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## Norway's OG21 – Oil and Gas in the 21<sup>st</sup> Century

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**Sponsors:** Norwegian Ministry of Petroleum and Energy, Research Council of Norway, the Norwegian petroleum cluster

**Type:** Strategy for concerted R&D effort in Norwegian petroleum industry, initiated by the Norwegian Ministry of Petroleum and Energy

**Organizer:** Norwegian Ministry of Petroleum and Energy

**Duration:** 2001-ongoing    **Budget:** NA    **Time Horizon:** approx. 2100    **Date of Brief:** March 2007

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### Purpose

The objective of the Norwegian foresight process “Oil and Gas in the 21<sup>st</sup> Century” was to assess the possibilities for a sustainable petroleum industry for the next 100 years through joint efforts concentrating on knowledge and technology.

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### Research for Norway's Energy Future

Norway's objective is to create maximum value for society by exploiting Norwegian Continental Shelf hydrocarbon resources. Global energy demand is soaring as never before, driving economic growth. Future growth will be underpinned by India's and China's economic development, which has been forecasted to account for about 40 percent of world economic growth altogether over the next quarter of a century. According to the International Energy Agency, global energy requirements could increase by as much as 60 per cent in the next 25 years. A broad range of energy options will be needed to meet this demand. Despite the expected growth in biofuels, wind and solar energy, the only realistic source of energy with the scale and versatility to meet the challenges of growing demands will be fossil fuels. The petroleum industry will also have to address the infrastructure constraints and bottlenecks along the supply chain, from upstream to downstream, to bring oil and gas from the source to the consumer. Major techno-

logical progress and investments are called for to satisfy the world's need for energy.

One of the key success factors in the development of an advanced Norwegian petroleum industry has been the willingness to invest in research and development from the beginning. The estimates of the Norwegian Petroleum Directorate show that considerable potential still exists for enhancing the value creation from the oil and gas industry. Fulfilling this potential will depend on a continued commitment to more research and development.

In 2001, in order to push petroleum technology, the authorities took the initiative to establish OG21 – Oil and Gas in the 21st Century. This is a national drive aimed at uniting industry and public research resources in an effort to address the challenges and find solutions ensuring a positive development on the Shelf, as well as aspiring to doubling the export of technology by 2008. OG21 has succeeded in aligning stakeholders behind its strategy work.



## Eight Future Visions

The future extraction of resources on the Norwegian Continental Shelf will be demanding. Working on strategies, OG21 has identified eight key challenges crucial to future value creation on the NCS and for enhancing the competitiveness of the oil and gas industry:

- Sustainable development and zero harm to people and the environment.
- Increased reserve replacement rate through exploration, (find more petroleum reserves to replace the amount that is produced).
- Increased hydrocarbon recovery.
- Cost effective technology for Arctic developments.
- Development of marginal fields (fields that require new technology to become profitable).
- Increased value creation from gas.
- Future competence development and increased recruitment to the industry.
- Increased export of technology.

Together, the key challenges will contribute toward meeting technology needs as shown in the road map in Figure 1.

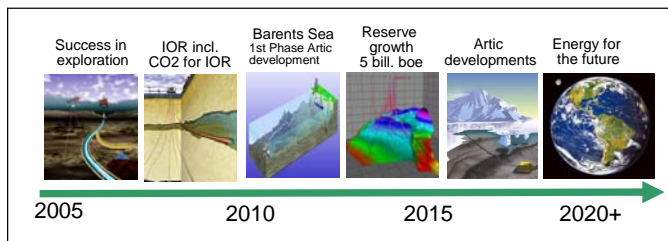


Figure 1: Roadmap for technology needs

## Public Private Partnership

In Norway, partnering between the government, oil companies (Norwegian and international), supply industry, research institutions and academia has established a suitable environment for technological developments. The companies have cooperated to develop, test and implement new technological solutions in various projects on the NCS.

## Abundant Recoverable Resources

Norway is still a promising petroleum province. Slightly less than one third of the recoverable resources have been produced. Furthermore, estimates show that one quarter of the total oil and gas resources on the NCS remains to be found. The resource potential on the NCS is also significant in an international context. The industry's ability and willingness to apply new technologies will continue to be a driving force in developing this potential, both in the mature parts of the NCS and the still unexplored large frontier areas.

## Technological Challenges

Many of the areas that will produce oil and gas in the future are characterized by great technical or logistic risks requiring a long lead-time to develop. Driven by the need to broaden/enlarge the reserve base, oil companies are looking to leverage technology to convert unconventional resources into reserves – this applies to both ends of the API gravity scale, i.e. heavy crude oil and gas.

