Business, Energy and Industrial Strategy Committee
Inquiry on Energy pricing and the future of the Energy Market

Written evidence jointly prepared and submitted by the researchers based at the University of St Andrews' Centre for Energy Ethics (CEE).

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The Centre for Energy Ethics at the University of St Andrews brings together 81 energy researchers across all disciplines to address the challenge of how to balance our energy demands with concerns for anthropogenic climate change. More information about the Centre can be found at: energyethics.st-andrews.ac.uk.

This submission responds to the call for evidence on the following points:

- The functioning and performance of the 'energy price cap' and an assessment of its use in the future, and an assessment of the role of auto-switching.

- The role of retail market reform in the context of the UKs net zero transition and domestic energy security requirements.

1. Executive Summary

- The 2018 Domestic Gas and Electricity (Tariff Cap) Act came into effect in January 2019. The cap limits the default tariff rates suppliers can charge for energy and gas, as well as standing charges. Since its introduction, the cap has provided a degree of price certainty to consumers.
- In response to rising wholesale gas prices, Ofgem increased the price cap in April and October 2021. The cap is expected to increase again in April 2022.
- Low and middle-income households in the UK are most vulnerable to the impact of rising energy prices. Rising energy prices, compounded with economic stress associated with the Covid-19 pandemic, inflation, and falling real wages, **exacerbate inequalities** between income groups.
- In 2021, a range of factors led to a **sharp increase in wholesale gas prices**. The spike in wholesale prices, combined with the energy price caps, forced many suppliers to set retail electricity prices below wholesale costs. Almost 30 energy suppliers in the UK ceased operations between 2021 and 2022.
- The wave of UK energy supplier bankruptcies indicates that many **suppliers were not prepared** for an acute short- to medium- term rise in wholesale UK energy prices.
- Evidence suggests that hedging strategies are currently underutilised in the UK. Retail energy market reforms aimed at **bolstering financial and natural hedging practices** among suppliers could curb the risk of such market failures in the future.
- Stress testing also offers an effective means by which regulators can ensure that firms are strong enough to withstand severe economic scenarios. Whilst Ofgem has announced its plans to introduce **stress testing for energy companies** beginning in January 2022, **energy system stress testing** could further enhance the UK's ability to adapt to rapid changes in energy wholesale prices, demand, and supply.
- The pursuit of greater competition has been a key feature of UK energy and gas markets for over twenty years. Our research suggests that the UK retail energy market may have been characterised by **excess entry.** The recent wave of supplier bankruptcies and consolidations presents an opportunity to investigate the optimal number of firms needed to promote competition among energy suppliers.
- Energy customers must be a central consideration of retail energy market reforms. Widespread implementation of **auto-switching technology** could potentially eliminate the need for price caps, and an **exceptionally low tariff scheme** for the poorest households could fill the gaps in current low-income protection programs.
- There is an opportunity to invest in new **flexible storage facilities** and infrastructure that can be utilised for natural gas in the short term and transitioned to renewable fuels in the long term – thus becoming a part of a smart and flexible energy future.

2. Key Definitions

2.1 **Financial hedging** uses derivatives, such as futures contracts and options, to reduce the risk of financial losses associated with potential future price volatility (rising and falling prices).

2.2. **Futures contracts** are legal agreements that oblige the contract owner to buy or sell a particular commodity at a specified date in the future. Futures contracts are traded through regulated exchange houses. The price of futures contracts fluctuates up and down, representing buyers' and sellers' perceptions of future production and consumption conditions relative to today's commodity prices. Producers, manufacturers, and investors around the world use futures contracts to hedge against and speculate on commodity price changes.

2.3 **Futures options** are legal agreements that give contract owners the right, but not the obligation, to buy or sell specified futures contracts at a particular price on or before the options contract expires.

3. The Problem

3.1 In 2017, Prime Minister Theresa May announced that the Government would introduce a temporary price cap on consumer energy bills. The cap was intended to address what she called "rip-off energy prices", after the Competition and Markets Authority estimated in 2016 that consumers were being overcharged billions of pounds by energy companies (May 2017). The crux of the issue was that consumer energy bills rose between 2008 and 2016 despite relatively stable wholesale energy prices (Rutherford 2018). The cap was intended to address the widening gap between the cheapest retail energy tariffs available to consumers and standard variable and default tariffs that disproportionally affect the lowest income households on variable rate pay-as-you-go meters (Ofgem 2016).

3.2 The 2018 Domestic Gas and Electricity (Tariff Cap) Act came into effect in January 2019 affecting 11 million consumers in the UK. The price cap limits the default tariff rates that suppliers can charge for each kWh of electricity and gas, as well as limits standing charges (Ofgem 2022a). The Act allowed for the price cap to be extended for one year at a time until the end of 2023. The Office of Gas and Electricity Markets (Ofgem) updates the maximum tariffs allowed under the cap twice a year. Since it was introduced, the price cap has provided a degree of price certainty to consumers on standard variable and default tariffs by guaranteeing prices would not rise above the cap rates. The current cap will remain in place until March 2022 (Ofgem 2022a).

