden)

250 [Q 235](#) (Sarah Breeden)

251 Letter from Sarah Breeden to the Chair of the Economic Affairs Committee (21 June 2021): <https://committees.parliament.uk/publications/22740/documents/167143/default/> [accessed 29 June 2022]

252 Sam Woods, *Speech on climate capital*, 24 May 2022: <https://www.bankofengland.co.uk/speech/2022/may/sam-woods-speech-on-the-results-of-the-climate-bes-exercise-on-financial-risks-from-climate-change> [accessed 29 June 2022]

investments on the environment.²⁵³ The Government provided more detail in its Greening Finance Roadmap, published in October 2021.²⁵⁴

200. Witnesses had mixed views on whether the opportunities provided by a green taxonomy would outweigh the risks. The Green Finance Initiative, which helped develop the taxonomy, said it could support investor confidence but would need to be “science based and robust”.²⁵⁵ Simon Redmond, Senior Director at S&P Global Ratings, said that a taxonomy could provide “a common set of rules” for companies, investors and other stakeholders, such as credit rating agencies.²⁵⁶
201. Dan Monzani, Managing Director, UK and Ireland at Aurora Energy Research, said green taxonomies “are generally helpful, but the real investments get made based on the real economics.” He explained: “if you put in place the right signals, carbon prices, policy supports and reforms to merchant markets, that will drive investment.”²⁵⁷ Taxonomies would “inevitably ... be fairly simplistic”.²⁵⁸
202. Michael Liebreich, Chairman and Chief Executive of Liebreich Associates, was against green taxonomies because they “stifle innovation” by driving capital towards “a subset of solutions.” He warned: “the idea you can make a list of things that are always good, and therefore by definition a list of things that are always bad, is absolutely impossible.”²⁵⁹ Professor Sir Dieter Helm CBE, Professor of Economic Policy at University of Oxford, also said taxonomies could be simplistic:
- “I would love to live in a world where something is either green or not green. It is simplistic to imagine that we can just decide that these are good and those are bad technologies. One has to look at how the technologies combine to take us on the pathway we want to go down.”²⁶⁰
203. Mark Carney, UN Special Envoy for Climate Action and Finance, had “some sympathy with the view that [taxonomies] may stifle innovation”, adding that they “have proven hard to adapt to be a true transition instrument to capture shades of green or shades of brown into green”. He thought a better approach would be to introduce net zero transition plans for companies and financial institutions, and to set transition pathways for economic sectors.²⁶¹
204. Sonja Gibbs described green taxonomies as “political constructs” reflecting “different national priorities.” She explained that green taxonomies in different countries needed to be interoperable otherwise there would be opportunities for the private sector to ‘greenwash’ investments by exploiting differences in what is considered environmentally sustainable.²⁶²

253 HC Deb, 9 November 2020, [col 621](#)

254 HM Government, *Greening Finance: A Roadmap to Sustainable Investing* (October 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1031805/CCS0821102722-006_Green_Finance_Paper_2021_v6_Web_Accessible.pdf [accessed 29 June 2022]

255 Written evidence from the Green Finance Institute ([ESI0034](#))

256 [Q 113](#) (Simon Redmond)

257 [Q 83](#) (Dan Monzani)

258 [Q 82](#) (Dan Monzani)

259 [Q 129](#) (Ian Simm)

260 [Q 61](#) (Professor Sir Dieter Helm)

261 [Q 191](#) (Mark Carney)

262 [Q 152](#) (Sonja Gibbs)

205. Ian Simm, founder and CEO of Impax Asset Management, warned that public sector green taxonomies were “quite dangerous” because of the complexity of defining what is green “and the additional problem of boundary issues”. There was a risk of mission creep, as governments may feel pressure to orientate other policies around the taxonomy. He said there was also a risk of driving capital out of sectors that are needed during the transition.²⁶³
206. The Government’s green finance strategy said the UK taxonomy would be “objective and science-based” and would aim for “compatibility with other international frameworks”. It will include ‘enabling activities’, which recognise measures which support other sectors through the transition, but which are not yet sustainable themselves.²⁶⁴
207. The then Economic Secretary told us that the UK was involved in the formation of the EU’s taxonomy while it was a member state. In developing a UK taxonomy the Government would seek to define standards which are compatible globally, and as “accessible and transparent as possible for business so that, as far as possible, they do not provide duplicatory or additional cost to business.”²⁶⁵ There has been a debate about whether or not nuclear energy and gas can be included in a green taxonomy in the EU and that decision will also be an important one for the UK.²⁶⁶
208. **Green taxonomies can help to provide investors with greater confidence to invest in sustainable projects, but they can also be seriously misleading by implying that projects and technology are either green or brown. If poorly designed, they risk driving capital to a narrow subset of existing options, which may stifle innovation and investment and they can fail to take account of the process of transition towards new sets of activities. The Government should be mindful of this risk by avoiding a narrow interpretation of the taxonomy and ensure that guidance to investors reflects the fact that the transition to net zero may involve complex trade-offs and interlinkages between renewables and fossil fuels. The Government should work with other jurisdictions’ authorities to ensure that the principles underpinning a UK taxonomy are consistent with other taxonomies: fragmentation causes confusion which can undermine investor confidence.**

Solvency II

209. Solvency II is the regime governing the prudential regulation of insurance companies in the UK. It comprises EU legislation which has been transposed to UK law. HM Treasury has said that reform to Solvency II could unlock growth and investment in UK infrastructure and green projects.²⁶⁷
210. The Government published a consultation on 28 April 2022. It had three main proposals. First, it proposes easing solvency requirements by reducing

263 [Q 129](#) (Ian Simm)

264 HM Government, *Greening Finance: A Roadmap to Sustainable Investing* (October 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1031805/CCS0821102722-006_Green_Finance_Paper_2021_v6_Web_Accessible.pdf [accessed 29 June 2022]

265 [Q 283](#) (John Glen MP)

266 On 6 July 2022, the European Parliament agreed to include nuclear and gas in the EU’s green taxonomy.

267 HM Treasury, ‘UK Government powers on with reforms to Solvency II’ (28 April 2022): <https://www.gov.uk/government/news/uk-government-powers-on-with-reforms-to-solvency-ii> [accessed 29 June 2022]

the ‘risk margin’, which is an extra capital buffer that many insurers must hold, Second, it proposes reforming the ‘matching adjustment’, which allows insurers to reduce their long-term liabilities if they invest in certain assets. The Government proposes changing the eligibility criteria to allow long-term projects to be included in these portfolios. The consultation said:

“The Government wants to ensure that it operates to better enable insurance firms to play an appropriate role in the provision of long-term, productive finance to the economy and the provision of sustainable finance, consistent with the Government’s ‘levelling up’ priorities and its objectives to address climate change.”

