

Research Briefing

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Energy Bill [HL] 2022-23, parts 1, 2 & 3: carbon storage, hydrogen, and new technologies



Summary

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Summary

The Government's [Energy Bill \[HL\] 2022-23](#) was introduced in the House of Lords on 6 July 2022. It makes provisions affecting the energy sector, focused on three areas:

- Leveraging investment in clean technologies
- Reforming the UK's energy system and protecting consumers
- Maintaining the safety, security, and resilience of the energy systems across the UK

This briefing covers leveraging investment in clean technologies and relates to parts 1 to 3 of the Bill: carbon dioxide (CO₂) transport and storage, hydrogen production and new technology.

Second reading of the Bill in the House of Commons is scheduled to begin on 9 May 2023.

Parts 1 to 3 of the Bill

The Bill's [explanatory notes](#) state that parts 1, 2 and 3 of the Bill aim to ensure a low carbon energy system is developed. This would reduce emissions and provide low carbon power. Measures include:

- Establishing an economic regulation and licensing regime for CO₂ transport and storage with the Office of Gas and Electricity Markets (Ofgem) as the economic regulator.
- Enabling the Government to implement and administer hydrogen and carbon capture business models including introducing a new hydrogen levy.
- Enabling the establishment of a market-based mechanism for low-carbon heat.
- Enabling the effective and safe delivery of a village scale hydrogen heating trial.
- Excluding fusion energy facilities from nuclear site licensing requirements under the Nuclear Installations Act 1965 (NIA 1965).

Debate during Lords stages

Purpose of the Bill

During Lords committee stage there was some debate about the Bill's overall purpose. Amendments were tabled calling for the Bill to be more closely linked to the UK's climate objectives, or to go further in securing the UK's energy supply. However, these amendments were either withdrawn or not moved.

Carbon capture, usage, and storage

Government amendments on carbon capture, usage, and storage (CCUS) were all agreed to. These were predominantly minor technical amendments with the exception of amendments 36 and 65. Amendment 36 inserts new schedule 3 into the Bill which provides for the enforcement of CO₂ transport and storage licence conditions. Government amendment 65 inserts new clause 84 which provides the Secretary of State with powers to modify the licences of gas and electricity market participants.

Hydrogen levy

Government plans to introduce a hydrogen levy have been met with [scepticism from some stakeholders](#) who feel it would place an unfair economic burden on consumers during increasing energy and living costs.

On report in the Lords, an opposition amendment which would remove the Secretary of State's power to impose a levy on gas and hydrogen suppliers was added to the bill.

Hydrogen village trial

There was debate during Lords stages about the viability of hydrogen as an option for decarbonising heat based on its efficiency, cost, environmental impact and safety.

The Government acknowledged concerns but set out that the hydrogen trial will provide evidence for strategic decisions on the future of heat decarbonisation. Clauses relating to the hydrogen grid conversion trial were retained in the Bill.

Low-carbon heat scheme

Heat pumps are a low carbon heating technology. They use electricity to extract heat from the surrounding environment to provide heating to buildings. Common types of heat pump include air source heat pumps (ASHPs) and ground source heat pumps (GSHPs).

To meet the Government's target to reduce UK emissions to 'net zero' by 2050, heating systems in homes will need to be decarbonised. Heat pumps are one of the main technologies being proposed by the Government to achieve this.

In October 2021 the Government published the [Heat and Buildings Strategy](#). This set out a range of plans to promote the use of heat pumps, including:

- A target to grow the market for heat pumps from the (then current) rate of around 35,000 installations per year to 600,000 per year by 2028, to help put the UK on track to meet the Government's 2050 'net zero' target.
- The introduction of a market-based mechanism for heat pumps, placing an obligation on fossil fuel boiler manufacturers to achieve the sale of a number of heat pumps proportional to their UK boiler sales over a given period. The obligation would be set in line with the trajectory required to deliver the 2028 target.

Part 3, chapter 1 of the Bill would contribute to the plans in the Heat and Building Strategy by introducing powers to enable the introduction and regulation of a new low-carbon heat scheme. This would obligate manufacturers of fossil fuel heating appliances to meet a rising standard for low-carbon heat pump sales as a proportion of their total appliance sales.

During the Lords stages Government amendments were agreed that would clarify how targets in the scheme apply to manufacturers, and would require regulations to provide for the right to appeal against financial penalties for non-compliance with the scheme.

Opposition amendments which included a proposal to set a timeline for implementing the low-carbon heat scheme were either withdrawn or not moved.

Nuclear energy

The Bill would amend section 1 of the [Nuclear Installations Act 1965](#) to explicitly exclude fusion energy facilities from nuclear site licencing requirements. No amendments were made to the single clause on nuclear energy.

1 Carbon capture, usage, storage and transport

1.1 Background

What is CCUS?

The [Explanatory Notes \(ENs\) accompanying the Bill](#) provide an overview of Carbon Capture, Usage and Storage (CCUS):

Carbon Capture, Usage and Storage (CCUS) is a process involving the capture of carbon dioxide (CO₂), from industrial and commercial activities, as well as power generation, and its transportation for the purposes of permanent containment, for example in very deep subsurface rock formations, or reuse, for example in cement. CCUS can be applied to a range of processes including chemical refining, cement, and residual waste management processes, and is likely to play an essential role in meeting the UK's statutory carbon emissions targets. The Climate Change Committee has described carbon capture and storage as “a necessity, not an option” for reaching net zero emissions.¹

A 2018 POSTNote on [carbon capture and usage](#) contains further information on the range of CCUS technologies and applications.

There are mixed views on the role CCUS will play in helping the UK meet its climate emissions objectives. The Climate Change Committee's (CCC) 2019 [Net Zero report](#) described carbon capture and storage as “a necessity not an option” if the UK is to reach its net zero commitments.² However the same CCC report also noted that CCUS was yet to get started in the UK but that there were 43 large-scale projects operating or being developed globally.

An article from the [energy, environment and sustainability website Edie](#), (June 2022) suggested that CCUS could be used by some industries as an alternative to reducing emissions but noted that the technologies involved are at an early stage of development.³

¹ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p11 para6

² Climate Change Committee, [Net Zero – The UK's contribution to stopping global warming](#), May 2019

³ Edie, [UK Government launches first licensing round for carbon storage projects](#), 14 June 2022

CCUS in industrial clusters

Chapter 8 of the Government's [ten point plan](#) for a green industrial revolution, published in 2020, set out ambitions for investing in and developing CCUS in the UK:

Our ambition is to capture 10Mt of carbon dioxide a year by 2030, the equivalent of four million cars' worth of annual emissions. We will invest up to £1 billion to support the establishment of CCUS in four industrial clusters, creating 'SuperPlaces' in areas such as the North East, the Humber, North West, Scotland and Wales. We will bring forward details in 2021 of a revenue mechanism to bring through private sector investment into industrial carbon capture and hydrogen projects via our new business models to support these projects.

[...] Our £1 billion CCUS Infrastructure Fund will provide industry with the certainty required to deploy CCUS at pace and at scale. These clusters will be the starting point for a new carbon capture industry, which could support up to 50,000 jobs in the UK by 2030, including a sizeable export potential. Alongside this, we will bring forward details in 2021 of a revenue mechanism to bring through private sector investment in industrial carbon capture and hydrogen projects, to provide the certainty investors require.⁴

In May 2021, the Government launched Phase 1 of its cluster sequencing for carbon capture, usage and storage (CCUS) deployment. The guidance accompanying the launch set out how this process would operate:

- In Phase-1, government will receive submissions from cluster organisations, and provisionally sequence those which are most suited to deployment in the mid-2020s onto Track-1, in accordance with government's stated objectives.
- In Phase-2, government will receive applications from individual projects across capture applications (industry, power, hydrogen) to connect to the Track-1 clusters. Through this process, government will select projects to enter negotiations for the support packages outlined above.⁵

In March 2023, the Government published information on [cluster sequencing Phase-2](#) which announced 8 projects that had been successful. It also provided details of Phase-1 projects, that include industrial carbon capture and carbon capture from power.⁶

Investment in CCUS

A 2021 [economic analysis of UK CCUS](#) (PDF) by the Carbon Capture and Storage Association (CCSA) found that meeting the CCUS targets set out in the Government's Ten Point Plan would require a £1.2 billion annually

⁴ BEIS, [The ten point plan for a green industrial revolution](#), 18 November 2020

⁵ BEIS, [Cluster sequencing for carbon capture, usage and storage \(CCUS\) deployment: Phase-1](#), 7 May 2021

⁶ BEIS, [Cluster sequencing Phase-2: eligible projects \(power CCUS, hydrogen and ICC\)](#), 30 March 2022

to achieve. Meeting the recommended CCUS deployment rates set out in the CCC's Sixth Carbon Budget would require £2.6 billion annually.⁷ However, the CCSA report highlights high uncertainty around these figures.

The [Impact Assessment \(IA\) of the Bill](#) (PDF) explains that a large amount of upfront capital investment would be required to develop the required infrastructure for a CO₂ transport and storage network. The IA also argues that, due to uncertainty around the scale and timing of demand for this, the investment is unlikely to be met wholly by the private sector:

Developing transport and storage infrastructure for CO₂ will require large upfront capital expenditure, and it is expected that without government intervention, a transport and storage [T&S] network for CO₂ would not be provided by the private sector due to uncertainty around the scale and timing of demand for the use of such a T&S network and therefore the future revenues of a network operator.

The aim of this legislation is to remove barriers to entry for T&S network providers, as well as to introduce a regulatory framework for these networks, given their monopolistic characteristics, to ensure fees charged by T&S network operators reflect efficient costs while ensuring a reasonable return on investments.⁸

Further details of the Government's plans for CCUS were announced in the [Carbon Budget Delivery Plan](#) and the policy paper [Powering up Britain](#), both published in March 2023.

An [article from the Grantham Research Institute](#) on CCUS sets out some of the current concerns about CCUS and its role in meeting emissions reductions targets. These include high costs, and the potential for CO₂ to leak from storage sites:

High cost is perhaps the most commonly cited drawback of CCUS. CCUS facilities are capital-intensive to deploy and energy-intensive to operate, making them particularly expensive when energy costs are high. There are also risks and uncertainties around the technological performance of CCUS operations. However, given tightening climate targets and increasing carbon prices, reducing emissions is not optional. Therefore, the cost and risks of CCUS should be compared with alternative decarbonisation pathways rather than with 'doing nothing'.⁹

CCUS and net zero

The CCC has outlined the possible contribution of CCUS in scenarios to reach net zero by 2050.

⁷ CCSA, [Economic analysis of UK CCUS](#) (downloads PDF), June 2021

⁸ BEIS, [Energy Bill – Impact Assessments \(IA\) - CO₂ transport and storage regulatory investment \(TRI\) impact assessment](#), 6 July 2022

⁹ The Grantham Research Institute, [What is carbon capture, usage and storage \(CCUS\) and what role can it play in tackling climate change?](#), 13 March, 2023

Under the CCC's 'Balanced Net Zero Pathway' scenario the total amount of CO₂ captured (across all sectors) is around 20 million tonnes in 2030, increasing to around 80 million tonnes in 2040 and just over 100 million tonnes in 2050.¹⁰ The 'Balanced Net Zero Pathway' scenario is the CCC's "recommended scenario that reaches Net Zero by 2050". Under this scenario CCUS removes the emissions from the remaining gas generation, hydrogen production and industry. It is also used to permanently remove carbon from the atmosphere through bioenergy with carbon capture and storage (BECCS). This would be a negative emissions technology as it uses sustainable biomass, which absorbs CO₂ when growing, and captures the emissions when biomass is burned as fuel. BECCS covers various sectors including biomass for power generation, hydrogen production and biofuels.¹¹

Greenhouse gas removals through BECCS form the majority of CO₂ captured in 2050 under this scenario. Other major elements of CO₂ capture are from gas used for either hydrogen production or electricity generation. Net removals through BECCS are assumed to be just over 50 million tonnes of CO₂ in 2050 under this scenario. These removals of greenhouse gases are needed to meet net zero as some sectors, such as aviation and agriculture are still expected to produce greenhouse gas emissions in 2050.¹²

Under its Balanced Net Zero Pathway the CCC estimates that gas with CCS could make up around 7% of capacity in 2050 and BECCS just over 2%.¹³ The CCC puts the costs of storage and transport at £15-19 per tonne¹⁴ of CO₂ and says there is plentiful storage capacity in the UK. The development of BECCS is said to be contingent on sourcing sustainable biomass. The CCC assumes 90-95% CO₂ capture in electricity generation for gas CCS and BECCS. If actual capture rates were lower, then their value as an emissions reduction technology would decrease.¹⁵

The CCC analysis expects both gas-fired power with CCS and BECCS to be able to deliver relatively flexible output at 'medium costs' in their Balanced Net Zero Pathway. Gas CCS costs are expected to be 'competitive' with new nuclear plants at around £80/MWh (8.5p/kWh). These estimates were made in 2020 when gas prices were substantially lower than at present. BECCS is forecast to be more expensive at around £130/MWh (13p/kWh), but potentially higher still. These prices are more expensive than wind and solar (both around £40/MWh), but they

¹⁰ The CCC developed this pathway to net zero emissions in 2050 as part of its sixth carbon budget covering the years 2033 to 2038. It describes the pathway as "...illustrative of what a broadly sensible path based on moderate assumptions would look like". The CCC uses this pathway as the basis for their sixth carbon budget recommendation.

¹¹ CCC, [The Sixth Carbon Budget. The UK's path to net zero](#) (Chapter 2), December 2020

¹² CCC, [The Sixth Carbon Budget. The UK's path to net zero](#) (Figures 2.9 and 3.11a), December 2020

¹³ Percentage of installed capacity. Their share of re-rated capacity, which adjusts for actual expected output across a year, would be higher.

