OCEAN ENERGY SAFETY ADVISORY COMMITTEE

Federal Advisory Committee to the Secretary of the U.S. Department of the Interior

Final Summary Report
APRIL 2011 – JANUARY 2013

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APPENDICES

CHAIRMAN'S OVERVIEW

The Ocean Energy Safety Advisory Committee was established by the Department of the Interior in the aftermath of the *Deepwater Horizon* accident in the Gulf of Mexico. The need for a cooperative approach among government, industry, academia, and public interest groups to enhance the safety of ocean energy development was clearly indicated by that incident. The Committee was chartered as a Federal advisory committee on February 8, 2011, and consisted of 15 members – four from industry, six from government, two from academia, two from non-governmental organizations, and one chairman. The mission of the Committee was to provide recommendations on matters relating to offshore energy safety, including drilling and workplace safety, collaborative research and development, well intervention and containment, and oil spill response. A central objective was to provide guidance to the government on the establishment of an Ocean Energy Safety Institute.

At the initial meeting on April 18, 2011, the Committee began hearing from invited participants and the public about knowledge gained from the *Deepwater Horizon* tragedy and established four subcommittees. They were 1) Spill Prevention, 2) Spill Containment (Source Containment), 3) Spill Response, and 4) Safety Management Systems. Each subcommittee had representatives from across the Committee and prepared information for consideration by the Committee as a whole at subsequent meetings.

Subsequent public meetings were held in Washington, D.C.; New Orleans, Louisiana; Houston, Texas; and Anchorage, Alaska. At each meeting, a report was given by each subcommittee, various topics were presented by invited participants, and input was received from the public. Beginning on April 26, 2012, the first of three formal sets of recommendations was reviewed and approved by the full Committee. These recommendations were subsequently submitted to the Secretary of the Interior through the Director of the Bureau of Safety and Environmental Enforcement (BSEE) on May 17, 2012. Additional recommendations were submitted on October 15, 2012, and January 25, 2013. The Director responded to each set of recommendations with a written summary of the intended approach to address the recommendations.

In August 2012, two additional subcommittees were established. One subcommittee was asked to formulate a recommendation on the approach to establishing the Ocean Energy Safety Institute. In response to a request by the Secretary and the Director, the other new subcommittee was tasked to develop recommendations on offshore energy development in the Arctic. These two subcommittees presented their findings at the January 2013 meeting and associated recommendations were approved by the Committee and transmitted to the Secretary and the Director on January 25, 2013. The final set of recommendations submitted in January 2013 completed the work of the Committee. This summary report was then compiled to document the Committee's work and provide a record of information submitted to the Committee, including public input.

This report starts with a brief history of the Ocean Energy Safety Advisory Committee, including its objectives, a summary of its activities, and a list of its recommendations. The next section of

the report provides information on the Committee's six subcommittees, including a summary of each subcommittee's activities, recommendations, and any white papers and other materials that provide explanations and context for the recommendations. The appendices include additional committee documents, including its charter, meeting minutes, the letters from the Committee Chairman transmitting recommendations to the Secretary and BSEE Director, BSEE's responses to committee recommendations, and other materials prepared by or submitted to the Committee. Additional information can be found on BSEE's website (*http://www.bsee.gov/About-BSEE/Public-Engagement/OESC/Index*), including the meeting minutes that include transcripts of the input received directly from members of the public.

Taken together, these recommendations provide achievable enhancements to the safety of offshore energy development in all the areas addressed by the Committee. If these recommendations are implemented, a stronger foundation can be achieved for the effective and environmentally responsible development of our offshore energy resources through cooperation between government, the energy industry, the public, national laboratories and American universities.

COMMITTEE OBJECTIVES

The Ocean Energy Safety Advisory Committee (OESC) was chartered on February 8, 2011, to advise the Secretary of the Interior, through the Director of the Bureau of Safety and Environmental Enforcement (BSEE), on a variety of issues related to offshore energy safety. The OESC's charter called for it to "provide recommendations … on matters and actions relating to offshore energy safety, including, but not limited to drilling and workplace safety, well intervention and containment, and oil spill response."

The OESC drew together U.S. government agencies, the offshore energy industry, national laboratories, non-governmental organizations, and the academic community to provide recommendations on new safety regulations, cutting-edge research and development (R&D), and training in the areas of offshore drilling safety and oil spill prevention, containment and response.

Some of the objectives of the OESC include:

- Providing a venue for representatives from industry, government, non-governmental organizations, national laboratories, and the academic community to exchange information and ideas, share best practices, and make recommendations on issues related to offshore energy safety;
- Identifying gaps in existing regulations, standards, practice, technical capabilities and R&D initiatives related to offshore energy safety, including drilling and workplace safety, and oil spill prevention, containment and response;
- Identifying, prioritizing and recommending new regulations, procedures, R&D projects and partnerships in the areas of drilling and workplace safety, and oil spill prevention, containment, and response;
- Providing advice on how best to stand up the proposed Ocean Energy Safety Institute, and on what role the OESC should play in the Institute going forward.

The Committee's charters are available as reference documents in the appendices to this report.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE MEMBERSHIP

Section 12 of the OESC Charter states:

Committee membership will consist of approximately 15 members representing the interests of the Federal Government, the offshore energy industry, the academic community, and non-governmental organizations. To ensure fair and balanced representation on the Committee, the Secretary shall appoint members based on the following criteria:

- up to six members representing the Federal Government, including one member representing the Bureau of Ocean Energy Management (BOEM); one member representing the United States Geological Survey (USGS); one member representing the Department of Energy (DOE); one member representing the National Oceanic and Atmospheric Administration (NOAA); one member representing the United States Coast Guard (USCG); and one member representing the Environmental Protection Agency (EPA);
- up to four members representing the offshore energy industry;
- up to four members representing the academic community and non-governmental organizations; and
- one chairperson appointed by the Secretary with expertise in a field related to offshore energy safety.

Members will be appointed by the Secretary, with input and recommendations from the above referenced federal agencies, the offshore energy industry, the academic community and other stakeholders.

On March 11, 2011, Secretary Kenneth L. Salazar appointed the original members to the Committee to serve two-year terms. In April 2013, Secretary Sally Jewell reappointed the members for an additional term to complete final recommendations/summary report.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE MEMBERSHIP

AFFIILIATION	MEMBER	TERM
Chairman	Thomas O. Hunter	03/11/11 – 6/22/13
Academia	Nancy G. Leveson	03/11/11 – Present
Academia	Tadeusz W. Patzek	03/11/11 – Present
Non-Governmental Organization	Lois N. Epstein	03/11/11 – Present
Non-Governmental Organization	Richard A. Sears	03/11/11 – Present
Offshore Energy Industry	Joseph M. Gebara	03/11/11 – Present
Offshore Energy Industry	Donald E. Jacobsen	03/11/11 – Present
Offshore Energy Industry	Paul K. Siegele	03/11/11 – Present
Offshore Energy Industry	Charles R. Williams II	03/11/11 – Present
Federal Government-BOEM	Walter D. Cruickshank **(Assumed Chairmanship 06/27/13)**	03/11/11 – Present
Federal Government-DOE	Christopher A. Smith	03/11/11 – Present
Federal Government-EPA	Mathy Stanislaus	03/11/11 – Present
Federal Government-NOAA	David G. Westerholm	03/11/11 – Present
Federal Government-USCG	Patrick E. Little Mary E. Landry (Alternate: John R. Caplis II)	03/11/11 – 07/31/12 08/29/12 – Present 08/29/12 – 05/31/13
Federal Government-USGS	Stephen H. Hickman	03/11/11 – Present

OESC Summary of Actions
Committee Meeting Dates and Places

Meeting Summary: The OESC met to address the scope and role of the Committee and begin framing the Committee's action plan for the next 12 to 24 months.