211. The third reform is intended to reduce administrative burdens on companies, including doubling the thresholds at which insurers are included within the solvency regime.²⁶⁸
212. The EU is also carrying out a review of the Solvency II framework to ensure it offers greater flexibility and opportunities for investment in infrastructure and long-term sustainable projects.²⁶⁹
213. The Association of British Insurers told us that a “meaningful reform of Solvency II would substantially increase the capacity of insurers to provide long-term capital to underpin investments consistent with the Government’s energy strategy.” It said it could release £95 billion, which could be reallocated to invest in sustainable energy sources and infrastructure.²⁷⁰
214. Sarah Breeden told us that the reforms could lower capital requirements on insurers, enabling them to support additional investment in productive assets. However, “it is also possible that insurers might give that capital back to shareholders rather than put it to work”, and there was a risk of reducing the resilience of the insurance sector. She explained that it was necessary to strike a balance between unlocking capital for investment and protecting policyholders.²⁷¹
215. Pension funds, although not directly affected by Solvency II reforms, are another source of long-term capital which can be used for investing in sustainable infrastructure. Occupational pension schemes in the UK hold almost £2 trillion in assets and the Government has said that they are the largest single group of institutional investors in the UK.²⁷² The then Economic Secretary told us that to encourage defined benefit pension schemes to invest in long-term assets the Government, working with the FCA, is introducing rules and structures for long-term investment funds: “we very much hope asset managers will take up [the opportunity], and we hope that we will

268 HM Treasury, *Review of Solvency II: Consultation* (28 April 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1071899/20220328_Review_of_Solvency_II_Consultation.pdf [accessed 29 June 2022]

269 On 17 June 2022, the European Council agreed its position on the Solvency II reform proposals. Work to agree a final text with the European Parliament can now start. See, European Council, ‘Solvency II: Council agrees its position on updated rules for insurance companies’ (17 June 2022): <https://www.consilium.europa.eu/en/press/press-releases/2022/06/17/solvency-ii-council-agrees-its-position-on-updated-rules-for-insurance-companies/> [accessed 6 July 2022]

270 Written evidence from the Association of British Insurers ([ESI0030](#))

271 [Q 237](#) (Sarah Breeden)

272 Department for Work and Pensions, *Consultation Stage Impact Assessment on Climate Change Risk – Governance and Disclosure (TCFD) Proposals* (27 January 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/955174/impact-assessment-consultation-climate-change-risk.pdf#page=5 [accessed 6 July 2022]

see funds launched imminently.”²⁷³ The ABI said the Government should ensure the criteria for “the long-term asset fund is as ambitious as possible”.²⁷⁴

216. The then Economic Secretary said that any reforms to Solvency II could unlock “several tens of billions that can be invested”, although he declined to provide a figure on how much. He said any reforms should not “drive more risk”; changes should be “reasonable” and “justified”.²⁷⁵
217. **The Solvency II legislation is designed to protect policy holders and provide financial stability, but it also limits investment levels by major asset holders in the insurance sector. Reform of Solvency II will be the first significant change to the UK’s financial regulatory architecture following the UK’s exit from the EU. We agree with the Government that there is a significant opportunity to allow insurers to provide long-term capital to support investment consistent with the transition to net zero. The insurance industry has said such changes would release substantial capital, but we note that insurers do not have an obligation to use released capital for such investments. When it publishes the outcome of its consultation the Government needs to set out how it can encourage unlocked capital to support the energy transition.**

273 [Q 284](#) (John Glen MP)

274 Written evidence from the Association of British Insurers ([ESI0030](#))

275 [Q 284](#) (John Glen MP)

CHAPTER 5: INTERNATIONAL COOPERATION

EU Common Purchase Platform

218. Uncertainty over the Russian supply of gas, following the Russian invasion of Ukraine, is causing high and volatile European gas and electricity prices. Some EU member states may struggle to replace Russian gas at reasonable prices.
219. On 8 April 2022, the European Commission announced it had hosted the first meeting of the voluntary ‘EU Energy Purchase Platform’ to secure supplies of gas (particularly LNG) and hydrogen. The Platform was created to secure the EU’s energy supply “at affordable prices in the current geopolitical context and to phase out dependency on Russian gas”. The EU intends to use the platform to mobilise “the collective political and market weight of the EU ... in particular for the refilling of gas storage facilities in time for next winter”.²⁷⁶ The exact role of the platform is unclear. More work is required to decide how joint negotiations between member states and their energy companies might operate in practice, and whether there is appetite in the private sector for joint negotiations. It is unclear what effect EU competition rules will have on the venture.
220. The Energy Minister told us the European Commission had said the EU Energy Purchase Platform “should also benefit EU partners in its close neighbourhood, potentially including the UK”. The UK would “act in our national interest but working with our friends and partners.” It was too early to say whether the UK would be included or excluded from the platform.²⁷⁷
221. **The EU has started to create the foundations for a Common Purchase Platform so that it can leverage its collective weight in negotiations with gas and hydrogen producers. While these plans are at an early stage, if the EU’s ambitions are realised, they may affect the UK’s energy supply. The UK could benefit from buying energy with the EU, but more detail is needed on how trade would operate in practice. It is important that the Government engages with the EU to increase the chance that the UK can benefit from working with the Common Purchase Platform in the event that there is some advantage in doing so. The Government should explain its assessment of the EU’s plans, what role it foresees for the UK, and how UK policymakers and the private sector could contribute to policy decisions.**

Supply chains for the transition

222. The sharp increase in competition for gas supplies has led many governments, including the UK’s, to accelerate steps to become more self-sufficient in producing energy, particularly via low-carbon sources such as nuclear and renewables. However, we heard that greater reliance on these technologies would make the UK dependent on resources from other countries and that

276 European Commission, ‘Energy Security: Commission hosts first meeting of EU Energy Purchase Platform to secure supply of gas, LNG and hydrogen’ (8 April 2022): https://ec.europa.eu/commission/presscorner/detail/en/IP_22_2387 [accessed 29 June 2022]. The European Council agreed the proposal on 25 March 2022.

277 [Q 255](#) (Greg Hands MP)

geopolitical competition in renewable energy generation and supply chains would be a factor.²⁷⁸

223. China has significant power over the international supply chain for certain renewable technologies.²⁷⁹ The European Commission said there are “major concerns” over the supply of rare earths in the manufacture of wind turbines and the supply of components for solar; the European Commission described China’s role in both as “quasi-monopolistic.” China supplies 66% of finished Lithium-ion batteries.²⁸⁰
224. The Government’s March 2021 *Integrated Review of Security, Defence, Development and Foreign Policy* warned how states could undermine the economic and security interests of rivals: “there will be increased competition for scarce natural resources, such as critical minerals including rare earth elements, and control of supply may be used as leverage on other issues.”²⁸¹ Critical minerals include lithium, cobalt and rare earth elements such as neodymium, which are integral to low-carbon technologies such as batteries, electric vehicles, wind turbines and solar panels.
225. According to the US government, global demand for critical minerals will rise by 400–600% over the next few decades. For lithium and graphite, which are used in electric vehicle batteries, demand may increase by 4,000%.²⁸² An April 2022 report by Euromateux, a European industry body, identified risks to supply from 2020 to 2050 as the deployment of renewable energy technologies increases, as set out in Figure 11.²⁸³

278 For example, see written evidence from the UK Energy Research Centre ([ESI0029](#)) and [Q 142](#) (Professor Michael Bradshaw).

