

# World's first LNG onboard regasification port

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February 20th 2007 saw the first ever flows of natural gas from a liquefied natural gas (LNG) ship directly into the onshore natural gas grid – the culmination of a remarkable 12 month project to create the fastest and lowest cost LNG importation facility in the world.

John Baldwin, senior consultant with UK gas consultants Gas Strategies, tells the story of the groundbreaking Teesside GasPort project.

## Excelerate Energy

Throughout Europe and America, around 30 LNG importation terminal projects are being developed, including two new facilities at Milford Haven which will be completed in early 2008. A typical LNG re-gasification terminal takes five years from initial planning to completion and costs around £400 million, comprising at least two LNG storage tanks and plant to regasify the LNG before exporting the gas into the high pressure gas grid.

One company has a different approach. Rather than investing £400 million in each regasification facility, Excelerate Energy has developed technology to allow the LNG to be converted back into natural gas onboard the ship, with natural gas going direct into the high pressure pipelines. It costs around £40 million extra to modify a standard LNG ship into an Energy Bridge Regasification Vessel (EBRV) to allow offloading of gas as high pressure gas, either via a connection into an offshore pipeline or, as at Teesside, to flow directly into the national gas grid.

So, for £400 million, Excelerate can have a number of ships, currently three in service with others being built in Korea to give a total fleet of nine ships by 2010 (eight EBRVs), and a number of access points such as Teesside, which also cost about £40 million each. This means that Excelerate can place regasified LNG into the highest value markets around the world – in Europe, North America or Asia without the necessity of having constructed a conventional LNG import and re-gasification terminal.

## Why GasPort and why Teesside?

This successful outcome was by no means inevitable. The story begins in late summer 2005, when Excelerate was alerted to the rise in UK gas prices caused by the decline in North Sea production coupled with delays to the completion of new gas import infrastructure. Excelerate commissioned industry consultants Gas Strategies to identify a port in the UK that could accommodate Excelerate regasification vessels and allow a new source of gas to come to the UK market.

Excelerate Energy and Gas Strategies reviewed all ports in the UK and selected Teesside based on:

- Sufficient water depth to accept a large LNG vessel (65,000 tonnes of LNG)
- Access to the UK gas grid – the National Transmission System (NTS)
- Jetty availability
- Source of high pressure nitrogen for gas blending purposes
- Favourable planning environment which allowed the possibility of a fast-track project



Figure 1. Excelerate Energy has developed technology to allow LNG to be converted back into natural gas onboard the ship, with natural gas going direct into the high pressure pipelines.

Photo courtesy: Ian Clowes

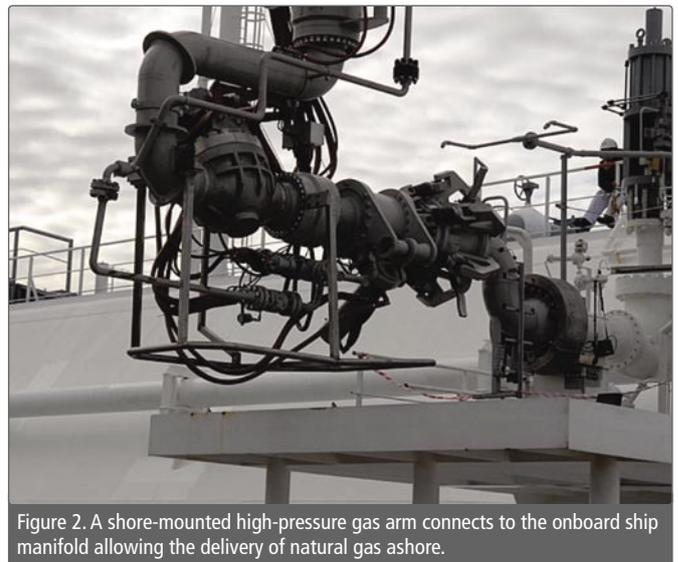


Figure 2. A shore-mounted high-pressure gas arm connects to the onboard ship manifold allowing the delivery of natural gas ashore.

Photo courtesy: Ian Clowes

Excelerate Energy supported by Gas Strategies identified two possible locations on Teesside and carried out a detailed evaluation to identify the most appropriate site, culminating in the decision, in February 2006, to progress the development of a refurbished jetty located on the site of a former Shell oil refinery. Given its history of receiving large vessels, a sufficiently deep berthing pocket was available alongside the jetty to accommodate the draught of the EBRVs. This limited dredging to restore the pocket to its design depth minimised the additional marine work required.

At this time, Excelerate supported by Gas Strategies began discussions with the local port authority, PD Ports, for land and jetty access. In the months following this decision, Excelerate retained MouchelParkman to provide engineering and development services, px Holdings Limited to provide operational services, Murphy Pipelines Limited to provide design and construction services and BOC Limited to provide nitrogen supplies to the project and Watson, Farley and Williams to provide legal support. This was the team that worked together to complete the facility by early 2008.

