Step off the gas

Why over-dependence on gas is bad for the UK

TONY LODGE

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ISBN 978-1-905389-91-9

Printed by 4 Print, 138 Molesey Avenue, Surrey

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SUMMARY

- At the end of the 1980s, more than 60% of electricity was generated from coal-fired power stations.
- The 'dash for gas' has now replaced over-reliance on one fuel with an over-reliance on another fuel – gas.
- New research for this paper shows that, today, 90% of all conventional planned power stations with planning approval are gas-fired. Gas-fired electricity will soon account for half of the UK's generating capacity, a figure that on current trends will rise to 70% or higher in 2020.
- North Sea gas is running out. Gas imports have risen from just 2% of UK demand in 2003/04 to over 50% this year. By 2020, 80% to 90% of the gas needed will have to be imported.
- Gas imports are by their nature unreliable. 56% of the world's reserves are located in three countries: Qatar, Russia and Iran. Transporting liquefied gas from Qatar is inherently risky while recent history suggests that neither Russia nor Iran can be considered as reliable trading partners.

- Norway is a significant source of gas for the UK and is the only potential supplier belonging to the OECD. However a leak from a Norwegian pipeline in August sent gas prices soaring by 15% and was followed with the closure of the pipeline. Demand from other EU countries for Norwegian gas is also likely to increase strongly.

- Global demand for gas is expected to double by 2020. The price is already extremely volatile as it remains tied to the oil price which is forecast to rise again.

- UK electricity is now more expensive than that of our neighbours. UK households are paying an average of £100 more a year than those in France.

- Recent record high energy bills are largely the result of the over-reliance on gas. The Government has estimated that the price of electricity from gas-fired stations costs 45% more than that from coal-fired stations.

- The increased reliance on gas has helped push more than 5 million families into fuel poverty as well as damaging Britain's economic competitiveness. UK fuel poverty levels have nearly trebled in the past five years.

- Since 1997, the Government has approved the construction of more than 32 Gigawatts (GW) of gas-fired plant. Over this period there have been no new nuclear or clean coal power stations approved.

- In the next six years many ageing coal-fired and nuclear power stations are due to close. It is expected that 12.2 GW of coal and oil, and 6.9 GW of nuclear, power stations will come off-stream.

- Britain suffers a serious lack of gas storage infrastructure at only 15 days. Compared with France at 99 days and Germany with 122 days. This lack of adequate storage facility creates greater volatility in wholesale prices paid by the UK.

Recommendations

- The lives of the UK's existing nuclear and coal stations need to be extended. This would involve the UK seeking an urgent derogation from new EU emissions rules which were to see Britain's older coal and oil stations closed by 2015.

- The recent conversion of the Government to supporting new nuclear power stations is welcome. However it is too late to prevent the UK's over-dependence on gas. The first new nuclear power station will not be commissioned before 2018.

- The failure of EU gas market liberalisation exacerbates the situation. EU suppliers do not respond to strong UK price signals for gas and do not sell to the UK, especially in the winter months.

- There are numerous clean coal projects awaiting approval around the UK. They should be encouraged and supported. Kingsnorth represents an opportunity for the UK to lead with clean coal technology and carbon capture and storage (CCS). E.ON UK has said it will retrofit CCS technology to Kingsnorth when it is commercially available.

FOREWORD

This study by Tony Lodge tells a stark and deeply worrying story.

Through error and complacency those responsible for the UK's energy policy have allowed our country to drift into a dangerous over-dependence on gas for our daily electricity supply, with the certain prospect of that dependence increasing much further in the near future.

Twenty five years ago around 1% of our electricity involved the burning of gas. Now the figure is 43%. This will grow even higher as older nuclear and coal stations are retired and as replacements are repeatedly delayed. Even if decisions are made now, no new nuclear stations could begin to supply the grid before 2018. Meanwhile new clean coal stations are delayed, with the gap growing wider between what we need in the coming years and our existing generating capacity.

Wind energy may help at the margins. But for baseload generation, new gas turbines provide the only possible means of filling this gap. And here's the rub. The gas they need will have to be found from imports as our own North Sea fields run out.

To secure that gas Britain will have to pay top price. We are at the end of the supply lines from Russia and on the coldest days, as we have discovered, very small volumes reach us as other customers get in first. There are also questions over Russian gas reliability and over Russia's ability to supply the volumes Europe will need as EU gas demand rises.

We can buy more from Norway, but new pipelines are being built to send more Norwegian gas to our neighbours. And we can contract to buy more frozen gas (LNG), when our terminals are ready, but again as we have discovered, LNG cargoes can easily be diverted on the high seas to the biggest bidder.

The situation is precarious. Unless the position is candidly explained to the public and policies are swiftly adapted there could be a real possibility of power shortages and black-outs ahead. Having relied on North Sea gas, Britain's emergency storage capacity in case of interruptions is very small, smaller than any other country in Europe.

Many of us can remember what happens when our energy supply system depends too much on one source. Over-reliance on coal brought the country to its knees in the last century. Over-reliance on gas could do the same now.

Tony Lodge's pamphlet is a warning bell, and unless policy makers swiftly heed its message it will toll for all of us.

David Howell
(Secretary of State for Energy 1979-81, currently Deputy Leader of the Opposition and Opposition Spokesman for Foreign Affairs in the House of Lords)
March 2009

1. THE DASH FOR GAS

In 1965 natural gas was discovered in the North Sea. By 1967 a pipeline transmission system was under construction.

