nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

Gas Generation Call for Evidence
Area 4E
3 Whitehall Place
London
SW1A 2AW

Manager

Direct tel:

www.nationalgrid.com

28th June 2012

Dear Sir/Madam

DECC Consultation: A Call for Evidence on the Role of Gas in the Electricity Market

National Grid welcomes the opportunity to comment on the Department of Energy and Climate Change's call for evidence of the role of gas in the electricity market. National Grid plays a vital role at the centre of the energy industry connecting millions of people safely, reliably and efficiently to the energy they use. National Grid owns and operates the high voltage electricity transmission system in England and Wales and as National Electricity Transmission System Operator (SO) operates the Scottish high voltage transmission system. National Grid also owns and operates the gas transmission system throughout Great Britain and through the low pressure gas distribution business, distributes gas in the heart of England to approximately eleven million offices, schools and homes. In addition, National Grid owns and operates significant electricity and gas assets in the US, operating in the states of New England and New York.

In the UK, National Grid's primary duties under the Electricity and Gas Acts are to develop and maintain efficient networks and also to facilitate competition in the generation and supply of electricity and the supply of gas. Activities include the residual balancing in close to real time of the electricity and gas markets. Through its subsidiaries, National Grid also owns and maintains around 18 million domestic and commercial meters, a Liquefied Natural Gas (LNG) importation terminal at the Isle of Grain, and has shared ownership and operation of the electricity interconnectors between England and France (IFA) and England and the Netherlands (BritNed). In addition, the wholly owned subsidiary, National Grid Carbon Limited, has advanced the transportation and storage elements of the Carbon Capture and Storage (CCS) supply chain.

National Grid agrees that gas provides a reliable and flexible source of electricity generation and is a vital part of the UK's current and future energy mix. In addition to the responses given to the specific questions in the consultation (as outlined in Appendix 1), there is a need to consider gas generation in the context of other areas of policy and regulatory debate to ensure that a holistic approach is taken, in particular:

- Electricity Market Reform
- Heat
- Security of Gas Supply
- Electricity / Gas Interaction
- Flexibility of Gas Network
- Incentives

Electricity Market Reform

The Electricity Market Reform (EMR) aims to incentivise low carbon generation whilst ensuring security of supply. Incentivising low carbon generation will help the UK achieve its CO_2 emissions targets in 2020 and onto 2050. Large scale penetration of variable low carbon generation can only be realistically achieved if it can be accommodated in system balancing. Over the course of this decade, the primary system balancing tool is widely recognised to be the use of firm back up capacity. Over the longer term, electricity interconnection, electricity storage, and electricity demand side response will increasingly contribute to system balancing but firm back up capacity will remain part of the balancing "toolkit". Given that currently gas generation is the quickest in construction time (3 to 4 years typically from the start of construction to commercial operation), in establishing supply chains, in connection to gas and electricity grids and has the lowest capital cost per MW of new firm capacity, it is likely that gas generation will have a role.

The EMR Capacity Mechanism should incentivise the construction of firm generation capacity and electricity storage or facilitate demand reduction, thus ensuring that plant margins are sufficient to meet periods of very high demand. Given EMR's pivotal role in maintaining a sufficient plant margin[1], it is important to give the market confidence by avoiding either delay to the delivery timetable for EMR or major unexpected changes to the mechanism between now and its delivery.

Heat

Given the unique position of gas being a major contributor to two energy sectors, heating and electricity generation, it is essential that strategies for gas in both these sectors are aligned. Any strategy for the decarbonisation of heat is likely to result in an increase in electric heating, either through heat pumps or resistance heating and will therefore have the effect of reducing volumes on the gas distribution system, while increasing load on the electricity system. The recent *Future of Heating: A strategic framework for low carbon heat in the UK*[2] consultation set out a framework for decarbonising heat, by removing gas from the domestic heat sector entirely.

Where Combined Cycle Gas Turbines (CCGTs) form a significant part of the electricity mix, the volumes on the gas transmission system would shift from more distribution off-takes to fewer larger single off-take points, as gas demand moves from the domestic sector to the power generation sector. As the majority of gas plants are directly connected to the gas transmission system, any heat strategy (and the degree of electrification) should consider the commercial, regulatory, financial and practical implications of this and assess the implications for customers, the networks and supply chain.

