
NEW GAS GENERATION STRATEGY

DELIVERING A SECURE
AND AFFORDABLE ROUTE
TO A LOW CARBON
ECONOMY

Response to the
Government's Call for
Evidence

DELIVERING A SECURE AND AFFORDABLE ROUTE TO A LOW CARBON ECONOMY

Arguments in support of an increase in conventional gas-fired generation and UK gas storage

Who are we?

Stag Energy (Stag) is a British company established in 2002. With a team led by George Grant, Chairman, the company draws on a depth of experience and has created and delivered over 10,000 MW of power generation and related infrastructure projects, raising over £6bn in commercial debt financing.

In the UK, Stag is currently leading two major developments:

- **Watt Power** – an independent power generation company established in association with the Singapore listed Noble Group (Noble Group turnover in 2011 \$56bn). The company is a new entrant to the UK electricity sector focused on the potential development of flexible gas-fired generation plant to support security of supply and system stability in the transition to a low carbon economy. Facilities will be located throughout the UK with a target capacity of 1,500-2,000 MW.
- **Gateway Storage** - an independent gas storage development in the East Irish Sea with Petrofac as its Technical Operator. The facility has the potential to deliver up to 3bcm of capacity and is the largest storage project being developed by an independent. Gateway was the first storage project in the UK to secure a gas storage license from the Department of Energy and Climate Change (DECC).

As a potential new entrant in the UK energy market, Stag is well-placed to advise the Government on what measures are required to stimulate new investment in the gas to power chain to ensure the security of electricity supply at an affordable cost.

What is the scope of our submission?

This submission (a) summarises our key arguments and (b) addresses the questions raised in the DECC Call for Evidence.

We have included a statistical appendix which contains evidential support in the form of charts and tables.

Finally, we have attached a summary political briefing paper outlining our suggested amendments to the current draft Energy Bill relating to gas-fired generation and storage.

What are our main arguments?

- The Government forecasts a doubling of electricity consumption to 2050 as demand switches from oil and gas to electricity in the transport and heating sectors.
- The Government wants this demand to be met from low carbon sources but seriously underestimates the cost and time required to switch away from fossil fuels. Significant uncertainty surrounds new nuclear, Carbon Capture and Storage (CCS) and the timing of off-shore wind.

- Consequently there is a serious risk to security of supply during what will be a 25-30 year transition to a low carbon energy economy.
- The cost to the economy of a disruption to gas and electricity supplies would be significant:
 - ✓ DECC estimate that an unscheduled disruption to 10% of our gas supplies would cost the economy £300m per day¹.
 - ✓ DECC also estimate the opportunity cost to consumers of losing one MWh of electricity is £10,000². If there was an unscheduled disruption to 10% of our electricity supplies for one day, it would cost the economy £900m. (2010 GB electricity consumption totaled 328,318 GWh – DUKES 5.2)

In summary, the negative economic impact of voltage reductions, “black outs” and/or interruptions to gas supplies would be both large and unpredictable.
- The Government has recognised that conventional gas-fired generation has a critical role to play in meeting current demand and supporting intermittent wind generation but has so far failed to acknowledge the scale of the potential problem and that new investment in the gas to power chain requires stable and predictable revenues.
- We estimate at least 15GW of new flexible conventional generation is required by 2025 to maintain a safe generation capacity margin of between 15-20%.
- New investment in gas-fired generation compares favourably with existing gas and coal plant in terms of its lower carbon emissions, reliability, flexibility and overall cost to consumers.
- Gas with CCS could have a role to play in the long term. But the technology is not yet proven and more importantly there is significant uncertainty surrounding commercial funding and whether CCS can provide the flexibility of response required by renewable energy.
- The decision to grandfather the Emissions Performance Standard (EPS) level of 450g/kWh for CCGT through to 2045 provides some investor comfort but it is not enough to secure new investment.
- Vertical integration, the absence of long term supply contracts and the prospect of new plant operating at low variable loads indicates the clear need for a capacity support mechanism which facilitates new long term investment. A suitably structured capacity mechanism will unlock new sources of equity and debt financing.
- Security of electricity and gas supplies are inextricably linked. Government cannot simply assume that there are adequate supplies of gas and that generators will be able to access the gas they need at an affordable price.
- The market for gas will tighten and with rapidly declining UK production and an over-dependency on short term imports the UK supply chain is vulnerable. Added to this, volatility in demand due primarily to fluctuations in wind generation will increase significantly.
- Gas-fired generators will require access to more reliable and flexible UK gas storage facilities if peak variations in electricity demand are to be met without exposing consumers to unacceptable price spikes. This view is supported by the Energy and Climate Change (ECC) Select Committee.