Despite the excitement over Britain's new-found energy reserves, gas was at first regarded as a special case, a 'noble fuel' to be reserved for premium domestic and industrial use, too valuable to be used to generate electricity.[1] By the end of the 1980s, a more relaxed view was taken by the UK. While the UK was still reliant on coal for electricity (over 60% of electricity was generated in coal-fired stations at the end of the 1980s), gas became seen as the cleanest, most reliable and cheapest source of energy available.[2] The advantages of gas were enhanced further in the early 1990s when environmentally-aware countries switched from coal to gas in their attempt to hit the targets of lower carbon dioxide emissions agreed under the Kyoto Protocol.

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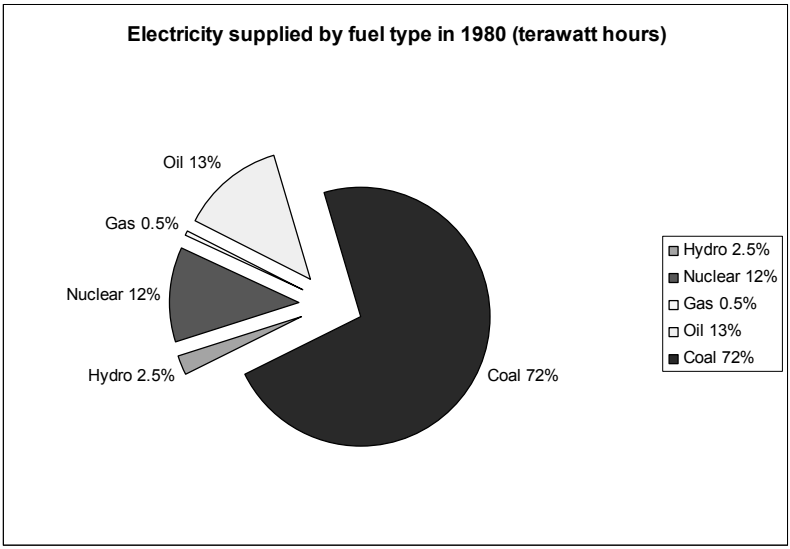
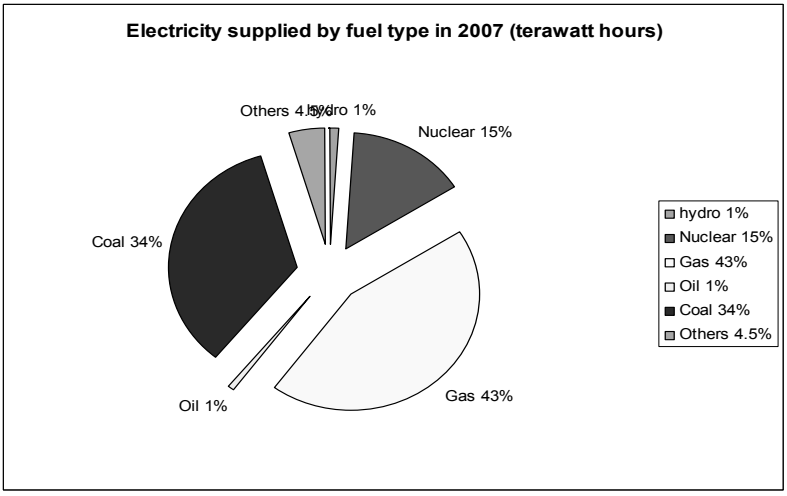
1 The widespread aversion to use gas to generate electricity was illustrated by an EEC Directive passed in February 1975 which restricted the use of natural gas in power stations (75/404/EEC).

2 The miners' strikes of the 1970s and 1980s had also made the reliance on coal unattractive.





Source: DBERR

The development of the large gas-fired power station, known as the Combined Cycle Gas Turbine (CCGT), gave a further boost to gas. These CCGT stations enjoyed the benefits of low capital costs and short construction times. The preconditions for the 'Dash for Gas' were all in place.[3]

The size and speed of the Dash for Gas of the 1990s was influenced by three key factors. First was the interaction of the structure of the newly privatised electricity industry in England and Wales: the Government was determined to increase competition in power generation. However, it was politically unthinkable to break up the biggest two new generating companies, National Power and Powergen, so soon after setting them up. But promotion of new entrants in generation could reduce the dominant market shares of these two companies, (whose generation was overwhelmingly coal-based). Encouraging the construction of new CCGT power stations owned by outside companies was the most cost-effective way of providing new generating capacity. In this way, reducing the market share of the two big generators involved a move into gas at the expense of coal.

Second, the liberalisation of the UK gas market also increased the supply of gas. Under the old regime, new gas fields were brought into supply only when British Gas needed them. This changed after liberalisation: between 1989 and 1993, 36 new gas fields were contracted for, but only nine of these went to British Gas, the other 27 fields being sold to 18 different organisations.[4]

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3 A sign of how the use of gas in power generation was no longer regarded as undesirable was the revocation in 1991 of the 1975 Directive discouraging such use.

4 See M J Parker and A J Surrey, *UK Gas Policy*, SPRU, 1994.

Third, the regional electricity companies saw independently-owned CCGTs as a way to achieve a measure of independence from the two major generators. Significantly, all the CCGT developments in these early years had regional electricity companies as part of the consortia. In addition new environmental legislation forced the big two companies to clean up their coal plants and to retrofit expensive Flue Gas Desulphurisation (FGD) technology to cut sulphur emissions. This also made new investments in CCGTs attractive to the two main power generators, particularly as this could help mitigate their loss of market share and could ensure that independent producers did not secure all of the gas supplies.

This investment in CCGT technology was further boosted by relatively high electricity prices. This made investment in this new generating plant attractive, even though non-modified coal plants generated cheaper electricity than the new gas stations. The reason that this did not prevent CCGTs being built was that decisions were based on prices, not costs; and the coal plants did not seek to exploit their cheaper status by offering much cheaper prices into the electricity pool. If this had happened it may have made the new gas-fired powered stations significantly less attractive and even unprofitable.

