Shell response to the Gas Generation Strategy Call for Evidence

Summary

i. Shell welcomes this Gas Generations Strategy and the aim to create a long-term policy framework and positive investment climate in which developers of gas generation are comfortable once more to invest in this technology.

ii. There are many benefits to the UK of maintaining a large role for gas in the electricity sector. Gas can help with all three of the UK's energy objectives. It can help the UK meets its CO_2 targets, by helping decarbonise the electricity sector in the short-term by replacing coal and in the long-term with Carbon Capture and Storage (CCS). It is the cheapest technology to build reducing the cost to consumers and is flexible and quick to build so vital for security of supply.

iii. For gas to maintain its longer-term role there needs to be clear regulatory and policy support for CCS technologies. All analysis suggests that gas CCS will be a competitive low-carbon technology but to achieve this we need to demonstrate CCS as quickly as possible so that it is ready to deploy on a large scale in the late 2020s.

iv. The upstream gas sector should not be a constraint on developing gas generation. Global gas supplies are now more abundant and diverse than previously thought and the UK gas market is in a very good position to benefit from these developments and enjoy a more secure supply position.

Introduction

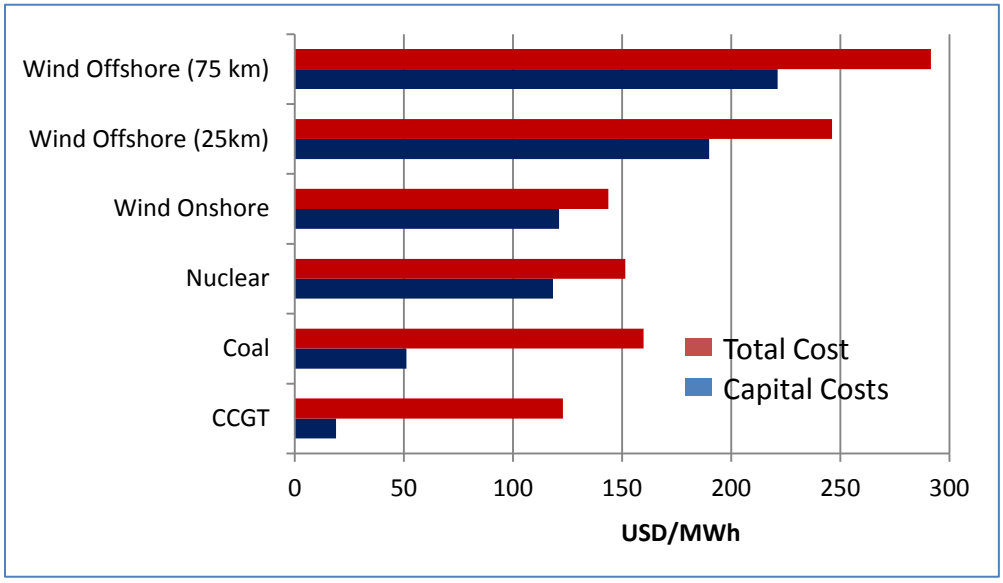
1.Shell welcomes the Gas Generation Strategy and is pleased to have the opportunity to respond to the call for evidence. We believe gas generation is going to continue to play a very important part in the future UK electricity mix. Given this, it is important that the UK Government takes a holistic approach at looking at what is required to enable gas generation to play this part, and considers the potential barriers and solutions throughout the gas supply chain.

2.Our response is focussed on the six questions that were listed in the call for evidence and covers these sequentially.

Q1. What are the main strengths and weaknesses of gas generation in helping deliver a secure, affordable route to decarbonisation through to 2020 and then by 2050?

3.There are many benefits to the UK energy sector and wider economy in maintaining an important role for gas in the UK electricity mix.

4. The benefits that the use of gas can bring from a macro-economic perspective are often underestimated. With deficits and government debt at historically high levels, there is an acute need for strict budget discipline. Maintaining the affordability of electricity prices is also important from a competitive perspective. Any increases in UK electricity prices that are not mirrored in other countries could impact industry's competitiveness and have a negative impact on jobs. Most countries will find that natural gas is far more affordable than any other source of electricity, especially in front-end (capital cost) investment terms. Shell estimates that the capital cost comparison of gas-fired power versus other power sources as approximately: gas 1; coal 2-3; nuclear 5; onshore wind 7-10; offshore wind 10-15. (NB These estimates are in line with other estimates, such as those produced by Mott MacDonald and included in Figure 1 below. Moreover these estimates do not include the additional balancing and network costs that renewables would incur). Construction times for gas are also lower than for other technologies, so gas can be deployed quickly to meet any potential future supply gaps.



