# THE INFRASTRUCTURE PLANNING
## (APPLICATIONS: PRESCRIBED FORMS AND PROCEDURE) REGULATIONS 2009

**Preesall Underground Gas Storage Facility, Lancashire**

**Preesall Need Case**

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</table>
| Author:        | CNG Services  
               | John Baldwin (Managing Director)  
               | Virginia House  
               | 56 Warwick Road  
               | Olton  
               | Solihull  
               | B92 7HX |
|                | Tel: +44 (0)121 707 8581  
               | Email: john.baldwin@cngservices.co.uk |
| Date:          | November 2011 |
| Version Number:| 1 |
Document prepared by CNG Services Ltd

Author: John Baldwin

Document checked and approved for issue

Name: John Baldwin  Date: 11th November 2011

Document History

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Issue</th>
<th>Date Modified</th>
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<tr>
<td>Issue 1</td>
<td></td>
<td>11th November 2011</td>
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</tbody>
</table>

Documents Issued to:

Halite Energy Group Limited
### Contents

1 **Summary** ...................................................................................................................... 1  
1.1 Introduction .................................................................................................................. 1  
1.2 UK Energy Policy ......................................................................................................... 1  
1.3 UK Energy Security ....................................................................................................... 1  
1.4 Gas Storage Alternatives ........................................................................................... 2  
1.5 Preesall Locational Benefits ....................................................................................... 2  
1.6 Conclusions .................................................................................................................. 3  

2 **Need for Gas Storage** .................................................................................................. 4  
2.1 UK Government Energy Policy .................................................................................... 4  
2.1.1 UK Needs More Gas Infrastructure ....................................................................... 4  
2.1.2 Encouragement of Low Carbon Energy ................................................................ 4  
2.1.3 Electricity Market Reform ....................................................................................... 7  
2.1.4 Tighter supplier obligations to encourage gas storage ....................................... 7  
2.1.5 UK Energy Supply: Security or Independence? ..................................................... 7  
2.2 Why is Gas Storage Needed? ....................................................................................... 8  
2.2.1 Declining UK gas supplies ..................................................................................... 8  
2.2.2 Seasonality and daily variation in gas demand ...................................................... 9  
2.2.3 Balancing gas supply and demand ...................................................................... 10  
2.2.4 Annual gas supply/demand balance .................................................................... 10  
2.2.5 Peak gas supply/demand balance ........................................................................ 15  
2.2.6 The role of gas storage as a complement to renewable energy production .......... 21  
2.2.7 Gas market efficiency ............................................................................................. 24  
2.3 UK Gas Storage and Energy Security ......................................................................... 26  
2.3.1 National Grid Ten Year Statement – UK Gas Storage Development .................. 26  
2.3.2 Gas storage capability relative to consumption – UK compared to Europe ....... 28  
2.3.3 Implications of the 3rd EU Energy Directive ....................................................... 29  
2.3.4 UK treaty obligations with respect to Ireland and Belgium .................................. 29  
2.3.5 UK Need for Local Storage ................................................................................... 30  
2.3.6 Long term case for more storage in the UK ......................................................... 30
3 Gas Storage Options and Viable Alternatives ........................................... 33

3.1 Gas provision in winter ........................................................................... 33

3.2 Alternatives for winter gas provision ....................................................... 33

3.2.1 Water aquifers storage ......................................................................... 33

3.2.2 Salt cavity storage ............................................................................... 33

3.2.3 Depleted oil/gas field storage ............................................................... 34

3.2.4 LNG storage ....................................................................................... 34

3.3 Within-Day Flexibility ............................................................................. 37

3.4 Alternatives for provision of within-day gas flexibility ......................... 37

3.4.1 Investment in other gas storage facilities ............................................ 37

3.4.2 Investment in additional onshore pipeline capacity with surplus linepack 38

3.4.3 Reduction in wind generation with more base-load gas fired generation 38

3.5 Conclusions ............................................................................................ 38

4 Specific Need for Preesall Storage ............................................................ 40

4.1 Suitable Storage Sites ............................................................................. 40

4.2 Offshore Storage Costs ........................................................................... 40

4.3 Locational Benefits .................................................................................. 40

4.4 Economic and Environmental Benefits of Shallow Salt ....................... 42

4.5 Comparison with alternative sources of within-day flexibility ............... 44

4.6 Other benefits ......................................................................................... 44

Appendix A - National Energy Policy ............................................................ 45

A1 Introduction ............................................................................................... 45

A2 UK energy policy on security of supply and the role of gas storage .......... 45

A3 Ofgem ....................................................................................................... 51

A4 Interpretation of National Energy Policy ............................................... 53

A5 Strategic Storage and the EU 3rd Directive ........................................... 53

A6 Conclusions ............................................................................................... 54
# Table of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inland Consumption of Primary Fuels and Equivalents for Energy Use 1970-2008</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Consumption of Town Gas and Natural Gas 1970 to 2008</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Historic and Forecast UKCS Production (source: National Grid)</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Annual Gas Demand Forecast Base Case (source: National Grid)</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Annual Gas Demand Sensitivities Range</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>National Grid Base Case Annual Match (Slow Progression)</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>National Grid Forecast for Annual Demand</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>National Grid Range of Demands</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>'Maximum Supply'</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
<td>Relationship Between 'Maximum Supply' and Import Dependence since 2000</td>
<td>19</td>
</tr>
<tr>
<td>11</td>
<td>Peak Supply Deliverability Compared to Peak Day Demand (Slow Progression)</td>
<td>19</td>
</tr>
<tr>
<td>12</td>
<td>Peak Supply Deliverability Compared to Peak Day Demand (Gone Green)</td>
<td>20</td>
</tr>
<tr>
<td>13</td>
<td>Actual and Projected Power Generation Gas Demand</td>
<td>22</td>
</tr>
<tr>
<td>14</td>
<td>Storage Levels in Each EU Member State</td>
<td>28</td>
</tr>
<tr>
<td>15</td>
<td>Level of Storage for Each EU Member State if All Projects were Completed</td>
<td>31</td>
</tr>
<tr>
<td>16</td>
<td>NTS, Compressor Stations and CCGTs within 100 miles of Preesall</td>
<td>41</td>
</tr>
<tr>
<td>17</td>
<td>Energy Consumption for Shallow and Deep Salt</td>
<td>43</td>
</tr>
</tbody>
</table>
1 Summary

1.1 Introduction

1.1.1 Halite Energy Group Limited (Halite) is applying to the Infrastructure Planning Commission for a Development Consent Order (DCO) to construct and operate an Underground Gas Storage Facility (UGS) at Preesall, Lancashire. The proposed facility will have up to 19 caverns and a working capacity of up to 600 million m$^3$ to provide seasonal and flexible gas storage. This report covers UK energy policy relevant to the need for gas storage, energy security, alternative gas storage options and specific need (and advantages) for gas storage at Preesall. It also reviews the impact of additional wind generation on the need for gas storage.

1.2 UK Energy Policy

1.2.1 The UK Government is strongly promoting the development of renewable energy, particularly offshore wind. Given the intermittent nature of wind, flexible gas fired power generation will be required to produce electricity when there is no wind.

1.2.2 The Government published a National Policy Statement (National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines, EN-4) that includes support for projects to create more gas storage and is proposing to introduce additional incentives on gas suppliers in the event of a gas supply emergency. This is a direct strategy by Government to increase the amount of gas storage in the UK.

1.2.3 The Energy and Climate Change Committee Report “UK Energy Supply: Security or Independence?” published in October 2011 concludes “The UK needs more gas storage capacity capable of delivering gas at a high rate. The Department of Energy and Climate Change should be concerned about the lack of gas storage used to manage seasonal demand fluctuations. It should aim to double the UK’s current gas storage from current levels by 2020 in order to avoid exposure to gas supply interruptions and price spikes, and in the longer term, to ensure a resilient gas supply to flexible gas plants acting as "backup" to intermittent electricity generated from wind”.

1.3 UK Energy Security

1.3.1 United Kingdom Continental Shelf (UKCS) production is in decline and imports have been rising to meet demand. By 2025 the UK will be reliant on imports for around 75% of its gas.

1.3.2 Intrinsic to a reliable gas market is balancing physical supply and demand as there is a strong seasonal and within-day variation in gas demand and supply failure could result in an explosion caused by air entering the gas supply.
1.3.3 Gas (unlike electricity) travels along the supply system to final consumers relatively slowly; this increases the difficulty of balancing gas supply and demand at the point of consumption.

1.3.4 Imports from Norway are forecast to decline post 2015 and imports from the Continent are uncertain. LNG (Liquid Natural Gas) imports are forecast to become comparable with those from Norway in the near future and post 2015 are forecast to become the major import source for the UK. However, there is a world market for LNG, which makes supplies and prices volatile, with cargoes of LNG going to the highest priced markets. The risk of relying on LNG imports is therefore that other markets (in particular the Far East) could pay higher prices for the LNG, reducing available supplies for the UK market and increasing prices for UK consumers.

1.3.5 It is expected that gas will remain the predominant source of domestic heating in the UK for the foreseeable future. Electricity demand is set to rise significantly over the next 40 years, with around 50% generated in the short to medium term from natural gas. With the Government’s renewable energy strategy supporting the development of renewable energy such as offshore wind, gas fired power generation is critical in ensuring electricity supply is maintained when there is no wind. Hence, in addition to gas as the primary fuel for heating domestic customers in the UK, gas will remain the main fuel for maintaining electricity supplies.

1.4 Gas Storage Alternatives

1.4.1 The main types of available gas storage in the UK are LNG storage, depleted gas fields and salt cavity storage. LNG storage is expensive and National Grid is closing its LNG peak saving plants. Offshore gas storage fields require very high capital costs and none have been developed in the UK since the 1980’s. There are 4 potential onshore salt cavity storage areas: East Yorkshire, Cheshire, Dorset and Preesall in Lancashire.

1.5 Preesall Locational Benefits

1.5.1 Gas from Preesall can enter the National Transmission System (NTS) at a location where there is spare capacity and can be directed down a number of different pipelines. It is also close to a number of gas fired generation plants, which will be increasingly important in the provision of electricity and provide flexibility for gas suppliers.

1.5.2 The proposed project will have up to 19 caverns and a working capacity of up to 600 million cubic metres (mcm) at Standard Temperature and Pressure (STP). The gas storage facility will be able to provide both seasonal and flexible gas storage. This is achieved by the low operating pressure range of the facility with gas injected at no more than 95 bar, together with fast response electrically driven compressors which can move at high flow-rates.
1.5.3 Proximity to the sea allows seawater to be used for cavern washing, avoiding significant demands on freshwater resources.

1.5.4 There already is a large, reliable electrical connection nearby which will allow quiet, environmentally friendly electrical gas compression to be used and minimise the amount of new electrical infrastructure needed to supply the Preesall facility.