Additionally, there is a trend towards developing technologies in order to access both conventional and unconventional hydrocarbon reserves in new operating environments such as ultra-deep water, arctic/sub-ice and other environmentally sensitive areas that require an expensive and complex infrastructure. More advanced technology must be mobilized to access new reservoirs and to develop “unconventional” deposits.

## Recovering Deep Water & Arctic Resources

The potential for increasing the global recovery of oil reservoirs is significant. The current global average recovery rate stands only at about 35%. A 5% increase in worldwide recovery would bring more oil than Saudi Arabia's reserves. Deep water and arctic resources will grow in importance, but production cannot be ramped up quickly.

## OG21 Strategy and Recommendations

The OG21 strategy describes:

- the challenges facing the Norwegian oil and gas industry;
- high-priority target areas necessitating concerted efforts;
- specific actions required to enhance value creation in each of the target areas;
- competence objectives; and a proposal for strategy implementation and execution.

The OG21 mandate sets the direction and vision for the work:

- To generate new technology and knowledge ensuring profitable and sustainable resource development on the Norwegian Continental Shelf (NCS)
- To enhance the industry's international competitiveness by producing attractive new technological products, system solutions and competence.

OG21 objectives are to co-ordinate and concentrate Norwegian R&D efforts to help meet the technological challenges facing the oil and gas industry, as well as to be an effective instrument for enhancing value creation. OG21 itself does not have the means to finance these projects, but serves as a cata-

lyst and an arena where operating companies, researchers and authorities can meet. Figure 2 illustrates the vision, main objectives and key challenges of OG21.

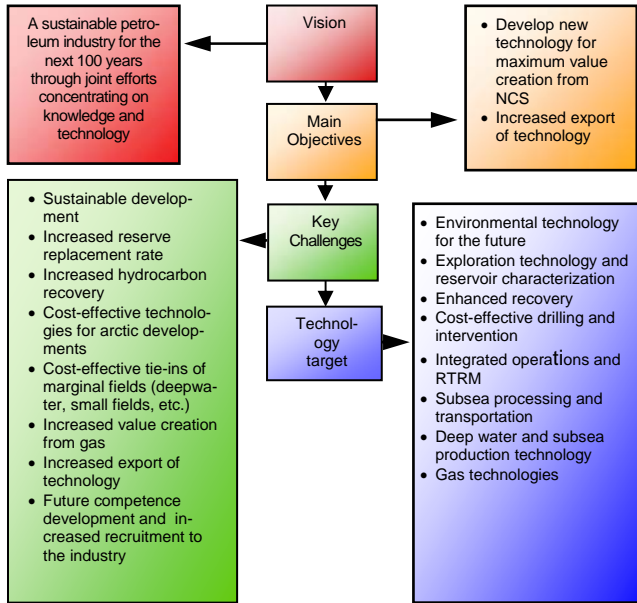


Figure 2: Strategy structure

## Low-carbon Diet for the World

The global concerns for the environment are growing. One of the most critical environmental challenges facing the world today is reducing the long-term increase in greenhouse gas emissions. What will it take to put the world on a low-carbon diet? The use of fossil fuels to meet the world's energy needs has contributed to an increase in emissions, primarily of carbon dioxide and methane, into the Earth's atmosphere. This is causing climatic changes, with potentially adverse effects on people, economies and environment, from coastal flooding and droughts to changes in ecosystems and biodiversity. Most governments and businesses agree on the importance of managing the impact of climatic changes. The challenge is how to do so while still providing the energy required to meet the demands of growing populations and economies. Mitigating carbon emissions is a daunting task, with no single solution. However, the development and deployment of technology will play a key role. The issue of carbon capture and storage is high on the agenda, both as a possible way of mitigating climatic changes and from the perspective of increased oil recovery. Development of new energy technologies and innovative solutions that can reduce emissions to air and water has a high priority with OG21. CO<sub>2</sub> capture and storage will not solve the climate problem, but it can play an essential role in the development of a more sustainable energy system.

## Sources and References

Strategy Report and sub-strategies for each Technology Target Area can be found on [www.og21.org](http://www.og21.org).

**About the EFMN:** Policy Professionals dealing with RTD, Innovation and Economic Development increasingly recognize a need to base decisions on broadly based participative processes of deliberation and consultation with stakeholders. One of the most important tools they apply is FORESIGHT. The EFMN or European Foresight Monitoring Network supports policy professionals by monitoring and analyzing Foresight activities in the European Union, its neighbours and the world. The EFMN helps those involved in policy development to stay up to date on current practice in Foresight. It helps them to tap into a network of know-how and experience on issues related to the day to day design, management and execution of Foresight and Foresight related processes.