3.3 In the last year, a combination of factors has contributed to the rapid rise in UK wholesale energy prices:

i) Globally, natural gas supply and demand have remained relatively stable, incrementally increasing year-to-year (EnerData 2022). The International Energy Agency estimates that global demand rose slightly (3%) in 2021, driven by extreme weather, economic recovery, and fuel switching from coal to natural gas. Global production too remained steady overall, despite short-term regional production issues, such as the impact of the 2021 Texas winter storm (Field 2021; IEA 2022a,b; Newson and Taylor 2021; USEIAa,b). These data indicate that global supply and demand alone cannot account for the rapid rise in global and UK natural gas prices.

ii) European supplies of natural gas are now at historic lows of roughly 50% of 2020 levels. The reduction of natural gas being stored in Western Europe has been linked to the drop in gas shipments from Russia to continental Europe, from which the UK sources nearly 50% of its natural gas supplies (BEIS 2021a; Sheppard et al. 2021). This shipment reduction and low European stores have sparked fears of a regional natural gas shortage across Europe, which has pushed up both natural gas futures prices and wholesale spot prices.

iii) Dependence on natural gas generated electricity increased in 2021 as a result of lower than expected wind generated electricity (BEIS 2021b). While, between the first quarter of 2020 and the third quarter of 2021 an average of 38% of the UK's electricity was generated from natural gas, this fluctuates based on the availability of other sources of electricity generation (BEIS 2021a; BEIS 2022; see Fig. 1). Therefore, wholesale natural gas prices have contributed to an increase in UK wholesale electricity prices as well.

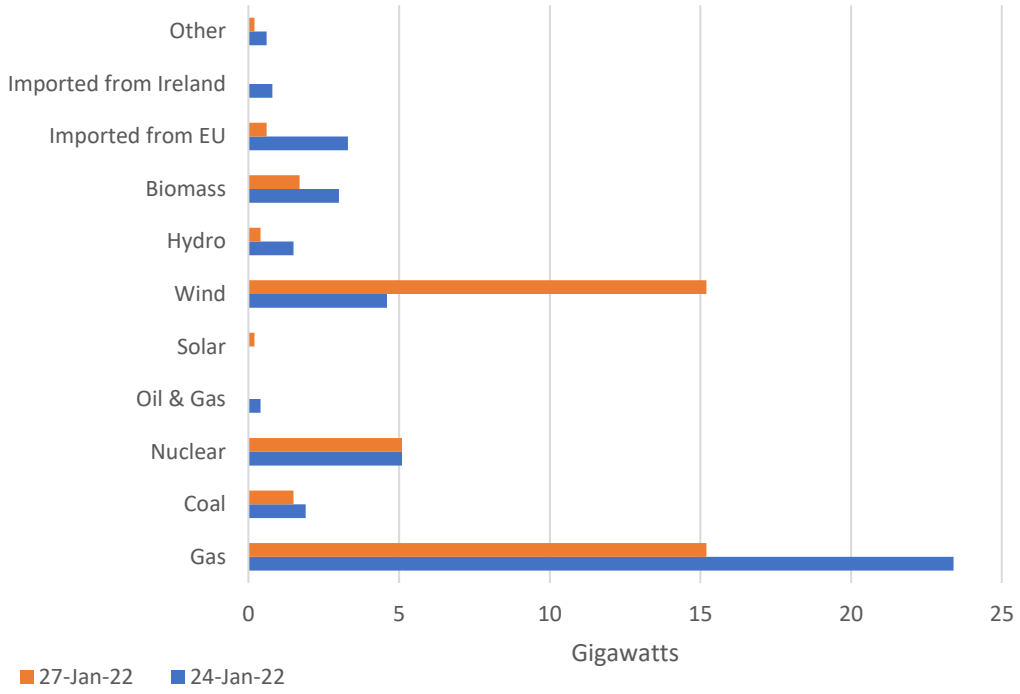

Figure 1: Sources of UK electricity, 24 & 27 January 2022[i]. Source: Energy Numbers (2022).

3.4 In response to rising wholesale natural gas prices, Ofgem increased the price cap on 1 April 2021, pushing up household gas bills by an average of £90/year. The cap was increased again on 1 October 2021, costing households an estimated extra £139-153/year (Rossington 2021; Ofgem 2021a). Currently, the cap set by Ofgem is priced at £1,277/year for direct debit consumers and £1309/year for prepayment consumers[ii] (Ofgem 2021a). It is widely expected that the Tariff cap will increase again in April 2022.

