

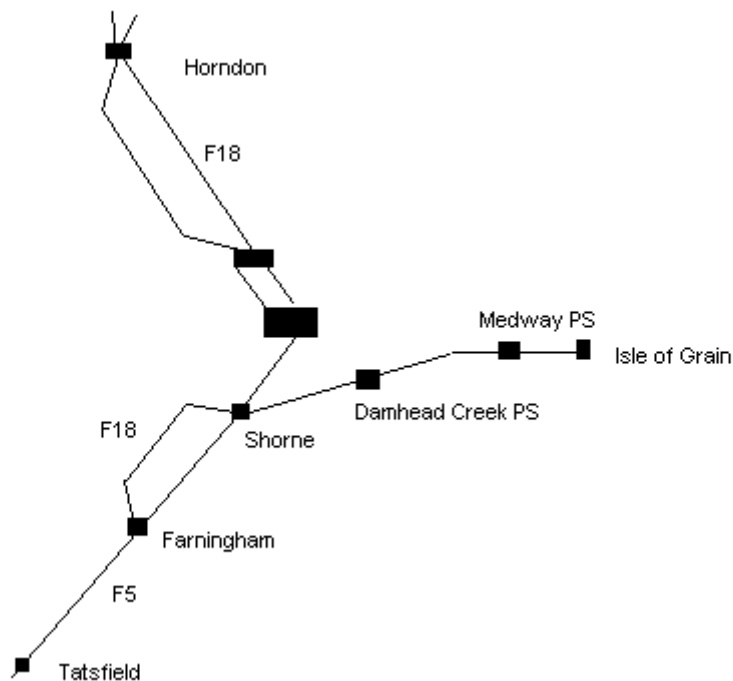
## Q-2.1 Penetration of higher oxygen gas from grain into the NTS or Zone of influence

### ANSWER

In order to assess the impact of the proposal to raise the oxygen limit at the Isle of Grain, DNV GL were commissioned to carry out a study and risk assessment of the proposal. The risk assessment was carried out according to the process outlined in T/PM/GQ/8 Management Procedure for Assessing the Requirements for Gas Quality, Calorific Value and Flow Measurement Systems.

As part of the risk assessment a zone of influence was established, the following is an extract from the DNV GL report.

*"As previously stated, establishing the zone of influence of Grain LNG was fundamental to this assessment as this directly determines the type of end users that might be affected. The Isle of Grain (IoG) LNG import terminal exports vaporised LNG, which has been ballasted with nitrogen, into the National Transmission System (NTS). Gas from IoG is supplied to Medway and Damhead Creek power stations prior to entering the main transmission system at Shorne. A schematic of this network is shown below.*



Network Schematic of Isle of Grain Connection to the National Transmission System

#### Network Schematic of Isle of Grain Connection to the National Transmission System

Under normal operation and gas demands gas flows south down Feeder 18 to supply the South East region. Under extreme conditions it is possible that transmitted gas could reach Avonmouth to the west however it is considered very unlikely, particularly with gas being supplied by South Hook and Dragon. If Bacton supplies were shut off due to maintenance or a major failure at Bacton terminal, it is possible that IoG gas could be transported north and exported via Interconnector to Europe. During the last 5 years IoG gas has been conveyed north along Feeder 5 to Horndon but has not been reported as far north as Yelverton, (approximately 30 miles south of Bacton). However network analysis on the previous five years revealed that the Exit Point may be in a position to export Isle of Grain originated gas to the continent on around 40 days per year. During the summer months, demand at the Exit Point for gas to reach the continent is higher. In order for the gas from Isle of Grain to reach the Exit Point, the Isle of Grain inputs in would have to be particularly high, as maybe the case as the IoG site is expanded. If flows from other entry points,

for example Theddlethorpe and Easington, reduce then IoG gas may be more likely to be pushed further up the network.

At an IGEM seminar in 2010 National Grid presented the following diagram indicating typical flow pattern for periods up to 2020. [5] Confirming the possibly that IoG gas could flow North but that flows west, towards Avonmouth, are unexpected.

