

## Arctic Challenges

(Output from ITF Theme Day, Stavanger, Norway)

### A Collaborative Approach to Investment in Technology

**The Industry Technology Facilitator (ITF)** is a not for profit organisation owned by, and with access to funds from major oil and gas operating and service companies that comprise its membership. ITF has an impressive track record in delivering finance to help develop new initiatives for oil and gas technologies from early stage joint industry projects (JIPs) through to field trials and commercialisation. Since 1999, ITF has supported **131** projects worth in excess of **£38 million** in funding. ITF's key objectives are to identify technology needs, foster innovation and facilitate the development and implementation of new technologies.

A fundamental element of ITF's role as an internationally recognised champion for facilitating research, development and deployment of technology innovation within the upstream oil and gas industry is to engage with key industry sources. ITF uses a proven process, working in collaborative participation with both its Members and industry to identify technology needs and potential solutions.

**The ITF process**, illustrated below as a step-by-step course of actions, endeavours to bridge the gap between the industry's large global players and development community with the ultimate aim of implementing new technology solutions:

**STEP 1** - Understand and Identify Technology Needs

**STEP 2** - Engage the Development Community / Invite Proposals

**STEP 3** - Evaluate Proposal Submissions

**STEP 4** - Secure Funding

**STEP 5** - Assist the Launch of JIPs

**STEP 6** - Facilitate the Implementation of Technologies

ITF has contractual confidentiality arrangements with all its Members and will enter into a parallel agreement with all developers submitting proposal applications. Proposals will be submitted to our Members only for the purpose for which they are provided, i.e. assessment for funding support and implementation.

Proposals submitted under this Theme will be reviewed for financial sponsorship by **all ITF Members** therefore this is an excellent opportunity to gain access to a global audience in seeking support for your technology. The focus of all ITF themes is to identify technologies which bring clear benefits to sponsors but which require assistance in **research, development, and / or field trial**.

For details of ITF's full Portfolio of Members, please visit our Website - [www.oil-itf.com](http://www.oil-itf.com)

## Background to the Theme

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This Call for Proposals is the collective output of an ITF 'Arctic Challenges' Theme Day held in Stavanger, Norway on 26<sup>th</sup> November 2008.

The Arctic covers an area in excess of 30 million square kilometres and 24 time zones and has a population of 4 million people. A US Geological Survey preliminary assessment suggests that the Arctic seabed may hold as much as 25 percent of the world's undiscovered oil and gas natural reserves, with an estimate of 400 billion barrels lying beneath the Arctic seabed.

The High North of the region in particular is estimated to hold a considerable share of the world's remaining reserves of oil and gas, mainly offshore. Although the melting of the Arctic ice cap is gradually making resources more easily accessible, harsh climatic conditions such as drifting ice and frost make it technologically more challenging to recover resources. As much of the offshore area is ice-covered for most of the year, subsea solutions enabling the extraction of oil and gas from beneath the ice is a significant technological challenge. Issues that are currently taken for granted become major challenges in the Arctic environment.

The Theme Day included an intensive, facilitated workshop which brought together ITF Members, Operators, Service Companies, Small and Medium-sized Enterprises and research and academia players. Attendees discussed the challenges faced when attempting to exploit and unlock reserves held in the harsh Arctic region and the output of these discussions has formed the basis of this Call for Proposals.

## Theme Timeline

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Each ITF Theme follows a nine month timeline from Theme Day to Theme Completion. The following list of tasks describes the key milestones and their associated date:

- Theme Start / Theme Day Nov 2008
- Call for Proposals Issued Jan 2009
- Deadline for Receipt of Proposals Mar 2009
- Publish to Members for Review Mar 2009
- Member Review and Voting May 2009
- Technical Clarification Meeting Jun 2009
- Members finalise commitment to sponsor Aug 2009
- Theme Complete Aug 2009

## **An Open Invitation to Global Technology Developers**

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This document aims to stimulate proposals from global development expertise which meet the specific requirements for deployment within the Arctic Region. ITF and its Members will jointly assess all submitted proposals and our Members will potentially fund those proposals of greatest interest.

ITF and its Members will not prescribe specific technology solutions, but instead use the output gathered from the Theme Day to stimulate innovative proposals that offer potential solutions to identified needs. Key technology drivers, as identified by ITF Members, are the desire to produce fields in a more cost effective and efficient manner.

This is an open invitation to any organisation seeking sponsorship for **innovative technologies** in the oil and gas industry to submit proposals for **research, development, and / or field trial** in the following areas, **associated with the identified needs of the Arctic Challenges Theme:**

- The Harshness of the Arctic Climate
- The Impact of Ice
- The Sensitivity of the Environment
- The Remoteness of the Location

The list of detailed technology challenges are identified within each area that are of explicit interest to ITF Members in the 'Specific Technology Requirements' below. This information highlights key elements required but allows for innovation and flexibility in interpreting the most appropriate technical solutions.