3.5 Evidence suggests that the rising price caps have had an adverse effect particularly on low- and middle-income households across the UK, who are most vulnerable to the impact of rising energy prices (see Fig. 2).

3.6 Whilst there are some variations between individual nations, this pattern has been observed across the UK.

i) In Scotland, where the annual average pre-tax income for employees is £25,600, it is estimated that about 25% of all households are 'fuel poor' – meaning they spend more than 10% of their net income after other household expenses on heating and the funds leftover are insufficient to support a reasonable standard of living (Aiton 2020; McCall 2021; Scottish Government 2022). Single-parent households are the most financially vulnerable to rising energy prices, a situation made worse by un/under-employment caused by the COVID-19 pandemic (IPPR 2020; SPHO 2021).

ii) In England, fuel poverty is defined as people living in households with energy efficiency ratings of band D or below and whose disposable income after housing costs and energy needs is less than 60% of the national median (Newson and Taylor 2021). Prior to the current UK energy crisis, the Department for Business, Energy and Industrial Strategy (BEIS) estimated that over 3 million households (13%) in England were living in fuel poverty (BEIS 2021c). It is expected that more than 1 million additional households will be pushed into fuel poverty as a result of energy price cap increases over the next year (Newson and Taylor 2021).

iii) Overall, more households across the UK are struggling to pay their energy bills as successive price cap increases have allowed the per unit cost of electricity and natural gas to rise (CAFP 2020; CSE 2021). This has compounded the economic stresses associated with the COVID-19 pandemic, inflation, and falling real wages, exacerbating inequalities between income groups (ONS 2022).

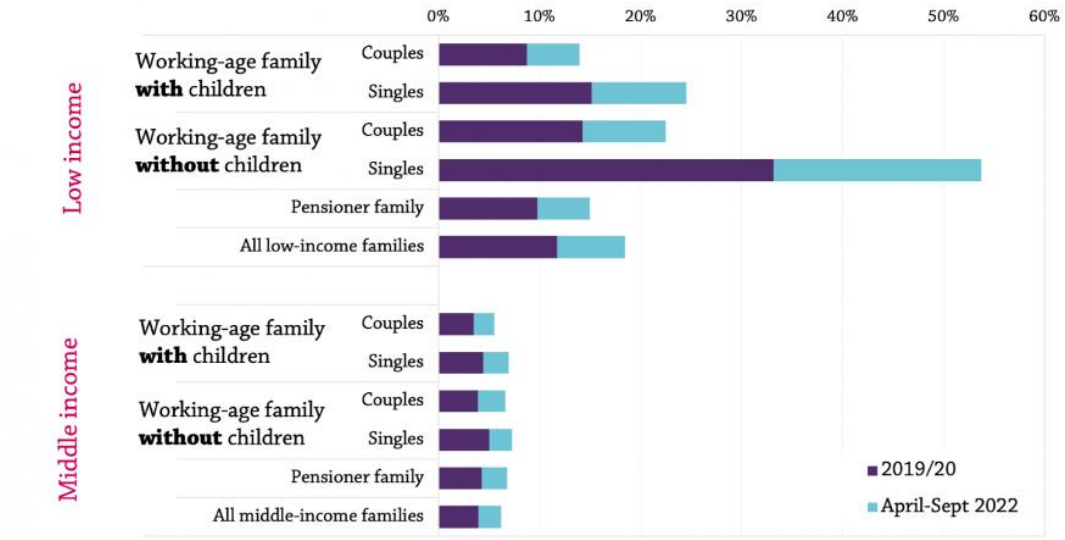

Figure 2: UK energy bills as a proportion of income after household costs.
Source: Anderson (2022)

3.7 **When tariff price caps were introduced in January 2019, UK wholesale electricity and gas prices were characterised by a period of relative stability** (see Figs. 3 and 4). Price caps set out in the Tariff Cap Act were **not designed to respond to or address rapidly rising wholesale prices being passed onto consumers** and were only intended to be a temporary regulatory measure designed to bring standard variable and default tariffs in line with the lowest tariff rates offered to consumers.

Figure 3: UK Wholesale Gas Prices, Day Ahead Contracts (Monthly Average).
Source: Ofgem (2022b)

3.8 For energy suppliers, the recent spike in wholesale prices combined with price caps has obliged some of them to set retail electricity and gas prices below what it costs for them to buy gas and electricity from wholesalers. Evidence indicates that price caps severely affected some retail energy suppliers, with around 30 suppliers having ceased operations between 2021 and 2022 (majority in the six months to January 2022), see Table 1.

3.9 Statistical analysis of the data from which Table 1 was derived indicates that the primary energy sources from which companies provided consumers with power (coal, gas, nuclear, and other sources) did not significantly factor into their likelihood of ceasing operations. Combined with evidence that many of the companies that absorbed the consumers of these bankrupt suppliers are integrated energy companies with natural hedging capabilities (see 4.X for a discussion of natural hedging), further suggests that these **bankrupt retail energy suppliers were insufficiently hedged against or financially ill-resilient to rising wholesale energy prices**.