279 US Government, ‘Securing a Made in America Supply Chain for Critical Minerals’ (22 February 2022): <https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/22/fact-sheet-securing-a-made-in-america-supply-chain-for-critical-minerals/> [accessed 29 June 2022]

280 European Commission, *Critical Raw Materials for Strategic Technologies and Sectors in the EU: A Foresight Study* (2020): https://rmis.jrc.ec.europa.eu/uploads/CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2020.pdf [accessed 29 June 2022]

281 Cabinet Office, *Global Britain in a Competitive Age: the Integrated Review of Security, Defence, Development and Foreign Policy* (16 March 2021): <https://www.gov.uk/government/publications/global-britain-in-a-competitive-age-the-integrated-review-of-security-defence-development-and-foreign-policy/global-britain-in-a-competitive-age-the-integrated-review-of-security-defence-development-and-foreign-policy> [accessed 29 June 2022]

282 US Government, ‘Securing a Made in America Supply Chain for Critical Minerals’ (22 February 2022): <https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/22/fact-sheet-securing-a-made-in-america-supply-chain-for-critical-minerals/> [accessed 29 June 2022]

283 Eurometaux, *Metals for Clean Energy: Pathways to solving Europe’s raw materials challenge* (25 April 2022): <https://eurometaux.eu/media/jmxf2qm0/metals-for-clean-energy.pdf> [accessed 29 June 2022]

Figure 11: Global supply and demand per decade under IEA transition scenarios

	STEPS Scenario			SDS Scenario		
	2020 - 2030	2030 - 2040	2040- 2050	2020 - 2030	2030 - 2040	2040- 2050
Aluminium	Yellow	Grey	Grey	Yellow	Grey	Grey
Copper	Yellow	Grey	Grey	Red	Yellow	Grey
Zinc	Grey	Grey	Grey	Grey	Grey	Grey
Silicon	Grey	Grey	Grey	Grey	Grey	Grey
Lithium	Yellow	Grey	Grey	Red	Grey	Grey
Nickel	Yellow	Yellow	Grey	Red	Yellow	Grey
Cobalt	Yellow	Grey	Grey	Red	Yellow	Grey
Dysprosium	Yellow	Grey	Grey	Red	Grey	Grey
Neodymium	Yellow	Grey	Grey	Red	Grey	Grey
Praseodymium	Yellow	Grey	Grey	Red	Grey	Grey

■ Not enough projects announced to meet demand
■ Base case supply insufficient, project pipeline sufficient. Innovation and investment needed
■ No issues expected, supply potential sufficient

Source: Eurometaux, *Metals for Clean Energy: Pathways to solving Europe’s raw materials challenge* (25 April 2022): <https://eurometaux.eu/media/jmxf2qm0/metals-for-clean-energy.pdf> [accessed 29 June 2022]. STEPS refers to the IEA’s Stated Policies Scenario and SDS refers to demand under the IEA’s Sustainable Development Scenario.

226. Mark Carney told us that China had “given a lot of thought and taken a lot of actions to secure supply, some of it domestically and some of it more broadly, whereas we in the G7 have done relatively little”.²⁸⁴ Simone Tagliapietra, a Senior Fellow at Bruegel, said reducing this dependency on China was “a major political challenge” for all the OECD countries.²⁸⁵ In response to heightened geopolitical tensions, the US and EU have launched strategies for securing reliable supplies of critical minerals.

227. In June 2021, the US government published an assessment of supply chain dependencies, which made recommendations on how it will reduce reliance on “adversarial nations” for critical minerals and materials. These

284 Q 189 (Mark Carney)

285 Q 142 (Simone Tagliapietra). He said that the European Union imports more than 65% of the raw materials it uses from China.

recommendations included raising international standards in commodities trade and governance, expanding domestic production and incentivising sustainable production by US allies.²⁸⁶ In April 2022, Janet Yellen, US Treasury Secretary, outlined a vision to foster new supply chains in raw materials with trusted allies through an “extension of market access”, which presumably entails new trade agreements.²⁸⁷

228. In September 2020, the European Commission published an action plan on critical raw materials and an accompanying “foresight study” for strategic technologies and sectors.²⁸⁸ The Commission announced the establishment of a European Raw Materials Alliance to increase resilience in EU supply chains, increase mining and processing projects in the EU by 2025, increase research and development spending on mining and processing technologies and develop sustainable financing criteria for mining and extractive sectors. The Commission will develop international partnerships to secure the supply of critical raw materials not found in Europe while introducing high-sustainability standards. In November 2019, the European Investment Bank introduced an “energy lending policy”, under which it will support projects relating to the supply of critical raw materials needed for low-carbon technologies in the EU.²⁸⁹
229. In the UK, the British Geological Survey has long had a role in assessing the security of supply of critical minerals.²⁹⁰ More recently, the Government established a Critical Minerals Expert Committee to provide independent advice. The Government has announced the establishment of a Critical Minerals Intelligence Centre to provide analysis on stocks and flows of critical minerals and will publish a critical minerals strategy in 2022.²⁹¹
230. Simone Tagliapietra explained several steps that he thought the Government should take to diversify supply away from China. First, there should be a more active industrial policy to oversee the development of technologies which are less dependent on such materials. Second, new supply chains based in the UK and among close allies should be developed, which could build on the EU’s recent work exploring the availability of critical minerals in Europe. Third, more critical minerals should be recycled, reducing the need for imports and reducing carbon emissions during manufacture.²⁹²

286 US Government, *Building resilient supply chains, revitalizing American manufacturing and fostering broad based growth* (June 2021): <https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf> [accessed 29 June 2022]

287 Atlantic Council, ‘Transcript: US Treasury Secretary Janet Yellen on the next steps for Russia sanctions and ‘friend-shoring’ supply chains’ (13 April 2022): <https://www.atlanticcouncil.org/news/transcripts/transcript-us-treasury-secretary-janet-yellen-on-the-next-steps-for-russia-sanctions-and-friend-shoring-supply-chains/> [accessed 29 June 2022]

288 European Commission, ‘Commission announces actions to make Europe’s raw materials supply more secure and sustainable’ (3 September 2020): https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1542 [accessed 29 June 2022]. The European Commission also published a list of critical raw materials.

