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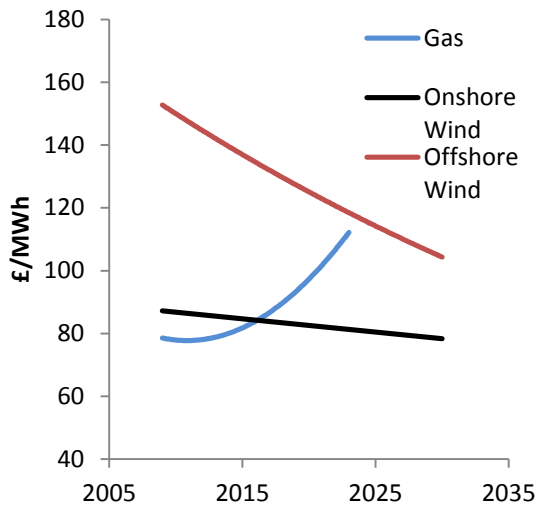
Introduction

The gas review goes to the heart of the government's choice about the UK's energy future. A choice between stable bills, inward investment and clean sustainable energy, or a gamble on expensive, imported and polluting gas leading to policy failure on climate change.

The UK already relies on gas for almost all of its domestic heat and is set to import 70% of gas demand by 2020[i]. We therefore believe any significant expansion of gas generation for electricity would engender a dangerously un-diversified energy mix. It would fail to save money over the medium term, pass highly volatile and unmanageable price risk to consumers, lead to unnecessary wealth transfer from UK consumers to foreign governments and companies, present significant wider macro-economic and geo-political risks, and lead to a substantial chance of policy failure on decarbonisation.

Energy will become more expensive in all scenarios – but only if the government relies on gas will that result in economic hardship and environmental damage.

No cheaper than low-carbon generation



Gas generation from here to 2030 is not cheap. A Greenpeace analysis of all available projections of wind and gas generations costs is shown left (See attached spreadsheet).

Therefore falling wind costs and rising fuel and carbon costs mean gas becomes more expensive than onshore wind in 2015 and comparable to offshore wind by 2025; however, a combination of low wind scenarios and high gas prices could bring the point of equal cost to 2017.

Further to these figures, the Offshore Task Force[ii] – setup by DECC – recently suggested the costs of **offshore wind** could fall more steeply, by 30% to £100/Mwh by 2020, given investor certainty and a favourable policy environment – including action to lower the cost of capital.

Risks increased energy bill volatility

Increased reliance on gas generation would not prevent bill rises, and would significantly increase bill volatility. Figures from Ofgem show that over the last year the average UK bill rose by £150, with £100 of this due to the rising cost of gas.[iii] The Committee on Climate Change's analysis of the impact of policies on household bills[iv] shows that from 2004-2010 rising wholesale gas prices added £290 to bills, compared to £30 for investments in all 'green' policies over that period.

Every independent forecaster expects gas prices to keep rising by between 40% and over 100% on 2010 prices[v]. Indeed even in the IEA's "golden age of gas scenario", which assumes best-case policies for the development of shale gas outside the US, European gas prices rise 40% by 2020[vi].

This means gas will also be the primary driver of bills in future. The CCC concludes that efforts to promote energy efficiency and support new clean technologies will add around £110 to bills between now and 2020 (primarily through ECO), rising gas prices (based on DECC's scenario) will add £175 by 2020.

The high and volatile variable costs of gas generation mean consumers are directly exposed to almost overnight fluctuations in their costs of energy. Increasing gas generation would merely increase this exposure, multiplying the impact of heating, fuel and goods price rises.

In August 2011 British Gas increased electricity prices by 16% and gas prices by 18%[vii] overnight due to higher wholesale costs driven by international events such as the disaster at Fukushima and the Arab Spring. Similarly between May and October 2008 Ofgem figures show an increase of more than 20% in the average dual fuel bill due to high demand for oil and gas in Asia[viii]. This trend is set to continue and Centrica has already warned bills will rise further this year by at least 15%.[ix]

Sudden price increases can have a greater impact on consumer perception and spending than larger –but more gradual – increases. A recent report for DECC by Oxford Economics found "a shock to gas prices has a greater impact at the whole economy level and across all sectors other than transport. This reflects the importance of gas-fuelled power stations in electricity generation and the relatively large share of electricity in energy inputs"[x]

Energy security

Increased gas generation would also leave the UK businesses and consumers over-exposed to risks from the international gas markets. Last year the UK imported more gas than it produced for the first time since 1967. It has been a net importer since 2004 and must compete for it on volatile global markets.[xi] This presents significant supply risks for any expansion in gas generation.