Figure 4: UK Wholesale Electricity Prices, Day Ahead Baseload Contracts (Monthly Average). Source: Ofgem (2022b)

Table 1: List of recently closed retail energy suppliers

Supplier	Source of Energy for Electricity Generation					Acquired By	Acquisition Date	Residential Consumers	Non-Residential Consumers
	Coal	Gas	Nuclear	Renewable	Other				
Ampoweruk Ltd	13.5	41.4	11.3	29.4	4.4	Yu Energy	7.11.2021	600	2,000
Avro Energy	6.3	72	8.2	8.3	5.2	Octopus	26.09.2021	580,000	
Bluegreen	0	0	0	100	0	British Gas	7.11.2021	5,900	
Bulb	0	0	0	100	0	na*	24.11.2021	1,600,000	1
CNG	6.3	72	8.2	8.3	5.2	Pozitive Energy	7.11.2021		41,000
Colorado Energy	0	0	0	100	0	Shell Energy	01.10.2021	15,000	
Daligas	na	na	na	na	na	Shell Energy	01.10.2021	9,000	
Enstroga	6.3	72	8.2	8.3	5.2	EON Next	3.10.2021	6,000	
Entice Energy	0.1	1.4	0.2	98	0.1	Scottish Power	1.12.2021	5,400	
Goto Energy	0	0	0	100	0	Shell Energy	21.10.2021	22,000	
Green	0	0	0	100	0	Shell Energy	01.09.2021	255,000	
Green Network Energy	0.8	9.1	1	88.5	0.7	EDF	31.01.2021	360,000	
HUB energy (Gulf Gas & Power)	0	0	0	100	0	EON Next	13.08.2021	6,000	9,000
Igloo Energy	0	0	0	100	0	EON Next	3.10.2021	179,000	
MA Energy Ltd	na	na	na	na	na	Smartest Energy	7.11.2021		300
MoneyPlus Energy	na	na	na	na	na	British Gas	11.09.2021	9,000	
Neon Reef Ltd	1.7	21.6	2.8	72	1.8	British Gas	21.11.2021	30,000	
Omni	0	0	0	100	0	Utilita	7.11.2021	6,000	
Orbit Energy	0	0	0	100	0	Scottish Power	1.12.2021	65,000	
People's Energy	0	0	0	100	0	British Gas	19.09.2021	350,000	1,000
Places for People (PFP) Energy	6.3	72	8.2	8.3	5.2	British Gas	11.09.2021	82,000	5,600
Pure Planet	0	0	0	100	0	Shell Energy	01.10.2021	235,000	
Simplicity	6.3	72	8.2	8.3	5.2	British Gas	31.01.2021	50,000	
Social Energy Supply	0	0	0	100	0	British Gas	21.11.2021	5,500	
Symbio	0	0	0	100	0	EON Next	3.10.2021	48,000	
Together Energy	0	0	0	100	0	British Gas	18.01.2022	176,000	1
Utility Point	6.3	72	8.2	8.3	5.2	EDF	18.09.2021	220,000	
Zebra Power	6.3	72	8.2	8.3	5.2	British Gas	7.11.2021	14,800	
Zog	6	74.5	9.8	3.5	6.2	EDF	1.12.2021	11,700	
	2.5	25.1	3.2	67.3	2.1			4,346,900	58,902

Caption: Table was created by authors. Data Sources: BlueGreen Energy (2021), CNG (2020), Cyrus (2022), Electricity Info (2020), Neon Reef (2021), Ofgem (2022c), Social Energy (2021), Sust-It (2022), Zog (2021).
*Note: Bulb is currently (January 2022) in special administration.

3.10 Overall, **the function and performance of the energy price cap has been eroded by rapidly rising wholesale electricity and natural gas prices within the current regulatory and infrastructural environment**.

i) Originally formulated to provide default rate payers a sense of price security and fairness, this function of the energy price cap has been eroded as consumers have been thrust from one supplier to another amid a wave of supplier bankruptcies. The price cap was not designed to respond to or protect low- and middle-income consumers from energy price increases arising from acute wholesale price volatility.

ii) The inability of the cap to fluctuate with acute wholesale price fluctuations has, at the same time, undermined retail suppliers' ability to deliver energy to consumers, undermining the security of the UK retail energy sector as a whole.

3.11 **Problem Summary -** The current UK energy crisis exposes:

i) That the energy price cap is not designed for a volatile wholesale energy price environment.

ii) That the energy price cap is not designed to protect low- and middle-income consumers from acutely rising wholesale energy prices.

iii) That many UK energy suppliers were ill prepared for the potential of an acute rise in wholesale energy prices.

iv) That the UK continues to be dependent on natural gas as a primary energy source for direct usage and for electricity generation, especially imported natural gas where its availability and price are subject to geopolitical pressures, global supply and demand, and financial market expectations.