289 European Investment Bank, *European Investment Bank, Energy lending policy: supporting the energy transformation* (14 November 2019): https://www.eib.org/attachments/strategies/eib_energy_lending_policy_en.pdf [accessed 29 June 2022]

290 Q 142 (Professor Michael Bradshaw)

291 Department for Business, Energy and Industrial Strategy, *HM Government, Net Zero Strategy: Build Back Greener* (19 October 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf [accessed 29 June 2022]

292 Q 142 (Simone Tagliapietra)

231. Dr Jack Sharples, a Research Fellow at the Oxford Institute for Energy Studies, said that dependence on potentially adversarial countries for critical minerals was different to dependence on them for fossil fuels:

“If you have a gas-fired power plant you need a continuous supply of gas in order to continue generating electricity from that plant. [However] if you build an offshore wind farm, once it is in place then that will keep—you might not be able to build any more if your supply of raw materials is interrupted but the infrastructure that you have will continue generating electricity.”²⁹³

232. Jason Bordoff agreed that the risk profile for critical mineral dependency was different to fuel dependency but said national security policy should aim to reduce such dependencies anyway.²⁹⁴ He said that governments should encourage diversity of supply by supporting resource extraction, particularly in “friendly” countries:

“The greatest resilience for supply of imported raw materials will come ... from diversification of supply sources and encouraging competition between them. I think that geopolitical means can be deployed to ensure resilience of such supply sources, including trade deals that satisfy reciprocal needs”.

233. He said China’s dominance in processing critical minerals was a “national security concern” and incentives should be provided to establish environmentally responsible domestic processing. He said sustainability standards should be negotiated with like-minded international partners.²⁹⁵

234. The Rt Hon. Greg Hands MP, the Energy Minister, told us that the Government’s critical minerals strategy would include “steps to improve the security of supply of critical minerals, boosting domestic capabilities and showing leadership internationally.”²⁹⁶

235. **Increasing the UK’s reliance on renewable energy sources will create new dependencies on foreign countries, particularly in terms of manufacturing renewable technologies and accessing critical minerals and components which are used in the production of those technologies. This could create new risks in supply chains. To mitigate this, the Government should work with allies to ensure that the UK does not become reliant on strategic competitors, notably China, for critical minerals and components, and identify what investment is needed to achieve this. The Government will need to ensure that its foreign and trade policies (on both critical minerals and oil and gas) and its policy on net zero are aligned.**

236. **The Government’s critical minerals strategy, which is due to be published later in 2022, should examine supply chain vulnerabilities and policies to mitigate them. Ahead of its publication, the Government should engage with the financial and industrial sectors to assess the viability of preferential supply chains, the timeframes in which they could be created and how they might affect the cost of capital over time for developing renewable technologies. It should publish its conclusions in the upcoming strategy.**

293 [Q 142](#) (Dr Jack Sharples)

294 [Q 226](#) (Jason Bordoff)

295 [Q 227](#) (Jason Bordoff)

296 [Q 254](#) (Greg Hands MP)

CHAPTER 6: AN ENERGY STRATEGY FOR THE FUTURE

237. **Given all the issues raised in this report, we conclude that a detailed and comprehensive plan is needed from Government which so far is missing. The gaps between the Government's ambitions and practical policy are significant. The Government has set targets for low carbon power generation, without explaining what the transition will cost, what combination of public and private investment it expects, and what choices will be required. The Government should set this out in broad terms and provide an assessment of relevant costs and savings.**
238. **The Russian invasion of Ukraine has created global energy supply issues and has highlighted the vulnerabilities of the UK energy supply. To help avoid a disorderly transition, the Government should set out a net zero delivery plan which takes account of energy security and foreign policy considerations. It should make clear what decisions will need to be made and by when. Any such plan will need to incorporate the flexibility required in a three-decade, economy-wide transition. Nevertheless, such a plan would help to provide additional confidence to the public, businesses, and investors. The present uncertainty and lack of direction in policy and strategy is hampering consumers, businesses, and investors from responding on the scale and with the urgency required.**

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Introduction

1. Decarbonising the UK's energy system while ensuring that the UK's energy supply is affordable and reliable is a highly complex challenge. Russia's invasion of Ukraine has made the task more complex. No government can be expected to predict the future with accuracy, nor should a government seek to plan for every eventuality. Instead, the Government should address issues that undermine investor confidence and increase resilience in the energy system. The Government will need to:
 - Explain how the transition will be funded, including the balance of public and private investment;
 - Establish appropriate market mechanisms and incentives to encourage investment in low carbon technologies;
 - Review the planning system in England to ensure that the system, which already reflects climate change objectives, is updated to reflect energy security objectives;
 - Plan for the emerging international competition over renewable energy supply chains. (Paragraph 19)
2. One challenge for the Government is to ensure that short-term measures to maintain security of supply are consistent with the Government's net zero plans, and that this objective is well communicated to industry. While the Government should continue to address the impact of the immediate supply crisis, it should also act to encourage long-term investment to facilitate the transition to net zero, which should help to ensure more sustainable energy security and greater long-term price stability. In this report, we set out what needs to be done now to increase investment that will assist in carbon reduction and improve energy resilience. (Paragraph 20)

Investment and action in the short term

3. High energy prices mean households are concerned about energy prices and may therefore focus more on energy usage. The Government can harness this public concern to speed up the pace of home insulation and other measures to improve home energy efficiency. Increasing the supply of installations should be driven by clear, long-term signals from the Government, and a commitment to working with the private sector. These measures require significant investment in both the near and longer-term. The Government's British Energy Security Strategy does not sufficiently explain how such investment will be released. (Paragraph 30)
4. We recommend that the Government publishes an energy demand reduction strategy. To strengthen public confidence, the Government should work with the financial sector to provide financing options and increase incentives for investment in energy efficiency measures. In addition, the Government needs to set clear signals so supply capacity can be increased along with steps to support the development of resilient supply chains and workforce skills. It should have a clear, practical delivery plan which learns from the failings of previous initiatives. The strategy should be published as soon as possible. (Paragraph 31)

5. The British Energy Security Strategy sets out several ambitions for increasing the deployment of renewable energy, which we support. While we acknowledge some local opposition, onshore wind is one of the cheapest and fastest ways to increase renewable energy generation. We recommend the Government re-examines its ambitions for onshore wind when it publishes its consultation on creating local partnerships with communities living near energy infrastructure, later in 2022. (Paragraph 39)
6. We support the Government in seeking to maintain existing energy generation in the short term, including coal-fired power stations where necessary, to reduce dependency on expensive gas imports. We welcome the Government's continuing commitment to renewable energy in the longer term. Extending the life of nuclear power stations over coal power stations where possible, and cost effective, would result in lower carbon emissions. (Paragraph 44)
7. While we welcome statements from ministers on UK–EU cooperation on energy security, we note reports of Government contingency planning for scenarios in which either the UK or EU cuts gas exports to the other party if there is a severe shortage. As one of the few countries in Europe with significant ability to import LNG and transport natural gas, the UK is playing an important role in supporting security of supply in Europe. In return, some EU countries have gas storage capacity from which the UK could benefit this winter. The Government should urgently seek an agreement with the EU and, if necessary, Norway on energy cooperation to manage possible shortages. (Paragraph 54)