¹ DECC Energy Markets Outlook – Paragraph 2.2 Dec 2008

² DECC EMR Impact Assessment – July 2011

- There is currently an absence of long term price signals in the gas market to support new investment in UK gas storage and as a result some form of support is required. The most market efficient option is a Public Service Obligation (PSO) on gas suppliers. This view is supported by energy intensive users.
- To support essential and cost-effective gas-fired generation, the Government needs to acknowledge the link between electricity and gas security of supply and take urgent action to provide the right signals for financiers to proceed with new investment in gas-fired generation and storage. These signals should be included within the current draft Energy Bill.

What are our responses?

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

Strengths:

- proven and reliable generation technology
- lowest capital cost of any generation technology (Chart A)
- plentiful global gas supplies (Reference IEA: World Outlook Report 2012)
- flexibility of response to short term variations in demand
- relatively low level of carbon emissions viz coal and oil (Chart A)

Weaknesses:

- vulnerable fuel supply as domestic gas production declines
- potential short term price volatility
- high relative carbon emissions viz nuclear and wind
- lack of stable and predictable incentives for new investment

The Government has accepted that conventional gas-fired generation has a critical role to play “in the short and medium term as a reliable and flexible source to meet core demands now and balance demands in the future”. But in the Energy Bill, the crucial issues of security of supply and affordability appear to be made subservient to the low carbon goal.

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

- Conventional gas generation should be seen as a vital long term component in the fuel mix providing support for low carbon technologies.
- For the next 10-20 years, gas has a key role to play in providing security of supply to offset the negative impact of (a) closures of existing coal plant due to emissions and cost impact of the proposed new carbon tax (b) the early closure of older gas plant which is uneconomic to operate on a flexible basis (c) the likely delay in new nuclear and potential delays in offshore wind (d) significant increases in the number of periods over the year when demand exceeds available supply due to intermittent wind generation and the possible non-availability of nuclear (i.e. technical or maintenance issues)
- The more nuclear and wind in the system the more gas will need to play a support role to meet demand.

- Even taking into account the extension of the life of existing nuclear plant, we estimate that to maintain a safe capacity margin of 15-20%, there is a need for new investment in conventional gas capacity of between 12GW and 15GW over the next decade (Chart B). Further new investment may be required depending on the rate of closure of existing coal plant and delays in the construction of new nuclear and off-shore wind.
- Gas with CCS is forecast to play a material role in achieving the 2050 CO₂ target, particularly as coal would require the capture of twice the level of carbon. However, the technology is not proven and more importantly, it is not yet clear whether gas with CCS would be able to provide flexible support on a cost-effective basis.

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

- Historically, gas-fired generation has responded to price movements with gas being more economic to run when coal is more expensive taking into account plant efficiency and carbon costs. At the moment the spark spread favours coal over gas.
- However, even assuming that short term spark spreads will move in favour of gas, it would not incentivise new investment in gas-fired generation. There are a number of fundamental factors inhibiting new long term investment:
 - ✓ the absence of a stable and predictable long term price curve for electricity. Over the years, vertical integration has undermined both the efficiency and liquidity of the wholesale market. Measures being proposed by Ofgem to improve short term market liquidity will not result in adequate long term price incentives.
 - ✓ the absence of long term PPAs which means that generators have no security of demand. The unpredictability of long term prices means that suppliers are unwilling to take on the credit risk associated with contracting power long term.
 - ✓ the transition to a low carbon economy will take coal out of the system. In this situation gas will set the marginal price of electricity and the scope for making a margin on energy sales will be severely reduced. In addition, there is the strong likelihood that gas plants in the future will be operating at less than full capacity for long periods of time. This prospect increases the revenue risk associated with new investment.
- Our conclusion is that the above deterrents to new investment in gas-fired generation will only get worse as the Government's low carbon strategy evolves. Action is needed to support investment in gas-fired generation in the same way that renewable investment is being encouraged. Regulatory uncertainty is currently the main factor inhibiting new investment.

Q4 What barriers do investors face in building new gas generation plants? What are the key regulatory uncertainties that may prevent debt and equity investors making a final investment decision in gas generation and supply infrastructure?

- In this section we focus on what we consider to be the essential pre-conditions
- required to unlock investment in new conventional gas-fired generation (the related issue of investment in new UK gas storage is dealt with below).