4. Reforming the UK Retail Energy Market

4.1 Ensuring the UK Energy Sector is Financially Resilient

4.1.1 The wave of UK energy supplier bankruptcies indicates that many suppliers were not prepared for an acute short- to medium-term rise in wholesale UK energy prices. Reforms aimed at bolstering hedging practices amongst suppliers, ensuring firm- and system-level resiliency, and safeguarding optimal levels of supplier competition could substantially curb the risk of such market failures in the future.

4.1.2 **Financial market hedging** is a common financial strategy in commodity trading and can play an effective role in sheltering energy firms from short- to medium-term spikes in wholesale energy prices.

i) For energy suppliers who purchase energy on the wholesale market, financially hedging against short- to medium-term price spikes (e.g. 2-18 months) could take the form of purchasing futures contracts to 'buy' (long) electricity or natural gas in the months ahead. As these 'buy' contracts approach expiry, suppliers would 'unwind' these contracts by purchasing an equivalent number of futures contracts to 'sell' electricity or natural gas in the same month the 'buy' contracts are set to expire, thus cancelling the two . If wholesale energy prices rise between the time the buy contract was purchased and unwound, the

energy supplier would be buffered from the price rise by the profits gleaned from hedging, minus fees.[iii]

ii) Firms could alternatively hedge against unexpected increases in wholesale prices by purchasing a futures option, which would give them the right, but not the obligation, to buy futures contracts at a set price in the future.

iii) While there are rarely 'perfect' hedges that shield hedgers from all price risk and hedging strategies require monetary investments, they can be an essential tool in building energy firms' financial resiliency (ICE 2022a,b).

iv) The electronic exchange house and financial data management services firm ICE offers futures contracts for UK natural gas and UK electricity, as well as UK natural gas options (ICE 2022a,b).

v) Our research on the energy industry in the United States shows that financial market hedging is commonly and successfully adopted by a range of US energy firms – and the evidence suggests it could be similarly successful when effectively applied in the UK energy market.

4.1.3 While Ofgem reports that some energy suppliers were practicing financial hedging prior to the present crisis, available evidence also suggests that UK energy suppliers that recently ceased operating (see Table 1) were insufficiently hedged against rising wholesale prices (Ofgem 2021b).

4.1.4 **Natural hedging** can also play an effective role in buffering firms against short- to medium-term spikes in wholesale energy prices (Johnson 2015: 201). Natural hedging involves physically storing energy commodities and utilizing and/or selling these stores when prices acutely rise.

i) Large integrated energy companies with operations in energy generation, storage, shipping, wholesaling and retailing are naturally hedged by their natural gas storage facilities, and also because they operate as both buyers and sellers of wholesale electricity and gas.

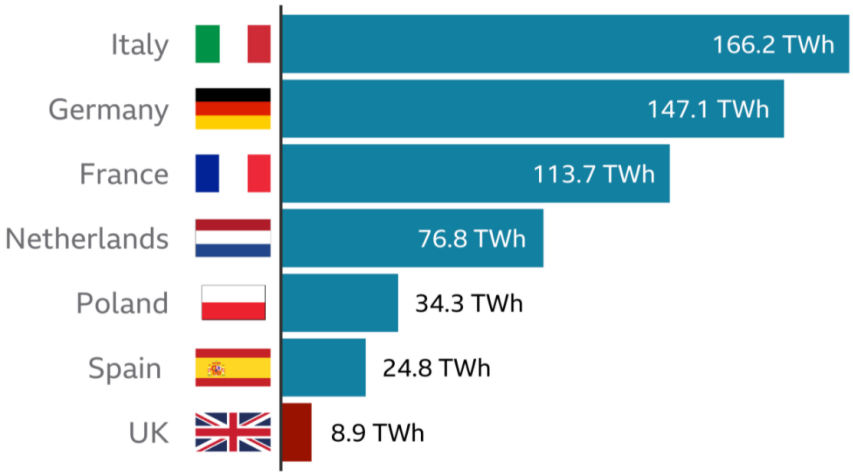

Figure 5: Gas Storage for selected countries in terawatt-hours, September 2021.
Source: Plummer (2022).

ii) Currently, the UK has relatively little onshore natural gas storage capacity compared to other European countries (see Fig. 5) and this capacity is owned by only a handful of firms (see Table 2). The country's gas storage capacity was significantly curtailed by the closure of the Rough facility, near Yorkshire, by Centrica the parent company of British Gas and Scottish Gas (Vaughan 2017). Prior to its announced closure in 2017, the Rough facility is reported to have accounted for 70% of the UK's natural gas storage capacity (Ambrose 2021).

iii) **Onshore natural gas storage capacity is crucially important for naturally hedging against wholesale price volatility** and smoothing out available low-cost domestic natural gas supplies. Physical storage provides flexibility to import or domestically stockpile gas when prices are low and to utilize or sell these stores when prices are high, providing the entire UK energy system with economic resilience and security.

iv) Natural hedging strategies require investments in building and maintaining storage. Available evidence shows this is a key strategic opportunity of crucial national importance in need of public and/or private sector investment.