1.6 Conclusions

1.6.1 As a result of the UK’s renewable energy targets for 2020, the UK Government is supporting a massive expansion in offshore wind generation, which means that gas Combined Cycle Gas Turbines (CCGTs) will be the main providers of electricity as a back-up to wind generation. Such gas CCGTs will need to access gas at short notice and be able to remove gas from the NTS when wind generation starts again. Close to market gas storage will be required to provide the flexibility to maintain efficient operation of the CCGTs.

1.6.2 The proximity of the Preesall facility to the NTS and its ability to provide the flexible gas supplies needed in 2020 helps to underpin the case for the Project. This supplements the basic role of storing gas in the summer for use in winter at times of high domestic customer demand.

1.6.3 The salt quality, electricity supply, and water washing infrastructure all help to underpin the case for having gas storage at Preesall.
2 Need for Gas Storage

2.1 UK Government Energy Policy

2.1.1 UK Needs More Gas Infrastructure

2.1.1.1 The UK economy faces a major challenge as indigenous gas supplies decline and there is increasing dependence on imported gas. Without additional storage to store gas in the summer there will be both higher gas prices for UK consumers and increased risk that supply disruptions in winter will lead to gas shortages.

2.1.1.2 At the same time, the UK Government is strongly promoting the development of renewable energy, with particular focus on offshore wind. Given the intermittent nature of wind (which only blows around 25 - 30% of the time), flexible gas fired power generation will be required to produce electricity when there is no wind. The use of gas storage facilities offers an ability to maintain gas in store that is not required at times of high wind. When the wind drops, the gas can be withdrawn from store. The Preesall facility is in a good location to provide this flexibility and can do so with lower energy consumption than other storage facilities. The knock-on effect of lower energy consumption is significantly lower CO₂ emissions per unit of flow in and out of the Preesall facility.

2.1.1.3 To maintain supplies to UK consumers at reasonable prices and to provide flexibility for wind generation, it is critical that new gas storage is developed in the UK. The rate of decline of indigenous UK gas production means that there is now some urgency in respect to this requirement.

2.1.1.4 The requirement for additional gas storage in the UK is set out in the National Policy Statement (National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines, EN-4).

2.1.1.5 In addition, the July 2011 Energy White Paper for secure, affordable and low-carbon electricity includes the following statement (page 9):

2.1.1.6 “It is clear that fossil fuels without Carbon Capture and Storage (CCS), especially gas, will also continue to have a key role to play in the coming years”.

2.1.1.7 Appendix A provides a detailed description of consistent UK Government support for the development of more gas storage infrastructure.

2.1.2 Encouragement of Low Carbon Energy

2.1.2.1 Gas as a primary fuel has been a major contributor to meeting the needs of UK energy demand for many years and is expected to continue to be a primary energy source for the foreseeable future, even following the building
of new nuclear power stations and renewable energy sources. The historical picture is shown by the following graph (Figure 1) which is taken from the 2009 Digest of UK Energy Statistics (DUKES) – Long Term Trends (Chart 1.1.1).

![Figure 1 Inland Consumption of Primary Fuels and Equivalents for Energy Use 1970-2008](image)

2.1.2.2 It is clear from Figure 1 that gas has the highest market share of all the different primary energy sources, despite a recent small downturn in demand.

2.1.2.3 What is also noticeable from the above table is the increasing role of renewable energy within the overall energy mix. The relationship of gas storage, wind, CCGTs and Preesall is an important one.

2.1.2.4 Electricity demand is set to rise significantly over the next 40 years and certainly in the short term that rise will be met by generation from natural gas. Installed gas generation capacity will rise from around 34% currently to 41% by 2016/17 at the same time as installed wind capacity is rising from 3% to 13%.

2.1.2.5 As part of the Government strategy to reduce emissions and increase the use of renewable energy DECC (The Department of Energy and Climate Change) have published a document entitled “2050 Pathways Analysis - July 2010” to demonstrate how the energy market could look by 2050 under a wide range of different scenarios. Many of the scenarios have circumstances whereby the use of natural gas has substantially declined, partly driven by energy efficiency and partly by replacing natural gas by either biogas or in the case of...
end use replacing natural gas with renewable heat or electricity, generated largely from renewable sources.

2.1.2.6 However DECC themselves acknowledge that the efficiency savings may be optimistic as:

a. 28% of owner-occupiers do not take up any measures irrespective of how cost effective they are

b. No incentive for landlords to spend money on insulation to save on their tenants’ energy bills – however, there is some new legislation in the Energy Bill 2011 that is intended to address this situation

c. People are put off by floor and internal solid wall insulation because of the disruption and loss of floor space from the wall insulation

d. Greater efficiency encourages “comfort taking” such that energy efficiency supports higher internal temperatures

2.1.2.7 On the subject of sources of renewable heat there are potentially many barriers to adoption:

a. Biomass cannot be used in city or urban locations without additional costs for clean-up of emissions as a result of restrictions imposed by air quality legislation;

b. Installation costs of many sources are very high and have long payback periods – the introduction of the “Green Deal” whereby loans are made to consumers and paid back from the savings in energy costs appears to be targeted at energy efficiency not renewable energy so it is unclear if renewable energy installation costs can qualify for assistance. In any event unless there is a massive subsidy some payback periods could be up to 50 years or more;

c. Some types of renewable heat become more inefficient as the temperature drops (air source heat pumps for example) and therefore either become too expensive to run compared to gas heating (they use electricity to operate) or need support from another heat source, with natural gas the only secure alternative;

d. Recent trials of ground source heat pumps show that they are not ideally suited for the gas supply area;

e. The Government’s own consultants outline that a major barrier to a change in consumer behaviour is inertia.
2.1.2.8 Given all the above it would seem that gas will remain the predominant source of domestic heating in the UK for many years to come, despite the development of renewable heat sources. National Grid have developed forecasts of gas demand which take account of meeting Government targets on emissions reduction and the impact on peak gas requirements are not significant.

2.1.3 Electricity Market Reform
2.1.3.1 The Government launched an Electricity Market Reform in December 2010 which included the following statement:

2.1.3.2 “So we must build the next generation of power stations, and act to ensure there will be enough reserve capacity to meet our needs. Together with renewables, we will need new gas-fired power stations and new nuclear plant.”, and

2.1.3.3 “Today, we are proposing new incentives to drive investment, while protecting the rules for investments already made. The focus will shift permanently from conventional fossil fuel-fired electricity to low carbon technologies – renewables, nuclear and cleaner fossil fuels.”

2.1.4 Tighter supplier obligations to encourage gas storage
2.1.4.1 Consistent with the Electricity Market Review, the Government is proposing to introduce additional incentives on gas suppliers in the event of a gas supply emergency. This is seen as a direct strategy by Government to increase the amount of gas storage in the UK and move the UK towards the levels of storage of similar sized countries.

2.1.5 UK Energy Supply: Security or Independence?
2.1.5.1 The Energy and Climate Change Select Committee published its Eighth Report in October 2011. This document is available at the web address http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenergy/1065/106502.htm

2.1.5.2 Section 5 provides a detailed discussion in relation to gas storage. The conclusions are as follows “The UK needs more gas storage capacity capable of delivering gas at a high rate. The Department of Energy and Climate Change should be concerned about the lack of gas storage used to manage seasonal demand fluctuations. It should aim to double the UK’s current gas storage from current levels by 2020 in order to avoid exposure to gas supply interruptions and price spikes, and in the longer term, to ensure a resilient gas supply to flexible gas plants acting as "backup" to intermittent electricity generated from wind”
2.2 Why is Gas Storage Needed?

2.2.1 Declining UK gas supplies

2.2.1.1 The following graph (Figure 2) was taken from 2009 DUKES – Long Term Trends and demonstrates the substantial growth in gas consumption and how the end use of gas has changed dramatically in recent years as consumption for electricity generation has grown.

![Graph showing consumption of town gas and natural gas from 1970 to 2008.](image)

**Figure 2 Consumption of Town Gas and Natural Gas 1970 to 2008**

2.2.1.2 Gas demand in the UK has been primarily met by indigenous gas production from the United Kingdom Continental Shelf (UKCS) but in recent years the UKCS production has been declining and imports have been rising to meet demand. The historic and forecast UKCS production is shown on the following graph (Figure 3) which has been taken from page 49 of the National Grid publication – Gas Transportation Ten Year Statement 2010, published in December 2010.
2.2.1.3 Figure 3 shows clearly that by 2025 the UK will be reliant on imports for around 75% of its gas. It also illustrates that even if gas demand were to fall significantly, imports would make up a large proportion of gas supply to the UK market. The National Grid forecasts are independent from any commercial interest and are able to utilise confidential data that is not available to other parties. These forecasts provide the detailed numbers that help to put into context the DECC and Ofgem concerns described earlier which underpin the urgent need for new gas storage including Preesall.

2.2.2 Seasonality and daily variation in gas demand

2.2.2.1 A central feature in creating a reliable gas market is balancing physical supply and demand. There are a number of reasons for this:

a. There is a very strong seasonal element in gas demand (largely arising from household demand for central heating purposes in winter) — the ‘swing factor’, i.e. the ratio of winter peak daily gas demand to annual average daily demand is over 30%, much higher for domestic consumers;

b. There is also a strong within-day element in gas demand: gas demand is not ‘flat’ over each period of 24 hours, but, especially in winter, tends to peak in the evening and to fall in the very early morning;

c. Gas ‘fails to danger’ (i.e. in the event of a supply failure there is a risk of air entering the gas supply pipes thereby creating a highly explosive and dangerous situation); because of this it is highly important to maintain continuity of supply to (especially) the household market;

d. And yet gas (unlike electricity) travels along the supply system to final consumers relatively slowly; this increases the difficulty of balancing gas
supply and demand at the point of consumption, and therefore adds a geographical element to the balancing problem.

2.2.3 Balancing gas supply and demand
2.2.3.1 There are three kinds of tool for providing the flexibility to balance the physical gas market:

2.2.3.2 On the supply side:
   a. By varying (increasing or decreasing) supplies of gas into the market;
   b. By drawing on close-to-market gas storage facilities

2.2.3.3 On the demand side:
   c. Through demand management; in practice, by relying on the commercial arrangements between gas market players and gas consumers to reduce gas demand at times of tight supply. There is some demand-side flexibility, but the much higher winter demand compared to summer demand means there is inevitably an important role for the supply side in balancing the market in the winter, and thereby preventing a supply failure that could result in interruptions to users or even air entering the gas supply system, creating a potentially dangerous situation.”

2.2.3.4 There are a number of uncertainties in the current economic climate with regard to the ability of the UK gas market to achieve a supply/demand balance. Growth in gas demand and the development of supplies are both affected. However the future of the economy will be dependent on sufficient energy supplies being available from all possible sources to meet demand. National Grid are seen within the industry as a reliable wholly independent source of supply and demand forecasts and therefore the information in the following sections of this report is sourced from National Grid documents. National Grid has published a detailed report on their supply and demand forecasts as part of their Gas Transportation Ten Year Statement 2010. They have also developed a range of scenarios to accompany these forecasts to illustrate the uncertainty that there is in both supply and demand.

