Final draft Arctic Offshore Oil and Gas Guidelines (2009)

Protection of the Arctic Marine Environment (PAME) working group of the Arctic Council—Mark-Up Copy of the Arctic Offshore Oil and Gas Guidelines (2009)

Inside Front Cover

The Arctic Council was established in…………… challenges faced by the Arctic governments and the Indigenous Peoples of the Arctic.

The Permanent Participants of the Arctic Council are:

- Aleut International Association (AIA)
- Arctic Athabaskan Council (AAC)
- Gwich'in Council International (GCI)
- Inuit Circumpolar Council (ICC)
- Russian Association of Indigenous Peoples of the North (RAIPON)
- Saami Council (SC)

Preamble

The Ministers of the Arctic States—Canada, Denmark, Iceland, Finland, Russia, Sweden, Norway and the United States of America— originally adopted the Guidelines at the Fourth Ministerial Conference on the Protection of the Arctic Environment, 11-12 June, 1997 in Alta, Norway by declaring: "**We receive** with appreciation…the "Arctic Offshore Oil and Gas Guidelines" developed under AEPS, and **agree** that these Guidelines be applied."

The 2nd Ministerial Meeting of the Arctic Council 9-10 October 2002 in Inari, Finland recognized the updated version of these Guidelines by the following statement: "We… endorse the updated Offshore Oil and Gas Guidelines and encourage the concerned stakeholders to apply them."

The endorsement of these Guidelines recognizes a uniform understanding of the minimum actions needed to protect the Arctic marine environment from unwanted environmental effects caused by offshore oil and gas activities. The Ministers, however, acknowledge that further steps can be taken nationally as a part of the environmental and natural resource management policies of the Arctic States.

The users of these Guidelines will find that all stages of offshore oil and gas activity, are included, with the exception of transportation of oil and gas. The Introduction sets forth the background for the Guidelines and important general concerns. The chapters that follow set forth the specific suggested operational steps to follow when planning for Arctic offshore oil and gas activities.

Neither PAME nor the full Arctic Council has established a single geographic definition of the Arctic. This is left for Arctic states to determine. For the purposes of these Guidelines, the definition of the Arctic is contained in Annex A.

1. Introduction

1.1 Background

The Guidelines were originally written in response to the *Report of the Third Ministerial Conference on the Protection of the Arctic Environment* (Inuvik, Canada, March 20-21, 1996) which expressed *concern regarding the potential impacts related to future increases in offshore petroleum activity in the Arctic.* The Report requested PAME: ...(to develop) "*guidelines for offshore petroleum activities in the Arctic, in particular guidelines for timely and effective measures for protection of the Arctic environment. In this regard, the Ministers welcomed the initiative of the United States to conduct a government designated expert meeting to develop such guidelines, in cooperation, as appropriate, with other AEPS Working Groups"* (Paragraph 2.3.5(ii)).

In addition, the Inuvik Report requests AMAP (Arctic Monitoring and Assessment Program Working Group) to "*...review the feasibility of developing sub-regional cooperative oil- related monitoring and assessment activities, as appropriate*." (Paragraph 2.1.2.1).

Finally, the Report requests EPPR (Emergency Preparedness, Prevention and Response Working Group) to "*...continue their work on contributing to development of preventative, mitigating and response measures for oil and gas accidental releases in the Arctic*" (Paragraph 2.4.5).

Although PAME had the overall responsibility for developing the 1997 guidelines, they were the result of a group effort and reflect coordination within the Arctic Council working groups that the ministers emphasized in the 1996 Inuvik Report.

The 1997 Guidelines stated in Section 1.7 Periodic Review, *"These Guidelines should undergo periodic review and amendment, as necessary, to take into consideration experiences in the management and control of offshore oil and gas operations. The Guidelines must remain current if they are to support timely and effective measures for protection of the Arctic environment. An Experts Meeting should be held after the third anniversary of the adoption of the Guidelines to review and update them."*

In 2002 the Guidelines were updated and improved by PAME with the help of EPPR, AMAP, and CAFF (Conservation of Arctic Fauna and Flora Working Group) and with an attempt to incorporate the principles of sustainable development. The 2002 update was greatly assisted by the involvement and comments received from representatives of Arctic, regional and other governments, non-governmental organizations, industry, indigenous people, and the scientific community to provide agreed guidelines for offshore oil and gas activities in the Arctic.

It is acknowledged that a number of legal instruments related to offshore oil and gas activities exist, *e.g.* United Nations Convention on Law of the Sea; the International

Convention for the Prevention of Pollution from Ships (MARPOL 73/78); the London Convention 1972; and regional conventions such as OSPAR. Arctic petroleum activities must be conducted in compliance with applicable international law.

Additional guidance and information resources that have relevance to the Arctic Offshore Oil and Gas Guidelines, have been provided by the Arctic Council since 2002, including the Human Health Report (2003), the Arctic Marine Strategic Plan (2003), the Transfer of Refined Oil and Oil Products in the Arctic (TROOP) Guidelines (2003), the Arctic Shoreline Clean-up Assessment Technique (SCAT) Manual (2004), the Arctic Guide for Emergency Prevention, Preparedness and Response (2004), the Arctic Climate Impact Assessment (2005), the assessment, Oil and Gas Activities in the Arctic—Effects and Potential Effects (OGA, 2008).

1.2 Goals

Purpose of the Guidelines

These Guidelines are intended to be of use to the Arctic nations for offshore oil and gas activities during planning, exploration, development, production and decommissioning Recommendations on the transportation of oil and gas are found in the OGA, 2008. The Guidelines should be used to help secure common policy and practices. The target group for the Guidelines is thus primarily the authorities, but the Guidelines may also be of help to the industry when planning for oil and gas activities and to the public in understanding environmental concerns and practices of Arctic offshore oil and gas activities. While recognizing the non-binding nature of these Guidelines, they are intended to encourage the highest standards currently available. They are not intended to prevent States from setting equivalent or stricter standards, where appropriate.

Policy development should take into account the domestic situation with respect to political, economic, legal, and administrative conditions. Consideration should be given to macro-economic effects, regional effects, and potential environmental impacts. Such consideration should result in a staged opening plan, and ensure protection of areas of special environmental concern. While these guidelines do not address socio-economic aspects in any detail, nor do they set standards for assessment of potential socio-economic effects of offshore oil and gas activities, these are nonetheless important to consider and integrate into the planning and conduct of exploration and development.

The Guidelines are intended to define a set of recommended practices and outline strategic actions for consideration by those responsible for regulation of offshore oil and gas activities (including transportation and related onshore activities) in the Arctic (see Figure 1 and Annex A). It is hoped that regulators will identify the key aspects related to protection of human health and safety and protection of the environment for the management of offshore activities, while at the same time remaining sufficiently flexible in the application of these management regimes to permit alternative regulatory approaches. It should be recognized that the eight Arctic nations have different systems with different emphases on the division of responsibility between the operator and the regulator. The goal is to assist regulators in developing standards, which are applied and enforced consistently for all offshore Arctic oil and gas operators. Sensible regulation will vary to some degree based upon local circumstances. Thus, it is expected that, based on the outcome of environmental impact assessment procedures, regulators will establish policies such that offshore oil and gas activities are conducted so as to provide for human health and safety and protection of the environment.

Offshore Arctic oil and gas operations may result in a variety of related onshore activities. Individual governments should determine the extent to which these Guidelines apply when evaluating these activities.

Figure 1 The Arctic Region

Goals for Environmental Protection during Oil and Gas Activities in the Arctic Area

Offshore oil and gas activities in the Arctic should be planned and conducted so as to avoid:

- adverse effects on air and water quality that exceed national or applicable international standards or regulations;
- changes in the atmospheric, terrestrial (including aquatic), glacial or marine environments that exceed national or applicable international standards or regulations;
- detrimental changes in the distribution, abundance or productivity of species or populations of species;
- further jeopardy to endangered or threatened species or populations of such species;
- degradation of, or substantial risk to, areas of biological, cultural, scientific, historic, aesthetic or wilderness significance;
- adverse effects on livelihoods, societies, cultures and traditional lifestyles for northern and indigenous peoples; and
- adverse effects to subsistence hunting, fishing and gathering.

1.3 General Principles

Arctic offshore oil and gas activities should be based on the following principles:

Principle of the Precautionary Approach

In order to protect the environment, the precautionary approach as reflected in Principle 15 of the Rio Declaration shall be widely applied by States to oil and gas activities according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Polluter Pays Principle

National authorities should endeavor to promote the internalization of the application of the polluter pays approach as reflected in Principle 16 of the Rio Declaration. The polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.

Continuous improvement

All parties should continually strive to improve health, environment and safety by identifying the processes, activities and products that need improvement, and implement necessary improvement measures. The process of identifying what can be improved may be based on mappings and results of analyses, investigation of situations of hazard and accident, or near hazards and accidents, handling of non-conformities, experience from internal follow-up or auditing, or experience gained by others.

Sustainable Development

In permitting offshore oil and gas activities Arctic governments should be mindful of their commitment to sustainable development, including, *inter alia*:

- protection of biological diversity;
- the duty not to transfer, directly or indirectly, damage or hazards from one area of the marine environment to another or transform one type of pollution into another;
- promotion of the use of best available technology/techniques and best environmental practices (See some examples in Annex B);
- the duty to cooperate on a regional basis for protection and preservation of the marine environment, taking into account characteristic regional features and global climate change effects;
- the need to maintain hydrocarbon production rates in keeping with sound conservation practices as a means of minimizing environmental impacts;
- development which meets the needs of the present without compromising the ability to meet the needs of the future;
- integration of environmental and social concerns into all development processes; and
- broad public participation in decision making.

1.4 Existing Effects and Potential Effects

Impacts to marine Arctic areas from all human activities within Arctic countries at present mainly affect coastal areas. Effects in offshore areas are mainly due to long-range transport of contaminants by wind and sea currents, and rivers, but also include sediment transport in sea ice.

Some coastal areas of the Arctic may be contaminated by direct runoff from cities, villages, industry or mining, through river discharges, from dumping and from nuclear tests. Hot spots have been identified by the Arctic Council, but few of these are relevant in the context of these guidelines. Based on the results of the Arctic Council assessment AMAP 2002 persistent organic pollutants (POPs) and mercury represent the greatest contaminant related threat to the Arctic environment. While levels of most POPs appear to be declining in response to global restrictions on production and use, a group of new chemicals that includes brominated flame retardants and fluorinated surfactants are being measured at increasing concentrations in the Arctic marine environment. Levels of mercury in the marine environment from long range transport appear to be increasing, particularly in the North American Arctic. At higher trophic levels, both POPs and mercury are found at levels that pose a potential toxicological risk to wildlife. Artificial radionuclide seem to pose only a minimal threat to the environment.

Currently, the vast majority of the Arctic marine environment, away from local natural or anthropogenic sources, is largely pristine with regard to oil hydrocarbons. Physical disturbance due to exploration activities has declined over the last 2 decades due both to a reduction in activities and due to improvements in technology and use of best practices

Climate change presents numerous challenges to arctic marine environments and ecosystems, which are thoroughly discussed in the Arctic Climate Impact Assessment (ACIA 2005). Climate change will also influence contaminant pathways and processes resulting in changes to current levels in the marine environment. Increased offshore activities may disturb marine life with their presence, noise, and discharges.

1.5 Potential Effects of Oil and Gas Activities on Environment and Society

Natural environment

The Arctic Council Oil and Gas Assessment in 2008 found that a significant threat from offshore oil and gas activities was the risk and potential impact of oil spills in an area of vulnerability to crucial habitats or threatened species However, concentration levels are elevated in some areas from natural sources such as oil seeps and erosion of coal-bearing rock. According to the AC, 2008, the Arctic has high sensitivity to oil spill impacts and the least capacity for natural recovery. During much of the year and under many conditions, response capabilities and methods are limited by environmental conditions, lack of resources capable of responding in a timely manner, and limited technologies for responding to oil spills in ice conditions.

Offshore oil and gas activities may entail considerable inputs of gases to the air from power generation, flaring, venting, well testing, leakage of volatile petroleum components, supply activities and shuttle transportation. These emissions contribute greenhouse gases to the atmosphere and increase the amount of pollutants emitted to the Arctic thus potentially affecting the climate and possibly causing acidification on nearby land. Although not currently widely practiced in the Arctic, discharges of drill cuttings with associated oil and chemicals and discharge of produced water may have acute effects on sea floor flora and fauna and reduce both their abundance and diversity in the immediate vicinity of the installations.

AC 2008 indicates that Arctic offshore operations currently contribute a very small part of atmospheric or marine contaminants, but an anticipated increase in activity has the potential to increase these.

Discharges of produced water and chemicals to the water column have the potential for acute effects on marine life only in the immediate vicinity of the installations However, according to the AC, 2008, discharge of produced water is not currently routinely practiced the Arctic offshore and if necessary is done in accordance with the guidance of Section 6.1 and Section 6.2.

Good and transparent governance, comprehensive but responsive regulatory regimes, and the use of international standards and practices coupled with evolving advances in technology and best practices have lessened the effects of oil and gas activities over time, including those in the offshore. But risks may arise as conditions change or new areas are explored and developed and evidence also shows that accidents will happen and best practices will not always be followed. Governments should continue to ensure that best practices, including oil spill response mechanisms, are in place before activities begin.

The accelerating loss of polar sea ice has drawn the attention of nations and industry for the possibility of increased oil and gas and shipping activities in their arctic waters. Therefore, all stakeholders share a concern about future oil and gas development in this changing and fragile environment and in dealing with the impacts and stresses both from direct environmental risks and those posed by climate change.