- The decision to grandfather the EPS level of 450g/kWh for CCGT plant through to 2045 is a positive step which will remove some investor uncertainty but it is not enough alone to stimulate the level of new investment required.
- The key to unlocking new investment is a capacity mechanism which is technology specific (ie facilitates the construction of flexible and operationally efficient plant) and allows payments made on prices bid rather than a lower average clearing price (i.e. rewards existing plant at the expense of new more efficient plant)
- We have spoken with a number of financial investors and the consensus is that the new capacity mechanism needs to provide a long term incentive to cover fixed capex and opex costs. In the words of Simon Wilde, Head of Power and Utilities at Macquarie Capital:

“There is no appetite amongst equity or debt providers to fund long term infrastructure projects where returns are volatile and unpredictable. To attract new entrants into the market the proposed capacity payment contracts need to be long enough – 15 to 20 years – to reduce both the cost of capital and keep capacity payments low. For lenders and equity investors payments need to be large enough to cover fixed costs. In the absence of long term supply contracts, variable load factors and gas prices setting the marginal cost of electricity, there will be few if any opportunities for operators to use electricity revenues to cover fixed costs. However if the conditions on term and cover I refer to are met then there would be a significant number of institutional investors and banks prepared to invest in the UK generation market”

- There are **FOUR** guiding principles that we would like to see included in the draft Energy Bill which would give new entrants (a) the confidence to proceed with their developments and (b) allow DECC time to work out the details so that the first auction can proceed as planned in Q3/4 of 2014.
 1. Encourage new entrants to provide reliable, flexible and affordable new gas generation. This would enhance competition and increase market liquidity
 2. Exclude projects supported by FiTs and other mechanisms including ROCs
 3. Evaluate bids on the basis of price, reliability, flexibility and overall affordability (including carbon emissions)
 4. Bids to be accepted against prices bid as opposed to some form of average clearing price
- Affordability to the consumer is a critical factor. In this context the capacity mechanism needs to take account of both the cost of the capacity payments and the operational running cost of the plant as well as its CO₂ emissions. We have analysed the different operational running costs of existing and new plant (Chart C) which indicates that (a) more expensive but more flexible gas plant has lower operating costs which more than offsets the capacity bid price and (b) with a single clearing price there would be the risk that less efficient plant with higher CO₂ emissions could be rewarded and new, cleaner more efficient plant could be penalised.

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

- The key issue is timing. It takes up to three years to secure planning permission for new gas plant and another three years to build. Given the relatively short time scale up to the planned first capacity auction, we as new entrants are concerned that DECC is not proposing to finalise its recommendations on the capacity mechanism until Q2 2013.
- We believe that the policy making process should be accelerated to ensure that certain guiding principles(see above) are included in the Energy Bill this year. In the absence of regulatory clarity, investment in new gas-fired generation will be extremely challenging with the consequent risk to the future security of supply.
- In addition to taking action to underpin new investment in gas-fired generation, there is an equally urgent need for the Government to take action to define the required security of gas supply and introduce measures to ensure new investment takes place in UK gas storage capacity. (see below)

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?

- A cursory analysis of global gas supply and demand might suggest that supplies are plentiful, but there are various sources of supply and optional destinations under any given price scenario. With the rapid decline in indigenous production and growing import dependency, there is a serious risk that at times of peak demand, gas consumers in the UK (in particular generators) may not have access to the gas they need at an affordable price.
- Economic recession combined with the rapid exploitation of unconventional gas in the USA has cushioned global gas prices. But by 2015 the market is expected to tighten again and the situation in the UK could well be aggravated by some fundamental deficiencies in the operation of the wholesale market:
 - ✓ the lack of an efficient forward market where buyers can hedge contracts
 - ✓ dependency on 3-4 gas importers who may choose to store or sell gas outside the UK
 - ✓ reliance on LNG imports with few long term contracts to underpin supply
 - ✓ very low level of UK based flexible storage relative to the size of UK demand
- The planned expansion in wind generation will prompt a significant increase in the peak demand for gas even if, with electrification, the overall demand for gas continues to fall. National Grid estimates that daily variations in wind generation could exceed 100mcm/d compared with daily average of 153mcm/d. With such variations there is a serious risk of supply disruption and increased price volatility.

- There is a need for more UK based flexible gas storage. This proposal is supported by the ECC Select Committee. We estimate that an additional 5bcm of new gas storage is required. (Chart D) sufficient to cover 30 days of average Winter demand (in accordance with EU gas security regulation 994/2010).
- Storage projects are highly capital intensive and require confidence in consistent and positive long term revenues to secure private sector financing. Current seasonal price differentials are not sufficient to attract long term investment and are unlikely to recover in the near term to support long term funding (Chart E). Furthermore, the issue is not just managing seasonal variations in demand but ensuring that peak demand fluctuations caused by variations in wind generation can be met without undue price spikes. At this stage the scale and frequency of these variations are difficult to forecast but they are essential to ensure UK security of power and gas supply.
- To help unlock new storage investment, we support the introduction of a PSO framework which would apply to all suppliers and shippers where they would have a defined storage obligation based on their current portfolio of consumers. This would underpin long term demand for UK storage and would provide the most cost effective solution to work with the grain of the market in providing necessary system resilience. (Chart F)
- The PSO approach is supported by energy intensive industrial users. According to Dr Laura Cohen, Chief Executive of the British Ceramics Federation and a member of the Energy Intensive Users Group:

“More UK gas storage together with the requirement to use it via a PSO is likely to provide the highest supply security and hence the lowest price volatility since gas is held where it can be called upon, and holding a larger volume provides a larger contingency. Furthermore supplier PSOs are already the market norm in many European countries. We accept that this will result in an increased cost for all consumers and we need to understand the implications here more fully on annual bills including costs for paying for the storage assets and contents - but it is likely to be better than some other alternatives”

- The likely impact of shale gas on the UK market is difficult to predict. Shale gas developments in the UK and Europe may well be limited for cost or environmental reasons. Furthermore, while the availability of shale gas could reduce overall gas prices, this does not provide flexible gas supplies and will therefore not alleviate the need for more gas storage to ensure that peak demands are met without undue price volatility.

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Chart D – Required Level of Additional UK Gas Storage

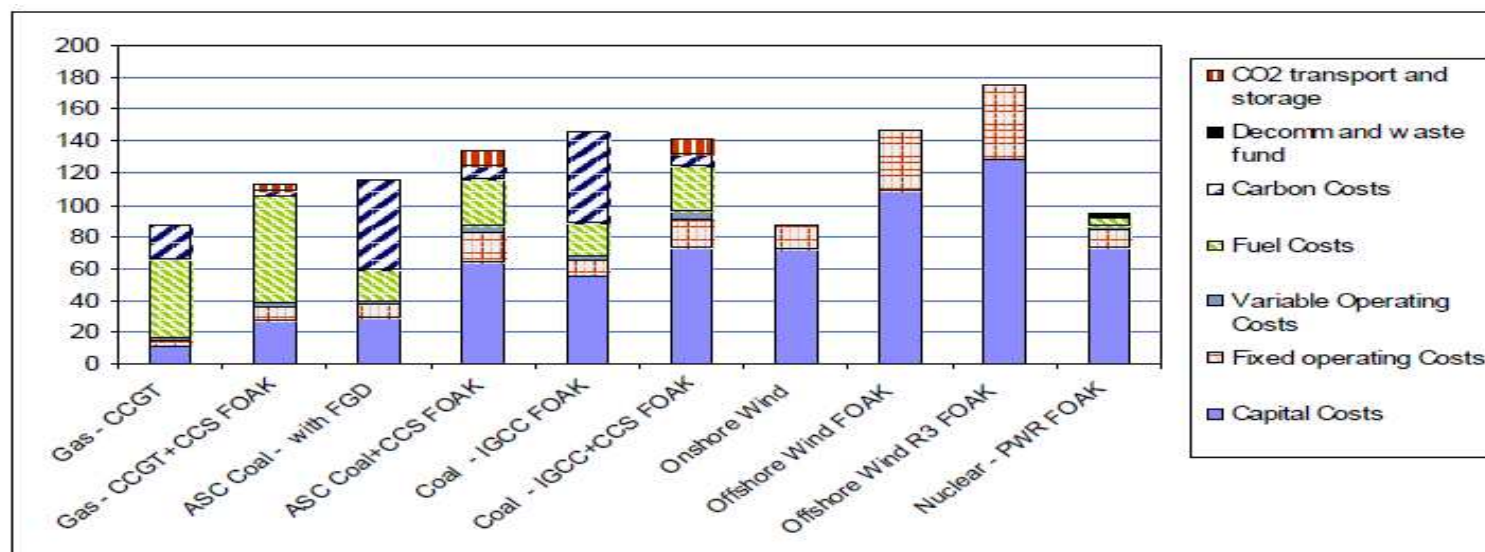
Chart E – Absence of Investment Signals for UK Gas Storage