¹⁴ These and all other prices in this section are in 2019 values

¹⁵ CCC, [The Sixth Carbon Budget. Electricity generation](#), December 2020

have value in the generation mix as they can help meet demand when renewable output is low.¹⁶

Regulatory regime

Government guidance on [UK carbon capture, usage and storage](#) provides further details on its approach to CCUS and information on the regulatory regime:

The Energy Act 2008 (the Act) provides for a licensing regime that governs the offshore storage of carbon dioxide. It forms part of the transposition into UK law of EU Directive 2009/31/EC on the geological storage of carbon dioxide. The Carbon Dioxide (Licensing etc.) Regulations 2010 (SI 2010/2221), which transpose many other requirements of the directive, came into force on 1 October 2010.

The regime applies to storage in the offshore area comprising both UK territorial sea and beyond designated as a gas importation and storage zone (GISZ) under section 1(5) of the Act.¹⁷

The guidance also sets out that licensing powers for offshore CO₂ storage were transferred from the Secretary of State for Business, Energy and Industrial Strategy to the Oil and Gas Authority (OGA) in 2016:

The OGA is now the licensing authority for offshore storage, except within the territorial sea adjacent to Scotland, which Scottish ministers authorise. The OGA regulates offshore carbon dioxide storage, approves and issues storage permits, and maintains the carbon storage public register. In addition to applying for a licence, developers must obtain a grant of the appropriate rights from The Crown Estate or the Scottish Crown Estate.¹⁸

Decommissioning carbon transport and storage networks

In 2021, the Government consulted on the [offshore decommissioning regime for CO₂ transport and storage](#). The consultation set out the Government's view on establishing decommissioning funds including the need for adequate safeguarding to ensure they are managed effectively and used for their intended function:

The consultation outlined the government's rationale as to why localised decommissioning funds would deliver better outcomes than a centralised fund to cover all decommissioning liabilities associated with CCUS projects across the UK. Specifically, there would be a decommissioning fund for each storage site, as each site would have its own storage licence issued by the Oil and Gas Authority (OGA). Accordingly, where a T&SCo managed

¹⁶ CCC, [The Sixth Carbon Budget. Electricity generation](#), December 2020

¹⁷ BEIS & DESNZ, [UK carbon capture, usage and storage](#), 22 January 2013 (updated 1 February 2019)

¹⁸ BEIS & DESNZ, [UK carbon capture, usage and storage](#), 22 January 2013 (updated 1 February 2019)

multiple storage sites, it would manage a portfolio of separate decommissioning funds, which would cover their entire T&S network.¹⁹

The consultation received 20 responses, primarily from industry and trade associations, but also from the Scottish Government and the Northern Ireland Executive. A government response to the consultation was published in January 2022. The Government stated that “respondents showed broad support for the majority of the items raised”²⁰ and that it would use the new information to develop its future CCUS decommissioning regime.

1.2 Measures in the Bill

Overview

The following [overview provided by law firm Brownrudnick](#) sets out some of the key elements in Part 1 of the Bill:

The Bill introduces licensing and regulatory requirements for hydrogen and CO₂ transport and storage infrastructure. Ofgem will be the economic regulator of CO₂ transport and storage; it will have powers to grant, modify and enforce relevant licences. A licence will determine the allowed revenue that a transport and storage operator may receive, which should reflect its efficient costs and a reasonable return on its capital investment.

The Bill provides the secretary of state with U.K.-wide powers to financially support the establishment of carbon capture, usage and storage (“CCUS”) and low-carbon hydrogen production. The secretary of state will also be able to designate and direct counterparties to support the managing of contracts under the low carbon hydrogen and CCUS business models. The Bill also establishes an allocation process for these contracts and empowers the secretary of state to appoint an allocation body, as well as issue regulations (that will, for example, introduce standard terms and conditions in respect of hydrogen production revenue support contracts and carbon capture revenue support contracts), and establish a hydrogen production levy.

The Bill will also establish funded decommissioning programs in respect of CO₂ storage and transport assets and a special administration regime and step in rights for the secretary of state.²¹

¹⁹ BEIS, [Carbon capture, usage and storage \(CCUS\): offshore decommissioning regime for CO₂ transport and storage](#), 2 August 2021

²⁰ BEIS, [Carbon capture, usage and storage \(CCUS\): offshore decommissioning regime for CO₂ transport and storage](#), 2 August 2021

²¹ Brownrudnick, [The Energy Bill – Key Points for Hydrogen and CCUS Business](#), 9 December 2022

Part 1: Licensing of carbon dioxide transport and storage

Part 1 of the Bill contains 55 clauses which set out the regulatory framework and licensing regime for carbon dioxide (CO₂) transport and storage.

Clause 1 establishes the Gas and Electricity Markets Authority (Ofgem) as the economic regulator of CO₂ transport and storage. It sets out the principal objectives and duties of the Secretary of State and the economic regulator.

Clauses 2 to 5 cover licensable activities. Clause 2 makes it offence to carry out unlicensed activities whilst clause 3 sets out the requirement on the Secretary of State to consult on any proposed new licensable means of transportation. Clauses 3 to 5 cover the territorial scope of prohibited activities, exemption from prohibition and the procedure for revoking or withdrawing an exemption.

The Bill defines licensable activities as:

- a) operating a site for the disposal of carbon dioxide by way of geological storage;
- b) providing a service of transporting carbon dioxide by a licensable means of transportation.²²

The Bill also defines licensable means of transportation as:

- a) a pipe or system of pipes, or
- b) any other means of transportation that may be specified by regulations made by the Secretary of State.²³

Clauses 7 to 15 cover the granting of and conditions of licences. This includes details on the power to grant licences, which lies with the economic regulator, and the power to create new license types which rests with the Secretary of State.

Clauses 16 to 19 relate to the power of the Secretary of State to grant licences. The ENs accompanying the Bill set out that this power will then be transferred to the economic regulator Ofgem:

The Secretary of State will grant initial licences and determine the initial terms and conditions of the first licences. These licences will be regulated by the economic regulator. For the enduring regulatory regime, the power to grant licences will be transferred to the economic regulator.²⁴

²² [Energy Bill \[HL\] 2022-23](#), Clause 2, page3 , line 32

²³ [Energy Bill \[HL\] 2022-23](#), Clause 2, page3 , line 37

²⁴ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p33 para142

The date for transferring the power to grant licence to the regulator will be determined by the Secretary of State, through regulations. Clauses 17 and 18 cover the power of the regulator to terminate or transfer licenses.

Clauses 20 to 25 cover appeals from decisions of the economic regulator. Clause 20 sets out the initial rights of a license holder to appeal a decision by the economic regulator:

This clause establishes that a licence holder, or a transport and storage network user whose interests are materially affected by a decision by the economic regulator to modify a licence condition, has a right to appeal a licence modification decision to the CMA. This is intended to ensure due process and that there are sufficient safeguards for investors whose rights may be interfered with by a proposed licence modification during the term of the licence.²⁵

Clauses 21 to 25 set out further details on the procedure for determining an appeal and the time limit for doing so.

Clauses 26 and 27 cover the information provided by Ofgem and the Secretary of State. Clauses 28 to 31 describe other functions of the regulator including monitoring and gathering of information. Clauses 32-35 cover enforcement and criminal liability.

Functions with respect to competition

Clauses 36 to 38 set out functions with respect to competition and existing legislation. This provides for both the regulator (Ofgem) and the Competition and Markets Authority (CMA) to exercise certain functions under the [Enterprise Act 2002](#) and under the [Competition Act 1998](#). Further details on clause 36 are set out in the ENs accompanying the Bill:

This covers those functions under Part 4 of the Enterprise Act 2002, other than certain powers which rest only with the CMA, i.e. s166 (duty on the CMA to compile a register), 171 (duty on CMA to publish information and guidance relating to the exercise of their functions) and 174E (power for CMA to publish a statement on penalties), insofar as those functions:

- are exercisable by the CMA Board (within the meaning of Schedule 4 to the Enterprise and Regulatory Reform Act 2013); and
- relate to commercial activities connected with the transportation and storage of carbon dioxide i.e. those activities which are ordinarily prohibited without a licence under Part 1 of the bill, and any ancillary activities.²⁶

Clause 37 enables Ofgem to “investigate and enforce matters relating to anti-competitive behaviours and abuse of dominant position”²⁷ in carbon transport and storage activities. This would enable Ofgem to exercise

²⁵ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p33 para146

²⁶ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p37 para175

²⁷ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p37 para177

these powers concurrently with the CMA under Part 1 of the Competition Act 1998.

Clause 38 provides for Ofgem and the CMA to consult one another prior to exercising functions under the [Enterprise Act 2002](#) and under the [Competition Act 1998](#). It also prevents either entity exercising its functions under those Acts if they have already been exercised by the other. It also provides for the secretary of State to determine “whether the economic regulator has concurrent powers in relation to a particular case”.²⁸

Reporting requirements

Clauses 39 to 42 set out the reporting requirements of the regulator Ofgem. They include a requirement for Ofgem to annually publish a document that contains a general description of the relevant projects it plans to undertake during the year. This should set out the objectives of those projects and a forward work programme. Additionally, the regulator must publish a CCUS policy and strategy statement and a transport and storage report that includes information on progress made and any relevant activities of the CMA in that year.

Transport and storage administration orders

Chapter 4, Part 1 of the Bill contains eight clauses (42 to 49) covering transport and storage (T&S). It provides “for the application of a Special Administration Regime (SAR), in the event of a CO₂ transport and storage company insolvency”.²⁹ It provides “the Secretary of State or, with the Secretary of State’s permission, the economic regulator, with a power to apply to the courts for the appointment of a special administrator”.³⁰ The purpose of this is to ensure that the activities of the licensed company continue in an efficient and economical manner and that the safety and security of the transport and storage network is maintained.

This part of the Bill also sets out that certain provisions in the [Energy Act 2004](#), relating to special administration regimes, apply to a T&S administration order in the same way as they do to an energy administration order.

Transfer schemes

Chapter 5 of the Bill (clauses 50 to 52) makes provisions for the Secretary of State to create a statutory transfer scheme. This enables certain property, rights, and responsibilities of a licence holder to be transferred to the Secretary of State or an appropriate body. This can be

²⁸ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p37 para178

²⁹ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p38 para182

³⁰ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p38 para183

used where a licence has been terminated and is intended to allow for the continued operation of the affected part of the T&S network.

Clause 51 allows the Secretary of State to consult specified persons or persons deemed appropriate by the Secretary of State before carrying out a statutory transfer. It applies to Schedule 3 which sets out the scope of what may be transferred and the process by which the transfer scheme takes place.

Miscellaneous

Chapter 6 contains the final three clauses of this part of the Bill and inserts new sections 34A and 34B into the Energy Act 2008. This provides for information sharing and cooperation between the relevant CO₂ storage licensing authority and the regulator. Clause 54 explains that amendments to existing legislation are set out in Schedule 4 and clause 55 contains definitions of terms for the purpose of interpreting this part of the Bill.

Revenue support

Chapter 1, clauses 56 to 81, covers revenue support contracts for carbon dioxide transport and storage, hydrogen production and carbon capture.

Clauses 56 to 58 set out the definitions, provide powers for the Secretary of State to make regulations about revenue support and set out the duties of revenue support counterparties to comply with these regulations.

Decommissioning carbon storage installations

Chapter 2, Part 2 of the Bill deals with decommissioning carbon storage installations. It sets out where existing legislation would be amended to include new activities and installations involved in carbon capture and storage.

Clause 84 would enable further modification to Part 4 of the [Petroleum Act 1998](#), in relation to the definition of carbon installations, and the establishment of decommissioning funds.

Clauses 85 and 86 of the Bill would amend Section 30A and 30B of the [Energy Act 2008](#), broadening their scope to include carbon storage installations and network pipelines.

Clause 253 in Part 12, chapter 2 of the Bill, would amend the Petroleum Act 1998 to create powers to establish a new fee charging scheme to recover the costs of regulating the decommissioning of carbon storage (and offshore oil and gas) infrastructure. For more information, see the separate Library briefing [Energy Bill \[HL\] 2022-23: provisions on oil, gas and offshore wind](#) covering parts 11-12 of the Bill.

Strategy and Policy Statement

Clauses 88 to 91 of the Bill establish that the Secretary of State may designate a strategy and policy statement for CCUS. This would allow strategic priorities and outcomes to be established. However, regulatory decisions would be made independently by the economic regulator Ofgem. Similar arrangements are already in place in other regulated sectors such as the [water industry](#).

Carbon Dioxide Storage Licences

Clauses 98 to 101 make provisions about changes of control in holders of carbon dioxide storage licences issued by the Oil and Gas Authority, including associated offences and information gathering powers, by amending existing legislation and the terms of existing carbon storage licences. New before the event powers for the Oil and Gas Authority (OGA) will be introduced by amending [Schedule 1 of the Storage of Carbon Dioxide \(Licensing etc.\) Regulations 2010](#) (“the 2010 Regulations”) Additionally, amendments to regulation 8 of the 2010 Regulations will allow for the revocation of carbon dioxide storage permits for breaches of the change in control provisions by the operator.

Under this part of Bill, amendments will also be made to sections 23 and 29 of the [Energy Act 2008](#) to ensure licensees do not commit an offence and granting powers to the OGA to request information required to carry out its functions.

1.3

Debate and amendments

Committee stage

Several technical amendments were made to Part 1 of the Bill in both committee and report stage. At [committee stage](#) on 5 September 2022, amendments 25, 28, 33, 34 and 36 were agreed to. These received little debate. No amendments were put to division.

Several amendments would have added new clauses to the Bill. Amendments 1 to 7 would require new clauses to be inserted into the bill setting out its strategic purpose. Baroness Blake of Leeds (Lab) tabled amendments 1 to 4. These were sponsored by Lord Lennie (Lab). [Amendment 1](#) would have inserted a new clause in the Bill setting out the principal purpose of the Bill and “a requirement for a Strategy and Policy Statement in line with this Act”.