Human environment

Oil and gas activities may have pronounced positive effects on a nation's employment and economy. They also have socio-economic effects, both negative and positive, on local communities and indigenous people. The Arctic Council Oil and Gas Assessment also found that social effects of oil and gas activities, including those offshore, are often greatest at the local level, whereas the economic effects are often shared more widely. The economic value of oil and gas reserves developed will influence the scale of the activities and the magnitude and type of positive and negative effects at the national, regional and local level. Socio-economic effects also vary according to the 'life-cycle' stage of oil and gas activity and tend to be higher and more local at the exploration and construction phase, and stabilize and be more regional in the production stage. Expansion of oil and gas activities across the Arctic has increased the overlap and potential conflict between the industry and traditional land use and ways of life of indigenous people. Industry activity such as seismic surveying, exploratory drilling with associated vessel traffic, facility emplacement, subsequent development drilling, and production and transportation of oil or gas all have some potential for interfering with traditional marine subsistence hunting and fishing activities.

At the same time, in many Arctic countries, indigenous people are becoming active participants in oil and gas activities as decision makers, business owners, and employees. Project planning, environmental assessments and regulations should take into account indigenous and traditional knowledge when addressing local concerns and developing ways to mitigate possible environmental damage and negative socioeconomic effects.

In addition to direct effect of oil and gas activities on indigenous communities, provision should be considered to address secondary and cumulative impacts from oil and gas activities and the possible role of additive effects from other social stressors to the arctic peoples. These could include impacts on human health from changes in diet resulting in an increased risk of diabetes, obesity, hypertension, and cardio vascular disease, or social strain and potential for increased access to drugs and alcohol from contact with outsiders leading to higher risk of social pathologies

1.6 Institutional Strengthening in the Regional Context

Management of Arctic oil and gas activities and their effects on the Arctic offshore and near shore areas requires participation of governments, the public, non-governmental organizations and operators. In order to implement these Guidelines, institutional mechanisms or capabilities are required at the local, national and regional levels to:

- encourage the open, transparent and consistent application of regulatory regimes;
- facilitate strict enforcement of regulatory regimes;
- enable government agencies, local communities and non-governmental organizations to participate as appropriate in environmental management;
- make sure that scientific, technical and indigenous traditional knowledge are available to the processes and are effectively used;
- promote communication between operators, government bodies and communities that is conducted in culturally appropriate ways and in local languages;
- facilitate regional activities and mechanisms that best suit the regional physical,

biological and socioeconomic environments, and potential regional impacts;

Efforts to establish effective communication with local residents for all processes involved in oil and gas activities should make sure that:

- technical terms and ideas are clearly presented and are not lost in translation to another language;
- terminology is consistent;
- summaries as well as the complete documents are available in advance of public review and comment meetings; and
- adequate advance notice is given of public consultation meetings that take into account local communities harvesting, hunting and fishing annual schedules

To address the above needs, Arctic States should:

- review their own needs, and regional needs, for institutional strengthening and capacity-building in these areas, and identify priority needs with schedules for addressing them; and
- cooperate in and facilitate bilateral and multilateral initiatives to address the needs, in concert with the public and with oil and gas industry operators.
- develop regional oil spill contingency plans that clearly delineate: response authorities and capabilities; acceptable response actions through pre-approvals and agreements; agreements for sharing expertise and resources

2. Arctic Communities, Indigenous Peoples, Sustainability and Conservation of Flora and Fauna

Offshore oil and gas activities should be conducted so as to protect, and avoid adverse impacts on, living resources and the ecosystems on which they depend; to avoid adverse impacts on the traditional ways of life, resource uses and cultural values of Arctic indigenous communities; and to coordinate with other human activities in the region.

2.1 Living Resources

Measures should be taken as necessary to ensure that Arctic flora and fauna and the ecosystems on which they depend are protected during all phases of offshore oil and gas activities. Special attention - particularly with regard to intrusive activities - is required for species (e.g. fish, birds, whales, seals, polar bears, and other marine mammals), which are resources for human use, particularly by indigenous people, and for special habitats (such as ice-edge zones, coastal lagoons and barrier islands, wetlands, estuaries, bays, and river deltas). Onshore features that should be considered for protection and/or avoidance during offshore exploration and production activities include areas used significantly by waterfowl (such as high-density nesting, brood-rearing, molting and staging areas), caribou (such as major calving and insect relief areas), and by musk oxen. Consistent with the interests of human safety and well-being, a primary governing policy in the Arctic should be the conservation of resources for sustainable use. This includes protection of subsistence hunting, fishing, and gathering.

2.2 Cultural Values

In planning and executing offshore oil and gas operations, necessary measures should be taken, in consultation with neighboring indigenous communities, to recognize and accommodate the cultural heritage, values, practices, rights and resource use of indigenous residents. Arctic States, in cooperation with the oil and gas industry, should address the economic, social, health and educational needs based on equal partnership with indigenous people. All phases of oil and gas activity should avoid disturbance of historic or prehistoric resources including archeological and sacred sites, historic shipwrecks and other potentially important cultural sites.

2.3 Other Human Activity

Offshore oil and gas activities should be conducted in coordination with other human activities in the region, such as tourism, fishing, shipping, and scientific research. There should be a solid understanding of other human uses in the area to forecast potential areas of conflict both annually and seasonally. Advanced information collection and analysis may permit improved consultation and dialogue to proactively avoid conflicts as well as target enhanced socio-economic impact analysis where required. Arctic governments should consider the use of integrated management schemes.

2.4 Arctic States should:

- incorporate local and traditional knowledge into the decision-making process including the initial siting studies and disposition of resource use rights. For example, ethnological expert studies are being used in Russia in which scientific and local knowledge are combined;
- pursue regulatory and political structures that allow for participation of indigenous people and other local residents in the decision making process as well as the public

at large;

- urge and, where appropriate, require industry to integrate cultural and environmental protection considerations into planning, design, construction and operational phases of oil and gas activities;
- improve cross-cultural communication methods to ensure full and meaningful participation of indigenous residents including procedures to incorporate local knowledge;
- identify and appropriately manage oil and gas activities in ecologically and culturally sensitive areas; and
- for use in planning and decisions, identify species, which are resources for human use and their ecological requirements, and identify patterns of their use as resources.

3. Environmental Impact Assessment

Environmental impact assessment (EIA) procedures should be used to determine the potential impacts of offshore oil and gas exploration, development, transportation and infrastructure on the environment and human communities so as to inform decision-making. Arctic countries use a variety of methods and approaches. Annex B gives examples of the EIA process in several Arctic countries. Assessments may have a broad scope or be project specific. The responsibility for conducting the EIA or preliminary impact assessments (PEIA) varies from country to country (See Annex C)
Several approaches may be used for environmental assessments with a broad scope.

Examples of these approaches follow:

- regional assessments for oil and gas activities;
- ecosystem based approach;
- Integrated oceans and coastal management;
- Strategic Environmental Assessment (SEA);
- regional cumulative impact assessment and studies; and
- land use or spatial planning.

Many of these approaches address common elements. They assess potential environmental impacts on the ecosystem and potential social and economic effects. They include a long-term focus that addresses both effects and planning. They include a discussion of the potential cumulative effects of oil and gas activities with the effects of other activities. They address competing interests.

Assessments should consider alternative development options and any impacts that alternative activities may have, including potential cumulative impacts from other existing and known planned activities.

PEIAs and EIAs should consider, in particular, the following effects (for example contamination, habitat disturbance and alteration) on:

- human society including indigenous ways of life;
- cultural heritage;
- socio-economic systems;
- other human activities (e.g., tourism, scientific research, fishing, and shipping);
- overall landscape (e.g., fragmentation);
- subsistence ways of life (e.g. harvest practices and availability of food supply);
- oil spill preparedness and response in sea ice conditions;
- permafrost and transition zones;
- climate;
- sustainability of renewable resources;
- flora and fauna including marine mammals;
- air, water and sediment quality;
- ports and shore reception facilities;
- Arctic shipping routes;
- ice dynamics;
- human health; and
- the interaction among any of the above.

(See the table showing an overview of offshore activities and potential environmental effects in Annex D.)

Baseline environmental studies should be done on a regional basis to provide information for the EIA process. Regional baseline and monitoring programs should be established prior to activities and may be done as part of the SEA. This is in addition to project specific monitoring as further described in Section 4 (**Monitoring**).

When monitoring biodiversity the best available knowledge, including indigenous and traditional knowledge should be employed. Independent scientific peer review and public input should be used to assure program quality.

Since project impacts may have international effects, it is important that environmental monitoring programs are adequate and intercompatible so that results may be compared from one year to another and from one place to another allowing changes to be measured and trans-boundary effects considered.

3.1 Purpose

A main purpose of the EIA process is to integrate environmental considerations in the overall planning from the beginning. Environmental impact assessment aims at determining potential impacts of offshore oil and gas activities to the Arctic environment, its flora and fauna, abiotic components, and human health, security and well being, and assessing their probability and potential consequences. It does this to help inform decision making authorities at all stages of project review.

3.2 Technique and Process

The EIA process

The EIA process is a series of interactive steps, including feedback mechanisms and quality assurance procedures. Some of the main features are:

Organization
Responsibility for coordination of the EIA process, including arrangements for logistical and financial support should be with a single organization or harmonized between appropriate entities. A first task of this group should be to define the boundaries of the assessment area and reach agreement on the timetable to be followed.

Scope
The scope of the assessment should be comprehensive. However, it may be decided that initial assessments should give priority to environmental sectors considered to be most at risk from the planned activities. In the context of offshore petroleum activities this may be for instance particularly sensitive nesting or feeding habitats for seabirds, or spawning grounds for important fish species which may determine whether and how development takes place.

Roles and Responsibilities
There should be a clear and accepted understanding of roles and responsibilities regarding the EIA process to ensure efficiency and avoid misunderstanding of work to be performed and associated cost requirements in keeping with the scope of the assessment.

Data Quality Assurance
A system of quality assurance for data and their collection should be in place.

Timetable
It is essential that the EIA process is performed according to a realistic time table agreed upon at an early stage of the process. The timeframe will vary depending on the extent and type of assessment to be carried out.

Sources of Information
Data for EIA purposes may be gathered from existing sources (scientific literature, databases, registers, indigenous and traditional knowledge, public hearings and comments, etc.) and necessary additional information may be obtained through baseline investigations or monitoring programs.

Decision/Implementation/Project monitoring/Modification
There should be a description of monitoring programs to determine effects, assess the effectiveness of mitigation measures and provide any early warning of adverse effects. The programs should be designed with flexibility so they can be modified to respond to unforeseen effects. These programs should be elaborated in a manner consistent with Section 4 **Monitoring**. They should also provide for the possibility of modification of an activity, where warranted. And there should be adequate time to properly conduct studies and digest and assess the scientific content of the resulting reports.

Risk Assessment and Environmental Risk Analysis

The reason for a risk assessment or analysis is to determine if an action has an acceptable level of risk. Both regulators and industry use the information gathered through an EIA and risk analysis to make decisions on whether a proposed activity or development should go forward as planned, to institute preventative and mitigating measures to reduce risk, or to chose another alternative action.

Prior to carrying out an environmental risk analysis, risk criteria should be defined. The risk criteria should be documented and the regulator and/or operator should update the criteria during the course of operations as appropriate and necessary for enhancing the safety level and as an effort to achieve the objectives defined for the activities. Risk or acceptance criteria must at a minimum incorporate national and international laws and standards. Consultation should also include input from local communities and interested parties for risk criteria analysis. If data is insufficient to define risk criteria, then the risk assessment should also incorporate the precautionary principle as reflected in Principle 15 of the Rio Declaration.

The environmental risk analysis should be initiated as soon as practical to allow time if needed for public consultation. The analysis should be valid for the period of the year the operations will be carried out. If there is uncertainty of the timing of operations, the analysis should be valid for a longer period.

Risk associated with offshore oil and gas activities has two main elements--the risk that an event might happen, such as an oil spill, and the risk that something will be impacted, such as ecologically sensitive areas. A risk assessment should be carried out in order to estimate the risk of an acute oil spill or other event. An environmental risk analysis should be conducted to identify impact sensitivities from an acute spill or event, as well as, spills that result from routine operations, including approved discharge of drilling fluids or cuttings. The analysis of each potentially affected environmental resource should clearly distinguish between the risk of oil spills or other accident and impact severity. The risk of contact in an acute spill does not influence the impact severity. Probabilities related to acute oil spills should be estimated or modeled based on geological studies on resource estimates and distribution, development scenarios, site-specific and regional considerations, exploration and production plans, and historical data. An analysis of response strategies, techniques, and capabilities should be conducted to determine the efficacy and feasibility of oil spill response throughout the year.

The analysis also should identify the need for risk reducing and contingency measures. Requirements stipulated by or in law or regulations, including requirements for risk reducing measures and the operator's safety objectives, should form the basis for defining an acceptable level of risk.

A flow-chart depicting an environmental risk analysis scheme is represented in Annex E.

The contingency planning process is one of the key best management practices for evaluating the environmental effects of the response operation. Through the planning process, response options (e.g., no response, dispersant use, in situ burning, or mechanical recovery) can be fully evaluated under varying weather and ice conditions to decide ahead of time which options may be most successful in minimizing the effects of a spill and subsequent clean-up operations. By conducting this risk assessment through a multilateral contingency planning process such issues as disturbance to marine mammal migration from response, including ice-breaking activities can be evaluated in the context of each response measure and/or a combination of response measures. Through a multilaterally developed plan, response options would be vetted through the countries in preparation for an incident. The plan should establish training schedules so that response organizations are exercised periodically, and communicate on a regular schedule.