Less than 50% of UK gas demand is now met indigenously, with imports forecast to rise to between 75% and 80% of UK demand by 2020.[xii] As a result the UK has become increasingly dependent upon shipments of Liquefied Natural Gas (LNG) from Asia and Africa. According to National Grid, LNG is set to become the single biggest source of the country's gas by 2020-21, meeting almost 40% of total demand.[xiii]

LNG is an unreliable supply source. UK imports of LNG fell 30% this year as prices rose due to increased Asian demand.[xiv] Dozens of LNG cargoes that were originally destined for EU countries have been sent instead to Japan[xv]Merrill Lynch Bank of America has warned that: "With Asian demand resurging, UK and European gas prices will have to increase to stem the on-going diversion of LNG cargoes to Asia."[xvi]

Indeed Ofgem Chief Executive Alastair Buchanan recently argued the UK could face very high gas prices in future as China increasingly competes for gas on the world market.[xvii] According to analysts at Wood Mackenzie, China needs to increase its LNG imports by 80% to meet rising domestic

demand.[xviii] The UK is "incredibly dependent on Qatar from an LNG perspective. If you are going to change that you are going to have to start contracting on a firm basis," they concluded[xix]

Figures from Deutsche Bank show non-Qatari cargoes heading to the UK fell steadily from 56% in 2009 to about 10% in 2011, despite British government efforts to promote greater diversity.[xx] Figures from HMRC reveal that from January-March 2012, the only other country the UK received LNG imports from was Iran. Other sources for LNG include Algeria, Yemen, Nigeria and Trinidad and Tobago.

The UK's top five sources of gas imports by value 2011 (£) (source HMRC)	
Qatar	4,251,336,852
Norway	2,662,157,566
Nigeria	250,808,662
Yemen	145,513,816
Trinidad and Tobego	116,083,417

But the UK has made limited progress in securing long term gas deals. In internal briefings for the UK's Department of Energy and Climate Change, obtained by Greenpeace, Centrica expressed concerns about its 2011 three year, £2bn deal with Qatargas, one of the UK's largest gas suppliers. 'The draft agreement presented by the Qataris is not acceptable to Centrica,' said the private Department of Energy and Climate Change briefing, written shortly before the signing. 'The cargoes could be fully diverted, and price is high, and the contract duration (three years) too short.'

The UK's increasing reliance on LNG imports from Qatar has also been questioned by UK military leaders, who recently warned that almost half the UK's gas imports would be halted if, as it has threatened, Iran blocks the Strait of Hormuz. Lord West, former head of the Royal Navy, recently argued that if the strait were blockaded, the sharp fall in the UK's gas supplies would be the country's single most critical issue. [xxi]

A National Grid study in January 2011, an unusually mild month, into the impact of a shock to the UK gas supply, such as the closing of the Suez Canal or an international increase in demand for gas imports, found that if this had taken place, consumers would have faced gas supply interruptions.[xxii]

<u>Impact of cost shocks</u>

A greater reliance on gas generation would also magnify the impact of a cost shock beyond the immediately impact on consumer bills. This means using gas as a 'transition fuel' in the energy mix, even with CCS, poses economic risks which can be removed by a greater reliance on alternative generation options.