2.2.4 Annual gas supply/demand balance
2.2.4.1 To develop an annual gas supply/demand balance it is necessary to first forecast annual gas demand and then to match that demand with the forecast gas supplies.

Demand
2.2.4.2 As a consequence of high energy prices and a rapid decline in the UK economy, energy demand for both gas and electricity has fallen significantly. For the 2009/10 financial year, weather corrected gas demand in the
Distribution Network (DN)\(^1\) market areas fell by 7%, the fifth consecutive year of decline.

2.2.4.3 National Grid’s longer term forecasts for energy demand assume that end user prices remain relatively high. The combination of long term high energy prices and increased energy efficiency measures, higher carbon prices and government initiatives, results in gas Distribution Network\(^1\) demand forecasts that are essentially flat. National Grid’s forecasts for gas demand in the power generation sector are for modest increases in the short to medium term as new CCGT plant replaces some coal and ageing nuclear plant. Through to 2019/20 National Grid forecast 15 GW of new CCGT plant to be connected to the NTS, of which 9.5 GW is already commissioned or under construction.

2.2.4.4 Over the ten-year forecast period (includes 2010), total gas demand is projected to fall at a rate of around 0.45% per annum, with Distribution Network demand falling at 0.3% per annum and NTS demand forecast to decline at an average of 0.54% per annum.

2.2.4.5 Their base case forecast, designated as Slow Progression\(^2\) is shown below (Figure 4)

\[^1\] These are the networks that supply gas to the majority of consumers as opposed to the NTS which moves gas around the country to the DN’s and supplies a small number of very large customers mainly power stations.

\[^2\] Slow Progression is defined as “business as usual” as compared to Gone Green which is a scenario that National Grid have developed assuming that the governments 2020 emissions targets are met.
In addition to the two scenarios “Slow Progression” and “Gone Green”, National Grid have developed a range of demands based on numerous sensitivities. These have been developed by changing their assumptions on economic variables, fuel prices, energy conservation, household numbers, power generation capacity and output, CHP capacity, warm weather and exports to both Ireland and the Continent. The full range of demand forecasts are shown below (Figure 5):
2.2.4.7 Figure 5 shows the potential for a substantial range of possible demand though there is a high degree of uncertainty, with the UK renewable targets and recession tending to reduce gas demand but the closure of coal and nuclear generation plant increasing gas demand. An observation to be made is that given that outcome of 2010 is already known, the substantial difference between the two main scenarios cannot be sustainable in the short term. Furthermore, post-recession the impact of renewed economic growth could lead to sustained growth in demand beyond the period identified by National Grid. It is very important not to underestimate the impact that this could have on gas security especially given the long lead times for development of new infrastructure to support growth.

Supply

2.2.4.8 As indicated previously, UKCS supplies are declining at a rapid and sustained rate and large amounts of gas imports will be required during the next ten years. National Grid is predicting high levels of uncertainty with regard to where imports will be landed to meet demand. In constructing their base case forecast they assess each supply source in terms of what gas must flow, is likely to flow and what gas may flow. At a high level they forecast UKCS to continue to decline. Imports from Norway are forecast to marginally increase before declining post 2015 as Norwegian production plateaus before commencing a decline. Imports from the Continent are subject to some uncertainty and are forecast at comparable levels to those experienced over the past 3 years. Following the significant growth in LNG imports during 2009, National Grid forecast growing levels of LNG import with LNG imports becoming comparable to those from Norway in the near future and post 2015 becoming the major import source for the UK.
2.2.4.9 Although biomethane (renewable natural gas) could develop significantly, it is not expected to contribute significantly to gas supplies as demonstrated by the low levels of “Unconventionals” in the National Grid forecast. However a major contributor to gas supply, currently in its early days of development in the UK, is Shale Gas. The first development is being considered in the Blackpool area and early forecasts suggest that Shale Gas could meet up to 10% of UK gas demand.

2.2.4.10 National Grid has to make a match between supply and demand in order to assess the impact that new sources of gas will have on their network. The National Grid base case annual match (Slow Progression) is shown below (Figure 6). This clearly shows a high reliance on gas imports by 2025/26 as a direct result of the steep decline in UKCS supplies.

![Figure 6 National Grid Base Case Annual Match (Slow Progression)](image)

2.2.4.11 As indicated above, the decline in UKCS production and high reliance on gas for residential heating and power generation means that it is important that new gas storage is built. This also gives UK consumers access to lower priced summer gas supplies.

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3 Shale gas is gas that is extracted from gas bearing shale. Extensive development of this source is currently taking place in the US.
2.2.5 Peak gas supply/demand balance

**Demand**

2.2.5.1 With regard to 1 in 20 peak day demand\(^4\) National Grid are forecasting some significant growth in peak gas demand contrary to their forecast for annual demand as shown in the graph below (Figure 7). The major driver for the steep increase in 2012/13 is the change in the arrangements for interruptible customers. All of these customers are classified as firm demand from that date and therefore can only be interrupted if there is a prior commercial agreement in place with those customers to curtail demand.

![Figure 7 National Grid Forecast for Annual Demand](image)

**Figure 7 National Grid Forecast for Annual Demand**

2.2.5.2 This indicates that the demand for gas on a peak day is forecast to be substantially higher over the next 15 years than it is today under the National Grid Slow Progression scenario. Even under the Gone Green scenario the

\(^4\) 1 in 20 peak day demand refers to a level of demand that is used by the industry to define the design criteria for the gas transmission network, and as a basis for setting a maximum level of daily demand to assess gas supply requirements against. It is calculated using statistical simulation techniques, and in any winter the probability of the 1 in 20 peak day demand being exceeded is 0.05.
peak demand will remain broadly similar to the level today. In the past, the UKCS provided the majority of peak day gas but this proportion is falling in line with UKCS production.

2.2.5.3 Whilst new LNG importation facilities and pipelines are able to supply gas on a peak day, there is no guarantee that the gas will actually be there – it may have been bought by others and taken to India or the Far East (Japan, South Korea, China), for example. China is particularly important here as they are planning many new facilities, but there is also growth in Japan as a result of closures of nuclear power stations following the Tsunami in 2011. In addition, there is reduced diversity compared to when peak gas was sourced from the UKCS and as a result, having peak supply available in storage facilities such as Preesall is increasingly important.

2.2.5.4 As with the annual demand National Grid have prepared a range of demands based on numerous sensitivities. This is presented in Figure 8 below:

![Figure 8 National Grid Range of Demands](image)

2.2.5.5 It is clear from the National Grid Ten Year Statement that they are concerned about the impact of fluctuations in wind generation on their peak demands as the following statements illustrate.

2.2.5.6 “Due to the need for additional power generation in Gone Green to cover for wind intermittency, the peak demand forecasts for Gone Green and Slow Progression are not materially different as gas fired power generation is assumed to provide much of the generation cover. Consequently the supply components in meeting Gone Green need to be more responsive or flexible in terms of meeting gas demand than in Slow Progression.
2.2.5.7 This flexibility is anticipated to be delivered from those supplies that are best placed to respond, notably gas storage and possibly also from LNG imports (from gas held in LNG storage tanks) and through existing or modified gas interconnectors with the Continent. A further consequence of more flexible/responsive supplies is the need for a gas network able to accommodate greater flow variations including those from one day to the next.”

2.2.5.8 This demonstrates that National Grid clearly believe that storage is vital to future gas security of supply.

Supply

2.2.5.9 The development of a peak match is produced along similar lines to the annual supply match except that when all available peak delivery from supplies is included there is a deficit, which has to be met by the inclusion of storage deliverability. National Grid have analysed the UKCS peak capability and there is, as with the annual UKCS supply, a forecast steep decline in peak gas from the UKCS.

2.2.5.10 In their Ten Year Statement 2010 National Grid describe the process that they have gone through to establish what they consider to be the maximum supply requirement to ensure a 1 in 20 peak day match. The graph below, Figure 9, is taken from the Statement and National Grid State:

2.2.5.11 “‘Maximum supply’ (a measure of supply diversity) always exceeds the highest demand day and since the onset of increased import capacity in 2006/07, this level of supply has rapidly increased from about 500 to over 600 mcm/d. This increase can be traced to increased import dependency/supply diversity, whereby the day to day flows of imports, notably IUK and LNG and to a lesser extent from Norway is far more variable than for UKCS supplies. The key reasons for this are the surplus of import capacity and the options for most import sources to flow gas to alternative markets.”
2.2.5.12 This is further developed by National Grid on page 76 where the graph below\(^5\) (Figure 10) in National Grid’s words:

2.2.5.13 “Shows the relationship between ‘maximum supply’ and import dependence since 2000 and projects this relationship forward. With increasing import dependency the ‘maximum supply’ is forecast to increase further. This delivers a very important message as not only does it emphasize the need for increasing supply diversity it highlights that the transmission network needs to be designed to accommodate an increased range of supplies from numerous permutations.”

\(^5\) Note the forecasts lines show both Gone Green and Slow progression, with the dashed lines representing Gone Green.
Figure 10 Relationship Between 'Maximum Supply' and Import Dependence since 2000

2.2.5.14 The following graph taken from page 77 of the National Grid Ten Year Statement 2010 shows the peak supply deliverability from different sources compared to the peak day demand for the Slow Progression (Figure 11) and Gone Green (Figure 12) scenarios. The ‘maximum supply’ is taken from Figure 10 above.

**Slow Progression**

Figure 11 Peak Supply Deliverability Compared to Peak Day Demand (Slow Progression)
2.2.5.15 National Grid’s commentary is as follows:

2.2.5.16 “The demand line on the charts is our 1:20 peak day demand. On first inspection the charts look similar, the key differences are lower demand in Gone Green and higher LNG imports and storage for Slow Progression. Both charts show a healthy supply surplus but this does not reflect the growing needs of increased supply capacity to cover for increasing supply diversity arising through higher import dependency. This need is shown in the ‘maximum supply’ and this is closely aligned to the peak level of supply.”

2.2.5.17 What Figure 11 and Figure 12 illustrate is that there has to be a steady growth in the amount of storage in order to ensure that there is sufficient total supply availability to meet peak demand. It is clear that storage will, for the foreseeable future, make an essential contribution to meeting peak demand. In addition, on a peak day, very high flows of Norwegian gas, continental imports and LNG will be required. At the present time, UKCS gas suppliers do not have such gas on firm contracts with gas producers so there is a significant risk that the gas may not be there when it is required. The best safeguard against this is to have bought lower cost summer gas and put it in storage facilities such as proposed at Preesall.

2.2.5.18 There are two key consequences of a supply/demand deficit. If insufficient annual gas supplies are available to meet average daily demand then the scarcity of supply will drive up the wholesale price of gas, which will ultimately have to be passed on to the consumer as has been seen in recent years.
2.2.5.19 A far more serious consequence however is that if there is a shortage of gas at any time during the year then it will be necessary to curtail supply to gas fired power stations. This will be particularly important during peak periods, but it could occur at any time during the year. The emergency hierarchy has been agreed with the industry and in the event of supply shortfall emergency procedures are invoked and the largest customers are curtailed first to ensure integrity of the gas supply network. The majority of these sites are gas fired power stations, with the other sites being large industrial users. This clearly has major implications for electricity security.