Chart F – Relative Costs of Energy Security for UK Consumers

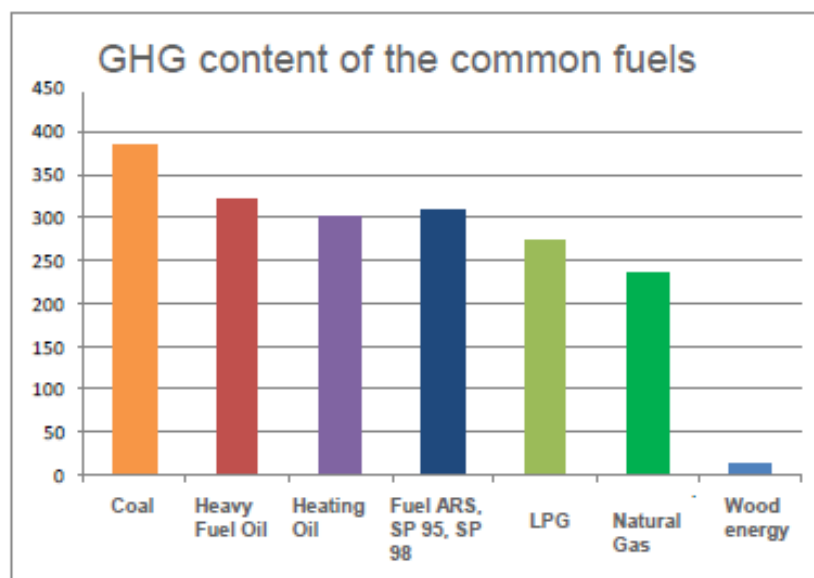
Policy Appendix

“What’s Missing from the Energy Bill?”

Chart A. Capital Costs by Technology and Related CO2 Emissions



Source: Mott MacDonald



GHG contents are assessed in an analysis of a full life cycle to take into account emissions of the energy use but also the emissions due to the supply chains and the energy chains (production, transport, distribution up to consumers...)