Date: April 18, 2011
Place: Washington, D.C.

Meeting Summary: The OESC met to address progress on outreach efforts, subcommittees' assignments, and Federal initiatives relevant to the work of the Committee.

Date: July 13-14, 2011
Place: New Orleans, Louisiana

Meeting Summary: The OESC met to address progress on OESC outreach to the academic community and the states. The OESC's subcommittees reported on their progress to date on their interim recommendations on spill prevention, spill containment, spill response and safety management systems for the OESC's consideration and action. In addition, the following topics were discussed: BSEE's incident data analysis; development and implementation of safety and environmental management systems from the perspective of major and independent operators; a summary of the findings of the Deepwater Horizon Joint Investigation Team; draft American Petroleum Institute (API) standards Deepwater Well Design and Construction (API Recommended Practice 96) and Well Construction Interface Document Guidelines (API Bulletin 97); and BSEE's proposed rule on revisions to safety and environmental management systems.

Date: November 7-8, 2011
Place: Washington, D.C.

Meeting Summary: The OESC met to address the OESC Subcommittees' activities to date on spill prevention, spill containment, spill response and safety management systems. Interim recommendations were presented to the OESC from its four subcommittees for consideration and action.

Date: April 26, 2012
Place: Houston, Texas

Meeting Summary: The OESC met to address the OESC Subcommittees' activities to date on: spill prevention, spill containment, spill response and safety management systems. Presentations were received on safety culture and a proposed Ocean Energy Safety Institute. Interim recommendations were presented to the OESC from its four subcommittees for consideration and action.

Date: August 29-30, 2012
Place: Anchorage, Alaska

Meeting Summary: The OESC met to address the OESC Subcommittees' activities to date on spill prevention, spill containment, spill response, safety management systems, the Arctic, and a proposed ocean energy safety institute. Interim recommendations were presented to the OESC from its six subcommittees for consideration and action.

Date: January 9-10, 2013
Place: Washington, D.C.

Ocean Energy Safety Advisory Committee (OESC)

Committee Recommendations

Since inception, the OESC submitted 56 recommendations to the Secretary of the Interior, through the Bureau of Safety and Environmental Enforcement (BSEE) Director, for consideration and appropriate action. The letters transmitting the recommendations and their reference documents and the enclosures cited below can be found in the appendices of this report.

April 2011

1. **DOI/BSEE should establish a subcommittee to address oil spill prevention.** This subcommittee would focus on issues related to preventing blowouts and oil spills. The focus would primarily be on drilling safety technologies and practices, rather than on worker safety. The membership should be comprised of OESC members with expertise or interest in this area.

2. **DOI/BSEE should establish a subcommittee to address oil spill containment.** This subcommittee would focus on issues related to containing a well after a blowout has occurred. The membership should be comprised of OESC members with expertise or interest in this area.

3. **DOI/BSEE should establish a subcommittee to address oil spill response.** This subcommittee would focus on issues related to oil spill clean-up and response. The membership should be comprised of OESC members with expertise or interest in this area.

4. **DOI/BSEE should establish a subcommittee to address safety management systems.** This subcommittee would examine the human/management factors that contribute to the risk of an uncontrolled blowout and oil spill. The OESC would re-evaluate whether to merge the Subcommittee with the Oil Spill Prevention Subcommittee in the future. The membership should be comprised of OESC members with expertise or interest in this area(s).

April 2012 (Transmitted May 17, 2012)

5. **Safety Management System Enhancement:** DOI/BSEE should redirect further work on Safety and Environment Management Systems (SEMS) II as proposed and concentrate its effort on addressing four critical issues with the current SEMS regulations; jurisdiction, responsible party, performance-based approach and process safety management. If these four issues are not addressed, it could have a negative impact on overall safety of offshore personnel and OCS environment. We further recommend that BSEE find means to implement those elements of SEMS II that are consistent with the concerns expressed by this Committee in Vector #2, Topic #1 document, dated April 10, 2012. See Reference Document #1 of the transmittal letter for details on recommendation.

6. **Safety Culture:** DOI/BSEE should establish an Offshore Leadership Safety Council (OLSC) that includes: key executives of regulatory bodies involved in offshore drilling and operations; key executives from industry, operators and contractors; as well as key representatives from stakeholder organizations. The role of the OLSC is to focus on:

    - Developing, communicating and fostering a safety culture for the industry which provides a common value and common set of objectives, which will evolve regularly.
    - Formulating a safety culture recognition program that motivates organizations to develop and foster their safety culture. Focusing on leadership behaviors and leadership communication of the safety values of their organization.
    - Encouraging and incentivizing engineering schools to include elements of safety engineering programs. Focusing not only on process safety, or systems safety, but also on safety awareness and engraving safety mentality early in the engineering education process.
    - Encouraging industry to develop a structure for conducting independent, consistently detailed accident and near accident investigations and reporting them to the industry and regulators.

    The OLSC is meant to be the forum at which the leaders of all stakeholders and regulators come together on a regular basis, quarterly, or yearly to check the pulse of the safety in the industry and to provide direction and leadership. See Reference Document #2 of the transmittal letter for details on recommendation.

7. **Leadership and Communication Training:** BSEE/DOI shall work with industry along with the support and guidance of the OLSC to develop leadership and communications safety training requirements that will ensure that the safety values and objectives that are agreed at the OLSC are communicated, discussed and cascaded to the industry workforce through the leadership of the industry starting from the Secretary of the DOI, the Director of BSEE, the top executives of the operating companies, the top executives of contractors, and all the way to the members of the facility operating staff. The message should be carried and disseminated through all levels of the organization from managers by managers and supervisors to the workforce. The focus of the OLSC should be on developing the requirements and ensuring a proper environment exists within industry to foster the development of the right safety culture.

    The OLSC is encouraged to work closely with the Center for Offshore Safety which can support managers and supervisors with the required training for them to be able to properly communicate the changes in values and behaviors necessary to achieve a strong safety culture. See Reference Document #2 for details on recommendation.

8. **Workshop on Organizational and Systems Readiness for Containment Response:** DOI/BSEE, in consultation with other federal agencies, should immediately commission the development of a workshop to debrief government, industry, and academic resources involved in the Deepwater Horizon (DWH) source control efforts to discuss lesson learned and chart a path forward in responding to future oil spills.

9. **Assessment and Development of Research Priorities for Containment of an Non-Capable Blowout[1]:** DOI/BSEE would immediately begin synthesis of DWH reports on organizational and system readiness pertaining to source control.

[1]"Non-capable blowout used throughout this document refers to a blowout that cannot be successfully capped.