Table 2: UK Gas Storage Facilities, January 2021.

Facility	Capacity (mcm)	Withdrawal Duration at Full Capacity & Max Withdraw Rate (days)	Facility Start Date	Owner
Aldbrough	205	6	2009	SSE/Equinor
Hatfield Moor	70	60	2000	Scottish Power
Hornsea	285	20	1979	SSE
Humbly Grove	243	34	2005	Humbly Grove Energy
Holford	237	19	2011	Uniper
Hill Top Farm	59	5	2011	EDF
Stublach	400	13	2014	Storengy

Note: mcm indicates millions (000,000) cubic meters (m^3). Source: Ofgem (2021c).

4.1.5 **Stress Testing** is a means by which regulators can ensure that firms are strong enough to withstand severe economic scenarios, map areas of weakness, and chart how they can prepare for the worst. The Bank of England (2022) annually applies stress tests across the UK's banking and insurance sectors to ensure firms have enough capital to withstand extreme economic shocks and are able to support the economy.

i) With an increasing number of energy suppliers entering the UK market prior to 2021, UK consumers were given an unprecedented number of choices about who they would buy their gas and electricity from. The recent market consolidation indicates many of these relatively **new entrants were unable to withstand the financial stress of rapidly rising wholesale energy prices**.

ii) Ofgem announced on 15 December 2021 its plans to introduce stress testing for energy suppliers beginning in January 2022 (Ofgem 2021d,e). This is an important step to ensuring that UK energy suppliers are resilient enough to survive price volatility, consumer debt defaults, and significant consumer acquisitions or losses, whilst remaining competitive and open to new entrants able to meet this threshold.

iii) Current Ofgem plans are limited, however, to firm-level stress testing. While important, the current UK energy crisis highlights a strategic and crucial opportunity to introduce **systemic stress testing that gauges the resiliency of the entire UK energy system**. This form of systemic stress testing would examine the UK energy system's ability to withstand and quickly adapt to acute price volatility, rapid changes in domestic energy demand, and acute availability shortages of one or more primary energy sources.

4.1.6 **The pursuit of greater competition** has been a key feature of UK retail electricity and gas markets for over two decades[iv]. The thinking is that a more competitive retail energy market structure gives consumers greater choice about who they source their energy from, which in turn, forces suppliers to perform better in terms of price or quality of service for fear of losing consumers. Recent evidence indicates, however, that this market structure may require revisions.

i) Since UK retail electricity and gas markets were opened to competition over two decades ago, the number of retail suppliers has surged, peaking at 70 firms in 2018 (see Fig 6). Yet, the market continues to be dominated by a handful of large suppliers. British Gas, Eon, SSE/OVO, EDF and Scottish Power account for 70% of the gas and electricity supplied to the retail market, with British Gas controlling the largest market share for both overall (Mettrick 2021; Ofgem 2022e).

ii) In addition, the recent wave of supplier bankruptcies and retail market competition (Table 1) suggests that the **retail energy market may have been characterised by excess entry**. Excess entry arises because the number of firms that are needed in an industry to generate the sort of benefits to consumers referred to above is typically smaller than the number that will choose to enter in pursuit of profit, resulting in an inefficiently large number of sunk assets being stranded in one industry that could be better used elsewhere. The instability we have seen with firms entering and leaving the market suggests that this a real concern which is ultimately costing consumers and the Government more than they otherwise would have paid in time, resources, and fees.

