



# 6

## Industry, employment and technology development

Petroleum-related industry

Employment in the petroleum sector

The significance of technology development for value creation  
and competitiveness in the petroleum sector

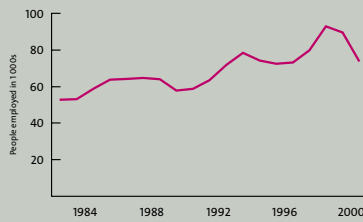


Figure 6.1 Employment in Norway's petroleum sector.  
(Source: Directorate of Labour)

### PETROLEUM-RELATED INDUSTRY

One of the policy objectives formulated after the discovery of oil and gas in the Norwegian North Sea was that these resources should form the basis for developing petroleum-related industry in Norway. Transfer of expertise from abroad and the build-up of domestic operations were important elements in this development. A competent and competitive Norwegian supplies industry for oil operations has been gradually developed.

The country now has a large number of companies in this sector, covering most stages in the petroleum value chain from exploration via development to production and operation. In certain areas, Norwegian suppliers to the oil and gas industry are among the world leaders. This applies particularly to seismic surveying, subsea installations and floating production solutions.

Activity in Norway's offshore supplies industry has so far largely related to new investment, maintenance and operational assignments on the NCS. The likelihood that future activity in these waters will be lower, combined with a high level of expertise, means that the industry is focusing to a greater extent on international market opportunities.

The global market for deliveries to the oil and gas sector is substantial. It has been valued at roughly NOK 1 600 bn per year by the UK authorities. In a study on deliveries by Norwegian companies to oil and gas production at home

and abroad, Norway's Foundation for Social and Industrial Research (SNF) estimated that overall exports of Norwegian goods and services for this sector in 1999 totalled NOK 27-29 bn.

In cooperation with the domestic petroleum industry, the government established the Intsok – Norwegian Oil and Gas Partners foundation in 1997 to promote deliveries to the international market. Currently embracing 70 companies, Intsok aims to boost revenues from abroad to NOK 50 bn. Such growth will require a substantial and purposeful commitment.

### EMPLOYMENT IN THE PETROLEUM SECTOR

The Directorate of Labour has compiled annual statistics for petroleum-related employment since 1973. Its latest survey was conducted in August 2000. Figure 6.1 shows developments in such employment from 1982 to 2000.

A total of 73 647 people were employed by the Norwegian petroleum sector in August 2000, corresponding to roughly three per cent of total employment in Norway. The number of people employed declined by 15 872, or roughly 18 per cent, from August 1999 – the largest contraction since records began. Employment was thereby back to the 1996 level.

The employment peak in 1997-98 reflects a large number of development projects during this period.

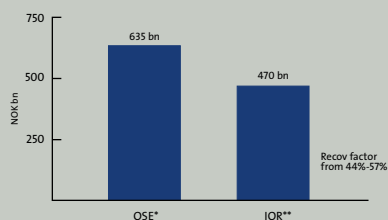


Figure 6.2 Possible value creation from improved oil recovery. (Source: OG21)  
 \*Oslo Stock Exchange, February 2001 \*\*Gross present value, size dependant on timing and volumes

Petroleum-related employment shrank by about 20 per cent from August 1998 to August 2000 because new development projects were not pursued as a result of uncertainty over low oil prices. Table 6.1 shows employment over the past six years, grouped by four functional areas. The worst-hit area has been construction and maintenance of platforms and vessels, which shed 13 282 jobs or about 32 per cent of the total. This category covers the bulk of the supplies industry, including fabrication yards and engineering companies.

Of the 73 647 people employed in the petroleum sector at August 2000, 17 600 worked in oil companies while the remainder were employed by the supplies industry. Among suppliers, manufacturing and construction companies account for the largest

number of jobs at 21 443, followed by engineering at 7 268 and service companies at 6 777.

THE SIGNIFICANCE OF TECHNOLOGY DEVELOPMENT FOR VALUE CREATION AND COMPETITIVENESS IN THE PETROLEUM SECTOR

The need for an overall review of strategy for technology and research was discussed in Report no 39 (1999-2000) to the Storting on oil and gas operations. As a follow-up, the MPE initiated a process in the summer of 2000 to produce recommendations on a national strategy for the overall commitment to technology and research in the petroleum sector.

Table 6.1 Employment by functional areas. (Source: Directorate of Labour)

Group	1995	1996	1997	1998	1999	2000
Exploration, drilling and production, etc	25 678	25 469	27 861	30 270	30 130	28 724
Bases, logistics, catering, administration, etc	10 635	11 522	12 480	13 652	13 285	13 212
Construction and maintenance of platforms and vessels	29 693	30 160	34 200	43 535	41 032	27 750
Construction and operation of processing and landing facilities	6 522	6 020	5 161	5 164	5 072	3 961
Total	72 528	73 171	79 702	92 621	89 519	73 647



Named OG<sub>21</sub> (for oil and gas in the 21st century), this study was conducted by representatives of the oil companies, supplies industry and research institutions. A final report, which will form the basis for further work, was submitted to the MPE in February 2001.