August 2012 (Transmitted October 15, 2012)

10. **Workshop on Organizational and Systems Readiness for Containment Response:** DOI/BSEE, in consultation with other federal agencies, should immediately commission the development of a workshop to debrief government, industry, and academic resources involved in the Deepwater Horizon source control efforts to discuss lessons learned and chart a path forward in responding to future oil spills. **Note:** This recommendation was originally presented to DOI/BSEE in a letter dated May 17, 2012. The enclosed white paper is intended to amplify and clarify this recommendation by providing additional details on motivation and background, issues to be addressed at the workshop, integration with other activities, and bibliography of relevant reports. Reference material can be found in Enclosures 1-2 of the transmittal letter. **(Spill Containment)**

11. **DOI should recommend that Department of Energy (DOE) collaborate with private industry to develop improved early kick detection systems which would increase the probability of responding to a well kick with minimal volume influx.** Reference material can be found in Enclosures 3-4 of the transmittal letter. **(Spill Prevention)**

12. **BSEE should facilitate a joint industry project (JIP) to develop technologies to enable continuous monitoring of well-bore integrity throughout the full depth extent of a well using real-time telemetry of temperature, pressure, acoustic, and other signals.** Reference material can be found in Enclosures 3-4 of the transmittal letter. **(Spill Prevention)**

13. **DOI/BSEE should facilitate a JIP with industry participants and academia to develop enhanced shearing technologies to completely cut drill pipe, tool joints, and casing strings, and to assure that the blind shear rams installed in the blowout preventer (BOP) stack are capable of shearing the pipe and/or sealing the wellbore under maximum anticipated pressures.** The JIP should also consider unconventional severance and/or shut-in technologies. Reference material can be found in Enclosures 3-4 of the transmittal letter. **(Spill Prevention)**

14. **BSEE should initiate a discussion with BOP manufacturers, operators, and drilling contractors to define the current state and future needs for technology in BOP instrumentation, monitoring, and data recording.** BSEE should facilitate a JIP to fill any identified gaps. Reference material can be found in Enclosures 3-4 of the transmittal letter. **(Spill Prevention)**

15. **DOI should recommend that DOE sponsor research on the viability of acoustic activation of BOPs and other submerged well-control equipment in the deepwater (DW) Gulf of Mexico (GOM).** Further, the research should include the feasibility and viability of integrating the use of acoustics with independent/secondary BOP stacks (short stacks) similar to the capping stack. This could serve as a totally redundant and robust backup/emergency BOP stack. Reference material can be found in Enclosures 3-4 of the transmittal letter. **(Spill Prevention)**

16. Work is being carried out through the American Petroleum Institute Standards process to standardize remotely operated vehicles (ROV) connection ports for all subsea BOP stacks in the U.S. Outer Continental Shelf (OCS) and develop ROV pump capabilities to achieve closing time and volume requirements for all critical functions that meet or exceed current standards. **BSEE should monitor these activities, and incorporate these standards into regulations as appropriate.** Reference material can be found in Enclosures 3-4 of the transmittal letter. **(Spill Prevention)**

17. **That DOI support continued and dedicated research and development (R&D) funding from the Oil Spill Liability Trust Fund as a Department priority to support oil spill response research, including the National Oil Spill Response Research and Renewable Energy Test Facility (Ohmsett).** DOI should maintain the Ohmsett facility under direction of BSEE's Oil Spill Response Division. Additionally, BSEE should work with the Department to secure long-term research funding, develop a R&D strategic plan to address various OCS operating conditions including those encountered in deepwater and in the Arctic, and upgrade the Ohmsett facility to support testing of new and improved oil spill response technologies. Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

18. **That DOI support the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) as the Federal coordinating body for oil spill research.** BSEE should keep ICCOPR apprised of oil spill response R&D as intended under Oil Pollution Act of 1990 (OPA 90) as the primary means to leverage the efforts of other Federal agencies engaged in similar research affecting offshore oil spill response. BSEE should also coordinate with ICCOPR to facilitate and better incorporate the knowledge from state and local agencies, academia, and industry into oil spill response R&D projects. Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

19. The United States Geological Survey (USGS) is not a member of ICCOPR, but has research programs and interests relevant to the activities of this committee. **It is recommended that USGS attend ICCOPR meetings and if supported by DOI apply to the committee for ad hoc or permanent membership.** Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

20. **BSEE should continue to work with its interagency partners to develop a process to evaluate selected oil spill response equipment and tactics under realistic conditions and utilize this information to inform planning tools and requirements, and regulatory changes.** Complementing this effort would include completing the BSEE/

U.S. Coast Guard (USCG) co-funded study on improving the planning standards for mechanical recovery equipment (i.e., the effective daily recovery capacity, or EDRC), and publishing new regulations that implement improved standards by BSEE and USCG. These improved standards would: 1) provide a more realistic measure of a skimming system's potential to recover oil, and 2) improve the effectiveness of removal equipment by providing credit for innovations that result in greater oil recovery in planned offshore spill conditions. Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

21. **DOI should explore the use of periodically reviewed performance-based standards to spur innovation in oil spill response technology and ensure utilization of best available technology.** BSEE should consult with industry and interagency stakeholders during development of such standards. Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

22. **BSEE, within its responsibility, should continue to play a strong role in conducting and/or supporting oil spill response research and technology development, both nationally and internationally.** This pertains to all aspects of oil spill planning, preparedness and response related to offshore exploration, production, and development, and includes technology R&D related to mechanical recovery equipment and systems, in-situ burning, dispersants, cold weather and ice response, remote sensing technologies, etc. Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

23. **In compliance with statutory and permitting requirements, BSEE should work with federal partners and relevant authorities to encourage and facilitate controlled experimental releases of oil that benefit offshore spill response R&D and equipment testing.** This would include coordination with regional response teams (RRTs) in the proposed areas of release. BSEE should also consider the possibility of international cooperation in this area, as the U.S. has participated and been invited to participate in controlled experimental releases in other countries such as Norway. Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

24. **BSEE should evaluate the need for Arctic oil spill equipment deployment exercise(s) prior to beginning drilling operations.** Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

25. **That DOI continue its participation with groups listed in Enclosure 8.** For groups in which BSEE is currently the lead for DOI, BSEE's Oil Spill Program should be the focal point for this participation. Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

26. **Because of their trustee role the U.S. Fish and Wildlife Service (USFWS) usually represents DOI at the RRT. USFWS should ensure that the views and mandates of BSEE and the other DOI Bureaus are represented adequately during all RRT discussions.** This is especially important in areas such as cascading of response equipment, offshore logistics, use of subsurface dispersants, containment and protection

strategies, as other DOI Bureaus such as BSEE, Bureau of Ocean Energy Management, National Park Service, USGS and Bureau of Indian Affairs manage federal land, determine lease sites, approve oil spill response plans and bring significant experience and expertise to spill response. Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

27. **That DOI and its Bureaus continue to monitor activities of the international organizations in which they are currently engaged (Enclosure 8), especially in the Arctic to ensure that BSEE's regulations and policy related to planning, preparedness and response can adapt to new information that will be obtained as Arctic oil exploration increases around the world.** BSEE Oil Spill Response Division should be the focal point for this participation. Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

28. **That DOI determine the best way to pass information between Bureaus on spill response planning and preparedness.** The DOI Emergency Operations Center and Emergency Management Council fill critical roles in preparing for and responding to spills at a high level, but do not provide the detailed, ongoing information exchange between Bureaus that is necessary to take maximum advantage of DOI expertise and activities in spill response planning and preparedness. Two possible means for implementing this increased communication are:

    - DOI identify an "oil spill group" consisting of one person per Bureau or Office who would serve as the single point of contact to represent that agency. These representatives would be responsible for receiving and passing information related to spill response expertise and activities either through an identified DOI representative (e.g., from BSEE's Oil Spill Response Program) or as part of regular meetings (e.g., a subcommittee to the Emergency Management Council, using face-to-face or electronic meetings). This person would not have to be the subject matter expert for all activities related to oil spills, but would be responsible for bringing the appropriate assets of their Bureau to oil spill planning, preparedness, response and restoration.
    - Develop a virtual "oil spill forum" that would include individuals throughout DOI with an interest and responsibility in spill response. Through such an interactive on-line forum, members could post information and exchange ideas related to spill-related expertise and activities.