In addition, the electric heat load which will have to be met by the marginal generation, which in this decade will generally be gas or coal fired, may therefore be less efficient (and have greater CO_2 emissions) than the gas boilers that have been replaced. The timing of heat electrification is therefore important, as the greatest gains with regards to reducing CO_2 emissions can be made when the emissions from the power generation sector have been significantly reduced.

Improving heat energy efficiency is a critical aspect of any heat strategy. Insulation will reduce the level of heating demand, and therefore the physical quantity that needs to be decarbonised through electrification. A focus on energy efficiency to reduce heat and electricity demand could therefore also reduce the gas-fired plant capacity required for security of supply purposes, thus removing some of the potential for 'locked-in' CO_2 emissions over the lifetime of these plants.

---

1 Definition of Plant Margin: the amount of available generation capacity (expressed as a percentage) in excess of the peak level of electricity demand.

2 http://www.decc.gov.uk/en/content/cms/meeting_energy/heat_strategy/heat_strategy.aspx

Given the seasonal and variable nature of heat demand, a hybrid gas / electric heating approach may be prudent, allowing decarbonised electricity to meet heat demand on the majority of days, with gas heating providing a "top up" on the coldest days. As illustrated in Appendix 2, this approach could avoid the need for significant additional electrical generation / transmission / distribution capacity to be built to meet heating demand on a relatively small number of days.

Security of Gas Supply (molecules)

Between now and 2015 around 10 GW[3] of coal and oil plant will close due to the Large Combustion Plant Directive. The subsequent implementation of the Industrial Emission Directive in 2016 (for existing combustion plant greater than 50MW in generation capacity), combined with rising carbon prices and ageing plant, is likely to see the closure of more coal plants by 2023. If gas plants are to replace a proportion of this closing generation capacity, the gas network infrastructure needs to be robust in order to support these new plants and the associated increase in dynamic operation likely to be required of them in order to accommodate variable (or intermittent) low carbon generation.

Increased reliance on gas for power generation (especially the role to provide back-up for intermittent generation) could create security of supply issues that span from on the day, through to seasonal and longer term needs:

On the day

- Gas transmission network dynamic operability to manage all supply and demand permutations.
- Competition of supply, notably with the Continent. For example Norwegian gas can flow to both the UK or to the Continent, however due to the contractual position, in the event of a supply disruption the UK tends to be disproportionally affected. Also the increased liberalisation of the UK market compared to the Continental markets means that the Continent can always access UK gas and electricity (albeit at a price) whilst the reverse at time of 'market distress' is not necessarily fully reciprocated.
- Availability of storage, notably from flexible supplies that could have been depleted within winter.

Seasonal

- Competition of supply including lack of supply contracts. Many of these are not necessarily physical gas hence there is always the risk that the 'market' may not always provide.
- Competition with other markets, notably LNG supplies that may have been contracted pre-winter to alternative markets. For example, last winter when Japan secured more LNG at the expense of UK and other Continental markets.
- Availability of storage, compared to the Continent. The UK currently has only one large seasonal storage facility that can provide about 10% of the UK's needs on a cold day, and less when assessed across the winter. Most other European countries not only have a higher level of storage but conditions in place to ensure that the depletion of storage is 'managed' rather than being fully available to the market.

Long term

- Competition of supply including limited long term supply contracts.
- Location. The UK is remote in terms of provision of supply from, for example Russia (Europe's biggest supplier) or LNG imports. Consequently the UK is more at risk to international events that could disrupt energy supplies than most other nations (for example constraints on shipping in the Strait of Hormuz). This is exacerbated by the UK's lower storage capacity.
- Availability of storage. Currently due to market prices, there is little or no incentive to develop large storage facilities in the UK.

---

[3] This figure excludes any capacity reductions that have already taken place and any coal capacity that has already converted to biomass.

Maintaining a diverse generation mix, in conjunction with greater electricity interconnection, storage and demand side response, would allow switching at times of high gas demand, as happens currently between coal and gas generation, reducing the impact of a security of gas supply issue.