Increasing investment in the transition

8. While we welcome the Government's clear and ambitious targets for many renewable technologies, it should set out now the policy detail on how these targets will be met. The Government should provide more detail on the capacity, timeframes and expected costs of long-duration energy storage. It should also quickly develop a market model for long-duration energy storage. The view among witnesses was that a cap and floor model would be most effective. (Paragraph 74)
9. We welcome the Government's ambition to increase hydrogen production. We support developing both green and blue hydrogen; the evidence suggests this builds on the UK's industrial and geological strengths in offshore wind and gas reservoirs. We recommend that the Government outlines market structures and mechanisms for hydrogen as soon as feasible. (Paragraph 87)
10. Carbon capture and storage is expected to play a small, but valuable, long-term role in the transition to net zero. The limited scale means that there is likely to be little appetite for the private sector to invest in it without a stable and enduring commitment from Government to support it. The Government should therefore play a role in setting up clusters and in designing market models as soon as feasible so that investors are given greater confidence that there will be a long-term market for carbon capture and storage. (Paragraph 94)
11. There have been conflicting statements from ministers about whether the Government intends to start the construction process for one nuclear reactor each year so that up to eight are in development at the same time or intends a different sequencing. This is especially important if a RAB model

of financing is used because of the costs that would fall on consumer bills, including those of the poorest, during construction. The Government should set out its delivery plan and construction timetable for nuclear reactors. It should also clarify what impact delivering multiple projects simultaneously could have on consumer bills. (Paragraph 104)

12. The Government should explain why it is aiming for a target of 24GW to be supplied by nuclear by 2050 when this is over double the capacity assumed by the Climate Change Committee. The Government should set out its cost analysis of 24GW of nuclear capacity compared to alternative options of providing baseload capacity. (Paragraph 105)
13. While we have heard that the Regulated Asset Base model could unlock private sector investment for nuclear, questions remain about the cost impact on consumers. The Government should ensure that plans for new nuclear power stations are as robust as possible, and credible in terms of cost and timing, and the Government should set out how it will protect energy bill payers in the event of cost overruns and construction delays. (Paragraph 106)
14. As there is evidence of substantial private sector-interest in investing in sustainable projects, the UK Infrastructure Bank should ensure that it adds value by focusing investment on innovative and potentially riskier projects with the aim of attracting and enabling additional private-sector funding. It should focus on using its investments to manage, share and reduce risk to enable the private sector to invest where otherwise it would be difficult. We note, however, that the UKIB has limited risk capital. (Paragraph 113)
15. In the short term, Europe needs alternative sources of oil and gas to replace supply from Russia. Moreover, the UK will continue to require gas during the transition. Enabling more investment in North Sea production can help address this, although it will not provide a significant reduction in energy prices over the next few winters. Over the medium term, the use of oil and gas needs to fall to align with the strategies on climate change. Any extension of oil and gas exploration or investment should focus on projects with short lead times and payback periods to limit the risk of stranded assets. There is uncertainty over how the risk of creating stranded assets will be managed. The Climate Compatibility Checkpoint should ensure that additional investment in oil and gas is focused on production that reflects the UK's diminishing but continued demand for gas during the transition and not enable substantial levels of long-term production that conflicts with net zero objectives. (Paragraph 127)
16. The UK may benefit from additional gas storage capacity which can also be made suitable for hydrogen storage. We welcome the Government and Centrica examining the case for reopening the Rough storage facility. Additional storage could provide more resilience against supply bottlenecks and would provide more security were agreements to import energy from mainland Europe to break down. The Government should examine the case for opening other storage sites which could be adapted for hydrogen. (Paragraph 134)
17. Balancing national policy with local preferences is challenging but the planning process takes too long for renewables, nuclear and the transmission network. (Paragraph 144)

18. We recommend that the Government encourages schemes to compensate residents for energy projects built in their areas. This already happens for certain onshore wind projects but should be extended to other forms of low-carbon generation, or grid infrastructure. (Paragraph 145)
19. We recommend that energy security objectives be included in the National Planning Policy Framework alongside the existing climate change objectives. (Paragraph 146)
20. We also recommend that the planning process be expedited for nuclear reactors that are sited on locations of former nuclear reactors, while maintaining high health and safety standards. (Paragraph 147)
21. Insufficient investment in the transmission network, is delaying the deployment of renewable projects. We support proposals by Ofgem to improve anticipatory investment and deliver sufficient investment in grid capacity to unlock additional investment in renewables and to increase the UK's energy supply at greater speed provided that the impact on consumer bills can be contained. (Paragraph 153)
22. The Future Systems Operator will have a key role in encouraging anticipatory investment to remove barriers in the grid transmission network and to enable a growing capacity of renewables to connect to the grid. We recommend that the Future Systems Operator be set up in a way that is operationally independent from Government. It should be set up promptly since decisions are needed in the short term to ensure that the grid is capable of transmitting the increased electricity supply needed for the net zero energy transition. (Paragraph 160)
23. The Government should set out clearly what the Future Systems Operator's relationship will be with BEIS, Treasury, Ofgem and the recently appointed Electricity Networks Commissioner. It is unclear what role the new Energy Networks Commissioner and industry champions will have in relation to the Future Systems Operator, especially since the Future Systems Operator is intended by the Government to take a 'whole system approach'. Although the Future Systems Operator should be operationally independent, the Government should be responsible for setting its overall policy remit. (Paragraph 161)
24. The Government has introduced an Energy Profits Levy to help pay for financial support to domestic energy consumers. It should explain what effect the levy is expected to have on investment decisions in the North Sea and when it says that the levy could end when oil and gas prices are at "normal" levels, it should quantify what "normal" means. (Paragraph 167)
25. The Government's decision to announce a possible extension of the levy to electricity generators, before having assessed whether it is justified, may risk affecting investor confidence in renewables. The Government should set out whether it intends to move forward with a levy on electricity generators as soon as possible, to avoid damaging investor confidence further. (Paragraph 168)
26. The Government should set out whether it plans to extend carbon pricing and provide detail on pricing levels and timescales. This could give more clarity to investors and could provide incentives to fund projects necessary for the transition. (Paragraph 171)