Lord Lennie set out why the opposition had tabled amendments 1 to 4:

[...] our amendments would, first, set out a purpose for the Bill by increasing resilience and reliability of energy systems across the UK; support the delivery of the UK’s climate change commitments; and reform the energy system. Secondly, they would bind the Secretary of State and

the public authorities to these purposes, to our international commitments on climate change, and to the desirability of reducing costs and alleviating fuel poverty and securing a diverse and viable long-term energy supply. They would require the Secretary of State to designate a statement as a strategy and policy statement with regards to the purpose of the Act and require the Secretary of State to review both the strategy and the policy on a five-yearly basis. This would, in turn, force successive Governments into long term thinking, widen the impact and ambition of the Bill to address both short- and long-term issues, and help to ensure that, for the future, action does not come either too late or too little to solve a crisis.³¹

Responding to Lord Lennie, Lord Moylan (Con) commended their intentions but added that “their amendments were “rather general in character and not entirely strategic”.³²

Lord Moylan tabled [amendment 5](#) which would require the Government to make statements on how the Act would have regard to existing Government policies such as the Ten Point Plan and Net Zero Strategy. It would also require statements on how the intermittency of energy supply from renewables would be managed.

Baroness McIntosh of Pickering (Con) tabled a probing amendment 6 which would set out that the principal objective of the Bill was energy security. Providing context for the amendment, Baroness McIntosh set out her concerns over the impact of rising energy prices.³³

Cross bench peer Lord Ravensdale tabled amendment 7 and stated:

Amendment 7 brings out two specific aspects that are further detailed in Amendment 242. These are the importance of a plan for delivering against the 2035 target to decarbonise our electricity system and for the electrification of energy use in the UK.³⁴

Lord Ravensdale explained why he was asking for greater emphasis on the electrification of processes in the UK so that they are powered by electricity rather than other primary energy sources:

[...] to replace ageing power plants and ensure that enough generation is built to meet peak demand requirements, the UK needs to build a minimum of 159 gigawatts of new generating capacity by 2035 - the equivalent of building the UK's entire electricity generation system one and a half times over in slightly more than 12 years. It is not only generating capacity but all the grid infrastructure to support it, as well as energy storage and data management.³⁵

Several Members explained why they wouldn't be supporting amendments 1 to 7. Lord Howell of Guildford (Con) stated that

³¹ HL Deb 5 September 2022, [\[Energy Bill\]](#) c17

³² HL Deb 5 September 2022 [\[Energy Bill\]](#), c17

³³ HL Deb 5 September 2022 [\[Energy Bill\]](#), c21

³⁴ HL Deb 5 September 2022 [\[Energy Bill\]](#), c24

³⁵ HL Deb 5 September 2022 [\[Energy Bill\]](#), c24

amendments 1 to 4 did “not add much to the purposes, or indeed deficiencies, of the Bill”.³⁶

After the debate on the strategic purpose of the Act and the need for new clauses, amendment 1 was withdrawn and amendments 2-7 were not moved.

Agreed amendments

The following Government amendments were agreed without division:

- Government amendments 25, 33 and, 34, which were technical amendments and amendment 28, a technical amendment tabled by Baroness Liddell of Coatdyke (Lab).
- Amendments 67 to 80, 82 to 85, 87 to 89, 90 to 98, and 101 to 111 which were technical Government amendments requiring modification to the text of existing clauses.
- Government amendments 36 and 65 to 66 to insert a new schedule and a new clause into the Bill. These are set out in more detail below:

Government [amendment 36](#) (PDF) inserts a new schedule, after schedule 2, in the Bill that provides for the enforcement of conditions or requirements CO2 transport and storage licence holders and the regulator must comply with. The new schedule sets out the procedures the regulator must follow when a licence holder contravenes or is likely to contravene its licence conditions. It also sets out the procedures the regulator must follow for imposing financial penalties when a licences holder breaches their licence conditions. Amendment 36 was agreed to without debate.

Government amendments 65 and 66 were agreed. They insert a new clause into the Bill providing the Secretary of State with powers to modify licences of gas and electricity market participants. Lord Callan also set out the procedures required to implement these modifications:

I can reassure your Lordships that these amendments of course include a requirement for the Secretary of State to consult the holder of any licence being modified and such other persons as the Secretary of State considers it appropriate to consult before making any modification. This will help ensure that relevant bodies are engaged in any potential modifications.

In addition, before making modifications under this power, the Secretary of State must lay a draft of the modifications before Parliament, where they will be subject to a procedure analogous to the draft negative resolution procedure used for statutory instruments. This also allows for additional scrutiny for any proposed modifications under this power.³⁷

³⁶ HL Deb 5 September 2022 [[Energy Bill](#)], c26

³⁷ HL Deb 7 September 2022 [[Energy Bill](#)], c248

Report stage

During [report stage](#), amendments 4 to 16, 20 to 32, 34 to 39 and 41 to 47 on CCUS were agreed to. Opposition amendment 18, on the hydrogen levy, was agreed to on division. This Government defeat in the Lords is covered in section 2.3.

Government amendments 4 to 16 were technical amendments to the wording of the Bill. These were agreed to with little debate, however, Lord Callanan set out some further details on their implications for the Bill.³⁸

Government amendments 20 to 32, 34 to 39 and 41 to 47 on CCUS were also agreed to. Lord Callanan provided [further context for these technical amendments](#), setting out where they would amend existing legislation and the intended purpose of the amendments.

1.4

Stakeholder reactions

There has been limited reaction to the specific measures on CCUS in the Bill. However, there was mixed reaction to announcement of increased investment in CCUS set out by the Government in its [Powering up Britain](#) policy paper and its [Spring Budget](#) of March 2023.

On 30 March 2023, Imperial College London published an [article providing reaction to the Government's energy policy](#) and spending plans. It highlights that most of the technologies needed to remove and store carbon “are yet to be proven at scale” and suggests that “many climate scientists fear these technologies will be used to justify the ongoing use of fossil fuels”.³⁹

An [article published in The Guardian](#) on 30 March, suggests that the Government is “gambling on CCUS”⁴⁰ despite doubts from scientists. However, an [article from the Grantham Research Institute](#) (March 2023) acknowledges that “CCUS is expected to play a crucial role in meeting global climate targets”.

An overview of reaction from the scientific community to the Government’s CCUS policies is provided in a March 2023 [article from Science Media Centre](#).

³⁸ HL Deb 28 March 2023 [[Energy Bill](#)], c167-168

³⁹ The Grantham Research Institute, [What is carbon capture, usage and storage \(CCUS\) and what role can it play in tackling climate change?](#), 13 March, 2023

⁴⁰ The Guardian, [UK government gambles on carbon capture and storage tech despite scientists' doubts](#), 30 March 2023

2 Hydrogen

2.1 Background

Using low-carbon hydrogen to heat buildings could provide an alternative to fossil fuels (oil and gas). To help develop this further, the Government is working with a range of stakeholders to deliver research, development and testing projects that will allow an assessment of the feasibility, costs and benefits of using hydrogen to be made.

[National Grid](#) provides further information on using hydrogen to heat homes and sets out some of the advantages of using this fuel instead of natural gas:

Hydrogen is the most abundant element in the universe, so there's a lot of it available. Unlike fossil fuels (which produce harmful emissions when burned), burning hydrogen does not release carbon dioxide. So using it for heating could make a huge difference to our carbon emissions and play a critical part in achieving net zero.⁴¹

A range of methods exist or are being developed to produce hydrogen. Colours are used to classify or group different types of hydrogen, based on the method of production and the emissions they produce (See Box 1). Further details on [low-carbon hydrogen supply](#) are provided a 2021 POSTNote.

1 Types of hydrogen

A range of methods exist or are being developed to produce hydrogen. Colours are used to classify or group different types of hydrogen, based on the method of production.

- **Grey hydrogen:** this is currently the most common form of hydrogen. It is produced from natural gas or methane under a process called steam methane reformation. This process can produce large amounts of greenhouse gases.
- **Blue hydrogen:** this refers to hydrogen produced in the same way as grey hydrogen but with the addition of carbon capture and storage. It is described as a low-carbon hydrogen.

⁴¹ National Grid, [Heating our homes with hydrogen](#), accessed 25 April 2023

- **Green hydrogen:** this refers to hydrogen produced under electrolysis and powered by renewable energy. Electrolysis is an electrochemical reaction that splits water into its component parts, hydrogen and oxygen. This is described as a zero-carbon hydrogen as the process emits no CO₂.

Other colour classifications of hydrogen exist such as black hydrogen produced using coal or pink hydrogen which relies on nuclear power. Further details on the [hydrogen colour spectrum](#) are provided by National Grid.

The National Grid's [webpage on hydrogen](#) states that there is optimism from some experts that “the switch to hydrogen heating will start to happen in the next 10 years” and “that hydrogen could be transported through our existing gas network and easily stored with conventional technology”.

Some research questions suitability of using hydrogen to heat homes. In September 2022, a review article on existing hydrogen studies was published. The author concluded that “the widespread use of hydrogen for heating is not supported by any of the 32 studies” included in the review.⁴² The article also stated that “research so far suggests that, compared to other alternatives such as heat pumps, solar thermal and district heating, hydrogen use for domestic heating is less economic, less efficient, more resource intensive, and associated with larger environmental impacts”.⁴³

The Climate Change Committee (CCC) 2018 report on [hydrogen in a low-carbon economy](#), found that hydrogen:

- is a credible option to help decarbonise the UK energy system but its role depends on early Government commitment and improved support to develop the UK's industrial capability
- can make an important contribution to long-term decarbonisation if combined with greater energy efficiency, cheap low-carbon power generation, electrified transport and new 'hybrid' heat pump systems, which have been successfully trialled in the UK
- could replace natural gas in parts of the energy system, where electrification is not feasible or is prohibitively expensive, for example in providing heat on colder winter days, industrial heat processes and back-up power generation
- is not a 'silver bullet' solution; the report explores some commonly-held misconceptions, highlighting the need for careful planning.⁴⁴

⁴² Rosenow, J, [Is heating homes with hydrogen all but a pipe dream? An evidence review](#), September 2022, Joule 6(10), DOI:10.1016/j.joule.2022.08.015

⁴³ Rosenow, J, [Is heating homes with hydrogen all but a pipe dream? An evidence review](#), September 2022, Joule 6(10), DOI:10.1016/j.joule.2022.08.015

⁴⁴ CCC, [The role of hydrogen in achieving Net Zero](#), 22 November 2018

The Science and Technology (S&T) Committee's 2022 report looks at [the role of hydrogen in achieving Net Zero](#). It highlights the role hydrogen could play in improving the UK's energy security and meeting net zero commitments:

Hydrogen has several distinctive features as a low-carbon gaseous fuel and could contribute to the UK's energy system, including through improving resilience and energy security. Whilst in some applications hydrogen is less efficient compared to alternative low-carbon technologies, the wider energy system benefits of deploying hydrogen must be acknowledged.⁴⁵

Based on the evidence it collected, the S&T Committee called on the Government to set out more clearly a timeline of key decision points and the technological developments needed for more widespread use of hydrogen:

The Government should, in the next two months, outline a series of decision points between now and 2050 that will determine the role of hydrogen in the UK, in each policy area identified in the Ten Point Plan for a Green Industrial Revolution. This should be accompanied by an outline of the scientific and technological progress that needs to be made to allow hydrogen to play its part in our energy system.⁴⁶

The Government's policy paper, [Powering Up Britain: Energy Security Plan](#), published in March 2023, sets out further details on its plans for encouraging the use of low-carbon hydrogen and whether this can be incorporated into existing gas distribution networks:

We are planning to take a strategic policy decision in 2023 on whether to seek to enable the blending of hydrogen in the existing gas distribution network. Further details will be provided this year including through the government response to our consultation on hydrogen transport and storage infrastructure, which we aim to publish in Q2 2023.⁴⁷

In March 2023, the Government also published the [hydrogen champion report](#), an independent report making "recommendations to government and industry to accelerate the development of the UK hydrogen economy". The Hydrogen Champion's role is to engage with industry stakeholders and investors to identify barriers and enablers to investment in electrolytic hydrogen projects.

Hydrogen levy

Between August and October 2021, the Government consulted on a [business model for low-carbon hydrogen](#). It set out the need to develop a business model to support investment and growth in low-carbon hydrogen:

⁴⁵ Science and Technology Committee, [The role of hydrogen in achieving Net Zero](#), 19 December 2022

⁴⁶ Science and Technology Committee, [The role of hydrogen in achieving Net Zero](#), 19 December 2022

⁴⁷ DESNZ, [Powering Up Britain: Energy Security Plan](#), 30 March 2023

Producing and selling hydrogen is currently more expensive than most high-carbon fuel alternatives, which deters widespread hydrogen adoption. This means that in the absence of government intervention it is unlikely that hydrogen producers would choose to invest in new low carbon production facilities as the high costs they face mean that it is not possible to make a return on their investment. While this lack of cost competitiveness might fall away over time, in the short term not only will low carbon hydrogen need to compete against cheaper alternatives for end users such as electricity, natural gas or biomass, but it will also rely on them for production inputs.⁴⁸

In April 2022, the Government published its [response to the consultation](#). This showed that there was both support and concerns regarding a levy to support hydrogen development. However, it also set out that the Government was “minded to introduce a levy to fund revenue support provided through the business model, subject to consultation and legislation, with the first electrolytic hydrogen projects supported through the 2022 allocation round being funded through general taxation until the levy is in force.”⁴⁹

The Energy Security Bill factsheet for [hydrogen and industrial carbon capture](#) outlines that in order to support investment and growth in hydrogen technologies, a levy will be introduced by 2025.

It is expected that from 2025 at the latest, all revenue support for low carbon hydrogen production will be levy funded, subject to consultation and legislation being in place.