2.2.6 The role of gas storage as a complement to renewable energy production

2.2.6.1 In the Energy Act 2008, the UK Government adopted a legally binding target to replace 15% of the fossil fuels used in 2020 with renewable energy. The Government Renewable Energy Strategy (July 2009) aims to reduce fossil fuel demand and support the development of renewable energy such as offshore wind.

2.2.6.2 In order to meet this 15% target, CCGT power generation is seen as critical in ensuring electricity supply is maintained when there is no wind. CCGTs can provide flexible electricity but require flexible gas, which can best be provided by local gas storage.

2.2.6.3 Energy consultancy ‘Poyry’ has completed a study for a group of energy companies including National Grid and Centrica. The study looked at the question “how could the impact of intermittent generation, required to meet targets for renewables and decarbonisation of generation, affect the wholesale energy markets in GB and Ireland?” Poyry presented their results at the National Grid TBE 2009 event in July 2009 including the following graph (Figure 13):
Figure 13 indicates that when the wind is blowing the majority of CCGTs will be shut down, and when the wind drops they will need to operate. This represents a dramatic change compared to today when CCGTs only require a limited amount of flexibility. The location of Preesall is ideal for providing flexibility for power generation, due to its proximity to a number of current and planned CCGTs. The energy per unit of gas injection and delivery is lower than for other gas storage facilities (see section 4.4).

In addition to this work National Grid has been looking at a similar type of analysis the results of which have been presented in their Gas Transportation Ten Year Statement 2010 on pages 78 to 82. Their analysis is in the early stages but they have the following high level observations and key messages.

a. The maximum total day to day demand change increases in both scenarios from 2010/11 to 2020/21 as additional wind generation is connected to the system

b. Beyond 2015/16, for any given forecast year, the Gone Green scenario with higher levels of wind generation shows a greater once a year increase in demand than the Slow Progression scenario

c. The change in demand due to wind is slightly less pronounced within the Slow Progression scenario. This is to be expected, as this scenario has
less wind generation capacity for any given year compared to Gone Green.

d. The output data from our modelling to date suggests that the occurrences of high demand changes due to temperature change are only partially coincident with high demand changes due to wind change.

e. The current probability of a 60 mcm/d increase in demand is calculated as once every 6 years, hence in a Gone Green 2020 environment, the likelihood of a 60 mcm/d increase in demand is 20 times more likely than it is today.

f. All the probabilities reported relate to an increase in demand and though not reported there is a similar number (marginally higher) of days when there is a comparable reduction in demand.

g. Further work will be undertaken to quantify the likelihood and impact of outlier events, that is the “low probability, high impact” demand changes. Also further work needs to be undertaken to further validate the wind distribution patterns and ensure that the data used is robust.

h. The next steps of work will include analysis to identify what supplies are best placed to be responsive to the forecasts of increasing variable demand. This applies for both demand scenarios.

2.2.6.6 As a result of the Government’s Renewable Energy Strategy gas is seen as the critical fuel for making electricity at times when there is no wind generation. Whilst gas fired power generation is well established, the interaction with wind is forecast to be an important new factor after 2015. This interaction leads to the requirement for National Grid’s NTS to provide additional flexibility to link gas fired power stations with gas storage facilities in particular. In addition, over the next 10 years the majority of UK coal fired generation will close down due to emissions legislation and the majority of nuclear power stations will also close down. Over this period, the natural gas share of total energy demand is forecast to rise.
2.2.6.7 Hence, in addition to gas as the primary fuel for heating domestic customers in the UK, gas will be the main fuel for ensuring electricity supplies to these same customers. With major decline in UKCS gas production, gas storage in the UK is vital in ensuring gas is available to provide heat and electricity to UK consumers in the period 2013 – 2020 and beyond.

2.2.7 Gas market efficiency
2.2.7.1 An efficient gas market requires a number of things:

a. Sufficient reliable gas transmission capacity to move supplies to customers;
b. Sources of gas commodity that can be relied upon at times of high demand or disruption of major supplies; and
c. Competition between producers of gas to sell their gas and between gas suppliers to sell gas to consumers.

2.2.7.2 Gas storage is required to provide support in relation to gas transmission capacity and also to provide near to market gas for gas suppliers. As indigenous gas supplies decline, there is a decline in sources of gas demand that can be relied upon at times of high demand. Gas storage is required to ensure that gas commodity is available at times of high demand and/or supply disruption.

2.2.7.3 In addition, a new role for gas arises as a result of the forecast growth in intermittent wind generation being promoted by the UK Government in relation to the UK’s 2020 targets for renewable energy. This is for CCGTs to switch on and off as wind generation output rises and falls. This leads directly for a need for gas to come in and out of store at relatively short notice.

2.2.7.4 There are two main scenarios that lead to gas demand exceeding supply - very cold weather over an extended period of time (when gas storage has been depleted) and major disruptions in supplies.

2.2.7.5 In the last few years we have seen a number of examples of both these:

a. Loss of Rough storage facility in March 2006;
b. Cold weather in December 2006; and
c. Disruptions of Russian gas supplies due to disputes with Ukraine and Belorussia.

2.2.7.6 If gas demand exceeds supply, National Grid attempts to buy additional supplies via the gas market which can incentivise gas users to stop taking gas and hence release gas into the market. If this is not successful in bringing
supply and demand into balance, National Grid (acting at Network Emergency Co-ordinator) can declare a National Emergency and shut-off gas supplies to large industrial customers including power generators. Next, if demand still exceeds supply, other firm customers can have their supplies curtailed. Ultimately, if demand still exceeds supply, National Grid has reserves of gas known as Operating Margins that are injected into the gas grid to manage an orderly rundown of the gas grid. The key objective is to avoid a situation where gas pressures are very low close to consumers which would allow air into the gas grid and a consequent risk of explosion. If this happens it can take many months to flush the air out of the gas system and re-start supplies to customers.

2.2.7.7 Gas storage provides a number of roles to different market players:

a. **To gas suppliers**, it allows them to maintain supplies to their customers at times of higher demand and allows them to buy gas at lower summer prices which can be held in storage to supply winter demand.

b. **To gas consumers** in a competitive market gas storage offers a greater level of security of supply and at the same time, offers lower gas prices due to the ability of gas suppliers to buy gas at lower prices in summer.

c. **To National Grid** as operator of the National Transmission System, gas storage offers the ability to match supply and demand within day on an hourly basis.

d. **To power generators**, gas storage offers an ability to use gas fired combined cycle gas turbines as back-up to wind generation which is only produced for around 30% of the time. When it is windy, the generators can put gas into stores such as Preesall.

e. **To the UK Government**, gas storage is crucial to maintaining security of supply if there are disruptions to infrastructure or political restrictions on gas flow. At the same time, gas storage provides the flexibility to allow wind generation to be developed without this risking electricity supplies.

2.2.7.8 Going forward, there is forecast to be higher level of imports each year and also greater levels of wind generation. Hence all the above roles will become increasingly significant.
2.3 UK Gas Storage and Energy Security

2.3.1 National Grid Ten Year Statement – UK Gas Storage Development

2.3.1.1 The following tables set out the latest information from National Grid in relation to gas storage. The information is broken down into a number of categories which include the potential storage projects, some held up by planning, others by lack of finance.

Existing UK gas storage

<table>
<thead>
<tr>
<th>Storage Project</th>
<th>Operator</th>
<th>Location</th>
<th>Space (bcm)</th>
<th>Deliverability (mcm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough</td>
<td>Centrica Storage</td>
<td>Southern North Sea</td>
<td>3.5</td>
<td>43</td>
</tr>
<tr>
<td>Aldbrough (part completed)</td>
<td>SSE</td>
<td>Yorkshire</td>
<td>~0.1</td>
<td>~10</td>
</tr>
<tr>
<td>Hatfield Moor</td>
<td>Scottish Power</td>
<td>Yorkshire</td>
<td>0.1</td>
<td>2</td>
</tr>
<tr>
<td>Holehouse Farm</td>
<td>Energy Merchants Gas Storage</td>
<td>Cheshire</td>
<td>0.05</td>
<td>8</td>
</tr>
<tr>
<td>Hornsea</td>
<td>SSE Hornsea</td>
<td>Yorkshire</td>
<td>0.3</td>
<td>18</td>
</tr>
<tr>
<td>Humbly Grove</td>
<td>Star Energy</td>
<td>Hampshire</td>
<td>0.3</td>
<td>7</td>
</tr>
<tr>
<td>LNG Storage</td>
<td>National Grid LNGS</td>
<td>Various</td>
<td>0.2</td>
<td>32</td>
</tr>
</tbody>
</table>

Total 4.6 120

Source: National Grid

2.3.1.2 The important factor from this table is that in the 25 years since the completion of the offshore Rough gas storage facility by the then British Gas (mostly built prior to privatisation) there has only been a relatively small increase in the amount of storage built from 4 billion cubic metres (bcm) (Rough, LNG and Hornsea) to 4.6 bcm. During this time, UKCS gas production rose from 36 bcm/annum in 1983 to 108 bcm in 2000, falling back to around 64 bcm in 2009.

Storage projects under construction

<table>
<thead>
<tr>
<th>Storage Project</th>
<th>Developer</th>
<th>Location</th>
<th>Space (bcm)</th>
<th>First Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldbrough (portion under construction)</td>
<td>SSE / Statoil</td>
<td>Yorkshire</td>
<td>~0.25</td>
<td>2009</td>
</tr>
<tr>
<td>Hill Top Farm</td>
<td>EDF Trading</td>
<td>Cheshire</td>
<td>0.1</td>
<td>2011/12</td>
</tr>
<tr>
<td>Holford</td>
<td>E.ON</td>
<td>Cheshire</td>
<td>0.2</td>
<td>2011/12</td>
</tr>
<tr>
<td>Stublach</td>
<td>GDF Storage</td>
<td>Cheshire</td>
<td>0.4</td>
<td>2013/14</td>
</tr>
</tbody>
</table>

Total ~1

Source: National Grid
This table indicates that the projects being built represent an increase of around 22%. During the same period, to 2013-14, it is forecast that UKCS production will decline by around 20 bcm. The 1 bcm of new storage is therefore only around 5% of the decline in UKCS production.