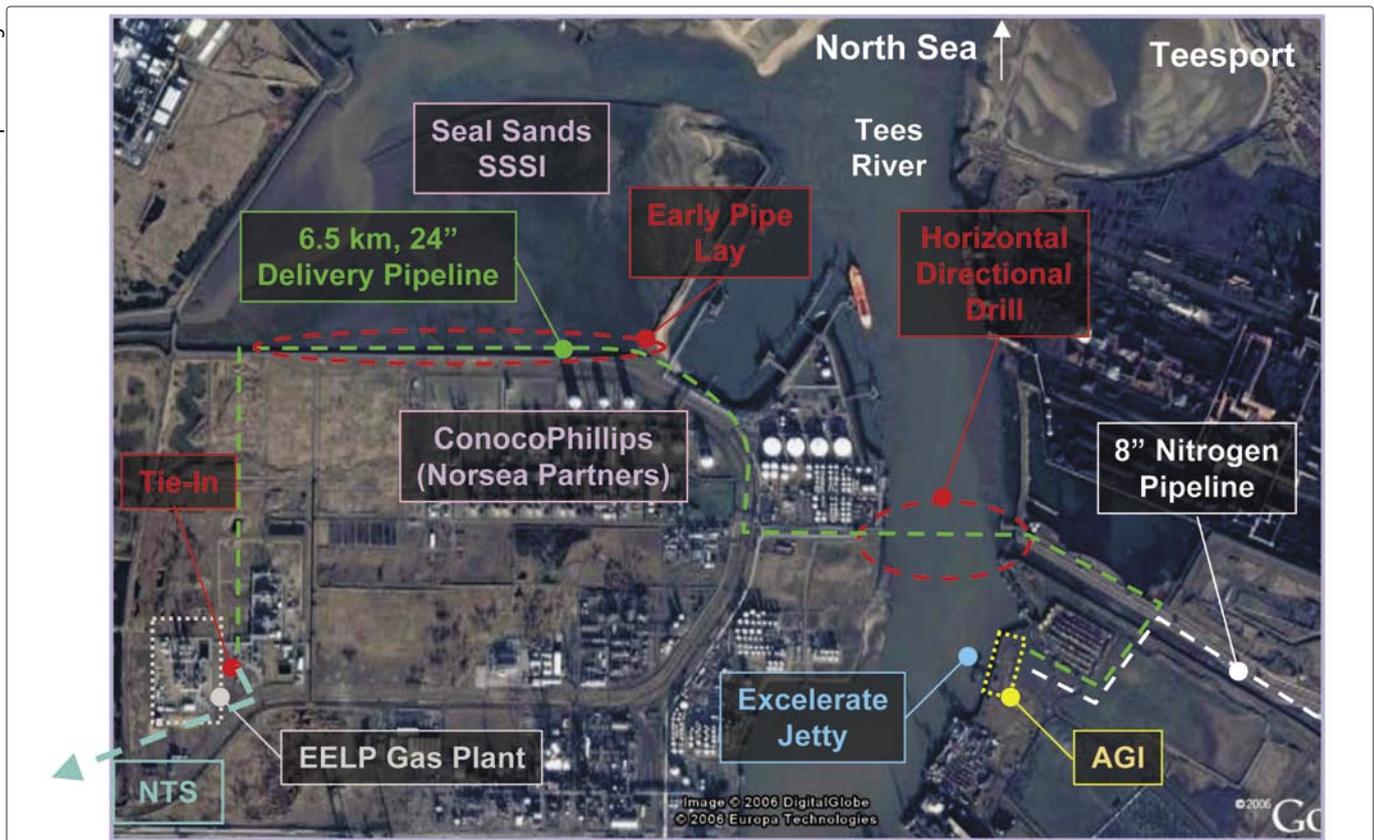


Figure 3. The Teesside GasPort design brings the EBRV alongside the reception jetty. A small above ground installation (AGI) is included in the design to provide for pressure control, metering and nitrogen blending.

## The basic design

The Teesside GasPort design brings the EBRV alongside the reception jetty, where a shore-mounted high-pressure gas arm connects to the onboard ship manifold allowing the delivery of natural gas ashore (see Figure 3). A small above ground installation (AGI) is included in the design to provide pressure control, metering and nitrogen blending. The nitrogen is required because most sources of LNG do not meet the specification for the UK gas grid as they are too rich to be safely burnt in UK gas appliances and hence ballasting with nitrogen is required. High-pressure nitrogen is delivered through an eight-inch pipeline from an existing BOC plant on Teesside (which makes oxygen and has nitrogen as a valuable by-product), enabling on-site conditioning of the natural gas so that LNG can be imported from virtually any location in the world.

From here the gas is piped a total of 6.5km (including going under the Tees) before connecting to the NTS. The project team opted to use existing facilities at the px gas processing plant, which processes gas from the CATS pipeline before it enters the NTS. This allowed a connection to the NTS in a shorter time period and at lower capital cost.