The purpose of the levy is to provide long-term funding for the hydrogen business model, which will enable hydrogen producers to overcome the operating cost gap between low carbon hydrogen and fossil fuels.⁵⁰

Hydrogen and net zero

Under their ‘Balanced Net Zero Pathway’ the Climate Change Committee sees various roles for low-carbon hydrogen in meeting net zero, these including industry, shipping, heavy goods vehicles and heating. Under this scenario the shift to low-carbon hydrogen and other low-carbon technology⁵¹ could provide around 9% of the reduction in emissions needed in to 2050 to reach net zero.⁵²

The Government’s [Carbon Budget Delivery Plan](#) sets out the potential reductions in greenhouse gas emissions resulting from its policies up to the end of the sixth carbon budget (2037). These look at a range of scenarios of deployment of hydrogen in heat. Meeting the Government’s 10GW capacity ambition for hydrogen in 2030 has little impact on emissions on its own, regardless of progress after 2030. Many of the

⁴⁸ BEIS, [Design of a business model for low carbon hydrogen](#), August 2021

⁴⁹ BEIS, [Low Carbon Hydrogen Business Model: government response](#), April 2022

⁵⁰ DESNZ, [Energy Security Bill factsheet: Hydrogen and industrial carbon capture business models](#) (March 2023)

⁵¹ Includes bioenergy and waste treatment measures

⁵² CCC, [The Sixth Carbon Budget. The UK’s path to net zero](#) (Figure 2.6), December 2020

other carbon savings linked to hydrogen, such as heating for buildings, are incorporated with wider savings from electrification, so are not just savings from hydrogen. The largest of these are in industrial fuel switching (saving 7.6 million tonnes of CO₂ equivalent a year in the mid-2030s⁵³) and heating deployment in buildings (saving up to 9.0 million tonnes of CO₂ equivalent a year in the mid-2030s⁵⁴).⁵⁵

The Government [impact assessment](#) of these measures sets out the case for intervening in these areas in the way the Government has chosen. It says that the primary legislation itself does not, by itself, create any direct costs to businesses or consumers. Secondary legislation may create some administrative/familiarisation costs to businesses. These would be estimated at the time any secondary legislation is produced. It also says that the Bill itself produces no additional costs to Government as it only enables them to fund activities through the Industrial Decarbonisation and Hydrogen Revenue Support scheme.⁵⁶ Funding for that scheme is expected to be £100 million to support up to 250MW of electrolytic projects in 2023.⁵⁷

Additional Government funding for hydrogen includes:

- £240 million Net Zero Hydrogen Fund
- up to £60m via the Industrial Energy Transformation Fund
- £55m through the NZIP Industrial Fuel Switching Competition
- £26m is being provided through the Industrial Hydrogen Accelerator.⁵⁸

Hydrogen trials

Low-carbon hydrogen could be one option for decarbonising heat in buildings, alongside more established technologies such as heat pumps and heat networks.

As set out in the Government's 2021 [Heat and Buildings Strategy](#), the Government will support industry to deliver a neighbourhood trial by 2024; a village scale trial by 2025; and a potential hydrogen-heated town before the end of the decade. The Government is working with industry, regulators and others to deliver a range of research, development and testing projects to assess the feasibility, costs and benefits of using 100%

⁵³ Equivalent to just under 2% of total emissions in 2022

⁵⁴ The 'high hydrogen' scenario where hydrogen takes up a large proportion of the heating mix in domestic and non-domestic buildings

⁵⁵ DESNZ, [Carbon Budget Delivery Plan](#) (March 2023)

⁵⁶ DESNZ, [Impact assessment. Hydrogen and Industrial Carbon Capture Business Models](#) (PDF)

⁵⁷ BEIS, [Hydrogen Business Model and Net Zero Hydrogen Fund: Market Engagement on Electrolytic Allocation](#) (PDF), April 2022

⁵⁸ DESNZ, [Energy Security Bill factsheet: Hydrogen and industrial carbon capture business models](#) (March 2023)

hydrogen for heating. This work includes a programme of community trials.

The trials will provide evidence to help enable strategic decisions in 2026 on the role of hydrogen for heat decarbonisation and whether to proceed with a hydrogen heated town, as set out in the [Hydrogen Strategy](#), and the [Net Zero Strategy](#).⁵⁹

To support the delivery of the hydrogen village trial, the Government held a [consultation in 2021](#) to seek views on the role that legislation should play in enabling the trial and protecting consumers. In the Government's response to this consultation, they set out their intention to introduce primary legislation to enable the delivery of the hydrogen village trial.⁶⁰

The Government is supporting industry to begin a large village trial to investigate the use of hydrogen for heating. This 'hydrogen grid conversion trial' will provide evidence to inform decisions on the role of hydrogen in heat decarbonisation in 2026.

The village trial will convert a large village of around 1,000-2,000 properties to hydrogen or an alternative heating solution instead of natural gas. Led by the gas distribution networks (GDNs), it will trial the conversion of existing gas network infrastructure in a local area, repurposing it for 100% hydrogen.⁶¹

Currently, Ofgem has taken forward two proposals by GDNs for 'Stage 2' funding for detailed design studies to enable a future decision on whether to proceed with the build and operation stages of a village trial in 2023. The two proposals are:

- Cadent in areas within Whitby, Ellesmere Port
- Northern Gas Networks in areas within Redcar, Teeside⁶²

2.2 Measures in the Bill

Revenue support and hydrogen levy

As set out in the Energy Security Bill factsheet for [hydrogen and industrial carbon capture](#), "the Bill provides the Secretary of State with

⁵⁹ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p13 paras 18-19

⁶⁰ Gov consultation, [Hydrogen for heat: facilitating a grid conversion hydrogen heating trial](#), April 2022

⁶¹ Department for Energy Security and Net Zero, [More about the Hydrogen Village Trial](#), GOV.UK, April 2023

⁶² Ofgem, [Hydrogen Village Trial Detailed Design Studies Decision](#) [PDF], May 2022

powers to appoint a levy administrator and to make regulations which will establish the levy”.

Chapter 1, clauses 56-81, covers revenue support contracts for carbon dioxide transport and storage, hydrogen production and carbon capture.

The Energy Security Bill factsheet for [hydrogen and industrial carbon capture](#) explains that:

Hydrogen will be critical in reducing emissions from heavy industry, as well as in power, transport, and potentially heat. ICC will support the deep decarbonisation of industries that often have no viable alternatives, such as chemicals, refining, cement, and residual waste management processes.

The Bill will enable business models to be brought forward to provide investors with the long-term revenue certainty they need to establish and scale up deployment of these industries. The hydrogen business model will help overcome one of the key barriers to deploying low carbon hydrogen: the higher cost of low carbon hydrogen compared to high carbon counterfactual fuels. The ICC business model will help to incentivise the deployment of carbon capture technology for industries which are hard to decarbonise.⁶³

Clauses 56-58 set out the definitions, provide powers for the Secretary of State to make regulations about revenue support and set out the duties of revenue support counterparties to comply with these regulations.

The explanatory notes (ENs) describe counterparties as persons designated by the Secretary of State who will enter into and manage contracts with eligible hydrogen producers, carbon capture entities.

Clauses 61 and 62 set out the designation of counterparties and establishment of contracts for carbon dioxide transport and storage, hydrogen production and carbon capture.

Clauses 65-67 cover the establishment of a hydrogen levy. They set out the appointment of hydrogen levy administrator, obligations of relevant market participants and the functions of the hydrogen levy administrator.

Hydrogen trials

The Bill will enable the delivery of a large village hydrogen heating trial by 2025, providing crucial evidence to inform strategic decisions in 2026 on the role of hydrogen in heat decarbonisation.⁶⁴

The hydrogen village trial will be led by gas distribution network (GDN) operators and will be a grid conversion trial. This means it will involve disconnecting a section of the local gas grid from the natural gas supply

⁶³ BEIS & Department for Energy Security and Net Zero [Energy Security Bill factsheet: Hydrogen and industrial carbon capture business models](#), updated 20 March 2023

⁶⁴ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p13 paras 20

and connecting it instead to a hydrogen supply. The Bill will enable this by including provisions that allow trial operators to deliver the trial safely and effectively, and allow for additional consumer protections to be put in place.

Part 3, chapter 2 of the Bill would give the Secretary of State the necessary powers to ensure the delivery of the planned hydrogen grid trial in terms of safety and consumer protection.

Clause 114 (originally 108) makes modifications to the [Gas Act 1986](#) to enable the safe and effective delivery of the hydrogen heat village trial. This includes modifications on powers of entry that would allow the person running the trial to enter private properties to carry out essential works, undertake inspections, and disconnect the gas supply.⁶⁵

Clause 115 (originally 109) provides the Secretary of State with the powers to establish additional consumer protections for people taking part in the trial including specified steps to ensure consumers are appropriately informed about the trial and the need for them to be disconnected from their gas supply before it happens.

This clause also provides the Secretary of State with a power to make regulations to introduce consumer protections for people who are, or are likely to be, affected by the trial,⁶⁶ details of which are listed in the Bill.⁶⁷

The European Convention on Human Rights Memorandum by the then Department for Business, Energy and Industrial Strategy identified that clauses 114 (originally 108) and 115 (originally 109) could engage Article 8 - the right to private and family life, home and correspondence. They go on to state:

The Department, however, regards these expanded powers as being necessary for the successful completion of the trial and that the trial itself is a necessary step in establishing whether one of the possible routes to decarbonising home heating, and thus reducing the UK's domestic carbon dioxide emissions from homes, is viable.

For these reasons Department regards any interference with Article 8 rights during the trial as likely to be minimal and that any interference that does occur is both necessary and proportionate to the aim being pursued.⁶⁸

⁶⁵ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p55 paras 330-333

⁶⁶ BEIS, [Energy Bill \[HL\] Explanatory Notes](#) (PDF), 23 April 2023, p55 paras 334-335

⁶⁷ [Energy Bill 295 2022-23 \[as brought from the Lords\]](#) (PDF), p106

⁶⁸ Energy Bill, [European Convention on Human Rights - Memorandum from the Department for Business, Energy and Industrial Strategy](#) (PDF), paras 68-69

2.3

Debate and amendments

Second reading

Baroness Hayman⁶⁹ (CB), Baroness Bennett of Manor Castle⁷⁰ (GP) and Baroness Boycott⁷¹ (CB) all questioned the viability of hydrogen as an option for decarbonising heat in buildings. They raised issues relating to the efficiency, cost, environmental impacts and safety of hydrogen in heating.

In response, Lord Callanan acknowledged the concerns raised but said that “Much further work is required to assess the feasibility, costs and potential benefits. As part of that, a neighbourhood trial will start next year, with a hydrogen village expected to go live in 2025. This is all part of the plan to work out the feasibility of the wide scale use of hydrogen for home heating.”⁷²

Committee stage

Government amendments 41 and 63 relating to the hydrogen levy were agreed to without division. Amendment 63 inserts new clause 78 into the Bill about the enforcement of regulations. Lord Callanan set out that it will enable the Gas and Electricity Markets Authority and the Northern Ireland Authority for Utility Regulation to enforce hydrogen levy requirements imposed on relevant Great Britain and Northern Ireland market participants respectively”.⁷³

Lord Callanan also set out that the amendment would, “help reduce the risk of defaults on levy payments and help ensure that the levy administrator can collect the money required to fund the hydrogen business model and cover related costs”.⁷⁴

On amendment 41, Lord Callanan set out that it would ensure “that regulations made under this new clause will be subject to the affirmative resolution procedure.”⁷⁵

Baroness Bennett of Manor Castle (GP), Lord Moylan (Con) and Baroness Worthington (CB) gave notice of their intention to oppose the Question that Clause 114 (then 108) and 115 (then 109) stand part of the Bill,

⁶⁹ HL Deb 19 July 2022 [[Energy Bill](#)], c1896

⁷⁰ HL Deb 19 July 2022 [[Energy Bill](#)], c1919

⁷¹ HL Deb 19 July 2022 [[Energy Bill](#)], c1921

⁷² HL Deb 19 July 2022 [[Energy Bill](#)], c1933

⁷³ HL Deb 7 September 2022 [[Energy Bill](#)], c214

⁷⁴ HL Deb 7 September 2022 [[Energy Bill](#)], c214

⁷⁵ HL Deb 7 September 2022 [[Energy Bill](#)], c214

which would remove provision for hydrogen grid conversion trials from the Bill.⁷⁶

Baroness Worthington⁷⁷ and Lord Teverson⁷⁸ spoke against clauses 114 (then 108) and 115 (then 109) standing part of the Bill. Baroness Worthington expressed the opinion that the hydrogen grid trials are unnecessary as existing scientific evidence already rules out hydrogen as an option in domestic heating. Furthermore, she said that the proposal of the trials was the result of lobbying by the hydrogen lobby. This position was supported by Lord Teverson. Lord Lennie, speaking for Labour, did not oppose the hydrogen trials, although he put forward amendment 127 that would ensure that no household would be forced to take part in the trial.

In reply, Lord Callanan recognised that there were strongly held opinions on the role of hydrogen in heating but reiterated the need to carry out the appropriate research and trials. He gave assurances that steps had been taken to ensure consumers in the trial area would be given the information required on safety and costs to make an informed decision on whether or not to participate. He also recognised the need for local support for the trials and gave assurances that no one would be forced to take part in the trials with alternatives offered to consumers who did not opt to convert to hydrogen.⁷⁹

Clauses 114 (then 108) and 115 (then 109) were agreed, although Baroness Worthington⁸⁰ said she was not assured by the responses and would return to the issue at the Report stage.