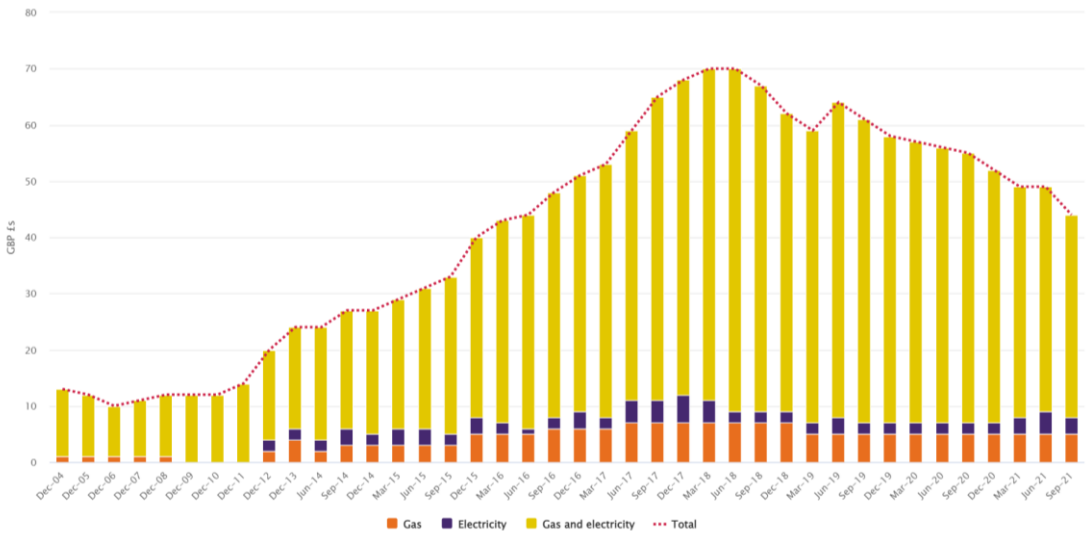

Figure 6: Number of active domestic suppliers by fuel type. Source Ofgem (2022d)

iii) The challenge facing the Government goes beyond ensuring retail suppliers are financially resilient enough to deliver energy to consumers under volatile market conditions, for example through hedging requirements (4.1.2) and supplier stress testing (4.1.5). It involves taking a clearer view on just how much entry is required to maximise the benefits from competition. Essentially it has to ensure that the sunk and fixed cost of entry are not so high that they stifle competition, but are not being wasted in inefficient entry.

iv) The recent consolidation presents an opportunity to investigate the optimal number of firms needed to promote competition amongst energy suppliers. One way to do this is to investigate what the Government deems to be acceptable profit margins among these suppliers – guarding against excess profits (e.g. 2-5%)

4.2 Enabling Consumers

4.2.1 **Energy Consumers** are a central consideration to retail energy market reforms. In particular:

i) **Auto-switching** technology, which is currently being trialled in the UK, promises to make the retail energy market more efficient and eliminate "loyalty penalties" by algorithmically matching consumers with the lowest rate providers available every 6 to 18 months when their contract with their existing supplier expires (BEIS 2021d; LAMB 2022; Wood 2021). Reforms that continue to encourage consumers to adopt auto-switching could be the impetus for turning passive consumers, who are unlikely to 'shop around' for energy suppliers, into engaged consumers and, resultantly, make the energy retail market more price competitive.

ii) There is no evidence that this technology (in its current form) benefits pay-as-you-go consumers, which tend to be the lowest income earners and subject to the highest tariffs, and particularly vulnerable to increases in retail energy prices.

iii) **Price Caps** can play an important role in narrowing the financial gap between standard variable and default energy tariffs and the lowest rate tariffs paid by consumers. As the current energy crisis has demonstrated, however, price caps can imperil non-financially resilient energy suppliers as wholesale prices rise rapidly while, at the same time, being called upon to shield low- and middle-income consumers from wholesale price hikes.

iv) More frequent revisions to the price cap, especially during times of acute wholesale price volatility, can increase the performance of the cap in responding to rapidly rising and falling wholesale energy prices. Quarterly revisions, rather than revisions every six months as Ofgem is currently considering, could be an effective reform to the price cap scheme (Ofgem 2021b).

v) Widespread adoption/implementation of **auto-switching technology**, particularly by consumers on standard variable and default tariffs, **could potentially eliminate the need for price caps altogether**. This potentiality would depend on full consumer adoption of this technology and the ability of auto-switching to move consumers from standard variable and default tariffs to fixed term lower cost tariffs.

vi) The current price cap scheme does not protect low- and middle-income consumers from rapidly rising wholesale prices. Low-income protection programs (such as the Warm Home Discount, Winter Fuel Payment, and Cold Weather Payment schemes) are also not designed

to respond to rapidly rising energy prices, are contingent[v], and designed for winter months only (Government 2022a,b,c). These programs exclude the possibility of cold spring and autumn months, as well as rising retail energy prices in the spring, summer and autumn. **An exceptionally low tariff scheme for the poorest households would address this retail market gap and take pressure off the Tariff Price Cap to perform in ways it was not designed to.** This form of tariff scheme would provide a measure of energy cost certainty and avoid payment-timing mismatches (whereby subsidies and payments arrive weeks or months after when they are urgently needed).

5. Investing in a Smart & Flexible Energy Future

5.1 The Government also faces the long-term challenge of ensuring the resiliency of the UK's energy suppliers and the country's energy system as it transitions away from fossil fuels. Aligning with the Government's demand-oriented Heat and Building Strategy, this requires recognizing the UK's current dependence on natural gas and building flexible energy supply infrastructure suitable for natural gas in the short-term and renewable fuels in the long term (BEIS 2021e).

