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Draft
Report and Recommendations on the Health Safety and Environmental Management Systems for Offshore Arctic Oil and Gas Activities
Report and Guidance/Recommendations on the Health Safety and Environmental Management Systems for Offshore Arctic Oil and Gas Activities

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- Prescriptive regulations for operations can limit the approaches and technologies best available to do the work safely in any given situation
- Prescriptive regulations may lead to an "affirmative defence" in an accident

Training certification of competency, testing, drilling, and fit-for-job.

"Tech Center" Concept an independent authority for review and reporting of any deviation from procedures.

V. Appendices

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Introduction

Safe offshore oil and gas operations and health of oil and gas industry workers as well as communities near operations, and the protection of the marine environment from pollution, are integrally related. Systems failure accidents can and do lead to injuries, deaths, fire and explosions, sinkings, and environmental disasters. In the wake of the Piper Alpha disaster in 1988, the investigative report identified failure of existing management systems as the fundamental cause of the disaster that killed 167 people on the UK North Sea. Similarly, investigative reports on recent blowouts such as those that occurred in the Montera well off of Australia and Macondo well in the Gulf of Mexico, have identified the human factor--failure of [1]HSE Management Systems and lack of "safety culture"--as a root cause of the specific problems that led to these blowouts.

The project originally included best practices in addition to HSE Management Systems. The authors decided that for this project Best Practices was subsumed into the Management System to a great extent.

Best practices may exist but rely on the human element to reduce risk.

- If best practices are not communicated, they will not be known or understood, and not used
- If best practices are not documented, it won't be known what was used, or if they were used
- If people are not trained in the use of best practices, they cannot use them or employ them
- Best practices will not be used if a decision is made not to use them

All of these barriers to employing best practices in offshore oil and gas operations are controlled by management systems and safety culture of the operating company. Therefore, this report deals primarily with the management of complex oil and gas operations as it may apply in the Arctic.

Although the common reference to HSE (Health, Safety and Environment) for these management systems is used in this report, for practical purposes, we deal only with process, or systems safety, not occupational safety per se. Also, we do not deal with the "H" or occupational health aspect. Nor do we deal specifically with routine environmental management issues such as waste handling and emissions. These aspects of HSE management are dealt with in the AOOGG 2009 and the OGA 2010.

Project Background

In the aftermath of the Macondo well blowout, the Deepwater Horizon fire and sinking, and massive Gulf of Mexico oil spill in Spring and Summer of 2010, the Arctic Council began to reevaluate the need for further guidance on Arctic offshore activities and possible policy or pollution prevention recommendations related to the findings of the investigations of the Deepwater Horizon incident and other associated or recent Arctic national management, regulatory and enforcement initiatives.

In evaluating the findings and recommendations of the OGA and the guidance in the AOOGG and other Arctic Council documents, it is clear that the basic guidance is still valid. However, several questions arose from this review of AC guidance on HSE management systems and use of best operating practices in offshore oil and gas operations,

1) Is the existing AC guidance adequate?
2) Is there a need for a more in-depth look at the management systems being employed by Arctic governments or industry?

[1] Although the term (Health, Safety and Environmental) HSE Management System is used throughout, it is recognized that some systems deal with different aspects, there may be Safety and Environmental Management Systems (SEMS) and others. HSE is used for convenience but applies to any combination of HSE system components and in the case of this report does not include occupational health.

3) Is there a need to emphasize Arctic aspects of HSE Management Systems and best operating practices in a new set of Guidelines?

This review of Arctic Council guidance and resulting questions, led the PAME working group to propose and adopt the project HSE Management Systems and Best Operating Practices for Offshore Oil and Gas Drilling Activities—A Report and Possible Guidelines as a follow-up project to the Arctic Offshore Oil and Gas Guidelines at their biannual meeting in February 2011. The HSEMS Project was approved at the Ministerial in Nuuk, May 2011.

The Proposed Main Components and Implementation of the HSEMS Project Plan are:

1. Develop a draft outline and implementation plan.
2. Conduct a survey and compilation of Arctic States requirements and guidance for Health, Safety and Environmental Management systems and operating practices for offshore oil and gas drilling operations.
3. Conduct an Arctic Workshop on HSE Management Systems including Risk Management and associated operating practices focusing on the comparison of systems and practices and identifying common elements and important differences.
4. Determine whether there is a need to expand and refocus the Guidelines now contained in the AOOGG 2009, for HSE Management Systems, Best Operating Practices and Risk Assessments and ascertain the most needed elements for expansion.
5. Draft guidelines developed.
6. Deliver Guidelines by 2013.

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Existing Guidance

Under Construction

In recognition of the importance of HSE Management Systems to the safety of operations, a tremendous amount of literature, research and guidance documents exist for developing, maintaining and improving HSE Management Systems for oil and gas and other industries (See Appendix HSE Guidance for a bibliography of HSE Guidance documents).

The Arctic Council has conducted assessments, developed Task Forces, Expert Groups, and provided guidance on the conduct of these and associated activities. The *Assessment 2007: Oil and Gas Activities in the Arctic-Effects and Potential Effects* (2010) and the *Arctic Marine Shipping Assessment* (2009) both contain policy and management recommendations concerning prevention of accidents and pollution from offshore oil and gas and associated activities. The *SAR Agreement* (2011) and the new *Task Force on Oil Spill Pollution Preparedness and Response and report and recommendations of the Recommended Practices for Prevention of Pollution from Petroleum* (2013) deal with many aspects of offshore oil and gas operations. Finally, there are many Arctic Council guideline documents that cover all aspects of offshore oil and gas activities such as *Arctic Region Oil Spill Response Resource and Logistic Guide*; *Arctic Response Cooperation Guidelines*; *Guidelines for Transfer of Refined Oil and Oil Products in Arctic Waters*; *A Field Guide to Oil Spill Response in Arctic Waters*; *Arctic Shoreline Clean-up Assessment Technique (SCAT) Manual*; *Environmental Risk Analysis of Arctic Activities*; *Circumpolar Map of Resources at Risk from Oil Spills in the Arctic*; *Arctic Guide for Emergency Prevention, Preparedness and Response*; and the *Arctic Offshore Oil and Gas Guidelines*. The *Arctic Offshore Oil and Gas Guidelines* (2009) devote a considerable amount of space to the concept and guidance on HES Management Systems and Best Operating Practices. Most recently, the EPPR Working Group has completed the *Recommended Practices for Prevention of Pollution from Oil* report

The Arctic Offshore Oil and Gas Guidelines offer general guidance on important and related HSE Management Systems issues in Section 5, Safety and Environmental Management (pp 25-29); Section 6 Operating Practices (pp 31-41); Section 7 Emergencies (pp 43-47), ANNEX B - Definition of Practices and Techniques (pp 79-80), ANNEX F - Environmental Risk Analysis Flow Diagram (p 88), and ANNEX G - Company Safety, Environmental Policies and Objective (p 89) (See Appendix AOOGG 2009 HSE Guidance).

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Systems Failure Accident Investigations (HSE Findings/Recommendations)

This section under construction

Deepwater Horizon and HSE Management Systems (See Appendix: Deepwater Horizon and Other Investigations)

NAE Report

- "Industry, BSEE and other regulators should foster an effective safety culture though consistent training, adherence to principles of human factors, system safety, and continued measurement through leading indicators.
- Require operators to develop a comprehensive 'safety case' as part of their exploration and production plans' for certain high-risk areas including the Arctic.
- Develop more detailed requirements for incident reporting and data concerning offshore incidents and 'near misses' …such reporting should be publicly available."

The NAE found that the lack of fail-safe design, testing, training, and operating practices aboard the rig contributed to the loss of rig and life.

There were multiple flawed decisions, no systems approach to safety, no one looking at totality of the operation, no one monitoring the margins of safety, at the totality of risk. A dozen decisions were made that were not integrated, and of contributing cause to disaster. There was no strong safety culture. Industrial management, the operator and contractors seem to not understand – and there was apparent confusion between systems and occupational safety.

NAE was concerned that the complex managerial structure of operations in Gulf of Mexico makes integrated systems safety harder to achieve. The only one who has the whole picture is the operating company. But the accountability is not clear.

Management and Safety Culture

- The lack of a strong safety culture resulting from a deficient overall systems approach to safety is evident in the multiple flawed decisions that led to the blowout.
- Industrial management failed to appreciate or plan for the safety challenges presented by the Macondo well.
- The complex structure of the offshore oil and gas industry and the divisions of technical expertise impacts the ability to perform and maintain an integrated assessment of the margins of safety.

Recommendations for Industry

- Operating companies should be held responsible and accountable for well design, well construction, and suitability of rig and safety equipment. The drilling contractor should be held responsible and accountable for the operation and safety of the offshore equipment.
- Industry should –Greatly expand R&D to improve overall safety of offshore drilling.
  –Significantly expand the formal education and training of industry personnel engaged in offshore drilling to support proper implementation of system safety.
  –Foster an effective safety culture through consistent training, adherence to principles of human factors, system safety and continued measurement through leading indicators.
  –Ensure timely access to demonstrated capping and containment capabilities.

Recommendations for Regulators

- Improve corporate and industry-wide systems for reporting safety-related incidents.
- Designate a single U.S. government agency with responsibility for ensuring an integrated approach for system safety for all offshore drilling activities.

- Significantly expand the formal education and training of regulatory personnel engaged in offshore drilling roles.
- Implement a hybrid regulatory system integrating a limited number of prescriptive elements into a pro-active, goal-oriented risk management system.
  - Neither industry nor U.S. regulators appear to have foreseen the risks of a Macondo-scale event.
  - Industry is investing significant resources in capping and containment systems, and regulators are making significant organizational and process changes.
  - The question remains as to whether these efforts are a start toward recognition, acceptance, and active management of the risks inherent in offshore oil and gas development or whether they represent a transitory response.

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling
Anticipating the challenges of Frontier Areas and the Arctic

Industry

- The oil and gas industry should establish its own "Safety Institute"
  - The nuclear power industry did this after Three Mile Island accident
  - Develops and enforces industry standards of excellence
  - Operate independently of the American Petroleum Institute
- The oil and gas industry must adopt a "culture of safety" as a collective responsibility
  - A focused commitment to constant improvement and zero failure rate
  - Other high risk industries have agreed to hold themselves and peers accountable for safety
  - Set up mechanisms to make this real
- Should benchmark safety and environmental practice rules against recognized global best practices
- Should have containment technologies immediately available

Providing protection for "whistleblowers" for safety problems

Regulators

- Promulgate improved regulations and interagency coordination
- Develop management system incorporating "safety case" approach
- Promote adoption of consistent international best practice standards

For the Arctic

- The U.S. should promote the development of international drilling standards for the Arctic
- Drilling must be done with the utmost care because of the sensitive Arctic environment

NEB Arctic Drilling Review

Key findings of Arctic Review

1. The root cause of most industrial accidents, such as blowouts in offshore drilling, is the lack of a broadly shared safety culture

- Tolerance of inadequate resources or systems; front line employees.
- Deviation of safety policy was normal and accepted; not everyone would follow, "rules don't apply to me."