Report Stage

During [report stage](#) on 28 March 2023, the Government was defeated in a vote on Opposition amendment 18. This relates to the introduction of a hydrogen levy

Opposition [amendment 18](#) was moved by Baroness Blake of Leeds (Lab):

Clause 66, page 57, line 25, leave out “relevant market participants (see subsection (8))” and insert “the Consolidated Fund or gas shippers”⁸¹

The explanatory statement sets out that “this amendment means the Secretary of State may put a levy on gas shippers, but may not put it on gas or electricity suppliers, thus taking responsibility for levies away

⁷⁶ Energy Bill, [Third Marshalled List of Amendments to be moved in Grand Committee](#), 19 July 2022

⁷⁷ HL Deb 12 December 2022 [\[Energy Bill\]](#), c95GC

⁷⁸ HL Deb 12 December 2022 [\[Energy Bill\]](#), c96GC

⁷⁹ HL Deb 12 December 2022 [\[Energy Bill\]](#), c97GC

⁸⁰ HL Deb 12 December 2022 [\[Energy Bill\]](#), c101GC

⁸¹ HL Deb 28 March 2023 [\[Energy Bill\]](#), c189

from households”. Speaking during the debate, Baroness Blake provided further context for moving the amendment:

[...] in the circumstances we are in, with the extra pressure on the cost of living from energy bills, why are we looking at a situation where we could be asking householders to pay more money? I acknowledge that there will be further consultation but I hope that, as well as it being done thoroughly, its conclusions will lead to the spirit of our amendment. As shown in our amendments, we believe that the Secretary of State could put a levy on gas shippers but not on gas and electricity suppliers, thus preventing responsibility for the levies falling on households.

We need to reflect on the spirit of the Bill—the whole idea is that, while reforming energy systems, we do everything we can to protect consumers and their ability to pay their bills. Every possible action should be taken to minimise the impact on consumers, focusing always on affordability. I am disappointed that the Minister has not gone further on this point. Unless he indicates a willingness to do so, due to the strong feelings surrounding the protection of consumers from inflated bills, I am minded to test the opinion of the House.⁸²

Responding to the proposed amendment, Lord Callanan set out why the Government did not intend to place a levy on gas shippers, indicating that this would also lead to costs being passed on to consumers:

[...] A gas shipper levy would be a completely novel scheme, with administration and set-up costs that could be considerably higher than those required to implement a supplier levy; this is well understood.

The Government have set out their intention not to levy gas shippers in the near term. Levies on energy suppliers have been used in the past to support the deployment of low-carbon electricity and increase the proportion of green gas in the gas grid. These levies are well understood by the private sector. By taking a similar approach with the hydrogen levy, we can help provide investors with the confidence they need to invest in low-carbon hydrogen production projects and support the delivery of our 10-gigawatt production capacity ambition.

[...] we anticipate that any costs associated with a levy on gas shippers would ultimately be passed on to energy consumers in a very similar way to levies on energy suppliers.⁸³

The Opposition amendment was put to division and agreed by 170 to 160. It amends Clause 66.

The potential impact of a hydrogen levy on consumers is discussed in more detail in Section 2.4 of this briefing.

Additional amendments

Government [amendment 22](#) was moved by Baroness Bloomfield (Con) and amends Clause 67 to make provision for the right to appeal financial penalties. Baroness Bloomfield, explained that the amendment and a

⁸² HL Deb 28 March 2023 [[Energy Bill](#)], c183

⁸³ HL Deb 28 March 2023 [[Energy Bill](#)], c184

number of additional amendments of the same intent were based on the recommendations of made by the Delegated Powers and Regulatory Reform Committee:

Turning first to Amendments 22, 34, 48, 49, 50, 51, 52, 55, 64, 76, 77, 92, 93, 99 to 103, 105 and 106, the committee highlighted that certain clauses of the Bill confer powers to make provision for the imposition of civil penalties without mandating a requirement for the regulations to provide for a right of appeal. While it was absolutely the Government's intention that regulations under such clauses would provide for a right to appeal, we have taken on board the committee's comments.

These amendments clarify this point and ensure that regulations made under these clauses, which make provision for a civil or financial penalty, must also include provision for a right of appeal to a court or tribunal against the imposition of such a penalty. The committee's recommendations referred to three specific instances in the Bill. To ensure consistency across the Bill, we have tabled similar amendments to a number of other clauses which make provision for a civil or financial penalty.⁸⁴

The remaining Government amendments, 48 to 52, were agreed to without debate.

Hydrogen trials

Lord Teverson (LD) and Baroness Sheenan (LD) submitted amendments 53 and 57 that would leave out Clauses 114 (then 111) and 115 (then 112), removing the Hydrogen Grid Conversion Trials from the Bill (as debated at Committee stage). Speaking for the amendments, Lord Teverson cited the high cost of hydrogen in comparison to electricity used for heat pumps, consumer resistance and better alternative uses for hydrogen as reasons to not go ahead with the trials.⁸⁵ He also tabled amendment 54 that would allow residents to opt out of the hydrogen trial.

Also speaking in support of amendments 53, 54 and 57, Baroness Sheehan (LD) cited evidence from a range of sources against the use of hydrogen in home heating on the grounds of cost, inefficiency, safety and public health.⁸⁶ Baroness Worthington (CB) and Baroness Bennett of Manor Castle (GP) both also spoke in support of these amendments.⁸⁷

Speaking in response to amendments 53, 54 and 57, Lord Callanan on behalf of the Government said that "the purpose of the trial is to provide important evidence for the strategic decisions that we will need to make on the future of heat decarbonisation." He gave assurances that the clauses were necessary for the safe and effective delivery of the trial.

⁸⁴ [\[Energy Bill\]](#) 28 March 2023, c184

⁸⁵ HL Deb 28 March 2023 [\[Energy Bill\]](#), c227

⁸⁶ HL Deb 28 March 2022 [\[Energy Bill\]](#), c229

⁸⁷ HL Deb 28 March 2022 [\[Energy Bill\]](#), c230 & c231

Amendment 53 was withdrawn and amendments 54 and 57 were not moved.⁸⁸

Lord Lennie (Lab) spoke to amendment 56 that would ensure that people were not disadvantaged whether they participated or took an alternative heat source from hydrogen and ensure they can opt out. He also stressed the importance of local support for the trials.

In response, Lord Callanan gave assurances that “the evidence that this amendment seeks to gather through a statutory consultation is already being gathered and will be reviewed by the department as part of our assessment process, following the submission of final proposals at the end of this month.” The amendment was not moved, although Lord Callanan agreed to provide Lord Lennie with further details and information relating to questions raised about entering properties as part of the trials.⁸⁹

Amendment 55 was moved by Lord Callanan, which requires regulations under Clause 115 (then 112) (regulations for the protection of consumers: hydrogen grid conversion trials) that make provision for the imposition of financial penalties to include provision for a right of appeal. The amendment was agreed.⁹⁰

2.4

Stakeholder reactions

Hydrogen use and consumer levy

A 2023 report from think tank E3G on [the case against the UK hydrogen levy](#) suggests that hydrogen is unlikely to play a role in the UK’s net zero heating mix and instead may be more suitable for use in industrial processes. The report questions imposing a levy on domestic customers and charging them to support commercial hydrogen production:

The government’s new revenue support mechanism for hydrogen will fund fossil fuel-derived blue hydrogen, which means gas companies who have made record profits from the energy crisis could receive support levied from consumer bills.

The government has declined to estimate what the cost to consumers might be for the additional levy, which it says will be introduced from 2025. Existing social and environmental levies on energy bills operate like a flat tax paid by all household energy consumers and come to £152 per year. However, unlike existing levies – such as the Warm Homes Discount fuel payment, and the Energy Company Obligation fuel poverty scheme – a levy for hydrogen development would not return a benefit to the most

⁸⁸ HL Deb 28 March 2022 c237 &c238 [\[Energy Bill\]](#)

⁸⁹ HL Deb 28 March 2023 c236 [\[Energy Bill\]](#)

⁹⁰ HL Deb 28 March 2022 c238 [\[Energy Bill\]](#)

energy-poor members of society. This is because hydrogen will not be used at scale to heat UK homes.⁹¹

Reaction to the levy follows an earlier [report from Cornwall Insight](#) published in September 2022 and commissioned by MCS Charitable Foundation, which found that hydrogen could cost 70-90% more than gas on average.⁹²

The [Energy Security Bill factsheet](#) explains that the hydrogen levy will not be introduced until 2025, and due to uncertainties around the final policy its impact remains unclear:

The levy is not expected to be implemented until 2025 (subject to legislation being in place) and so we do not expect it to have impacts on consumer bills before then. Once introduced, we expect its impacts will ramp up as we look to deliver our 2030 hydrogen ambitions to improve energy security. As policy development on the levy is ongoing, with a number of key decisions still pending, there is uncertainty regarding the precise impact of the levy on consumer bills.⁹³

Hydrogen trials

The hydrogen village trial has been the subject of significant interest in the two areas that are proposed for the trial.

As reported in the Guardian in November 2022, residents in Whitby have raised concerns about financial costs and safety.⁹⁴ This was followed up by another article in the Guardian in Mar 2023, which reported that residents in Whitby would not be forced to sign up to the trial and would be allowed to retain their natural gas supply.⁹⁵ Similar reports were also published in the BBC,⁹⁶ Telegraph⁹⁷ and others.

The main concern relates to Cadent's (the GDN leading the Whitby proposal) decision⁹⁸ to allow residents the choice to stay on natural gas supply following consultation with stakeholders.

Similar media stories have been reported from Redcar⁹⁹, although fewer than those from the Whitby area. In contrast to the decision by Cadent,

⁹¹ E3G, [The case against the UK hydrogen levy](#), 8 February 2023

⁹² Cornwall Insight, [New report shows fuel bills could rise 90% under Government's hydrogen plans](#), 26 September

⁹³ BEIS & Department for Energy Security and Net Zero [Energy Security Bill factsheet: Hydrogen and industrial carbon capture business models](#), updated 20 March 2023

⁹⁴ Guardian, ['We've got no choice': locals fear life as lab rats in UK hydrogen heating pilot](#), Nov 2022

⁹⁵ Guardian, [Cheshire villagers will not be forced to join hydrogen energy trial](#), March 2023

⁹⁶ BBC, [Hydrogen heating trial treats us like guinea pigs – residents](#), Dec 2022

⁹⁷ Telegraph, [Village revolt stops switch from gas boilers to hydrogen](#), March 2023

⁹⁸ Hydrogen Central, [Cadent – Whitby Residents will be Offered The Choice to Participate in Proposed Hydrogen Village Trial](#), March 2023

⁹⁹ Energy Live News, [Industry responds to reported concerns over UK hydrogen village](#), Jan 2023

Northern Gas Networks (NGN) (the GDN leading the Redcar proposal) will not give residents the option to remain on the natural gas supply.¹⁰⁰

Further reading

In addition to the various [publications providing information on the bill](#), the Government has published the following background documents specific to this measure:

- [Energy Security Bill factsheet: Enabling the Hydrogen Village trial](#), March 2023
- [More about the Hydrogen Village Trial](#), April 2023

The following documents provide further background on the development of this policy:

- BEIS consultation outcome on [Hydrogen for heat: facilitating a grid conversion hydrogen heating trial](#) (April 2022)
- Ofgem decision to approve Cadent and Northern Gas Networks (NGN) project funding for detailed design studies for a hydrogen village trial: [Hydrogen Village Trial Detailed Design Studies Decision](#) [PDF] (May 2022)

¹⁰⁰ Energy Live News, [No opt-out option for Redcar hydrogen trial](#), April 2023

3 Low-carbon heat schemes

Part 3, chapter 1 of the Bill would introduce powers to enable the introduction and regulation of a new low-carbon heat scheme. This would obligate manufacturers of fossil fuel heating appliances to meet a rising standard for low-carbon heat pump sales as a proportion of their total appliance sales.

3.1 Background

What are heat pumps?

Heat pumps are a low carbon heating technology that uses electricity to extract heat from the surrounding environment to provide heating to buildings. Common types of heat pump include air source heat pumps (ASHPs) and ground source heat pumps (GSHPs).

The International Energy Agency (IEA) explains how heat pumps work:

A heat pump uses technology similar to that found in a refrigerator or an air conditioner. It extracts heat from a source, such as the surrounding air, geothermal energy stored in the ground, or nearby sources of water or waste heat from a factory. It then amplifies and transfers the heat to where it is needed. Because most of the heat is transferred rather than generated, heat pumps are far more efficient than conventional heating technologies such as boilers or electric heaters and can be cheaper to run. The output of energy in the form of heat is normally several times greater than that required to power the heat pump, normally in the form of electricity. For example, the coefficient of performance (COP) for a typical household heat pump is around four, i.e. the energy output is four times greater than the electrical energy used to run it. This makes current models 3-5 times more energy efficient than gas boilers. Heat pumps can be combined with other heating systems, commonly gas, in hybrid configurations.¹⁰¹

The Energy Saving Trust (a consumer advice organisation) has a webpage which provides more information about heat pumps for consumers in the UK. It explains that:

For people using gas boilers (not LPG or oil boilers), heat pumps are likely to be slightly more expensive to run unless particular attention is paid to ensuring maximum efficiency of the heat pump in the heating system by using best practice radiator / underfloor heating design. However, as

¹⁰¹ International Energy Agency, "[How a heat pump works](#)" in [The Future of Heat Pumps](#), November 2022

utility prices fluctuate over time, we expect that heat pumps will become the cheapest as well as the lowest carbon form of heating available.¹⁰²

The role of heat pumps in net zero and energy security

To meet the Government's target to reduce UK emissions to 'net zero' by 2050, virtually all heat in homes will need to be decarbonised.¹⁰³ This will require a transition from most buildings being heated by appliances which burn fossil fuels, to the use of low-carbon technologies. Two of the main technologies being explored by the Government to develop widespread low-carbon heat are electrification using heat pumps, and conversion of all or parts of the natural gas grid to carry hydrogen. It is widely recognised that a mix of technologies will be required to decarbonise heating across the UK.¹⁰⁴

A recent DESNZ consultation sets out the potential role of heat pumps in reducing emissions:

Because most of the heat output of a heat pump is drawn from the ground or outside air, heat pumps produce several units of heat for every unit of energy consumed, meaning replacing a boiler with a heat pump is often the most impactful measure for reducing a building's energy demand.