The interaction of all these factors led to a rapid rate of ordering new CCGTs. By the end of 1990, some 4 Gigawatts (GW) of gas-fired plant had been ordered, 6 GW by the end of 1991 and 11 GW by the end of 1992. The Dash for Gas was well under way.[5]

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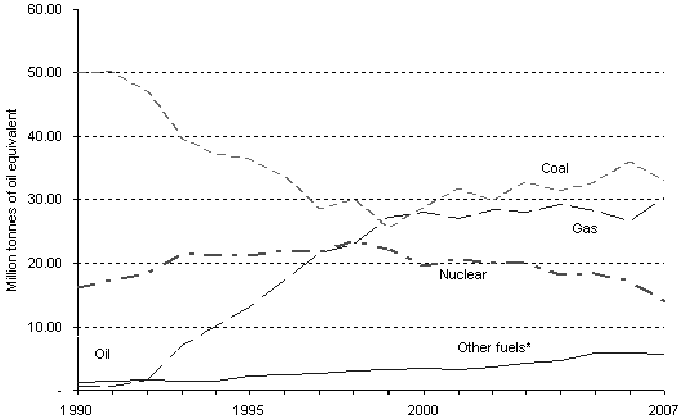
[5] To put this into context, today the UK has 77GW of installed electricity generating capacity.

The Dash for Gas - fuel input for electricity generation 1990 - 2007



Source: DBERR

2. PROBLEMS WITH PIPELINE GAS AND LNG

At the beginning of the Dash for Gas, it was assumed that the UK could use her own gas reserves to produce relatively cheap and clean electricity for a generation. This assumption was confidently stated by the then President of the Board of Trade, Michael Heseltine MP, who told the House of Commons:[6]

> "It is impossible to ignore the existence of United Kingdom-owned North Sea gas. That is the source of the remarkable opportunity to obtain lower cost electricity. At present consumption levels, North Sea gas supplies will last for another 50 years."

However, 17 years later the UK is set to become a net importer of gas for the first time as North Sea reserves run down. Whereas in 2003/4 imported gas accounted for just 2% of UK demand, in 2008/9 imports were expected to contribute over 40%; and 50% by 2010.[7]

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6 Hansard, 19 October 1992, col 217.

7 Energy Select Committee Evidence, 16 July 2008.

This could rise to 80% or 90% by 2020 according to the most recent Energy White Paper.[8]

Problems with dependency on Norwegian gas

Britain's gas pipeline imports come through four major projects:

- The Interconnector UK (IUK), connecting Bacton in the UK to Zeebrugge (Belgium) built initially to export surplus gas to the Continent;
- the BBL Interconnector with Holland (both the IUK and BBL pipeline allow the UK to indirectly receive Russian gas);
- the Vesterled and Tampen link between Norway and Scotland; and,
- the Langeled pipeline with Norway.

In August wholesale UK gas prices jumped 15% after a leak was detected at a key Norwegian supporting pipeline. Statoil Hyrdro, the Norwegian oil group, said it discovered the leak on a gas pipeline linking its Kvitebjoern field to an onshore processing plant. The company closed the pipeline, which pumps an estimated 5% of Norway's total output and said it might remain shut until this Spring. News of this development meant the forward price of gas for delivery to Britain this winter leapt from 90.75p to a record 104p per therm because of the leak.[9]

Despite these problems, the UK is looking to rely more and more on Norway, despite the fact that demand for Norwegian gas from other EU states is likely to soar. For example, it is

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8 *Meeting the Energy Challenge*, DBERR, May 2007.

9 'Energy bills may rise again', *The Daily Telegraph*, 21 August 2008.

anticipated that gas will account for a third of primary EU energy demand by 2030, up from 18% in 1990.[10] The long-term price of Norwegian gas can only be expected to increase in the face of these demand pressures.

Other sources of pipeline gas

Unlike the world's coal reserves, the world's gas reserves are heavily concentrated. About 56% of these reserves are split between three countries: Russia, Iran and Qatar. While the UK's relations with Qatar are good, this is not the case with either Russia or Iran.

Russia, Iran and Qatar have recently raised the prospect of the creation of an Opec-style gas cartel which would then control the majority of the global gas supply – and consequently gas prices. Alexey Miller, Chairman of Russia's Gazprom said they were forming a "big gas troika" and warned that the era of cheap hydrocarbons had come to an end. A meeting in October 2008, held in Tehran, was followed by Iran's Petroleum Minister saying, "There is a demand to form this gas OPEC and there is a consensus to form this gas Opec."[13] A gas Opec would effectively allow these countries to fix prices and control supplies.

In the UK and Europe, this development alongside Russia's decision to cut off gas to the Ukraine at the beginning of both 2006 and 2009, and its 2008 assault on oil and gas pipelines in Georgia, is causing energy planners to examine the wisdom of our reliance on gas.

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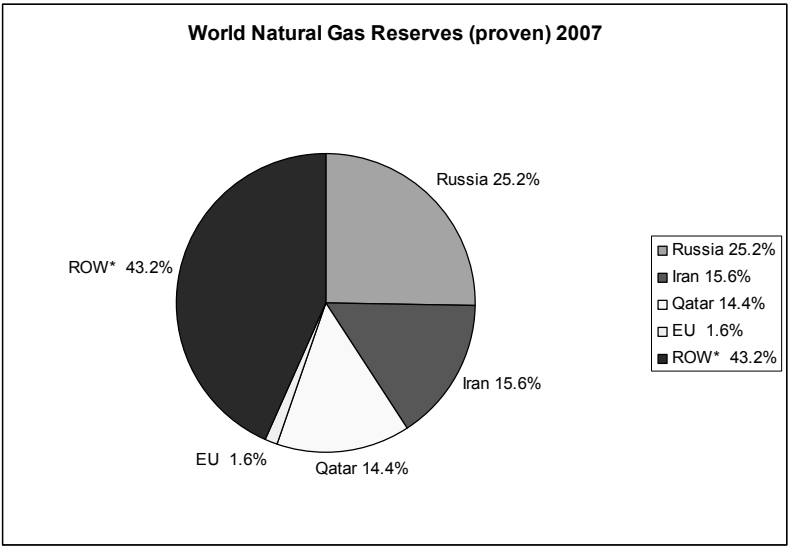
10 EuroGas – 'Long Term Outlook to 2030'.