- Complacency; accidents are rare and there's a feeling is it's not going to happen
- Work pressure; pressure to meet deadlines or cut costs can undermine safety behaviors.

(NEB; Mark Fleming paper)

Common to all of the accidents were the lack of

- Communications,
- Documentation, and
- Management of Change

(NEB; DnV study)

Identified Requirements
NEB needs

- Reporting of accidents and near misses;
- Accountability of contractors;
- Verifiable Management System.

A company must demonstrate safety culture that is accountable through NEB audits;

- Filing requirements,
- Accountable officer,
- Annual reporting performance and management systems,
- Policy and process for reporting of hazards.

SINTEF Deepwater Horizon Report for PSA Norway

Important *underlying causes* of the accident:

1. Ineffective leadership
2. Compartmentalisation of information and deficient communication
3. Failure to provide timely procedures
4. Poor training and supervision of employees
5. Ineffective management and oversight of contractors
6. Inadequate use of technology/instrumentation
7. Failure to appropriately analyse and appreciate risk
8. Focus on time and costs rather than control of major accident risks

Recommendations for the authorities

1. For critical operations, consider to require increased redundancy of BOPs, as for example double blind shear ram (BSR) or single BSR that works in all conceivable scenarios.

 Why: Today's design has operational limitations e.g. related to cutting of tool joints.
 How: Depending on the type of operation (topside or subsea BOP, complexity of reservoir, vulnerability of area, etc.) consider the need for stricter BOP requirements through regulations.
 Objective: Reduce the risk related to critical drilling and well operations.

2. Ensure and follow-up that the companies have implemented performance requirements (including reliability requirements) for critical safety functions related to drilling and well operations, and verify that these requirements are followed-up during operation.

 Why: Regulations already state that performance requirements for safety critical equipment shall be stipulated and followed-up during operation, but this is not consequently implemented by the companies.

- *How:* Through supervision verify that the companies (1) stipulate performance requirements and (2) follow-up these requirements. In particular, consider systems for kick detection, diverter system, mud treatment system and BOP.
- *Objective:* Ensure required integrity of barriers during drilling and well operations.

3. Revise the Stability Code, to ensure integrity of water tight compartments.

- *Why:* System errors and operational errors are main causes for incidents of stability loss.
- *How:* Requirements to internal log documentation when watertight doors etc. need to remain
open longer than a defined maximum duration. Requirements to periodical control and reporting.
- *Objective:* Reduce risk of stability loss.

4. Maintain continuous focus on maintenance management through audits and dialogue with the industry.

- *Why:* Inadequate maintenance is a recurring contributing cause of major accidents. Many installations on the Norwegian Continental Shelf extend their lifetime after a period of controlled phase out and reduced maintenance. As a result, they have built up a substantial amount of backlog.
- *How:* Auditing the companies' maintenance management, including management of maintenance backlog. Contribute in further development of maintenance management on the Norwegian Continental Shelf, through dialogue with the industry.
- *Objective:* Improved maintenance management in general, and justifiable (risk based) amount of backlog in particular.

5. Provide for necessary competence regarding well control methods, to enable the authorities to follow-up the decision processes in the companies on well control accidents of national significance.

- *Why:* During the DWH accident the authorities were criticized for not contributing actively in controlling the runaway well. Some of the well control attempts could have made the situation worse, and required approval by the authorities. A competent authority is a prerequisite for such approvals.
- *How:* By the exchange of experience on well control measures attempted during the DWH accident, and by stimulating research and development in this field.
- *Objective:* Fast and proper control of a blowout.

Others will be added

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Workshops

Health Safety and Environmental Management Workshop, Keflavik, Iceland June 10-12. 2012.
(Note: There is now a full transcript of the workshop and a new summary will be substituted for the summary below and the full transcript will be included as an appendix)

As planned in the project proposal, a workshop was held to gather international experts and Arctic stakeholders to hear and learn about the use of HSE Management Systems in the Arctic and lessons learned from accidents and experience. The workshop consisted of presentations and discussions. Workshop participants (see Appendix: Workshop Participants) were asked to consider some issues for discussion but encouraged to contribute their expertise in any topic or subject they felt important.

The HSE workshop was held 10-12 June at the meeting facilities at Hotel Keflavik in coordination with the related Arctic Council EPPR workshop on Recommended Practices for Prevention of Pollution (RP3), which took place from 11-12 June. The HSE Workshop agenda was coordinated with the related EPPR RP3 workshop agenda on 11-12 June with the aim to ensure that oil and gas experts had an opportunity to attend and contribute as relevant to both projects.

Outcomes of the Health Safety and Environmental Management Systems Workshop in Keflavik, Iceland June 10-12, 2012

Presentations

Sunday June 10

1. ***Welcome***, Ambassador Hjalmar Hannesson, Senior Arctic Official of Iceland;
2. ***Deepwater Horizon Investigation*** by Donald Winter of the University of Michigan and lead for the National Academy of Engineering;
3. ***Deepwater Horizon Assessment and Recommendations*** by Magne Ognedal Director General of the Petroleum Safety Authority Norway;
4. ***State of Alaska Hearings on Safety and Environmental Regulation*** by Cathy Foerster, Chair of the Alaska Oil and Gas Conservation Commission;
5. ***Arctic Offshore Drilling Review*** by Céline Sirois Technical Leader for Environment of the National Energy Board of Canada;
6. ***U.S. Safety and Environmental Management Systems***—SEMS by Joseph Levin Senior Engineer Offshore Regulatory Programs of the Bureau of Safety and Environmental Enforcement;
7. ***Norwegian HSE Management Systems*** by Magne Ognedal, Director General of the Norwegian Petroleum Safety Authority;
8. ***Greenland's HSE Management Systems*** by Jens Hesseldahl Legal Advisor to the Bureau of Minerals and Petroleum;
9. ***Arctic Offshore Canada HSE Management Systems*** by Céline Sirois, Technical Leader for Environment of the National Energy Board, Canada;
10. ***The Arctic Offshore Oil and Gas Guidelines—HSE Management Systems*** by Dennis Thurston Bureau of Ocean Energy Management, and PAME

Discussions

Discussions after the June 10 presentations and during the Offshore Oil and Gas Breakout Sessions associated with the RP3 workshop produced insight into the differences and similarities of existing (onshore and offshore) HSE Management Systems (HSEMS) and highlighted some of the main elements found to be critical to prevention of "process failure" accidents and pollution incidents. The main themes included:

- Elements of management systems that may have a "Delta Arctic" risk factor—additional risk for a particular element in the Arctic beyond the risk associated in all regions.

- Occupational health indicators (work loss days; minor accidents and injuries, etc.) were not considered to be a good measure of system process issues.
- There is a plethora of guidance on HSEMS and these can be highlighted by the Report in a referenced list.
- The HSE Guidance contained in the AOOGG 2009 is good but is somewhat scattered throughout and therefore needs to be updated and consolidated in the Report.

To be effective, it was felt that recommendations should be limited to the most important issues identified, yet still useful for regulators and other stakeholders.

Selected summaries of the main issues discussed:

Safety Culture: Demand a safety culture. Avoid complacency that exists in other regions.

Indicators: There is a need to develop safety culture indicators and clear ways to audit for HSE/SEMS compliance. The use of occupational indicators was thought not be relevant to "process safety" issues and major system failure accidents.

Accountability: Clear accountability is a must for operators and contractors and also for regulators (i.e. who amongst multiple agencies is in charge). The operator should be the Responsible Party.

Regulatory Approach: Performance-Based of Goal-Setting Regulatory Approach is favored in the Arctic because there is too little Arctic offshore experience to formulate a comprehensive prescriptive system and also because of possible rapid development of new technologies and practices. Inspect, Regulate, Monitor Performance, Improve Performance, and Penalize. Assess and Monitor more robustly. Eliminate regulatory complexity.

Near misses: Requiring operators to share information on "near misses" will be critical in the Arctic, where experience is essentially non-existent. Learning what almost went wrong is needed for risk analysis and can help others build safeguards into their operations.

Checks and Balances: Consider establishing an independent "Tech Authority" that is separate and independent from operator/regulator that just approve any variances from procedures. Discussion about operator, regulator or third party verifications.

Preliminary Decisions from the Workshop

Develop a report with a tiered nonbinding Guidance/Recommendations approach with a single top priority and successive tiers including more, but generalized, guidance.

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Safety Culture Workshop Halifax September 16, 2012 (Note: There is now a full transcript of the workshop and a new summary will be substituted for the summary below and the full transcript will be included as an appendix)

The Safety Culture Workshop was conceived as a result of the discussions and conclusions of the HSEMS Workshop conducted June 10-12, 2012. The purpose of the workshop was to inform the PAME Working Group Health Safety and Environmental Management Systems (HSEMS) Project on "safety culture" in the Arctic offshore oil and gas industry, which was identified as a fundamental issue for safe and environmentally sound operations at the HSEMS workshop.

The workshop lasted one day and was held in conjunction with the PAME II 2012 Halifax Meeting September 16. It consisted of a group of invited experts from various industries and government bodies who presented information on the subject of "safety culture" as it applies to the prevention of systems/process failure accidents and pollution incidents. The group collectively discussed the implications of the presentations and other expert opinions for improving Arctic offshore operations and provided advice to the PAME HSEMS project group on recommendations to improve system/process safety.

The following preliminary questions were invited as a possible focus of the invited presentations and moderated discussions.

"Safety Culture"
What is it?

- Not just Safety, also foundation of Environmental protection
- For process failure accidents, occupational indicators are not reliable
- "Culture is what you do when no one tells you to do it"
- A "black hole" that you can't see but can see evidence around it.
- From corporate board room to rig floor, operator to contractor.

How can it be instilled and implemented?

- Defined and incorporated in Health Safety and Environmental Management Systems
- Training
- Incentives
- On par with economic concerns in the company

How can it be measured/monitored/audited/verified?

- Performance measures, leading and lagging.
- Incentives ("Catch someone doing something good")

How can it be enforced/improved?

- Audits: in-house, third party, government
- Indicators: need to develop and/or standardize including "near-miss" definition and reporting requirements

What can we learn in the Arctic from the Deepwater Horizon and other offshore drilling accidents?

What can we learn in the Arctic oil and gas industry and regulatory community from other industries and activities such as Naval, Aviation and Nuclear?

What is the advice regarding Arctic offshore operations that can be given to regulators and policy makers?

Presentations

Presentations (found at www.pame.is log in area: username: pame, password: akureyri)
Sunday September 16, convened and ran by Dennis Thurston BOEM for the United States.