At the same time, as the UK electricity generation mix produces increasingly lower greenhouse gas emissions each year, so do electric heating systems. In this way, expanding the deployment of efficient, electric heating systems – especially when replacing fossil fuel heating – has an important role both in reducing overall energy demand, and in reducing the approximately 25% of total UK greenhouse gas emissions currently arising from heat in buildings.¹⁰⁵

The Climate Change Committee (CCC) has outlined the possible contribution of heat pumps in scenarios where the UK meets its carbon budgets on the way to net zero by 2050. Under the CCC's 'Balanced Net Zero Pathway'¹⁰⁶ scenario around three-quarters of the cut in emissions from residential buildings comes through low-carbon heat at a building scale. This is mainly through heat pumps. They estimate that annual domestic heat pump sales¹⁰⁷ would need to exceed 1 million in 2030 and continue to increase to around 1.4 million per year in the mid to late 2030s. In comparison, the current market for gas boilers is 1.6-1.7 million a year.¹⁰⁸ Under this scenario the total number of

¹⁰² Energy Saving Trust, [In-depth guide to heat pumps](#), undated, accessed 26 April 2023

¹⁰³ HMG, [Heat and Buildings Strategy](#) [PDF], GOV.UK, 19 October 2021, p11

¹⁰⁴ BEIS, [A market-based mechanism for low-carbon heat](#) [PDF], GOV.UK, January 2022, p8

¹⁰⁵ DESNZ, [Clean Heat Market Mechanism](#) [PDF], GOV.UK, March 2023, p7

¹⁰⁶ The CCC developed this pathway to net zero emissions in 2050 as part of their sixth carbon budget covering the years 2033 to 2038. They describe the pathway as "...illustrative of what a broadly sensible path based on moderate assumptions would look like". They use this pathway as the basis for their sixth carbon budget recommendation.

¹⁰⁷ In existing and new buildings

¹⁰⁸ DESNZ, [Energy Security Bill factsheet: Low-carbon heat scheme](#) (Updated 20 March 2023)

domestic heat pumps in use reaches 10 million in 2034 and 20 million in 2041.¹⁰⁹

The Government has also said the transition to heat pumps could reduce the UK's exposure to gas price volatility:

since nearly half of the fossil fuel gas consumed by the UK each year goes on heating, accelerating the transition to ultra-efficient electric heat pumps has a key role to play in reducing the country's reliance on volatile global gas markets.¹¹⁰

Existing policy support to promote the installation of heat pumps

The [Boiler Upgrade Scheme](#) (BUS) is the Government's main scheme to support the installation of heat pumps in homes and small non-domestic properties. It was launched in England and Wales in April 2022. Grants of £5,000 are for air source heat pumps and £6,000 for ground source heat pumps. The scheme had an initial budget of £450 million over three years. It has since been extended until 2028. Budgets for later years have not yet been announced. The scheme has three main objectives:¹¹¹

1. Support continued deployment of low carbon heating systems in homes, and some small non-domestic buildings, following the closure of the Domestic RHI (up to 90,000 installations in total between 2022 and 2025).
2. Contribute to decarbonising heating in the UK and to meeting carbon budgets by delivering up to 1.1MtCO₂e of carbon savings over Carbon Budgets 4 and 5, and 2.6MtCO₂e over its lifetime.
3. Expand the existing low carbon heat market and supply chain to support the mass roll out of low carbon heating technology, by supporting an average of 2,100 direct FTE and 1,800 indirect FTE per year over the three job-years covering 2022/23 and 2024/25.

Other policy support to promote the installation of heat pumps includes:

- The [Renewable Heat Incentive \(RHI\)](#) closed to new applicants on 31 March 2022. For owners of heat pumps (and other low-carbon technologies) who joined the scheme prior to this, it provides owners a fixed payment per unit of heat generated, similar to payments for renewable electricity generation under the Feed-in Tariff.

¹⁰⁹ CCC, [The Sixth Carbon Budget. The UK's path to net zero](#) (Chapter 3, figures 3.2a and 3.2c), December 2020

¹¹⁰ DESNZ/BEIS, [Energy Security Bill factsheet: Low-carbon heat scheme](#), GOV.UK, updated 20 March 2023

¹¹¹ DESNZ, [Boiler Upgrade Scheme statistics: March 2023](#)

- Targeted support to install heat pumps is available under the [Home Upgrade Grant](#) (which provides support via local authority funding) and the [Social Housing Decarbonisation Fund](#).
- Heat pumps are subject to a [rate of 0% VAT](#).

The following Library briefings provide more information:

- [Help with energy efficiency, heating and renewable energy in homes](#) (July 2022);
- [The Renewable Heat Incentive](#) (April 2017).

The UK heat pumps market

Towards the end of April 2023, a total of just over 188,000 heat pumps had been installed in the UK under the Microgeneration Certification Scheme (MCS).¹¹² This total includes heat pumps of all types installed in all types of buildings by MCS certified contractors since 2009. All heat pumps which receive Government support, either through the Renewable Heat Incentive (up to March 2023) or the Boiler Upgrade Scheme (from May 2023) have to be installed through this scheme. The MCS figures do not include all heat pumps as some installations are not eligible for support, such as in new buildings. The European Heat Pump Association estimates that around 380,000 heat pumps had been installed in the UK up to the end of 2022.¹¹³

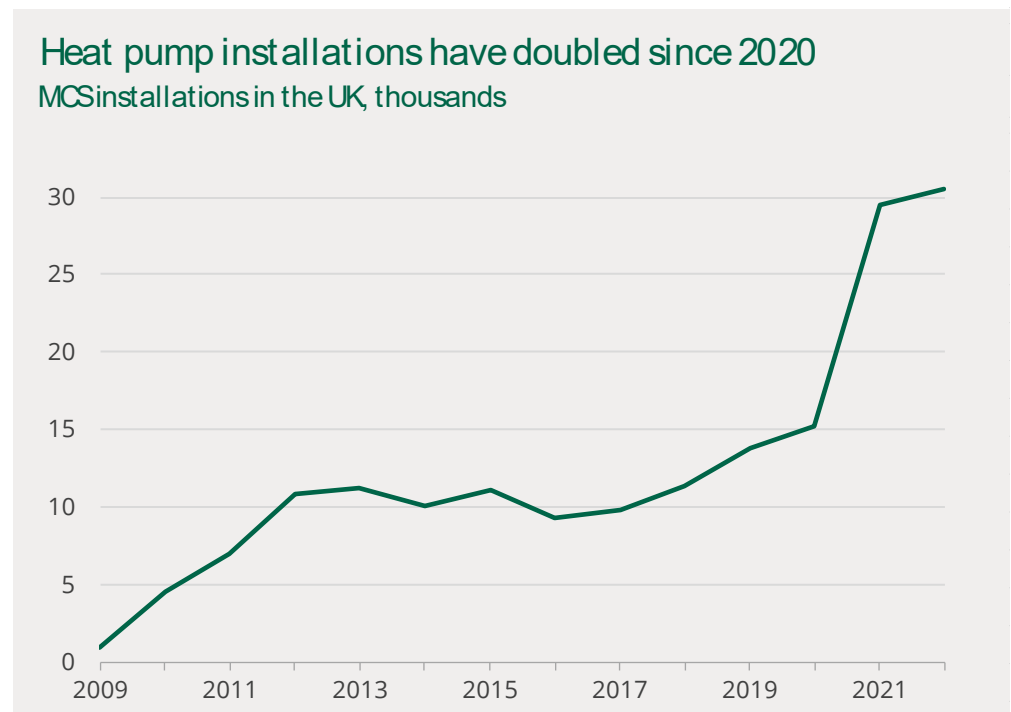
84% of the MCS heat pump installations were air source heat pumps and 16% ground/water source heat pumps. Domestic installations made up 89% of the total, 7% were in non-domestic and 4% commercial buildings. The local areas with highest MCS heat pump installation rates were all in remote rural areas with little or no mains gas, including Na h-Eileanan Siar (17.6% of households in the area), Orkney Islands (13.7%), Shetland Islands (7.4%), and Argyll and Bute (7.3%).¹¹⁴

The following chart shows trends in the number of new MCS installations.

¹¹² MCS, [The MCS data dashboard](#) (accessed 30 April 2023)

¹¹³ European Heat Pump Association data provided in: The Eco Experts, [Which Countries Are Winning the European Heat Pump Race?](#) 21 April 2023

¹¹⁴ MCS, [The MCS data dashboard](#) (accessed 30 April 2023)

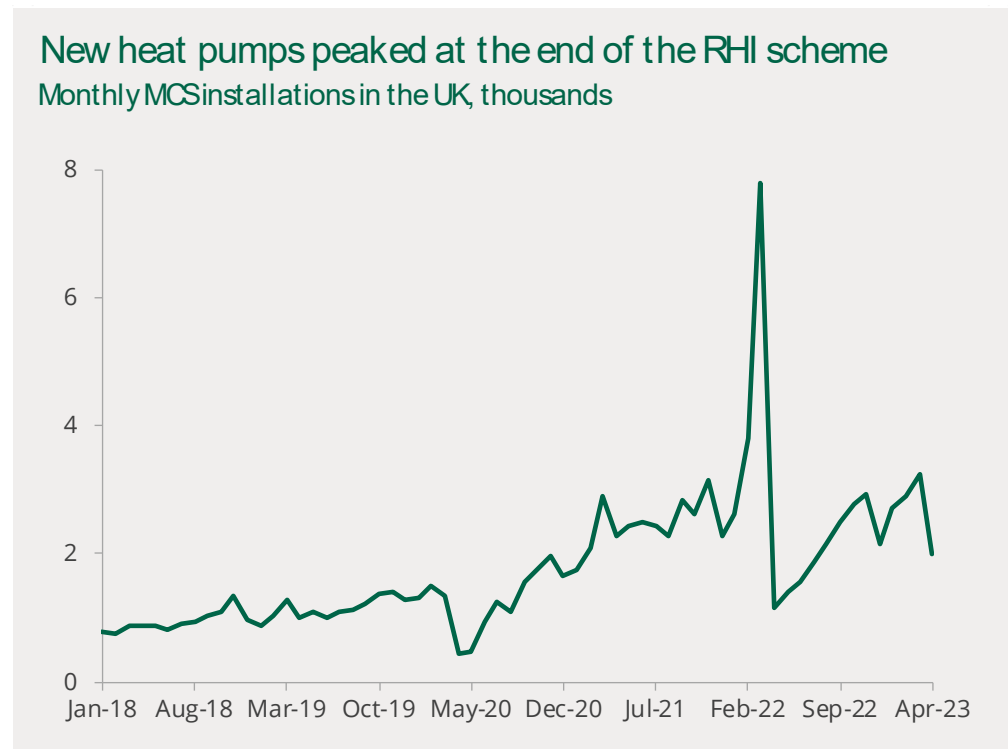


Source: MCS, [The MCS data dashboard](#) (accessed 30 April 2023)

There was a substantial increase in these installations in 2021, which was sustained in 2022 when the total reached a new high of 30,600. However, the latest annual total is still well below the Government's aim of 600,000 installations a year by 2028.¹¹⁵

The next chart looks at recent monthly installations and shows the peak month was in January to March 2022, the last months for new installations to receive support under the Renewable Heat Incentive (RHI). Its replacement in England and Wales, the Boiler Upgrade Scheme (BUS), launched in April 2022. The number of MCS heat pump installations in nearly every month of the first year of the BUS have been lower than in the same month a year earlier.

¹¹⁵ BEIS, [The Ten Point Plan for a Green Industrial Revolution](#) (Updated November 2020)



Source: MCS, [The MCS data dashboard](#) (accessed 30 April 2023)

The European Heat Pump Association (EHPA) says that total UK heat pump sales were just under 60,000 in 2022. This includes all sales, not just those for MCS installations. Their 2022 total was a 40% increase on the equivalent figure for 2021.¹¹⁶ While higher than MCS installations this figure is still only 10% of the Government's 600,000 aim for 2028.

Heat pumps across Europe

According to the EHPA total sales of heat pumps in the UK in 2022 were the fifth lowest out of 16 European countries. The near 60,000 sales in the UK were well below figures for Italy (502,000), France (463,000) and Germany (236,000). Total sales across these countries was 3 million in 2022, double the 2019 figure. UK sales per household were the lowest of these countries at 2.1 per 1,000 households. This was less than half the next lowest country. The Scandinavian countries had the highest rates with 69 per 1,000 households in Finland, 62 in Norway, 39 in Sweden and 30 in Denmark.¹¹⁷

The EHPA estimates that the total stock of installed heat pumps in the UK was 380,000 at the end of 2022. This was a rate of 56 per 1,000 population, the second lowest figure out of 21 European countries. The

¹¹⁶ European Heat Pump Association, [Heat pump record: 3 million units sold in 2022, contributing to REPowerEU targets](#) (20 February 2023)

¹¹⁷ European Heat Pump Association, [Heat pump record: 3 million units sold in 2022, contributing to REPowerEU targets](#) (20 February 2023)

highest rates were in Norway (297 per 1,000 population), Finland (242) and Sweden (227). Only Hungary had a lower figure than the UK.¹¹⁸

[EurObserv'ER data](#) gives higher figures on heat pump sales and total installations. They say this is because they include greater numbers of (reversible) air-to-air heat pumps which, in Southern Europe especially, are used for cooling in the warmer months. They put total heat pump sales in the EU27 at 4.2 million in 2020 and the total number installed at 42 million at the end of 2020.¹¹⁹

Costs of heat pumps

Installation costs

The [factsheet for the low carbon heat scheme](#) sets out the Government's view on prospects for lower installation costs in the future:¹²⁰

...the Government is confident that the installed cost of heat pumps will fall significantly over the coming years as the market scales up, making heat pumps an increasingly attractive and affordable option for more and more UK households. In the Heat and Buildings Strategy, we set an ambition to work with industry to achieve 25-50% reductions in the upfront cost of installing a heat pump by 2025 and for cost parity between owning and running a gas boiler and a heat pump by 2030.