A multilateral Arctic response plan would delineate regional response zones, clearly identify the lead response group for each region and identify response groups to cascade in to help with the response. The plan would identify roles and responsibilities, would be maintained so contacts could be made effectively given an incident, and would identify response capabilities (personnel, equipment, platforms, communication, infrastructure, etc.) for each region.

3.3 Strategic Environmental Assessment (SEA)

A Strategic Environmental Assessment (SEA) is a systematic process for evaluating the environmental consequences of a proposed policy, plan or program initiative in order to ensure they are included and appropriately addressed at the earliest appropriate stage of decision-making. An SEA involves an integrated approach.

An SEA provides decision-makers with information, strategies, and actual and projected environmental effects on a larger scale than an Environmental Impact Assessment (EIA). SEA's wider frame enables policy-makers to anticipate effects on species, habitats and ecological processes that site-specific studies do not necessarily capture. SEA also fits well with current scientific understanding in ecology and biodiversity conservation, which emphasizes the importance of ecosystems, their processes, and a multi-factor, broader analysis over a single-species or single-threat analysis.

The use of SEA is recommended on a regional basis to determine the potential environmental impacts of human activity including opening areas for oil and gas. As part of an SEA it is recommended that all available regional baseline monitoring information be used, as well as meaningful stakeholder and public involvement, and incorporation of indigenous traditional ecological knowledge.

The SEA is an ongoing process and initial analyses should be revised periodically to take into account new information and new developments. One important component of the SEA process is the analysis and tracking of cumulative impacts on a regional basis. This information in turn should be used to adjust polices, and development, accordingly.

A final function of SEA is to identify existing and potential protected areas in the region, as well as sensitive areas of biodiversity and cultural importance. This may include identification of areas where petroleum activities may be modified or prohibited. Some of these areas may already be protected; others are not. In the marine environment, any area with both sea ice and important biodiversity significance should be afforded appropriate levels of protection. This will involve regional spatial planning.

3.4 Preliminary Environment Impact Assessment (PEIA)

A PEIA (or similar process) is a screening level review that should contain sufficient detail to permit assessment of whether a proposed activity may have a significant impact and should include:

- a description of the proposed activity, including its purpose, location, duration, and intensity;
- consideration of alternatives to the proposed activity and any impacts that the activity and its alternatives may have, including consideration of cumulative impacts in the light of other existing and known planned activities;
- a determination whether significant impacts, that would require further assessment,

are likely to occur; and

- consideration of input from early engagement with local communities potentially impacted from the development

3.5 Environmental Impact Assessment (EIA)

An EIA should be based on the best available information and include:

- a description of the reference/initial state of the area where the activity is to take place and identification of baseline data needs;
- an environmental risk analysis of potential impacts and a risk analysis of potential spills from the activity. This should delineate pollution sources, transport mechanisms (including trajectories), routes and duration of exposure to species or habitats of concern;
- identification of oil spill response methods, and their respective limits of operation and tradeoff evaluations under varying environmental conditions (oil type, seasonality, ice conditions, etc.);
- the best available time series data;
- a description of the proposed activity, including its purpose, location, duration, and intensity. This includes the physical characteristics of the proposed activity and its land use requirements during construction and operation phases. It should state the main characteristics of the development process proposed, including type and quantity of materials to be used;
- the estimated type and quantity of expected residues and emission (including air, water, soil, vibration, light, heat and radiation pollution);
- the forecasting methods used to assess effects on the environment and any limitations on models due to lack of data, in undertaking the assessment;
- based on the above, an identification of the area of potential impact;
- the likely significant effects, direct or indirect and an evaluation of their spatial and temporal scales;
- the likelihood of transboundary impacts;
- potential socio-economic effects and the effects on traditional ways of life of

indigenous people;

- a description of the measures proposed to avoid, reduce or rectify identified potential significant adverse effects, taking into consideration the recovery and regenerative capacity of the Arctic;
- an accounting with the principles of conservation biology, including disturbance and cumulative effects;
- other development options, and where authorities prepare the analysis, this may include the alternative of no action. This discussion should include an evaluation of the different alternatives and the reasons for choosing the selected activity;
- a summary in non-technical language, assisted with figures and diagrams, of the information specified above. If need be, other means of displaying this information, based on cultural heritage of the local and indigenous residents should be prepared;
- an assessment of all associated sources of noise, including seismic or other testing equipment, vessels, aircraft, drillships, drilling operations, and ice-breaking equipment and their potential effects on fish, marine mammals, and other wildlife including cumulative effects;
- an assessment of human health effects involving a systematic consideration of public health status baseline and analysis of oil and gas activity; and
- integrate the results of the Arctic Climate Impact Assessment and other research into the evaluation of possible impacts of oil and gas activities and infrastructure in the Arctic Ocean

3.6 Consultations and Hearings

Consultation is an effective dialogue between and amongst regulators, potential operators and stakeholders. In general, consultation should commence at the planning stage and continue throughout the lifetime of a project. It ensures transparent interaction and minimises potential risks for all parties. Consultation also provides a mechanism to resolve disagreements and provide appeal rights to all parties. Consultation is generally thought of in terms of public hearings, but it can also work effectively through informal discussions, focus group and key interviews and questionnaires. There is no single, standard approach to consultation, however some guiding principles promote effective consultation. These include:

- effective consultation is two-way;
- identifying and building relationships with potential consultees can take considerable time;
- consultation programmes are integral to project planning and decisions making;
- there are limits to the consultation process; and
- consultation should be open and transparent

Collection and review of information from publicly available sources and stakeholders is important and continuous through the life of a project. Such information, including vital indigenous and traditional knowledge can enhance the understanding of the project on all sides, including its social setting, the stakeholder community and the issue and values that are important to those stakeholders.

To ensure that various deliberative processes protect social and environmental values, timely release and dissemination of critical information to potentially affected parties is essential. In order to ensure that local communities are informed and involved in all appropriate phases, alternative methods for communicating information such as translation into indigenous languages, multimedia, radio, TV, public meetings, etc. should be explored.

States should consult and cooperate with the indigenous peoples concerned through their own representative institutions in order to understand and integrate their needs and concerns with any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources, such as oil and gas.

4. Environmental monitoring

4.1 Aims and Objectives

The operator should carry out environmental monitoring to ensure that the basis for decision-making and the knowledge about the marine environment are sufficient to maintain acceptable environment conditions as a result of petroleum activities. Sufficient information should be obtained to see that all pollution and disturbance caused by the activities is detected, mapped, assessed and alerted so that necessary measures can be implemented.

Environmental monitoring implies systematic and regular examinations to document the state of environmental resources, describe the risk of pollution and disturbance and keep a check on their effects on marine resources.

Marine environment means sea, coast, shore, seabed, water column and environmental resources.

Environmental resource means naturally occurring or natural biotic and abiotic components which may include one or more species, biotopes and/or types of nature in a marine environment.

Environmental monitoring entails:

- establishing a basis for identifying environmental responses and trends;
- mapping of critical conditions and parameters for risk, transportation and spreading of pollution;
- measuring possible effects of disturbance and noise on marine habitats and organisms
- mapping of impact on environmental resources;
- helping to identify and assess geological and engineering hazards;
- assessing whether the observed environmental impacts are in line with the forecasted and accepted environmental impacts identified in the EIA; and
- compiling information to aid future decisions about where, when, how and if oil and gas activities should be allowed to occur

Environmental monitoring should measure physical, chemical, and biological conditions that may impact or be impacted by the activities being conducted. Before activities commence, environmental monitoring should begin with a comprehensive baseline investigation, which should incorporate existing information, and comprise as a minimum all monitoring sites and variables planned to be used in the long term monitoring program. The environmental monitoring program should continue through the decommissioning and reclamation phases.

Environmental monitoring should preferably be conducted so as to distinguish impacts due to oil and gas activities from other relevant sources. Environmental monitoring should be carried out regionally and be integrated so that interactions between multiple activities may be more easily detected. The type of monitoring conducted depends on the specific type of activity anticipated and the nature of the environment that could be affected.

Priority monitoring should comprise the following areas during all phases of oil and gas activities to assess and minimize or mitigate adverse effects:

- environmental accounting of emissions to air, discharges to water and sea floor and emissions of noise;
- natural and industrial hazards in the region of activities including seismic and extreme weather and ice events;
- physical disturbance to sea floor, benthic communities, fish, ice edge communities and the sea shore, and effects on species populations, distribution and migration routes;
- levels of contaminants such as heavy metals, total hydrocarbons, polyaromatic hydrocarbons, phenol, barium, and POP's in bottom sediments and the water column; and their effects on living marine resources, seabirds and other wildlife, with particular attention to vulnerable life stages and areas of critical habitat;
- effects of petroleum activities on local human populations, subsistence access and harvest and other human activities;
- environmental effects on the integrity of the infrastructure;
- subsistence hunting and fishing activities such as the timing, position of harvest, search areas, and species, to aid in conflict avoidance; and
- acoustic monitoring of marine mammals in case of potential significant impact

The type and content of environmental monitoring will vary depending on the phase of the activity. Exploratory drilling and production activities will demand different monitoring emphasis.

Environmental monitoring programs should be reviewed on a regular basis to determine whether the results they are yielding indicate a need for changes in operational practices (for example, as a result of failing to achieve the initial hypotheses set out in the EIA or because of unforeseen impacts). Programs should also be reviewed to determine whether they should continue, be modified or terminated. Ultimately, the length and breadth of environmental monitoring programs will be determined by the scale and duration of offshore oil and gas activities and the immediate or longer-term impacts.

The main emphasis of the baseline survey and/or EIA should be to make a complete inventory of environmental resources that may be affected by the planned petroleum activity and identify resources, areas or uses particularly sensitive to the various phases of the petroleum activities. Some resources may be sensitive to acute or continuing discharges/emissions even at sub-lethal concentrations. Both types may have effects on local biological communities, directly or indirectly through effects on the ecosystems.

Programs for identification and understanding of spatial and temporal distribution of biota particularly sensitive to pollution/discharges and emissions from petroleum activities should not only include adult stages and established communities (e.g. seabird feeding grounds, shoreline communities) but also early stages in the life cycle of plants and animals including larval stages, which may be more vulnerable to oil and chemicals than adult stages, if they are spatially or temporally relevant. Such programs should also consider acute and long-term chronic exposures. Therefore, not only vulnerable species should be identified prior to setting up a monitoring program, but particularly sensitive life stages should also be identified.

4.2 Environmental monitoring methods

Environmental monitoring of trends in levels of contaminants in sediment, water, ice/snow and biota has been the traditional way of monitoring impacts of pollutants on environment. This is still the backbone of most monitoring programs, since reliable trend data are needed both to document changes in the environment as the result of the activities and as a basis for the prediction of future changes.

Monitoring should not only measure the level of potential pollutants in environmental compartments, but also the potential effects these might have on living resources. These effects may be monitored by recording changes in biodiversity over time or by measuring effects on single indicator species. Such methods, including the use of biological indicators, could give early warning of negative changes in the environment. Methods for monitoring effects should be an integrated part of monitoring programs.

The monitoring programs should not only be centered around field monitoring, but also include laboratory experiments and combinations of laboratory experiments and field studies whenever relevant.

4.3 Standards and Practices for Environmental Monitoring

Monitoring standards and practices for environmental monitoring should be established for all phases of offshore petroleum activities, including offshore seismic operations and marine transportation. Environmental monitoring activities should occur before any activity in the area, during drilling, development, production, decommissioning, and reclamation, as well as during transportation of oil, gas, supplies and personnel.

Most monitoring should have a long-term perspective showing developmental trends, and should form the basis for predicting what impacts to expect in the years to come. Monitoring surveys should be more frequent during the first years of investigation until the main impacts and trends are clarified and then as frequent as necessary in subsequent years. Environmental accounting and budgeting should be part of the monitoring system, showing the type and quantity of chemicals and substances that are used and discharged, what environmental impacts have been monitored, and what might be expected in subsequent years.

Requirements for monitoring should be defined in each country's legal and regulatory framework.

Environmental monitoring should start with a baseline survey establishing pre-activity population structure, distribution and size; habitat status; and existing level of contamination in the environment and biota. This information is essential if previous introductions of the contaminant in question have already taken place either naturally or from human activity. Usually, environmental monitoring will be the chemical measurement of the level of the contaminant in the air, water, ice/snow, sediments, or biological tissue. The levels found are then compared to applicable criteria such as baseline data or appropriate standards. The ultimate goal, however, must be to measure the effects of contaminants on organisms.

Monitoring of contamination levels related to petroleum activities should take into account the source of the contaminant, the potential routes of transport (e.g., aqueous, particulate, or air borne) and the potential pathways for bioaccumulation. Besides the contaminant in question and the particular processes that might be involved, other considerations may include: wind strength and gustiness; ocean currents; relevant river flow; precipitation; air temperature; ocean temperature; sea ice conditions and movement; water depth; sea surface state; subsurface geology; and other resources affected.

Data from environmental monitoring should be harmonized in collaboration with AMAP and could be collected and stored in Arctic database repository, such as Circumpolar Biodiversity Network and GINA (Geographical Information Network Alaska), Arctic Ocean Observatory, and others, where it would be available freely to all national environmental protection and monitoring authorities and to other users.

Whenever appropriate, operators should consider local indigenous populations for contractual monitoring activities as well as drawing upon indigenous and traditional knowledge for the identification of historical environmental extremes and trends. Establishment of cooperative relationships with resident indigenous communities for biological sample collection, environmental observation and monitoring, should be pursued.

Results have shown that air emissions from the offshore installations may have an impact on nearby land areas and the results of any monitoring of these impacts should be included in updated monitoring guidelines.

For an example of guidelines for environmental monitoring of oil and gas activities refer to the OSPAR Convention (see references).