The HSE Management Systems Project and Purpose of the Workshop (Dennis Thurston, PAME HSE Management Systems project leader)
Lessons learned from the Deepwater Horizon Accident: what influences safety culture? (Fran Ulmer, Chair U.S. Arctic Research Commission and Member of the National BP Oil Spill Commission)
Process and Systems Safety (Donald Winter, University of Michigan, Lead Author of the National Academy of Engineering's Investigation into the Deepwater Horizon Accident).
U.S. Navy's Submarine Safety Culture (David Duryea, RADM, NavSea)
Safety Culture in the Offshore Oil and Gas Industry-A Shell View (Dwight Johnston, VP of Safety, Environment, and Sustainable Development for DeepWater, Shell)
Safety Culture and Leadership Improvement—Modern Day Alchemy, (Mark Fleming, Saint Mary's University).

Discussions

Discussions ranged from common elements of Safety Culture in general, to specific enterprises such as the U.S. Nuclear Submarine program, to offshore oil and gas including the Deepwater Horizon incident, to Arctic specific operations and considerations. The presenters touched on Safety Culture from the point of view of the regulator, industry, and academia, and discussions with participants brought in the perspectives of Arctic indigenous people and NGOs. The discussions were engaging and informative and brought out some strong points, such as the necessity to define it, use leading not just lagging indicators to measure it, and to continuously improve it.

How to embed meaningful safety culture?

Must address issues that influence decision making:

1. Financial incentives and disincentives (cost, profit, loss, insurance, penalties). *Later during discussion added pay for performance programs, bonus structures, and non-financial rewards such as promotion, recognition, etc. Also noted the direct link between regulatory "grading" in the nuclear industry and insurance rates.*
2. People (leadership, training, peer pressure, culture). In this context, culture was defined as shared values and norms upon which decisions are made
3. Information (reliable access and reporting including data analysis, disclosure, comparison, continuous improvement*). This is an interesting note as management systems are data driven and if implemented effectively, they can be the primary information engine.*
4. Regulation (effective, constructive, independent, enforcement to assure attention to risk management, accountability)
5. Three way partnership between labour, government, and industry

Discussion following presentation noted that rewards and bonuses should not only look at outcomes, but also be process (system) oriented through the use of leading indicators (per Mark Fleming).

Also that there is an inherent conflict between fiduciary responsibilities and safety management. Because these major accidents happen so rarely, often shareholders don't perceive this as a credible risk to the business and therefore financial and human resources are limited.

Systems safety versus occupational safety
Systems safety refers to major accidents impacting multiple workers and/or the public = low probability/high risk (James Reason's organizational accidents)

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Systems safety accidents have complex causality. The safety measures as far more complex and expensive than occupational safety controls such as PPE.

Understanding of what is considered proprietary creates inherent challenges (even within an operating company) in facilitating the collective learning that needs to occur.

Of particular note, most systems safety issues are not accessible to workers; they require access to data and the ability to assess complex interactions. The use of contractors adds another layer of complexity as their involvement makes it more difficult to see system holistically and there is often limited dissemination of data to contractors. As a result, operators are the only organizations with all of the data they must be held accountable.

System safety is about tradeoffs between efficiency (cost and schedule) and safety. Must accommodate all uncertainties through initial risk assessment and then throughout activity via reassessment.

On increasing regulatory burden, this allows for "affirmative defense" in which compliance with the rules constitutes defensible action whether or not the system was safe. It also limits corporate and personal reliability. Safety culture is a better approach than increasing number of regulations as it establishes the priority between safety, schedule, and cost.

Expectations and priorities must be clearly and consistently stated to all (management behaviours and communication must be consistent at all times at all levels). This starts with CEO priorities and compensation incentives and makes its way through organization so you need a zero/one or claw back provision for safety irregularities

Speaker: Dave Duryea, Rear Admiral, US Navy Undersea Warfare

Creation of Subsafe Program following the loss of USS Thresher in 1963 with loss of 112 officers and 17 civilians

Focus of Subsafe program is very clearly stated: Integrity of hull from flooding and operability integrity of critical systems and components.

The fundamentals include:

- Work discipline
- Material control (correct materials installed correctly)
- Documentation
- Compliance verification
- Separation of powers (authorities)
- Continual training
- OQE – objective quality evidence (to demonstrate compliance)
- Non-deviation from specs, procedures, etc.

Two audit types are performed: certification audits after each sub is constructed and functional audits of facility's processes, procedures, policies (every 2 years)

Oversight also includes self-assessments, internal audits, trouble reporting (significant problems reported and "critiqued" for lessons learned including the 5 Why approach – in almost every case, 5 Why's result in identification of root-cause)

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Separation of Powers

All staff from entry level to 3 star generals attend subsafe training annually. Annual training includes lesson learned. Speakers from various industries are brought in to discuss system and engineering failures.

Subsafe staff are constantly out talking to all layers in the system about safety culture.

What keeps Dave up at night? Ignorance, arrogance, and complacency

Safety culture is included in considerations during selection criteria for staff ad naval procurements are not based on price alone, but also history, incidents, safety culture audits. You must qualify to be on the procurement list.

Speakers: Dwight Johnson, Shell

Need to make good distinction between personal and process safety (as a result of BP Texas City)

Shell has adopted Goal Zero – no people hurt, no leaks

Chronic unease is a product of behaviours

They have introduced life saving rules for personal safety. If you break a rule, the result is immediate termination.

They have generated lifesaving rules for process safety based on 11 factors that have caused accidents. Rules are related to work processes and hardware barriers.

Strong leadership focus in order to get to goal zero. This includes visible and heartfelt leadership, enhanced contractor engagement, improved HSE data analysis, and improved incident investigation.

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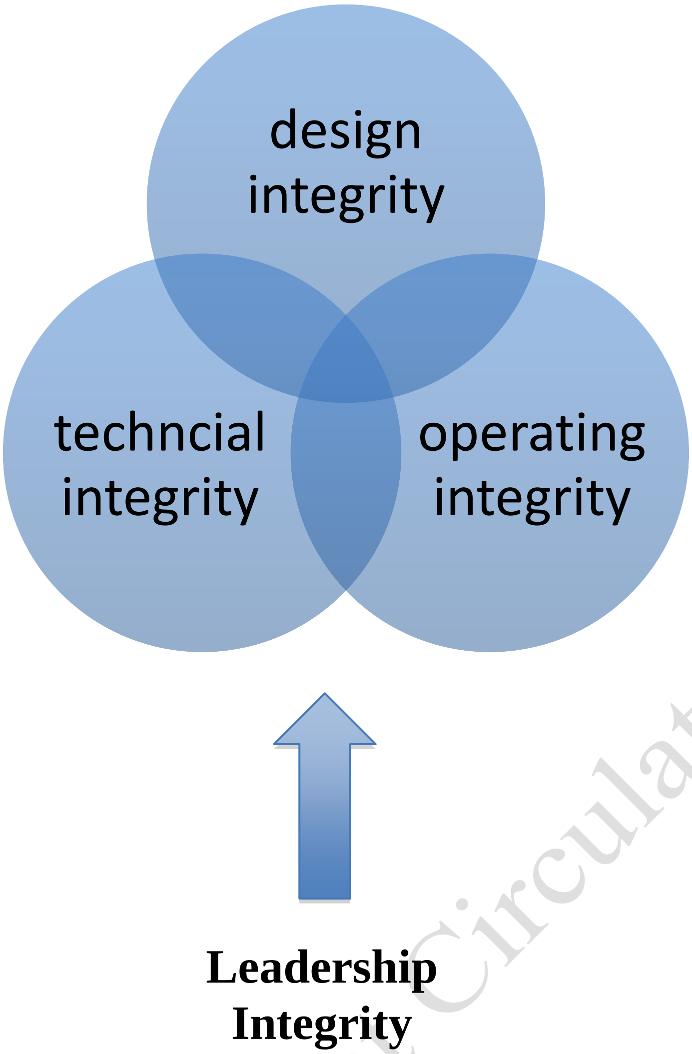

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Centre for Offshore Safety created by industry following Deepwater Commission recommendations (associated with API so not independent and neutral). Provides anonymous metrics for comparison and benchmarking, sharing of lessons learned across industry, assessing what competencies are required to be SEMS auditors (per BSSE requirement).

Noted that process safety metrics need to follow realm of personal safety metrics and include both leading (alarm mgmt, overdue management of change, near misses, and mtce schedules) and lagging (spills, and fires).

Management should review integrity and process safety performance on a regular basis.

During discussion, it was suggested that companies perform random sampling of sub-contractors work and conduct safety culture assessments of contractors and subs.

Speaker: Mark Fleming

"Culture determines how well you live your systems"

Mark has been developing a new safety culture improvement model:

Continual auditing sits in centre of model.

Repeated most common cultural causes of organizational accidents presented during Arctic Review: inadequate systems, normalization of deviance, complacency, work pressure/cost.

*Assessment based on multi-method approach conducted biannually (includes questionnaires, interviews, and document review) plus continuous assessment using safety culture metrics or indicators found in daily operations such as quality of safety reports submitted. These indicators are about the quality of things and not the number of things.

Focus of regulation should be on processes, not outcomes.

His current project is looking at safety culture attributes and indicators and is funded by Encana. An attempt to have the offshore regulator join the steering committee was rejected. However, post presentation discussions opened the door for a group of regulators to be established to share best practices re: safety culture as part of Mark's work at St. Mary's.

Of note, a safety culture perception survey is different than an actual cultural assessment.

In order to regulate safety culture, regulator must provide a clear definition of safety culture and their related expectations.

Some preliminary Highlights:
-Safety Culture is hard to create;
-Safety is not a priority, it is a value;
-Operators should always experience "Chronic Unease" to avoid complacency;
-We have to change the "business as usual" approach, especially in the Arctic.
-Industry and the regulators must work together to institute and maintain a safety culture.
-Agree to a definition of Safety Culture.
-Common "cultural" issues in the causes of major accidents are

- Tolerance of inadequate systems and resources,
- Normalization of deviance,
- Complacency, and
- Work pressure/cost.

-Risk Assessment:

- Assess risk "as you drill" because you learn as you go. (Management of Change)
- The authorities, companies and industry guidance, standards and regulations are rarely adequate, so continuous risk assessments and process improvements are critical. (Continuous Improvement)
- Technology is generally pushed until an accident happens, so it is important to assess risks continuously and improve process safety performance.
- Learning from history is not easy, the learning peak erodes and complacency sets in.
- Lessons are lost or forgotten.
- Invest in determining causes of accidents and near misses and avoid.

-Responsibility:

- The Operator should always be responsible party because only they have the overall picture of the complex operations and systems.
- Affirmative defense—make the operator responsible by not approving their plans, but by holding them responsible for following them (as in Norway's system).