    Reference material can be found in Enclosures 5-9 of the transmittal letter. **(Spill Response)**

29. **DOI/BSEE should put greater emphasis on measuring the health of the safety culture by requiring the reporting of safety performance indicators.**

    - BSEE should work with other regulators, industry, academia, and nongovernmental organizations to define appropriate safety performance indicators.

- Center for Offshore Safety (COS) has an ongoing effort to identify safety performance indicators, initially for the DW GOM. BSEE should look into this work.
- BSEE should also review similar international initiatives (e.g. from International Association of Oil and Gas Producers, International Regulators Forum, Petroleum Safety Authority, etc.)
- BSEE should consider using the COS to analyze and maintain the data.
- If BSEE elects to receive the safety performance indicator information, it could be used to direct BSEE-initiated inspections and audits, but should neither be made public in its raw form, nor used to punish individuals or organizations.
- BSEE should develop a system to make this information public in a neutral format (i.e. non company specific)

Reference material can be found in Enclosures 10-12 of the transmittal letter. **(Safety Management Systems)**

30. **BSEE should develop and implement a submittal and approval process for leaseholder Safety and Environmental Management Systems (SEMS) programs.** In addressing this recommendation BSEE should (a) implement this requirement over a period of time to obtain the necessary resources, and (b) consider the dynamic nature of a leaseholder SEMS program, and recognizing that this program changes, develop an adequate approval process for program amendments. Reference material can be found in Enclosures 10-12 of the transmittal letter. **(Safety Management Systems)**

31. **BSEE should review inspection/audit practices carried out by other countries and other industries, as well as the team based approach in BSEE's Focus Facility Reviews and the California State Lands Commission facility evaluations and revise their approach to audit and inspection.** In developing this revised approach, BSEE should consider the recommendations of the National Research Council report "Evaluating the Effectiveness of Offshore Safety and Environmental Management Systems." Reference material can be found in Enclosures 10-12 of the transmittal letter. **(Safety Management Systems)**

32. **The proposed SEMS II rule requires the use of independent third party SEMS auditors. BSEE should revise this requirement and allow leaseholders to (a) perform qualified, independent internal auditing and/or (b) use a third party auditor.** Reference material can be found in Enclosures 10-12 of the transmittal letter. **(Safety Management Systems)**

33. **BSEE should utilize the OESC and any successor federal advisory committee as a resource for input and early stakeholder feedback on important BSEE issues and initiatives.** This includes regulatory development, use of industry standards, policies and procedures, and research-related decisions. BSEE should ask OESC to provide recommendations on specific issues of concern to the Bureau. Reference material can be found in Enclosures 10-12 of the transmittal letter. **(Safety Management Systems)**

34. BSEE regulations as written do not address all the unique Arctic operating conditions. **To ensure common standards for Arctic OCS exploration and production, the Committee recommends that DOI develop Arctic specific regulations and/or incorporate standards for prevention, safety, containment and response preparedness in the Arctic OCS.**

35. DOI/BSEE should establish a subcommittee to address the Arctic. This subcommittee will evaluate the efforts of the four original subcommittees to develop a formal set of recommendations on the Arctic.

36. DOI/BSEE should establish a subcommittee to address a proposed Ocean Energy Safety Institute (OESI). This subcommittee will evaluate the efforts of the original four subcommittees and develop a consolidated recommendation on establishing the OESI to be considered by the Committee at its next meeting.

January 2013 (Transmitted January 25, 2013)

37. The OESC recommends that a BSEE facilitated Joint Industry Project (JIP) be formed to address the improvements needed in automated well safety systems. The JIP would:

- Establish the ultimate goal of automated well safety systems
- Establish a technology roadmap with a step-wise approach to the goal
- Determine the gaps between existing projects and the need for additional work
- Determine technology that should be adopted from other industries
- Recommend appropriate parties for newly identified projects
- Recommend an oversight and alignment mechanism to monitor and assure Progress

Participants in the JIP should include expertise from the following organizations:

- Government agencies such as BSEE, U.S. Coast Guard (USCG), U.S. Geological Survey (USGS), Department of Energy (DOE), and National Oceanic and Atmospheric Administration (NOAA)
- Industry companies from operators, equipment manufacturers, service companies and drilling contractors
- Academia
- National laboratories

Funding for the JIP would be derived from either Federal appropriations or revenue from Federal royalties, rents, and bonuses on Federal offshore oil and gas leases issued under the Outer Continental Shelf (OCS) Lands Act. In addition industry would provide "in-kind" and monetary contributions. Monitoring/oversight of the JIP could be performed by the Offshore Energy Safety Institute (OESI) as recommended by the OESC. Reference material can be found in Enclosures 1-2 of the transmittal letter. **(Spill Prevention)**

38. BSEE should establish a process for implementing the Best Available and Safest Technology (BAST) provisions of the OCS Lands Act, through a partnership with the proposed OESI. Specifically:

BSEE, with input from OESI, would identify and prioritize the technologies, equipment and/or processes to consider based on OESI's work to identify safety critical technology and regulatory gaps, and the results of investigations into offshore incidents.

For the chosen technologies, equipment and processes, industry standards organizations would develop testing protocols for establishing performance levels, failure points, and reliability. The criteria should be based on the operating environment in which the technology would be used.

OESI would facilitate forums that convene the relevant expertise to provide input to BSEE on BAST-related topics, including the suitability of test protocols, establishing performance standards based on test results, and analyses of the costs and benefits of applying relevant standards across the OCS.

These forums would recur on a regular basis to support the goal of an evergreen process. These forums could also be used to provide peer review to technology projects being carried out by other entities (e.g., oil and gas companies; manufacturers; research consortia), by reviewing testing and assurance data and advising on whether the technology is ready to be tested/used on the OCS.

Based on input from OESI and the expert forums, BSEE would decide whether to accept the testing protocols and evaluation criteria.

The critical technologies and equipment would be tested using BSEE-accepted protocols. Based on these tests, analyses of economic feasibility and input from the expert forums, OESI would recommend performance standards.

The OESI recommendations would also address, based on the economic feasibility analyses, whether the standard would apply prospectively only or would also apply to existing facilities.

BSEE would then adopt performance standards for BAST based on its consideration of these OESI recommendations. Operators would be required to meet BSEE-adopted performance standards.

If an OESI is not established or charged with implementing the BAST process, BSEE should develop other options for obtaining third party expertise to manage the BAST process. Reference material can be found in Enclosures 1-2 of the transmittal letter. **(Spill Prevention)**

39. BSEE should revise its regulations at 30 CFR 250.107(c).

The revision would remove the language stating that complying with BSEE regulations constitutes compliance with the BAST requirement.

The revised regulation would specify that technologies and equipment that are evaluated through the BAST process recommended above, as adopted or adapted by BSEE, would be considered BAST.

BSEE should incorporate performance standards identified through this BAST process into its regulations, as appropriate. Priority should be given to those items identified in the initial BAST gap analysis that are not covered by regulation.

BSEE should maintain its existing regulations through which new technologies, processes and equipment can be approved, including approval of alternate procedures and equipment (30 CFR 250.141); approval of departures from the regulations (30 CFR 250.142); and incorporation of standards by reference (30 CFR 250.198).