The closure of existing coal stations will reduce the UK's energy storage capacity as stock piles of coal are depleted. Consideration must therefore be given to managing the UK's energy storage capability, be it as fuel (e.g. gas storage, biomass, nuclear, and coal with carbon capture and storage), or through increased electricity storage. The introduction of the European Gas Security of Supply Regulation means that in an EU Gas emergency, Member States must a) ensure that no measures are taken to restrict the flow of gas to affected markets b) make sure that no measures are taken that are likely to endanger the gas supply in another member state c) ensure that cross border infrastructure is maintained as far as is technically and safely possible. This means that it cannot be assumed that gas in UK storage will be available for use in UK power stations but implies that gas in EU storage should potentially be available to the UK gas market.

Electricity / Gas Interaction

Gas power stations have historically provided much of the within day flexibility required to balance power generation with consumer demand. In the future this role will increase due to the closure of existing coal stations and the increased use of gas stations to provide generation back-up for intermittent electricity generation. Therefore there will be an even closer coupling or interface between the electricity and gas markets with the dynamics of the electricity network feeding directly through to the gas network. Whilst the instantaneous needs of the electricity network will not be fully replicated for the gas network, the operation of the gas network will have to accommodate far greater rates of change than has been observed historically.

The consequences for gas are therefore considerable, for example gas supplies will need to be more responsive and the gas network will also need to be more dynamic and flexible to accommodate the variation in supplies. The increased requirements on gas to be more responsive / dynamic have numerous associated risks. Notably the impact of loss of gas supply, this is particularly acute now through the increased reliance of imports at relatively few locations i.e. supply diversity has been replaced with increased supply concentration.

Flexibility of Gas Network

The exact nature of future gas demand and supply behaviour is still uncertain but under most scenarios the gas network is required to be very flexible. Gas is supplied via a global market that determines where the gas flows. By having diversified sources of gas supply the uncertainty can be managed through flexible supply options e.g. storage or LNG.

Given this uncertainty and in response to stakeholder feedback, National Grid Gas Transmission's RIIO-T1[4] submission includes an uncertainty mechanism to facilitate the provision of increased network flexibility if a need case is agreed with stakeholders. Whilst this diversity is of great benefit to security of supply, it requires the gas network to be flexible enough to accommodate very different supply and demand flow patterns and will increasingly be required to respond very rapidly as those patterns change. In itself, the gas network has energy storage capability which, if it can be accessed in a timely way, could be a relatively low cost means of managing these rapid changes in gas or electricity demand.

---

4 http://www.talkingnetworkstx.com/gastransmissionplan/default.aspx

Incentives

Maintaining a diverse generation mix is essential for security of supply; diversity allows any issues in the fuel supply chain to be mitigated by switching generation type and will assist in providing flexibility in how the system is operated (given the different functional characteristics between various generation power stations). Excessively increasing the proportion of gas generation will reduce the opportunities to fuel switch and lead to gas generally setting the electricity price. In order to maintain a diverse generation mix it is essential that all generation types are correctly incentivised. EMR has incentives for low carbon generation through the Feed in Tariffs and the carbon price floor. If gas generation is over incentivised, either through the Capacity Mechanism or other policies, there is a possibility that low carbon generation would not be built, risking the UK not meeting its CO_2 emissions targets, or resulting in feed in tariff rates that are set artificially high and distort the market. Equally if gas generation is under incentivised there maybe security of supply issues.

Consideration should also be given to the Emissions Performance Standard (EPS) element of EMR to ensure that generation fitted with Carbon Capture and Storage (CCS) and other forms of low carbon generation are not disincentivised by allowing unabated gas plants to be built.

Summary

Uncertainty in the UK electricity market makes it appropriate to consider all forms of electricity generation in order that the CO_2 emissions targets are met and security of supply is maintained. This is best achieved through a diverse generation mix and support of low carbon generation. The precise path that will be taken is unknown but gas generation is likely to have a role providing backup for intermittent low carbon generation, security of supply or as part of the general electricity mix. Given EMR's pivotal role, it is important to give the market confidence by avoiding either delay to the delivery timetable for EMR or major unexpected changes between now and its delivery. It is also important to consider any impacts arising from a strategy to electrify heat and to consider gas security of supply.