-Financial incentive and disincentives:

- Raise liability caps
- Tie safety performance to insurance
- Tie safety and environmental performance to management compensation such as by instituting "clawback" provisions for bonuses (using the USA Sarbanes/Oxley Act for financial institutions as an example).

-People:

- Leadership, training, peer pressure can shape culture.
- Shared values.
- Everyone feels ownership for safety.
- Employees are encouraged to a have questioning attitude

-Information:

- Data sharing, analysis, disclosure, and comparison are necessary.
- Continuous improvement should be based on the data and risk analysis.
- Find a way around the "proprietary" nature of some information.

-Change the way Governments Regulate:

- Effective and constructive with independent enforcement to assure attention to risk management.
- Accountability—for the Operator and the Regulator.
- Whistle-Blower protection guarantees.
- Safety Record of the whole company should be an indicator of performance.
- Mandatory reporting and analysis of near-misses to identify trends before an accident happens.
- Consider special elements of Arctic work.
- Establish or promote international drilling standards.
- Consider establishing an independent Safety Institute that develops and enforces industry standards.
- Consider establishing an Independent Technical Authority to sign off on any deviations from agreed procedures.
- Institute required real time operations centers.

The workshop results were used in the preparation of the HSE Management Systems Project Report.

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Findings and Recommendations

This section under construction

Findings

Occupational Health and Safety

In preparing this report and recommendations, it was found that a focus on occupational health and safety does not indicate a company's commitment to system safety or a safety culture. It is possible, as in the case of the Deepwater Horizon, that operators and contractors can have a good occupational safety record, while not adhering to safety of the complex systems and processes inherent in drilling in a frontier area—Transocean managers were on board the Deepwater Horizon to celebrate seven years without a lost-time accident when the explosion happened. A company and their contractors who have a demonstrated safety culture and pay close attention to systems safety will also have a good occupational health and safety program. A company with a good occupational health and safety program however, may not necessarily have an adequate safety culture nor pay enough attention to systems safety.

Continuous improvement

To prevent a major accident from occurring during offshore oil and gas operations in the Arctic, the industry must implement, monitor, and continuously improve their management systems.

A guiding principle from the Arctic Council Offshore Oil and Gas Guidelines 2009 (p 6).
"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."

"Lessons Learned (or Forgotten?)"
Investigations of recent major offshore oil and gas accidents have resulted in many findings and recommendations that are pertinent to such complex operations in the Arctic. The drilling of a deep water well such as Macondo, is an extremely complicated endeavour involving many interacting systems, processes and complex technology--in an extreme environment. The Arctic is also a frontier area, where technology and practices are pushing against the experience envelope. There are many challenges and unknowns to working in the offshore Arctic. The relatively few offshore wells drilled in the Arctic and sparse technical experience, much of which has been lost over the decades, necessitates constantly evaluating and assessing the risk of systems failures. The potential for human failures is great—not just failures of individual humans, but more importantly, failure of human management systems.

"SNAFU--Situation Normal All Fouled Up"(Normalization of deviance)
The Macondo well lost integrity, the Deepwater Horizon experienced explosions, caught fire, and sank, 11 people were killed and many injured, the well spewed more oil into the Gulf of Mexico than had ever been spilled in the marine environment of the United States, wildlife were affected, and livelihoods and economic wellbeing were damaged, all because of human errors and bad judgements made without considering the risk and consequence of those decisions. For such a sequence of bad judgements and decisions to take place, systems safety was not part of a culture that tolerates inadequate systems and resources, and normalizes deviance.

"Occupational Safety Awards and Drinking the Kool Aide" (Complacency)
Complacency stemming from looking at the wrong indicators of systems safety is a risk factor for low probability-high consequence accidents. Occupational safety was being rewarded on the Deepwater Horizon Platform when the blowout occurred. Safe work records and no-loss work days do not

indicate a positive Safety Culture nor serve as reliable indicators of systems safety--the type of safety that prevents disastrous accidents. Acceptance and belief in an exceptional occupational safety record or a company's own public relations statements about safety can offer a false sense of security and result in complacency and acceptance of substandard conditions or tolerance of inadequate systems or resources.

"No Cowboys" (Risk and Hazards)
Both the oil and gas industry and many "northerners" share a history of adaptation and innovation to live or operate in new challenging conditions—a pioneering attitude and culture that often accepted higher levels of risk.

For northern settlers this meant adaptation of southern ways of doing things to the north. This often entailed extensive and costly trial and error methodologies without assessing the risk or having a high tolerance for risk. But as the adaptation occurred over time, and innovations were successful, it led to a "can do" attitude and culture that glorified "finding a way to get it done". Making do with what is available such as fixing your airplane with tape and wire, or repairing machines or buildings with local materials, is part of the lore that persists in the North. In Arctic oil fields, many southern exploration and development techniques and technologies were imported to the north and most failed to some extent resulting in environmental damage and injuries. But with the prevalent "can do" attitude, lessons were learned and the technologies and practices were modified to correct inadequacies or mistakes made. Arctic offshore oil and gas operations experienced this frontier "can do" attitude and culture first in the late 1970's and mid-1980's when Arctic offshore exploration was at its peak (Figure ___.). Fortunately, there were no major incidents during this "frontier" period, but the lack of major incidents gives a sense of confidence that is perhaps misplaced. We can no longer afford to operate this way. A change in culture is needed to one of Safety, and there is little room for the trial and error high risk operating practices and makeshift adapt-on-the-fly technology used in the past. "Can do" needs to be replaced with "Can do carefully and safely."

"*flying by the seat of our pants.*" *(Management of Change)*

"They don't know what they don't know." (Risk/Hazards Analysis)
As pointed out in the National Investigation on the BP Deepwater Horizon Oil Spill, a survey of the Transocean crew regarding "safety management and safety culture" on the Deepwater Horizon conducted just a few weeks before the accident found that Transocean's crews "don't always know what they don't know. [F]ront line crews are potentially working with a mindset that they believe they are fully aware of all the hazards when it's highly likely that they are not."

Findings

Prescriptive vs Performance Based Regulation
Not enough is known and there is not enough Arctic experience to support a classic prescriptive approach (see Figure Arctic Wells drilled). Performance Based is more flexible allowing new technology and practices to be employed. Performance Based places responsibility on Operator.

The experience in drilling offshore Arctic wells is relatively little and mostly decades old. Compared to the mature areas such as the Gulf of Mexico where literally 10s of thousands of exploration and discovery wells have been drilled, the Arctic offshore is a frontier area. There is no basis for complacency or over-confidence despite that fact that there have been no major accidents offshore. There have been so few wells drilled and the institutional knowledge and experienced personnel have been mostly lost.

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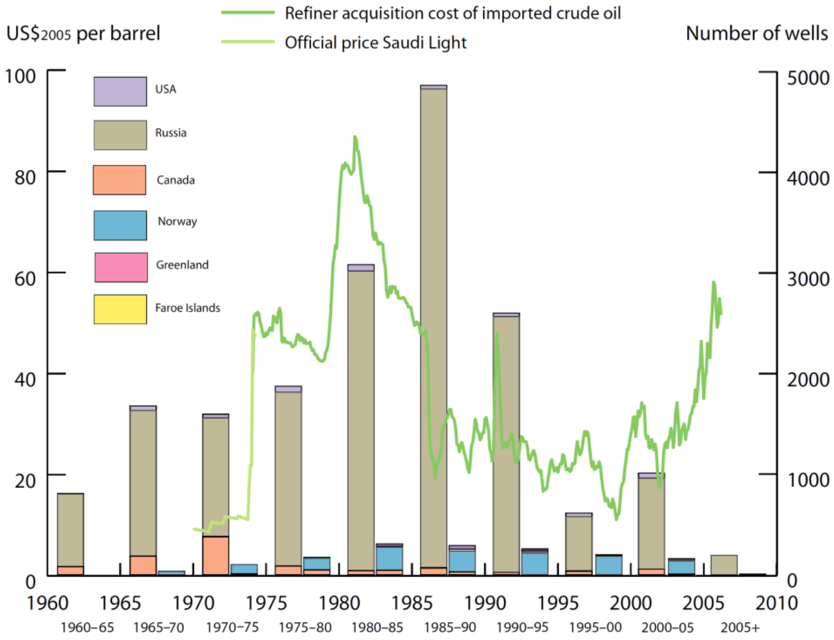

Figure ___. Number of exploration and discovery wells drilled in Arctic areas from 1960 to 2007 in 5-year increments, plotted against the oil price curve inflation adjusted to 2005 dollars from the Energy Information Agency, 2007. Paired columns show onshore wells on left and offshore wells on right.
Modified from OGA Chapter 2 Figure 2.2c.

HSE Management Systems

Common Elements

Thirty three elements were compared between the AOOGG, Greenland, Norway, Canada and the United States

Elements common in systems failure accidents

- Communications,
- Documentation
- Management of Change
- Hazard Analysis
- Operating Procedures
- Quality Assurance/Mechanical Integrity
- Training and Competence

Investigations of multiple industrial accidents has shown a disconnect between safety policy and commitment statements of the management systems, and the hazard identification, risk assessments and the related controls.

Safety Culture

With all else equal (use of tested management systems, excellent standards, best technology and practices), an organization without a positive Safety Culture is more likely to have a low probability/high consequence disaster. It is clear from case studies of accidents and management systems, that government has a role in ensuring that the operations management has a positive safety culture. Therefore, guidance/recommendations are primarily aimed at what Arctic countries can do to promote safety culture in the industry it regulates.

Common Cultural Elements in Systems Failure Accidents

- Tolerance of Inadequate Systems or Resources
- Complacency
- Deviation from Safety Policy becomes Normal and Accepted

- Work Pressure

Definition

- Many, such as "Culture is what you do when no one tells you what to do," or "the shared values, norms and activities used by an organization to management risk," or "Safety culture is the product of individual and group values, attitudes, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of an organization's health and safety programmes."
- It must be defined, understood, and clearly communicated by operators and regulators

Indicators and Metrics

- Onsite visits
- Document review
- Employee surveys
- Audits
- Near incidents

Near-Miss Reporting

- Leading indicator—used in tracking trends in systems safety performance before an accident or other incident
- Not defined
- Not always required
- Data are often proprietary
- No comprehensive database for Systems failure near misses
- No standardized analytical methods for comparable trends

Prescriptive vs Performance Based Regulation

- Lack of experience in the Arctic offshore to draw on for developing a prescriptive regime
- Prescriptive regulations for operations can limit the approaches and technologies best available to do the work safely in any given situation
- Prescriptive regulations may lead to an "affirmative defence" in an accident

Training/Competency

- Support for the Regulators

An outcome-based regulatory regime involves a wider scope of oversight requiring personnel with more and different skills than a typical prescriptive regime. Instead of inspecting components of systems and checking boxes on compliance forms, the process for reviewing, monitoring, improving and enforcing safety and environmental performance in an outcome-based regime, requires more people, training and support.