BSEE maintains its authority to require or authorize technologies, equipment and/or processes through its existing rule-making process. Reference material can be found in Enclosures 1-2 of the transmittal letter. **(Spill Prevention)**

40. The DOI working with the USCG and other appropriate agencies should request and work with industry to amend the current version of American Petroleum Institute (API) Recommended Practice (RP) 75 to incorporate all operations and activities that take place on an operator's facility in addition to the ones only covered by BSEE's jurisdiction.

BSEE, USCG, Department of Transportation (DOT) and others could then request that responsible parties have a Safety Management System which is consistent with API RP 75. Each agency could then decide how it will assure the adequacy of the Safety Management Systems in so far as it pertains to the agency's individual responsibilities. Memoranda of Understanding (MOUs) between the agencies should address issues of review, inspection, and/or audit of various aspects of the Safety Management Systems. Reference material can be found in Enclosure 3 of the transmittal letter. **(Safety Management Systems)**

41. BSEE should amend the Safety and Environmental Management System (SEMS) regulations such that "major contractors", in addition to the Operator[1], are responsible for having a SEMS program that holistically covers operations and activities that take place on the OCS. Bridging documents should also be required between Operators[1] and "major contractors" in order to adequately detail the linkage of the SEMS programs and specific roles and responsibilities. The term "major contractor" means drilling contractors and production facility owners or facility operators when not considered to be the Operator[1]. Reference material can be found in Enclosure 3 of the transmittal letter. **(Safety Management Systems)**

30 CFR 250.105 Definitions:

Operator[1] means the person the lessee(s) designates as having control or management of operations on the leased area or portion thereof. An operator may be a lessee, the BSEE-approved or BOEM-approved designated agent of the lessee(s), or the holder of operating rights under the BOEM-approved operating rights assignment.

42. **BSEE should work with industry to develop an assessment methodology and/or audit protocol that tests the process safety focus of a SEMS program. This would include evaluating the appropriate performance measures and controls as part of a comprehensive improvement process to SEMS. This assessment methodology could be developed in conjunction with the Center for Offshore Safety and should be supported by appropriate leading indicators that should be regularly reported.** Reference material can be found in Enclosure 3 of the transmittal letter. **(Safety Management Systems)**

43. **BSEE should amend the SEMS regulation so that it can be applied in a risk-based fit-for-purpose manner that differentiates between facilities. SEMS should be performance-based and specific to the needs of the operation. For example the regulation should not impose the same requirements on a free standing caisson with minimal production and equipment, and a platform that has a high production rate, complex processing systems and living quarters.** Reference material can be found in Enclosure 3 of the transmittal letter. **(Safety Management Systems)**

44. **The OESC reaffirms its recommendation for a workshop on organizational and system readiness for source control. If a workshop as previously recommended by OESC is not or cannot be held, the OESC recommends that future containment exercises are designed to fully test the decision-making necessary for comprehensive source control, the interaction and leadership responsibilities of the agencies and industries involved in source control efforts, and the identification and deployment of critical technical experts.** Reference material can be found in Enclosure 4 of the transmittal letter. **(Spill Containment)**

45. **The OESC recommends that BSEE support an industry/government/academic workshop on the scientific, well-planning, and regulatory issues associated with underground blowouts and seafloor broaches.** Reference material can be found in Enclosure 4 of the transmittal letter. **(Spill Containment)**

46. **The DOI should establish an OESI, reporting to the Director of BSEE, through a competitive request-for-proposal process that is repeated every several years. The Institute would support BSEE's missions regarding offshore safety and environmental management through various means, which may include:**

    - Research and development, including development and maintenance of a technology research and development (R&D) roadmap and dissemination of research results;
    - Facilitating a new BAST process;

- Facilitating communication and collaboration among entities involved in offshore safety and environmental management through workshops and other methods;
- Other topics as may be identified in the future.

Reference material can be found in Enclosure 5 of the transmittal letter. **(Ocean Energy Safety Institute)**

47. To ensure common standards for Arctic OCS exploration and production, the OESC recommends that DOI develop Arctic-specific regulations and/or incorporate standards for prevention, safety, containment and response preparedness in the Arctic OCS.

Although some existing regulations and national Notices to Lessees are applicable and sufficient for Arctic activities, BSEE regulations as written do not specifically address all the Arctic operating conditions. In particular, to ensure full system readiness for Arctic OCS exploration and production, BSEE/DOI (in coordination with other agencies, as appropriate) should do the following as described in recommendations 48-51:

Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

48. Spill Prevention - adopt spill prevention standards specifically for the Arctic OCS. These standards should apply to, for example, designs for wells, pipelines, rigs, vessels, blowout preventers (BOPs) and other equipment suitable for Arctic OCS conditions. Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

49. Safety Management - commission a study on the human factors associated with working in the Arctic OCS to identify specific regulations needed to support development of Arctic-specific work practices, technologies and operating procedures. Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

50. Spill Containment - adopt spill containment standards specifically for the Arctic OCS. These standards should include, for example, capping stacks, relief rigs, and other containment equipment designed for Arctic OCS conditions and positioned for prompt deployment. Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

51. Spill Response – review Oil Spill Response Plan (OSRP) regulations, associated permitting regulations, and past approvals and revise regulations as appropriate to respond effectively to spills in the U.S. Arctic OCS, including a worst-case discharge.

In particular, OSRP regulations and associated permitting regulations and approvals should address at least the following elements:

- Seasonal drilling limitations that consider the timing and adequacy of oil spill response operations, given available technologies and type of drilling operation.
- Prompt deployment of response equipment and adequately trained personnel.
- Ice capable equipment appropriate for expected conditions.
- Adequate strategies and equipment to protect important ecological and subsistence areas that could potentially be impacted by an off-shore oil spill.

Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

52. BSEE in coordination with the USCG, Environmental Protection Agency (EPA), and Pipeline and Hazardous Materials Safety Administration (PHMSA), should review and assure the adequacy of Oil Spill Removal Organizations (OSROs) for the Arctic OCS.

The USCG classifies OSROs to better validate capabilities and suitability of companies providing response resources listed in industry response plans they regulate. BSEE conducts similar inspections to ensure an OSRO's equipment and personnel meet industry planning requirements as specified in OSRPs.

The USCG OSRO classification program is presently not climate specific. To help ensure that equipment and personnel listed in OSRPs are sufficient for responding to spills in the Arctic OCS, BSEE should collaborate closely with the USCG, EPA and PHMSA to share information and establish common expectations, consistent requirements and coordinated inspection regimes for OSRO equipment and personnel. Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

53. BSEE should evaluate the need for Arctic oil spill equipment deployment exercise(s) prior to beginning drilling operations.

An OSRP must demonstrate that an operator can respond quickly and effectively whenever oil is discharged from one of their facilities. This requires that the equipment be in good condition and that crews have the skills necessary to operate this equipment safely and to its maximum potential.

Existing regulations provide for exercises, training, and inspections to validate that spill response equipment is being maintained and can be deployed quickly when called upon.

As the Arctic is a frontier area and response equipment listed in OSRPs may be largely new or may not have been subject to inspection by BSEE, the OESC recommends that BSEE evaluate the need to require deployment of categories of response equipment listed in an OSRP that have not yet been successfully deployed, in advance of the initiation of drilling operations where such equipment might be used. Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

54. DOI should enhance its engagement with other agencies and stakeholders, including the Alaska Regional Response Team (ARRT) and the North Slope Subarea Planning Committee, in support of ongoing development of the North Slope Subarea Contingency Plan (SCP). BSEE should continue to ensure that Arctic OSRPs are consistent with the SCP.