Air quality monitoring should include identification and reporting of all air pollution sources, emissions of priority air pollutants including nitrogen oxides, carbon monoxide, volatile organic compounds, PAHs, ozone, etc. and hazardous and toxic substances.

4.4 Following up environmental monitoring

Results of environmental monitoring should also be utilized by regulators in compliance audits and on-site regulatory supervision as the basis for requiring any modification, postponement, or shut-down of operations or specific components of an operation and also as a basis of revising legislation when necessary. Monitoring activities can be conducted in conjunction with environmental audits to verify that the equipment and procedures associated with an operation are functioning within design parameters and will not lead to any significant impact on the environment.

Authorities should use environmental audits to verify that the results of monitoring are used by the petroleum companies and reflected in their environmental strategy (see Annex G, Examples of Generalized Monitoring Plans).

Results from environmental monitoring should be used by regulators in evaluating whether the legislation and specific requirements that apply is adequate and sufficient, and take action to change this if needed.

5. Safety and Environmental Management

Two basic regulatory approaches are available for dealing with the safety and environmental aspects of offshore Arctic oil and gas operations. They are: (A) a performance-based system and (B) a prescriptive approach.

(A) In the performance based approach, the regulator sets specific quantifiable goals but does not specify how the operator must meet these goals. This system allows the operator the flexibility to specify how they intend to comply with a regulatory body's mandate that operations be conducted safely and in an environmentally sound manner. There are a variety of approaches available to the operator to meet the intent of this alternative, including the use of technical standards, company guidelines, "safety case" initiatives, or combinations of the above.

(B) The prescriptive approach to regulation is based on a series of specific regulatory requirements, which typically represent minimal expectations on behalf of the regulatory body. This approach can be complemented by a performance-based program. Under the prescriptive system, a regulatory body normally develops requirements addressing all phases of offshore operations. The requirements are typically developed from a series of existing standards, practices, guidelines, and procedures. Compliance with these requirements are normally evaluated by a regulatory body through review and evaluation of a series of plans, permits, and related documents and through a system of field based inspections and evaluations.

Either regulatory approach, performance or prescriptive, can be modified to form a ‘hybrid” system of regulation, composed of appropriate elements from both regimes. Such a system of regulation may represent a viable alternative for a regulatory body to consider adopting due to the systems’ ease of operation and flexibility.

Today, there has been significant interest by both the offshore oil and gas industry and the various regulatory bodies to adopt, when applicable, appropriate international standards as a component of a regulatory system (performance, prescriptive, or hybrid). Use of these international standards addresses the fact that more often than not, regulators are regulating a global industry and there is value in using global standards wherever practical.

In either approach, before oil and gas activities are approved, regulatory bodies should require the operator to demonstrate financial capacity to carry out all aspects of the operation, including responding to environmental emergencies and decommissioning of facilities. This should also include the proven ability to adequately clean up oil spills.

There are many similarities between the two systems of regulation. An important management tool to assist the operator in meeting the regulatory objectives of either system, eliminating unsafe behavior, and achieving continual improvement in safety and pollution prevention practices is defining and communicating a culture focus on safety and environmental performance to the workforce and ensuring that they are fully motivated to implement it through a management system. This philosophy can also be applied to a hybrid regulatory program. See Annex F.

5.1 Management Systems

Proper planning to address the environmental sensitivities of a project and to ensure safety of the work force is essential. Whether required by the regulator or conducted voluntarily within industry, environmental and safety planning should be contained in a formal management system. Often referred to as EMS (Environmental Management System), HSEMS (Health and Safety and Health Environmental Management System) or SEMP (Safety and Environmental Management Program) these systems focus attention on the influences that human behaviour and organization have on accidents. Various types of management system documents have been developed around the world with applicability to the offshore oil and gas industry. These include; American Petroleum Institute (Recommended Practice 75), the International Organization for Standardization (ISO 14000 and 9001 series) and Oil and Gas Producers (OGP) and UNEP/OGP publications.

These systems all have as a common and central feature a cyclic process involving sequential consideration of:

- policy and strategic objectives;
- organization, resources and documentation;

- risk evaluation and risk management;
- planning;
- implementation and monitoring; and
- auditing and review

Each step of the cyclic process requires leadership and commitment by the implementing body and the principal aim of the system is to deliver continual environmental, safety and health performance. This is assessed by periodic audit or review of a management system's performance to ensure that necessary components are in place and that they are effective.

The key elements of a management system can be described as follows:

5.1.1 Policy and Strategic Objectives

The operator's management should define and document its safety and environmental policies and strategic objectives and ensure that these:

- have equal importance with the operator's other policies and objectives;
- are implemented and maintained at all organizational levels;
- are publicly available;
- commit the operator to meet or exceed all relevant regulatory and legislative requirements;
- commit the operator to reduce the risks and hazards to health, safety and the environment (HSE) of its activities, products and services; and
- provide for the setting of safety and environmental objectives that commit the operator to continuous efforts to improve performance

The operator should also take steps to ensure that all contractors engaged in operations are also able to meet the requirements of the operator management system and applicable laws and regulations.

A more detailed and specific list of possible objectives is set out in Annex F.

5.1.2 Organization, Resources and Documentation

Successful management of safety and environmental matters is a line responsibility, requiring the active participation of all levels of management and supervision. This should be reflected in the organizational structure and allocation of resources. The operator should define, document and communicate - with the aid of organizational diagrams where appropriate - the roles, responsibilities, authorities, accountabilities and interrelations necessary to implement the HSEMS and meet regulatory responsibilities. The operator should also stress and encourage individual and collective responsibility for safety and environmental performance to all employees. It should ensure that personnel are properly trained, competent, and have necessary authority and resources to perform their duties effectively.

5.1.3 Evaluation and risk management

The operator should maintain and implement procedures to identify systematically the hazards and potential effects, which may affect or arise from project inception through to decommissioning and disposal. Procedures should be maintained to evaluate (assess) risk and potential effects from identified hazards against screening criteria, taking into account probabilities of occurrence and severity of consequences for:

- People;
- Environment; and
- Assets.

The operator should maintain procedures to select, evaluate and implement measures to reduce risks and effects throughout the project. Risk reduction measures should include both those to prevent incidents (*i.e.* reducing the probability of occurrence) and to mitigate chronic and acute effects (*i.e.* reducing the consequences). In all cases, risks should be reduced to a level deemed as low as reasonably practicable, reflecting amongst other factors, local conditions and circumstances, the balance of costs and benefits and the current state of scientific and technical knowledge.

5.1.4 Planning

The operator should maintain, within its overall work program, plans for achieving environmental objectives and performance criteria. These plans should include:

- a clear description of the objectives;
- designation of responsibility for setting and achieving objectives and performance criteria at each relevant function and level of the organisation;
- the means by which they are to be achieved;
- time scales for implementation;
- programs for motivating and encouraging personnel towards a suitable HSE culture;

- mechanisms to provide feedback to personnel on environmental performance;
- processes to recognise good individual and team environmental performance; and
- mechanisms for evaluation and follow-up.

The operator should develop, document and maintain and review plans and procedures for responding to emergencies. These plans and procedures should reflect site-specific characteristics. In order to assess effectiveness of response plans, the operator should maintain procedures to test emergency plans by scenario drills and other suitable means at appropriate intervals. Plans should be revised and updated as necessary in light of experience gained. Plans should be available to the affected communities and the public at large.

5.2 Compliance Monitoring, auditing and verification

Compliance monitoring, which include carrying out audits, inspections and verifications, are key activities for the authorities when it comes to following up the petroleum activities in the Arctic.

Compliance monitoring may be carried out within a variety of organizational frameworks. For example, the recommendations of the European Parliament and Council provides for minimum criteria for environmental inspections in the European Union (EU).

The regulatory supervision should cover all stages of design, fabrication, installation, operations and removal of offshore installations. It should address all relevant parts of the operating company's management systems, such as procedures for ensuring compliance with legislation, licences, permits, and approved plans, as well as how the carrying out of activities are documented and reported. The regulatory supervision should also encompass the company's systems for pollution control and environmental monitoring, drilling and well operations techniques, production, and pipeline operations.

Representatives of the regulatory agencies should have the legal base to take appropriate action in case of violations, noncompliance, or if the operator fails to react adequately to dangerous situations. These actions can include issuing warnings, injunctions, shutting down specific operation, a complete shut-down of the installation, withdrawal of environmental licence or permit, or initiating prosecution by the relevant authority.

Authorized and qualified representatives from the regulatory agencies should have the legal base to access the installations and to see all relevant documentation and equipment at any time. The operating company shall provide for, as far as practical, the accommodation and necessary transportation.

Compliance monitoring may be carried out regularly as a part of a programme, or unscheduled in response to complaints, in connection with the issuing, renewal or modification of an authorisation, permit or licence, or in the investigation of accidents, incidents and occurrences of non-compliance. The frequency and extent of such activities should be decided by the regulatory agencies.

The regulatory agencies should establish plans for these supervisory activities. The extent and the issues to be covered should be based on the relevant regulatory requirements, the previous experience with the operators' compliance, environmental and geologic conditions, the type of activity carried out by the operator, the type of technology applied, reported accidents and incidents, and general knowledge regarding the operator and its ongoing activities. The plans should be available to the public.

Procedures should be maintained for compliance monitoring to:

- determine whether environmental management system elements and activities conform to requirements in the legislation, and are implemented effectively;
- examine line management systems and procedures, field operations, internal compliance monitoring practices, and data to see if they fulfill the company's environmental policy, objectives, and performance criteria;
- review incident reporting and remedy schemes in relation to incidents that have occurred;
- find out how identified current and potential environmental problems have been dealt with by the operator and how this is reflected in the environmental management system;
- determine compliance with relevant legislative and regulative requirements;
- identify areas for improvement, leading to progressively better environmental performance; and
- formulate the conclusions in a report, which must be well documented.

<u>Reporting and evaluation of compliance monitoring activities</u>

The reports from compliance monitoring activities should include the following information:

(a) legal basis for carrying out compliance monitoring;
(b) background for carrying out the specific monitoring activity;
(c) issues covered during the inspections or audits;
(d) non-compliances or deviations found, as well as other observations;
(e) requirements regarding correcting non-compliances or deviations, including time

lines and needs for reporting back to the authorities; and
(f) listing parties taking part in the inspections or audits.

The reports should be available to the public.

To prevent illegal cross-border environmental practices, the coordination of inspections with regard to installations and activities which might have transboundary impact should be encouraged.

6. Operating Practices

6.1 Waste Management

Offshore oil and gas activities produce a variety of wastes in the form of aqueous and solid discharges and atmospheric emissions that need to be managed to avoid air and water pollution, smothering of benthic communities, and contamination of materials and food sources. Waste management should be included in the overall planning from the beginning and combined with pollution prevention measures. Prevention and elimination of these discharges and emissions, which pose pollution threats to the Arctic environment, should be a targeted goal of regulatory activity. New technology makes this goal achievable in some situations. Arctic governments should set discharge standards.

The operator should to the extent possible avoid generation of waste. Any waste generated should be handled in an environmentally and hygienically adequate manner. Solid waste should not be discharged into the sea.

The operator should prepare a plan connected to waste, including possibilities for waste reduction, waste segregation, reuse, recycling, energy recovery or treatment. The need for enhanced onshore infrastructure should be looked into.

Transfer of pollutant from one media to another should be avoided, based on risk assessment.

Examples of Recommended Preventative Management Techniques

- consider no discharge of the main waste streams at the planning and construction stage, in particular drilling waste and produced water;
- reduce waste at the source by process modification, material elimination, material substitution, inventory control and management, improved housekeeping, and water recovery;

- reuse of materials or products such as chemical containers, and oil-based or synthetic-based drilling fluids;
- recycle/recovery by the conversion of wastes into usable materials and/or extraction of energy or materials from wastes such as recycling scrap metal, recovery of hydrocarbons from tank bottoms and other oily sludge, burning waste oil for energy, and the use of produced water for enhanced recovery;
- reduce toxicity of effluents through the careful selection of drilling fluids and chemical products used in separation equipment and wastewater treatment systems;
- perform radiation surveys of equipment and sites to prevent or minimize the spread of Naturally Occurring Radioactive Materials (NORM); and
- where NORM-scale formation is anticipated, use scale inhibitors to minimize or prevent the buildup of radioactive scale in tubulars.

Management Techniques for Drilling Wastes and Production Effluents

Waste from Drilling Activities

Drilling wastes in the form of residual drilling fluids and cuttings comprise the principal wastes generated during well drilling. Initially, a determination needs to be made on whether or not to prohibit discharge based on the nature/volume of the discharge and its effect on the environment. In certain areas, due to identification of environmentally sensitive areas drilling fluids and cuttings may need to be managed in a manner that will prevent discharge. In areas where discharge is permitted, the method of disposal should be based upon careful consideration of drilling fluid formulation and specific environmental conditions at the site.

Where water-based drilling fluids are employed, additives containing oil, heavy metals, or other substances with negative ecotoxicological properties should be avoided or removed prior to discharge. Persistent and toxic substances should be avoided. Criteria for the maximum allowable concentration of harmful or hazardous substances should be established. If the option of land disposal is used, then both the properties of the drilling fluid and the environmental conditions at the proposed disposal site should be carefully considered to determine acceptability of the disposal site. This is particularly important in the arctic where creation of a disposal site on land may lead to greater environmental damage.

Environmental considerations favor the use of non oil-based drilling fluids for drilling. In shallow portions of a well, saltwater and saltwater with clay are often used as the primary drilling fluid and the cuttings and residual fluids can generally be safely discharged into the marine environment.