Yours faithfully

By e-mail

Richard Smith
Future Transmission Networks Manager

Appendix 1: Addressing the Department of Energy and Climate Change's Specific Questions

Our detailed responses to the specific questions raised in the call for evidence paper are as follows:

a) 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?

Facilitating a low carbon future is a crucial part of National Grid's RIIO business plans. Any decarbonisation path to 2050 has to be balanced with the need for a safe, affordable, reliable and secure supply of electricity.

The following points relating to gas generation should be considered in the context of decarbonisation and security of supply:

1. Capital costs for the construction of gas plant are currently the lowest cost per MW, when compared to other forms of new capacity[5]. Construction times are also quicker than for other forms of new firm capacity. Supply chains are in place and the end-to-end delivery of gas plant is established. The infrastructure, transmission and distribution networks, for supplying gas exists and is currently sufficiently flexible to meet existing user requirements, however will need modest enhancements to meet future needs of existing connections to the transmission network. If new gas plants are required in order to maintain security of supply, their construction and connection to the gas network could be one of the least expensive and quickest ways to achieve firm capacity. However any gas transmission network reinforcement to support this capacity requiring a Development Consent Order will be subject to timescales required by the Planning Act (2008).

2. Gas plants can operate as baseload generation or more flexibly, either two-shifting[6] or as purpose built Open Cycle Gas Turbines (OCGT) that can be on load within 20 minutes of being instructed. The increasing penetration of variable renewable generation, most notably wind, is likely to lead to conventional generation being required to operate in a more flexible way than it has historically. Given the potential for more flexible running of gas plants it is essential that the gas network is sufficiently incentivised in order to enable this flexibility. Flexible generation would contribute to security of supply at times of varying generation and potentially allow greater penetration of variable generation by providing reliable backup to support it.

3. The Large Combustion Plant Directive (LCPD) will see the closure of ~6.5 GW of coal generation and ~3.4 GW of oil generation by end of 2015[7]. The Industrial Emissions Directive (IED) from 2016 will result in the closure of more coal plant in the period 2016 – 2023. Replacing a portion of this with new gas generation will:

    a. Decarbonise electricity generation in the medium term as higher carbon content generation, from coal and oil, is replaced with lower carbon content generation from gas alongside deployment of renewables. However, without other forms of flexible low carbon generation the carbon intensity of electricity generation may not continue to fall in the longer term. It is essential that other forms of flexible low carbon generation (e.g. coal or gas with carbon capture & storage (CCS), nuclear or biomass) are sufficiently incentivised to allow a realistic transition to meet 2050 targets.

---

5 http://www.decc.gov.uk/assets/decc/11/about-us/economics-social-research/2127-electricity-generation-cost-model-2011.pdf
This excludes re-planting or biomass conversions.

6 The process of shutting-down a power plant during periods of low system demand (such as overnight) and re-starting it when demand increases.

7 This excludes any capacity reductions that have already taken place and any coal capacity that has already converted to biomass.

b. Reduce the diversity of generation on the system as the percentage of gas generation capacity on the system will increase. A high proportion of gas on the system will potentially lead to high demand for gas at times of peak electricity demand and low variable generation (e.g. on a cold winter's day with little wind). In order to supply large volumes of gas, the gas network needs to be sufficiently flexible and gas molecules readily available through multiple sources – UK Continental Shelf, pipeline to Europe, LNG and Storage. Increasing generation diversity will aid gas security of supply when demand is high, as there is a global market for gas and the molecules flow where the market dictates. Gas generators have to compete in this market for their fuel supply.

If there is a requirement for new capacity in order to maintain security of supply in the medium term (post LCPD closures in 2015) gas generation will probably supply most of this capacity in the current decade, given the points set out previously and also that the main low-carbon, non-renewable alternatives are nuclear and coal with CCS, which are unlikely to be available until 2020 at the earliest.