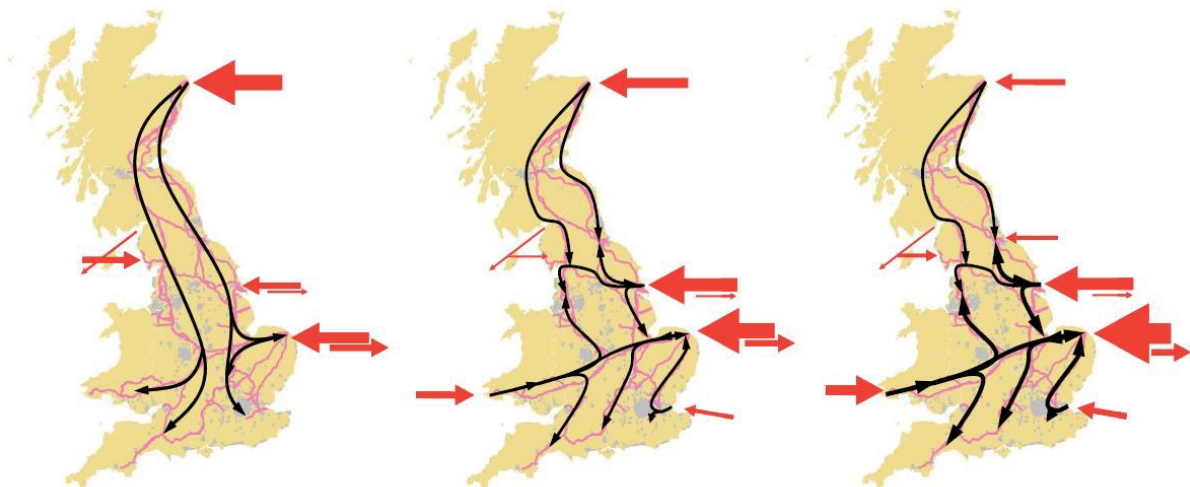
## Typical gas flow patterns

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Mid 1990's to 2005

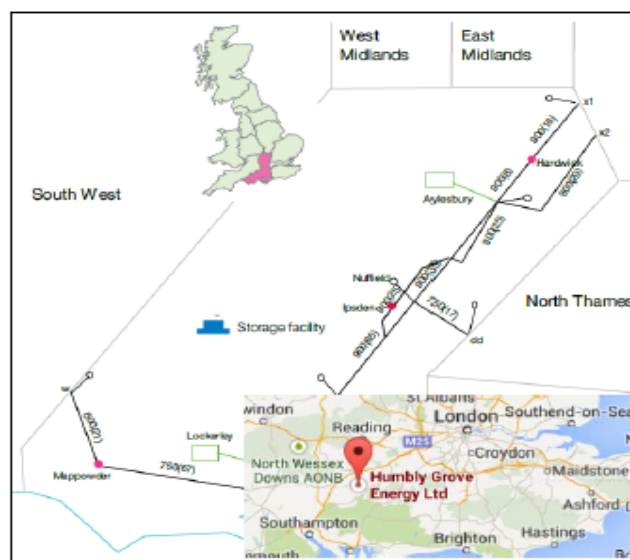
2010

2020



Typical Gas Flow patterns: IGEM Industrial Affiliates – Kegworth, 9th November 2010

The only other significant gas facility within the zone of influence is the Humbly Grove Underground Gas Storage site located at Alton, Hampshire. As shown on the map and transmission schematic below. It is considered highly likely that Humbly Grove will receive IoG gas as it has been recorded at Ispden. (Note; located in red on the figure below.)



Location of Humbly Grove Underground Storage facility

*It is important to consider future developments that could impact on the operation of the network. For example expansion of the IoG could see significantly higher gas flows to Bacton and hence possible export to Zeebrugge via the IUK Interconnector. The risk of gas reaching Avonmouth will be removed when the site stops operations at the latest in 2018, but possibly as early as April 2016 [6]."*

It should be noted that any further expansion at the Isle of Grain would be subject to approved modifications to the NEA, and also that the Avonmouth Storage site has now ceased operations.

#### **Q-2.1 Potentially a move from nitrogen ballasting to air ballasting at Grain**

##### **ANSWER**

The assumption that IoG terminal is moving from nitrogen ballasting to air ballasting is incorrect. The terminal has never had any intention of switching from nitrogen ballasting to air ballasting and hence will continue to utilise a nitrogen ballasting system in order to comply with GS(M)R gas specifications. The reason IoG terminal has proposed a modest increase to the oxygen content limit is to accommodate supply of LNG from the US shale gas market. The terminal has been advised by two of its shippers that future cargos from US which could be offloaded at the Isle of Grain Import Terminal may contain oxygen at a concentration of up to 60 ppm. During the unloading process this LNG will be mixed with rest of the terminal stock hence the actual send out should not therefore exceed 60 ppm O<sub>2</sub> and there is no likelihood of a continuous stream of 200 ppm O<sub>2</sub> gas from Grain to the NTS.

During the process of unloading an LNG ship additional quantities of gas are produced and exported to the Local Distribution Zone as part of the unloading process. The gas produced during the offloading process is richer in the lighter compounds of the LNG, i.e. it preferentially contains higher quantities of nitrogen, and in this case oxygen. This gas could contain upto 200 ppm oxygen, but it is exported into the LDZ only and will have no impact on the NTS and cannot therefore affect the gas storage site at Humby Grove. It is also limited in duration, to the duration of the ship offloading process which would normally take around 24 hours.

A change in the oxygen limit will not require IoG to change the site plant process operations and therefore there will be no impact on the terminal operating costs as the site plant process operations will remain unchanged.

#### **Q – Forecast of Grain LNG Utilisation & US Shale imports.**

##### **ANSWER**

IoG's customers have indicated that new supply coming on-line is likely to seek a home in Europe due to weak demand and depressed prices in Asia, leading to an increase in utilisation of the site's annual gas export delivery capacity, from the current 5% upwards towards 20%.

Certain customers have entered into supply arrangements with US liquefaction projects and would like to deliver additional volumes into the IoG as a result. Unless the oxygen limits are increased, this volume will need to find an alternative home. As the UK currently relies almost entirely on Qatari LNG, it seems that facilitating volumes from alternative sources would be highly beneficial to security of supply, which hinges on diversity of supply. Currently, IoG would be forced to reject any request to offload a US cargo with higher oxygen content.

IOG's expectations are that should the level of utilisation reach upwards of 15-20%, US shale gas would account for 40-50% of the utilisation.