The total cost of all heat pump installations under the Microgeneration Certification Scheme (MCS) is routinely collected by the MCS Service Company. This covers the entire costs of the installation, not just the heat pump itself, but other equipment, labour costs, installer overheads etc. The average cost of air source heat pumps installed in 2022 by MCS approved installers was £12,400 or around £1,300 per kW of capacity. This is the cost before the £5,000 grant under the Boiler Upgrade Scheme (from April 2022).¹²¹

It is not straightforward to make direct comparisons with the costs of a new gas boiler. The costs of a replacement gas boiler, typically put at around £3,000,¹²² excludes any other costs. Heat pump installations often include other equipment (such as a hot water tank, piping, radiators and controls) to help the heat pump work effectively and improve the overall efficiency of the heating system. A [recent UK Energy Research Centre report](#) reviewed evidence on costs of heat pump installations and found that equipment costs made up around 60% of total costs. These were 'approximately evenly' shared between the heat pump itself and other equipment. Labour costs made up around 60% of the non-equipment costs (or around one quarter of total costs), with design, commissioning,

¹¹⁸ European Heat Pump Association data provided in: The Eco Experts, [Which Countries Are Winning the European Heat Pump Race?](#) 21 April 2023

¹¹⁹ EurObserv'ER, [Heat pumps barometer 2021](#)

¹²⁰ DESNZ, [Energy Security Bill factsheet: Low-carbon heat scheme](#) (Updated 20 March 2023)

¹²¹ MCS, [The MCS data dashboard](#) (Accessed 30 April 2023)

¹²² See, for instance, CCC, [The Sixth Carbon Budget: Buildings](#) (Table M3.1)

distribution and overheads making up the rest of non-equipment costs.¹²³

The report said that in the UK there was “little or no reduction in the average total installed cost of heat pumps over the past decade”. Some cost reductions had been found in other countries. They summarised forecasts of future cost reductions for the UK. These averaged at cuts of 20-25% in 2030, with larger falls for non-equipment (31%) than equipment costs (16%).¹²⁴ This would be well below the Government’s cost reduction ambitions.

Running costs

The running costs of a heat pump, and whether it is cheaper to run than a gas boiler, depends on a range of factors including its efficiency, the design of the central heating system, the efficiency of heating source it replaces and the relative price of a unit of electricity and gas. Since the Renewable Heat Incentive scheme closed in March 2022 Government support for heat pumps is through a one-off grant to help with installation costs, rather than ongoing support.

Research on heat pumps installed in the UK in 2020 and 2021 found an average Seasonal Performance Factor¹²⁵ of 2.8.¹²⁶ This makes it more than three times as efficient as a gas boiler (with 85% efficiency). Under current energy prices it means that on average a heat pump is marginally cheaper to run at present.¹²⁷ ¹²⁸ However, this calculation will vary property-to-property and is highly dependent on the relative price of electricity and gas.

3.2

Policy development

In October 2021 the Government published the [Heat and Buildings Strategy](#). This set out a range of plans to promote the use of heat pumps, including:

¹²³ UKERC, [Decarbonising Home Heating: An Evidence Review of Domestic Heat Pump Installed Costs](#) (April 2023)

¹²⁴ UKERC, [Decarbonising Home Heating: An Evidence Review of Domestic Heat Pump Installed Costs](#) (April 2023)

¹²⁵ The ratio of heat produced to electricity consumed

¹²⁶ Energy Systems Catapult/DESNZ, [Electrification of Heat Demonstration Project Interim Insights from Heat Pump Performance Data](#)

¹²⁷ Average GB gas and electricity prices under the Energy Price Guarantee (April to June 2023); DESNZ, [Energy Price Guarantee: regional rates, April to June 2023](#)

¹²⁸ If installing a heat pump meant the household no longer needed any gas supply then they would also save on their gas standing charge, currently just over £100 a year.

- A target to grow the market for hydronic¹²⁹ heat pumps from the (then current) rate of around 35,000 installations per year to 600,000 per year by 2028, to help put the UK on track to meet the Government's 2050 net zero target.¹³⁰
- The introduction of a market-based mechanism for heat pumps, placing an obligation on fossil fuel boiler manufacturers to achieve the sale of a number of heat pumps proportional to their UK boiler sales over a given period. The obligation would be set in line with the trajectory required to deliver the 2028 target.¹³¹
- An ambition to work with industry to reduce the costs of installing a heat pump by at least 25-50% by 2025, and to ensure heat pumps are no more expensive to buy and run than gas boilers by 2030.¹³²

BEIS launched a first [consultation on the market-based mechanism \[PDF\]](#) alongside the Strategy. It explained that the aim of the mechanism was to “create a market incentive to grow the numbers of heat pumps installed in existing premises each year, providing industry with a clear, long-term policy framework for investment and innovation”.¹³³ The consultation sought views on the scheme's design, including whether it would be preferable to introduce an obligation on manufacturers of fossil fuel heating appliances or energy suppliers.

In May 2022 BEIS published its [response to the consultation](#). The summary of consultation responses noted that:

The overall majority of respondents, and the majority in most stakeholder groups, were broadly supportive of the market-based mechanism proposal, while emphasising that wider policy action is likely to be needed alongside to further support the transition to low-carbon heating and the effective implementation of the mechanism itself.

Fossil fuel heating appliance manufacturers (many of which supply a range of heating technologies, including heat pumps) and related trade associations [...] [were] split more evenly between opposition to the proposals and more neutral positions.

There was a clear preference [...] [for] an obligation on manufacturers of fossil fuel heating appliances to meet a rising standard for low-carbon appliance sales, over the alternative of placing a heat pump obligation on energy suppliers. Respondents said that this would provide the clearest signal to the market and be most likely to contribute to cost reductions.

Central to the arguments raised in opposition to the proposals was that appliance manufacturers have little influence over consumers' purchasing

¹²⁹ 'Hydronic' heat pumps are heat pumps that deliver heat to buildings via a wet central heating system (i.e. a system with a central heat pump which heats water, which is in turn pumped through radiators).

¹³⁰ HMG, [Heat and Buildings Strategy \[PDF\]](#), GOV.UK, October 2021, p21

¹³¹ HMG, [Heat and Buildings Strategy \[PDF\]](#), GOV.UK, October 2021, p191

¹³² HMG, [Heat and Buildings Strategy \[PDF\]](#), GOV.UK, October 2021, p12

¹³³ BEIS, [Market-based mechanism for low carbon heat](#), GOV.UK, updated 10 January 2023

decisions and that the proposed scheme could introduce unnecessary complexity to the market.¹³⁴

BEIS confirmed its intention to develop and legislate for a market-based mechanism from 2024, which would place an obligation on fossil fuel boiler manufacturers to sell a certain number of heat pumps, in proportion to their fossil fuel boiler sales, over a given period of time.¹³⁵

In March 2023, DESNZ launched a second [consultation on the Clean Heat Market Mechanism](#) in March 2023, as part of the Government's [Powering Up Britain](#) package of energy announcements. The consultation is seeking views on the detailed design of the scheme, including installation targets, credit trading within the scheme, the use of data and administration, compliance and enforcement. The consultation will close on 8 June 2023.

In April 2023 DESNZ published the [Heat pump net zero investment roadmap](#). This summarises the Government's heat pump policies, including the Clean Heat Market Mechanism, and sets out available investment opportunities.

3.3 Measures in the Bill

The proposed measure in the Bill would give the Secretary of State powers to regulate and to introduce a new Low-Carbon Heat Scheme. Once introduced the scheme would:

place an obligation on the manufacturers of fossil fuel heating appliances to meet a rising standard for low-carbon heat pump sales as a proportion of their total appliance sales. Manufacturers [would] be able to meet the new standard either through sales of their own heat pumps, or by purchasing credits from other heat pump manufacturers, or a mix of both.¹³⁶

The DESNZ [factsheet on the Low-Carbon Heat Scheme](#) provides more information.

The Impact Assessment says the direct impacts of the measure in the Bill are expected to be "very limited". It instead aims to illustrate the potential impacts of the scheme itself, once established through secondary legislation.¹³⁷

¹³⁴ BEIS, [A market-based mechanism for low-carbon heat: Summary of responses received and Government response](#) [PDF], GOV.UK, May 2022, p6

¹³⁵ BEIS, [A market-based mechanism for low-carbon heat: Summary of responses received and Government response](#) [PDF], GOV.UK, May 2022, p7

¹³⁶ DESNZ/BEIS, [Energy Security Bill factsheet: Low-carbon heat scheme](#), GOV.UK, updated 20 March 2023

¹³⁷ BEIS, "Annex 1.6: Clean heat market mechanism impact assessment" in [Energy Bill - Impact Assessments](#) [PDF], July 2022, p72 (p1 of Annex 1.6)

A [DESNZ factsheet](#) [PDF] and the [Impact Assessment](#) [PDF] provide commentary on the expected consumer impacts of this measure, as well as the Bill's wider measures to support clean heat technologies:

With companies having a clear incentive framework to invest in supporting more UK consumers to make the switch to a heat pump, consumers will benefit from a thriving competitive market in which a growing range of products and services are offered to suit an increasingly diverse set of consumers and buildings so that more and more households can decarbonise their home.¹³⁸

The impacts on domestic consumers of measures included in the Bill will differ based on their household characteristics, meaning costs and benefits will differ across the consumer base. For example, adopting clean heat technology currently has high upfront capital costs, which may be a barrier to adoption for lower income households in the short run. However, policies in this area aim to drive market scale and promote long-term cost reductions in low-carbon heating, reducing this barrier in the longer term¹³⁹

Clauses 104 to 113

Part 3, chapter 1 of the Bill would give the Secretary of State powers to establish a low-carbon heat scheme and set out provisions for this scheme and the regulations that provide for it.

Clauses 104 to 106 would give the Secretary of State powers to make regulations to set up a scheme to encourage the sale and installation of low-carbon heating technologies, such as electric heat pumps, through the imposition of targets on certain market actors (such as manufacturers and suppliers of relevant products).

Clause 107 would set out operational and administration features of the scheme that the regulations may provide for, including how credits for meeting targets might be transferred between parties, and consequences for parties failing to meet targets under the scheme.

Clause 108 would set out how the scheme's regulations may provide for the appointment of an administrator of the scheme. It would also provide that if the administrator is a public authority, they may make changes to primary legislation for the purpose of enabling it to carry out its functions under the scheme.

Clause 109 would provide for the regulations to enable the administrator to conduct enforcement activities. It would also provide for the regulations to specify civil penalties for non-compliance with the requirements of the scheme and to create offences.

¹³⁸ DESNZ/BEIS, [Energy Security Bill factsheet: Low-carbon heat scheme](#), GOV.UK, updated 20 March 2023

¹³⁹ DESNZ, [Energy Bill Summary Impact Assessment](#) [PDF], GOV.UK, April 2023, p26

Clause 110 would provide for the regulations to make provision about the application of amounts paid for failing to meet targets under the scheme or for non-compliance with the scheme.

Clause 111 would provide for the scheme's regulations to make provision about appeals against decisions made by the administrator and civil penalties or enforcement action imposed for non-compliance with the scheme.

Clause 112 would establish procedural requirements for the making of scheme regulations. It specifies the circumstances in which the regulations would be subject to the negative or the affirmative procedures.

Clause 113 would provide definitions for terms used in Chapter 1.

The schedule includes a number of delegated powers to make regulations. Whether these would be subject to the negative or affirmative procedures are explained in the [Delegated Powers Memorandum](#) [PDF]. The House of Lords Delegated Powers and Regulatory Reform Committee did not draw attention to any of these powers in its [report on Part 6 of the Bill](#) [PDF].¹⁴⁰

3.4 Debate and amendments

Introducing the Bill during second reading, Lord Callanan said the Low-Carbon Heat Scheme would “help build the market for heat pumps to 600,000 installations per year by 2028”.¹⁴¹ Responding to concerns about cost during the debate, he said the Government was “confident that the instalment cost of heat pumps will come down significantly over the coming years as the market scales up, making heat pumps an increasingly attractive and affordable option for more and more UK households”.¹⁴²

At Committee stage Lord Callanan proposed amendment 123 to clause 106 (previously clause 100). The clause would provide examples of how targets for a low-carbon heat scheme may be set. The amendment specified that for a target referring to the energy efficiency or carbon intensity of a heating appliance, the target could apply to all of a given manufacturer's heating appliances sold in the UK, whether or not they were sold or installed by the manufacturer itself. The amendment was agreed.¹⁴³

Baroness Worthington (crossbench) moved amendment 117 which sought to require the Secretary of State to make regulations establishing

¹⁴⁰ House of Lords Delegated Powers and Regulatory Reform Committee, [Seafarers' Wages Bill \[HL\]: Energy Bill \[HL\]: Parts 3–6](#) [PDF], 5 October 2022, HL 65

¹⁴¹ HL Deb 19 July 2022 [\[Energy Bill\]](#), c1885

¹⁴² HL Deb 19 July 2022 [\[Energy Bill\]](#), c1932

¹⁴³ HL Deb 12 December 2022 [\[Energy Bill\]](#), c79GC-83GC

a low-carbon heat scheme within a year of the Bill receiving Royal Assent.¹⁴⁴ In the substantive debate on grouped amendments, this was supported by Labour, with Lord Lennie also proposing wider amendments that would specify targets and deadlines for the delivery of the policy.¹⁴⁵ Lord Callanan responded that whilst the Government intended to introduce the scheme in 2024, it would “not be appropriate” to specify this in the bill as it could limit the Government’s ability to respond to unforeseen changes in market conditions. The amendment was withdrawn.¹⁴⁶

At report stage the Government moved amendments 48 to 52 to clause 111 (previously clause 108). These would require that where regulations to establish and operate low carbon heat schemes make provision for the imposition of financial penalties, they also include provision for a right of appeal. The amendments were agreed.¹⁴⁷

The measure was not discussed in the Third Reading debate.