Gas is by far the cleanest fossil fuel without waiting for CCS

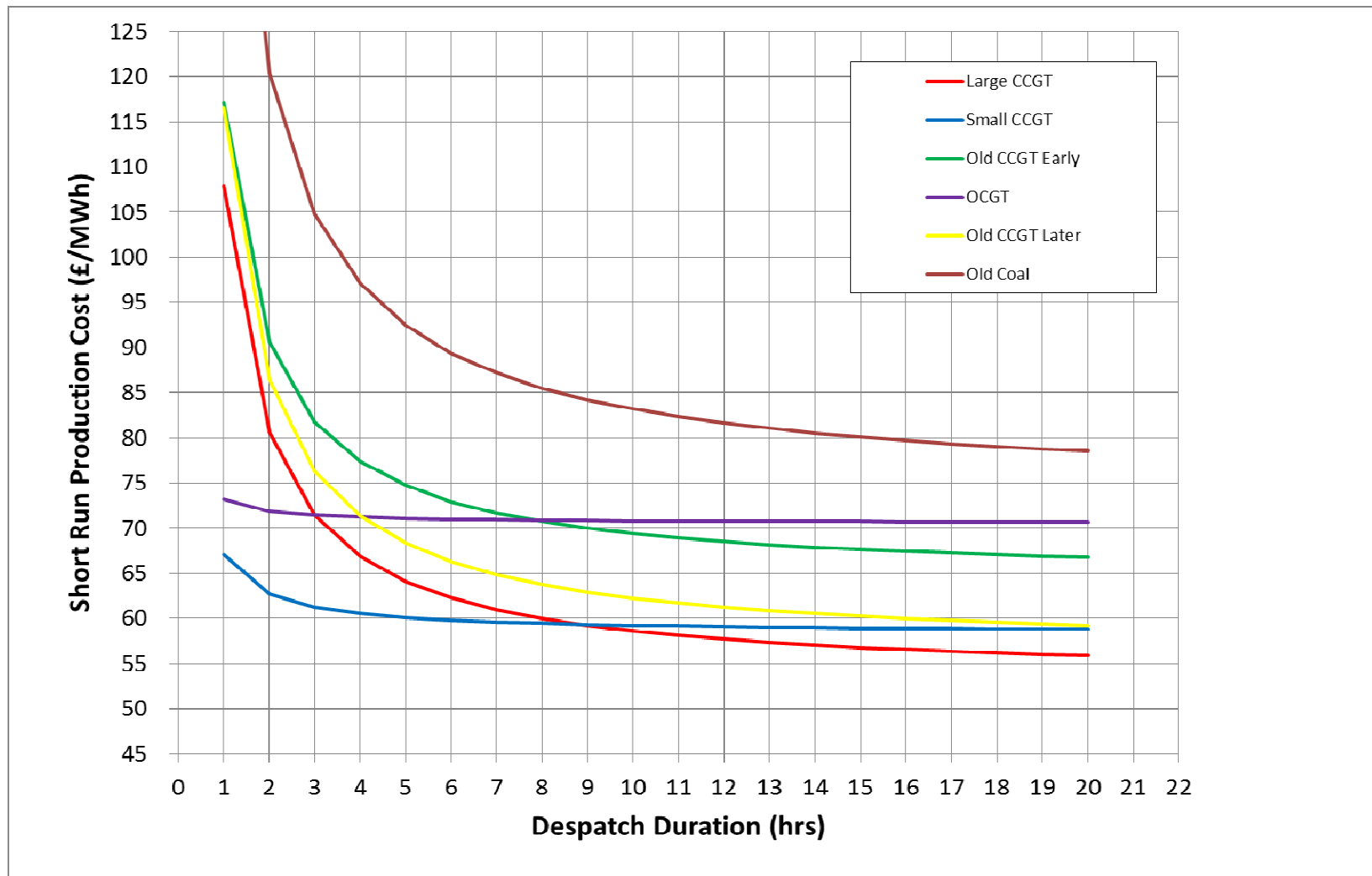
Source: ADEME

Chart B. Required Additional Gas Generation Capacity

- ◆ In order to maintain a 15% and 20% capacity margin by 2025, we anticipate the requirement for new gas build will be 12GW and 15GW respectively
- ◆ Key assumptions behind this are as follows:

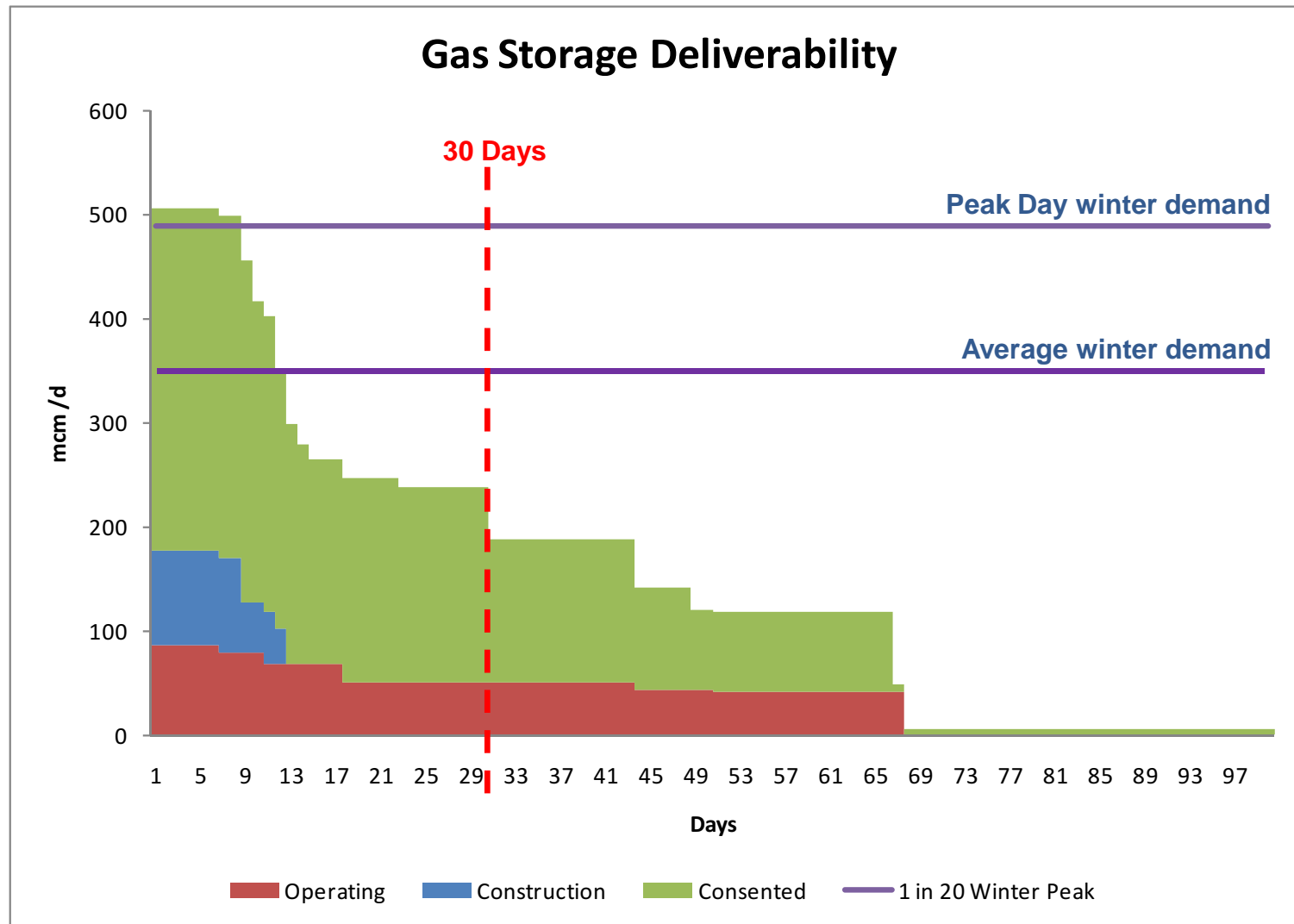
Driver	Assumption
Demand	NG Base Case (Gone Green)
LCPD	12 GW of opt-out plant close end of 2015
IED	17 GW of coal and gas plant close by end of 2023
Nuclear Closures	<ul style="list-style-type: none">- Oldbury and Wylfa close 2012- All other existing nuclear plant gain 7 year life extensions- Hinkley Point B and Hunterston close 2022,- Dungeness B closes 2025- All others close post 2025
Availability	As NG Winter Outlook, other than: <ul style="list-style-type: none">- 75% for Nuclear- 0% for Interconnector

