

- Exploiting new discoveries using existing production facilities is an important way of obtaining maximum value from established production infrastructure.
- Subsea tiebacks, which link new discoveries to existing infrastructure, are becoming a viable proposition as the costs come down and oil and gas price remains high.
- The number of tieback projects is expected to rise significantly as production from larger wells declines.

## Tieback time

Subsea tiebacks connecting new oil and gas discoveries to existing production facilities can extend the life of production infrastructure, and they are becoming increasingly viable, both technically and economically.

SUBSEA TIEBACKS ARE SET TO BECOME A MAJOR FACTOR IN THE DEVELOPMENT OF new oil and gas reserves in the 21st century. With larger oil and gas discoveries becoming less common, attention has turned to previously untapped, less economically viable discoveries.

Many companies are pushing forward the technology of subsea tiebacks to produce more oil and gas at lower cost, over longer distances and in deeper waters. The deployment of subsea tiebacks maximises the life of existing production infrastructure.

If a deposit is isolated, it is usually not economically viable. However, rising crude oil prices and increasing demand for gas means that previously uneconomical deposits are now starting to look attractive.

Of course, this still does not solve the technical difficulties of laying subsea pipelines and the installation of subsea production platforms and processing units. How much easier and less expensive it would be if existing infrastructure could be used to recover the oil and gas and transport it to market. This is where subsea tiebacks are now becoming an appealing option.

Subsea tiebacks can require significantly lower initial investments compared with developments using floating production, storage and offloading (FPSO) or fixed installations. The economics of a field are, however, governed by a number of factors specific to that field:

- Distance from existing installation
- Water depth
- Recoverable volumes, reservoir size and complexity
- Tariffs for processing the produced fluids on an existing installation
- The potentially lower recovery rates from subsea tiebacks versus standalone development, due to limitations in the receiving facility's processing systems
- The potentially higher recovery rates from platform wells, due to easier access to well intervention and workovers

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### Projects in the pipeline

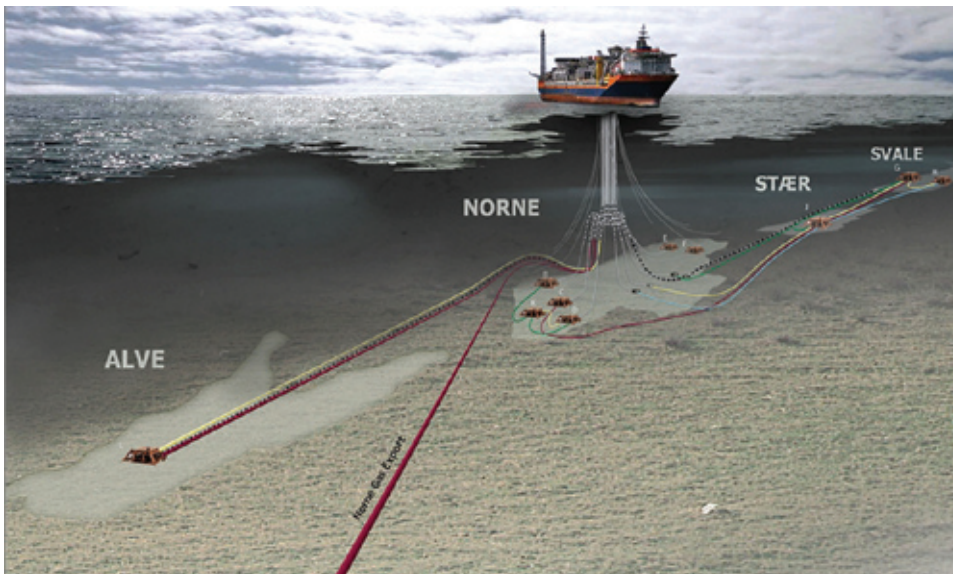
The Scandinavian oil giant Statoil has instigated a number of recent subsea tieback developments. One of these has recently come online, the Skinfaks/Rimfaks project in the North Sea.