13 'Russia, Iran and Qatar announce cartel that will control 60% of world's gas supplies', *The Guardian*, 22 October 2008.

Almost a sixth of Britain's gas imports come indirectly from Russia – about 16% of total usage. Britain and Europe's dependence on Russia can only grow unless new pipelines are built from other non-Russian gas-rich regions. The main alternative source for this is the gas-rich Caspian Basin (and possibly Northern Iraq). However the proposed Nabucco pipeline which will connect these gas fields with the EU has already experienced delays and cost over-runs; and has recently been dealt a blow by the EU Energy Commissioner Andris Piebalgs who has said that there will be no EU funding for the project.[14] Meanwhile, Russia is developing plans for two new pipelines into Europe.



*including the former Soviet Union

Source: BP

[14] Euractiv.com, "EU rules out funding Nabucco gas pipeline", 19 January 2009.

Another problem is where these reserves are located. The countries of the former USSR hold almost a third of the world's natural gas reserves.[15] Russia alone has reserves of 45 tcm. The world's other major gas reserves are in the United Arab Emirates (6 tcm), Nigeria (5 tcm) and Venezuela (4 tcm). Only 8% of the world's natural gas reserves lie in the politically and economically stable members of the OECD.

Problems with LNG (Liquefied Natural Gas)

LNG is a piece of the gas jigsaw, albeit an expensive one. LNG involves super chilling natural gas to –260°F so that it compacts to 1/600th of its volume, transporting it in special tankers over long distances, and then re-gasifying it at the destination port.

LNG imports provided less than 5% of the UK's gas supply in 2007/8. However, this is expected to rise to 35% in the next 10 years as new import facilities come into use. It is clearly hoped that LNG is a safe alternative to pipelined Russian gas. However, as with pipeline gas, there are reliability and security problems with LNG.

Firstly, Qatar is the world's biggest exporter of LNG. All Qatari LNG shipments must pass through the narrow Straits of Hormuz between Iran and Oman.[17] Roughly 17 million barrels of oil a day, more than 20% of the world's total oil supply, already go through this route. Oil shipments through the Straits of Hormuz are projected to grow to nearly double (to 32 million barrels of oil a day) in 2030, while LNG shipments along the same route are

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15 The world's proven reserves of natural gas were 177 trillion cubic metres (tcm) at the end of 2007.

17 The Straits of Hormuz, at the mouth of the Arabian Gulf, are 21 miles wide, but the navigable channel for tankers is only three miles.

expected to jump from 28 billion cubic metres (bcm) to 175 bcm.[18]

But if the Straits of Hormuz were blocked, only a small share of the oil, and none of the LNG, could be transported along alternative routes.[19] Mines left in this channel, or even the rumour of them, would paralyse shipping and cut off nearly 20% of world crude oil supplies and cease all Qatari LNG traffic. Future suppliers could look to piping gas across the Middle East to LNG ports on the Mediterranean to negate these obstacles but this would be a long-term project.[20]

Second, all LNG cargoes have security problems. An LNG gas transporter is a vulnerable vessel and terrorist target. Naval escort protection is increasingly necessary, particularly in the face of the increasing threat of Somali pirates off the Gulf of Aden.[21] This will add significantly to the cost of this form of

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18 *World Energy Outlook*, International Energy Authority, 2008.

19 Other vulnerable points are the Bab el-Mandab passage (which connects the Gulf of Aden with the Red Sea) and the Suez Canal. The closure of either of these routes would force oil and LNG tankers destined for Europe and North America to take the much longer route around the Cape of Good Hope. Such a diversion would add up to three weeks to journey times for energy cargoes from the Middle East to Europe and North America, a cost eventually met by consumers.

20 Another alternative route for Iraqi gas would be to build gas pipelines through Syria to the Mediterranean. Again, this option would be vulnerable to geo-political considerations.

21 The seizure of the Sirius Star supertanker in November 2008 illustrates the danger. It is estimated that this one tanker was holding more than a quarter of the daily oil exports from Saudi Arabia, the world's largest oil exporter. See 'Pirates raise stakes with seizure of Saudi vessel', *The Financial Times*, 18 November 2008 and Roger Middleton, *Piracy in Somalia – Threatening Global Trade*, Chatham House, 2008.

energy, with insurance premiums for cargoes crossing the Gulf of Aden having already increased tenfold.[22]

The threat from maritime terrorist attacks was demonstrated on 12 October 2000 when a small boat loaded with explosives rammed the USS Cole in Aden Harbour. Two years later the same tactic was used against the French tanker Limburg which was rammed several miles off the Yemeni coast.

A third problem with LNG is that cargoes can be, and often are, diverted to other ports around the world while in transit. LNG cargoes are increasingly frequently auctioned while they are at sea, with a growing arbitrage trade as ships bound for Europe, the US or Asia being diverted to the highest bidder.