Financial regulation

27. We note the Chancellor's decision to balance the Bank of England's remit to support the transition to net zero with a requirement to have regard to its policies on energy security. Net zero and energy security are compatible objectives and well-designed supervisory policy can support their alignment. We recommend that the Financial Policy Committee, the Prudential Regulation Committee and the Financial Conduct Authority set out, at the earliest opportunity, high-level principles on how they are interpreting the Chancellor's instruction on energy security. (Paragraph 179)
28. Understanding climate risk and managing the transition to a lower-carbon economy requires data and appropriate analytic approaches, which disclosures will help to accumulate. HM Treasury and financial regulators will need to support businesses to make disclosures consistently. Businesses will need support on how to identify quantitative data on their climate impact, particularly in relation to scope 3 emissions which are especially difficult for companies to assess. (Paragraph 188)
29. The quality of data and analytic approaches for assessing climate risks, especially transition risks, are insufficient for regulators to reach judgements on increasing capital requirements on the financial sector. The weakness of the data is exacerbated by a lack of clarity from the Government on energy needs during the transition and how sectors will be expected to adapt. (Paragraph 198)
30. Green taxonomies can help to provide investors with greater confidence to invest in sustainable projects, but they can also be seriously misleading by implying that projects and technology are either green or brown. If poorly designed, they risk driving capital to a narrow subset of existing options, which may stifle innovation and investment and they can fail to take account of the process of transition towards new sets of activities. The Government should be mindful of this risk by avoiding a narrow interpretation of the taxonomy and ensure that guidance to investors reflects the fact that the transition to net zero may involve complex trade-offs and interlinkages between renewables and fossil fuels. The Government should work with other jurisdictions' authorities to ensure that the principles underpinning a UK taxonomy are consistent with other taxonomies: fragmentation causes confusion which can undermine investor confidence. (Paragraph 208)
31. The Solvency II legislation is designed to protect policy holders and provide financial stability, but it also limits investment levels by major asset holders in the insurance sector. Reform of Solvency II will be the first significant change to the UK's financial regulatory architecture following the UK's exit from the EU. We agree with the Government that there is a significant opportunity to allow insurers to provide long-term capital to support investment consistent with the transition to net zero. The insurance industry has said such changes would release substantial capital, but we note that insurers do not have an obligation to use released capital for such investments. When it publishes the outcome of its consultation the Government needs to set out how it can encourage unlocked capital to support the energy transition. (Paragraph 217)

International cooperation

32. The EU has started to create the foundations for a Common Purchase Platform so that it can leverage its collective weight in negotiations with gas

and hydrogen producers. While these plans are at an early stage, if the EU's ambitions are realised, they may affect the UK's energy supply. The UK could benefit from buying energy with the EU, but more detail is needed on how trade would operate in practice. It is important that the Government engages with the EU to increase the chance that the UK can benefit from working with the Common Purchase Platform in the event that there is some advantage in doing so. The Government should explain its assessment of the EU's plans, what role it foresees for the UK, and how UK policymakers and the private sector could contribute to policy decisions. (Paragraph 221)

33. The EU has started to create the foundations for a Common Purchase Platform so that it can leverage its collective weight in negotiations with gas and hydrogen producers. While these plans are at an early stage, if the EU's ambitions are realised, they may affect the UK's energy supply. The UK could benefit from buying energy with the EU, but more detail is needed on how trade would operate in practice. It is important that the Government engages with the EU to increase the chance that the UK can benefit from working with the Common Purchase Platform in the event that there is some advantage in doing so. The Government should explain its assessment of the EU's plans, what role it foresees for the UK, and how UK policymakers and the private sector could contribute to policy decisions. (Paragraph 221)
34. Increasing the UK's reliance on renewable energy sources will create new dependencies on foreign countries, particularly in terms of manufacturing renewable technologies and accessing critical minerals and components which are used in the production of those technologies. This could create new risks in supply chains. To mitigate this, the Government should work with allies to ensure that the UK does not become reliant on strategic competitors, notably China, for critical minerals and components, and identify what investment is needed to achieve this. The Government will need to ensure that its foreign and trade policies (on both critical minerals and oil and gas) and its policy on net zero are aligned. (Paragraph 235)
35. Increasing the UK's reliance on renewable energy sources will create new dependencies on foreign countries, particularly in terms of manufacturing renewable technologies and accessing critical minerals and components which are used in the production of those technologies. This could create new risks in supply chains. To mitigate this, the Government should work with allies to ensure that the UK does not become reliant on strategic competitors, notably China, for critical minerals and components needed for low-carbon technology, and identify what investment is needed to achieve this. The Government will need to ensure that its foreign and trade policies (on both critical minerals and oil and gas) and its policy on net zero are aligned. (Paragraph 235)
36. The Government's critical minerals strategy, which is due to be published later in 2022, should examine supply chain vulnerabilities and policies to mitigate them. Ahead of its publication, the Government should engage with the financial and industrial sectors to assess the viability of preferential supply chains, the timeframes in which they could be created and how they might affect the cost of capital over time for developing renewable technologies. It should publish its conclusions in the upcoming strategy. (Paragraph 236)

An energy strategy for the future

37. Given all the issues raised in this report, we conclude that a detailed and comprehensive plan is needed from Government which so far is missing. The gaps between the Government's ambitions and practical policy are significant. The Government has set targets for low carbon power generation, without explaining what the transition will cost, what combination of public and private investment it expects, and what choices will be required. The Government should set this out in broad terms and provide an assessment of relevant costs and savings. (Paragraph 237)
38. The Russian invasion of Ukraine has created global energy supply issues and has highlighted the vulnerabilities of the UK energy supply. To help avoid a disorderly transition, the Government should set out a net zero delivery plan which takes account of energy security and foreign policy considerations. It should make clear what decisions will need to be made and by when. Any such plan will need to incorporate the flexibility required in a three-decade, economy-wide transition. Nevertheless, such a plan would help to provide additional confidence to the public, businesses, and investors. The present uncertainty and lack of direction in policy and strategy is hampering consumers, businesses, and investors from responding on the scale and with the urgency required. (Paragraph 238)

APPENDIX 1: LIST OF MEMBERS AND DECLARATIONS OF INTERESTS

Members

Lord Bridges of Headley (Chair)
 Viscount Chandos
 Lord Fox
 Lord Griffiths of Fforestfach
 Lord Haskel (resigned May 2022)
 Lord King of Lothbury
 Baroness Kramer
 Lord Layard (joined May 2022)
 Lord Livingston of Parkhead
 Lord Monks
 Baroness Noakes
 Lord Rooker
 Lord Skidelsky
 Lord Stern of Brentford

Declarations of interest

Lord Bridges of Headley (Chair)
Senior Adviser to Banco Santander

Viscount Chandos
Shareholder in Greencoat UK Wind Plc
Trustee of Esmee Fairbairn Foundation (Investor in Green Energy Funds)

Lord Fox
No relevant interests declared

Lord Griffiths of Fforestfach
No relevant interests declared

Lord Haskel (resigned May 2022)
No relevant interests declared

Lord King of Lothbury
Consultant, Citigroup Global Markets Ltd

Baroness Kramer
No relevant interests declared

Lord Layard (joined May 2022)
No relevant interests declared

Lord Livingston of Parkhead
Non executive director of National Grid plc (also shareholder but below House of Lords threshold of £50k)
Non executive director and shareholder, S&P Global Inc, who has a small part of their business which assesses companies re Sustainability

Lord Monks
No relevant interests declared

Baroness Noakes
Interests in listed shares as shown in the Register of Interests, including shares in energy and financial services companies, some of which could be impacted by the issues covered by the inquiry.