Chart C. Plant Operational Efficiencies and Affordability



Source: Moffatt Associates

Chart D. Required Level of Additional UK Gas Storage

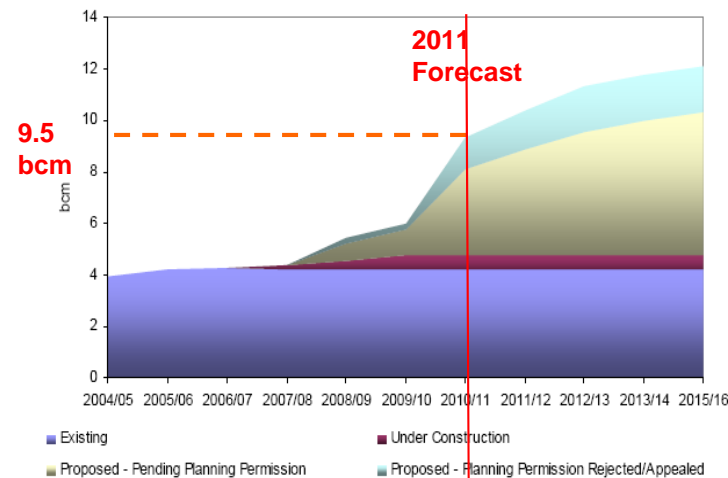


Source: Stag Energy

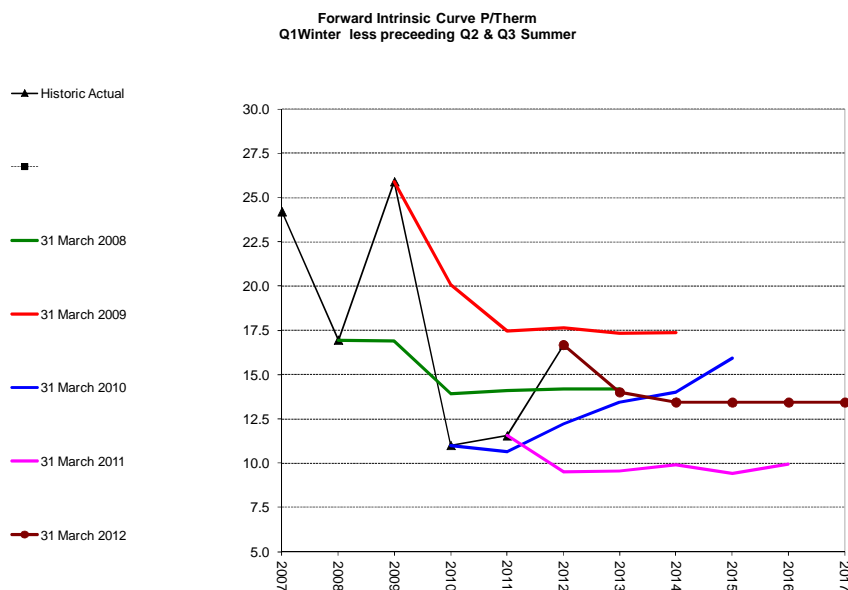
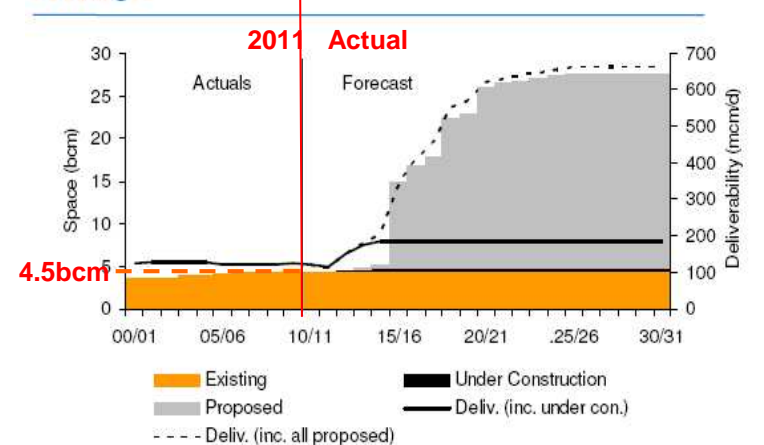
Chart E. Absence of Investment Signals for UK Gas Storage