The recent report by Oxford Economics for the Department of Energy and Climate Change argues that: "high and volatile energy prices have a negative effect on the economy of a fossil-fuel importing country such as the UK: they dampen economic activity and they lead to an increase in the price level and potentially an increase in the inflation rate. Since fossil fuels are an input into many goods, both consumers and producers bear losses." [xxiii]

Instead Oxford Economics[xxiv] concluded that: "once the UK fully transitions to a low-carbon economy, the negative impacts of energy price volatility on these 4 factors are halved:

- Halving the impact of energy price volatility on disposable household income, and therefore reducing amount households would have to put aside to spend on energy bills.
- Halving the negative impact on the level of business investment.
- Halving the impact on inflation
- Halving the impact on levels of unemployment, which could rise through increased economic inactivity caused by high energy prices."[xxv]

Long term economic impact

Investing in imported gas, either with or without CCS involves substantial wealth transfer from UK consumers to foreign governments and companies.

Non-oil fuels, predominantly gas, currently account for around 7.5% of the UK trade deficit[xxvi]. Electricity generation accounts for around 1/3 of total demand for gas[xxvii] so the proportion of the trade deficit due to gas for electricity generation alone accounting for 2.5% of the trade deficit and set to rise significantly as imports and gas prices increase.

The CBI recently warned that "the UK's rising energy trade deficit, as North Sea oil and gas production declines, will increase the need to find alternative sources. Diversifying towards renewable energy will both decrease energy imports and stimulate business investment. The UK is already one of the most energy-efficient economies in the world and can take advantage of medium-term opportunities offered by emission reduction targets."[xxviii]

A report by Innovas for the Renewable Energy Association found that just meeting the UK's renewables targets by 2020 – instead of relying on gas for power - would displace £60bn worth of fossil fuel imports and create 110,000 jobs in the UK[xxix]

Last year the average UK household spent £71 on gas imports from Qatar alone – a number that is set to double.[1]

Greenpeace believes that rather than send increasing amounts of capital overseas to purchase gas, it is prudent economic policy to encourage investment in demand reduction and renewable energy here at home. This can help to rebalance the UK economy, aid a fragile economic recovery, and create high-skilled, long-term jobs.

Shale – not part of the transition

The economic impact might be mitigated if shale gas were either to significantly reduce the global price of gas or provide significantly increased UK production. However, the evidence suggests neither of these outcomes are plausible within the time-scale of decarbonisation.

Economically falling gas prices in the US are a one-off - the result of large amounts of new wells coming on stream just as the economy flat lined. But figures from oil field services firm Baker Hughes show the 'rig count' for gas there has steadily fallen, down nearly 30% since October last year[xxx].As

[1] (Calculation: Total imports from Qatar £4,251,336,852 (HMRC) * % of domestic gas use (301/906 Twh DECC) / number of UK households (26.3 million, ONS) = Amount spent per household for heating =£54 + Total imports from Qatar £4,251,336,852 (HMRC) * % of gas used for electricity (307/906 Twh DECC) / % of electricity for domestic use (112/316 Twh DECC) number of UK households (26.3 million, ONS) = £17.6. Total :£71

the rig count has fallen – the price has gone up[xxxi] with Shell now amongst many predicting the price in the US will increase by around 100% between now and 2014-15.[xxxii] Gas reserves are also lower than thought. This year the US Energy Intelligence Agency (EIA) [xxxiii] revised down its estimate of the technically recoverable shale gas resources in the US by a staggering 42%.

And the shale revolution from the US is extremely unlikely to travel to Europe – for economic, political and geological reasons.

Two recent reports, one by respected energy consultancy Poyry[xxxiv] for regulator Ofgem, and the other by Deutsche Bank[xxxv], have warned that Europe's shale is unlikely to have a substantial impact on the price of gas. Europe is far more densely populated, the shale is generally deeper, the water more scarce, land rights less helpful and the regulations justifiably tighter. The world's largest gas services company, Schlumberger, was recently reported as saying the price of drilling in Poland was already three times that of the US [xxxvi] and the Polish geological institute has already significantly cut its shale gas estimates.[xxxvii]The world's largest energy company , Exxon, has withdrawn from Polish and European shale altogether. [xxxviii]

The UK government, following consultation with Shell, Centrica the EA and other agencies has come to a similar conclusion saying that if all the UK's shale reserves are exploited it could provide "5, maybe 10%" of our energy needs. Even Cuadrilla who are actively seeking investment partners and whose shale reserve estimates are 40 times less than the last estimate by the British Geological Survey[xxxix] admits "Nobody on either side has said it would transform Britain."[xl] Cuadrilla has also admitted that as little as 5% of its estimated reserve may be obtainable.