Financial

- The low probability of major systems failure accidents coupled with the often high costs associated with mitigating their low risk of occurring, do not gain much shareholder support.
- Compensating or rewarding management for financial performance, and employees only for completing operations under schedule, under budget, or without any occupational accidents or last work-days, conflicts with fostering a safety culture.

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Recommendations/Guidance

General--Change "business as usual" approach in the Arctic.

- Industry and the regulators must work together to institute, implement, monitor, and continuously improve HSE Management Systems and safety culture.
- Establish or promote international drilling standards.
- Consider establishing an independent Safety Institute that develops and enforces industry standards.
- Consider establishing an Independent Technical Authority to sign off on any deviations from agreed procedures.
- Institute required real time operations centers.

HSE Management Systems

-Delta Arctic: For each critical procedure or operation a complete assessment of risks with a risk assessment matrix or other methodology taking into account the full range of Arctic multipliers should be undertaken.

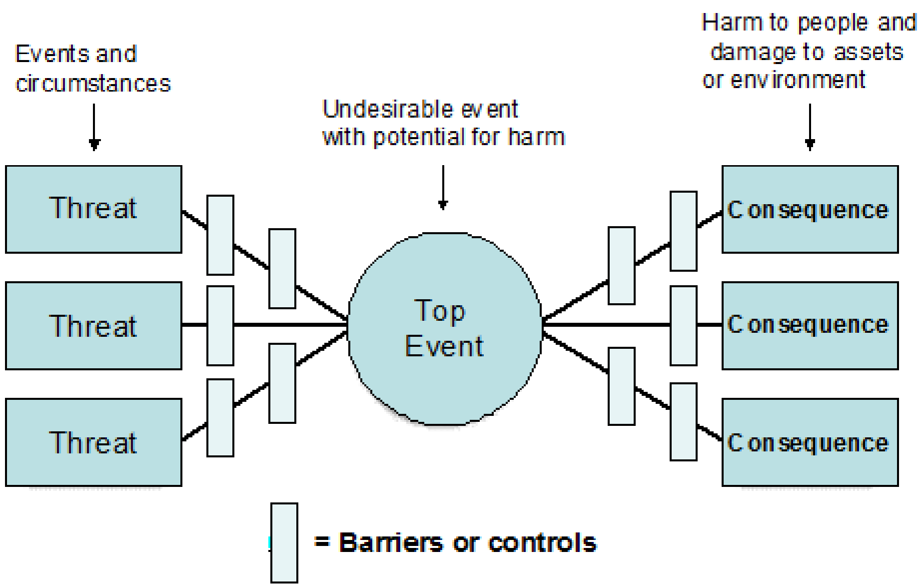
- Table of Selected HSE Management Systems elements with Arctic considerations (or Reference Appendix)

-Risk Assessment:

- Continually assess risk because you learn as you go in Frontier Areas.
  - Geology in the well
  - Weather, sea, ice
  - Improve management of change
- Continuously assess risk to inform the process of improving regulatory, operator, and industry guidance, standards and regulations.
  - Invest in determining causes of accidents and near misses and avoid.
  - Consider use Risk Based Life Cycle (RBLC) Regulatory Approach
- Continuously assess risks associated with technological solutions to improve process safety performance before an accident happens.

-Risk Management

- Require Monitoring of Risk and Risk Margins
  - Barrier Management
  - Use Failure Modes & Effects Analysis
  - Situational Awareness (i.e. weather, ice, sea conditions)
- Use Bow-Tie Risk diagrams to improve barrier management and risk margin monitoring



- Use Safety Margin Management as a proactive approach to ensure establishment of margins of safety in the design
  - Define what is adequate
  - Proven practice
  - Assess uncertainties and adjust levels of margins
  - Factor in the differences in exploration and production operations and geology

-Responsibility:

- The Operator should always be the responsible party because only they have the overall picture of the complex operations and systems.
- The Operator is responsible for their contractors (training, competence, certification, HSE Management systems, safety culture, etc.).
- [Hold the Operator accountable for developing a comprehensive Management System and robust safety culture and audit their operations to observe and validate the Management System and safety culture.]
- Train the government auditors for competency and provide the necessary support to ensure adequate and appropriate oversight

-Information and Reporting:

- Share data, methodologies, analysis, and trends between operators and regulators.
- Continuous improvement should be based on the data and risk analysis and reviews and audits.
- Find a way around the "proprietary" nature of some information.
- Operators should agree in writing to make public their:
  - Safety Plans;
  - Contingency Plans;
  - Emergency Response Plans (if such plans exist separately from other Contingency Plans); and
  - Environmental Protection Plans

-Near-Miss Reporting

- Define near misses. Such as body-to-body incident definitions etc. possibly through IRF as part of the Common International Incident Reporting Requirements initiative.
- Standardize analytical methods for comparable trends
- Require near miss reporting
- Make data publically available
- Develop a Worldwide database

Safety Culture

Industry and regulators should foster an effective safety culture though consistent training, adherence to principles of human factors, system safety, and continued measurement through leading indicators. (NAE 2011)

-Require Operator to define their Safety Culture.
-Require Operator to define indicators of positive safety culture
-Require Operator to monitor and assess safety culture through leading indicators
-Require Operator to improve safety culture
-Require Operator to identify a responsible person for their safety culture

-Financial incentive and disincentives:

- Raise liability caps
- Tie safety and environmental performance to lease or license qualifications
- Tie safety and environmental performance to insurance
- Tie safety and environmental performance to management compensation such as by instituting "clawback" provisions for bonuses (using the USA Sarbanes/Oxley Act for financial institutions as an example).
- Whistle-Blower protection guarantees.
- Safety Record of the whole company should be an indicator of performance.
- Mandatory reporting and analysis of near-misses to identify trends before an accident happens.

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Appendix: Comparisons of HSE Systems

This table still needs some input from Norway (check Laws and Regs, and add KLIF as necessary) and the USA (check regs and add US Coast Guard aspects). Do we want to try to track down Russian info?

Given the international nature of the Arctic oil and gas industry, it is important to have an understanding of what the different HSE systems are, including critical elements, how an operator must comply, implementation, how are contractors addressed, monitoring, and enforcement, among other things. A comparison of Arctic States requirements and systems may give the regulators and global operators a better understanding of what the different HSE/management systems are across the Arctic nations, and could provide a Guideline document explaining the differences and similarities across Arctic States and emphasizing common practices and possible needs for better understanding of their elements.

To this end PAME members have compiled a table of 33 HSEMS elements from 4 National Systems and the AOOGG and cross referenced these elements with the applicable laws and guidelines. A version of this table is located on the PAME website that provides links to each of the elements described in national system requirements (www.pame.is). First you log into the "login" area which is located in the top right corner of the homepage using the following user name and password:
USERNAME: pame (all lower cases)
PASSWORD: akureyri (all lower cases).
Then you click on the "Protected Area" icon and go into *"HSE Workshop 2012"* on the left hand bar..

Table1 Compiled and Compared HSE Systems--Canada, USA, Norway, Greenland, and AOOGG[2]

HSE Management Systems for Offshore Oil and Gas Operations in the Arctic					
	Norway	**Canada**	**Greenland**	**United States**	**Arctic Council Offshore Oil and Gas Guidelines 2009**
Regulator					
Mandatory?	Yes	Yes	Yes	Yes	No
Consolidated Authority for HSE?	No o Safety—PSA o Environment - Klif o Ministry of Health	Yes NEB	Yes	No o Safety and Environment--BSEE o Health--OSHA	NA
System Components					
Objectives and Strategies (Goals)	X C3 S7	X Part 2 Management System, 5(1), 5(2)(a, b)	X EO §19	X CFR §250.1909 (a)	X p26; p89

[2] PAME I 2012 Agenda Item 5.2 HSE Management Systems Project PAME Meeting Background Documents. This is being updated by country experts.

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HSE Policies clearly stated or described	X C2 S6	X Part 2 Management System, 5(2)(a, b), 8(a), 9(a)	X EO chapter 6	X CFR §250.1909 (a, e); § 250.1912 (a)	X p26
Show how Management is Committed to HSE	X C2 S6	X Part 2 Management System, 5(2)(g, h, k)	X Pre-qualification procedure, EO § 19	X CFR §250.1909 (a, e)	X p27
Planning	X C4 S12	X Part 2 Management System, 5(2)(j), 6(b, c, d)	X DG 1.2 EIA App 1, section 6	X CFR §250.1909 (g, h)	X p27
Documentation is current, valid and approved	X C2 S6; C7 S24; C9 S42	X Part 2 Management System, 5(2)(g, h), 5(3), Part 3 Operator's Duties, 17(1, 2)	X MRA 79.3, EO §§ 19, 22, 23	X 30CFR §250.1909 (g) and 30CFR § 250.1910 (a, b [1,2,3]); § 250.1912 (f); § 250.1913 (e); § 250.1914 (a); § 250.1916 (d); § 250.1924 (b [4, 5]); § 250.1928; § 250.1929	X p27
Process for Periodic Review and Audit	X?	X Part 2 Management System, 5(2)(i)	X MRA 79.2, 79.3 EO §15.3, §16.3, §17, §19, §20, §21	X CFR §250.1909 (d, j); § 250.1913 (c); § 250.1914 (e [1]); § 250.1916 (c, h); § 250.1920; § 250.1926	X p28
Continued improvement	X C2 S6; C6 S23	X Part 2 Management System, 5(2)(b, i)	X EO, §19, 1), §28.2	X CFR §250.1909 (a, d, j); §250.1911 (3); § 250.1914 (e [1])	X p6
Measurement parameters and indicators (of the management system)	X C3 S10	X Part 2 Management System, 5(2)(f, i), 8(a, h), 9(a, h)	X EO §19, DG 1.2	X CFR §250.1909 (a); § 250.1929	
Mechanical Integrity	X?	X Part 2 Management System, 5(2)(e), 8(e), 9(e), Part 4, Equipment and Operations, Part 7, Measurements, 62	X EO §§30-33, DG chapter 5	X § 250.1916	
Operating Procedures/Work Processes	X C4 S13	X Part 2 Management System, 6(b, c, d), 8, 9	X EO 19.6) DG 1.2, chapter 5	X CFR §250.1909 (g); § 250.1912 (a, 2); § 250.1913; § 250.1914 (f, g); § 250.1915 (a, b, c);	X p31-39