Discharge to the marine environment should be considered only where zero discharge technologies or reinjection are not feasible. Based upon site-specific biological, oceanographic and sea ice conditions, risk assessment methods should be used to determine whether the discharges should be at or near the sea floor or at a suitable depth in the water columns to keep impact on marine life as low as possible. These discharges should be considered on a case-by-case basis.

Where the use of non-aqueous fluids is required, for example in highly deviated wells or in certain geological formations, operators should ensure that the content of harmful or hazardous components is as low as possible, and that fluids are recycled as far as practicable. Disposal of cuttings contaminated with such fluids should be assessed on the basis of a comparative assessment of alternatives, including re-use of the material, injection into geological formations and discharge on to the sea bed taking into account possible impacts on the sea and other environmental compartments.

Spent oil-based or synthetic-based drilling fluids can often be reconditioned and recycled. Injection into disposal wells or encapsulation of reserve fluid pits containing drilling fluids and cuttings, including those with acceptable levels of NORMs, and other pumpable wastes, are potential disposal techniques. Where geological conditions permit, reinjection of wastes into the reservoir achieves a significant reduction of discharges to the marine environment of cuttings and drilling fluids. Management of down-hole disposal will require diligence to ensure that wastes do not migrate into unsealed or undesirable stratigraphic zones and that well integrity is maintained. Stabilized burial at approved onshore disposal sites is another alternative.

Production Waste Discharges

During production, produced water can be properly treated and discharged or may be reinjected. Other fluids, which are brought to the surface in connection with completion, work over, well treatment or production, may be mixed with waste waters, unless those waters are identified as hazardous waste at the time of injection. In most cases they can be commingled with produced water for treatment and discharged within acceptable limits or reinjected.

Produced water treatment should be taken into account in the design phase and when significant modifications in operations are carried out. As characteristics of production water differ from one platform to another, there is no single system that can be applied successfully to all offshore platforms. Therefore, a site-specific combination of technologies should be employed based on the characteristics of produced water such as droplet size, stability of emulsion, ratio of droplets/dissolved hydrocarbons, and the presence of other substances such as corrosion inhibitors, solids, and naturally occurring substances.

Regulators and the industry should give consideration to the options for reduction and possible elimination of produced water discharged to the sea through the application of BAT, for example, injection, down hole separation or water shut-off. The focus should be on reducing the volume of discharges of produced water with the highest loads of oil and other substances.

Regulators and industry should ensure that BAT and BEP are implemented on each platform and that BAT and BEP are regularly reviewed. In addition, regulators and industry should ensure that new offshore platforms or major modifications to existing platforms should consider design changes that minimize discharges, and preferably aspire to produced water not being discharged at all.

Produced sand containing elevated levels of naturally occurring radioactive material should be re-injected, encapsulated, or removed from the site and stored in a safe and environmentally sound manner that is carefully controlled and whose risks and circumstances have been properly evaluated. Management of these wastes will require diligence to ensure that radioactive wastes taken to shore are handled and disposed of in accordance with applicable international law and in an appropriate and approved manner. Radioactive materials should be transported in approved containers with proper labeling, which identify the substance and its special transport and handling requirements. Appropriate record keeping and proper notification for shippers should be maintained.

Deck wash and chemical/fluid releases are another concern to the marine environment, especially where oil-based drilling fluids are in use. A facility plan should be developed to address these potential conditions and methods of spill control and leak minimization should be incorporated into facility design and maintenance procedures. These plans, minimization efforts and controls shall be applied to, but not limited to, material storage areas, loading and unloading operations, oil/water separation equipment, wastewater treatment, waste storage areas, and facility runoff management systems.

All washdown waters, hydrocarbon contaminated rainwater and deck wash, and machinery drainage space fluids should be either processed through an oil-water separator prior to overboard discharge, meeting MARPOL 73/78 requirements, or equivalent, or injected where possible.

Fluid Waste from Well-Testing

There may be oil or water containing oil which will not be completely incinerated when flaring during well testing. The regulators must determine whether this may be discharged into the sea, and if so, the quality of the fluid which is allowed discharged. One possibility is to allow discharge after treatment, if the quality of the water is similar to the discharges from produced water or drainage water.

Solids and Domestic Wastes

Disposal of solid and domestic wastes should be done in conformity with international law, such as MARPOL 73/78, and national legislation.

Sanitary Waste

Sanitary wastes such as sewage and gray waters should be processed according to international or local government standards prior to discharge into the marine environment. Processing in an acceptable sanitary waste treatment unit will generally properly treat waste streams prior to discharge.

Hazardous Waste Handling and Disposal

The most effective way of protecting human health and the environment from the dangers posed by hazardous wastes is to ensure the reduction of their generation to a minimum in terms of quantity and/or hazard potential. Minimizing the generation of hazardous wastes requires the implementation of environmentally sound low-waste technologies, recycling options, good housekeeping and management systems. Necessary measures should be taken to ensure that management of hazardous wastes is protective of human health and the Arctic environment.

The availability of adequate disposal facilities should be ensured prior to allowing an activity to generate hazardous wastes. Hazardous wastes requiring transport to a disposal site should be packaged, labeled, and transported in conformity with generally accepted and recognized international rules and standards in the field of packaging, labeling, and transport. Due account should be taken of relevant internationally recognized practices. Transported hazardous wastes should be accompanied by a movement document from the point at which movement commences to the point of disposal.

6.2 The use and discharge of chemicals

The use and discharge of chemicals from the oil and gas industry should be strictly regulated to avoid or reduce possible negative effects on the marine environment.

The amounts of chemicals used and discharged should be as low as possible.

All substances in chemical preparations should be tested for their ecotoxicological properties such as potential for bioaccumulation, biodegradation rate and acute toxicity. The tests should be performed by laboratories that are approved in accordance with established international standards, for example, OECD's principles for good laboratory practice (GLP) or equivalent.

Biodegradability

The substance should if possible be tested in accordance with established standards, for example, the seawater test OECD 306 "Biodegradability in Seawater or equivalent.

Bioaccumulation

Chemicals that consist of several substances should be tested for the individual organic substance's bioaccumulation potential. The substances should be tested according to established standards, for example, OECD standards [or equivalent. For substances where standardised tests are not applicable, as for surfactants, a calculation or a scientific evaluation of the bioaccumulation potential may be performed.

Acute toxicity

Inorganic and organic chemicals should be tested for acute toxicity. Toxicity tests specified in the OSPAR *Protocols on methods for testing of chemicals used in the offshore industry* may be used.

Assessing chemical risk

The operators should ensure that risk evaluations are done based on the chemicals' intrinsic properties, time, place and amounts of discharge, and also other conditions of significance for the risk. The operator should choose the chemicals which according to environmental risk evaluations poses the lowest risk of harming the marine environment.

The operator should have plans to ensure that hazardous chemicals are substituted with substances which pose less risk of harm to the environment. The plans shall give a description of which chemicals are prioritized to replace, and when this can take place.

Chemicals should be stored in a safe and prudent way.

6.3 Emissions to air

Emissions to air

Air emissions associated with oil and gas exploration and production activities can be generally categorized as arising from three activities: (1) the combustion of fuels for power generation; (2) emissions arising directly from the production, treatment, storage or transportation of produced oil and gas, and (3) flaring of gas.

Energy efficiency

Overall emissions reductions can best be achieved through programs that emphasize energy efficiency and conservation in all activities, exploration (survey and exploratory drilling), development (construction and drilling), production, and transportation. Such programs can also encourage the use of energy effective technology (turbines with high power efficiency, waste heat recovery units when heat demand, dry low emission turbines etc.)

Policy instruments to reduce emissions/discharges from petroleum activities

The regulators can apply terms and conditions when awarding licenses, as requirements connected to EIAs, in emission or discharge permits, and/or in production permits. Such terms may include taxes on emissions of CO_2 and NOx.

Using such economic measures may be used to enhance power generation efficiency and reduce emissions.

Emissions from flaring

If associated gas is flared, this may be a significant source of emissions to air. To reduce the amount of gas flared from an offshore installation is beneficial both from and environmental point of view, but also can help avoid potential waste of resources and reservoir energy.

There may be a need for specific licenses or permits covering flaring of gas. Flaring permits can be issued after a thorough assessment of environmental considerations and evaluations in accordance with technology, economy, resources, safety, infrastructure, jurisprudence etc. The regulators should early in the process of awarding licenses specify what the operators must expect with regard to limiting flaring of associated gas. Some gas may be utilized for power production at the installation, but if a large amount of gas is produced, possible solutions may be injection into the reservoir or export through pipelines. Every effort should be made to flare only where necessary for safety purposes.

The planning and execution of activities regarding flaring reduction is extremely time consuming and cost intensive. This has to be taken into account in the early phases of deciding on the production strategy of the field. Technologies that could be used for reducing emissions from flaring may be *closed flare* technology and/or *flare gas recovery* systems.

VOC emissions

Offloading and storage of oil is an emitting source of volatile organic compounds. Emissions of such non methane volatile organic components (nmVOC) can be significantly reduced by applying technologies for nmVOC recovery. These can be condensation, absorption or adsorption technologies, and can be installed at storage ships and shuttle tankers.

Best Available Techniques (BAT)

All large combustion plants offshore (both existing and new) should apply integrated prevention and reduction of pollution. This implies application of Best Available Techniques (BAT). Regulators should refer to BAT when discharge limits are set in the discharge permits, and reflect what levels of reduction can be achieved without a definite resolution on what technology to use. Instructive reference documents (see reference) for guidance on what to consider as BAT has been developed. These reference documents will inform the relevant decision makers about what may be technically and economically available in order to improve the industry's environmental performance and consequently lead to environmental improvements. The reference documents can be considered as guidelines for considerations regarding BAT.

When making plans for development of new fields, it is important to take into consideration the need to reduce emissions to air. It is important that operators inform the regulators on BAT considerations at an early stage in the development. The operator should as early as possible, for example in the EIA document that BAT has been considered (e.g Dry Low Emission turbines, power co-ordination, and waste heat recovery if heat is needed).

6.4 Design and Operations

Offshore oil and gas activities should make use of the best available and safest technologies as appropriate and be conducted in a manner to minimize impact on the environment. Operators should identify technologies and procedures to be employed for each step of the process from prospecting to exploration, development, production, platform decommissioning, and site clearance. Regulators should examine technologies and procedures proposed for use by operators and their adequacy to ensure that they are appropriate for the Arctic.

Of primary importance is the need to ensure that wells remain under control at all times during drilling, well-completion, production, and well-workover operations. This capability must be maintained even while operating under extreme conditions.

When planning an offshore oil and gas operation, a risk analysis may be used as a tool to identify potential hazards and prevent personal injuries, loss of human lives, and pollution of the environment. Criteria used for conducting such an analysis should be based on local regulatory requirements, local environmental conditions in the area of operation, and the planned operational activity.

A risk analyses should:

- address prevention of injuries, loss of human life, and pollution of the environment;
- include risk criteria that has been defined prior to conducting the analysis and document the evaluations forming the basis of the acceptance criteria;
- be used to follow the progress of activities in planning and implementation;
- identify risk that has been assessed with reference to the acceptance criteria, form the

basis of systematic selection of technical operational and organizational risk to be implemented;

- be updated on a continuous basis and included as part of the decision making process; and
- systematically follow-up implemented risk reducing measures and assumptions made in the analysis to ensure safety within the defined criteria.

Technology

Offshore platforms and other structures used for oil and gas activities in the Arctic should be designed, built, installed, maintained, and inspected to ensure their structural integrity taking into account the site-specific environmental conditions. Standards exist for the construction of fixed offshore platforms, including those constructed of steel and concrete; mobile offshore drilling units; and floating production, storage and offloading units (FPSOs). (FPSOs should be double hulled). Standards, such as those under the International Organization for Standardization (ISO), are under development for offshore artificial islands including those constructed of sand, gravel and ice. In iceberg-prone areas, provision should be made for the emergency removal of removable installations.

Employment of effective well control technology and practices including incident drills and exercises will lower the risk of blowouts and unintended release of other hazardous substances. Blowout preventers and related equipment should be suitable for operation in subfreezing conditions. Drilling fluids, well casing programs, cements, emergency well shut-in procedures and well safety programs should also be suited to Arctic conditions including moving ice and possible subsurface permafrost.

Pipelines should be installed, operated, and maintained in a manner that minimizes disturbance of sea floor habitat and does not unreasonably interfere with other uses of the sea floor in the area. Pipelines should be installed only after a thorough survey of the seafloor for hazards or cultural resources. Design of offshore Arctic pipelines should follow recommended practices such as those from Det Norske Veritas or the American Petroleum Institute and take into account factors such as thaw settlement, near shore strudel scouring, and ice keel gouging. Pipe properties, instrumented internal inspection techniques, leak detection systems and techniques, cathodic protection, and preventive maintenance must also be considered in the design of Arctic pipelines.

Procedures

Procedures relevant to the special conditions in arctic areas should be worked out as a part of the operator's management system.

Operators should submit a summary of the proposed project at the outset, followed by more detailed information prior to the initiation of each major activity, such as the drilling of a well. The application should describe all procedures to be employed, including those necessary to prevent harm to life and the marine environment. Special attention should be paid to operations in offshore areas underlain by permafrost.

Safe work procedures should be developed for all phases of the proposed operations, including construction activities, transportation, equipment operation and maintenance, safety tests and drills. For example, well-control exercises should be conducted regularly for each crew to develop an adequate level of response proficiency to conditions threatening a blowout. Exercises should cover a wide range of situations. As appropriate, procedures should also be developed to ensure that hot work, welding, burning, cutting, and other operations with the potential to cause ignition of flammable vapors are conducted safely. Safe work procedures may also be developed for cold work such as use of radioactive material, trenching and excavating, and work on fire suppression, gas detection or emergency shutdown devices. These procedures may include issuance of a work permit.