Although OSRPs must be approved by BSEE's Oil Spill Response Division, BSEE may provide these plans for review by other federal agencies. In locations where the State of Alaska has jurisdiction, it may conduct its own review.

For recent operations in the Beaufort and Chukchi Seas, a process was initiated to provide for additional reviews of OSRPs by the USCG, EPA, NOAA and other federal agencies with expertise in preparedness and oil spill response in the offshore environment. This interagency review process should be continued.

The OESC supports recent BSEE actions to make redacted versions of approved Arctic OSRPs freely available to the public. This will ensure public and stakeholder awareness of the level of containment and response preparedness in the Arctic OCS and how elements of the SCP are being implemented in Arctic OSRPs.
Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

55. BSEE should formalize a process with a fixed timeline for interagency review of Arctic OSRPs. Once an Arctic OSRP is approved, BSEE should make a version of the plan publicly available, wherein proprietary or confidential information has been removed.

Although OSRPs must be approved by BSEE's Oil Spill Response Division, BSEE may provide these plans for review by other federal agencies. In locations where the State of Alaska has jurisdiction, it may conduct its own review.

For recent operations in the Beaufort and Chukchi Seas, a process was initiated to provide for additional reviews of OSRPs by the USCG, EPA, NOAA and other federal agencies with expertise in preparedness and oil spill response in the offshore environment. This interagency review process should be continued.

The OESC supports recent BSEE actions to make redacted versions of approved Arctic OSRPs freely available to the public. This will ensure public and stakeholder awareness of the level of containment and response preparedness in the Arctic OCS and how elements of the SCP are being implemented in Arctic OSRPs. Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

56. If the charter of the OESC is renewed, then an Arctic subcommittee should be continued to advise DOI on issues related to implementation of the Arctic OCS recommendations presented in this document and to consider additional Arctic OCS issues, as appropriate.

With Arctic OCS oil and gas development likely in the years to come, DOI/BSEE will encounter new scientific, engineering and regulatory issues related to the Arctic's challenging operating environment.

One way for BSEE to obtain early and ongoing multi-stakeholder input would be through continuation of Arctic Subcommittee of OESC.

The intent of this continued Subcommittee would be to address technical and regulatory issues needed to improve safety in offshore and related operations and protect marine ecosystems and nearby coastal areas. Reference material can be found in Enclosure 6 of the transmittal letter. **(Arctic)**

OCEAN ENERGY SAFETY ADVISORY COMMITTEE

Records and Website

The OESC official records are available on the BSEE website listed at this address: http://www.bsee.gov/About-BSEE/Public-Engagement/OESC/Index/. The website provides access to *Federal Register* meeting notices, meeting agendas, meeting proceedings, meeting minutes, committee recommendations, and BSEE's response to committee recommendations. In addition to these documents, the charter and press releases related to the Committee's work are also available.

Ocean Energy Safety Advisory Committee (OESC)
Historical Records

Federal Register **Notice Establishing the Committee and First Meeting** – Published January 24, 2011

OESC Charter – Established/Filed (Effective) February 8, 2011

OESC Charter – Renewed/Filed (Effective) February 6, 2013

OESC Fact Sheet – 2011

OESC Subcommittees

- Oil Spill Containment Subcommittee
- Oil Spill Prevention Subcommittee
- Oil Spill Response Subcommittee
- Safety Management Systems Subcommittee
- Ocean Energy Safety Institute Subcommittee
- Arctic Subcommittee

OESC Recommendations

- April 2012 OESC Recommendations to DOI/BSEE – May 17, 2012
- August 2012 OESC Recommendations to DOI/BSEE – October 15, 2012
- January 2013 OESC Recommendations to DOI/BSEE – January 25, 2013

DOI/BSEE Response to OESC Recommendations

- DOI/BSEE Response to May 2012 OESC Recommendations – August 10, 2012
- DOI/BSEE Response to August 2012 OESC Recommendations – January 4, 2013
- DOI/BSEE Response to January 2013 OESC Recommendations – August 14, 2013

All committee documents are available in the appendices of this report (see enclosed CD for actual files).

OESC Meeting: Washington, D.C. – April 18, 2011

***Federal Register* Notice of Meeting –** Published April 01, 2011

OESC Meeting Minutes – Washington, D.C. (April 2011)

- OESC Meeting Agenda
- Members/Representatives in Attendance
- Public and Press in Attendance
- **Remarks by Deputy Secretary David J. Hayes**, Department of the Interior
- **Presentation by Dr. Cherry A. Murray**, Commissioner, National Commission on the BP Deepwater Horizon Oil Spill and Deepwater Drilling
- **Presentation by Dr. Donald C. Winter,** Chair of the National Academy of Engineering/National Research Council Committee Examining the Probable Causes of the Deepwater Horizon Explosion
- **Presentation by Mr. Sean C. Grimsley,** Deputy Chief Counsel to the National Commission on the BP Deepwater Horizon Oil Spill and Deepwater Drilling
- **Remarks by Secretary Kenneth L. Salazar,** Department of the Interior
- **Remarks by Mr. Michael R. Bromwich,** Director, Bureau of Ocean Energy Management, Regulation and Enforcement
- **Presentation by Mr. James H. Dupree,** BP Regional President, Gulf of Mexico
- **Presentation by Rear Admiral Roy A. Nash,** Deputy Federal On-Scene Coordinator, Deepwater Horizon Response for New Orleans, Louisiana
- **Presentation by Mr. Lars T. Herbst,** Regional Director, Gulf of Mexico Region, Bureau of Ocean Energy Management, Regulation and Enforcement
- **Public Comments by Michael Gravitz,** Oceans Advocate, Environment America
- **Public Comments by James Pappas,** Vice President, Ultra-Deepwater Program, Research Partnership to Secure Energy for America
- **Public Comments by James Pappas,** Vice President, Ultra-Deepwater Program, Research Partnership to Secure Energy for America (Follow-up E-mail) – April 22, 2011

Additional Material Distributed at Meeting

- Members' Bios
- Speakers' Bios

Materials Received/Related to OESC Meeting

- First OESC Meeting Preparatory Information – April 8, 2011
- Tasking Memorandum from the Director to the OESC – April 16, 2011
- Building a Master Oil Spill Prevention and Response Facility in St. Martinville, LA Binder – April 18, 2011

OESC Meeting: New Orleans, Louisiana – July 13-14, 2011

***Federal Register* Notice of Meeting** – Published June 27, 2011

OESC Meeting Minutes: New Orleans, Louisiana (July 2011)

- OESC Meeting Agenda
- Members/Representatives in Attendance
- Public and Press in Attendance
- **Remarks by Mr. Michael R. Bromwich,** Director, Bureau of Ocean Energy Management, Regulation and Enforcement – July 13, 2011
- **Presentation by Mr. Martin W. Massey,** Chief Executive Officer, Marine Well Containment Company – July 13, 2011
- **Presentation by Mr. Hani Sadek,** Director, DeepStar – July 13, 2011
- **Presentation by Mr. Bryan A. Domangue,** Bureau of Ocean Energy Management, Regulation and Enforcement – July 13, 2011
- **Report by Oil Spill Prevention Subcommittee** – July 14, 2011
- **Report by Oil Spill Containment Subcommittee** – July 14, 2011
- **Report by Oil Spill Response Subcommittee** – July 14, 2011
- **Report by Safety Management Systems Subcommittee** – July 14, 2011
- **Report by National Oceanic and Atmospheric and Oceanic Administration** – July 14, 2011
- **Report by Department of Energy** – July 14, 2011
- **Report by U.S. Geological Survey** – July 14, 2011
- **Report by U.S. Coast Guard** – July 14, 2011
- **Report by Bureau of Ocean Energy Management, Regulation and Enforcement** – July 14, 2011
- **Public Comment by Mr. Gabriel Scott,** Public Citizen – July 14, 2011
- **Public Comment by Mr. Paul Sawyer,** Director of Federal Programs, Louisiana Department of Economic Development – July 14, 2011
- **Public Comment by Messiah Darryl Paul Ward,** Public Citizen – July 14, 2011
- **Public Comment by Mr. Phil C. Nugent,** Attorney at Law, Phil C. Nugent and Associates – July 14, 2011
- **Public Comment by Matthew Welsh,** Public Citizen – July 14, 2011