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Internal Communications and Analysis	X C2 S6; C3 S8;	X Part 2, 5(2)(f)	X MRA 79.3, EO chapter 2-3, 19.6)	X CFR §250.1909 (a, e); § 250.1913 (a, b, e); § 250.1915 (c);	X P27
Risk Management	X C2 S4; C2 S5	X Part 2, Management System, 5(2)(c)	X MRA 53.4-6, 79.1; 79.3 EO chapter 6	X §250.1901 (a, b); §250.1911; §250.1913	X p27; p89
Risk Analysis	X C5 S16: C5 S17	X Part 2, Management System, 5(2)(c), 8(b, c), 9(b, c)	X MRA 53.4-6, 79.1; 79.3 EO chapter 6, 8	X CFR §250.1909 (h); §250.1911; § 250.1913 (d)	X p27; p89
Hazards Analysis		X Part 2, Management System, 5(2)(c), 8(b, c), 9(b, c)	X MRA 79.1; 79.3 EO chapter 6, 8 DG 1.2	X §250.1911; § 250.1913 (d)	
Risk Acceptance Criteria	X C3 S9	X Part 2, Management System, 8(c), 9(c)	X (MRA §79, EO §19.7-8) chapter 8)	X CFR §250.1909 (g, h)	
Safety/Working Environment Analysis	X C5 S18	X Part 2, Management System, 8(b), 9(b)	X EO §§ 10-13, 38-40 DG 1.2	X CFR §250.1911(b)	X p38
Decision basis and criteria	X C3 S11	X Part 2, Management System, 8(c), 9(c)		X 30CFR § 250.1910 (a);	X p89
Consent/Approval (API RP75 pre-startup review?)	X C7 S25; C7 S26	X Part 2, Application for Authorization,,6	X MRA §§ 73-75, 86, EO chapter 7, DG 1	X? 30CFR § 250.1917	
Training	X?	X Part 2, Management System, 5(2)(d), Part 3, Operator's Duties, 19(l), Part 10, Training and Competency, 72	X EO 19.4) §35	X § 250.1912 (e); § 250.1915; § 250.1916 (b)	X p40
Manning and Competence	X C4 S14	X Part 2, Management System, 5(2)(d), Part 3, Operator's Duties, 19(l), Part 10, Training and Competency, 72	X EO 19.4) , §22.3) §35, DG 1.2	X CFR §250.1909 (f, i); § 250.1911 (2); § 250.1912 (e); § 250.1914 (b, c [2], d); § 250.1915 (a, b); § 250.1926	
Accountability for Contractors and all parties		X Part 2, Management System, 5(2)(j)	X EO chapters 2-4	X § 250.1914; § 250.1915 (d); § 250.1924; § 250.1925;	
Fit for place and purpose		X Part 2, Management System, 5(4); ,COGO Act, 5.11(1, 2, 3), 5.12(1, 2, 3, 4)	X MRA §§53, EO chapter 6, DG 1	X § 250.1911	

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Collection, processing and use of data	X C6 S19; C9 S42	X Part 2, Management System, 5(2)(f), 6(i), 8(g), 11(b), Part 5, Evaluation of Wells, Polls and Fields, 49 to 55, Part 11 Submission of Samples and Data, 53 to 55	X DG 2.1, 3, 11, 12 EIA 2, Appendix 1, 6	X 30CFR § 250.1910 (a, b [1,2,3]); §250.1911 (2); § 250.1914 (e [2]); § 250.1928	
Reporting, review and investigation of hazards and accidents	X C6 S20; C8 S29; C8 S30; C8 S31; C8 S32; C8 S33; C9 S36	X Part 2, Management System 5(2)(f), Part 11, Incidents and Near-misses, 75	X MRA §65, 79.1; 79.3 EO §§ 37, 19.8-12) chapter 6, 8 DG 1.2	X CFR §250.1909 (d) and § 250.1911 (1 [iv], 2); § 250.1913 (d); § 250.1919; § 250.1928	
Handling of situations/Emergency Response and Control measures	X	X Part 2, Application for Authorization, 6(j), Part 11, Environmental Reports, 86(1)(b), 86(2)(B)	X MRA §64 EO chapter 9, §45.2, DG 1.2	X 30CFR § 250.1918	
Identification of the responsible person(s) for system establishment, maintenance and implementation		X Part 2, Management System, 5(2)(k)	X EO chapters 2-4, §19.3	X CFR §250.1909 (b, c); §250.1911 (2, 3); § 250.1920 (d [2])	
Management of Change		X COGO Act, 5.11	X EO §19.12) , §23 DG 2.2	X § 250.1912	
Information requirements	X C4 S15; C9 S34; C9 S35; C9 S37; C9 S37: C9 S38; C9 S40; C9 S42	X Part 2, Application for Authorization and Well Approvals. 6 to 12	X MRA §§65, 82, 86.3	X 30CFR § 250.1910 (a, b [1,2,3]); §250.1911 (a, b); § 250.1913 (a, 8 and 10); § 250.1919 (a); § 250.1928 (d)	
Reporting Work Hours	X C7 S27	X Canada Labour Code, Part II	X EO §36, DG 1.2	X Form BSEE–0131	
Compliance Audits and Inspections	X C6 S21	X Part 2, Management System 5(2)(i)	X MRA §86.2, EO chapters 2-3, 5-6, 12	X § 250.1924; § 250.1925; § 250.1926	X p28
Issues of Non Compliance	X C6 S22; C10 S43	X Part 2, Management System 5(2)(i); COGO Act, Regulation of Operations, 16	X MRA §§ 89, 96.2, EO chapter 14	X § 250.1927	
Enforcement	C10 S43	X COGO Act, Safety and Connservation Officers, 53 to 54, 58	X MRA §§ 89, 96.2, EO chapter 14	X § 250.1927 (b, c)	

Safety culture			X EO § 12, § 19.6), DG 1.2, 6		

For the United States:
30 CFR Subpart S, Safety and Environmental Management Systems (1010–0186), including Form BSEE–0131, Performance Measures Data
http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=a6aca655228a4f5d6ca2a70b35270de2&rgn=div6&view=text&node=30:2.0.1.2.2.19&idno=30

For Canada: (Acts and associated Regulations are current to 2012-02-20)
Canada Oil and Gas Operations Act (O-7) (COGO Act), http://laws-lois.justice.gc.ca/eng/acts/O-7/FullText.html

- Canada Oil and Gas Drilling and Production Regulations (SOR/2009-315), http://laws-lois.justice.gc.ca/PDF/SOR-2009-315.pdf
- Canada Oil and Gas Certificate of Fitness Regulations (SOR/96-114), http://laws-lois.justice.gc.ca/eng/regulations/SOR-96-114/FullText.html

Canada Labour Code, Part II, (R.S.C., 1985, c. L-2), http://laws-lois.justice.gc.ca/eng/acts/L-2/FullText.html

- Oil and Gas Occupational Safety and Health Regulations (SOR/87-612), http://laws-lois.justice.gc.ca/eng/regulations/SOR-87-612/FullText.html

For Norway:
Regulations Relating to Management and the Duty to Provide Information in the Petroleum Activities and at Certain Onshore Facilities (The Management Regulations)
http://www.ptil.no/management/category401.html#_Toc280619385

For Greenland:
Health, Safety and Environment connected to hydrocarbon drilling activities in Greenland are regulated after:

- The Mineral Resources Act ("MRA")(framework act), chapter 13, 14, 15: environmental protection, environmental liability, environmental impact assessment, chapter 17: health and safety for offshore installations
  http://www.bmp.gl/images/stories/faelles/mineral_resources_act_unofficial_translation.pdf
- Executive order on health and safety in connection with offshore hydrocarbon activities in Greenland (draft, expected issued within a short while) ("EO")
  http://dk.nanoq.gl/Service/Hoeringsportal/Bekendtgoerelser/2011/sikkerhed%20og%20sundhed%20på%20mobile%20offshoreanlæg%20ifb%20med%20offshore%20kulbrinteaktiviteter%20i%20Grønland.aspx
- BMP exploration drilling guidelines (DG)
  http://www.bmp.gl/images/stories/petroleum/110502_Drilling_Guidelines.pdf
- BMP guidelines for preparing an Environmental Impact Assessment (EIA)
  http://www.bmp.gl/images/stories/petroleum/BMP_EIA_Guidelines_Jan_2011.pdf
- BMP terms of approval for an exploration drilling programme
  http://www.bmp.gl/petroleum/approval-of-activities/exploration-drilling
    - In approving the exploration drilling activities the BMP will adhere to the NORSOK standards, e.g.:
        - NORSOK D-010: NORSOK Standard D-010, August 2004, Well Integrity in Drilling and Well operations.
          NORSOK D-SR-007: NORSOK Standard D-SR-007, Jan 1996, System Requirements - Well Testing Systems.
        - NORSOK R-003: NORSOK Standard R-003, July 2004, Safe use of lifting equipment.

- NORSOK S-001: NORSOK Standard S-001, February 2008, Technical Safety.
- NORSOK S-003: NORSOK Standard S-003, December 2005, Environmental Care.
- NORSOK Z-013: NORSOK Standard Z-013, Oct. 2010, Risk and emergency.

For the Arctic Council:
Arctic Offshore Oil and Gas Guidelines 2009 www.pame.is

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Appendix: Arctic Considerations for Selected HSE Elements

The PAME HSEMS Project group selected 16 of the 33 elements they identified that might be viewed with more focus in the Arctic context for possible further consideration of limiting and special circumstances that might apply.
We will use this in the discussions in the main body of the report that is still under construction. Some of these need more thought and input. These are the "Delta Arctic" aspects discussed in the RP3 workshop.