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

National Grid's 2011 UK Future Energy Scenarios[8] document describes plausible future generation mixes to 2030 in a number of scenarios. The Gone Green scenario is constructed in a way that the UK meets its renewable and CO_2 emissions targets in a balanced approach while maintaining security of supply. Fossil fuel plants such as gas plants can play an important supporting role along side nuclear and renewable generation, interconnection, demand side response and storage in meeting UK targets.

In order to meet the 2050 greenhouse gas reduction targets, it is likely that the majority of gas generation will need to be fitted with CCS equipment. However there may be some unabated flexible gas plants running at low load factors to provide back up to variable generation within a broad, balanced generation mix.

From a security of supply perspective, currently the least expensive available options to maintain adequate plant margins are to keep existing plants open (e.g. gas), followed by bringing back mothballed / "preserved" gas plants, followed by the building of new gas plants. This implies that gas plants are likely to have a role in maintaining security of supply in the future, for example by filling in any supply gaps left by variable generation and by delays in building other forms of low carbon generation.

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

The economics of investing in new gas generation are driven by the clean spark spread. A major change to the electricity market is the increased uncertainty seen in terms of fuel price volatility and the economic difficulties in both the UK and the Euro Zone. The latter has the effect of reducing electricity demand and dampening the EU ETS carbon price, which combined with lower coal prices, has the effect of making the clean dark spread more economical than the clean spark spread.

The volatility of gas prices is driven by many factors. The gas market is a global market and the market determines where the gas flows. The global market creates both demand and supply

8 http://www.nationalgrid.com/NR/rdonlyres/86C815F5-0EAD-46B5-A580-A0A516562B3E/50819/10312_1_NG_Futureenergyscenarios_WEB1.pdf

pressures as well as increasing demand and supply interruptions. It is unlikely that this volatile market can be easily addressed, so it is crucial that other uncertainties are addressed where possible. For example, as discussed earlier, it is also important to consider the impact of any heat strategy on the costs borne by gas generators.

Increasing the capacity of variable generation is likely to reduce the load factors of new gas generation, reducing its income over the lifetime of the plant. Given the long time required in order to see a return on investments, any uncertainty can make investments more difficult to justify as there is a higher chance of not sufficiently recovering costs.

The uncertainty in terms of reduced load factors can be addressed through the EMR's capacity mechanism. There is still uncertainty around how the mechanism will operate, how new and existing plant will be treated under the mechanism and when the mechanism will begin, including whether plants currently under construction or with consent will be considered new or existing plant. It is therefore important that the EMR delivery timetable is met to provide the necessary investor certainty and that there are no unexpected changes.

The uncertainty in terms of the EU ETS carbon price can also be addressed through the EMR, via the carbon price floor. This will produce longer term certainty over the price of carbon in the UK although the volatility of the EU ETS will still be a factor (the carbon price floor is a support to the EU ETS and is determined two years in advance from forward prices of carbon). The UK's carbon price will become detached from the rest of the EU potentially leading to carbon leakage from the UK to Europe. It should be noted that the carbon floor price set to be implemented in 2013 is currently double the EU ETS price, which could put UK fossil fuel plants at a disadvantage when compared with plant in the rest of Europe.

d) 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?

National Grid does not build generation in the UK and so has no direct evidence as to barriers faced by investors. However the following points obtained from discussions with stakeholders could be considered.

The main barrier that investors face when looking to build new gas generation in the UK is uncertainty in the market. EMR can help to reduce some of the uncertainty in the market, for example via the Capacity Mechanism reducing the risk to returns of the reduced load factor that new gas plants are likely to experience due to increased intermittent renewable generation being built.

Gas generation is also subject to UK legal regulation and EU directives. There is uncertainty as to future regulations affecting a gas plant built today. If a European directive replaces the IED after its compliance period from 2016 to 2023, its effects need to be understood sufficiently in advance in order to reduce the potential uncertainties relating to limited running hours or emissions ceilings for example. Also the UK Emissions Performance Standard (EPS) will tighten emissions standards over time, with grandfathering of standards until 2045. Providing details of how the standard will change over time and how the grandfathering will be applied will help to reduce the regulatory uncertainty.