Source: Mott MacDonald for DECC

Figure 1: *Costs of different generating technologies*[1,2]

5. A report by Redpoint published in 2010 for the UK Energy Networks Association[3], found that pathways with greater ongoing gas use could offer a cost-effective solution for a low-carbon transition relative to scenarios with higher levels of electrification. Their baseline assumptions

[1] CCGT = Combine Cycle Gas Turbine
[2] Total costs = Capital costs + Fuel Costs + Operating Costs
[3] Redpoint (2010) – 'Gas future scenarios project'.
http://energynetworks.squarespace.com/storage/ena_publications/ena_gas_future_scenarios_report.pdf

indicate potential savings to Great Britain of almost £700bn over the 2010 to 2050 period on a Net Present Value (NPV) basis – around £20,000 per household or £10,000 per person – with consequential benefits for consumers, the economy, and the competitiveness of GB industry. For the power sector the avoided costs are £244 billion over that same period. Moreover, the conclusion that more use of gas in the power sector is the lowest cost pathway is robust under different gas price sensitivities. In addition, this scenario requires the least interconnection with other countries, which can be costly and slow to build. And critically, with this pathway, the UK can still meet its CO_2 emissions reduction and renewable energy targets.

6. Similarly a study[4] from the European Gas Advocacy Forum (a group of European gas companies)[5] supported by McKinsey, shows that the EU can meet its 2020 targets[6] and an 80% greenhouse gas reduction target in 2050 by adopting a pathway that maintains a strong place for gas in the energy mix. Compared to the pathway with 60% renewables by 2050 presented in the European Climate Foundation (ECF) Roadmap 2050 work[7], the pathway with a stronger gas component would reduce investment costs by €450-550 bln in the period to 2030. This translates into a €150-250 saving per household per year and will help preserve Europe's economic competitiveness. Growth in gas-fired power in the short to medium term enables a more measured transition to renewables and nuclear, allowing the optimisation of technology and driving down of cost before they are deployed at scale.

7.One of the main challenges to the case for growth or maintenance of gas in the power generation mix is the perceived likelihood of 'lock-in' of fossil fuel technology and their respective CO_2 emissions, or the "stranded asset" problem – ie constructing plant which becomes redundant when more stringent CO_2 regulation is implemented. Neither scenario need be the case. First, it is coal-fired power which is currently responsible for the fastest sector growth in CO_2 emissions worldwide. Modern gas-fired plants emit 50% less CO_2 than coal plants per kilowatt hour of electricity generated. So replacing coal with natural gas is the surest, fastest and cheapest way to reduce CO_2 emissions over the next ten vital years. For the UK, Shell analysis shows that, replacing existing coal with gas power plants would lead to a 24% cumulative reduction in UK CO_2 emissions by 2050 (see Figure 2).

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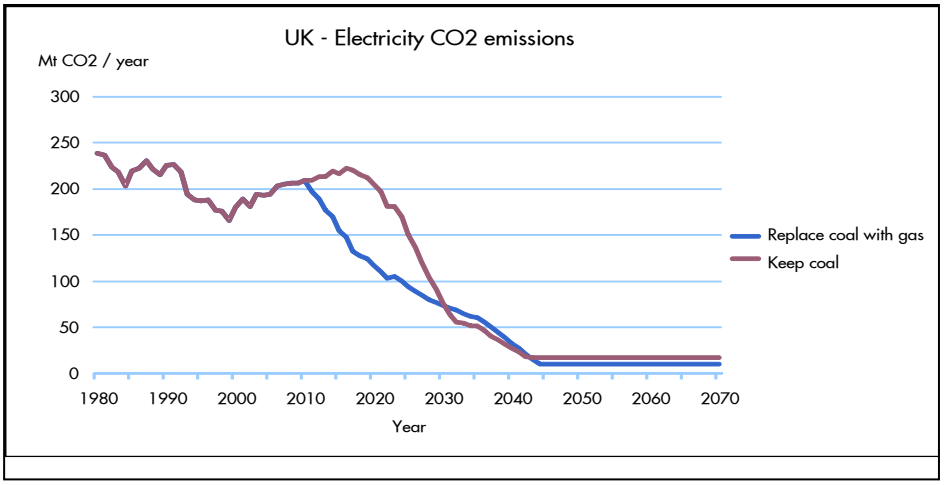
[4] EGAF (2011).'Making the Green Journey Work : Optimised pathways to reach 2050 abatement targets with lower costs and improved feasibility'.