Lord Rooker
Director of the Ludlow Hydro Co-op

Lord Skidelsky

No relevant interests declared

Lord Stern of Brentford

Non-executive Chair of the Board, Systemiq

Climate Advisor RBS/NatWest

Senior Adviser (Climate), Citi

A full list of Members' interests can be found in the Register of Lords' interests:

<https://members.parliament.uk/members/lords/interests/register-of-lords-interests>

Specialist Adviser

Professor Richard Green

No relevant interests declared

APPENDIX 2: LIST OF WITNESSES

Evidence is published online at <https://committees.parliament.uk/work/6535/uk-energy-supply-and-investment/publications/> and available for inspection at the Parliamentary Archives (020 7219 3074).

Evidence received by the Committee is listed below in chronological order of oral evidence session and in alphabetical order. Those witnesses marked with ** gave both oral and written evidence. Those marked with * gave oral evidence and did not submit any written evidence. All other witnesses submitted written evidence only.

Oral evidence in chronological order

*	Julian Critchlow, former Director General of Energy Transformation and Clean Growth at Department for Business, Energy & Industrial Strategy	QQ 1–15
**	Paul Spence, Director of Strategy and Corporate Affairs, EDF Energy	QQ 16–29
**	Emma Pinchbeck, Chief Executive, Energy UK	QQ 16–29
*	Christophe McGlade, Head of the Energy Supply Unit, International Energy Agency	QQ 30–41
*	Catherina Hillenbrand Von Der Neyen, Head of Research, Carbon Tracker	QQ 30–41
*	Mike Tholen, Director of Sustainability, Offshore Energy	QQ 42–52
*	Dr Nina Skorupska CBE, Chief Executive, Renewable Energy Association	QQ 42–52
*	Professor Sir Dieter Helm, Professor of Economic Policy, Oxford University	QQ 55–73
*	Dan Monzani, Managing Director at Aurora Energy Research	QQ 74–90
*	Ed Northam, Green Investment Group, Head of Europe and UK, Macquarie Group Limited	QQ 91–105
*	Simon Redmond, Senior Director, S&P Global	QQ 106–117
*	Michael Liebreich, CEO, Liebreich Associates	QQ 118–132
*	Ian Simm, Founder and CEO, Impax Asset Management	QQ 118–132
*	Professor Michael Bradshaw, Professor of Global Energy, University of Warwick	QQ 133–145
*	Simone Tagliapietra, Senior Fellow, Bruegel	QQ 133–145
*	Dr Jack Sharples, Research Fellow, The Oxford Institute for Energy Studies	QQ 133–145
*	Mike Zehetmayr, Financial Services Risk, Compliance and Regulatory Technology Leader, EY	QQ 146–153

*	Sonja Gibbs, Managing Director and Head of Sustainable Finance at Institute of International Finance	QQ 146–153
*	Simon Virley, Vice Chair, KPMG	QQ 154–160
**	Steve Smith Head of Group Strategy, Market Fundamentals and Internal Consulting, National Grid	QQ 154–160
*	Lord Turner of Ecchinswell, Chair of Energy and Transitions Commission at Institute for New Economic Thinking	QQ 161–166
**	Tom Greatrex, Chief Executive, Nuclear Industry Association	QQ 167–178
**	Tom Samson, CEO, Rolls-Royce SMR	QQ 167–178
*	Mark Carney, UN Special Envoy for Climate Action and Finance at the United Nations	QQ 179–192
**	Martin Pibworth, Chief Commercial Officer at SSE plc	QQ 193–208
*	Zoisa North-Bond, Chief Executive, Octopus Energy Generation	QQ 193–208
*	Marco Alverà, Author of The Hydrogen Revolution, Snam	QQ 209–220
*	Matt Harper, Chief Commercial Officer, Invinity Energy Systems	QQ 209–220
*	Jason Bordoff, Co-founding Dean at Columbia Climate School	QQ 221–230
*	Sarah Breeden, Executive Director, Financial Stability Strategy and Risk, Bank of England	QQ 231–238
*	John Flint, Chief Executive, UK Infrastructure Bank	QQ 239–247
**	Rt Hon. Greg Hands MP, Minister for Energy, Clean Growth, Climate Change at the Department for Business, Energy & Industrial Strategy	QQ 248–269
*	Akshay Kaul, Networks Director, Ofgem	QQ 248–269
*	John Glen MP, Economic Secretary, HM Treasury	QQ 270–289
*	Fayyaz Muneer, Deputy Director Green and Prudential Team, HM Treasury	QQ 270–289

Alphabetical list of all witnesses

*	Marco Alverà, Author of The Hydrogen Revolution, Snam (QQ 209–220)	
	Association of British Insurers (ABI)	ESI0030
	Balance Power	ESI0008
	BEAMA	ESI0003

- * Professor Michael Bradshaw, Professor of Global Energy, University of Warwick ([QQ 133–145](#))

British Geological Survey [ESI0037](#)

Britishvolt [ESI0036](#)
- * Jason Bordoff, Co-founding Dean at Columbia Climate School ([QQ 221–230](#))
- * Sarah Breeden, Executive Director, Financial Stability Strategy and Risk, Bank of England ([QQ 231–238](#))
- * Mark Carney, UN Special Envoy for Climate Action and Finance at United Nations ([QQ 179–192](#))

Chemical Industries Association [ESI0011](#)
- * Julian Critchlow, former Director General of Energy Transformation and Clean Growth at Department for Business, Energy & Industrial Strategy ([QQ 1–15](#))
- ** Department of Business, Energy and Industrial Strategy [ESI0031](#)
- ** EDF Energy [ESI0020](#)

Energy Intensive Users Group [ESI0018](#)
- ** Energy UK [ESI0025](#)

Roland Fisher [ESI0028](#)
- * John Flint, Chief Executive, UK Infrastructure Bank ([QQ 239–247](#))
- * Sonja Gibbs, Managing Director and Head of Sustainable Finance at Institute of International Finance ([QQ 146–153](#))
- * John Glen MP, Economic Secretary, HM Treasury ([QQ 270–289](#))
- ** Tom Greatrex, Chief Executive, Nuclear Industry Association ([QQ 167–178](#))