Part of the background for the OG<sub>21</sub> initiative was that the industry has defined technology as the most important factor for reducing costs and enhancing the competitiveness of Norway's oil and gas business. In addition, technology will play a key role in meeting major challenges facing the industry.

Research efforts in the sector have so far been fragmented. A more unified and purposeful system needs to be established for technology, research and development directed at this business.

Effective technological development could help to ensure:

- improved resource utilisation and continued profitable value creation
- strengthened industrial competitiveness and internationalisation, including increased exports
- major national environmental gains.

One of the main conclusions of the OG<sub>21</sub> report is that resources on the NCS represent an unrealised value potential without parallel in a national context. However, this potential has so far been under-focused, and the report notes that stronger attention needs to be paid to the unexploited opportunities which could be addressed through future technology development.

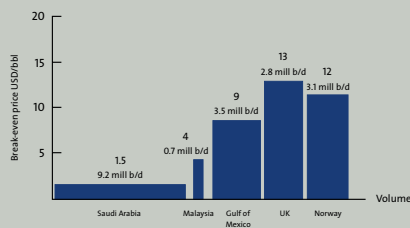
The vision is that the NCS will become the world's most productive petroleum province. A review of the potential for improved recovery from different categories of field – small with reserves of less than 50 mill scm, medium-sized with 50-200 mill scm and large with more than 200 mill scm – was one of the approaches taken by OG<sub>21</sub> in studying the value creation potential on the NCS.

A potential for improving the offshore recovery factor from today's 44 per cent to 57 per cent was identified on this basis. An increase on this scale would allow Norway to recover additional oil with a gross present value of NOK 470 bn measured by current official price expectations applied in the national planning budget. By comparison, the combined value of stocks listed on the Oslo Stock Exchange in February 2001 was roughly NOK 630 bn. See figure 6.2 on page 32.

Enhanced productivity in utilising gas resources is not included in the above-mentioned gross present value. A potential value increase from productivity gains for gas would boost the overall value of the additional volumes yielded by improved recovery.

The NPD has operated since 1997 with 50 per cent as its target for the average offshore recovery factor. According to OG<sub>21</sub>, achieving an average of 57 per cent would require an improvement in the recovery factor from 28 to 35 per cent for small finds, 39 to 50 per cent for medium-sized discoveries and 46 to 60 per cent for big fields.

The Verteks analysis conducted by the Rogaland Research institute in Stavanger notes that no technology currently available can bring the



**Figure 6.3** Daily production and break-even prices for various upstream provinces.  
 (Source: "Oil and Gas Industry Task Force, Energy Information Administration: Country Analysis Briefs, BP Amoco Statistical Review, MSDW, NPD" in T Reve and EW Jakobsen: Et verdiskapende Norge, Universitetsforlaget 2001)

recovery factor up to the desired level. On the contrary, this analysis concludes that the recovery factor could decline from the present average of 44 per cent with today's technology – partly because remaining resources are more technically and commercially demanding to produce than those already recovered.

Market fluctuations in 1998-99, with consequent swings in revenues and levels of activity, indicate that Norway's offshore operations need to become more commercially robust. This is largely due to the high cost level, as shown by the expenditure comparison between the NCS and other upstream provinces in figure 6.3.

As the figure illustrates, Norway has the highest level of offshore costs in the market. Reducing costs accordingly represents one of the principal challenges in securing the continued competitiveness of the country's offshore sector. As figure 6.3 shows, the break-even price for Norwegian offshore developments is USD 12 per barrel.

The Demo 2000 collaboration on project-oriented technology has helped to reduce the break-even oil price required for new developments on the NCS by USD 2-3 per barrel. Devising the next generation of development and production solutions offers a major value creation potential. According to the review of Demo 2000 provided in Report no 39 (1999-2000) to the Storting, future technological leaps offer potential cost reductions close to USD 5 per barrel.

In addition to enhancing value creation on the NCS, new technology could contribute to more

stable and robust growth for Norway's supplies industry through internationalisation. OG21 concluded that the aim should be to increase the value of exports by this sector from roughly NOK 27 bn today to NOK 70 bn by 2010, without taking account of market growth during the period.

The global offshore market is very dynamic, with requirements and needs in constant change. New technology and leading-edge expertise must therefore form the basis for any growth. Strengthened Norwegian expertise in such areas as deepwater technology, improved recovery and utilisation of small fields could represent a basis for significant international opportunities.

Substantial environmental gains are also offered by technological leaps. Reducing the overall burden on the environment imposed by the petroleum business should be a goal for new technology. Many of the technical solutions developed and adopted to improve recovery on the NCS could also have a positive environmental effect. Technology for separating wellstreams on the seabed or downhole would save energy, for example.

Participants in OG21 agree on the need to establish a stronger and more unified system for R&D, demonstration and commercialisation in the petroleum sector, in part to realise the value creation opportunities outlined above and to strengthen the coordination and productivity of the overall commitment in the area. This recommendation is being followed up with the petroleum sector.