[5] The European Gas Advocacy Forum (EGAF), is an industry group including Centrica, E.ON Ruhrgas, Eni, Gazprom Export, GDF SUEZ, Qatar Petroleum, Shell and Statoil.

[6] EU targets for 2020 are: 20% improvement in Energy Efficiency; 20% Renewables Contribution and 20% CO_2 Emissions Reduction from 1990 levels.

[7] European Climate Foundation (ECF): 'Roadmap 2050 – A practical guide to a prosperous, low-carbon Europe'. http://www.roadmap2050.eu/



Source: Shell internal analysis

Figure 2: *UK electricity CO_2 emissions under different scenarios*

8. There is a vital long term role for gas in a low-carbon power sector as the natural complement to intermittent renewables which need back-up power. Gas can help maintain the stability of the electricity system as it can respond during the extended periods when the electricity output from wind decreases, a service that will be required more frequently in the future as the share of renewables in the electricity mix increases. Gas is one of the least carbon intensive technologies to use for helping balance the electricity grid, and if this role is not appropriately recognised in policy it may lead to more carbon intensive forms of load balancing such as coal.

9.Longer-term, gas power plants should and can be retrofitted with CCS which reduces emissions by 90%. CCS is technically established (all elements are well proven) but the market still has to see scaled-up demonstration and then widespread application. There is very little reason to doubt this is achievable in the 2020s and, provided the appropriate regulatory framework and government support is established, we should see large scale CCS take off by 2030. In the longer term, as these technologies move to "nth of a kind status" (or mature status), the levelised costs of CCS equipped plant will make them very cost competitive with other technologies such as offshore wind and solar PV[8].

10. In addition, retrofitted gas CCS is cost-competitive with coal-CCS. Gas CCS also requires less transport and storage infrastructure as the CO_2 captured and stored is significantly less than that of coal, making gas CCS less capital intensive and allowing more storage solutions to be developed for use by CCS applications in other sectors.

11.So in the period to 2030 there is a strong need for unabated gas generation. This is consistent with meeting the UK's 2050 targets, since CCS can be retrofitted to gas plants after 2030 and reduce their carbon footprint. Shell analysis has shown that the UK 2050 target would need CCS build-out

[8] Mott MacDonald (2011). ' Costs of low-carbon generation technologies'.

rates of one to two GW per year from 2030 to 2050 which is equivalent to 1.5% to 3% of current UK fossil fuel generation capacity. This needed CCS build rate is realistic when compared to the UK's "dash for gas" build activity from 1991-2002 which was between 0.5 and 3.5 GW a year.

Q2. What role can gas fired generation play in the future and what level of gas generation capacity is desirable?

12.As described in the answer to the first question, gas generation can play a positive role in the future and should not be constrained by any of the three Government's objectives of reducing CO_2 emissions, having secure supplies and having supply at affordable prices. Gas generation and in future gas CCS can help achieve all three of these objectives.

13.It is desirable for the UK to continue to have a diverse electricity supply and provided the policy framework is appropriately designed, gas and gas CCS will play their role alongside other technologies in meeting the UK objectives. It is not optimum to pre-determine the desired level of capacity as setting the electricity mix centrally often leads to costly and inefficient choices.

Q3. What are the key factors driving the economics of investing in new gas-fired power generation and how are these factors likely to change?

14.The key factors impacting investment in gas-fired power are driven primarily by the electricity market itself and not the upstream gas market. In the electricity market the key drivers are the relative cost of fuels and CO_2 (the clean spark spread), the changing policy landscape and the economic climate.