Up until July 2008, just four cargoes of LNG had arrived at the Isle of Grain terminal, on the Kent coast. For the same period in 2007, there were ten shipments, although the terminal has capacity to handle twice that number. Jake Ulrich, a Managing Director at Centrica, which owns British Gas, has stated that:[23]

> "The existence of new pipelines and LNG terminals does not automatically mean much gas will come here. Much LNG goes to Asia where it fetches a higher price. Despite a competitive market, a large number of buyers and sellers, and a significant investment by Centrica and others in attracting new gas from Norway and elsewhere, the existence of

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[22] An alternative to the Gulf of Aden and Suez Canal is to divert shipping around the Cape of Good Hope. This has already happened: three LNG ships bound for Milford Haven were re-routed at great cost around the Cape instead of using the Suez Canal thus delaying their arrival by weeks.

[23] 'Sharp Decline in LNG dashes hope of cheaper bills', *The Sunday Telegraph*, 1 June 2008.

> new pipelines and LNG terminals does not automatically mean that gas will come here unless wholesale prices reflect the increasingly global price that Britain must pay for its supplies."

Similarly, BP Executives told the Commons BERR Select Committee in July that:[24]

> "Greater reliance on imports of gas is bound to necessitate higher consumer prices, despite the various infrastructure enhancements coming on stream."

It is clear that over-reliance on gas is not a sustainable option in either the short- or the medium-term, either in terms of reliability or of price. Yet that is precisely where the UK is.

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[24] BP evidence to Commons BERR Select Committee Inquiry on Energy prices, July 2008.

3. THE VOLATILITY OF ELECTRICITY PRICES

Until 2003, electricity prices had fallen consistently since 1985. However, since then, electricity prices have increased since spring 2003 and, as with gas, price increases have been greater since autumn 2005. The January 2007 price peak was 44% above the 2003 low. The 2006 level was the highest since 1997 and 2007 bills were historically high. Figures from the OECD reveal that energy prices in Britain have increased by 16.7% over the past year.[25] Industrial and energy intensive sectors have recently faced even sharper energy price rises, thereby hitting economic competitiveness and profit margins.[26]

The current economic crisis is having a marked impact on energy prices and availability. The falling value of the £ against the US$ has made foreign uncontracted imports of energy 25% more

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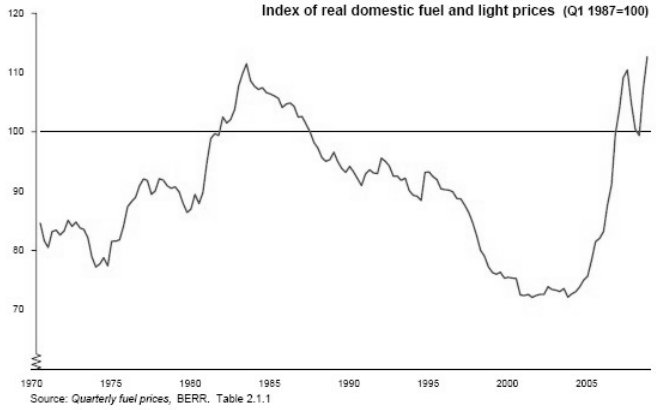
25 'Energy bills rise four times faster in the UK than Europe', *The Daily Telegraph*, 9 January 2009.

26 Low energy costs were once considered to be a necessary part of the competitiveness of the UK's industrial base. This consideration appears to have been lost in the last decade as the focus has shifted to reducing greenhouse gas emissions.

expensive, while the price of indigenous coal and gas remains the same.

But before the current crisis unfolded, price volatility and uncertainty in energy supply was forcing energy intensive users to change maintenance schedules, use more night shifts (when energy is cheaper and supply is more reliable) and, most alarmingly, to reduce production man hours. None of these measures can be a long-term solution, even with their immediate impact being alleviated by the current economic crisis).



Source: *Quarterly fuel prices*, BERR. Table 2.1.1

The impact on fuel poverty

Since 2003 the proportion spent on fuels by households has increased for five consecutive years – the first time this has happened for more than two decades.[27] Just as the UK became

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[27] Consumer trends quarter 3 2008, ONS.

more dependent on imported gas, so did the number of households in fuel poverty soar to over five million.[28] According to OFGEM for every 10% increase in energy prices 400,000 households fall into fuel poverty. The impact of this calculation is stark when one considers the retail gas price increases of almost 50% in 2008.

The impact on households in fuel poverty will only increase as the current economic crisis develops. Household incomes will be increasingly strained for obvious reasons. But this will be compounded by the difficulties now facing the retail distributors who are having to pay higher deposits to the energy wholesalers who are in turn worried that their customers will not be able to honour their commitments in the future. Ofgem Chief Executive, Alastair Buchanan, told MPs that gas companies are being charged considerably more by their banks to borrow money:[29]

> "Companies are having to decide how much of this should be pushed through to consumers. This is very, very frightening."

Comparative prices

Measuring the comparative generation costs of electricity is a complex task, not least because of the huge impact of the underlying financial assumptions which have to be made. In the case of a CCGT plant, the crucial assumption is the price of gas, which may account for up to 75% of operating costs. Similarly, in the case of nuclear power, the most sensitive financial

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[28] A household is defined as being in fuel poverty if it spends 10% or more of its income on energy bills.

[29] ' "Frightening" energy bills ahead', *The Daily Telegraph*, 26 November 2008.

assumption is the WACC (Weighted Average Cost of Capital) required to finance the plant. Hence, any data on average generation costs can vary widely.

However, according to the Government's own figures, the UK's increasing import dependence on gas is likely to result in higher electricity prices.[30] DBERR has published some data on comparative generation costs, which at least provides a guide to the relative costs from different power sources.[31]

Fuel Source	**Price Range (£ per MWh)**
Coal	26 – 29
Gas	37 – 38
Nuclear	32 – 45
Offshore Wind	56 – 89
Onshore Wind	48 – 64

Note: This data is based on 2006 gas prices and assumes no carbon prices supplements being applicable.