Meanwhile shale is unlikely to mitigate rising global gas prices driven by demand in Asia. Even in China – estimated to have the world's largest shale reserves – large-scale extraction is years if not decades from reality. The geology and infrastructure in China – as in Europe – is very different to the US and water supplies are a major problem.[xli] In Argentina, another potential shale producer, the energy company with the rights to drill for shale was recently nationalised leaving investors sceptical as to whether it still has the resources or expertise.[xlii]

The IEA report "Golden Rules for a Golden Age of Gas"[xliii] found that shale gas in Europe will be 50% more expensive to extract than in the US. The IEA also claimed that shale gas extraction outside the US would not occur at scale for a decade or more saying "Most of the increase comes after 2020, reflecting the time needed for new producing countries to establish a commercial industry." This would be too late to play a significant role in 2030 decarbonisation.

<u>Carbon Capture and Storage – untested gamble</u>

Gas burning could only be consistent with decarbonisation by 2030 if Carbon Capture and Storage (CCS) were to be rolled out at commercial scale on almost every gas station in the country by 2030. However, this is not currently a credible scenario – and relying on the potential for ambitious levels of CCS deployment as the means to achieve decarbonisation is incredibly risky, and potentially extremely expensive.

There is currently only an obligation for new build gas to be 'CCS ready' (with a vague definition lacking in any credibility) and there is no obligation to actually fit CCS, even if it became

commercially viable. The announcement that energy utilities needn't worry about needing to abate emissions from gas plant until 2045 will also have discouraged CCS investment and deployment.

With extremely limited public funding for CCS demonstration, and no regulation requiring CCS, and no terms and conditions about, for example, siting of new gas plant to be better suited for CCS in future – there is no indication this technology is at anything beyond the idea stage.

Indeed the government's own energy market reform contains no mechanism to incentivise CCS with Gas. Contracts for Difference – which offer a fixed strike price – are a highly inefficient tool for paying for a generation source for which there is no price discovery and with a high, and volatile, variable cost component.

CCS is currently estimated to double the cost of electricity production over gas without CCS[xliv]. Cost estimates for CCS are, at best, speculative as no commercial scale example yet exists and existing cost forecasts fail to factor in costs for planning delays and other risks which account for a significant portion of other technology options.

It is our view that proposals to exempt gas plant from emissions performance standards until 2045 are clearly inconsistent with this necessary decarbonisation goal. Instead, new emissions standards should apply to all fossil fuel plant and be set at a lower level that is consistent with ensuring power sector emissions in 2030 are no more than 50g/Co2/Kwh.

Climate change risk

In their advice to the government on meeting the carbon targets set out in the Climate Change Act, the Committee on Climate Change (CCC) have said "any path to an 80% reduction by 2050 requires that electricity generation is almost entirely decarbonised by 2030." The CCC defines this goal more specifically as meaning that by 2030 our electricity system should produce no more than 50g of CO2 for every kilowatt of electricity generated.[xlv]

DECC state that the emissions intensity of a modern gas plant – a Combined Cycle Gas Turbine (CCGT) - is 350g/CO2/kWh at the point of generation.[xlvi]

Methane – the main constituent of gas - is also a very potent greenhouse gas, 21 times more powerful than carbon dioxide over the medium term according to the US Environmental Protection Agency.[xlvii] As the UK becomes increasingly reliant upon LNG imports, the impact of gas usage on the climate could also be worse than expected because of emissions beyond those produced at the point of electricity generation.

LNG imports are understood to be particularly damaging with a recent research note by Scottish Widows Investment Partnership noting that the emissions for processing and transporting gas, added to methane leakage from gas production, undermine the benefits of gas over coal for electricity generation. Their research concluded, "If you combine the additional 15-20% CO2 emissions from the LNG process with the warming impact of the fugitive methane emissions… the climate benefits of gas are further eroded." [xlviii]

A study at Carniege Mellon University [xlix] found that the lifecycle emissions of burning a gas mix containing just 20% LNG were 21% higher than the emissions at the plant, for which generators purchase carbon credits. It also found this brought total lifecycle emissions close to coal, reducing the benefits of burning gas for the climate.

