Institute for Sustainable Resources,
Centre for Net Zero Market Design

Energy Security and Net Zero Committee Inquiry: The cost of energy

Written evidence submitted by UCL's Centre for Net Zero Market Design, within the Institute for Sustainable Resources

8th April 2025

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The UCL Institute for Sustainable Resources' mission is to provide evidence, expertise and training to respond to climate change and support sustainable transitions for people and planet. The Centre for Net Zero Market Design works across academia, industry, government, regulatory bodies and other stakeholders, to provide expert advice on the best policies and practices for creating and maintaining effective electricity markets as we decarbonise power systems in the UK and beyond.

We welcome the opportunity to submit evidence to this important inquiry. We would be delighted to discuss this response, or any of our other work. Please contact Claudia.brown.21@ucl.ac.uk.

Q2: How should consumer bills be insulated from inflated prices due to shocks to the global supply of gas? What needs to change?

The electricity component.

Great Britain currently operates a marginal pricing-based wholesale electricity market; prices are set by the operational costs of the final, most expensive generating power plant brought online to meet total demand. This market design choice dates to privatisation in the 1980s, when fossil fuel power plants dominated electricity generation and were broadly characterised by relatively high day-to-day costs but low upfront capital costs.

Now, around half of our electricity is derived from low-carbon sources. Renewables have thus far proven to be cheaper on an average-cost basis[1,2,3], and exhibit opposite cost structure to fossil fuels – higher capital costs but much lower operating costs. Consequently, electricity prices are still mostly set by incumbent gas assets (which are typically more expensive to operate), despite accounting for a shrinking share of total generation. During the energy crisis, gas set the price of electricity 98% of the time despite only accounting for around 40% of total generation, leaving British consumers severely exposed to the European gas price shocks caused by Russia's invasion of Ukraine.[4]

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[1] Stewart (2023) Why is cheap renewable electricity so expensive on the wholesale market? House of Commons Library. Available at: https://commonslibrary.parliament.uk/why-is-cheap-renewable-electricity-so-expensive/ . Of course, there is always the potential for gas prices to crash and for this trend to reverse.
[2] Jansen et al. (2020) Offshore Wind Competitiveness in Mature Markets without Subsidy. Nature Energy. https://doi.org/10.1038/s41560-020-0661-2.
[3] Beiter et al. (2024) The Enduring Role of Contracts for Difference in Risk Management and Market Creation for Renewables. Nature Energy https://doi.org/10.1038/s41560-023-01401-w.
[4] Zakeri et al. (2022) The Role of Natural Gas in Electricity Prices in Europe. UCL ISR. Available at: https://www.ucl.ac.uk/bartlett/sustainable/sites/bartlett_sustainable/files/the_role_of_natural_gas_in_electricity_prices_in_europe_updated_may_2023.pdf

A core challenge investigated under the 'Review of Electricity Market Arrangements' (REMA) programme is how best to decouple gas and electricity prices to pass through the benefits of renewables to consumers. To address this challenge, colleagues at UCL published research proposing new market design – a 'Green Power Pool' (GPP).[5] If implemented, a GPP would be a new market, operating adjacent to the current wholesale market, specifically designated for the procurement of low-carbon electricity.

Prices would be based on the long-run marginal costs of generation, rather than the short-run, better reflecting the cost structure of renewables. In our proposal we explored the ability to aggregate renewable generation on CfDs in a GPP, using their agreed strike prices to represent their long-run marginal costs.[6] All electricity bought and sold in the GPP would, therefore, be decoupled from the price of gas, the volume of which would grow with the rising capacity of renewables.

In the second REMA consultation document, the GPP was discounted from further consideration.[7] This was partly due to the perception that its benefits would be limited given the target pace for renewables deployment. A graph is then presented in the document (Figure 6, Page 34), depicting gas setting the price less than 10% of the time by 2030. These results appear ambitious. While rising renewables capacity is reducing the total dependence on gas[8], assuming gas prices remain above the strike prices of renewables, only a fraction of gas generation per hour would be required for it to remain the marginal generator, and thus be the price-setter during a significant number of hours per year. Further, DESNZ's results are presented without accompanying information detailing exactly how they were achieved, nor the modelling assumptions.