### Storage projects with planning consents, final investment approval not made

<table>
<thead>
<tr>
<th>Storage Project</th>
<th>Developer</th>
<th>Location</th>
<th>Space (bcm)</th>
<th>Planning Granted</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldbrough II</td>
<td>SSE / Statoil</td>
<td>Yorkshire</td>
<td>0.35</td>
<td>May-07</td>
<td>No FID, under review</td>
</tr>
<tr>
<td>Bains</td>
<td>Centrica</td>
<td>Irish Sea offshore Barrow</td>
<td>0.6</td>
<td>Jun-09</td>
<td>No FID</td>
</tr>
<tr>
<td>Caythorpe</td>
<td>Centrica</td>
<td>East Yorkshire</td>
<td>0.2</td>
<td>Feb-08</td>
<td>No FID, on hold</td>
</tr>
<tr>
<td>Gateway Storage</td>
<td>Stag Energy</td>
<td>Irish Sea offshore Barrow</td>
<td>1.5</td>
<td>Nov-08</td>
<td>No FID</td>
</tr>
<tr>
<td>Hatfield West</td>
<td>Scottish Power</td>
<td>Yorkshire</td>
<td>0.04</td>
<td>Feb-10</td>
<td>Some consents still to be obtained</td>
</tr>
<tr>
<td>Kings Street</td>
<td>NPL</td>
<td>Cheshire</td>
<td>0.2</td>
<td>Dec-09</td>
<td>No FID</td>
</tr>
<tr>
<td>Portland</td>
<td>Portland Gas Ltd</td>
<td>Dorset</td>
<td>1.0</td>
<td>Jul-07</td>
<td>No FID</td>
</tr>
<tr>
<td>Saltfleetby</td>
<td>Wingaz</td>
<td>Lincolnshire</td>
<td>0.7</td>
<td>Q4 10</td>
<td>No FID</td>
</tr>
<tr>
<td>White Hill Farm</td>
<td>E.ON</td>
<td>Yorkshire</td>
<td>0.4</td>
<td>Oct-07</td>
<td>No FID</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>~5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: National Grid

Of these projects, 2.1 bcm relate to offshore projects which are expensive to finance and may not go ahead even though the planning hurdle has been cleared. Other projects with planning permission have been impacted by the credit crunch and are having difficulties raising finance.

### Storage projects awaiting planning consents

<table>
<thead>
<tr>
<th>Storage Project</th>
<th>Developer</th>
<th>Location</th>
<th>Space (bcm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albury I</td>
<td>Star Energy</td>
<td>Surrey</td>
<td>0.2</td>
</tr>
<tr>
<td>Albury II</td>
<td>Star Energy</td>
<td>Surrey</td>
<td>0.7</td>
</tr>
<tr>
<td>Baird</td>
<td>Centrica / Perenco</td>
<td>Offshore Bacton</td>
<td>2.2</td>
</tr>
<tr>
<td>British Salt</td>
<td>British Salt</td>
<td>Cheshire</td>
<td>Various</td>
</tr>
<tr>
<td>Deborah</td>
<td>Eni</td>
<td>Offshore Bacton</td>
<td>4.6</td>
</tr>
<tr>
<td>Esmond Gordon</td>
<td>Encore Oil</td>
<td>Offshore</td>
<td>3.4</td>
</tr>
<tr>
<td>Preesall</td>
<td>Halite Energy</td>
<td>Fleetwood</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>~12</td>
</tr>
</tbody>
</table>

Source: National Grid
2.3.1.5 These projects have had planning permission rejected and are in the appeal or resubmission process, or are yet to submit a planning application.

2.3.1.6 Of potential projects, more than 90% of capacity is located offshore (10.2 bcm out of 12 bcm). This indicates that there are a limited number of potential storage sites that are onshore and companies are starting to look offshore. Potential onshore sites that are close to the gas grid are in short supply, Preesall being one of them. It is by no means certain that any of the offshore projects will go ahead because of the technical difficulty and high cost of developing such offshore projects. In the entire EU area there are believed to be only 3 offshore gas storage projects, with more than 70 onshore (salt and depleted oil/gas fields).

2.3.2 Gas storage capability relative to consumption – UK compared to Europe

2.3.2.1 A comprehensive analysis of the different storage levels in each EU Member State has been carried out by the DECC and this was presented at a conference on the 29th June 2009 by Gill Campbell Assistant Director, European and Energy Policy Directorate at DECC. The graph below (Figure 14) shows how different countries have approached their storage requirements.

![Figure 14 Storage Levels in Each EU Member State](image-url)
2.3.2.2 The UK is at the bottom of this league of major gas consuming countries, a position that reflects the fact that until 2004 the UK was broadly self-sufficient in gas and the delays that there have been in building new storage.

2.3.2.3 The UK currently has a better coverage of import levels than of total demand levels as a consequence of the residual UK Continental shelf production. In the medium term however, to 2015, UKCS production is forecast to fall by around 25 BCM per annum during which period gas demand for power generation is forecast to increase by around 25%. Taken together these factors will reduce the UK percentage to around half of that for France. Crucially, however, France does not rely on gas for power generation but has nuclear generation with back-up from hydro-electricity and other fuels. This illustrates the urgency of the need for facilities like Preesall.

2.3.2.4 Even taking into account UKCS reserves and production, the UK is still well below the levels of countries that have gas demand levels comparable to the UK (Germany and France). Other high demand countries are Italy and the Netherlands. Italy has lower coverage of imports and the Netherlands has no gas imports. If we look at the storage capacity as a percentage of winter demand a similar picture arises (UK 9%, Germany 32% and France 35%).

2.3.3 Implications of the 3rd EU Energy Directive
2.3.3.1 To date DECC have dismissed the possibility of creating a strategic gas reserve in the UK on the grounds that the many disadvantages of this type of storage (which ultimately lead to higher consumer costs) far outweigh the advantage of having the reserve in place to provide some protection against market failure, claiming that in fact it may contribute to market failure. Strategic gas storage is however a feature of other Member States most notably Italy and Hungary.

2.3.3.2 There has been some discussion in the EU as part of the 3rd EU Energy Directive of the regarding the requirement of Member States providing some form of strategic gas reserve, but the only specific legislation produced to date that may have some impact on this area is the new Regulation 994/2010. This does not contain any specific reference to a strategic reserve but does set out some clear requirements for Member States to work more widely with its’ neighbours to develop strategies that will allow assistance to be provided should there be a national gas supply shortage. The details of how this will affect the UK are yet to be developed, but it is clear that Ireland’s heavy reliance on gas for electricity generation and the planned steep rise in their reliance on wind generation, particularly in the South, will require support from the UK mainland. Storage located in the vicinity of the export route to Ireland could provide that support.

2.3.4 UK treaty obligations with respect to Ireland and Belgium
2.3.4.1 In addition to possible requirements to support Ireland under the 3rd Directive there is a Treaty between UK and Ireland which makes provision for supplies to continue to be provided to the Irish gas customer, in the event of a National
Gas Supply Emergency on the UK mainland under the same conditions that would apply on the UK mainland. Again storage located in the vicinity of the export route to Ireland could provide that guarantee.

2.3.4.2 There is also a similar Treaty between the UK and Belgium.

2.3.5 UK Need for Local Storage
2.3.5.1 One of the fundamentals of gas transportation is the fact that short term gas flow changes in a transmission network have to be accommodated by variations in flows in the fixed capacity network. Sudden changes of flow at one location (e.g. a power station offtake) require the gas pipeline to provide additional gas, known as linepack.

2.3.5.2 Should this linepack be insufficient to meet the flow change or the local network is operating at lower than its maximum pressure, resulting in lower linepack, then flow must be provided into the local network from either another upstream network or local storage. If using flow from an upstream network then the additional flow required may have to ultimately come from additional gas flow entering the whole network from some remote location. However in order for this to have any effect it must be transported to the local network virtually instantaneously to ensure that the required change at the offtake can be met. Some flexibility in this can be allowed as a result of linepack in the upstream pipeline and by operating compressors but the added complexity of making this happen introduces delays and hence there could still be a risk of system failure. The most efficient and effective way to do this is to put gas into the network from local storage.

2.3.5.3 This approach to dealing with short term shocks is supported by the fact that National Grid when providing for its own Operating Margins makes provision for some locational requirements from gas storage.

2.3.6 Long term case for more storage in the UK
2.3.6.1 The next graph (from a presentation given by Gill Campbell of DECC at an SMI Gas Storage conference in 2009) shows the position if all known new storage projects had been completed (Figure 15). As explained above, it is very unlikely that all such projects will come forward, but the exercise is useful in understanding the scale of the problem facing the UK. This assumption would place the UK in a better position compared to the current situation and in line with the largest consumers and developing economies.
2.3.6.2 This begs the question “will this be sufficient gas storage for UK?” There is no
absolute level of gas storage that there should be as a proportion of gas
demand. However, there are a number of factors that help to inform gas
suppliers, consumers, regulators and Governments as to what percentage of
demand is appropriate, including:

a. Penetration of gas in the residential market – the higher this level, the
more winter gas demand (around six times the summer level for
residential customers), and the higher the storage required. More than
80% of UK homes are connected to the gas grid, one of the highest
levels of penetration in the world.

b. Penetration of gas in the power generation market – the UK is forecast to
generate more than 60% of electricity from gas by 2020, which is much
higher than Germany (24%) and France (7%) for example.

c. Robustness of gas importation infrastructure and supply chain – whilst
the UK has the physical capacity to bring in gas, our economy is
vulnerable because gas suppliers do not contract to make such imports
in the event of a cold winter or major supply disruption. So, whilst we
may have physical infrastructure available to import gas in a cold
January, we may not be able to buy enough gas to import.
2.3.6.3 These factors would indicate that the UK should have a higher percentage of gas storage as a percentage of demand than many other similar economies. Even if all the possible projects are developed (including the offshore ones) the UK will not be served as well as the fundamentals indicate is appropriate. The pressing need for increased gas storage capacity is clear.
3 Gas Storage Options and Viable Alternatives

3.1 Gas provision in winter
3.1.1 With UKCS flows declining, there are three main alternatives to the storage of gas in Salt cavity storage facilities such as proposed at Preesall:

a. Other gas storage;

b. Reduction in winter gas demand; and

c. Additional winter gas imports by pipeline or LNG.

3.2 Alternatives for winter gas provision
3.2.1 As previously explained, gas storage is needed to provide additional gas supplies in winter when demand is higher and also to provide flexibility to respond to within day variations in gas demand. There are four main types of gas storage:

a. Water aquifer (onshore or offshore);

b. Salt cavity (onshore or offshore);

c. Depleted oil/gas field (onshore or offshore); and
d. LNG storage.

3.2.1 Water aquifers storage
3.2.1.1 In the UK, there have not been any developments associated with water aquifers because of the availability of depleted gas fields and salt strata, both of which offer good capability for storing gas with minimal environmental risk and known costs. There are not believed to be any water aquifer storage projects being considered in the UK.

3.2.2 Salt cavity storage
3.2.2.1 The UK has four areas with salt strata at a depth to be appropriate for the storage of natural gas. East Yorkshire has major facilities at Hornsea and Aldbrough. In Cheshire, a number of salt storage facilities are being developed. There is also salt near Swanage in Dorset where Portland have received planning permission for a storage facility. Preesall in Lancashire, (the subject of this Report) is the other area.

3.2.2.2 Because the UK has such a shortage of gas storage, facilities in all these salt strata are required and can expect to be developed.
3.2.3 Depleted oil/gas field storage

**Offshore**

3.2.3.1 As set out above, the UK has a limited number of gas storage facilities. The only offshore gas field, Rough, was developed by British Gas 25 years ago and is the only such facility that has been built. The capital costs associated with offshore storage are much higher than onshore which tends to require facilities to be bigger.