5.2 Natural gas is currently the main energy source in the UK's energy mix, accounting for about 40% of total primary energy consumption across industries and households[vi]. Over the next decade, natural gas will likely continue to be an abundant and cost-effective energy source. Despite recent increases, market indicators suggest that wholesale prices are expected to fall in the next 12-14 months as fears about regional shortages subside (Field 2021; ICE 2022c; IEA 2021). The combination of horizontal drilling, hydraulic fracturing and new well completion techniques pioneered in the United States have unlocked more natural gas reserves than previously imagined, while making many previously inaccessible reserves accessible. Mature North Sea gas fields are being revitalized using this technology (Thomas 2022; UKERC 2021).

5.3 The UK Government's Net Zero Strategy seeks to minimize natural gas in the UK's energy mix by 2050, by blending it with biomethane and green hydrogen, as well as replacing it with renewable electricity. Until this happens, however, the UK will continue to be dependent on natural gas and natural gas infrastructure to meet its energy needs, as the Government's Net Zero Strategy shows (Government 2021: 81).

5.4 The two biggest barriers to public and private sector investment in new natural gas storage and infrastructure, which are crucial to natural hedging opportunities and the security of the UK's energy system, are that such investments:

i) Run counter to pledges to achieve net zero by 2050

ii) Risk becoming "stranded" by a transition away from fossil fuels (Carney 2014)

5.5 There is an opportunity, to invest in **new flexible storage facilities and infrastructure** that can be utilized for natural gas in the short-term and transitioned to renewable fuels in the long-term.

5.6 According to information received from the Scottish Hydrogen and Fuel Cell Association, 100% of the UK's gas transmission and gas distribution networks can be repurposed to 100% hydrogen (IGEM 2022; SHFCA 2022). The UK's Gas distribution networks are currently undergoing an iron mains replacement programme with much of the older cast iron pipelines being replaced by polyethylene pipelines that are compatible with hydrogen.

5.7 New storage facilities and infrastructure, connected to this network, could be flexibly utilized to naturally hedge against wholesale price volatility and smooth domestic gas supplies in the short to medium term while flexibly transitioned to biomethane and green hydrogen in the future.

5.8 New flexible natural gas infrastructure investments will not be stranded in a transition away from fossil fuels, but rather be central to a smart transition. This suggests that a clear return on investment is likely to be realised on flexible storage and shipping infrastructure that can pivot between natural gas and replacement renewable energy fuels (BEIS 2021e, f).

6. Recommendations: Opportunities for Government Action

Based on the evidence above, we have identified several opportunities for government action:

6.1 Ensure new and existing energy suppliers without natural hedging capacities are sufficiently and robustly financially hedged against acute rises in wholesale energy prices.

6.2 Introduce energy supplier *and* energy system stress testing that gauges:

i) New and existing suppliers' capacity to withstand extreme economic conditions.

ii) The UK energy system's capacity to quickly adapt to price volatility, rapid changes in domestic energy demand, and acute availability shortages of one or more primary energy sources.

6.3 Invest in, or incentivise investment in, new flexible natural gas storage capacity and infrastructure that:

i) Can be utilized to naturally hedge against wholesale natural gas price volatility and smooth out available low-cost domestic natural gas supplies in the short- to medium-term.

ii) Can be transitioned to renewable fuels in the future, such as biomethane and green hydrogen.

6.4 Investigate the optimal number of firms needed to promote competition in the retail energy sector, in an effort to curb excess entry and to define a target profit margin among suppliers that the Government deems acceptable.

6.5 Revise the Tariff Price Cap to include more frequent revisions to the price caps so that they can more quickly be adjusted to rapidly rising and falling wholesale energy prices.

6.6 Introduce an exceptionally low tariff scheme for the poorest to relieve pressure on the Tariff Price Cap to protect low-income households.

6.7 Consider the large-scale implementation of auto-switching as a consumer enabling technology capable of eliminating the gap between standard variable and default tariffs, and lower cost fixed term tariffs.

7. References

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Notes:

[i] Electricity production from gas is generated from combined cycle gas turbines. Electricity production from oil and gas is generated from open cycle gas turbines.
[ii] These are estimated averages based on 'typical' household energy usage.
[iii] If wholesale prices were to fall, however, they would lose money when they unwound their contracts.
[iv] Liberalisation was initiated by the 1986 Gas Act and the 1989 Electricity Act.
[v] We say "contingent" here because the Warm Home Discount scheme is contingent on recipients applying for the scheme, meeting energy suppliers' eligibility criteria, and a limited number of discounts available for distribution.
[vi] This includes 37% electricity and the use of gas for heating in 87% of UK households. Approximately half of this is currently imported, as domestic natural gas production in the UK has declined over recent decades (BEIS 2021a; Statista 2022).