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## **The Innovation and Application of Upstream Technology**

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Oil and gas accounts for almost 65% of the world's primary energy supply. At least 45 countries depend on hydrocarbons as their major source of hard currency income. The industry now produces more oil and gas than ever before in history - and the demand is still rising. New supplies to meet this rising demand will increasingly come from the fragile Arctic (mainly in Russia and North America) and deepwater developments. In addition, consumers increasingly demand lower carbon fuels, which are richer in hydrogen and cleaner. At the same time, societies expect from industry environmentally sound approaches towards sustainable development of our planet and its inhabitants. New technologies and innovative ways to apply will allow the oil and gas companies to master the challenges ahead, and to transform themselves into energy companies.

In creating new technologies, there are three basic questions which we need to address: which technologies do we focus on, how will we apply them, and last but not least, who pays for research and development (e. g. producers, suppliers, academia, government etc.).

A vibrant oil and gas industry will require us to focus technology development for the short and medium term in the following areas:

- Reducing the cost of finding and extracting oil and gas from increasingly difficult areas (e.g. seismic and drilling and producing in the Arctic and deep-water developments).
- Increasing recovery factors and managing fields optimally through their full lifecycle.
- Managing technical and commercial risk to enhance project economics
- Understanding markets and moving products more quickly and cheaply to them. (e. g. long distance gas transportation).
- Improving our environmental impact and safety performance.

BP and its partners are developing the new e-Field. In this we combine the ability to look deep into the reservoir and in parallel deep into the markets we serve, to assure that our production always satisfies customers' needs and to identify ways to develop and produce hydrocarbons in a commercially, socially and environmentally acceptable manner. This requires intelligent wells, ongoing reservoir monitoring, predictive modelling and much more.

Key examples of e-field technologies, new deepwater technologies, as well as new technologies for the Arctic will be presented.

In the context of the energy industry it is useful to talk about "three waves of technology". The first wave has a short-term focus (<one year) and contains technologies geared towards improving performance, the second wave of technologies (with a two to ten year horizon) aims at finding new approaches to today's business. The technology areas mentioned above all fall under these two "waves". However, to build the foundations for long-term success, an energy company needs to go beyond that. It needs to work today already on a "third wave", which covers those technologies that will transform the core business of the company over the next several decades (e.g. from oil to gas to wind to solar and further to hydrogen).

The question of who conducts and pays for the development of new technology is complex, and it includes many interested parties. What is clear is that many of the technology advances we see in our industry are achieved through partnerships: with producer and service companies, governments, and academia all playing their part.

In BP we believe that cooperation in technology development is the key to unlock the future of our industry. We see commercial benefit through the application of new technologies to meet our business needs. BP aims to work in partnership to identify and develop new technical solutions and can provide test-beds for field-scale experimentation and implementation. While we want our deserved share of recognition for inventing good new technologies, we are less concerned about who 'owns' a technology. What matters more is how we can apply a technology - self invented or bought - quickly and cost effectively. In many cases BP encourages the ownership of the intellectual property and the rights to market it freely to rest with our service company partners, even if the original idea was ours and we have invested time and money to develop it.. This open approach distinguishes BP from its competitors and has triggered a river of innovation flowing towards the company.

The energy industry will be at the core of sustainable development of mankind. Innovation and application of technology will get it there.