3.2.3.2 The difficulty in financing large offshore gas storage is that a lot of cushion gas is required to remain in the reservoir in order to provide a basic gas pressure. However, this cannot be sold when the field is operational. It is possible that other offshore gas storage projects will be developed but this depends on longevity of economic signals of a winter to summer differential price, which have not existed.

3.2.3.3 There are four potential offshore depleted oil/gas field storage projects in the pre-approval stage of development. It is by no means certain that any of these will be developed because of the economics of such projects.

3.2.3.4 There are believed to be only three offshore storage projects developed in Europe compared to over 70 onshore projects. Furthermore, there are indications that there may be competition for the use of these depleted reservoirs for the capture of CO₂ from fossil fuel electricity generation plants.

**Onshore**

3.2.3.5 Whilst offshore UKCS has a large number of depleted gas fields, there have been a much smaller number of onshore oil/gas field discoveries. Storing gas in depleted onshore oil/gas fields is an attractive idea because the capital costs are lower and the gas is closer to market, often close to the onshore National Transmission System and able to utilise existing assets.

3.2.4 LNG storage

**Existing LNG storage owned by National Grid**

3.2.4.1 National Grid own and operate three onshore LNG facilities at Glenmavis, Partington and Avonmouth. These were built in the 1970’s and contain a relatively small volume of gas but have high deliverability. When these facilities were built they were at the end of NTS pipelines, were filled in summer with the gas available for use in winter at times of very high demand.

3.2.4.2 A fourth facility at Dynevor Arms was closed in 2008 as it was no longer required due to the new gas pipeline bringing gas to South Wales from Milford Haven. National Grid have indicated that Partington and Glenmavis are now
closing in 2011-12 because they have reached the end of their useful lives. This just leaves Avonmouth.

3.2.4.3 The main reasons for Avonmouth remaining open is to provide ‘Operating Margins’ gas to manage the orderly rundown of the gas grid in the event of a national gas emergency.

3.2.4.4 Avonmouth has no access to LNG direct from LNG importation terminals. There are no new developments of similar facilities in the UK or elsewhere in the EU that take gas out of a grid and store it to be re-gasified and injected back into the gas grid at times of high demand. The fundamental difficulty with such facilities is the very high capital and operating cost associated with making and storing LNG, in particular high electricity demand. Such facilities also have a high carbon footprint.

**LNG storage at the new LNG importation terminals**

3.2.4.5 There are 4 LNG importation terminals in the UK that have been built and commissioned in the last 5 years:

a. Isle of Grain (National Grid);

b. Excelerate Energy Teesside

c. Milford Haven – Dragon (BG); and

d. Milford Haven – South Hook (ExxonMobil).

3.2.4.6 Apart from Excelerate’s Teesside facility, all these facilities have LNG storage tanks, with sufficient capacity to be able to unload a full cargo of LNG in around 12 hours. The LNG tankers then return to the source of LNG, such as Algeria or Qatar, to collect the next cargo.

3.2.4.7 None of these LNG facilities is believed to have any current plans to invest in additional LNG storage to be able to provide supplies to customers at peak times. The reason is similar to that which applies to the pipeline owners in that to build an LNG tank will cost over £100 million, which is not an attractive proposition for a facility that can only take LNG from ships and cannot access pipeline gas. In addition, spot capacity in the NTS may not be available to move the extra gas to market, a situation that does not arise at Preesall because of the existing un-used NTS capacity in the North West.

**Reduction in gas demand**

3.2.4.8 The current economic recession has reduced gas demand but National Grid forecast that this will recover. Going forward, as described above, gas demand is subject to two main drivers, both environmentally driven. On the
on one hand the Government is introducing measures and incentives to reduce gas demand as part of the strategy to have 15% renewable energy by 2020. However, the closure of coal fired power generation plants to reduce harmful emissions and also closures of nuclear power generation plant have combined to lead to a large increase in gas fired power generation.

3.2.4.9 Taking these two drivers together, National Grid forecast that annual gas demand will decline a small amount in the period to 2020, but peak demand will increase significantly over the same period, even remaining flat in their Gone Green scenario.

Additional gas imports by pipeline

3.2.4.10 There are a number of pipelines that import gas into the UK:

a. UK Continent Interconnector (Bacton to Belgium);
b. BBL Interconnector (Bacton to Netherlands);
c. Langeled (Easington to Norwegian gas sources); and
d. Vesterled (St Fergus to Norwegian sources).

3.2.4.11 There are no projects underway to increase the capacity of these pipelines to bring gas to the UK. For all these pipelines, there are no 'low cost and straightforward' means to increase capacity to bring additional peak volumes to the UK. Given that, there would have to be very strong economic signals that UK peak gas was valuable in the long term in order for the owners of these pipelines to invest in additional capacity.

3.2.4.12 If such signals existed (and they do not because the forward gas market does not go beyond 3 years), then the key alternative economic option for these pipeline owners would be to invest in gas storage facilities close to the UK market, such as Preesall. It will always be lower cost to build gas storage in the UK that can be filled using the existing pipelines and can move available volumes of gas. The companies that are aiming to make investment in new onshore gas storage in the UK are companies who would bring gas into those facilities in summer using these pipelines and from LNG.

3.2.4.13 Gas storage facilities are built in countries which have demand for gas with the objective of being filled at off-peak times and releasing the gas in winter. This applies to the existing UK gas storage and to gas storage in Germany, Netherlands, France and other EU countries. It is generally always favoured over additional pipeline capacity though there can be occasions when pipeline capacity can be increased at relatively low cost (e.g. by changing design of compression plant). No such opportunity exists for the pipelines connected to the UK.
Additional gas import by LNG

3.2.4.14 The main risk facing UK consumers is that, in the event of a cold winter, the UK gas suppliers will need to buy large volumes of LNG from the world LNG spot market. If there is also increased demand at the same time in India and the Far East, or if there is a major supply disruption (such as loss of supplies from Qatar), UK will have to compete on price to attract cargoes to the UK. Whilst this may be possible it cannot be relied upon and there is no guarantee that sufficient un-contracted LNG will be available. In addition, if such LNG is available, it can be expected that prices would be high.

3.2.4.15 The appropriate safeguard in a commercial and risk sense is for UK gas suppliers to purchase additional volumes of LNG during summer months when more cargoes are available and the price is generally lower. This LNG can then be re-gasified, input into the NTS and transported to gas storage facilities.

3.2.4.16 For this to take place there has to be gas storage facilities available in the UK to accommodate this gas. Reliance on un-contracted cargoes of LNG to maintain supplies to UK customers during a cold winter represents an unacceptably high risk that is inappropriate for such a basic commodity as natural gas.

3.3 Within-Day Flexibility

3.3.1 In addition, in respect to the within-day flexibility provided by onshore gas storage there are a number of alternatives:

a. Investment in other gas storage facilities;

b. Investment in additional onshore pipeline capacity with surplus linepack; and

Reduction in wind generation with more base-load gas fired generation.

3.3.2 This section reviews alternatives to Preesall in both of its roles.

3.4 Alternatives for provision of within-day gas flexibility

3.4.1 Investment in other gas storage facilities

3.4.1.1 The gas storage facilities discussed above are also able to provide the within-day flexibility that is required to provide gas for changes in demand primarily as a result of weather changes. As has been described above, the requirement for such flexibility will increase due to the development of wind generation, which is intermittent given that an appropriate level of wind is only available for around 30% of the time.
3.4.1.2 Flexibility can be provided by facilities such as Preesall to input additional gas into the NTS or to take gas out of the NTS. For example, if Preesall is inputting 5 mcmd (million cubic metres per day) into the NTS, if there is an increase in wind generation, there would be too much gas into the NTS as CCGTs would not need it. In this example, Preesall could switch to taking gas out of the NTS and take 5 mcmd out of that system. The use of the Preesall facility will allow wind and CCGT generators to provide the necessary flexibility required with high levels of wind generation. The use of gas storage is the most efficient way to provide the necessary flexibility, in effect this allows the storage of electricity with significant environmental benefits.

3.4.1.3 A locational advantage of Preesall is that it is close to a number of existing and proposed gas fired power generation plant. This is discussed in more detail in section 4.

3.4.1.4 The analysis by Poyry in relation to the wind and CCGT interaction together with the decline in UKCS production means that it is likely that, in due course, the majority of potential storage developments will be required.

3.4.2 Investment in additional onshore pipeline capacity with surplus linepack

3.4.2.1 National Grid does not have a policy of making any new investment to provide additional line-pack that can be used to support within-day changes in gas demand that occur. National Grid does offer a service with a small amount of line-pack to support shippers balancing of their supply and demand but it is limited in volume to less than 5 MCMD.

3.4.3 Reduction in wind generation with more base-load gas fired generation

3.4.3.1 As a result of the Energy Act 2008, the UK Government has a legally binding obligation to replace 15% of fossil fuels by 2020 with renewable energy. The development of wind generation is seen as critical in meeting that obligation. This requires gas fired generation as back-up which leads to the requirement for additional flexibility.

3.4.3.2 At the present time, it is not credible to believe that the UK Government will abandon its commitment to the 2020 target and hence reduction in wind generation is not a viable alternative.

3.5 Conclusions

3.5.1 Peak gas demand is forecast by National Grid to rise in the period to 2020. Given this, the decline in UKCS production means that additional gas storage is required in the UK.

3.5.2 It can be expected that depleted onshore oil/gas fields together with salt cavity storage will provide the majority of new storage in the UK. The advantage of such facilities is that because they are smaller and closer to market than offshore storage, they generally have more flexibility to increase or reduce
flow-rate. This is a characteristic that will become increasingly important as wind generation is developed leading to more flexible gas supplies for power generation.

3.5.3 In the context of salt storage projects, Preesall is particularly attractive because of its proximity to the NTS in the North West, which has surplus capacity, and to gas fired power generation plants which will be critical in providing back-up to wind generation.
4 Specific Need for Preesall Storage

4.1 Suitable Storage Sites
4.1.1 As stated above there are very limited opportunities to build relatively low cost storage facilities in the UK. Shallow salt cavern storage of the type proposed by Preesall have the ideal operating characteristics for the 2020 energy market. There are limited other suitable sites for shallow salt storage development in the UK.

4.1.2 Preesall presents an ideal opportunity to develop a facility that could be used for decades to come with a lower carbon footprint than similar facilities.

4.2 Offshore Storage Costs
4.2.1 Offshore storage has always been expensive compared to onshore storage due to the high capital cost uplift for offshore developments compared to onshore. This explains why there are only 3 such projects in the EU.

4.3 Locational Benefits
4.3.1 The ability of gas from Preesall to enter the NTS at a location where there is spare capacity is attractive for UK consumers in that National Grid may not have to make any significant investment to accommodate Preesall gas flows.