Irrespective of how frequently gas sets the price, two-sided Contracts-for-Difference (CfDs) will increasingly shield the annual level of energy bills from gas price shocks, as the share of renewables. As currently designed, generators with CfDs are obliged to pay back any revenue above their 'strike price' to suppliers via the Low Carbon Contracts Company. However, it is important to note that clawback payments are made ex-post, so whilst the aggregate annual bill should be increasingly stable, consumers may remain exposed to volatile prices, without relief, for up to 6 months.[9] For the millions of households living pay cheque to pay cheque, this is insufficient. Further, the price cap is currently the primary mechanism to ensure suppliers return these clawback payments to customers. While functional, this is not an optimal design to ensure prices remain low or stable for consumers. A GPP may deliver additional benefits to consumers.

Without changes to market design, removing gas generation (which is predominantly internationally traded) from the generation stack means faster consumer protection from price shocks. But given that this will likely take many years, we believe that a well-targeted social tariff should be implemented to insulate the most vulnerable consumers.

During the energy crisis, we advocated for an automatically applied unit rate discount for fuel poor households (using National Energy Action's definition of fuel poverty), to be mandated across suppliers.[10] Data sharing between HMRC and energy suppliers would be required to ensure that

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[5] Grubb et al. (2022) Separating electricity from gas prices through Green Power Pools: Design options and evolution. UCL ISR. Available at: https://www.ucl.ac.uk/bartlett/sustainable/sites/bartlett_sustainable/files/navigating_the_energy-climate_crises_working_paper_4_-_green_power_pool_v2-2_final.pdf

[6] The ability of a GPP to function without disrupting the revenue certainty delivered by CfDs would help to minimise disruption to renewables investor confidence.

[7] DESNZ (2024) Review of Electricity Market Arrangements Second Consultation Document. Available at: https://assets.publishing.service.gov.uk/media/65ef6694133c220011cd37cd/review-electricity-market-arrangements-second-consultation-document.pdf

[8] Low-carbon generators now account for around 50% of electricity generation (compared to 20% a decade ago), while gas accounts for just around 30%. DESNZ (2025) Energy Trends UK, October to December 2024 and 2024. Available at: https://assets.publishing.service.gov.uk/media/67e4f62cf356a2dc0e39b522/Energy_Trends_March_2025.pdf

[9] LCCC (2021) Contracts for Difference – delivering affordable low carbon electricity in GB. Available at: https://www.lowcarboncontracts.uk/insights/contracts-for-difference-delivering-affordable-low-carbon-electricity-in-gb/

[10] UCL and Aldersgate Group (2023). The Case for a Social Tariff: Reducing Bills and Emissions, and Delivering for the Fuel Poor. Available at: https://www.ucl.ac.uk/bartlett/sustainable/sites/bartlett_sustainable/files/report_-_the_case_for_a_social_tariff_-_reducing_bills_and_emissions_and_delivering_for_the_fuel_poor31.pdf , UCL ISR (2023) Energy Security and Net Zero Committee Inquiry: Preparing for Winter. Written Evidence. Available at: https://www.ucl.ac.uk/bartlett/sustainable/sites/bartlett_sustainable/files/isr_submission_esnz_preparing_for_the_winter27.pdf

the number of households in receipt of support would be responsive to energy price fluctuations and changes to household income.