Table 3: Arctic Considerations for Selected HSE Elements

Planning: Arctic conditions and issues perhaps require more and different planning elements than operations in other regions; i.e. Ice dynamics; deployment and replacement/repair of special cold and ice resistant equipment; difficult working and operating conditions of darkness and deeply cold temperatures; poor communications ability; long supply and support distances and frequent no-travel conditions; avoidance of sensitive wildlife; many laws, regulations, rules and mitigation measures; a tremendous amount of environmental assessments, permits and approvals; avoidance of conflict with marine subsistence users...
Documentation is current, valid and approved: Accurate onsite documentation may be challenged by working and environmental conditions, maintaining accurate and timely documentation may be compromised by shortened exploratory drilling season as compared to other regions; operational changes due to sudden harsh environmental conditions or unexpected equipment issues may go undocumented due to schedule pressure, approval of documents may be more difficult for Arctic operations due to short drilling season and remoteness from and possible communications difficulty with the home office and the regulators.
Mechanical Integrity: Equipment and facilities must withstand extra stress and are more prone to failure from environmental conditions and may need extra attention compared to other regions; equipment and facilities may require especially hard to get or replace components and may lead to makeshift repairs or delayed maintenance; compressed exploratory drilling seasons and may place extra pressure to jerry-rig equipment and facilities components to make it through the program on time.
Operating Procedures/Work Processes: The Arctic is different with many extra challenges to the standard operating practices and work process. Waste management, operating practices, and training are all affected by darkness, extreme cold, extreme weather, environmental sensitivity, remoteness; and short exploratory drilling season putting pressure to get the job done. All Arctic offshore operating procedures and work processes require carefully thought out modifications and additional practices to the operations and work processes, with an emphasis on safety and environmental protection.
Internal Communications and Analysis: Communications between the home office and drilling unit can be delayed or interrupted requiring back up systems or contingencies; communications on the drilling rig may be difficult or may be deferred due to environmental conditions of extreme cold or extreme weather; in a short exploratory drilling season, pressures for completion of the program may tend to diminish important communications between the different operations groups.
Risk Management: With many risk factors not encountered elsewhere due to extreme cold, moving ice, icing, fog, darkness, remoteness, safe operations that do not harm the environment must not be undercut by short exploratory drilling seasons, downtime, repairs or other economic factors. Similar risk for operational practices or work processes in other regions may result in different magnitudes of consequence in the Arctic.
Risk Analysis: In the Arctic there are many risk factors for safety not encountered elsewhere due to extreme cold, moving ice, icing, darkness, remoteness, and environmental sensitivities and these must be addressed in the risk analysis.
Hazards Analysis: In the Arctic there are many hazards to human health, safety, and operational integrity not encountered elsewhere including extreme cold, moving ice, icing, darkness, fog, remoteness, offshore permafrost, ice gouging, subsea methane hydrates, and environmental sensitivities and these must be addressed in the analysis. The consequence risk of a common hazard found elsewhere, such as shallow gas or active faults, may be much different and extreme in the Arctic.
Safety/Working Environment Analysis: Must account for offshore Arctic conditions of extreme cold, remoteness, darkness, extreme weather, icing,
Training: Specialized training for cold weather operations, firefighting, emergency and environmental response and other aspects including cultural sensitivity will be required of personnel. Cross-training will be necessary for personnel who may be required to fill-in for or assist primary personnel in critical operations due to either limited vessel occupancy capacity or in case of emergency response.

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Manning and Competence: Qualified and Arctic experienced personnel may be difficult to recruit; Personnel may have to be competent in more than one responsibility under extreme and isolated conditions with limited communications and transport capability. In Arctic operations, self sufficiency is important, with fewer available persons, longer rotation schedules, and diffuclty and sometimes impossible shore-to-rig transport, having the best trained and competent crew necessary.
Fit for place and purpose: Besides elements of size and phase of operations, Arctic conditions might need more elaborations; i.e. Exploration drilling operations will have short drilling seasons and must deal with ice, cold, currents, extreme weather, remoteness; Production operations must deal additionally with darkness and extreme cold weather where equipment fails and aircraft and cannot operate.
Handling of situations/Emergency Response and Control measures: Must account for moving ice**;** remoteness from support, assistance, extra equipment and manpower; Must account for firefighting and emergency control and response in sub zero temperatures or in darkness; must account for Evacuations in extreme cold and weather, darkness and remoteness; must account for possible relief well drilling in short exploratory drilling seasons and logistical difficulties due to remoteness, weather, ice, and limited support; Oil Spill and Emergency Response must account for limited available resources such as vessels, aircraft, supplies, personnel and equipment and extreme cold, weather, darkness, ice, and remoteness.
Management of Change: To be discussed and added
Information requirements: Must account for information and forecasting of ice; sensitive biological and ecological areas; cultural sites and subsistence use areas and practices; cold temperature engineering data; Arctic specific geologic data (i.e. ice gouging, strudel scour, shallow permafrost, gas hydrates); SAR and OSR resources and practices;
Compliance Audits and Inspections: Difficult onsite conditions for thorough inspections and self audit proceedures; difficulty in access for inspectors to remote drilling locations; consideration of 24/7 inspectors.

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Appendix: Major HSE Management System Element Categories

We will use this table in discussions in the main body of the report that is still under construction..

Table 4. Major HSE Management System Element Categories

Major HSE Management System Element Categories								
USA Major SEMS Categories				Hazards Analysis	Management of Change	Operating Procedures	Mechanical Integrity
Norway Major HSE Categories	Objectives, Internal Requirements and the Basis for Making Decisions	Risk Management	Resources and Processes	Analysis	Follow-Up and Improvement		
AOOGG Major HSE Categories	Policy and Strategic Objectives	Evaluation and risk management	Organization, Resources and Documentation				Planning
~~NEB/ Pembina Institute Major Topic areas~~	~~Responsibilities~~	~~Occupational health and safety~~	~~Emergency preparedness~~	~~Personnel competence and training~~	~~Performance monitoring and compliance~~		~~Reporting and notification of accidents or emergencies~~
PAME HSE Project Plan (1)[3] Major HSE Elements	Mandatory and Voluntary Health Safety and Environmental Management Systems	Risk Management criteria		Training, Testing, Certification, and Drills	Compliance and monitoring/auditing techniques and protocols	Best Operating Practices for Well Control and Spill Prevention	
PAME HSE Project Plan (2)[4] Major HSE Categories for Workshop	Policy and strategic objectives	Risk evaluation and risk management	Organization, resources and documentation	Hazards analysis	Auditing and review	Implementation and monitoring (combined with Auditing and Review)	Planning
	3	4	3	3/3	5	2	2

Compliance Monitoring and Review	5
Risk Management	4
Policy and Objectives	3
Hazards Analysis	3
Resouces and Documentation	3
Competence and Training	3
Operating Practices	2
Planning	2
Responsibilities	1
Occupational health and safety	1
Emergency Preparedness	1
Mechanical Integrity	1

[3] PAME 2011-2013 Workplan http://www.pame.is/images/stories/PAME_Work_Plan_2011-2013.pdf
[4] PAME 2011-2013 Workplan http://www.pame.is/images/stories/PAME_Work_Plan_2011-2013.pdf

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Appendix: HSE Guidance

There are a lot more of these Guidance documents and we will seek input from industry to add to the list. We will also add weblinks to these documents.

Iris and U of Stavanger for PSA
Technology and Operational Challenges in the High North
October 2011

Transportation Research Board of the National Academies
Effectiveness of Safety and Environmental Management Systems for Outer Continental Shelf Oil and Gas Operations Interim Report 2011

PSA
The Thought Process
HSE and Culture

Greenland Bureau of Minerals and Petroleum
Exploration Drilling Guidelines May 2011

OSPAR
Recommendation 2003/5 to Promote the Use and Implementation of Environmental Management Systems by the Offshore Industry 2003

IRF

North Sea Offshore Authorities Forum (NSOAF)

ICRARD (International Committee on Regulatory Research and Development)
www.icrard.org primarily has information on HSE-related research and development projects in the USA, Canada, the United Kingdom and Norway.

G-20
GMEP Best Practices

OGP
'Guidelines for the Development and Applications of Health, Safety and Environmental Management Systems' 2003
2012

- **Catalogue of international standards used in the oil & gas industry**

2011

- **Managing health for field operations in oil and gas activities**
- **Process safety: recommended practice on key performance indicators**
- **Environmental performance in the E&P industry – 2010 data**
- **HSE guidelines for metocean surveys including Arctic areas**
- **Human factors engineering in projects**
- **Safety performance indicators – 2010 data**
- **Health and Safety data reporting system users guide – 2010 data**
- **Substance Misuse: a guide for managers & supervisors in the oil & gas industry**

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UK Health and Safety Executive

- **Reducing Error and Influencing Behaviour**
- **Improving Maintenance; A guide to reducing human error**
- **Culture & Work Environments Elements**

Step Change
Changing Minds - A Practical Guide for Behavioural Change in the Oil & Gas Industry

Shell Exploration & Production
Hearts and Minds Tools, 2002

Human Engineering for the Health & Safety Executive
Culture & Work Environments Elements Research Report 365 2005

International Standards Organization Documents
ISO TC 67 Arctic Offshore Structures
ISO 17776 Petroleum and natural gas industries - Offshore production installations - Guidelines on tools and techniques for hazard identification and risk assessment
ISO 14001:1996, Environmental management systems - Specification with guidance for use
ISO14004:1996, **Environmental management systems - General guidelines on principles, systems and supporting techniques**

American Petroleum Institute
API RP 75 and 74L HSE Management Systems
http://publications.api.org/Exploration-Production.aspx

International Association of Drilling Contractors (IADC): www.iadc.org
Health Safety and Environment Case Guidelines for Mobile Offshore Drilling Units
November 2011

E&P FORUM
Guidelines for the Development and Application of Health, Safety and Environmental Management Systems Report No. 6.36/210

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Appendix: Deepwater Horizon and Other Investigations

We can decide to keep this as just Deepwater Horizon investigations or expand to include Montera and Piper Alpha etc.

Deepwater Horizon Investigations

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling
DEEP WATER--THE GULF OIL DISASTER AND THE FUTURE OF OFFSHORE DRILLING REPORT TO THE PRESIDENT January 2011

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling
PRESIDENTIAL SPILL COMMISSION'S CHIEF COUNSEL REPORT Feb. 17, 2011

Det Norske Veritas, Arctic Offshore Drilling Review, National Energy Board Canada
MAJOR HAZARD INCIDENTS
February 2011.

Bureau of Ocean Energy Management, Regulation, and Enforcement
FORENSIC EXAMINATION OF DEEPWATER HORIZON BLOWOUT PREVENTER
Volume I Final Report (DnV) 20 March 2011

United States Coast Guard
FINAL INVESTIGATIVE REPORT ON DEEPWATER HORIZON EXPLOSION
April 22, 2011

BP
Deepwater Horizon Accident Investigation Report
September 8, 2011

Bureau of Ocean Energy Management Regulation and Enforcement
REPORT REGARDING THE CAUSES OF THE APRIL 20, 2010
MACONDO WELL BLOWOUT September 14, 2011

National Academy of Engineering
MACONDO WELL–*DEEPWATER HORIZON* BLOWOUT LESSONS FOR IMPROVING OFFSHORE DRILLING SAFETYING OFFSHORE
Committee for Analysis of Causes of the Deepwater Horizon Explosion, Fire, and Oil Spill to Identify Measures to Prevent Similar Accidents in the Future December 2011

SINTEF
THE DEEPWATER HORIZON ACCIDENT: CAUSES, LEARNING POINTS AND RECOMMENDATIONS FOR THE NORWEGIAN CONTINENTAL SHELF May 2011

Petroleum Safety Authority of Norway
THE DEPWATER HORIZON ACCIDENT—ASSESSMENTS AND RECOMMENDATIONS FOR THE NORWEGIAN PETROLEUM INDUSTRY June 2011

International Regulators Forum
2011 OFFSHORE SUMMIT – WHERE DO WE GO FROM HERE? SUMMARY OF CONCLUSIONS October 2011

National Energy Board of Canada

Rough Draft 2-08-13 Not for Circulation

The past is always present: Review of Offshore Drilling in the Canadian Arctic--Preparing for the future. December 2011

U.S. Chemical Safety and Hazard Investigation Board
INVESTIGATION INTO MACONDO BLOWOUT AND EXPLOSION IN GULF OF MEXICO
Interim Reports Scheduled 2012

U.S. Justice Department

OGP and IADC are working with PSA Norway and the IRF on BOPs in wake of DWH

EC?

