



### Chronology

- June 2002** Qatar Petroleum and ExxonMobil sign HoA for a fully integrated two-train LNG venture
- October 2002** Feasibility study proves project viability
- February 2003** Pre-Front-End Engineering and Design (FEED) work complete
- July 2003** FEED to commence for four sub-projects
- February 2004** Start drilling first development well
- September/October 2004** First jacket installation
- December 2004** Engineering, procurement and construction (EPC) awards
- 2H 2006** Expected accession of Total to second train
- Winter 2007/08** First gas sales in UK

## South Hook | The UK's next big step in LNG

Robert Hastings gives up-to-date project data on the landmark South Hook LNG development at Milford Haven, and explores how it and similar projects will ultimately revolutionise the UK's energy supply

### Project scope

- A US\$13 billion dollar mega-project employing full value chain integration, step-out technologies, and economies of scale to offset distance to market.
- Gas from world's largest gas field (North Field); 2.8 billion cubic feet per day (bcfd).
- Two 7.8 million tonnes per annum (mtpa) trains will be the largest ever constructed; 60% larger than any to date.
- A fleet of 14 large LNG ships; at 210-265km<sup>3</sup>, 70% larger than any ever built.
- Receiving terminal in the UK to re-gasify and deliver 2.1bcfd – 20% of UK demand.
- Incorporated joint venture between state-run Qatar Liquefied Gas Company Limited (II) or Qatargas II (70%) and ExxonMobil (30%) operating as South Hook LNG Terminal Ltd, which will manage the terminal operations. The gas will be sold to ExxonMobil Gas Marketing Europe, which will then sell the gas into the market.
- New 128km 48" National Grid gas pipeline between Milford Haven and Aberdulais on schedule for October 2007 delivery. Includes 180km 48" reinforcement of existing grid from Felindre-Tirley. EIA submitted to DTI August 2006. Aiming for 1Q 2008 completion.

It seems extraordinary that it was as far back as October 1964 that the world's first commercial shipment of liquified natural gas (LNG) was delivered to Canvey Island in the UK. For 15 years, one million tonnes per annum (mtpa) arrived from Algeria, but by 1980, the North Sea fields had overtaken supply, and Canvey was unceremoniously dismantled. Now, after an absence of over 20 years, LNG gas is finally making a return to the UK's shores.

Two new terminals to import LNG are being built at Herbrandston and Waterston, both of which are near to Milford Haven in western Wales. The terminals are being developed by South Hook LNG and Dragon LNG. The LNG will arrive by ocean-going tanker, be transferred ashore into LNG storage tanks and then converted back into gaseous form, for onward transportation through the National Gas Transmission System.

Dwarfing any previous facilities, South Hook represents the world's largest LNG project and will import LNG from North Field, a reservoir off the coast of Qatar in the Arabian Gulf, and will act as a 'buffer' in terms of gas supplied, mitigating, to some extent, the volatility of natural gas prices. With the number of gas customers rising daily in the UK, the Exxon/Qatar Petroleum behemoth, under the umbrella South Hook LNG Terminal Company Ltd, is the most extensive and expensive step in bridging the supply gap that opened up in 2005, and will involve a considerable expansion of National Grid 94barg (1,364psi) pipelines to accommodate the new supplies and connect them to the National Gas Transmission System. Work began in March 2006 on the Milford Haven to Aberdulais section.

As Robert C Olsen, chairman and production director of ExxonMobil International Ltd, has commented: "The South Hook LNG receiving terminal at Milford Haven, together with the new pipeline under construction by National Grid, will be a major long-term addition to the UK's energy infrastructure and the resulting diversification in gas source will boost security of supply."

Government energy minister Malcolm Wicks has heralded the vital importance of Milford Haven in securing the UK's supply: "Qatar[is]... gas fields will help increase the diversity of the UK's energy mix and increase our reliability of supply...Timely investment is critical if the world's energy resources are to reach consumers. Securing access to energy for all at affordable prices is what drives every country."

### On budget, on schedule

Despite its unprecedented ambitions, work at South Hook and on its related technology has continued apace, as Mohamed al-Naimi, commercial manager of South Hook LNG Terminal Com has revealed: "The terminal is on schedule; we have all the planning permits. We will deliver the first gas end of 2007-08."

The gas processing terminal will be able to receive one LNG ship every two and half days, including the biggest class of such vessels, Q-Max, according to Naimi.