## Planning

Clearly, it was not a straightforward task to complete the works from planning to commissioning within 12 months. The Energy Bridge ships and GasPort infrastructure are designed to be flexible, but successful completion of the project required a team with a wide variety of strengths working together efficiently.

The port operator, PD Ports, was a key member of this team, demonstrated during the planning phase. South of the Tees is Redcar and Cleveland Borough Council, north is Stockton Borough Council. Planning permission for the gas and nitrogen pipelines and all associated infrastructure was granted by both local planning authorities on 31 August, 2006, just 12 weeks after

being submitted. A full Environmental Impact Assessment had been carried out to reduce the risk of statutory consultees such as English Nature objecting to the project which included laying pipelines next to a Site of Special Scientific Interest (SSSI). PD Ports' relationships with the Local Authorities was a key success factor – had planning taken 16 weeks rather than 12 then it would not have been possible to complete the facility by February 2007.

In addition, PD Ports and the project team secured the support of regional trade associations and large industrial consumers in Teesside and across the UK such as Terra Nitrogen and Corus, which were helpful in securing permission in such a timely fashion. Likewise the UK DTI and the energy regulator Ofgem were supportive in demonstrating the need for the project, which was helpful in the planning process.

## Technical challenges

There were a number of technical, environmental and consenting issues to overcome during the 12-month project, and critical to success was an innovative, integrated team structure, including early contractor and operator involvement, which guaranteed a partnership approach to planning and problem solving.

Simply designing and building all of the required infrastructure in twelve months was difficult enough. More particularly, the 6.5 kilometre pipeline (24-inch diameter) connecting the AGI to the NTS had to cross a number of important UK pipelines including the 48" Ekofisk oil line (operated by ConocoPhillips), the CATS gas pipeline (operated by BP) and the pipeline supplying gas to Teesside Power Ltd, the UK's largest CCGT (1,875 MW). Ekofisk carries one million barrels per day – at \$60 per barrel it was critical that this was crossed with no incidents. The three pipeline operators were naturally concerned to ensure minimal risk to their assets – it was here that good local relationships with both PD Ports and px limited were helpful in gaining the necessary permissions in time.



Figure 4. The onshore gas pipeline.

Photo courtesy: Ian Clowes

Although one of the reasons that Teesside was selected for GasPort was the region's affinity with heavy industry, the project team had to manage the potential problems caused by an environmentally important Site of Special Scientific Interest (SSSI) being located next to the route of the pipeline connection to the NTS. In order to protect the birds that visit the site, English Nature made certain mandatory conditions including one that required Murphys to complete the laying of the 1.5 km section adjacent to the SSSI by 31 October 2006, only nine weeks from receipt of Planning Consent and three weeks after delivery of the new pipelines from Corus at Hartlepool (helpfully only 10 km away).

The main gas pipeline required a horizontal directional drill (HDD) under the River Tees for one kilometre. This was completed with pipe which was bought from E.ON who had procured it for a new project but did not need it in 2006 – this was a good example of a party not part of the project acting in a helpful way to facilitate new gas coming to the UK.

HDD's carry significant risk because the actual ground condition cannot be known until the drill takes place, and this task could have taken several months had anything gone wrong. However, the project team took advantage of the fact that BOC had drilled in the same area five years earlier and used the same HDD contractor, with the new HDD completed on schedule eight weeks after start.

The AGI and pipeline connecting the jetty to the NTS required HSE approvals, which were obtained by treating these assets as additional assets covered by the existing px Safety Case – reducing the time required for these consents at the same time ensuring that high standards of operational safety were maintained.



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## The future

As it turned out, UK gas prices in January 2007 were lower than anywhere else in the world due to the mildest UK winter since the 17th Century! This meant that Excelerate ships delivered LNG cargoes elsewhere. However, an initial cargo was offloaded in February 2007 in order to commission the facilities... how much gas will flow next winter depends on the UK weather and the relationships between UK, European, US and Asian gas prices.

### ABOUT THE COMPANY

Excelerate Energy, L.L.C., based in The Woodlands, Texas, is a liquefied natural gas (LNG) importer and marketer that's redefining the way LNG moves around the globe. Excelerate Energy's fleet of Energy Bridge LNG regasification vessels combined in Excelerate GasNet with downstream investments in GasPorts and deepwater port Gateways give the company and users of GasNet the equivalent of a flexible, global 'pipeline' that can transport LNG from virtually any point to any other point – facilitating delivery to the highest value markets around the world. For more information please visit [www.excelerateenergy.com](http://www.excelerateenergy.com).

Gas Strategies provides innovative solutions to the challenges faced by its clients – solutions rooted in a deep understanding of the industry in which its clients operate. Unlike many firms, Gas Strategies consultants come mainly from major organisations in the natural gas and LNG sector and therefore its talent pool has an unrivalled depth of industry knowledge, perspective and expertise.

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