Not only would this social tariff insulate vulnerable households from *further* price shocks, it would also help to reduce the current rate of fuel poverty in the UK; fuel poverty has remained stubbornly high, at 6.1 million households compared with 4.5 million households pre-crisis.[11] Further, the Committee on Fuel Poverty notes that rates appear to be plateauing rather than trending to decline.[12] In practice, this means enduringly high levels of energy rationing, self-disconnection and the accompanying physical and mental health consequences of living in a cold home.[13]

During the crisis, the countless calls for an emergency measure to support the fuel poor[14] may ultimately have been overshadowed by debates over the specific design of the tariff and the prospect of a lengthy process to establish the data sharing of sensitive information. Now that we consider ourselves beyond the crisis, but with the enduring need to reduce fuel poverty and protect the most vulnerable from future price shocks, we may finally have the opportunity to implement a well-targeted social tariff.

The gas component.

Around 85% of UK households are currently reliant on gas for home heating.[15] To protect consumers from future gas price shocks, we must accelerate the adoption of alternative low carbon heating technologies. The evidence clearly suggests that the electrification of domestic heating, as opposed to the use of hydrogen, is the most efficient route to decarbonisation,[16] yet we are currently well behind our heat pump deployment targets.[17]

We patiently await the decision on the future roles of hydrogen for domestic heating (due 2026), which currently creates uncertainty, delaying the investment signals required to meaningfully incentivise heat pump uptake.[10] A prompt, clear decision could drive further innovation, encourage domestic manufacturing and installation capabilities, and would help to create economies of scale.

Important is also the fact that heat pumps are capital-intensive home upgrades. Without dedicated financial support, lower income households will likely struggle to transition from their gas boilers. It would be an inequitable outcome for wealthier households, able to invest in a heat pump, to not only be protected from gas price shocks, but also able to access bill savings as electricity prices gradually come down with renewables deployment, while lower income households remain exposed volatile gas prices.[18]

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[11] NEA (2025) What is Fuel Poverty? Available at: https://www.nea.org.uk/what-is-fuel-poverty/#:~:text=The%20average%20annual%20energy%20bill,UK%20households%20in%20fuel%20poverty.

[12] Committee on Fuel Poverty (2024). Can Fuel Poverty by Ended? Available at: https://www.gov.uk/government/publications/committee-on-fuel-poverty-annual-report-2024

[13] Fawcett et al (2024) Using smart energy meter data to design better policy: Prepayment meter consumers, fuel poverty and policy targeting in Great Britain. Energy Research & Social Science. 116, 103666. Available at: https://www.sciencedirect.com/science/article/pii/S2214629624002573#:~:text=Households%20with%20PPMs%20are%20a,average%2028%20h%20of%20disconnection.

[14] In contrast with the universal support provided by the Energy Price Guarantee and Energy Bill Support Scheme.

[15] DESNZ (2024). Hydrogen heating: overview Available at: https://www.gov.uk/government/publications/hydrogen-heating-overview/hydrogen-heating-overview--2#:~:text=There%20are%20nearly%2030%20million,use%20natural%20gas%20for%20heating.

[16] National Infrastructure Commission (2024). Second National Infrastructure Assessment. Available at: https://nic.org.uk/studies-reports/national-infrastructure-assessment/second-nia/.

[17] DESNZ (2025). Heat Pump Deployment statistics. Available at: https://www.gov.uk/government/collections/heat-pump-deployment-statistics

[18] We acknowledge our underlying assumption - that international gas prices will remain high. It is possible that with declining European demand (reduced levels of industry and decarbonisation efforts) and American ambitions to increase output, global LNG prices could decline significantly, potentially dropping below the cost of renewables. We discuss this further in question 4.

Q4: Is it practical for consumer bills to be reduced by £300 before the end of the Parliament?

To measure a £300 reduction in energy bills before the end of Parliament, comparisons will be made with bills prior to the election of the Labour government.[19] The pre-election Ofgem price cap (April to June 2024) stood at £1,690 per year.[20] The most recent price cap stands at £1,849, therefore, we are currently discussing a £459 reduction in 4 years. Said reduction would still leave energy bills 22% higher than pre-crisis levels.[21]

The electricity component.

