GE Submission to DECC call for evidence on the role of gas in the electricity market

28 June 2012

Executive Summary:

1**. Role of Gas**: Gas is a significant contributor to UK energy security and competitiveness. As part of a "fast blue" scenario, GE sees a move towards more gas and renewables as part of a global trend. Gas can be widely sourced and brings immediate reductions in carbon emissions, enables renewable energy sources and will contribute to a low carbon economy.

2. **Existing and New Build**: As the medium term outlook for gas is expected to be more favourable than the current spark spread, it is important that plant can respond to meet a rise in demand. The gas strategy should consider the different treatment of existing and new build. A longer-term price signal will be needed to ensure adequate returns for investing in new high efficiency CCGT needed to provide both flexible and baseload capacity. Meanwhile a liquid, competitive wholesale market is also fundamental to promoting efficiency improvements in existing plant.

3. **Proposals for a UK Capacity Market**: Based on current proposals it is unlikely that a capacity market will sufficiently reward both peaking plant and flexible generation. The former is only likely to drive short-term investments which risk undermining the UK's low carbon objectives. To reward flexible generation a capacity market should recognise 'capability' such as low emissions and fast-starts (not just capacity).

4. **Oil & Gas Production**. From just a handful of employees a decade ago, GE Oil & Gas is a major UK investor with the hub of our European Services business based in Aberdeen to support North Sea customers. Essential to maintaining and attracting further investment is a stable fiscal regime to ensure the sector remains a global leader and to drive the innovation required to extend the life of the UK continental shelf.

About GE

- GE serves the energy sector by providing technology and service solutions that are based on a commitment to quality and innovation. The businesses that comprise GE Energy—GE Power & Water, GE Energy Management and GE Oil & Gas—work together with more than 90,000 global employees and 2011 revenues of $43 billion, to provide integrated product and service solutions in all areas of the energy industry.
- Given our broad UK portfolio GE currently plays a vital role in supplying power generation technologies and wider system management solutions that help meet 18% of UK electricity needs.
- GE Oil & Gas is a world leader in advanced technology equipment and services for all segments of the oil and gas industry, from drilling and production, LNG, pipelines and storage to industrial power generation, refining and petrochemicals. We are a major investor in the UK's Oil & Gas supply chain with a Global Subsea Centre of Excellence based in Aberdeen and a number of strategic sites located across the UK where we employ up to 1600 staff.

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- GE Energy is part of General Electric, a global infrastructure, finance and media company. GE is proud of its presence in the UK since the 1930s. and employs over 18,000 people having invested over £14bn since 2000.

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Consultation issues addressed in this response:

1. Role of Gas & GE's fast-blue scenario
2. Investment fundamentals for new and existing CCGT
3. Role of gas supply and key enablers
4. Production
5. Supply Chain Support

GE response

- **What are the main strengths and weaknesses of gas in helping to meet UK targets**
- **Role of gas in future and desired level of gas generation capacity?**

1. Role of Gas & GE's fast-blue scenario

Gas is, and has the potential to be, a significant contributor to UK energy security and competitiveness providing as much as 60% of the UK's energy supply to 2020. Technology innovation will remain key to sustaining UKCS production, and has enabled UK companies to be successful in the global Oil & Gas industry. However, the right support and investment climate is needed based on fiscal and investor certainty to support technology development, job creation and exports.

Meanwhile UK power generation faces unprecedented challenges to enable the UK to meet its carbon emissions and renewables targets. GE sees a move towards more gas and renewables as part of global trend and a long term solution to achieving a low carbon economy. As part of a scenario we term "Fast Blue", gas brings immediate reductions in carbon emissions, enables renewable energy sources and will contribute to a low carbon economy.

It is the cleanest hydrocarbon fuel and is a secure and reliable energy source, essential to delivering the EU's climate and energy goal.

<u>i. The need for flexible generation</u>

Natural gas provides an ideal balancing resource as it is easy to store and can respond swiftly to load and demand changes. Increasing the deployment of intermittent wind and inflexible nuclear capacity will require a significant volume of flexible generation that delivers responsive fast-starts and low emissions.