Field recovery in the project will be increased using several wells via tieback to the Gullfaks C platform. When all the project wells are onstream, Rimfaks and Skinfaks will account for around 35% of the Gullfaks licensed oil production.

Lars Christian Bacher, senior vice-president for the Tampen business cluster says: 'By combining Skinfaks development with several Rimfaks wells we have achieved an economic development of two satellites that individually would have been marginal. The development is an important measure for increasing oil recovery in the area. This project secures good exploitation of the Gullfaks area infrastructure with a small investment.'

### Technological advances

Andre Maerli, a senior engineer in subsea early phase and new concepts for Statoil, explains how subsea technology has come to the fore in Statoil projects over the last ten years: 'The technology for subsea tiebacks has been widely available for the last 15–20 years, but more established and field-proven technologies are



The Alve oil and condensate field will be tied back to the Norne production ship.

subsea tiebacks, as the infrastructure is developing, production capacity is becoming available and production from the large fields is beginning to plateau. Obviously, as oil prices increase, the economics of smaller developments become more attractive, and as more areas of the world are developed and matured, the number of subsea tiebacks worldwide is expected to grow significantly. The advent of subsea processing has now made subsea tiebacks even more attractive, as this can alleviate flow assurance and interfacing difficulties with existing production facilities.

sometimes preferred because they reduce the risks in small or marginal developments.

'However, advances in flow assurance and multiphase transport now allow the use of tiebacks over much longer distances, while the introduction of subsea processing will strengthen the business case for subsea tiebacks in future developments. At the same time, new tools have become available for boosting pressure and removing sand and water from the wellstream, and for assisting reservoir pressure on subsea tiebacks, and this has boosted the case for the development of marginal projects.'

One of these tools is Advantica's grouted tee hot tapping, developed as a lower-cost alternative to other pipeline modification methods for subsea installations. Such technologies are essential to the economics of subsea tiebacks.

### Pros and cons

Maerli says that subsea tiebacks provide a number of important benefits in the development of oil and gas fields. Because much of the infrastructure is already in place, projects can be fast tracked and brought into production much more quickly. There can be flexible and phased developments in certain fields, which are beneficial for small/marginal developments. In addition, as production capacity becomes available on existing installations and infrastructure, subsea tiebacks are very important in maintaining production levels. Statoil has a production ambition of 55% recovery from subsea wells.

Many small discoveries have been made on the Norwegian Continental Shelf (NCS) over the years that were not considered economic. These are now candidates for development using

### Subsea outlook

There are a number of interesting discoveries on the NCS that are candidates for subsea tieback development. These include Dagny, Gudrun, Morvin, Trestakk, Heidrun and several others. One recent plan submitted for subsea development was the Alve gas and condensate field. Spudding is scheduled for August 2007, and the first gas is expected in December 2008. Alve will be phased in via tieback to the Statoil-operated Norne field. The Norne field operates via the Norne production ship, which has spare capacity for satellite fields as the Norne field winds down and comes to the end of its useful productive life. The Urd satellite field was tied back to the Norne ship in 2005 and Alve will be the second satellite, securing gas production for years to come. Gas production of around four million cubic metres per day is expected from Alve, which has reserves estimated at 6.78 billion cubic metres and 8.3 million barrels of condensate.

Kjell Helge Eide, the project manager for the Alve field, says: 'It has become apparent that a plan for the development and operation (PDO) of smaller projects tied into existing infrastructure can be simplified considerably. This is more effective and economical for all parties. On the Alve project, we have saved a lot of time by simplifying the PDOs, and I hope our example will be followed.'

Tieback projects are an important component of oil and gas production. Advances in technology have made them less expensive, while the economic advantages of developing fields by tying them into existing infrastructure are obvious. The future looks bright for subsea projects. As more and more discoveries are made in deeper water and the world remains hungry for oil and gas, we can expect to see many more tieback developments in the future. ●