There is clearly *some scope* to reduce electricity bills. Gas prices could simply drop, achieving the stated objective. But beyond a fall in gas prices, there is also the opportunity to reduce bills by increasing the installed capacity of renewables, as has already been explored in our answer to question 2. In our answer to this question, we outline some of the key variables that could contribute to the Government's success or failure to meet this target.

Over time, increased renewables deployment should gradually push gas from the generation stack, particularly during periods of low demand but high wind and sun. During said periods, renewables output could even result in growing periods of 'surplus electricity', depending on the capacity of storage and flexibility on the system.[22] Due to the distortive nature of CfDs and the very low operational costs of renewables, during said periods of surplus, wholesale prices are likely to be increasingly driven near-zero or even to negative prices.

But crucially, due to two-sided CfDs, the aggregate annual cost of renewables generation in the wholesale component of the bill should gradually converge to the average of their strike prices.[23] The strike prices of renewables awarded CfDs in auctions over the coming years will therefore play a significant role in determining future electricity prices – the strike prices for CfDs awarded in AR7, AR8 and potentially AR9, would likely impact consumer bills by 2030.

There will also be a growing proportion of renewables that have rolled off their current support contracts (in their 'merchant tail') which should provide cheap electricity, reflecting their very low operating costs. While this should begin in the late 2020s, it is only well into the 2030s that we will see significant renewables capacity roll off their early contracts. These cost reductions will therefore only meaningfully materialise post-Parliament and depend on whether DESNZ decides to implement new CfDs for repowered assets,[24] reducing or eliminating the merchant tail operation of these assets.[25]

Another factor to consider when evaluating our ability to reduce consumer bills relates to the technologies that will displace gas in a low carbon power system, becoming price setters during

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[19] Johnson (2024) Government fails to confirm £300 energy promise. 4News. Available at: https://www.channel4.com/news/factcheck/factcheck-government-fails-to-confirm-300-energy-promise

[20] Ofgem (2024) New energy price cap level for April to June 2024 starts today. Available at: https://www.ofgem.gov.uk/news/new-energy-price-cap-level-april-june-2024-starts-today#:~:text=From%201%20April%202024%2C%20the,type%20of%20meter%20you%20have.

[21] The Ofgem price cap in April 2021 was £1,138. This was prior to the first indicators of the energy crisis when demand for energy rose faster than supply as countries emerged from pandemic-related lockdowns, causing fossil fuel prices to start rising, and as tensions between Russia and Ukraine also escalated. For current price cap levels, see Ofgem (2025) Energy Price Cap. Available at: https://www.ofgem.gov.uk/energy-price-cap

[22] Brown et al. (2024) Generating Surplus: the challenges and opportunities of large-scale renewables deployment. UCL ISR. Available at: https://www.ucl.ac.uk/bartlett/sustainable/sites/bartlett_sustainable/files/working_paper6_generating_surplus.pdf

[23] The wholesale component of the price cap now includes CfD policy costs. We acknowledge changes to CfD top ups during periods of negative pricing for generators awarded contracts in recent allocation rounds, further explored in our working paper (footnote 20).

[24] DESNZ (2025). Further reforms to the Contracts for Difference scheme for Allocation Round 7. Available at: https://www.gov.uk/government/consultations/further-reforms-to-the-contracts-for-difference-scheme-for-allocation-round-7.

[25] UCL is currently undertaking research exploring the impact of a range of support schemes for assets post-support contracts. The research is conducted with a view to realising the benefits of renewables in their merchant tail (with capital costs paid off, providing a visible stream of cheap low carbon electricity to consumers) whilst considering the importance of avoiding inefficient early closure of said low cost generating assets.

periods in which generation from renewables will be insufficient to meet demand. A large question remains around the future bidding behaviour of these dispatchable low carbon technologies, and the resulting level of wholesale prices during said periods of renewables deficit relative to demand.