Procedures should be developed to protect personnel from the toxic effects of hydrogen sulfide, if it is encountered during drilling and production.

Decommissioning, and site clearance are discussed in Section 8 (**Site Clearance and Decommissioning**). Operators shall incorporate into the design of an installation needed measures to ensure that removal of the installation can be accomplished without causing significant impacts on the environment.

6.4 Human Health and Safety

Threats to human health and safety including unsafe working conditions are factors contributing to accidents that could lead to environmental pollution. Possible threats or hazards affecting the health and safety of personnel in Arctic offshore oil and gas activities take many forms and comes from multiple sources. Principal sources include, but are not limited to, the harsh Arctic environment, the structural integrity of the installation, blowouts, fire and explosions, equipment failure, the transfer of personnel and supplies, and drilling, production, well completion, and workover operations.

All offshore activities should be conducted in a safe and skillful manner and equipment maintained in a safe condition for the health and safety of all persons and the protection of the associated facilities. All necessary precautions should be taken to control, remove, or otherwise manage any potential health, safety or fire hazards.

Management System and Work Procedures

One way to manage potential risks is through the use of an appropriate management system. A management system or plan should address the identification of potential hazards, the evaluation of risks to the health and safety of personnel and procedures to eliminate or reduce health and safety risks (See 5.1 **Management Systems**). Management plans should:

- identify and recognize significant health and safety risks;
- evaluate significant health and safety risks;
- plan and implement actions/procedures to manage risks;
- review and test preparedness and effectiveness on a regular basis;
- establish clear lines of communication with personnel;
- provide training to personnel;
- identify appropriate personnel protection equipment; and
- communicate contents of the management plan to all personnel.

Operators should ensure that all contractors pursue established safe working environment objectives. Safe working procedures should be established for all persons, including contractors, to ensure safe working conditions for all offshore activities. In addition work permits may be required for specific work activities including hot work, cutting, and welding (see 6.3 **Design and Operations**).

Another useful tool to consider in the management or elimination of risks is through the use of a Health, Safety and Environment (HSE) Committee. HSE Committee meetings could be held to ensure that critical safety and environmental control information is communicated to all parties throughout offshore operations. HSE meetings would coordinate among the operator, contractors, and employees to ensure a mutual understanding of potential hazards in working environment. Meetings would allow employees an opportunity to express safety concerns to be addressed by the operator.

Control of Materials

Materials specifications, inventories, separation, confinement, and handling of toxic or hazardous materials that can affect human health and safety should be determined, documented, labeled, and communicated to appropriate person and addressed (see 6.1 **Waste Management**).

6.5 Transportation of supplies and transportation infrastructure

Offshore transportation by air and water should be planned and carried out in a manner to eliminate or minimize adverse impact on the environment. The sections in these guidelines on management systems, monitoring programs and planning for emergencies should be applied, with adaptations where necessary, to transportation activities. Information gathering and mitigation measures identified at the environmental assessment stage of project planning should be fully utilized for minimizing the environmental impacts associated with transportation of supplies and people to and from offshore operations. For example, it may be necessary to select routes, frequency, flight altitudes and/or the time of voyages to avoid impact on wildlife or the harvesting of wildlife by area residents.

The planning and implementation of supply routes involves many considerations beyond environmental impacts. The system of transportation consists of supply bases, routes and mode. Procedures involved are the safe handling of cargo and safe navigation. All these elements must be carefully evaluated and accounted for prior to the field development. Transportation of supplies, infrastructure and crude oil, shall therefore be an integrated part of the environmental impact assessment outlined in these Guidelines.

Where roads are required, ice roads, which create seasonal rather than permanent physical barriers to animal movements, may be preferable to permanent roads. Planning and environmental studies should be done to ensure the use of water from lakes or rivers to make ice roads will not significantly affect important freshwater habitat, including habitat for migratory birds.

Ship-based transportation of supplies to offshore oil and gas installation are to be carried out under the administration of those requirements and guidelines laid down in the Safety of Life at Sea Convention, including in particular Chapter IX pertaining to the International Safety Management (ISM) Code, The International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), and the International Convention on the Prevention of Pollution from Ships (MARPOL 73/78), among others. The basis of the ship owners management system should include guidelines, codes and relevant international conventions to safeguard those additional requirements of the harsh environment of the Arctic such as those established by the Marine Environment Protection Committee (MEPC) and Maritime Safety Committee (MSC) of the International Maritime Organization.

Supplies

In maintaining the activity of an oil or gas installation in every aspect, supplies of many categories are involved;

- supplies for maintaining production;
- supplies for installation maintenance and safe operation; and
- supplies of domestic use.

Storage, packaging and operational procedures of handling are to be as in accordance with general rules of safe practice and to recommendations of the product manufacturer.

Supply base, routing and installations

Prior to field development, it is necessary to plan infrastructure required to serve the needs of the installation. In addition to systems for handling the production, a system is also required to secure sufficient and safe supply. Beside the installation itself, the main elements of such infrastructure are the supply bases and sea-routes. The location of such bases is often decided on the basis of compromises in which the requirements for safe transportation must compete with other possibly conflicting alternatives. This calls for an even closer focusing on safe routing. An Arctic land-offshore transport routing system might cover more than one field and therefore must be reliable. To assure safe operations, sufficient care must be taken regarding both climatic and environmental seasonal variations. In order to account for these factors, one should evaluate the possible need for ice handling and management procedures (integrated in the field operational plans if feasible) covering the installation, and the route as well as the supply base.

6.6 Training

Trained operator and contract personnel are the key to safe and environmentally sound oil and gas activities. Appropriate training plans, programs, and practices addressing offshore Arctic oil and gas activities should be established and implemented for these personnel in accordance with their duties and job responsibilities. (Refer to Section 7, **Emergencies**, for information concerning response training).

All personnel should be provided with training on basic safety and environmental issues and procedures specific to the offshore environment prior to assuming their duties. This training should provide personnel with the necessary skills and knowledge needed to conduct their jobs in a safe manner, provide for health and safety of all persons, and protect the environment.

Training programs should provide instruction on the operation of equipment, offshore operating practices, offshore emergency survival and fire fighting, local or regional regulatory requirements. It should include Arctic cultural, social, and environmental concerns including marine mammal interactions as dictated by an individuals' job responsibilities. Where appropriate, indigenous and traditional knowledge should be used in training programs.

Supervisory personnel should have a thorough knowledge of the operations and the operating procedures for which they are responsible. Individuals responsible for drilling, well completion, or workover operations should be properly trained in well control. Individuals responsible for production operations should be properly trained in production safety system operations.

A person designated by the operator to be in charge of the offshore operation should have a thorough knowledge of the operations and the operating procedures they are responsible for, and training in the following areas as appropriate:

- leadership and command ability;

- communication skills;
- team building;
- crisis management; and
- installation specific emergency training.

Periodic refresher training should be provided to personnel as appropriate. As required, procedures should be developed to monitor the effectiveness of training programs.

7. Emergencies

Arctic States that are party to the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC 1990) and/or the International Convention for the Prevention of Pollution from Ships (MARPOL 1973/1978, Annex I – regulations for the prevention of pollution by oil), are required to ensure that operators have oil pollution emergency plans and that these plans are carried on board installations.

7.1 Preparedness

Operators should establish and maintain emergency preparedness so that the mitigation of an incident will be carried out without delay in a controlled, organized, and safe manner. Risk analyses should be carried out in order to identify the accidental events that may occur and the consequences of such accidental events. Hazardous situations and accidents should be defined for the operations in question. An analysis should be carried out to design the emergency preparedness requirements so as to meet the specific circumstances of the operation. Such an analysis should include oil spill response strategies, techniques, and capabilities. The emergency preparedness required for the operation should be incorporated in the design and modification of the oil and gas installation, and for the selection of equipment. The performance requirements expected of both standby vessel and ice roads in emergencies should also be defined. This should include design criteria, equipment and manning requirements for standby vessels and design criteria and construction and maintenance requirements for roads. Emergency preparedness should be part of the safety and environmental program to ensure its integration into all phases of the operation in question.

Preparedness relating to oil pollution should ensure that the source of any oil pollution is first secured, and any release is effectively contained and collected near the source of the discharge as quickly as possible. Particular attention should be paid to response contingencies in ice conditions, where oil spill response, including containment, may require a range of techniques depending on the condition of the ice. The preparedness should also address protection of public health, environmental resources including shorelines, ice and water interfaces, and economic and cultural resources. The health and safety of all persons who may be involved in an incident (e.g., local populations and their representatives, responders, volunteers, etc.) should be a predominant consideration, and should be integrated into the overall emergency preparedness regime.

The communication within the emergency preparedness organization should ensure effective administration and control of all response resources when abnormal conditions and emergencies occur. The means of communication and their use should ensure unambiguous and effective transmission of information.

A key factor in preparedness is ensuring that personnel involved in the response are trained and instructed in their roles and duties.

Preparedness planning of the operator should include co-ordination with any relevant municipal, local, state or federal emergency response plan.

Governments are responsible for oversight including national emergency contingency planning. Governments should also make appropriate arrangements that facilitate international coordination and cooperation.

7.2 Response

Refer to the EPPR Field Guide for Oil Spill Response in Arctic Waters for a practical introduction to oil spill response. Emergency response plans should address abnormal conditions and emergencies that can be anticipated during the oil and gas operation being carried out, including:

- personnel injury or loss of life;
- loss of well control, or release of flammable or toxic gas;
- fire, explosion or other emergencies that may occur;
- damage to the oil and gas installation;
- loss of support craft including aircraft;
- spills of oil or other pollutants; and
- hazards unique to the operation including ice encroachment; uncontrolled flooding of the installation; loss of ballast control or stability; pipeline leaks or ruptures; vessel collision; and heavy weather and difficulties with support facilities such as ice roads, aircraft or shuttle tankers.

Contents of Emergency Response Plans

An emergency response plan should contain at least the following elements:

- a description of the response organization, clearly stating its structure, roles, responsibilities and decision-making authorities;
- policies and procedures for responding, including a summary of equipment to combat the particular condition or emergency situation, clearly stating the make and type of equipment, its capacity, location, type of transport, field of operation and operational procedures and training for operating staff. The procedures should include each key person's duties, when and how the emergency equipment is to be employed, and the action to be carried out. Policies should state measures for limiting or stopping the event in question and conditions for terminating the action. The procedures should be designed so as to be expedient to use for the emergency;
- a description of the alarm and communication systems, including notification criteria, reporting procedures and policies regarding government notification. Primary and secondary communication facilities among operational components should also be identified;
- Alert Criteria, whose procedures should list precautionary measures to secure the well and evacuate personnel in the event of damage from severe weather, sea, ice, erosion or other event;
- On-Site First Aid - List available backup medical support, medevac facilities and other emergency facilities, such as emergency fueling sites. Also describe required survival equipment, including extreme weather survival gear, alternate accommodation facilities, and emergency power sources; and
- Relief Well Arrangements - The operator should outline his immediate response to a well control incident or blowout. Also, the operator should demonstrate the availability of the necessary equipment, and support systems to be utilized.
- Designated response operation center to coordinate response actions; and
- "Emergency response contact list" in order to identify who and how key responders to an emergency are to be contacted.

Oil Spill Response Plan

Operators should be required to have site-specific or operator-specific plans. An oil spill response plan addresses an oil spill volume based on relevant well data, catastrophic loss of a tank ship or barge, or damage to a pipeline. The Plan should be supplemented by resource sensitivity maps arranged sequentially by month for those areas identified by spill trajectories as being potentially exposed to oil pollution. The plan should also describe the process for its development, which should include involvement by response entities, both government and private, health officials, scientists, local populations that may be affected, wildlife experts, trustees of resources, and anyone else who may be affected or who may have a role in the response. Operators should allow the opportunity for public review and comment of the Plan.

The oil spill response plan should include, in addition to the items described above, the following:

- a brief description of the operation;
- a description of remote sensing systems in order to detect and monitor oil spills;
- a description of the site, water depth, seasonal constraints, and logistical support;
- references to all environmental support material that would be relevant to establish cleanup priorities;
- details of the operator's capability in using real time wind and current data to implement an oil spill trajectory model both for open sea and for ice-infested areas;
- a map depicting sensitive areas to be protected;
- a description of cleanup and containment strategies required for shoreline and ice-covered areas;
- a description of alternative cleanup strategies such as the use of dispersants, in situ burning, and no response;
- a strategy to respond to small spills from the installation, shore base or loading operations;
- provisions for transport, storage, and disposal of recovered oil and oil contaminated materials;
- spill response crew relief & logistics; and
- a list or inventory of spill response equipment and their measured efficiency when used as expected in the plan.

Operators should have access to oil spill countermeasures equipment. The oil spill response plan should itemize equipment on-site for immediate containment purposes.

The plan should also provide details of oil spill equipment and resources that are not onsite but will be mobilized in the event of a spill; the details should include type of equipment, required resources, logistics and timing of mobilizing the equipment to the site.

The oil spill response plan should include the qualifications and training of personnel responsible for the management of oil spill responses. It should clearly define their authority to take actions to respond to such emergencies.

A national preparedness and response system should be developed on the basis of protecting the health and safety, the environment, and the socio-economic interests of the nation's citizens.

Oil spill response plans must take the existence of ice conditions into account. Broken ice conditions make it difficult to respond to oil spills with conventional mechanical response equipment because oil can be trapped in melting or freezing ice and require the coordinated application of a suite of response strategies. Through ice movement and drift, oil can be carried a long distance from the original site of the spill. Deployment of oil tracking buoys in the ice can aid in maintaining knowledge of the position of the oil. Where ice conditions exist, oil spill response plans must outline the strategies to be used, list the equipment to be deployed, and techniques to be implemented including for tracking oil in ice and for alternative response measures.