3.5

Stakeholder reactions

The Building Research Establishment (BRE) welcomed the proposal to introduce a low-carbon heat scheme in November 2022 (following the Government’s commitment to progress the then-paused Energy Bill). It said:

It is encouraging that the Energy Bill promises to set out a clear plan to drive private investment in the wider renewable energy market, and it’s crucial that this includes the heat pump industry. Heat pumps are likely to be the dominant technology used to transition households to clean energy over the short and long-term, but the pace of installation here is currently lagging behind comparable European countries.

To tackle this head-on, we welcome the government’s plan to implement a Low Carbon Heat Scheme which would stimulate heat pump sales and help the UK reach its ambition of installing 600,000 per year by 2028.¹⁴⁸

Several stakeholders commented on the launch of DESNZ’s consultation on the [Clean Heat Market Mechanism](#), which was published alongside the Government’s [Powering Up Britain plans](#) on 30 March 2023.

- The Heat Pump Association (HPA, a trade body) and Electrify Heat (an industry-backed campaign) both welcomed the Government’s

¹⁴⁴ HL Deb 12 December 2022 [[Energy Bill](#)], c75GC-76GC

¹⁴⁵ HL Deb 12 December 2022 [[Energy Bill](#)], c77GC-79GC

¹⁴⁶ HL Deb 12 December 2022 [[Energy Bill](#)], c80GC

¹⁴⁷ HL Deb 28 March 2023 [[Energy Bill](#)], cc203-204

¹⁴⁸ BRE Group, [BRE comments on the UK’s Energy Bill](#), 29 November 2022

support on focus for heat pumps, including the consultation on the new market mechanism.¹⁴⁹ The HPA said:

After Chris Skidmore’s Review of Net Zero which echoed the calls for greater efficiency in the UK’s housing stock, a renewed focus on low carbon heating is needed, and clarifications provided by government today should go far to realising this, and to increase consumer and installer interest in heat pump technology.

We look forward to working with government as it works to implement the below package of measures to ensure we reach the target of 600,000 heat pump installations per year by 2028. Proposed plans, if implemented effectively, will succeed in providing much needed clarity for the heat pump industry to invest in the technology and upskill heat pump rollout across the country.¹⁵⁰

- The Energy and Utilities Alliance (EUA, a trade body representing boiler manufacturers) said the Government’s plans to introduce the Clean Heat Market Mechanism in 2024 were “absurd”. It said the mechanism would push up prices and could undermine British manufacturers:

Mike Foster, chief executive of the EUA, described the Clean Heat Market Mechanism as being equivalent to imposing a £5,000 fine on manufacturers for every boiler sold over the unit sales quota.

[...]

He said: “Punishing manufacturers for selling the boilers that consumers want to buy is simply irrational, and by doing so, manufacturers may be left with no choice but to raise prices. If the public truly want to buy heat pumps, our members will sell them – that’s the basic law of demand and supply.”

“Instead, this absurd, Soviet-style production quota will force our members to import heat pumps into the UK, to avoid a fine and that’s at the expense of a British-built boiler.”

Another criticism made by the EUA about the government’s plans to mandate how many heat pumps manufacturers must provide at a certain scale was that there could be a potential risk on jobs with British manufacturers.¹⁵¹

- Trade publications [Utility Week](#) and [Specification Online](#) both published a summary of reactions to the various heat pump

¹⁴⁹ Heat Pump Association, [The Heat Pump Association welcomes announcements by the Government today to speed up the UK’s Net Zero pathway](#), 30 March 2023; Electrify Heat, [Heat pumps the big winner as dust settles on Energy Security Day](#), 30 March 2023

¹⁵⁰ Heat Pump Association, [The Heat Pump Association welcomes announcements by the Government today to speed up the UK’s Net Zero pathway](#), 30 March 2023

¹⁵¹ H&V News, [Boiler group slams government over “absurd” Clean Heat Market Mechanism](#), 4 April 2023

announcements included in the Power Up Britain plans, including the Clean Market Mechanism.¹⁵²

Further reading

In addition to the various [publications providing information on the bill](#) in general, the Government has published the following background documents specific to this measure:

- [Factsheet: Low-carbon heat scheme](#)

The following documents provide further background on the development of this policy:

- [Heat and Buildings Strategy \(2021\)](#)
- [Consultation on a market-based mechanism for low-carbon heat \[PDF\]](#) (October 2021) and [Government response](#) (May 2022)
- [Consultation on proposals for the Clean Heat Market Mechanism](#) (March 2023)

¹⁵² Utility Week, [Pathway set out to end gas and electricity price imbalance](#), 30 March 2023 [accessed via Nexis News]; Specification Online, [Mixed industry response to Government new energy plan](#), 31 March 2023

4 Nuclear

This part of the bill aims to confirm the exclusion of fusion energy facilities from nuclear site licencing requirements.

The Government has published a factsheet covering these provisions: [Energy Security Bill factsheet: Fusion regulation](#), updated 20 March 2023.

4.1 Background

What is nuclear fusion?

Nuclear fusion is the process whereby two light elements are “fused” together to form a heavier element. This process releases large amounts of energy. It is the opposite of nuclear fission (traditional nuclear), in which a heavy element is split to produce two lighter elements and release excess energy.¹⁵³ The International Atomic Energy Agency (IAEA)¹⁵⁴ states that fusion could generate four times more energy per kilogram of fuel than fission and nearly four million times more energy than burning oil or coal.¹⁵⁵

Fusion has not yet been demonstrated to work at a commercial scale. While fusion reactions have been successfully produced in many experiments, until December 2022, no fusion reaction had been able to produce more energy resulting from the reaction than went into it.¹⁵⁶ In this recent experiment the energy produced was reported as being equivalent to the energy of two Mars chocolate bars, or enough to boil six kettles of water. Commenting on the experiment, Professor Jeremy Chittenden, Co-Director of the Centre for Inertial Fusion Studies at Imperial College London, welcomed the breakthrough, but cautioned that to turn fusion into a power source, the energy gain will need to be boosted further still, in a way that can be reproduced more frequently and cheaply.¹⁵⁷

¹⁵³ BEIS, [Energy Security Bill factsheet: Fusion regulation](#), updated 29 December 2022

¹⁵⁴ An independent intergovernmental organisation that develops nuclear safety standards

¹⁵⁵ IAEA, [What is nuclear fusion?](#) 31 March 2022

¹⁵⁶ Imperial College London, “[‘Breakthrough’ as fusion experiment generates excess energy for the first time](#)” 13 December 2022

¹⁵⁷ Imperial College London, “[‘Breakthrough’ as fusion experiment generates excess energy for the first time](#)” 13 December 2022

Advantages of nuclear fusion

The UK government believes that fusion could be the “ultimate clean power solution, representing a low carbon, secure and effectively unlimited source of energy.”¹⁵⁸

In October 2021 the Government published the [UK’s Fusion Strategy: Towards Fusion Energy](#) (the “2021 strategy”), which summarises the advantages of fusion energy as follows, highlighting its lack of carbon emissions and higher levels of safety compared with traditional nuclear energy:

1. Fuel abundance: the fuels used in fusion reactions are effectively inexhaustible. Deuterium is readily extracted from seawater, and tritium is produced using lithium
- Baseload power: fusion energy does not depend on external factors such as wind or sun, making it continuously deployable at point of need
- High fuel efficiency: fusion produces more energy per gram of fuel than any other process that could be achieved on Earth
- Carbon-free: helium is the product of the fusion process – no carbon or other greenhouse gases are produced in the reaction
- No chain reaction: fusion is not based on a chain reaction; specific conditions of heat and pressure need to be maintained for fusion to occur. Therefore, if there were any technical problems, a fusion facility could be immediately switched off and the process would stop within seconds or less
- Shorter lived waste: fusion power plants are not expected to produce the very long lived, high level radioactive waste associated with nuclear fission.¹⁵⁹

The goals of the 2021 strategy are to demonstrate the commercial viability of fusion by building a prototype fusion power plant in the UK by 2040 and to build a fusion industry in the UK which can export fusion technology around the world.

Regulatory framework for nuclear fusion

Nuclear fusion in the UK is regulated as a radioactive substance activity. This means that in England, the regulation of fusion facilities is led by the Environment Agency (EA) and the Health and Safety Executive (HSE). Here, the EA regulates the keeping and use of radioactive material and the accumulation and disposal of radioactive waste, acting as both an environmental and a security regulator. Among other things the HSE regulates compliance with the [Ionising Radiations Regulations 2017](#) (SI 2017/1075), which require employers to keep exposure to ionising radiations as low as reasonably practicable. HSE also oversees requirements in the [Radiation \(Emergency Preparedness and Public](#)

¹⁵⁸ BEIS, [Energy Security Bill factsheet: Fusion regulation](#), updated 29 December 2022

¹⁵⁹ HM Government, [UK’s Fusion Strategy: Towards Fusion Energy](#), October 2021, p9

[Information\) Regulations 2019](#) (SI 2019/703), which puts in place a framework to ensure that members of the public are properly informed and prepared, in advance, about what they need to do in the unlikely event of a radiation emergency occurring.⁹

Nuclear fusion regulation is different to that for conventional nuclear energy sites, which are regulated by the Office for Nuclear Regulation (ONR).¹⁰ For conventional nuclear energy sites, requirements are prescribed by the [Nuclear Installations Act 1965](#), as amended, and the [Nuclear Installations Regulations 1971](#). Under these provisions, operators must obtain a nuclear site licence (a legal document) issued by the ONR and demonstrate compliance with a number of standard conditions relating to design, construction, operation and decommissioning.¹¹

The Government wants to provide clarity on the future regulatory framework for fusion. This is to ensure that fusion power plants are not inadvertently captured by traditional nuclear site regulations at any point in their lifetime. This is because the Government believes that the hazards associated with fusion energy different to traditional nuclear. The aim is to allow the industry to gain investment, plan and grow.¹⁶⁰

Alongside the 2021 strategy, the Government published a consultation outlining its proposals for a [regulatory framework for fusion energy in the UK](#). One of its proposals was to legislate to confirm that fusion energy facilities do not require nuclear site licences. The Government stated that traditional nuclear site licencing would be disproportionate for fusion, as that regime was designed for sites with higher hazards than those presented by fusion energy facilities. In the consultation paper it determined that the overall hazard profile will be “comparable with other facilities regulated by the Health and Safety Executive and environmental regulators in the UK, such as a large chemical plant.”¹²

A [Government response to this consultation \(opens PDF\)](#) was published in June 2022. It noted that not all respondents agreed with this hazard assessment, expressing concern that the Government had not sufficiently accounted for all the technical risks or complexity associated with a fusion energy facility. To allay concerns raised, the Government worked with the Nuclear Innovation and Research Office (NIRO) and the UK Atomic Energy Authority’s (UKAEA) Fusion Safety Authority to provide a supporting Technical Annex to the consultation response (Annex B).¹³ The annex provides additional technical information on radiological hazards and potential causes of radiological impact. In particular, it sets out further details on tritium, (the radioactive fuel that will be used in many fusion power plants), and on the range of hazards that are considered for fusion power plants.

¹⁶⁰ BEIS, [Energy Security Bill factsheet: Fusion regulation](#), updated 29 December 2022

Territorial extent

Nuclear regulation is reserved to the UK Government. Environmental protection is devolved to each administration in the UK with health and safety regulations reserved except in Northern Ireland. Planning is devolved to each administration except in the case of Wales where planning for facilities generating over 350 MW of energy is reserved.¹⁶¹ In the 2021 strategy the Government said that it was keen for these proposals to apply across the UK, and hoped that the proposed “non-nuclear” regulatory framework would be used by the Devolved Administrations in considering any changes to devolved areas.¹⁶²

4.2 Provision in the Bill and reaction to it

Clause 116 would amend section 1 of the [Nuclear Installations Act 1965](#) to explicitly exclude fusion energy facilities from nuclear site licencing requirements.

Public comment on this specific provision has been limited, although as noted above, responses were received as part of the Government’s consultation process. The [Global Energy Blog](#) from law firm Dentons called the provisions “a liberalising move that recognises the radical differences in safety implications of nuclear reactor (fission) technology and fusion.”¹⁶³ Similarly, energy management consultants Energy Impact Limited said that the provision would provide “clarity to developers of prototype/demonstration fusion facilities currently being planned to support rapid commercialisation.”¹⁶⁴

In a House of Commons Science and Technology Committee oral evidence session on fusion energy in May 2022, industry experts commended this approach to fusion regulation. Professor Andrew Sherry, Chair in Materials and Structures, University of Manchester, suggested this approach would attract inward investment and persuade companies to move to the UK.¹⁶⁵

This clause was not amended at any stage in the Lords.¹⁶⁶

¹⁶¹ HM Government, [Towards Fusion Energy: The UK Government’s response to the consultation on its proposals for a regulatory framework for fusion energy](#), June 2022 (opens PDF)

¹⁶² HM Government, [UK’s Fusion Strategy: Towards Fusion Energy](#), October 2021, p68

¹⁶³ Dentons Global Energy Blog, [UK government publishes ground-breaking Energy Bill](#), 7 July 2022

¹⁶⁴ Energy Impact, [Regulation decision to help ‘accelerate’ fusion energy progress](#), 21 June 2022

¹⁶⁵ House of Commons, Science and Technology Committee Oral evidence: Fusion, HC 230, 25 May 2022, HC (2022-23) 230, [Q105](#) [Professor Sherry]

¹⁶⁶ House of Lords Grand Committee, [Energy Bill](#), 14 December 2022, c140GC

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