Moreover, given the influence of the International Energy Agency's report 'Are we entering a golden age of gas' on DECC policy formation[l] it should be noted that a series of peer reviewed studies have found the life-cycle climate emissions from shale gas are close to that of coal. DECC appears to have based its confidence about a "benign global supply picture"[li] on IEA assumptions about the growth of shale gas, both in the US and beyond. In the unlikely event that shale gas is as successful in Europe and beyond as the IEA claims, the fugitive emissions from the fracking process, added to the increased emissions from processing and transporting LNG, will hugely undermine the benefits from a coal to gas switch.

A further peer-reviewed study[lii] from the National Center for Atmospheric Research (NCAR) in the United States concluded that "shifting from coal to natural gas would have limited impacts on climate" because coal-burning also emits tiny dust particles, aerosols, which have a cooling effect, and because of likely methane leaks associated with relying upon gas.

Policy options – limit build

In doing an impact assessment for their Emissions Performance Standard (EPS) proposal, DECC commissioned Redpoint to model gas-build to 2030. "The model baseline... suggests that there will be some 12GW of new CCGT gas plants [by 2030]".

A recent report for Friends of the Earth[liii] shows that some 9GW of new gas build is already in the pipeline and likely to be built by 2016, whilst Bloomberg[liv] anticipate 11GW new gas built by 2016, with a further 2GW built between 2016 and 2030. Crucially, Bloomberg also anticipate this plant to be generating c.125, 000 MWh per year in 2030 - i.e. not just covering peaking load.

If Bloomberg are correct and the UK has CCGT generating 125,000 GWh of electricity in 2030 - that would mean emissions of some 44MtCO2/yr. In contrast, the CCC have said that to meet the 2030 carbon goal power sector emissions in 2030 should not be more than 16 MtCO2 annually. There is therefore a clear need for the market reforms to prevent this outcome.

Despite this, Ministers have signalled they support a lot of new gas investment – and in a midnight announcement on 'budget weekend' revealed they will exempt gas plant from emissions regulations until 2045.[lv] Lord Turner recently wrote to the Energy Secretary[lvi] on behalf of the CCC to warn this would lead to "the risk that there will be too much gas-fired generation instead of low carbon investment" and that the policy could take emissions "beyond the limits implied by carbon budgets." The attractiveness of the business case for new gas plant, relative to lower carbon alternatives, will be shaped by the capacity payment arrangements that emerge from the government's electricity reforms and therefore these decisions will also have a significant impact on how much gas gets burned and consequently levels of emissions.

If the "Capacity Mechanism" is set at a level that means gas plant only end up operating occasionally at any one time, with resultantly low total emissions (even though per kWh they will remain high carbon) the average mix on the grid could still decline in carbon intensity. However, this would mean effectively mean taxpayers paying energy companies not to use their gas stations except when they were needed for times of "peak" demand – and it should necessarily see limits on the numbers of gas plant built.

Conclusion

Greenpeace believes the government must prioritise investment in renewables, meeting our 2020 targets and decarbonising the power sector by 2030. Pathways suggested by WWF's/Ecofys energy and European Climate Foundation reports[lviilviii] show this is possible without major new nuclear or CCS build.

Equally research for Greenpeace and WWF by Poyry[lix] suggested no new gas would be needed until 2020 if sufficient effort was put into energy efficiency and renewable energy. Beyond that point improved clean technology such as wave and tidal power and the recent life extension for nuclear mean new gas generation needs will be minimal.

Gas generation should, by then, be used as backup in line with the CCC's recommendations that no more than 6GW[lx] of gas is required by 2030 alongside significant investment in inter-connection. In this pathway Greenpeace research has shown that few – if any – new gas plants need to be built [lxi]

Gas already provides the vast majority of the UK's domestic heat. Ofgem data suggests dual fuel bills are already rising sharply due to spikes in international gas prices[lxiilxiii]. This problem may be exacerbated as the UK set to import 70% of its gas by 2020[lxiv]. We should not, therefore, increase our dependence on gas in the power sector and so further increase our vulnerabilities.

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