Exercises and Drills

To enhance response capabilities, response organizations should conduct regular safety and emergency response drills during which trained workers and emergency responders carry out regular exercises. Drills include desk-top exercises and actual equipment and operational deployment exercises. Such drills should be conducted by operators as well as by relevant government authorities in their areas of responsibility, such as coast guards for marine spills.

Ice Management Plan

Where there may be pack ice, drifting icebergs or ice islands at the operational site, the operator should develop an ice management plan that provides for the protection of the installation.

The Plan should include details regarding ice detection, ice surveillance, data collection, forecasting and reporting of ice encroachment, multiyear ice hazards, ice loading, and structural loading. If required, the Plan should also include details of ice avoidance or ice deflection, including forecasting oil-in-ice drift.

The Plan should include alert criteria and alert procedures to ensure a totally effective mobilization of all relevant emergency preparedness resources, including procedures for moving the installation. Measures for danger limitation should be implemented when a hazardous situation occurs in order to prevent its developing into an accident situation.

Emergency Preparedness Maintenance

All the established technical, operational and organizational measures that make up the emergency preparedness of the individual activity, as well as, the actual equipment should be maintained in order to keep up a state of effective emergency preparedness.

Oil spill response exercises should be carried out on a scheduled basis allowing responders to use actual equipment. In addition, a communication exercise in response to an emergency should be conducted on a scheduled basis. Exercises should be reviewed to ensure compliance with all requirements relating to emergency preparedness. Any deviation should be identified and corrected immediately; the causes of such deviation should be identified. In accordance with the safety and environmental program, emergency preparedness work should be verified and documented.

Measures should be taken to update the established emergency preparedness based on continuous evaluation of experience, technological development and new knowledge.

8. Decommissioning and Site Clearance

Decommissioning is an integral part of the life cycle of an offshore project. Plans for decommissioning should be incorporated at the design phase of a development and reviewed again when the facility is no longer needed for its current purpose. These plans should involve both technical considerations and financial provisions required to undertake the activity and any post-abandonment clearance and/or monitoring work.

A decommissioning plan should be site- and condition-specific and should take into account sound science and field experience and balance environmental, safety, health, economic and technological factors as well as any constraints imposed by intergovernmental agreements. It is noted that those Arctic States that are Contracting Parties to the OSPAR Convention have agreed to a binding package of measures (via OSPAR Decision 98/3) which generally prohibits disposal of installations at sea, but which allows for derogation from this prohibition in a limited number of instances. These include leaving in place the footings of a large steel jacket platform (with a jacket weight in excess of 10,000 tons) as well as a broad exemption for gravity-based concrete structures for which leaving in place and/or disposal at a designated site may be considered.

Other Arctic States will need to take into account the provisions of the London Convention (1972) or the 1996 Protocol to that agreement where full or partial disposal at sea (including toppling and leaving in place) is considered. For both the 1972 and 1996 agreements, Contracting Parties to the London Convention (1972) have adopted specific guidelines for disposal of platforms.

In addition to these agreements dealing with the special case of disposal of platforms, the International Maritime Organization has adopted "Guidelines and standards for the removal of offshore installations and structures on the continental shelf and in the Exclusive Economic Zone" (Resolution A.672(16))" which govern safety of navigation. Amongst other things, the guidelines state that for structures placed on the seabed after 1998, complete removal should be feasible.

Decommissioning plans should be developed in consultation with the competent authorities and stakeholders, including indigenous residents, fishing groups and other interested parties. The decommissioning plan should address both the facilities and the environment. (The London Convention (1972) Waste Assessment guidance is a useful reference in this regard.) Abandoned wells should be plugged and sealed. Pipelines may be removed, or cleaned flushed and left in space either on the seabed, if they will not interfere with other uses of the sea, or trenched. Removal of facilities should consider potential impacts on the site, including noise (as from the use of explosives), physical disturbance of communities established during the life of the facility and demobilization routes.

Site clearance and post decommissioning monitoring programs are important aspects. These will ensure that with the exception of facilities purposely left in place that the site is clear of debris and that no obstacles are left that might interfere with other uses of the site. Post decommissioning monitoring can also be used to assess the recovery of the production site. Where an artificial island has been constructed as a platform for drilling or construction, it may be appropriate to allow natural processes to return the site to its former configuration.

Development of a trust fund that can be used to decommission the infrastructure when its production life is over should be considered.

9. Abbreviations and Definitions

Accident: A sudden, unplanned, unintentional and undesired event or series of events that causes physical harm to a person or damage to property, or which has negative effects on the environment.

ADD: International Arctic Environmental Data Directory http://www.grida.no/add/

AEPS: Arctic Environmental Protection Strategy

AMAP: Arctic Monitoring and Assessment Program, a working group under the Arctic Council. http://www.amap.no/

API: American Petroleum Institute http//www.api.org

BAT: Best Available Technology/Techniques

BEP: Best Environmental Practice

BOP: Blowout Preventor--Safety system that quickly closes a well in the course drilling to avoid blowouts.

CAFF: Conservation of Arctic Flora and Fauna-- a working group under the Arctic Council. http://www.caff.is/

Chemicals: A generic term for both chemical substance and/or mixture of substances (see definition for 'mixture of substances').

Chemical Substance: A chemical element and chemical compound of several elements, naturally or industrially produced.

Chemical waste: Oil/fuel residues, empty chemical and paint packaging, all kinds of chemical waste (solid and liquid) and all kinds of paint and solvents.

Contamination: concentrations of naturally occurring substances enhanced by man's activities or the occurrence of synthetic substances in the environment at concentrations that do not give rise to adverse effects;

DNV: Det Norske Veritas, Classification, Consulting and Certification Society. http://www.dnv.com/

EIA: Environmental Impact Assessment

EMS: Environmental Management System

Emergency: An unplanned event which has caused injury, loss or damage or which is an actual or potential threat to human life, the environment or the installation and has made it necessary to deviate from the planned operation or suspend the use of standard operating procedures.

EPPR: Emergency Preparedness, Prevention and Response a working group and program of the Arctic Council. http://eppr.arctic-council.org/

Hazard: A physical situation with a potential for causing human injury, damage to property, negative effects on the environment or a combination of these. British Standards BS 8800 definition--A source or a situation with a potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these.

Hazard Analysis: The identification of undesired events that lead to the materialisation of a hazard, the analysis of the mechanisms by which these undesired events could occur and usually the estimation of the extent, magnitude and likelihood of any harmful effects.

Hazard Identification: (British Standards BS 8800) The process of recognising that a hazard exists and defining its characteristics.

HSEMS: Health, Safety, and Environmental Management System

HSE: Health, Safety and Environment

ISM: International Safety Management Code in Chapter IX of the Safety of Life at Sea Convention. http://www.imo.org/

ISO: International Organization for Standardization. http://www.iso.ch/

IMO: International Maritime Organization. http://www.imo.org/

Impact: an alteration to the natural environment arising from the activity in question

Incident: A sudden, unplanned, unintentional and undesired event or series of events having the potential of causing physical harm to a person or damage to property, or which has negative effects on the environment. British Standards BS 8800 definition—An unplanned event which has the potential to lead to accident.

MARPOL: International Convention for the Prevention of Marine Pollution. 1973, 1978. MARPOL-Annex I, IV, V and Annex VI. International Maritime Organization http://www.imo.org/

MMS: United States Department of the Interior, Minerals Management Service. http://www.mms.gov/

MSC: Maritime Safety Committee of the International Maritime Organization. http://www.imo.org/

MEPC: Marine Environment Protection Committee of the International Maritime Organization http://www.imo.org/

NORM: Naturally Occurring Radioactive Materials

OGP: International Association of Oil and Gas Producers http://www.ogp.org.uk/

OPRC: International Convention on Oil Pollution Preparedness, Response and Cooperation (1990) http://www.imo.org/

PAME: Protection of the Arctic Marine Environment http://www.pame.is/

PEIA: Preliminary Environmental Impact Assessment

Performance Standard: A statement, which can be expressed in qualitative or quantitative terms, of the performance required of a system, item of equipment, person or procedure, and which is used as the basis for managing the hazard e.g. planning, measuring, control or audit - through the life cycle of the installation.

Petroleum activity: is in this context used for all activities being an integrated part of oil and gas activities, including shuttle transportation of petroleum, supply transportation etc.

Pollution: the introduction by man, directly or indirectly of substances or energy into the marine environment which results, or is likely to result in hazards to human health, harm to living resources and marine ecosystems, damage to amenities or interference with other legitimate uses of the sea.

POP: persistent organic pollutants

Risk: The probability that physical harm to persons will be suffered or negative effects on the environment or that damage to property will occur as a consequence of exposure to a hazard.

Risk Analysis: (United Kingdom Health and Safety Executive, Offshore Research Issue 134/DEC01) The estimation of risk from the basic activity "as is"

Risk Assessment: (Lloyds Register Definition) The quantitative evaluation of the likelihood of undesired events and the likelihood of harm or damage being caused together with the value judgments made concerning the significance of the results. (British Standard BS 8800 Definition) The overall process of estimating the magnitude of risk and deciding whether or not the risk is tolerable or acceptable. (United Kingdom Health Safety Executive (HSE), Offshore Research Issue 134/DEC01) A review as to acceptability of risk based on comparison with risk standards or criteria, and the trial of various risk reduction measures.

Risk Management: (United Kingdom Health Safety Executive (HSE), Offshore Research Issue 134/DEC01) The process of selecting appropriate risk reduction measures and implementing them in the on-going management of the activity.

Safety: freedom from unacceptable risks to, personal harm, damage to property, or environmental pollution.

*Safe Job Analysis***:** A review of the work situation, in which the job is broken down into sub-activities. Possible elements of danger associated with each sub-activity are considered as well as how/which risk reducing measuring should be established.

SEA: Strategic Environmental Assessment--a systematic process for evaluating the environmental consequences of a proposed policy, plan or program initiative in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations.

SEMP: Safety and Environmental Management Program

UNEP: United Nations Environmental Program

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Environmental Protection Agency. Regulation and enforcement of waste, oil and hazardous discharges and air emissions and monitoring. National: www.epa.gov. Region 10 (including Alaska): http://www.epa.gov/Region10/.
National Oceanic and Atmospheric Administration. Marine mammal and fisheries management, protection, permits, and research. National: http://www.noaa.gov/. Fisheries

Alaska Region: http://www.fakr.noaa.gov/.
U.S. Army Corps of Engineers. Offshore dredging and dumping permits. Wetlands protection. National: http://www.hq.usace.army.mil/hqhome/.
Alaska: http://www.poa.usace.army.mil/hm/default.htm.
U.S. Coast Guard. Offshore oil and hazardous spill response and coordination. Also search and rescue, security and law enforcement. National: http://www.uscg.mil/. District 17 (Alaska): http://www.uscg.mil/D17/
U.S. Department of Transportation. Regulates aspects of offshore pipelines and production platforms. National: http://www.dot.gov/. DOT Pipeline and Hazardous Materials Safety Administration: http://www.phmsa.dot.gov/pipeline.
State of Alaska. Responsible for marine areas to 5 kilometers from shore. Departments of Environmental Conservation, Natural Resources, Fish and Game, Transportation and Public Facilities, Public Safety, Labor and Workforce Development, and Revenue are responsible for offshore leasing, permits, research, spill response, revenue management, economic resource analysis, environmental protection, safety, inspections and enforcement. State: http://www.state.ak.us/. DNR: http://www.dnr.state.ak.us/. DF&G: http://www.adfg.state.ak.us/. DEC: http://www.dec.state.ak.us/. DR: http://www.revenue.state.ak.us/. DTPF: http://www.dot.state.ak.us/. DPS: http://www.dps.state.ak.us/. DLWD: http://www.labor.state.ak.us/.

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Biodegradability:

- Marine BODIS test (for insoluble substances), modified ISO 10708
- Marine CO2 Headspace test, modified ISO/TC 147/CS 5/WG 4 N182

Bioaccumulation
The substances should be tested according to OECD 117 "Partition Coefficient (n-octanol/water), High Performance Liquid Chromatography (HPLC) Method" or OECD 107 "Partition Coefficient (n-octanol/water): Shake Flask Method".

Toxicity:

- Skeletonema costatum, ISO 10253
- Acartia tonsa, ISO 14669
- Scophtalamus maximus; Part B in the OSPAR Protocols on Methods for the testing of Chemicals Used in the Offshore Oil Industry, 2006. Sheepshead minnow is accepted as an alternative species.
- Corophium sp; Part A in the OSPAR Protocols on Methods for the Testing of Chemicals Used in the Offshore Oil Industry, 2006. Required if the chemicals absorb to particles (Koc>1000) and/or sink and end up in the sediments (e.g. surfactants)

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ANNEX A

Definition of the Arctic

Canada

Canada has defined its Arctic area to include the drainage area of the Yukon Territory, all lands north of 60 degrees North latitude and the coastal zone area of Hudson Bay and James Bay.

Kingdom of Denmark

The Arctic area within the Kingdom of Denmark is the Faroe Islands and Greenland, which is the world's largest island on which stands 9% of the World's ice cap.

Finland

In Finland the Arctic Area is defined as the territory north from the Polar Circle.

Iceland

Iceland has defined the whole of Iceland to be within the Arctic area.

Norway

Norway has no legal/formal definition of its Arctic areas, but for the purposes of these Guidelines, Norwegian Sea areas north of 65 degrees North form the Arctic.

Sweden

Sweden does not have any formal delimitation of the Arctic but has, for the purpose of AEPS, accepted the Arctic Circle as the southern delimitation of the Arctic area.