4.3.2 In addition, the area close to the location of Preesall is a critical area of the NTS located between gas inputs at Barrow to the North and Milford Haven to the South respectively. Inputting gas at the heart of this network is attractive because it can be directed down a number of different pipelines, providing flexibility to National Grid. It is also close to five existing UK CCGTs and three planned CCGTs, which will be increasingly important in the provision of electricity if the UK is to meet its climate change targets by 2020.

4.3.3 Gas moves relatively slowly through the NTS (around 30 mph) and hence the changes in demand for gas caused by the wind-CCGT interaction cannot easily be met by pipelines moving gas over long distances. NTS line-pack may be able to provide some short term flexibility, but this is limited in volume and duration. Preesall’s location can provide more of the necessary flexibility due to its proximity to CCGTs.

4.3.4 Figure 16 below shows the NTS around Preesall, including the compressor stations, and the existing and proposed CCGTs that are located within around 100 miles. The reason so many plants are in this area relates in part to the development of the electricity grid when the UK had a large coal industry and the majority of electricity came from coal fired generation.
Figure 16 NTS, Compressor Stations and CCGTs within 100 miles of Preesall
4.3.5 The Morecambe Bay Gas Fields were developed by British Gas as a super peaking gas supply. Now almost 30 years old, the Morecambe gas production is low and the fields can no longer provide significant swing capacity. Preesall has the ability to replace the declining swing capacity of Morecambe Bay gas.

4.4 Economic and Environmental Benefits of Shallow Salt

4.4.1 Existing alternatives to Preesall where salt cavities have been developed are typically deep salt caverns. These require much higher pressures to operate flexibly (250 bar maximum) whereas Preesall only operates at a maximum pressure of around 95 bar.

4.4.2 If we compare the energy consumption costs under the operating conditions that are needed to deliver a quick response for the provision of 1 mcmd of flexibility, the results are shown in Figure 17 below.

4.4.3 This calculation compares the primary energy used to compress 1mcmd of gas into a shallow store (such as Preesall) compared to a deeper salt cavity store. When the gas is extracted from the store, it must be heated to prevent hydrate formation and meet the gas grid temperature requirements. So energy is needed both for compressing gas into store and withdrawing it. The analysis shows that the primary energy associated with a shallow store is significantly lower than for a deep store. There is therefore a corresponding saving in CO₂ produced from energy consumption.
Figure 17 clearly shows that the combined energy consumption (energy used to generate electricity and to make heat) for shallow salt is only 0.9 MWh compared to 6.4 MWh for deep salt; so only around 15% of the energy used to provide the flexibility service. A similar relationship would be expected with regard to CO$_2$ emissions and this represents an important benefit from Preesall.
4.5 Comparison with alternative sources of within-day flexibility

4.5.1 As stated above the only viable alternatives to provide within day flexibility are storage facilities, which could include LNG importation sites. As stated above, it is considered that shallow salt sites like Preesall provide the lowest CO$_2$ emission option of all the storage options.

4.5.2 LNG facilities have the potential to vary their outputs but this may conflict with their underlying supply strategy of the users of their facilities. When National Grid contracted with Isle of Grain LNG for an Operating Margins service the cost of this service was substantially higher than the regulated prices for their own LNG facilities.

4.6 Other benefits

4.6.1 There are a number of additional benefits from Preesall’s location:

a. **Excellent water source**: Leaching salt caverns requires large amounts of water. Proximity to the sea allows the use of seawater for cavern washing and avoids significant demands on fresh water resources. Preesall’s location offers the opportunity to use the Fleetwood fish docks as a water source. This is particularly beneficial to the project as it allows the use of under-utilized infrastructure and avoids the need for construction of significant new water intake structures.

b. **Large reliable existing electrical connection**: The ICI Hillhouse complex at Thornton has historically been fed from the Stanah substation. The Stanah substation is one of the most robust and reliable connections to the NTS electrical grid. The Stanah feed to the Preesall project allows quiet, environmentally friendly electrical gas compression to be used and minimises the amount of new electrical infrastructure needed to supply the Preesall project.
Appendix A - National Energy Policy

A1 Introduction
A1.1 There are many specific references that have been made in national energy policy on the role of gas storage in the UK in improving energy security and market efficiency. Gas storage also plays a role in supporting the development of renewable energy sources, and in particular wind power. The need for more gas storage is essential and this is recognised in national policy including the Statement of Need issued by the Energy Minister to Parliament on 16 May 2006.

A1.2 In April 2006, the Department for Trade and Industry (DTI) Joint Energy’s Security of Supply Working Group (JESS) highlighted an increased need for new gas supply along with investment in infrastructure projects to meet annual demand as well as seasonal and daily fluctuations in demand. It considered that gas import dependency within the UK will rise to about 80% by 2014 – 2015. Presented in this report was a list of known and potential projects that will be necessary to meet demand peaks in the event of severe weather in the winters of 2006 – 2007 and 2007 – 2008. The use of the Saltfleetby gas field for gas storage was listed as a planned project. The JESS work led directly to a certain amount of urgency to develop more gas storage.


A1.4 The Statement said that investment was being made to improve UK gas infrastructure “the projects have the potential to make a real difference to our gas supply infrastructure; by 2010, our storage capacity could more than double and our import infrastructure is planned to more than triple” (Page 1, paragraph 5).

A1.5 As it turns out, by 2010 there has only have been an increase of UK gas storage capacity of around 23%, reflecting the difficulties associated with developing new gas storage projects

A1.6 There have been other statements by Government Ministers that reinforce these points, both from the previous Labour Government and the new Coalition Government. Some short extracts are provided here from national policy statements, together with comments on their significance to this report. All the relevant publications are listed in the document reference section in the Appendix.

A2 UK energy policy on security of supply and the role of gas storage
A2.1 A number of statements are made in the 2006 Statement of Need regarding the need for storage infrastructure and its role in ensuring security of supply. One summarising reference is made which is relevant to this report. It is on page 3 of the main summary.
A2.2 “In summary, we need timely and appropriately sited gas supply infrastructure to be delivered by the market, because:

a. Great Britain is becoming increasingly dependent on gas imports, and requires new gas supply infrastructure to help ensure security of supply;
b. New projects enable extra supply and storage options if they proceed without avoidable delays;
c. There are limited locations currently suitable for much needed gas storage projects;
d. Onshore storage is needed to enable slow-moving gas to be available close to market when consumers require it;
e. New energy infrastructure projects provide national benefits, shared by all localities.”

A2.3 This represents a clear case for gas storage in relation to security of supply and proximity to market. The additional focus on the 2020 renewable energy target and the need for CCGTs to provide flexible back-up to wind generation represents a new development since 2006.

A2.4 J.Havard and R.French of the Energy Markets Unit of DECC produced a paper that was included in the Geological Society, London, Special Publications 2009; v. 313; p. 13-15 doi:10.1144/SP313.2. In this paper they explain in some detail the importance of storage to the UK energy market. On page 13 they state.

A2.5 “Therefore close-to-market storage infrastructure is substantially more important to us now than it was when we had significant indigenous supplies. Our gas production from the North Sea previously reduced our need for gas storage, as compared to some of our European neighbours who lack indigenous supplies. Now, to replace the capability of the southern North Sea gas fields and the Morecambe Field in Morecambe Bay, which have traditionally provided increased gas supply to meet seasonal peaks in demand (e.g. in winter), we need more storage than we have required in the past.”

A2.6 On page 14 they comment on the fact that storage facilities can only be located in very specific geographical locations, but can provide national benefits

A2.7 “Due to geological limitations, applications from developers to construct such facilities may be more common in some parts of Great Britain than others. Although such facilities may not always appear to convey a local benefit, they do provide crucial national benefits, in which all localities share. In particular,
they add to the reliability of national energy supply, from which every user of the system benefits.”

**Energy White Papers**

A2.8 The need for increased gas supply infrastructure, and a regulatory environment to allow such infrastructure to be delivered to the market in a timely fashion, was set out by the Government in the Energy White Paper of 2003 (DTI 2005a): Our Energy Future — creating a low carbon economy. This identified four challenges, one of which was securing the reliability of energy supplies. This remains integral to an energy policy that meets the needs and expectations of all energy consumers. It was considered as part of the DTI’s Energy Review (DTI 2006a) and in the 2007 Energy White Paper which said:

A2.9 “Hence, as highlighted by respondents, to manage future gas security of supply risks better, Government will take action to (amongst other things) increase gas storage and import infrastructure by facilitating the construction of gas supply infrastructure both onshore and offshore, through reforms to the planning and licensing regime”.

A2.10 This demonstrates that the Government is concerned in relation to the development of new gas storage, a theme that is developed later in the report.

**Department of Energy and Climate Change – The Importance of gas storage to the UK – The DECC Perspective**

A2.11 The last Energy White Paper to make specific reference to the role of gas storage in national energy policy was published in May 2007. These references to gas storage in summary relate to the following material points for the inquiry:

A2.12 "Increase gas storage and import infrastructure by facilitating the construction of gas supply infrastructure both onshore and offshore, through reforms to the planning and licensing regime" (Page 120 – para 4.54 – third bullet)

A2.13 And:

A2.14 "Delays to new infrastructure projects can also affect the demand/supply balance for gas, which although not necessarily leading to shortages, can contribute to higher energy prices" (Page 255 – para 8.11 – fourth sentence)

A2.15 In addition, in the Energy Act 2008, the UK Government adopted a legally binding target to replace 15% of the fossil fuels used in 2020 with renewable energy. The Government Renewable Energy Strategy (July 2009) aims to reduce fossil fuel demand and support the development of renewable energy such as offshore wind. CCGT power generation is seen as critical in ensuring electricity supply is maintained when there is no wind. CCGTs can provide
flexible electricity but also require flexible gas supplies, which can best be provided by local gas storage. The attractiveness of the Preseall location for the provision of flexibility is explored later in this report.

A2.16 The latest Energy White Paper published in July 2009 made some general references to gas storage, although the focus of this paper was renewable sources of energy. These in summary are:

A2.17 “The UK’s gas import capacity has increased more than five-fold over the last decade as a result of private sector investment, and more capacity is under construction. The Government introduced the 2008 Planning Act to reform planning consents procedures, and this will enable the timely development of onshore gas storage projects, and the 2008 Energy Act paves the way for a consents regime for offshore proposals, such as storage and unloading facilities. The new tax relief for cushion gas (required to provide pressure within gas storage facilities) will provide a further incentive to invest in storage capacity.” (The UK Low Carbon Transition Plan - Page 106 – last paragraph)

**Department of Energy and Climate Change – Energy Markets Outlook**

A2.18 The Energy Markets Report published in December 2008 has a number of references to the importance of gas storage in ensuring continued security of gas supply in the UK. A number of these are given below.