Significant generation investment is needed to ensure the UK can meet future peak demand and flexibility requirements, despite relatively low forecast demand growth in the short-term. According to DECC forecasts, significant amounts of intermittent wind capacity is forecast to be connected to the system by 2020, with the closure of around 40% of current plant expected to occur over the same period to comply with environmental legislation. At the same time the need for flexible plant will actually increase owing to the hour-to-hour changes in demand net of wind output.

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ii. Reducing Emissions

Gas offers the potential for reducing the carbon emissions and increasing efficiency associated with electricity generation by replacing decommissioned coal power plants with new combined cycle gas turbine (CCGT) generation.

A recent study commissioned by GE Energy (Driving a Resource Efficiency Power Generation Sector in Europe) calculated that the EU27 could achieve significant cut in emissions relative to 1990 levels by converting all coal and oil fired power generation to best performance combined cycle gas turbines. It also illustrated that power plant optimisation and other measures to improve the efficiency of existing CCGT power plants could have a significant effect.

Coal power plants emit around twice as much CO2 as gas-fired CCGT. Standard assumptions are that gas plant emits around 202kg/CO2 per MWh of fuel consumed compared to a coal plant that emits 340.2 kg per MWh of fuel consumed. Meanwhile new CCGT plants are also more efficient than coal plants, therefore reducing overall fuel use. The typical net efficiency of a new gas CCGT is ~60%, while a coal plant may have a typical net efficiency of around 45% or less. Based on these assumptions this roughly equates to 419kg additional CO2 emitted for coal over gas for each MWh of electricity produced.

- **Key factors driving economics of investment and how are these factors likely to change?**
- **Barriers to investment, key regulatory uncertainties, debt and equity investors**
- **Policy issues that need to be addressed beyond proposals for the capacity mechanism and the EPS?**

2. New Build

The use of gas power generation provides investment options with capital costs the lowest per MW installed this leads to the lowest lock-in investments. A build-out of natural gas fired power before 2030 could transition into a backup role for renewable post 2030; this would be much more economic than building dedicated backup for renewable capacity after 2030.

In the nearer term, security of supply will be at risk unless there are market mechanisms which incentivise investment by recognising the critical importance of flexibility in maintaining security of supply in real time. This is best done by ensuring there are adequate returns for investment in flexible capacity that can run baseload to ensure the most efficient investment prevail. Neither of these is provided by the current energy-only market arrangements.

“Capability Markets”: to support low carbon and security of supply

By simply rewarding peaking generation, DECC's preferred approach to a capacity mechanism, the capacity market, does not on its own provide new CCGT plant with the sufficient signals that will be needed in the next 5 years to deliver security of supply services. The proposal could threaten security of supply by disincentivising new investment, when such plant may well present the most efficient and environmental investment option to provide flexibility generation.

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"Capability" could be rewarded via a hurdle or minimum performance standard for any party to bid into the Capacity Market. This would be administered via a tiered approach, the "rate" of capacity payment made could be a function of "grid support attributes per MW" as listed below:

- Ramp rates: potential for a generating station, when connected to the grid, to increase or decrease its output in MW as a function of time (e.g. MW/minute). Higher ramp rates provide greater support to the TSO.
- Start times: amount of time it takes for a generating station to reach full load from a request to start from the TSO.
- Minimum Stable Generation: The percentage to which a generating plant can reduce output from its nominal capacity, while still complying with emissions standards and grid codes.
- Efficiency: It is important to consider the thermal efficiency of the generation station when evaluating capacity mechanism and the associated impact on carbon emissions.

3. Existing CCGT

Gas can help improve energy efficiency in existing power generation. Efficiency improvements are designed to counteract the efficiency drop over plant lifetime. In more recent plants, implementation of some of these measures may lead to a net efficiency gain, while in older plant these measures will bring efficiency closer to that of modern plants.