The UK also faces higher electricity prices than its neighbours – largely because of its dependence on gas. As the Chief Executive of EDF, Vincent de Rivaz, has stated:[32]

> "In France electricity prices are lower because 80% is generated by nuclear power. By contrast 75% of electricity in the UK is from older coal or gas fired-plants. So for electricity generation, Britain is hugely

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30 DTI, *Energy Trends*, 2005.

31 DBERR, *The Future of Nuclear Power*, 2006.

32 'Britons pay for lack of nuclear plants', *The Daily Telegraph*, 9 August 2008.

exposed to volatile fossil fuel prices while France is largely insulated."

Gas and renewables

If more gas-fired power stations are approved alongside a large expansion in renewables, there is a danger that electricity prices will have to increase further – at a time when customers, whether industrial or household – can least afford it.

Many countries are quickly having to build new gas-fired power stations to shadow unreliable wind turbines, thus exacerbating all the problems with the dash for gas. In 2007 for example, Spanish power providers added nearly 7GW of new CCGT power capacity taking the total installed capacity of gas turbines to 21GW. This was needed to supplement the 15GW of installed wind capacity.[33] Natural gas is now the main source of Spanish electricity with 99.8% of it imported.

In Germany more than 20,000 wind turbines with a total capacity of 21GW have been installed. However, Germany's gas consumption for power generation more than doubled between 1990 and 2007, and now represents 11.7% of the country's total power generation, with the country importing 83% of its supply.[34]

Gas turbines may increasingly be seen as the best back-up for intermittent renewables. Yet the reverse is also true: the push to renewables aggravates gas dependence.

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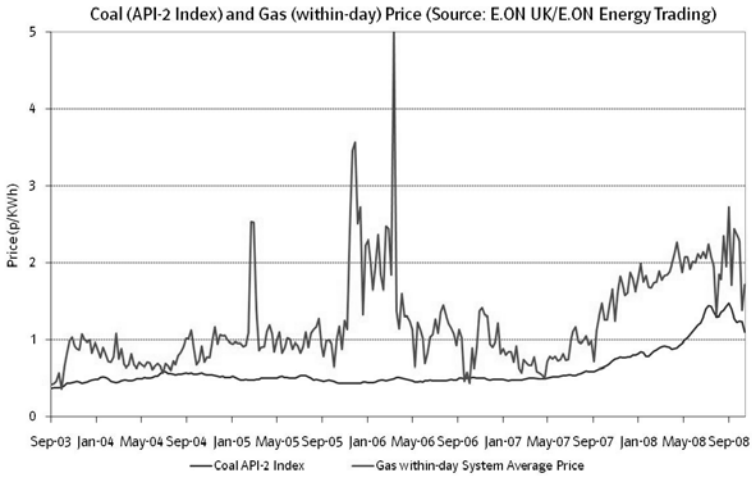
[33] Due to the intermittent nature of wind energy, and the fact that the peak load of the Spanish power grid is in the summer when wind speeds can be very low, gas-fired power stations are needed to ensure continuity of supply.

[34] Dr Fred Hanson, Adam Smith Institute Blog, 28 September 2009.

4. THE VOLATILITY OF GAS PRICES

The growing dependency on gas has been largely responsible for domestic electricity price rises in recent years. The following chart highlights the costs of electricity generated by comparatively stable coal and erratic gas in the past five years.



Source: E.ON UK

Three compounding factors have contributed to recent rises in the price of gas. The first of these is the shortage of UK gas import capacity. This is now being partially addressed and new large gas import facilities are set to come on stream. Two new

additional gas pipeline links with Norwegian gas fields are now on stream and LNG terminal construction and LNG storage expansion is occurring at five different locations.[35]

Second is the shortage of storage facilities. If the UK is to be dependent on gas imports, then its gas storage infrastructure must be addressed. Today the UK has only 15 days storage capacity. This compares with Germany which has 122 days and France with 99 days. This lack of adequate storage facility creates greater volatility in wholesale prices paid by the UK. Importantly, when demand is at its peak UK reserves would last only half the current number of days.

New underground gas storage facility construction needs to be speeded up through new streamlined planning processes. Ofgem warned MPs in November 2008 that Britain does not have enough storage capacity to buy and store gas when it is cheap, and the economic crisis has delayed projects that would have improved the situation.

Third, the lack of a fair playing field and free market in the EU on gas supplies resulted in other governments' rules diverting supplies away from the UK, when these supplies should have been responding to strong UK prices. In 2004, the then Trade and Industry Secretary, Alan Johnson MP, told the Commons:[36]

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35 *LNG Journal,* November/December 2007.

36 Hansard, 14 March 2005.

> "We are not getting the gas that we should be getting... the primary cause was that in the European Union, principle has not been put into practice."

The lack of transparency and competition in energy markets, which has been investigated by the European Commission, has highlighted former monopoly suppliers on the continent remaining in dominant positions and effectively preventing a free market in energy. The UK Government must do much more to end this uncompetitive cartel, which results in British consumers facing higher bills as cheaper abundant gas on the continent does not flow to the UK on demand. For example, in September 2007 Centrica and the National Grid urged the European Commission not to bow to pressure from EDF of France, and RWE and E.ON of Germany, who were lobbying against proposals to break up energy monopolies on the Continent and thus allow for a more liberalised and deregulated market in energy supply.[37]

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[37] 'Stand Firm over the break up of European energy giants,', *Independent on Sunday*, 16 September 2007.

5. THE NEW DASH FOR GAS

Despite all these problems with relying on gas, the UK is set to increase its dependency on gas in the short- to medium-term.[38]

New research for this paper shows how the Government has recently approved a significant clutch of new gas-fired stations. More applications and approvals are expected. In February 2009 alone, the Government approved three new large gas-fired power stations at Pembroke, Kings Lynn and Hatfield.[39] The proposed but delayed new supercritical clean coal plant at Kingsnorth has been allowed to become a 'cause célèbre' for environmentalists. However, if no new clean coal build goes ahead soon, the UK will become even more dependent on gas for electricity to cover the gap left by decommissioned coal, oil and nuclear plants. The following table shows that at present 90% of all the 20GW of

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38 Recently announced plans to build new nuclear power stations in the UK will have no impact at all until 2018 at the earliest when the first new nuclear power station will come on stream.