Q-Max ships can carry as much as 265,000cum of LNG (see right). The port will have five storage tanks with a total capacity of 155,000cum, says Naimi. Qatar's Q-Max tankers only serve South Hook. "Other ports in the world can take the Q-Max if slight modifications are made to the terminal such as in Japan or Korea."



### North Field

World's largest non-associated gas field

Proved gas reserves of 900+ trillion cubic feet (TCF)  
~250 years UK demand

#### Existing facilities/projects

Five LNG trains  
Contracted supply to Japan, Korea, Europe, USA

#### Future projects

Seven additional LNG trains  
(30+ MTA additional capacity)

### Location, location

A former Esso oil refinery, Milford Haven offers safe, deepwater anchorage readily accessible by large LNG tankers, with the existing jetty at the site being refurbished to allow berthing of the super-sized tankers.

There is a long history in the area of handling large vessels, as well as building and operating complex processing plants, and it has a rich seam of skilled workers available.

Given its strategic location in the west of the UK, shipping distance from the project's source of natural gas is shorter than many other potential sites, thus reducing transportation costs.

### LNG revival

The current UK gas supply squeeze is expected to dissolve as the second stage of the Langede project and associated Ormen Lange gas field in Norway comes onstream, and the South Hook and Dragon LNG terminals become operational. As supplies lift, so prices will fall. The existing Isle of Grain terminal can import 4.4 billion cubic

metres (bcm) of gas a year and there are plans to triple its capacity by the end of 2008. National Grid is also considering a third-phase expansion plan that would increase capacity to 20bcm a year by winter 2010.

A September 2006 report by Wood Mackenzie has forecast a tight winter ahead, but said that the supply-demand position has eased around 10% compared with last year. Up to 16 million cubic metres (mcm) of gas a day could flow through the Langede pipeline, 11mcm a day through shipboard LNG at Teesside and around 13mcm a day of gas through the Isle of Grain. Wood Mackenzie forecasts that indigenous production could peak at 248mcm a day, which together with imported supplies, would see a supply capacity of 490mcm a day: "just enough to meet peak demand this winter, even if extreme conditions transpire. We are likely to look back and regard gas prices as having peaked in the winter of 2006." Further proof LNG is transforming the UK's energy supply forever. ●



Q-Flex (eight ships, T4)  
210-217km<sup>3</sup>, five cargo tanks

Q-Max (six ships, T5)  
262-265km<sup>3</sup>, five cargo tanks

### Qatar large LNG ship construction

Rigorous technology qualification programme

Scale increase, slow speed diesel, and on-board re-liquefaction - "sell what you load"

Q-Flex - eight ships

13% increase in length, 17% in beam  
50% increase in cargo capacity

Q-Max - six ships

Add'l 10% increase in length/beam  
Add'l 25% increase in cargo capacity  
30% cost of service reduction  
DSME, SHI, HHI Shipyards  
Total capital expenditure \$3.5 billion

#### Status

Below budget, ahead of schedule  
Engineering underway  
First steel cutting Feb 2006

## UP-TO-DATE PROJECT INFORMATION

### Drilling/offshore development plan

30+/- wells

Three unmanned wellhead platforms

One each 34" and 38" wet gas pipelines to shore (lengths of ~80km & ~105km)

Power, communication, and control from QG complex

Total capital expenditure (capex) of \$1.7 billion spent over 2004-2010

Drilling \$900 million

Offshore \$800 million

#### Status

Three jackets installed (McDermott) and drilling underway

30 wells underway

On budget, on schedule

Topsides/PLs by NPCC; fabrication began February 2006

### Onshore inside facilities

APCI APX Process

GE Frame 9E turbines

Dry Low NOx burners

Waste heat recovery

Siemens/ASI Motor/gen on each string

15.6 MTA of LNG, 1.7 MTA of LPG, 100tbd condensate

\$4.5 billion CTJV main contractor

15% reduction in capital cost

35% reduction in operating cost

(vs. 4.7 MTA train)

#### Status

Train 4: 35% complete.

Train 5: 10% complete

First string test successful

On schedule, on budget

18,000 contractors on site

Site prep complete, civil and erection underway

### South Hook Terminal development plan

Upgrade and refurbishment of existing jetty

Five 155km<sup>3</sup> full containment LNG storage tanks

Two berths

Submerged Combustion Vaporizers (SCVs)

2.1 BDFD export

Pipeline extension (~128km) to national gas grid to be built and operated by NGG

PL grid reinforcement by NGG

EPC by Chicago Bridge & Iron

Total capex of \$1.4 billion spent over 2003-2009

#### Status

Phase 1 currently 50% complete

Phase II 37% complete

First gas winter 2007/08