The recent DECC Heat Strategy[9] maps out strategies to decarbonise the UK's heating including the electrification of heat via heat pumps. A consequence of this could be reduced demand for

[9] http://www.decc.gov.uk/en/content/cms/meeting_energy/heat_strategy/heat_strategy.aspx

gas through the gas distribution network. Further analysis on the commercial, regulatory, financial and practical implications of reduced demand for gas is required to assess the implications for customers, the networks and supply chain.

The most efficient gas plants are cooled by fresh water sources and cooling towers. Future pressure on water supplies, due to increased demand and the effects of climate change, could result in the provision of fresh water to cool power stations being seen as a low priority. Whilst gas plant can use closed cooling systems, these are less efficient and hence have greater emissions.

The majority of investors that are likely to invest in new gas plant in the UK are multinational companies with diverse portfolios in many counties. In order to attract investment for new gas plants in the UK they have to show these plants offer returns comparable to or better than alternative projects in other countries.

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

It is essential that all policies and strategies that relate to the electricity market are holistic in their approach. If polices and strategies are seen to be competing with each other or have contradictory messages this will only add to the uncertainty in the UK electricity market and reduce the creditability of the UK as a place to invest in the electricity market and supporting infrastructure.

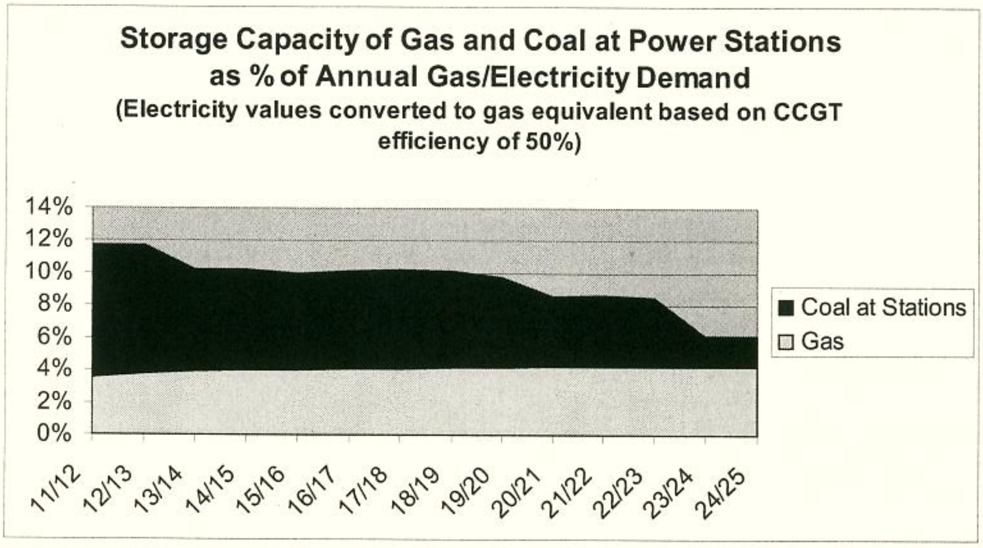
Once a policy or strategy has been decided it is essential that a realistic timetable is set out and that this timetable is met. This will create certainty and allow investment decisions to be taken in a transparent way. This applies to the parts of the EMR that have been decided, in particular the carbon price floor. The price floor is important in incentivising low carbon generation in order for the UK to hit its' CO_2 emissions targets.

Once a decision has been made to invest in gas generation the planning process needs to be able to make decisions on gas generation in a balanced, transparent and timely manner. This includes being able to manage the planning process for the generation plant, connection to the electricity grid and connection to the gas network in a holistic way.

Given the increased likelihood for high gas demand at times when there is high electricity demand and low generation from variable sources e.g. on a cold winter's day with little wind, there maybe a need for market intervention to incentivise additional gas storage. It is also advisable to ensure that forms of low carbon generation that can store their own fuels (e.g. biomass, nuclear and coal CCS) are not disincentivised.

The chart in Figure 1 shows over time the level of UK energy storage in gas equivalent terms provided by coal plants and gas storage facilities. It illustrates how the level of UK energy storage will decline as coal stocks reduce due to the closure of LCPD opted-out coal plants.