15.The current gas-coal price differential, combined with the low EU Emissions Trading Scheme (EU ETS) carbon permit price is reducing gas load factors and is also causing some gas plants to be mothballed. The threat of coal negatively impacting gas load factors is likely to persist as long as CO_2 prices remain depressed. Having a strong carbon price would help reverse some of the low gas load factors and gas could again be dispatched ahead of coal, reducing emissions.

16.The ongoing uncertainty around the detail included in the Electricity Marker Reform (EMR) package is delaying investment, as developers look to see what the finer details mean for investment in any particular generation technology.

Q*4. What barriers do investors face in building new gas generation plants in the UK? What are the key regulatory uncertainties that may prevent debt and equity investors making a final investment decision in gas generation and supply infrastructure?*

17.On the generation side the primary policy uncertainty that is affecting investors is the uncertainty around the EMR package. In particular the uncertainty on the details of the design of the capacity mechanism such as what the rewards and penalties will be and the timing of the instrument, all create uncertainty for Combined Cycle Gas Turbine (CCGT) investors.

18. As the details of the EMR package are still being discussed, it is unclear how much support low-carbon technologies are likely to get and therefore what their level of deployment is likely to be. This creates an unclear picture of the role of gas going forward and how much investment in gas generation capacity might be needed.

19.The uncertain future of CCS and gas CCS in light of the ongoing competition and lack of clarity on how CCS will be supported through to commercialisation is also creating uncertainty around the long-term investment in gas and gas CCS.

20.On the wider gas supply infrastructure chain the key barriers are economic. For example, it is hard to make the case to build long-range gas storage given the depressed summer-winter gas price differential and the ability of LNG supplies into the UK to flexibly respond to such variations. But the form of storage required will change over time as the UK will require more flexible, high-deliverability storage to be able to respond to the intermittency of renewables generation. The economics of building such short-range storage are much less challenging and there are already a number of such storage developments being proposed.

21.In terms of import infrastructure, the UK gas market has already responded and has allowed the UK to access gas supplies from a diverse set of sources. The UK imported gas from 10 countries in 2010 and that diversity may still increase. UK infrastructure is now capable of importing around 125% of annual gross demand. The UK NBP not only has the largest traded volumes in Europe, but it is also the most connected to other world gas markets, attracting by far the largest LNG volumes in Europe. The UK market became the largest European LNG market for the first time in 2011. So the UK is in an enviable position in sourcing the necessary gas supplies it will need from the world market.

Q5. Are there any other policy issues that need to be addressed beyond the Government's proposals for the capacity mechanism and the EPS?

22.Shell welcomes both the capacity mechanism and the recently announced details on the grandfathering arrangements for the Emission Performance Standard (EPS). A growing share of intermittent generation will reduce the economic case for CCGTs so they will require support to operate at low load factors. However there are still some outstanding issues with the capacity mechanism that need to be resolved as soon as possible. For example:

i. There is a need for clarity on the design of the mechanism to avoid stalling investment in gas generation.
ii. Clarity is required on how low carbon technologies like CCS can participate in the capacity market in the longer-term when they are commercially available (and not receiving other form of support e.g. CfDs).

iii. A capacity mechanism that is not attached to any emissions performance criteria in line with the EPS will incentivise dirty plant to run for longer, increasing the electricity sector's carbon footprint.

23.It is also critical that gas CCS can be demonstrated and becomes commercially available in the late 2020's so that the longer-term future for gas, to 2050, is assured. CCS is in the demonstration phase of technology development. This phase focuses on demonstrating the technology, reducing costs, mitigating risk and liabilities, and improving public acceptance. The reality is that there are not enough CCS projects to meet the goals outlined by associations such as the G8, International Energy Agency (IEA), and the EU. As a result, there needs to be a renewed sense of urgency from industry and governments to unlock the benefits of demonstration. For CCS to achieve commercial viability by 2030, governments need to take the following actions;

i. Reinforce commitments to CCS and strengthen policy support measures;
ii. Reduce the investment burden by co-funding demonstration projects;
iii. Establish investment security through a robust CO_2 price; and,
iv. Encourage collaboration and ensure public understanding and acceptance.
v. Knowledge sharing to effectively build global capability.