39 Powerfuel intends to build an IGCC coal gasification power station at Hatfield but the first phase will be a gas-fired plant, to be later converted to using coal.

potential new conventional generating capacity that is at various stages of development is to be gas-fired.

New Planned Power Stations 2009

	Total planned capacity (GW)	% approved	Approved capacity (GW)	% of total approved capacity
CCGT	19.7	100%	19.7	90%
Supercritical Coal	9.7	0%	0	
Coal Gasification	0.8			
Nuclear	11.5			
Total	45.5			100%

See Appendix for source details and methodology.

Note that unlike gas fired stations, none of the supercritical coal stations have yet been approved. This means that, unless some of the new clean coal plants do get the go-ahead in the near future, the UK could find itself 70% or more dependent on gas for electricity, 80% of which by 2020 will be imported. The UK will then produce as much electricity from gas as it did in the 1980s from coal.

And even if a small number of new clean coal stations are approved and older coal stations are allowed a life extension, we will still become 60% dependent on gas.

Electricity Mix: 2007 compared with 2020 (assuming no new coal stations)

	% Electricity by fuel type	
	2007	2020
Gas	43%	70%
Coal	34%	10%
Nuclear	15%	10%
Other	8%	10%
Total	100%	100%

Electricity Mix: 2007 compared with 2020 (assuming four new coal stations)

	% Electricity by fuel type	
	2007	2020
Gas	43%	60%
Coal	34%	20%
Nuclear	15%	10%
Other	8%	10%
Total	100%	100%

Source: DBERR for 2007; author's calculations for 2020 (see also Appendix).

6. SECURITY IN DIVERSITY

Outside the UK, there are four countries which could be considered as being overdependent upon one energy source. Both France and Lithuania generate close to 80% of their electricity from nuclear plants. As such they remain vulnerable to any major generic failing in their reactors. However, this is rare, and the benefits of huge carbon-free indigenous electricity capacity clearly outweigh the negatives.

Poland relies heavily on older coal-fired generation and therefore tougher EU carbon emissions rules criteria are becoming challenging. But this indigenous supply could become, with investment in clean coal technologies, a great asset. Beyond the EU, Norway, despite its formidable gas reserves, is almost entirely dependent on hydro-electric power. If there is insufficient snowmelt, the country's options can become limited.

Claude Mandil, Executive Director of the International Energy Agency (IEA) has said:[40]

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[40] IEA press release 'WEO Report 2006'.

> "Britain risks becoming too dependent on natural gas [to generate electricity] unless it builds more nuclear power stations, boosts other sources, including renewables and improves energy efficiency. The main threat to Britain is that new investment is focusing on gas fired power generation [for electricity] when Britain's own gas production is falling. Britain will have to find other ways of producing power."

These risks will only be exacerbated as indigenous gas reserves are rapidly exhausted. But time is pressing. The EU's Large Combustion Plant Directive (LCPD) will force one third of the UK's coal-fired stations to retire by 2015 and planners are already planning to fill this gap with yet more gas. However, one option here would be to seek a derogation under the LCPD to allow these coal-fired stations to continue and to limit more gas stations while potentially new clean coal stations, such as Kingsnorth and other new IGCC stations come on stream.[41]

Stations such as Kingsnorth operate at high thermal 'supercritical' efficiencies. This technology allows advanced supercritical coal stations to reduce their environmental impact to the near equivalent of current gas-fired stations, with carbon capture and storage taking it significantly beyond this point and

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[41] Coal gasification is the cleanest method for converting coal's energy potential into electricity. The process takes coal and turns it into a hydrogen-rich synthesis gas which facilitates the separation of the carbon dioxide pre-combustion in the turbine generators. It is this factor which offers a lower cost approach to carbon capture. The hydrogen rich stream could also potentially be used in clean transportation and in substitution of natural gas, as well as electricity production. This process, known as IGCC, could help lessen our gas import dependence if developed on a large scale.

reducing $C0_2$ by 90% in the future. But this requires political will: the Government continues to drag its heels, long after the local authority in Kent approved the planning application for Kingsnorth.

An alternative future

The next Government, whether Labour or Conservative, could face the worst energy crisis for a generation. It is time to accept that the decision to rely on one fuel for baseload generation, the majority of which will soon have to be imported, has huge implications on price and security of supply. The risks of doing so are widely recognised in the industry. Paul Goldby, Chief Executive of E.ON has warned:[43]

> "We can't become overly reliant on a single form of power generation if we're to secure security of supply, reduce our carbon emissions and ensure energy remains affordable for our customers. To become overly reliant on a single fuel – and one that will in the next decade or so, become 80% imported – is simply too dangerous."

Similarly, Centrica Chief Executive, Sam Laidlaw, has said:[45]

> "Thinking about power generation we can't have another dash for gas."

Replacing some of the planned CCGTs with a significant new generation of nuclear and clean coal power stations could limit dependency on gas in the fuel mix to 50% by 2025. Less reliance on gas should, in turn, reduce volatility in the wholesale

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[43] 'Dash for Gas "holds UK to ransom" ' , *The Observer*, 22 February 2009.

[45] Ibid.

power market. This might be expected to exert some downward pressure on electricity prices. These are all desirable ends, particularly for households in fuel poverty and for energy-intensive industries keen to see lower bills.