There are others we can find and add.

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Appendix: Arctic Oil and Gas Guidelines, 2009

This is sections on HSE and Best Practices from the AOOGG. We have several options. ~~1. We can renegotiate the language and include as a full "Chapter" in the HSE Report~~. 2. We can pare this down and put this up front in summary form or 3. We can append the whole thing to the report.

The Arctic Council Offshore Oil and Gas Guidelines 2009

Principle(s)

Continuous improvement (AOOGG p 6)

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.

Safety and Environmental Management (AOOGG p 25)

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.

Management Systems (AOOGG p26)

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:

Policy and Strategic Objectives (AOOGG p26)

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.

Organization, Resources and Documentation (AOOGG p27)

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.

Evaluation and risk management (AOOGG p27)

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.

Planning (AOOGG p27)

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.

Compliance Monitoring, auditing and verification (AOOGG p28)

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.

Reporting and evaluation of compliance monitoring activities (AOOGG p29)

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.

Design and Operations (AOOGG p36)

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 (AOOGG p37)

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 (AOOGG p37)

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.

Human Health and Safety (AOOGG p38)

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 (AOOGG p38)

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.

Training (AOOGG p40)

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.

Emergencies (AOOGG p43)

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.

Preparedness (AOOGG p43)

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.

Response

Contingency Planning (AOOGG p44)
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.

Emergency Response Plans (AOOGG p44)

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 (AOOGG p44)

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 (AOOGG p45)

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 (AOOGG p46)

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 (AOOGG p47)

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 (AOOGG p47)

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.

Definition of Practices and Techniques (AOOGG p79)

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.

Company safety, environmental policies and objectives (AOOGG p89)

Detailed elements that may be incorporated into 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 that 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.

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Appendix: HSEMS Project Plan

ANNEX 3 - PROJECT PLAN ON HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT SYSTEMS AND THE USE OF BEST OPERATING PRACTICES FOR OFFSHORE ARCTIC OIL AND GAS DRILLING ACTIVITIES

Health, Safety and Environmental Management Systems and the Use of Best Operating Practices for Offshore Arctic Oil and Gas Drilling Activities—A Report and Guidelines

In the wake of two recent major offshore oil spills due to blowouts, it is clear that health safety and environmental management systems in offshore operations and the use of best practices in this regard are critical to protecting human health and safety and, therefore, the environment.

This proposal is for a comparison of existing Arctic health, safety and environmental management systems, and best practices requirements for offshore drilling operations and possibly developing a corresponding set of expanded guidance for Arctic States beyond what is already in the Arctic Offshore Oil and Gas Guidelines, 2009. The project proposal will be brought to PAME I-2012 for further consideration and direction.

This will allow for consideration of important changes now taking place in Arctic countries' management, regulatory and enforcement regimes and the results of the many investigations into these recent blowouts, which are still underway.

I. Background

Most Arctic countries now or will soon have some form of requirement for industry to implement and employ management systems that address the safety and health of personnel, protection of the environment, and the use of best practices for offshore drilling operations. Although these systems focus attention on the influences that human behavior and organization have on accidents, they vary to differing degrees across the Arctic in emphasis, application, and enforcement as reflected in their various names such as EMS (Environmental Management System), HSEMS (Health and Safety and Environmental Management System) or SEMS (Safety and Environmental Management System).

Given the international nature of the Arctic oil and gas industry, it is important to have an understanding of what the different HSE systems are, including critical elements, how an operator must comply, implementation, how are contractors addressed, monitoring, and enforcement, among other things. A comparison of Arctic States requirements and systems may give the regulators and global operators a better understanding of what the different HSE/management systems are across the Arctic nations, and could provide a Guideline document explaining the differences and similarities across Arctic States and emphasizing common practices and possible needs for better understanding of their:
policy and strategic objectives;

- organization, resources and documentation;
- risk evaluation (including hazards analysis) and risk management;
- planning;
- implementation and monitoring; and
  auditing and review.

The Arctic Council's Arctic Offshore Oil and Gas Guidelines 2009, offer general guidance on these important and related issues in Section 5, Safety and Environmental Management (pp 25-29); Section 6 Operating Practices (pp 31-41); Section 7 Emergencies (pp 43-47), ANNEX B - Definition of Practices and Techniques (pp 79-80), ANNEX F - Environmental Risk Analysis Flow Diagram (p 88), and ANNEX G - Company Safety, Environmental Policies and Objective (p 89). However, in light of the initial findings of the U.S. National Academy of Engineering and National Research Council on the Deepwater Horizon disaster that best practices were not followed and risk assessment was flawed, and the preliminary findings of the Presidential Commission on the Deepwater Horizon Oil Spill that there was not a "safety culture" aboard the rig, it is suggested that this aspect of the AOOGG be evaluated and possibly elevated to a separate set of Guidance for Arctic Operations to accompany the comparison of systems report outlined above.

II. Key Objective(s)

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This project proposal would meet key objectives and recommendations enumerated in a number of Arctic Council documents such as the Arctic Marine Strategic Plan, the PAME Work Plan, the Oil and Gas Assessment, and the Arctic Offshore Oil and Gas Guidelines.

1. The consideration of existing and possible development of more comprehensive Guidance on HSE Management System and Best Practices, and Risk Management are important to implementing the AMSP, as summarized in the following "Strategic Actions" passages:

> ***7.2.3*** *it is recommended that the adequacy of Arctic Council guidelines related to the prevention of environmental impacts of oil and gas activities be examined in light of the Council's OGA, and at*
>
> ***7.2.6*** *where it is recommended that the Council identify potential areas, as appropriate, where new guidelines and codes of practice for the marine environment are needed.*

2. The development of more comprehensive Guidance on HSE Management System and Best Practices, and Risk Management would also address a key Objective and Action identified in the **PAME Work Plan 2009-2011**:

> **Objective I**
>
> "Improve knowledge and respond to emerging knowledge of the Arctic marine environment"
>
> Recommended **Action Number 2** is to "Follow up on the Arctic Offshore Oil and Gas Guidelines (2009)."

3. Such Guidance would also fulfill Recommendations of the Oil and Gas Assessment and expand on guidance in the Arctic Offshore Oil and Gas Guidelines as appropriate and needed.

Relevant Recommendations of the AMAP Report Arctic Oil and Gas Activities, 2007.

> ***Managing Oil and Gas Development***
>
> **Laws and regulations**
>
> Recommends that laws and regulations should, periodically reviewed and evaluated and where necessary strengthened and rigorously enforced.
>
> **Laws and regulations**
>
> Recommends the required use best industry and international standards in combination with clear and flexible management systems and regulations, which are reviewed regularly for effectiveness, adequacy, proper application, and to accommodate changes in technology.
>
> **Laws and regulations**
>
> Recommends the use of risk assessments that are rigorously applied.
>
> **Technology and practices**
>
> Recommends the adoption by the oil and gas industry of the best Arctic technology and practices currently available in all phases of oil and gas activity.
>
> **Spill Prevention and Response**
>
> Recommends that actions should be evaluated and applied to reduce risks of marine and terrestrial oil spills, especially aiming to prevent the occurrence of marine spills in the presence of sea ice.
>
> **Spill Prevention and Response**
>
> Recommends that emergency preparedness should be of the highest levels, and include training of crews to operate and maintain equipment, and conducting regular (and unscheduled) response drills.

The AOOGG 2009 recommended:

> 1.5 Potential Effects of Oil and Gas Activities on Environment and Society
>
> ***Natural environment***
>
> 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 AOOGG states at Section 5 Safety and Environmental Management, that "an important management tool to assist the operator in meeting the regulatory objectives is 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. "

III. Proposed Project Scope

Explore the need for a comparison of existing HSE Management systems employed by Arctic States for offshore oil and gas drilling operations and expand the Arctic Offshore Oil and Gas Guidelines on HSE Management Systems including Risk Management and Best Operational Practices as necessary.

Elements of comparison for the Arctic States offshore drilling management systems could include:

policy and strategic objectives;
organization, resources and
documentation; risk evaluation and
risk management; hazards analysis;
planning;
implementation and
monitoring; and auditing and
review.

As a result of the comparison above, wider and updated guidance could be developed for the use of these management systems and best operating practices in regards to:

Mandatory and Voluntary Health Safety and Environmental Management Systems
Risk Management criteria
Best Operating Practices for Well Control and Spill Prevention
Training, Testing, Certification, and Drills
Compliance and monitoring/auditing techniques and protocols

IV. Proposed Main Components and Implementation

1. Develop a draft outline and implementation plan.

2. Conduct a survey and compilation of Arctic States requirements and guidance for Health, Safety and Environmental Management systems and operating practices for offshore oil and gas drilling operations.
3. Conduct an Arctic Workshop on HSE Management Systems including Risk Management and associated operating practices focusing on the comparison of systems and practices and identifying common elements and important differences.
4. Determine whether there is a need to expand and refocus the Guidelines now contained in the AOOGG 2009, for HSE Management Systems, Best Operating Practices and Risk Assessments and ascertain the most needed elements for expansion.
5. Draft guidelines developed.
6. Deliver Guidelines by 2013.

Possible List of Tasks/Activities

1. Develop Project Outline
2. PAME through country experts confer with Arctic oil and gas regulators through the Arctic Council, International Regulators Forum, OSPAR and others as appropriate, Industry associations such as Oil and Gas Producers International, International Association of Drilling Contractors, American Petroleum Institute, Canadian Association of Petroleum Producers, and others to make a compilation and comparison of the different systems and practices
3. PAME, in cooperation with other partners, hold a workshop on these issues to identify commonalities and differences in existing systems and practices and areas of that may need expansion in the existing guidance provided in the AOOGG, 2009.
4. Begin drafting of Report and Guidelines w/meetings on the side of PAME meetings and via correspondence.
5. Circulate Draft for review
6. Deliver final Report and updated Guidelines for Health, Safety, and Environment management systems and best operating practices for offshore drilling activities to PAME, SAOs and the Arctic Ministers.

Possible Timeline and Major Milestones

February 2011: Discuss the proposal and the need for a comparison of HSE Management systems and best practices.

Develop TOR for project and circulate for review (PAME I-

2012). Approval of Project Plan

Begin compilation and comparison of existing Arctic HSE Management systems and best operating practices (possibly as product of the MRE Web-based Informational Resource project).

Hold an open workshop on Arctic HSE Management Systems and Best Operating Practices

First Draft Report (and Guidelines if agreed)

Final Report and Guidelines delivered to the PAME Working Group, SAOs and Ministers for approval

Budget
TBD

V. Main outcomes
Report to the PAME Working Group 2013-2014.

VI. Project Team Structure/Lead Countries
US Lead and co-lead and PAME contact group.