Green Finance Institute [ESI0034](#)
- ** Rt Hon. Greg Hands MP, Minister for Energy, Clean Growth, Climate Change at Department for Business, Energy & Industrial Strategy ([QQ 248–269](#))
- * Matt Harper, Chief Commercial Officer, Invinity Energy Systems ([QQ 209–220](#))

Dr Alexandra Harrington, Lecturer in Law (Environment), Lancaster University Law School [ESI0009](#)

F Hay [ESI0010](#)
- * Professor Sir Dieter Helm, Professor of Economic Policy, Oxford University ([QQ 55–73](#))

- * Catherina Hillenbrand Von Der Neyen, Head of Research, Carbon Tracker ([QQ 30–41](#))

Hitachi Energy [ESI0005](#)

Institution of Civil Engineers [ESI0012](#)
- * Akshay Kaul, Networks Director, Ofgem([QQ 248–269](#))
- * Michael Liebrich, CEO, Liebreich Associates ([QQ 18–132](#))

Liquid Gas UK [ESI0013](#)

Make UK [ESI0023](#)
- * Christophe McGlade, Head of the Energy Supply Unit at International Energy Agency ([QQ 30–41](#))

Professor Ann Muggeridge, Professor Adam Hawkes and Professor Richard Green’ [ESI0040](#)

Clive Moffatt, Consultant, Moffatt Associates [ESI0001](#)
- * Dan Monzani, Managing Director at Aurora ([QQ 74–90](#))

Fayyez Muneer, Deputy Director Green and Prudential Team, HM Treasury ([QQ 270–289](#))
- ** National Grid [ESI0026](#)

National Grid Electricity System Operator [ESI0032](#)
- * Ed Northam, Green Investment Group, Head of Europe and UK, Macquarie Group Limited ([QQ 91–105](#))
- * Zoisa North-Bond, Chief Executive, Octopus Energy Generation ([QQ 193–208](#))

Nuclear Consulting Group [ESI0033](#)
- ** Nuclear Industry Association [ESI0007](#)
- ** Martin Pibworth, Chief Commercial Officer, SSE plc ([QQ 193–208](#))
- ** Emma Pinchbeck, Chief Executive, Energy UK ([QQ 16–29](#))

Positive Money [ESI0016](#)
- * Simon Redmond, Senior Director, S&P Global ([QQ 106–117](#))

RethinkX [ESI0019](#)

RWE [ESI0038](#)
- ** Tom Samson, CEO, Rolls-Royce SMR ([QQ 167–178](#))
- * Dr Jack Sharples, Research Fellow, The Oxford Institute for Energy Studies ([QQ 133–145](#))

- * Ian Simm, Founder and CEO, Impax Asset Management ([QQ 118–132](#))
- Mr John Simmons, Visiting Lecturer at Hertfordshire Business School, University of Hertfordshire [ESI0004](#)
- * Dr Nina Skorupska CBE, Chief Executive, Renewable Energy Association ([QQ 42–52](#))
- ** Steve Smith Head of Group Strategy, Market Fundamentals and Internal Consulting, National Grid ([QQ 154–160](#))
- So Energy [ESI0017](#)
- ** Paul Spence, Director of Strategy and Corporate Affairs, EDF Energy ([QQ 16–29](#))
- ** SSE plc [ESI0014](#)
[ESI0035](#)
[ESI0039](#)
- * Simone Tagliapietra, Senior Fellow, Bruegel ([QQ 133–145](#))
- Tallarna Ltd [ESI0015](#)
- Dr Theodore D C Hobson, Postdoctoral Research Associate at Stephenson Institute for Renewable Energy, University of Liverpool [ESI0024](#)
- * Mike Tholen, Director of Sustainability, Offshore Energy ([QQ 42–52](#))
- John Tulloch, Retired power station electrical engineer at Ex-SSE [ESI0022](#)
- * Lord Turner of Ecchinswell, Chair of Energy and Transitions Commission at Institute for New Economic Thinking ([QQ 161–166](#))
- UK Energy Research Centre [ESI0029](#)
- Unite the Union [ESI0027](#)
- * Simon Virley, Vice Chair, KPMG ([QQ 154–160](#))
- * Mike Zehetmayr, Financial Services Risk, Compliance and Regulatory Technology Leader, EY ([QQ 146–153](#))

APPENDIX 3: CALL FOR EVIDENCE

The House of Lords Economic Affairs Committee, chaired by Lord Bridges of Headley, is launching an inquiry on UK energy supply and investment.

The UK's prosperity and competitiveness relies in part on access to secure and affordable energy. The Government has committed to reducing carbon emissions to net zero by 2050. Therefore, the Committee is seeking evidence to help it to answer the following question:

Is the Government's energy strategy delivering investment in an energy supply that is resilient, affordable and in line with achieving net zero emissions? If not, what should be done?

In answering this question, we invite authors of written submissions to address some or all the following supplementary questions:

1. To what extent are the causes of recent rises in energy prices likely to be long-term features of global energy markets? Are the Government's policies for reducing the impact of higher energy prices on consumers sustainable and in line with long-term energy objectives? If not, what alternatives are there?
2. What are the main challenges as regards energy supply and storage which public policy must address over the next decade?
3. What are the main international and geopolitical factors and risks affecting the security and affordability of the UK's energy supply? How should the Government work with international partners on energy policy and respond to greater international competition for energy supply?
4. What level of investment will be needed in the UK's energy supply to secure an orderly transition, particularly over the next decade? Is sufficient private capital being invested in reliable and affordable energy sources that are in line with climate objectives, including the commitment to net zero (for example, hydrogen and nuclear)?
5. What effect is financial services regulation, and the commitments made by financial services providers to achieve net zero in 2050, having on energy investment? Specifically, is regulation getting the right balance between encouraging investment in renewable energy and supporting the green transition, while also ensuring security of supply?
6. What should the Government do to incentivise and enable investment in, and financing of, reliable and affordable energy that is in line with its climate objectives, including net zero by 2050?
7. What role will oil and gas play in the UK's energy mix as it transitions to net zero? How should we ensure that these sectors receive sufficient investment to guarantee supply, while not slowing the move to renewable energy sources? What level of investment will be needed?
8. What incentives could the Government provide to households and businesses to reduce demand for energy or to improve energy efficiency?
9. What lessons are there for the UK from comparable countries in terms of securing investment in reliable and affordable energy?

Authors of written submissions are asked to note that the focus of this inquiry is on long-term energy policy and trends in the energy market.

The Committee is looking to hear from as diverse a range of views as possible—if you think someone you know would have an interest in contributing to the inquiry, please pass this on to them.

Short, concise submissions are preferred. Responses should not be longer than five sides of A4. The Committee cannot accept anything that has not been prepared specifically in response to this call for evidence, or that has been published elsewhere.

This is a public call for evidence. Please bring it to the attention of other groups and individuals who may not have received a copy directly.