Increased renewable generation and energy saving measures will have some impact. But they cannot meet the energy gap that is facing the UK in the time available. In any event, renewable generation (except potentially tidal power) requires an almost equivalent amount of fossil fuel back-up capacity to guarantee that peak base loads can be met.

In other words, only coal or gas can meet the gap. If there is no new coal, it will be gas. The UK will then be dependent for over 70% of its electricity supply on gas, a figure which could rise by 2020 to 80% on a cold, wind-free winter's day.

Another boost for energy diversity would come if the Government could reach a satisfactory early result from its carbon capture ready consultation and quickly announce the decision on the coal plant chosen to demonstrate carbon capture and storage. It must also ensure that gas and coal are treated the same way in related carbon management trading and regulatory systems.

Seeking and winning EU derogations to allow the UK to retain a more diverse energy mix, and allowing new non-gas generation to come on stream, may be the short-term solution. The long-term answer is to stop the new dash for gas.

The stakes for Britain and our future economic success could not be higher.

APPENDIX 1

PROPOSED UK POWER STATIONS

1. Combined Cycle Gas Turbine Stations

Project and Developer	Capacity (MW)	Expected completion	Status
Langage, Centrica	850	2009	under construction
Marchwood, ESBi/SSE	850	2009	under construction
Staythorpe, RWE Npower	425	2009	under construction
Staythorpe, RWE Npower	425	2009	under construction
Staythorpe, RWE Npower	850	2010	under construction
Severn Power, Welsh Power	850	2010	under construction
Immingham, Conoco	1230	2010	under construction
Grain Stage 1, E.ON	430	2011	under construction
Grain Stage 2, E.ON	860	2011	under construction
Drakelow, E.ON	1200	2011	under construction
Pembroke, RWE Npower	2000	2011	under construction
West Burton, EDF Energy	435	2011	under construction
Barking Power, Barking	470	2011	under construction
Sutton Bridge, EDF Energy	1280	2011	under construction
Carrington, Bridestones	860	2012	under construction
West Burton, EDF Energy	870	2012	under construction
Hatfield, Powerfuel*	900	2013	under construction
Teeside, Thor Generation	1020	2013	under construction
King's Lynn, Centrica	900	2012	under construction
Total under construction:	**16.7GW**		
Wyre Power, Welsh Power	850	2012	awaiting approval
Abernedd Pwr, BP Energy	870	2013	awaiting approval
Amlwch Canatxx	270	2013	awaiting approval
Scunthorpe, ABB Equity	294	2013	awaiting approval
Little Brfd, RWE Npower	475	2016	awaiting approval
Port Talbot, ESBi	1308	2016	awaiting approval
Total awaiting approval:	**4.1GW**		
Total:	**20.8 GW**		

Note: Powerfuel's 900 MW Hatfield project will commence as a CCGT operation to be converted to an IGCC coal gasification plant at a later stage.

Sources: DBERR & National Grid

2. Supercritical and IGCC Cleaner Coal Power Stations

Project and Developer	Capacity (MW)	Expected completion	Status
Kingsnorth, E.ON UK	1600	2013	not approved
Teeside, Centrica	800	2014	not approved
Cockenzie, Scottish Power	1200	2015	not approved
Longannet, Scottish Power	2400	2015	not approved
Tilbury, RWE Npower	800	2016	not approved
Cambois, RWE Npower	2400	2016	not approved
Ferrybridge, SSE	500	2016	not approved
High Marnham, E.ON UK	1600	2020	not approved
Total:	**11.3GW**		**All not approved**

3. Nuclear Power Stations

Project and Developer	Capacity (MW)	Expected completion	Status
Hinkley Point, British Energy	3300	2018+	not approved
Sizewell C 1, British Energy	1650	2018+	not approved
Sizewell C 2, British Energy	1650	2018+	not approved
Oldbury, E.ON UK	1600	2020+	not approved
Bradwell B, British Energy	1650	2020+	not approved
Dungeness C, British Energy	1650	2020+	not approved
Total:	**11.5GW**		**All not approved**

4. Other Power Stations

Project and Developer	Capacity (MW)	Expected completion	Status
Port Talbot, Prenergy Power (biomass)	350	2010	under construction
Belvedere, Cory Env. (energy from waste)	70	2011	under construction
Runcorn, Ineos Chlor (energy from waste)	100	2012	under construction
Stallingborough, Helius (biomass)	65	2012	under construction
Total	**0.6 GW**		

APPENDIX 2

PLANNED POWER STATIONS CLOSURES BY 2015

Coal Power Stations

Didcot A	2000 MW
Kingsnorth	1940 MW
Tilbury	1428 MW
Cockenzie	1200 MW
Ferrybridge C	1000MW
Ironbridge B	1000MW
Total	**8.5 GW**

Oil Power Stations

Littlebrook D	1475 MW
Grain	1300 MW
Fawley	968 MW
Total	**3.7 GW**

Nuclear Power Stations

Hinkley Point	1220 MW
Hartlepool	1210 MW
Hunterston B	1190 MW
Heysham 1	1150MW
Dungeness B	1110MW
Wylfa	980MW
Total:	**6.9 GW**

TOTAL PLANNED CLOSURE: 19.2 GW

Note that the UK has an installed electricity generating capacity of 77 GW.

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New research shows that 90% of all conventional planned power stations with planning approval are gas-fired. Gas-fired electricity will on current trends, account for 70% of conventional UK generating capacity in 2020.

As North Sea gas runs out, so gas imports have risen. By 2020, 80% to 90% of the gas needed will have to be imported. Yet gas imports come from largely unstable regions; the price is volatile; global demand will double by 2020: overdependence on such a fuel is clearly unwise.

The lives of the UK's existing nuclear and coal stations must therefore be extended. And clean coal projects awaiting approval – such as Kingsnorth – must go ahead.

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