24. More specifically the UK needs to create long-term certainty on the policy and funding for the CCS programme and allow flexibility in the CfD structure so that it works for demonstration and commercialisation of CCS projects, given the increased level of capital support required for demonstration purposes.

25.Strengthening the CO_2 price will help gas generation become more economic as its load factors will increase relative to coal, as well as supporting low-carbon technology options such as renewables, CCS and nuclear. The carbon price floor will go some way in addressing this problem, but there are also drawbacks of the UK acting unilaterally, such as negative consequences on competitiveness and carbon leakage.

26.A better way of achieving the same objective would be for the UK to work with its EU counterparts to strengthen the EU ETS. We support a baseline correction to the EU ETS through withholding allowances from the auctions in Phase III (2013-2020), along with an auction reserve price in Phase IV (post-2020), and a greenhouse gas emissions reduction target into the 2020s. We need to simplify what we have and restore the EU ETS back to its role as the primary driver to reduce emissions in Europe. Only then will low-carbon technologies be able to compete on a level-playing field.

27.On the wider gas supply chain, the UK has diversified infrastructure and supply sources to cope with extreme events – demonstrated through past experience such as Winter 2009/10. The market has also successfully delivered the required infrastructure. We do not therefore foresee

circumstances where the UK market will not be able to provide the necessary infrastructure going forward.

28.Actions that could be taken that would further enhance the UK's gas supply resilience are:

- Support further domestic production by maintaining regulatory and fiscal certainty.
- To benefit from any potential shale gas resources the UK needs to ensure that it has a robust but practical regime in place. We therefore welcome the UK Government's approach of seeking independent advice on the impacts of shale gas, such as the latest report on seismicity. To win the public debate it is important to demonstrate that the UK regulation is robust and can allow shale gas operations to continue in a safe manner. It is also important that Government work with industry to find practical and measured solutions to the perceived risks.
- To improve access to gas supplies from Europe, including Continental gas storage as well as LNG and pipeline gas originally sourced outside Europe, the UK should continue to champion for a more competitive single European gas market, underpinned by improved EU interconnectivity. In particular, ongoing efforts to remove physical bottlenecks, increase bi-directional flow capabilities, harmonise cross-border regulations and reduce contractual congestion deserve high priority, as these will strongly contribute to an unfettered international flow of gas when and where it is most needed.

Q6. Given a continuing role for gas and the potential for increased volatility in gas demand, to what extent is gas supply and related infrastructure a barrier to investment in gas fired generation? What impact will unconventional gas have on the case for investing in gas generation and the supporting infrastructure?

29.The developments in shale/tight gas have had a significant impact on global energy markets. The International Energy Agency has calculated that there are now 250 years worth of supply at current consumption rates, with indicative production costs at or below today's market prices ($2-$9 MMbtu). About half of this supply is shale/tight gas and coal bed methane. Though the impact of this increase in supply on gas prices is uncertain, and volatility may well persist, the magnitude of the global gas resource base should offer consumers of gas comfort in the long-term availability of gas.

30.Of course in Europe and the UK, the exploration of shale gas is still in its early stage; no commercial production is taking place at present and a significant period will be required for development. So far only around 20 shale gas wells have been drilled in Europe since 2007. In contrast some 35,000 shale gas wells have been drilled in N. America in the same period. As well as the geological uncertainty a key issue to consider when exploring for shale gas in Europe is public acceptance and the regulatory framework.

31.Shale/tight gas will play an increasingly important role in the growth of global gas supplies, but the location and timing of the development of these resources is still uncertain. As well as

shale/tight gas however there has been significant growth recently in the LNG trade. We estimate that the number of exporting and importing countries will double over the next decade. This brings more diversity and security.

32. So the case for investing in gas generation is robust no matter what the local developments on shale gas. As discussed above, the cost advantage of building CCGTs and gas CCS over some other low-carbon technologies is also large enough for gas generation technologies to be one of the preferred solutions under a wide range of gas price scenarios.

33.Given the level of current gas supply infrastructure in the UK and the flexibility it provides we do not see that the gas supply chain will pose any issues for the further development of gas generation in the UK.