Additional Material Distributed at Meeting

- Members' Bios
- Speakers' Bios
- *DeepStar™ 20 Years of Deepwater Innovation*
- **Public Comment Card and Attachment Received by Phil C. Nugent,** Attorney at Law, Phil C. Nugent and Associates – July 14, 2011
- **PowerPoint Presentation Distributed by Phil Nugent** during His Public Comments – July 14, 2011
- **Written Comment Received from Darlene Eschete** (E-mail) – July 13, 2011
- **OESC Questions to Consider Document/Handout for Each Subcommittee** – July 13, 2011

- **Spill Response Subcommittee Working Paper**

Materials Received/Related to OESC Meeting

- **Letter to Chairman Hunter and Notebook of Patents Received from Paul J. Hubbell, Jr., Inventor**
- **Letter from Messiah Darryl Paul Ward** – July 21, 2011
- **Letter/Package from Sine Rivali LLC**

OESC Meeting: Washington, D.C. – November 7-8, 2011

***Federal Register* Notice of Meeting** – Published October 18, 2011

OESC Meeting Minutes: Washington, D.C. (November 2011)

- OESC Meeting Agenda
- Members/Representatives in Attendance
- Public and Press in Attendance
- **Remarks by Mr. David J. Hayes, Deputy Secretary,** Department of the Interior – November 7, 2011
- **Presentation by Dr. Taduesz W. Patzek,** University of Texas at Austin (OESC Member – Academia) – November 7, 2011
- **Report by Oil Spill Prevention Subcommittee** – November 7, 2011
- **Report by Oil Spill Containment Subcommittee** – November 7, 2011
- **Report by Oil Spill Response Subcommittee** – November 7, 2011
- **Report by Safety Management Systems Subcommittee** – November 7, 2011
- **Presentation by Mr. Alan E. Spackman, Vice President,** Offshore Technical and Regulatory Affairs, International Association of Drilling Contractors – November 7, 2011
- **Summary of Vectors for Committee's Consideration** – November 8, 2011
- **Remarks by Mr. Kenneth L. Salazar,** Secretary, Department of the Interior – November 8, 2011
- **Remarks by Mr. Michael R. Bromwich,** Director, Bureau of Safety and Environmental Enforcement – November 8, 2011
- **Presentation by David O. Izon,** Petroleum Engineer, Operational Safety Branch, BSEE – November 8, 2011
- **Presentation by David N. Nedorostek,** National SEMS Coordinator, Operational Safety Branch, BSEE – November 8, 2011
- **Presentation by Frank M. Chapman,** President, Ashford Technical Services – November 8, 2011
- **Presentation by Gene P. Cella,** Corporate Health, Safety and Environmental Manager, Stone Energy Corporation – November 8, 2011
- **Presentation by W.E. "Skip" Koshak,** U.S. Environmental and Regulatory Manager, Shell Exploration and Production Company – November 8, 2011
- **Public Comment by Ian S. Sutton,** Petroleum Engineer, Process Risk Management, Amec Paragon – November 8, 2011
- **Public Comment by Michael Craig,** Independent Citizen – November 8, 2011
- **Presentation by Rick Graff,** Senior Drilling Engineer Consultant, Chevron Gulf of Mexico Deepwater Exploration – November 8, 2011

Additional Material Distributed at Meeting:

- Members' Bios
- Speakers' Bios
- ***Federal Register* Notice – Oil and Gas and Sulphur Operations in the Outer Continental Shelf—Revisions to the Safety and Environmental Management Systems** – Published September 14, 2011

- **NTL No. 2011 – N09 National Notice to Lessees and Operators of Federal Oil, Gas, and Sulphur Leases, Outer Continental Shelf** – October 21, 2011
- **International Containment Summit April 2011 Washington, D.C. – Tom Hunter's Notes**
- **Letter from Gary Kenny Managing Principal** – October 27, 2011
- **The Use of Safety Cases in Regulation by Professor Nancy Leveson,** Aeronautics and Astronautics/ Engineering Systems, Massachusetts Institute of Technology
- **Written Comment Received From Ted Tupper** (E-mail) – October 31, 2011
- **Safety: Integrated Disaster Prevention For the Offshore Driller: Rapid Engaging Blowout Emergency Capture and Control Apparatus –** October 22, 2011

Materials Received/Related to OESC Meeting

- **Public Comment Email from Carlisle on Prevention Safety** – November 4, 2011
- **Public Comment Email from Kevin Turpin** – November 4, 2011
- **Public Comment Email from Myron Engell Jensen** – November 4, 2011
- **Public Comment Email from Myron Sullivan** – November 4, 2011
- OESC Recommendation Vector Matrix – November 8, 2011

OESC Meeting: Houston, Texas – April 26, 2012

***Federal Register* Notice of Meeting** – Published 04/05/12

OESC Meeting Minutes: Houston, Texas (April 2012)

- OESC Meeting Agenda
- Members/Representatives in Attendance
- Public and Press in Attendance
- **Remarks by Mr. James A. Watson,** Director, Bureau of Safety and Environmental Enforcement
- **Report by Oil Spill Prevention Subcommittee**
- **Interim Report of the Prevention Subcommittee to the Ocean Energy Safety Advisory Committee**
- **Report by Oil Spill Containment Subcommittee**
- **Interim Report of the Containment Subcommittee to the Ocean Energy Safety Advisory Committee**
- **Report by Oil Spill Response Subcommittee**
- **Interim Report of the Response Subcommittee to the Ocean Energy Safety Advisory Committee**
- **Draft Ocean Energy Safety Advisory Committee (OESC) Subcommittee Recommendations for Oil Spill Risk Assessment, Preparedness and Response in the Arctic OCS**
- **Report by Safety Management Systems Subcommittee**
- **Ocean Energy Safety Advisory Committee Safety Management Subcommittee Safety Culture Recommendation** – April 10, 2012
- **Ocean Energy Safety Advisory Committee Safety Management Subcommittee Safety Management System Enhancement Recommendation** – April 10, 2012
- **Presentation on Proposed Ocean Energy Institute**
- **Ocean Energy Safety Advisory Committee Recommendations** – Adopted April 26, 2012
- **Public Comment by Steven Cutchen,** Chemical Incident Investigator, U.S. Chemical Safety and Hazard Investigation Board
- **Public Comment by Donald W. Davis,** Director Emeritus, Louisiana State University, Sea Grant Program
- **Public Comment by Robin Pitblado,** SHE Risk Management Service Area Registered Safety Professional, Governance & Global Development Division, Det Norske Veritas (U.S.A) Inc.