Figure 1: Gas Equivalent Storage Over Time



f) **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 supporting infrastructure?**

The recent investment in new gas generation implies that when the relevant investment decisions were taken, gas supply and related infrastructure were not significant barriers to investment in gas generation.

The exact nature of future gas demand and supply behaviour is still uncertain but under most scenarios the gas network is required to be very flexible in terms of both supply and demand. For supply, an increasing proportion of gas will be supplied via a global market that determines where the gas flows. By having diversified sources of gas supply, the uncertainty can be managed through flexible supply options e.g. storage or LNG. For gas demand, the gas network will need to be more dynamic and have the ability to respond to the increasing connectivity between electricity and gas markets brought about by the closure of existing coal stations and the increased use of gas stations to provide generation back-up for intermittent renewable generation

On the demand side, the location of new gas plants may be affected by a requirement to fit, or retro-fit, CCS equipment. The likely location of CO_2 storage in depleted North Sea gas fields could result in gas power plants being built closer to the east coast of the UK in order to reduce CO_2 transportation costs. If this happens, the gas network will need to be flexible enough to accommodate increasing flows towards the East. Alternatively gas plants may locate close to LNG terminals, e.g. Milford Haven in the West of the UK, or Grain in the South East. The Carbon Capture Ready test will also be a key determining factor and should be tightened to avoid large scale CCGT deployment with little likelihood of retro-fitting CCS. Regardless of location, the future operating pattern of both new and existing gas plant is still very uncertain but as noted above, will likely be more intermittent than seen today in response to increasing penetration of wind generation.

Taken together these development lead to increased uncertainty of flows on both supply and demand sides; the gas network will need to be flexible enough to accommodate very different supply and demand flow patterns and will increasingly be required to respond very rapidly as those patterns change.

Given this uncertainty and in response to stakeholder feedback, National Grid Gas Transmission's RIIO-T1[10] submission includes an uncertainty mechanism to facilitate the provision of increased network flexibility if a need case is agreed with stakeholders. The March 2012 business plan[11] also includes some minor investment to meet existing 1 in 20 demand obligations in the face of declining UKCS supplies and changing user behaviour in the South West of England, along with some "seedcorn" expenditure to keep future network investment options open whilst we work with stakeholders to better understand future requirements form the network.

Note that if a large amount of gas generation capacity is built on the East coast in addition to the large quantity of offshore wind farms planned in this area there could be a significant impact on investment in the electricity transmission system.

National Grid considers unconventional gas from sources outside the UK as contributing to existing gas supply sources. For example, exported US shale gas would be treated as LNG importation. Note that there is considerable uncertainty as to the level of future US gas exports that will be driven by shale gas development.

Within the UK, the main types of unconventional gas to consider are coal bed methane (CBM), shale gas and bio-methane. Bio-methane is likely to be injected directly into the gas distribution network; this will have the effect of displacing gas from the transmission system and marginally increasing the available capacity in the transmission system, where the majority of gas plants are connected. CBM and shale gas could be injected into the gas transmission system and would be considered part of the gas market; as such the market would determine where the gas flows.

Note that there is considerable uncertainty over the economically recoverable volumes of shale gas available in the UK - until this is known the full impact of shale gas cannot be determined. In the short term at least, it seems unlikely that unconventional gas will be delivered at scale in the UK. However, any future increases in unconventional gas could increase the diversity of UK gas supply and make investment in gas plants more likely.

10 http://www.talkingnetworkstx.com/gastransmissionplan/default.aspx

11 http://www.talkingnetworkstx.com/our-business-plans.aspx

Appendix 2: Typical Heating Demand Load Duration Curve

While daily electricity demand is relatively flat across the year, daily heat demand is highly seasonal (as shown in Figure 2 below). Here it can be seen that heating capacity required to provide approximately the first 50% of the maximum demand (the vertical axis) will provide 80% of the annual load (the first 8 horizontal slices). Capacity required to provide the remaining 50% of the maximum demand will only be used to provide 20% of the annual heat load (the top two horizontal slices). Electrifying all this heat could require building power stations and networks that are under utilised and could cost more than a hybrid gas / electric heating solution.

Figure 2: Heating Demand Load Duration Curve