The method for submitting a proposal is described later in this document but you can also learn how to submit a proposal by going to our website [www.oil-itf.com](http://www.oil-itf.com)

## Specific Technology Requirements

(Any submitted proposal **must** address one or more of the following identified requirements)

### THE HARSHNESS OF THE ARCTIC CLIMATE

#### Background:

The Arctic climate is characterised broadly by long cold winters and short cool summers and extremes of solar radiation. Parts of the Arctic are covered by sea ice, glacial ice, or snow. Winter temperatures can drop below  $-50^{\circ}\text{C}$  over large parts of the Arctic and average July temperatures can range from about  $-10$  to  $+10^{\circ}\text{C}$ . Additionally, fog is common during the summer. Despite these challenging climatic conditions, the Arctic remains a massive opportunity.

#### Requirements:

- Innovative ways of using waste heat to deliver a design that can cope with the effects of the cold.
- Hot water jacketing systems or similar designs to provide protection and insulation against the harsh climatic conditions.
- Improved accurate weather modelling and forecasting techniques. This will facilitate easier work planning and risk management in addition to better identifying suitable periods for onsite operations during the short ice-free working window.
- Alternative materials and damage tolerant coatings suitable for application in the harsh ice climate. The development of innovative, environmentally safe and benign materials for protecting structures. New materials / systems to repel the formation of atmospheric icing on structures.
- New and creative shelter designs to avoid the necessity of outside working under such difficult conditions.
- Robust and calibrated air, surface and subsea sensors to assist climate monitoring.

### THE IMPACT OF ICE

#### Background:

The Arctic is sometimes defined as the region where permafrost remains continuously frozen throughout the year and as the portion of the northern oceans that is covered with sea ice for at least part of the year. Average Arctic sea ice extent for the month of December 2008 was 12.53 million square kilometres. This was 140,000 square kilometres greater than for December 2007 and 830,000 square kilometres less than the 1979 to 2000 December average. Sea ice is the dominant surface type throughout the year in the Arctic Basin, and covers much of the ocean surface in the Arctic at some point during the year. Winds and ocean currents cause sea ice to move bringing associated interaction problems with surface and subsea offshore installations.

#### Requirements:

- Improved Ice Management. Examples for consideration are improved methods for measuring statistics, forecasting, monitoring and tracking, risk management, operational procedures and deflection techniques. A specific Arctic web system may help to facilitate some of these requirements.

- Methods for implementing fast connect and disconnect operations in ice conditions.
- Processes and equipment to provide early modelling of ice formation on structures.
- Alternative pipeline design. Existing approaches may be too expensive, technologically limited or uncertain to acceptably manage the increased risk to safety and the environment that Arctic conditions provide such as ice-seabed interaction due to ridges and \*stamukhi. Deep trenching is expensive and may not be practical in this area.
- Other industries, for example the military, may have knowledge and experience of ice conditions that can be transferred and utilised in the oil and gas industry.
- Maintenance-free or more robust equipment suitable for the Arctic requiring limited maintenance. Equipment may need to be made resistant to issues such as gouging from sea ice and icebergs. May be modular in design.
- Methods of providing high resolution (temporal and spatial) data for tactical and strategic use for iceberg tracking, ice edge detection and pollution.
- New design from traditional methods for escape and evacuation of personnel in conditions of sea ice. This presents different problems such as the impossibility of traditional free-fall evacuation.
- Following on from evacuation, new methods to track both emergency response vessels and evacuees in extreme Arctic conditions are also required.

\***stamukhi** - thick ridges that become grounded during the winter and become part of the fast ice zone; while the rest of the fast ice melts during the summer, a stamukhi remains throughout the summer attached to the ocean bottom.

## THE SENSITIVITY OF THE ENVIRONMENT

### Background:

Zero discharge and emission to the environment is the ultimate target. Arctic ecosystems are especially vulnerable to oil pollution as the limited sunlight and cold Arctic climate do not allow for rapid decay of organic pollutants. Hydrocarbons are likely to remain and concentrate in the flat, poorly drained soils and shallow depressions of the Arctic landscape. During spring melt, contaminants tend to follow the run-off, ending up in rivers and oceans. Pollution from oil and gas activities can potentially be devastating to the Arctic marine environment for example the marine mammal and Arctic bird populations. Associated threats could include noise pollution, water dispersal in the drilling phase, and the actual drilling process which can release oil and chemicals into the water.