There are three major areas where efficiency gains can be made in CCGT: upgrading technology and implementing efficiency measures; more accurately monitoring plant performance and altering the overall dispatch patterns to optimise plant efficiency

GE is working with a major utility in the UK to reduce emissions, improve efficiency and extend the life of its power station in Cambridgeshire. The project, the first of its kind in the UK, employs gas-combustion technology that enables a reduction in nitrogen oxide (NOx) emissions by 40 percent. And, it allows the plant to be operated at reduced power during off-peak periods resulting in reduced fuel consumption and lower operating costs.

Supply-side efficiency is relatively easy to implement but goes unrewarded when there are no adequate returns for making all flexible capacity available to the market. A liquid, competitive wholesale market is fundamental to promoting efficient investment. Inadequate levels of liquidity continue to have a detrimental effect on the development of efficient market price signals, which diminishes investor confidence. This has the potential to jeopardise supply-side efficiency improvements.

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4. Role of gas supply and price volatility as a barrier to investment: steps to a Fast Blue future

GE agrees that over reliance on one source of generation will not allow the UK to meet its energy challenges; however security of supply/price risks have been over-played from reliance on imported gas.

Whilst the impact of a similar shale gas revolution like the one in the USA may not be directly transferable to the UK or Europe, gas is certainly going to be an advantaged fuel because unconventional (shale) gas is changing the dynamics

Gas is a therefore secure generation fuel when supplied from multiple sources. Key measures include:

- It is important for the UK to leverage the growing diversification of gas supplies. Whilst domestic gas supply will continue to decline, other countries can offset this. For example, Norwegian gas projects will raise annual supplies over the next few years and there is potential for more growth beyond this. The UK can expand interregional pipelines, if necessary, to absorb newly available northwest European supply options.
- Although, Coal Bed Methane (CBM) development and other unconventional gas supplies are in their infancy we believe they will fill a valuable niche in the supply base. Natural gas can also be converted to a liquid form, for example Liquefied Natural Gas (LNG), to help with transport or storage, or to fuel transport. Assuming continued success in US shale gas and development of new south east Asia here is growing potential for a surplus of LNG supply and the UK is uniquely positioned to benefit. Atlantic basin LNG supply available to meet UK requirements will likely increase.
- The UK is short of gas storage capacity relative to the size of the market and seasonality of demand. Furthermore, increased reliance on imported supplies supports storage expansion. Storage will improve gas reliability and help moderate price volatility.

5. Oil & Gas Production

GE Oil & Gas is a world leader in advanced technology equipment and services for all segments of the oil and gas industry, from drilling and production, LNG, pipelines and storage to industrial power generation, refining and petrochemicals.

From just a handful of employees a decade ago, GE Oil & Gas is a major UK investor with around 1,600 people employees with the hub of our European Services business based in Aberdeen to support North Sea customers. Our presence consists of a world-class subsea tree assembly and test site, a new £3 million investment controls servicing facility and also a Downhole Technology platform which includes our Drilling Measurements product line.

Essential to maintaining and attracting further investment in UKCS Oil & Gas production is a stable fiscal regime. This will in turn encourage the technology innovation necessary to extend the life of maturing fields in the UKCS. The resulting new technology will support the continued competitiveness of the UK Oil & Gas supply sector around the world by creating jobs and exports.

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The experience gained in the UKCS now means the sector is regarded as a global leader in areas such as subsea engineering and able to meet the increasing demand in provinces around the world. GE's Subsea Centre of Excellence develops the skills and expertise in the kind of production optimization technology which is needed in the UK but also supports the export market for oil and gas goods and services.

6. Supply Chain and R&D funding

As the medium term outlook for gas is expected to be more favourable than the current spark spread, it is important the supply chain can respond to meet a rise in demand - particularly if existing plant are closed prematurely. CCGT technologies will be crucial not just as a 'transition fuel' if existing plant are closed prematurely and prior to new low carbon investment being made but also as a flexible generation fuel. As such the Strategy could consider ways to support CCGT supply chain investments and R&D with a focus on technology development needed to deliver fast starts, low emissions and higher efficiency that will support future flexible generation characteristics.

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