A2.19 “There is expected to be increasing diversity of the potential sources of gas supply to the UK, though there are widely differing views on the future sources of gas. For the medium and longer term, further investment in additional import and storage capacity is likely to be required. In particular, the need is recognised for additional gas storage in the UK over the coming years as UKCS supplies continue to decline and the UK becomes increasingly dependent on imports. Maximising the diversity of sources of supply and additional investment in import capacity are important in the medium term if the UK is to be able to maintain the position of being able to meet demand in the event of interruption to another supply route.” (Page 9 – para 2.9)

A2.20 “Higher levels of import dependence bring new risks. These are not necessarily any greater than the risks to indigenous supplies (which may arise, for example, due to technical difficulties, adverse weather conditions or problems with industrial relations) and they cannot be avoided altogether. They therefore need to be managed. Options for doing this, all of which are under way, include:

- Facilitating and encouraging investment in gas storage and import infrastructure to maximise the diversity of options available for gas supply;

A2.21 “The Government is encouraging new investment in gas storage and import infrastructure through reform of the planning and consents regulatory framework to ensure that it is clear and consistent and reflects the national need for new infrastructure.” (Page 59 – para 5.3.2)
**Report on Energy Security by Malcolm Wicks, the Prime Minister's Special Representative on International Energy (August 2009)**

A2.22 In his report, he makes a number of points in relation to gas storage including:

a. *UK levels of gas storage are much less than those in a number of other EU member states. In the past, indigenous production has meant that this was not problematic.* (Page 121, paragraph 6.52).

b. *Discussions with a number of market players during the review showed agreement that we will need substantially higher amounts of storage in future. A lack of adequate storage compromises our ability to respond quickly to emergencies by rapidly introducing additional gas to the market. More than two-thirds of existing storage is in the Rough facility. It could leave us vulnerable if, as in 2006, access to Rough was disrupted (in that case, by an accidental fire).* (Page 121, paragraph 6.53)

c. *A number of players in the gas market have plans for more commercial storage. There has been only limited development of new gas storage projects in recent years, and the amount built has consistently failed to meet earlier projections, but the Government has recently made welcome moves to streamline the planning process and on the tax treatment of ‘cushion’ gas in Budget 2009.* (Page 121, paragraph 6.54)

A2.23 The Prime Minister of the time welcomed the report and said:

A2.24 "We are already taking a number of responsible far-sighted steps to put the UK on a secure, low carbon, affordable energy footing in the long-term and I am grateful for the work undertaken by Malcolm Wicks. The ability to maximise domestic energy reserves and establish homegrown energy sources is vital alongside the UK’s ability to pull on every lever internationally in support of energy security". (Source www.malcolmwicks.org.uk/energy – 2nd from last paragraph)

**Gas Security of Supply - A policy statement from the Department of Energy and Climate Change – April 2010**

A2.25 This document makes a clear statement on page 2 para. E3 regarding the role of gas into the future with particular regard to the provision of flexibility.

A2.26 “However, as the cleanest and most reliable fossil fuel, gas will continue to play a central role in the UK’s energy mix out to 2020 and beyond. In particular, gas-fired electricity generation will help to maintain system flexibility as intermittent, renewable generation is scaled up.”

A2.27 There is continued support for storage projects and further action will be taken if there are barriers to development (page 5 para. E16).
A2.28 “Currently, 22 commercial gas storage projects are planned, which could quadruple GB’s gas storage capacity by around 2020. The Government will continue to monitor closely the progress of individual projects, in case any further barriers emerge that require Government intervention.

A2.29 This document also makes specific reference on page 52 paras.5.57 to 5.59 to the consideration of stronger obligations around storage capacity. Further work is being done in this area by Ofgem.

A2.30 “The Government has given some consideration to the case for strengthening shipper/supplier obligations. This could be done, for example, through Public Service Obligations (PSOs) and could work as an enhancement of the supplier security statement considered above. These options involve significant Government intervention into the market. While our initial analysis of these options has identified a wide range of disadvantages, the Government considers that it would be prudent to build up a more detailed understanding of the costs and benefits.

A2.31 Subject to a detailed assessment of the costs and benefits, the Government intends to keep the following measures under review:
- a supply security obligation (including Supplier Obligation Certificates);…..”

The Coalition Programme - May 2010

A2.32 This programme outlined some specific measures that will impact energy security and hence gas storage.

A2.33 “We will reform energy markets to deliver security of supply and investment in low carbon energy….“

A2.34 “We will instruct Ofgem to establish a security guarantee of energy supplies.”

Energy Bill 2011 – December 2010

A2.35 This Bill contains reference to providing Ofgem with the necessary powers to implement changes to the emergency cash-out arrangements, which are the first steps towards improving national security of supply.

A2.36 “Establish powers for Ofgem to require changes to be made to the Uniform Network Code so as to strengthen market incentive mechanisms for ensuring sufficient gas is available during a Gas Supply Emergency.”
A2.37 *Electricity Market Reform (Oral Statement to Parliament by Rt Hon Chris Huhne) – 16th December 2010*

A2.38 This Statement outlines the reforms that are proposed for the Electricity Market. Of particular note are the following statements reflecting the increased reliance on gas in this market.

A2.39 “So we must build the next generation of power stations, and act to ensure there will be enough reserve capacity to meet our needs. Together with renewables, we will need new gas-fired power stations and new nuclear plant.”

A2.40 “Today, we are proposing new incentives to drive investment, while protecting the rules for investments already made. The focus will shift permanently from conventional fossil fuel-fired electricity to low carbon technologies – renewables, nuclear and cleaner fossil fuels.”

A3 **Ofgem**

A3.1 In March 2009, Ofgem launched Project Discovery to review what they see as key challenges for the UK energy market including:

a. GB has demanding new carbon targets - reductions of 80 per cent by 2050 and an urgent need to plug the generation gap as coal and oil plant comes off the system to meet 2015 European emissions limits.

b. Britain’s exposure to global gas markets is increasing. Dependence on imports could be as high as 80% by 2020. There are also nearer term risks from this increased dependence on volatile international gas markets, as we saw last winter in the Russia/Ukraine crisis.

c. GB is experiencing a worldwide financial crisis, which threatens investment and highlights the risk that existing market arrangements may not be sufficient to protect consumers’ interests.

d. The amount of investment needed to hit environmental targets leaves no room for delay in medium term expenditure: some £50 billion is needed by 2020 to meet environmental targets; 33GW of renewable generation from 3GW today.

e. On the supply side, there are concerns regarding whether investment in additional capacity and infrastructure in Russia and elsewhere will be sufficient and timely enough to meet the increasing demand for imports to the EU.
A3.2 On page 1, para. 3 Ofgem summarise the content of this consultation as follows.

A3.3 “As part of this Initial Consultation we have undertaken a thorough review of the current gas market arrangements, and we present a range of options for reforms to enhance gas security of supply. These options include reforms to the gas emergency cash-out arrangements, as well as enhanced obligations on suppliers and/or National Grid Gas (NGG). GB has not been subject to a gas supply emergency and all the options are designed to decrease the likelihood and/or duration of such an emergency. Our preliminary view is that the options would produce significant benefits which would outweigh any impact on gas prices if an emergency were to occur.”

A3.4 One of Ofgem’s objectives (page 2) is to “minimise the likelihood of an emergency occurring, by encouraging gas shippers/suppliers to take out sufficient insurance (e.g. in the form of long-term contracts and storage capacity).”

A3.5 Ofgem are picking up the themes that have been developing in the UK gas market in the past decade and are all addressed by the Preesall development – increased dependence on imports, risk to security of supplies due to a severe winter, financing uncertainties and the wind-gas CCGT interaction.

A3.6 As part of Project Discovery, on 9th October 2009, published a comprehensive review of UK energy supplies in their Energy Market Scenarios document. The following extracts are from Page 8, paragraph 1.14

a. “Gas import dependency will increase dramatically, especially where environmental measures only achieve partial success, exposing the country to a greater range of potential supply shocks.”

b. “The greatest risk to security of supply appears to be maintaining gas supplies through a severe Winter.”

i. Uncertainty relating to the impact of environmental policy makes forecasting future gas demand much more challenging for potential investors than might have been the case historically. This may delay investment in gas infrastructure that might be required should environment measures not fully deliver

c. “Gas import dependency could be exacerbated by growth in gas-fired power generation to replace lost nuclear and coal fired capacity in some scenarios.”

d. “A rapid expansion of renewables would lessen the risk of gas import dependency, but would require thermal plant to operate more flexibility to manage variability in Wind output, which may require further investment;
and a more flexible demand side may be required in the future to better manage any shocks in gas or electricity supplies.”

A3.7 Subsequent to this review Ofgem published a more detailed assessment of the market arrangements on the 3rd February 2010 entitled “Project Discovery - Options for delivering secure and sustainable energy supplies.”

A3.8 They proposed a range of policy options, which will have a direct impact on the requirement for gas storage. The document contains specific reference to enhanced commercial incentives for gas shippers/suppliers to make provision for their customers in emergency gas supply conditions, enhanced supplier obligations and strategic storage.

A3.9 This has now been developed further in the recent consultation by Ofgem published on the 11th January 2011 entitled “Gas Security of Supply Significant Code Review (SCR) Initial Consultation.”

A4 Interpretation of National Energy Policy

A4.1 By Inspectors appointed by the Secretary of State for Energy and Climate Change

A4.2 In the context of a previous Planning Enquiry for a new storage facility at Saltfleetby in Lincolnshire the Inspector concluded that the Saltfleetby storage facility was consistent with the themes of National Energy Policy and in conclusion stated that “Accordingly, the proposed scheme complies in all respects with national energy policy.”

A4.3 This report demonstrates that there has not been any change in National Energy Policy since the 22nd March 2010 the date of the Inspectors report into Saltfleetby.

A5 Strategic Storage and the EU 3rd Directive

A5.1 To date DECC have dismissed the possibility of creating a strategic gas reserve in the UK on the grounds that the many disadvantages of this type of storage (which ultimately lead to higher consumer costs) far outweigh the advantage of having the reserve in place to provide some protection against market failure, claiming that in fact it may contribute to market failure. Strategic gas storage is however certainly a feature of other Member States most notably Italy and Hungary.

A5.2 There has been some discussion in the EU regarding the requirement of Member States providing some form of strategic gas reserve, but the only specific legislation produced to date that may have some impact on this area
is the new Regulation 994/2010. This does not contain any specific reference to a strategic reserve but does set out some clear requirements for Member States to work more widely with its’ neighbours to develop strategies that will allow assistance to be provided should there be a national gas supply shortage. The details of how this will affect the UK are yet to be developed, but it is clear that Ireland’s heavy reliance on gas for electricity generation and the planned steep rise in their reliance on wind generation, particularly in the South, will require support from the UK mainland. Storage located in the vicinity of the export route to Ireland could provide that support.

A5.3 In addition the Treaty between UK and Ireland makes provision for supplies to continue to be provided to the Irish gas customer, in the event of a National Gas Supply Emergency on the UK mainland and under the same conditions that would apply on the mainland. Again storage located in the vicinity of the export route to Ireland could provide that guarantee.

A6 Conclusions

A6.1 There are clear statements from the UK Government, National Grid and Ofgem that they are supportive of the development of new storage facilities to provide increased security of gas supply. This is essential given the increasing reliance on imported gas from around the world. The 2008 Planning Act identifies underground gas storage as nationally significant infrastructure.