### Requirements:

- Techniques to ensure improved flow assurance. Prevention of blockages potentially means fewer spills. Other flow assurance issues to be considered involve dealing with low seafloor temperatures and long distances.
- Alternative production methods to avoid or limit the use of chemicals (e.g. anti-freeze) in this sensitive environment.
- New types of well barrier explicitly for application in the Arctic Region.
- A harmonised catalogue of Arctic environmental standards.
- New technology for acquiring and utilising environmental data.
- In cases of oil spill, skimmers are effective in removing oil from wastewater. Methods to allow operation in freezing conditions without causing ice build-up.

- Original oil-in-ice detection and continuous oil spill and chemical spill monitoring and response techniques. Oil spills beneath ice must be quickly found and tracked. After 72 hours, emulsification prevents burning and dispersants from being used in the cleanup operation.

## THE REMOTENESS OF THE LOCATION

### Background:

The remoteness of the region, combined with the harsh climate, presents many extraordinary technological challenges in terms of the exploitation of oil and gas reserves and developing the means for transporting the products to markets. Geographically, the Arctic is the area north of the Arctic Circle (latitude 66°30' north) where 24 hours of daylight and 24 hours of night occur at least once a year. The Arctic is often referred to as the region north of the tree line, the point beyond which trees do not grow. As some measure of the isolation of the region, it is thought that more information is known about the moon than about the Arctic.

### Requirements:

- Improved processes for providing reliable asset tracking in the secluded region.
- New ways of providing supporting logistics, re-supply and infrastructure in such an isolated environment.
- Smart, intelligent monitoring methods along with techniques for remote diagnosis of problems would also prevent the need for human intervention and therefore potential danger.
- To avoid unnecessary risk to personnel working in such a remote environment, task automation and robotic techniques should be considered.
- Techniques for providing precision of position and heading in the Arctic.
- Communication in the region is difficult. New ways of providing high speed communication would be extremely useful. Enhanced satellite coverage would also help to improve the quality of image data currently possible.
- The remoteness of the location has implications for the provision of on-site power. Ways to get the power from the shore to the infrastructure are essential.
- In addition to the method of distributing power, alternative and innovative techniques for generating power are essential. Any power generation methods should avoid harmful emission and prevent harmful chemical discharge to sea.

## Process for Submitting a Proposal

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### 1. Register Interest with ITF

Register your interest as early as possible by sending an email to Keith Mackie at [k.mackie@oil-itf.com](mailto:k.mackie@oil-itf.com)

### 2. Visit the ITF Website - [www.oil-itf.com](http://www.oil-itf.com)

On the ITF Home page, click on the "How to Submit a Proposal" button or follow [this link](#) to access all the information required to submit a proposal.

### 3. Read the 'Project Application Guidance' Document

This document is available to view or download from the 'ITF Downloads' / 'Proposal Submission' section of the ITF Website. Reading this document prior to submitting a proposal is essential. If you require further clarification or are unsure if your proposal is suitable for submission, please call ITF (ITF Contact Information appears later).

### 4. Download and Complete the 'Project Application Form'

This form is available to download from the 'ITF Downloads' / 'Proposal Submission' section of the ITF Website.

### 5. Download and Complete the 'Project Presentation Template'

This template is available to download from the 'ITF Downloads' / 'Proposal Submission' section of the ITF Website.

### 6. Email the Completed 'Project Application Form' and 'Project Presentation Template' to ITF

Email the Completed 'Project Application Form' in Microsoft Word format (not PDF) and the 'Project Presentation Template' in Microsoft PowerPoint format (not PDF) to Keith Mackie at [k.mackie@oil-itf.com](mailto:k.mackie@oil-itf.com) by **no later than 16<sup>th</sup> March 2009**. Proposals received after this date may not be processed.

## Qualifying Technologies

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In order to qualify for potential sponsorship, technologies submitted in response to this Call for Proposals must:

- be applicable to at least one of the identified requirements
- be novel or innovative
- demonstrate a clear business case for support
- have a clear and demonstrable path to commercialisation and implementation

**Note:** Proposals submitted to any other ITF Call in the past nine months or any previously unsuccessful applications should not be resubmitted without first consulting ITF (contact information provided later in this document).

## Qualifying Organisations

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Proposals are invited from any organisation including SME's, academia, research institutions, large organisations, consortiums or alliances. Proposals may be submitted by a national or international organisation, and equal opportunities will be extended to all proposers. Please keep in mind however that should your proposal be taken forward, you will be required to participate in meetings and make presentations to interested parties in the UK and in the English language (teleconference and video conference are acceptable).

## ITF Contact Information

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If you would like to discuss any matters related to this call or any other issue related to ITF, please contact any of the following people:

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For more information on ITF please visit the ITF Website - [www.oil-itf.com](http://www.oil-itf.com)