In summary, the degree to which renewables can drive such cost reductions in this relatively short time frame is uncertain and highly dependent on our ability to accelerate an such extensive programme of deployment. Renewable generation cannot be built overnight, and even if changes were implemented to accelerate the process of receiving a grid connection, the window is narrow to bring new renewables (particularly offshore wind) online before the next Parliament. Additionally, we will require transmission and distribution network upgrades to help relieve what is already a highly constrained grid. We must consider the likely impact of said upgrades on consumer bills, likely to inflate the 'fixed costs' within the electricity component.

The gas component.

The capacity of the government to *ensure* a reduction of the gas component of the bill is unlikely given the UK's considerable exposure to international natural gas prices.

It is plausible that growing physical capacity to import gas to Europe, declining European gas demand, and American desires to increase gas output could reduce UK gas prices.[26] If Russian gas returned to Europe, this would likely depress prices further. However, as both Covid-19 and the recent energy crisis demonstrated, gas prices are inherently volatile and global demand increases could offset any hypothetical reduction.

Even if prices were to decline in the short term, this disregards the necessity to decarbonise household heating by 2050. Any method to decarbonise household heating and cooking (e.g. hydrogen, biomethane, electrification, etc) will invariably incur considerable costs. DESNZ's Boiler Upgrade Scheme aims to convert at least 400,000 homes to heat pumps per year by 2028,[27] suggesting disconnections from the gas distribution network will decrease from currently low levels; if heating becomes primarily electrified, this number will increase dramatically.

Disconnection costs are currently borne by households or their gas distributor; these costs have the potential to balloon if decommissioning becomes more widespread (Arup has estimated decommissioning costs of £49-74 billion by 2050 depending on hydrogen usage).[28] These costs will be placed on bills by default, and as they rise, households that remain connected to the gas grid will increasingly struggle. Thus, while the international gas market *could* deliver lower bills, these gains would likely be short-lived.[29]

In summary, if gas prices remain very high, it will likely be incredibly difficult to reduce gas bills before Parliament-end (without shifting some costs onto the Treasury). Longer term, reducing our dependence on gas both for heating and cooking, as well as for electricity generation, will reduce consumers' exposure to international gas price volatility. Further, Europe currently makes up over 20% of global LNG demand,[30] and UK and EU decarbonisation targets suggest a likely decline in European gas demand, which could reduce global gas prices.

If gas prices do indeed fall, the immediate benefits of decarbonisation may become less apparent, potentially risking a loss of momentum in the endeavour to reach net-zero. At such a point, re-

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[26] Forthcoming Melek, Salmon, Dixon, and Grubb (2025). European Natural Gas through the 2020s: the decade of extremes, contradictions and continuing uncertainties. Institute for New Economic Thinking (INET).

[27] National Audit Office (2024) Decarbonising home heating. Available at: https://www.nao.org.uk/wp-content/uploads/2024/03/Decarbonising-home-heating-HC-581.pdf

[28] Arup (2023). Future of Great Britain's gas network. Available at:https://nic.org.uk/studies-reports/national-infrastructure-assessment/second-nia/arup-gas-network-analysis/

[29] For more information on the current progress towards decommissioning the gas distribution network, see: Salmon and Watson (2025). Preparing to decommission the GB gas distribution system. UCL ISR. Available at: https://www.ucl.ac.uk/bartlett/sustainable/sites/bartlett_sustainable/files/gas_decommissioning_policy_briefing-_final.pdf.

[30] European Commission (2025). Quarterly report on European gas markets. Available at: https://energy.ec.europa.eu/document/download/4aebee79-01e9-4a06-927e-8dd42fc4f9a8_en?filename=New%20Quarterly%20Report%20on%20European%20gas%20markets%20Q4%202024.pdf

emphasising the savings of climate change mitigation and adaptation, compared with the higher costs of delaying the transition, will be critical.[31]

[31] Stern (2006) The Economics of Climate Change: The Stern Review. Summary of Conclusions. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20100407172811/https:/www.hm-treasury.gov.uk/d/Summary_of_Conclusions.pdf