Russian Federation

In accordance with the draft Law of the Russian Federation "On Zoning of North Russia", the Arctic areas of North Russia include:

> All lands and islands of the Arctic Ocean and its seas;
>
> Within the Murmansk region: Pechenga district (coastal areas of the Barents Sea including populated centers located on Sredniy and Rybachiy Peninsulas, as well as Liynakhamareye populated center, and the town-type settlement of Pechenga) Kolsk district (territories administered by the Tyuman and Ura-Guba rural government

bodies), Lovozersk district (territory under the Sosnovsk rural government body), territory administered by the Severomorsk municipal government, and closed administrative-territorial entities of Zaozersk, Skalistiy, Snezhnogorsk, Ostrovnoy, and the city of Polyarniy with populated centers administratively Attached to it;

Nenets autonomous national area – all territory;

Within the Komi Republic – city of Vorkuta, within areas managed by it;

Within the Yamal-Nenets autonomous national area; Priural, Tazov, and Yamal District, and territories and administered by the Salekhard and Labytnang Municipal governments;

Taimyr (Dolgan-Nenets autonomous area) – all territory;

Within the Krasnoyarsk territory – areas administered by the Norilsk municipal government;

Within Sakha Republic (former Yakutia): Allaikhov, Anabar, Bulun, Nizhnekolym, Olenek and Ust-Yan district:

Chuckchi autonomous national area – all territory;

Within the Koryak autonomous area -- Olutor district.

United States of America

All United States territory north of the Arctic Circle and all United States territory north and west of the boundary of formed by the Porcupine, Yukon and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering and Chukchi Seas; and the Aleutian chain.

ANNEX B

Criteria for the Definition of Practices and Techniques mentioned in Paragraph 3(b)(i) of Article 2 of the OSPAR Convention

BEST AVAILABLE TECHNIQUES (BAT)

1. The use of the best available techniques shall emphasise the use of non-waste technology, if available.
2. The term "best available techniques" means the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste. In determining whether a set of processes, facilities and methods of operation constitute the best available techniques in general or individual cases, special consideration shall be given to:
   (a) comparable processes, facilities or methods of operation which have recently been successfully tried out;
   (b) technological advances and changes in scientific knowledge and understanding;
   (c) the economic feasibility of such techniques;
   (d) time limits for installation in both new and existing plants;
   (e) the nature and volume of the discharges and emissions concerned.
3. It therefore follows that what is "best available techniques" for a particular process will change with time in the light of technological advances, economic and social factors, as well as changes in scientific knowledge and understanding.
4. If the reduction of discharges and emissions resulting from the use of best available techniques does not lead to environmentally acceptable results, additional measures have to be applied.
5. "Techniques" include both the technology used and the way in which the installation is designed, built, maintained, operated and dismantled.

BEST ENVIRONMENTAL PRACTICE (BEP)

6. The term "best environmental practice" means the application of the most appropriate combination of environmental control measures and strategies. In making a selection for individual cases, at least the following graduated range of measures should be considered:
   (a) the provision of information and education to the public and to users about the environmental consequences of choice of particular activities and choice of products, their use and ultimate disposal;
   (b) the development and application of codes of good environmental practice which covers all aspect of the activity in the product's life;
   (c) the mandatory application of labels informing users of environmental risks related to a product, its use and ultimate disposal;
   (d) saving resources, including energy;
   (e) making collection and disposal systems available to the public;
   (f) avoiding the use of hazardous substances or products and the generation of hazardous waste;
   (g) recycling, recovery and re-use;
   (h) the application of economic instruments to activities, products or groups of products;
   (i) establishing a system of licensing, involving a range of restrictions or a ban.
7. In determining what combination of measures constitute best environmental practice, in general or individual cases, particular consideration should be given to:
   (a) the environmental hazard of the product and its production, use and ultimate disposal;
   (b) the substitution by less polluting activities or substances;
   (c) the scale of use;
   (d) the potential environmental benefit or penalty of substitute materials or activities;
   (e) advances and changes in scientific knowledge and understanding;
   (f) time limits for implementation;
   (g) social and economic implications.
8. It therefore follows that best environmental practice for a particular source will change with time in the light of technological advances, economic and social factors, as well as changes in scientific knowledge

and understanding.

9. If the reduction of inputs resulting from the use of best environmental practice does not lead to environmentally acceptable results, additional measures have to be applied and best environmental practice redefined.

ANNEX C

Environmental Assessment Flowchart

Phase	Procedure	Activity	Responsible
Opening of new area for petroleum activities	***PEIA*** ⇓ hearing ⇓ ***EIA*** ⇓ hearing ⇓ opening ⇓ Baseline survey	Environmental survey Impact assessment Regulations	Authorities
Exploration	***EIA*** in Particularly Sensitive Areas Risk assessment Contingency planning and emergency response	Seismic Drilling	Operator/Authorities
Development	***EIA*** ⇓ Permission for discharge ⇓ Risk assessment Contingency planning and emergency response	Construction activities Transportation Drilling	Operator/Authorities
Production	***Monitoring*** Risk assessment Contingency planning and emergency response	Drilling Discharges to water Air emissions Transportation	Operator/Authorities/ Third Party
Decommissioning	***PEIA/EIA***		Operator/Authorities

	Monitoring		

ANNEX D

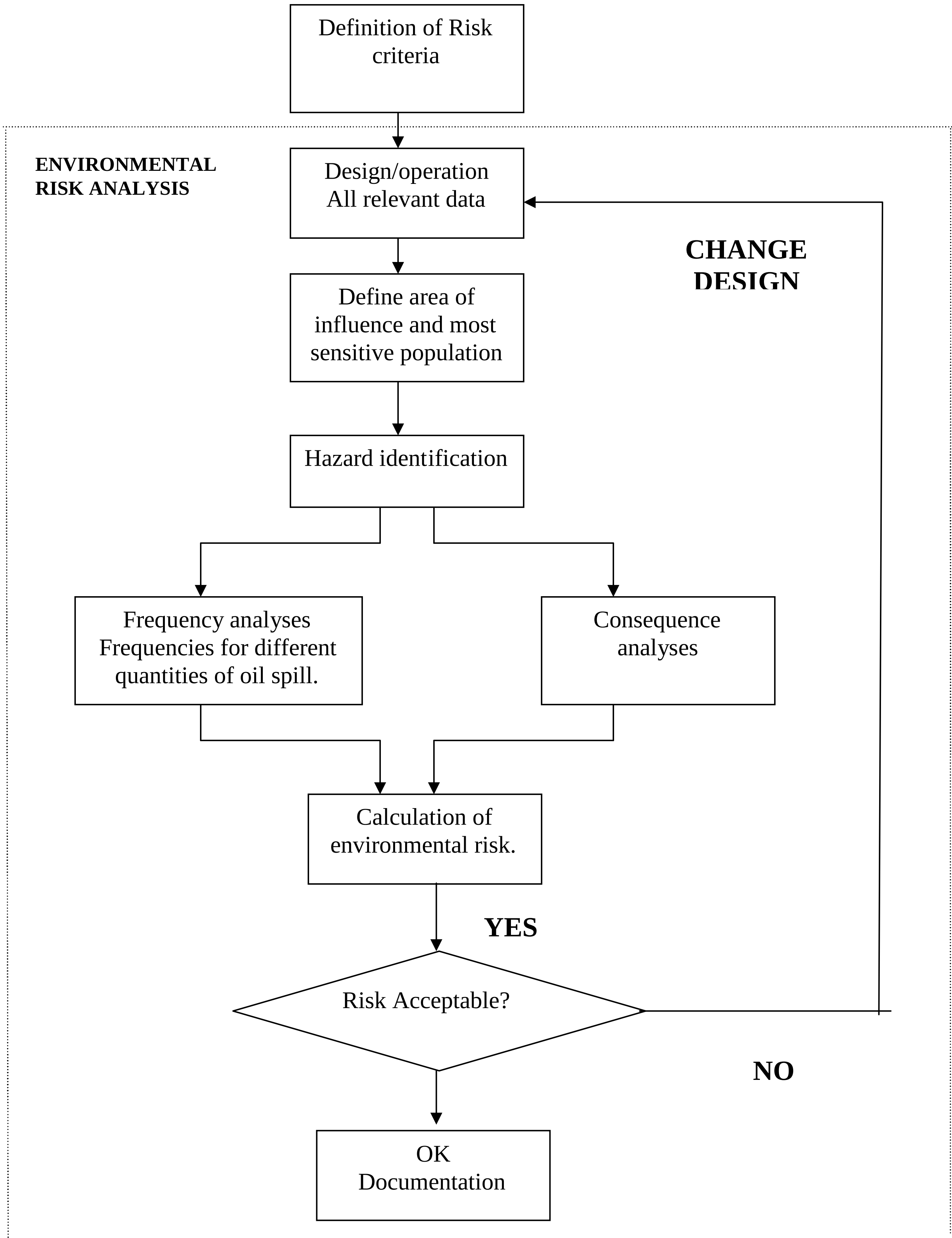
Overview of offshore activities and potential environmental effects

Activity	Possible Causes	Potential environmental effects
Evaluation Seismic activity	Noise	Effects on fish, sea birds and marine mammals such as avoidance behavior.
Exploration Rig emplacement Drilling	Dredging, filling, anchoring, and/or rig set-down. Discharges of drill cuttings, drill fluids, excess cement, platform drainage, household discharges and emissions of exhaust gases. Discharges from supply vessels, helicopter transportation, etc. Risk of blowouts.	Seabed disturbance. Predominantly local effects on living resources. Potential effects on living resources such as birds and marine mammals, as well as susceptible areas of the coastal zone.
Development and production Facility and pipeline installation Drilling	Potentially more dredging, filling and anchoring. Extended risk of blowouts and oil spills. Discharges of produced water. Emissions of gases.	Long and short-term seabed disturbances. As under exploration, but more extensive in both the water column and air. Potential effects on the reproduction of fish and possible contribution to climate effects, acidifying effects, etc.

Production	Spills, discharges and emissions connected to transportation (tankers, supply vessels, pipelines etc.).	Additional risks of effects on the marine environment and atmosphere.
Decommissioning and reclamation Removal of installations Leaving artificial islands or partial installations in-place	Cutting piles containing oil and chemicals, dredging, air emissions, noise, etc. Exposed Biophilic substrate or surfaces.	Seabed disturbance, possible effects on fish, sea birds and marine mammals. Development of habitat for fish, mammals and/or birds.

ANNEX E

Environmental Risk Analysis Flow Diagram



ANNEX F

Detailed elements that may be incorporated in to company safety and environmental policies and objectives

- Competent personnel are used during planning and implementation of the separate phases, including design, fabrication and installation and operation
- The operator's personnel and those of any Contractors are provided with necessary training
- Lines of responsibility, authority and communication are clearly defined and understood;
- Risk evaluation should be a part of the project management strategy in order to establish and maintain an acceptable level of health Safety and Environmental protection for the personnel and the environment;
- No activity should be performed unless and acceptable level of HSE protection can be maintained;
- Management of discharges should be achieved through the application of Best Available [Techniques/Technology]
- Experiences from arctic operations should be integrated into specifications, functional requirements, standards and procedures;
- Safety evaluations should be undertaken both prior to start-up and in subsequent phases of the operation;
- Administrative systems are established for the control of all documentation in all phases of the operation;
- Purchase documents and specifications should contain Quality Assurance requirements;
- Contractor's Quality Assurance systems should be evaluated and assessed and be the subject of regular audits;
- The quality of supplied and materials should be documented;
- Quality Assurance and Quality Control during operations should function effectively and corrective action should be taken when quality control indications deviation from specification;
- Operational programmes should be prepared and compiled with relevant regulations and their functional capability should be subject to verification;
- Specifications for repairs should be established and specifications provide sufficient basis and requirements for their execution;
- Temporary equipment may be installed and operated in a secure way and in accordance with established specifications;
- Modifications should not reduce the degree of safety originally specified;
- An emergency preparedness system should be established and maintained so hat necessary measures can be activated effectively and authorities involved notified;
- Administrative decisions made be the supervisory personnel are communicated effectively to the personnel and contractors;
- There should be continuous control and monitoring of all aspects of the working environment with regard to health safety and environmental risks and that necessary actions are implemented
- There should be continuous control and monitoring of the danger of pollution of the external environment and that personnel at all times will perform their tasks in such a way that pollution is avoided ;
- Both operator and contractor personnel should be made aware of the potential danger of accidents and inherent health and pollution aspects and they are given necessary information, training and exercises.

ANNEX G

Example of a Generalized Monitoring Plan

Region	Installation	Phase	Type of investigation	Part of environment	Elements to be included	Frequency
Region I	***Installation 1***	planning for development	baseline	Seabottom /water column /shoreline etc	inventory of biota/eco-systems, levels of all relevant contaminants, identification of particularly sensitive resources	once, before activities are started
		development	monitoring	Seabottom and other as relevant	physical disturbance, biota, contaminants	every year and as frequent as necessary, depending on the type of activity
		production	monitoring	Seabottom		every year first 3 years, thereafter every 3 years
				Water column	relevant contaminants in environment and biota, effects on biota	every 3 years and /or periodically as necessary
				Seashore and other as relevant	as relevant	
		decommissioning	monitoring	Seabottom and water column, as relevant	levels of contaminants and effects on biota, as relevant	during operations and once at reclamation phase
	Installation 2					
	Installation 3					
Region II	***Inst. 1***					
	Inst. 2					
	Etc					
Region III	***Inst. 1***					
	Etc					
Etc	National shelves should be divided into regions where monitoring of the individual installations is coordinated. Regional monitoring of the water column is coordinated for the entire shelf of each country.					