- The market is not providing price signals to support investment, and forward price curves have no materiality(depth) further out than 2 years
- Credit capacity constrains long term contract commitments

NGG Storage Summary - 2006



NGG Storage Summary - 2011



Source: Stag Energy

Chart F. Relative Costs of Energy Security for UK Consumers

- A simplistic assumption of capital costs amortised over 30yrs, provides a relative indication of the level of cost associated purely with anticipated capital investment over the next 10-12 years:
 - Electricity Generation £6.26bn
 - National Grid £1.31bn
 - Gas Storage £0.13bn
- If it is also assumed that costs will be met 50/50 be industrial/commercial and domestic consumers. On the basis that there are 20 million domestic households, a simple indication of the capital cost burden per household may be calculated:
 - Electricity Generation £156/yr
 - National Grid £ 33/yr
 - Gas Storage £ 3/yr
- It is clear that some of the investment assumptions are in question (eg timing and magnitude of new nuclear generation) and that the importance of gas in covering any shortfalls or intermittency.
- The relative cost to consumers of dramatically increasing the level of gas security implies that it should almost be without question.

2012 – 2022	Investment £bn	Amortised Cost over 30yrs (£bn/yr)	Amortised Cost/ household (£/yr)**
Generation *			
Renewables	8.13	0.27	6.78
Wind	85.83	2.86	71.53
Coal	12.00	0.40	10.00
CCGT	11.94	0.40	9.95
Nuclear	69.96	2.33	58.30
Generation	=====	=====	=====
Total	187.87	6.26	156.56
National Grid			
Transmission	19.60	0.65	16.33
Electricity	14.00	0.47	11.67
Gas	5.60	0.19	4.67
National Grid	=====	=====	=====
Total	39.20	1.31	32.67
Gas Storage	4.00	0.13	3.33

* Capital Cost estimates from Mott MacDonald "UK Electricity Generation Cost Report commissioned by DECC

** Amortised cost per household assumes 50% of cost met by domestic consumers and 20 million homes

Source: Stag Energy

WHAT'S MISSING FROM THE ENERGY BILL?

The need for Government to support competitive new investment in gas generation and storage to ensure security of energy supply and a cost-effective transition to a low carbon economy.

What new investment is required?

The transition to an energy economy based on nuclear and wind will take many years. In the meantime, the Government has accepted that “gas has a critical role to play in the short and medium term as a flexible and reliable resource to meet core demands now and balance demands in the future”. But it cannot be simply assumed that gas will be there when it is needed.

Even taking into account the life extension of existing nuclear plant, we estimate that in order to maintain a normal safety capacity margin of 15% and 20% by 2025, an investment in new gas fired generation of between 12GW and 15GW is needed. This new investment will not happen without a capacity support mechanism to provide stable, long term incentives.

In addition, gas generators will need access to reliable and flexible supplies of gas if volatile changes in power demand caused by increasing reliance on intermittent wind are to be met without exposing consumers to unacceptable price spikes.

According to the ECC Select Committee, the answer to this latter problem is “for the UK to significantly increase its gas storage capacity by an additional 5bcm”. Our view and that of industry is that a Public Service Obligation (PSO) on gas suppliers is the most cost effective method of encouraging new investment. This will provide the trigger to unlock new storage investment.

What is needed in the Energy Bill? .

In our view, the current draft Energy Bill needs to be amended to:

- ***embrace the issue of energy security and the need to underpin the gas to power chain.***
- ***encourage new entrants, investment and competition in the generation market***
- ***avoid a bias in the capacity market for supporting existing, less efficient and clean generation***
- ***ensure the capacity market can support new, flexible and efficient investment in gas generation***
- ***include a target for the desired level of generation margin and UK based gas storage capacity***
- ***include a commitment to the introduction of PSO mechanism to support storage investment.***

In addition, there is an urgent need to integrate and accelerate a number of separate but related DECC policy initiatives to speed up the policy-making process. These include the analysis of measures to support long term gas security, the consultation on gas generation strategy and the on-going work on capacity market design.

Why the sense of urgency?

Gas generation and storage are large, complex projects. There is no appetite in the financial community for investment in long term infrastructure projects with unpredictable and volatile returns. There is therefore an urgent need for clear regulatory principles and incentives to be established as soon as possible to allow investors to proceed with confidence. With a suitable regulatory framework, investment and job creation will flow into the economy 10-15 years before the inevitable costs of increased security of supply lead to higher energy prices.