Additional Material Distributed at Meeting

- Spill Containment Subcommittee Recommendation and Resource Presentation
- Ocean Energy Safety Institute Whitepaper

Materials Received/Related to OESC Meeting

- **OESC Recommendations to DOI/BSEE** – May 17, 2012
- **DOI/BSEE Response to OESC Recommendations** – August 10, 2012

OESC Meeting: Anchorage, Alaska – August 29-30, 2012

***Federal Register* Notice of Meeting** – Published 08/10/12

OESC Meeting Minutes: Anchorage, Alaska (August 2012)

- OESC Meeting Agenda
- Members/Representatives in Attendance
- Public and Press in Attendance
- **Remarks by Mr. James A. Watson,** Director, Bureau of Safety and Environmental Enforcement – August 29, 2012
- **Remarks by Chairman Thomas O. Hunter,** Ocean Energy Safety Advisory Committee – August 29, 2012
- **Spill Prevention Subcommittee Report** – August 29, 2012
- **Spill Prevention Subcommittee Memorandum to Chairman Hunter** on Interim Research and Development Recommendations with Proposed Draft Letter to Secretary Salazar and Director Watson for Committee Consideration and Action
- **Spill Prevention Subcommittee's Artic Recommendation** – August 22, 2012
- **Spill Prevention Subcommittee Vector 1 Interim Recommendation**
- **Spill Containment Subcommittee Report**
- **Spill Containment Subcommittee's Artic Recommendation**
- **Spill Containment Subcommittee Vector 1**
- **Spill Containment Subcommittee Vector 1 Supplemental Information**
- **Spill Containment Subcommittee: Tri-Labs Lessons Learned Report**
- **Spill Response Subcommittee Report**
- **Spill Response Subcommittee Draft Appendix 1:** Vector 1: Facilitate Research and Development of Oil Spill Response Technology
- **Spill Response Subcommittee Draft Appendix 2:** Vector 2: Oil Spill Response Planning, Preparedness, and Response in the Arctic OCS
- **Spill Response Subcommittee Draft Appendix 3:** Vector 3: Interagency Coordination on Oil Spill Response Issues
- **Spill Response Subcommittee Appendix 4** (Vector 3 Continued) Interagency Coordination Matrix
- **Draft Report of the Spill Response Subcommittee** to the Ocean Energy Safety Advisory Committee
- **Draft Response Subcommittee Comments on an Ocean Energy Safety Institute**
- **Safety Management Systems Subcommittee Report**
- **Safety Management Systems Subcommittee Vector 1**
- **Safety Management Systems Subcommittee Vector 2**
- **Safety Management Systems Subcommittee Stakeholder Recommendation**
- **Safety Management Systems Subcommittee: Safety Culture Presentation**
- **OESC Discussion on Proposed Ocean Energy Institute**
- **Safety Culture**
- **Public Comment by Chris Storhok,** Community Economic Development Specialist, Fairbanks North Star Borough – August 30, 2012

- **Public Comment by Tom Lokash,** Parker Associates/Private Citizen – August 30, 2012
- **Public Comment by Delice Calcote, Alaska InterTribal Council** (Read by Nikos Pastos) – August 30, 2012
- **Public Comment by Carl Wassilie,** Alaska Big Village Network – August 30, 2012
- **Public Comment by Thomas Tse Kwai Zung,** Buckminster Fuller, Sadao, & Zung Architects – August 30, 2012
- **Public Comment by Fran Ulmer,** Arctic Research Council – August 30, 2012
- **Public Comment by Nikos Pastos,** Private Citizen/Center for Water Advocacy – August 30, 2012
- **Public Comment by John Chase,** Northwest Arctic Borough – August 30, 2012
- **Public Comment by Rick Steiner,** Oasis Earth – August 30, 2012
- **Public Comment by Earl Kingilie,** Private Citizen/Native Village of Point Hope – August 30, 2012
- **Public Comment by Peter Van Tuyn,** Private Citizen – August 30, 2012
- **Public Comment by Doreen Lampe,** Inupiat Community of the Arctic Slope – August 30, 2012
- **Public Comment by Tina Robinson, Private Citizen** – August 30, 2012
- **Public Comment by Betsey Beardsley, Alaska Wilderness League** – August 30, 2012

Additional Material Distributed at Meeting

- Written Request for Public Comment with Technology Abstract: *ORCoD Oil Recovery Containment Geodesic Dome* (Email - Thomas T.K. Zung) – August 22, 2012
- Written Public Comment on *Advancement of Advisory Committee Activities and Mandate* by Tom Lokash, Private Citizen/Parker Associates
- Release: Alaska Big Village Network: Alaska Tribal and Indigenous Groups Ban and Oppose Use of Chemical Dispersants in Oil Spills – August 30, 2012

Materials Received/Related to OESC Meeting

- OESC Expectations and Objectives for the August 29-30, 2012 OESC Meeting/End of Current Charter's Term
- OESC Arctic Recommendations Voting
- Resolution 11-28 from the Northwest Arctic Borough Presented to Committee for Review and Consideration by John Chase – July 26, 2011
- Public Comment Card from Royce O'Brien on Oil Spill Response Organizations – August 30, 2012
- Public Comment Card from Royce O'Brien on Enhance Safety Environmental Management Systems – August 30, 2012
- Public Comment Card from Royce O'Brien on Safety Culture – August 30, 2012
- Letter from Rick Steiner, Oasis Earth, to Royal Dutch Shell PLC and Shell Alaska Regarding Confirmation/Clarification of Issues Regarding Shell's 2012 Arctic Ocean Drilling Plans Off Alaska – May 15, 2012
- OESC Recommendations to DOI/BSEE – October 15, 2012
- DOI/BSEE Response to OESC Recommendations – January 4, 2013

OESC Meeting: Washington, D.C. – January 9-10, 2013

***Federal Register* Notice of Meeting** – Published December 12, 2012

OESC Meeting Minutes: Washington, D.C. (January 2013)

- OESC Meeting Agenda
- Members/Representatives in Attendance
- Public and Press in Attendance
- **Remarks by Director James A. Watson,** Bureau of Safety and Environmental Enforcement – January 9, 2013
- **Remarks by Secretary Kenneth L. Salazar,** Department of the Interior – January 9, 2013
- **Remarks by Chairman Thomas O. Hunter,** Ocean Energy Safety Advisory Committee – January 9, 2013
- **Spill Prevention Subcommittee** Vector Recommendations for OESC Review
- **Vector 2: Recommendations** on Development and Implementation of Data Analysis, Alarm, and Automated Control Systems to Help Prevent Loss of Primary Well Control
- **Vector 3: Recommendations** on Implementing a Process for Best Available and Safest Technology
- **Containment Subcommittee:** Review and Recommendations for OESC Review
- **Assessing and Mitigating Risks Posed by Underground Blowouts and Seafloor Broaches Safety Management Systems (SMS) Subcommittee Report**
- **Ocean Energy Safety Advisory Committee Safety Management Subcommittee:** Safety Management System Enhancement Recommendation (Vector #2)
- **Arctic Subcommittee:** Recommendations for OESC Review
- **OESC Arctic Subcommittee Report Enclosure 6:** Ocean Energy Safety Advisory Committee: Recommendations on Oil Spill Prevention, Safety, Containment and Response on the U.S. Arctic Outer Continental Shelf
- **Ocean Energy Safety Institute Recommendation Report**
- **Ocean Energy Safety Institute Recommendation White Paper**
- **Ocean Energy Safety Institute Recommendation**
- **Remarks by Deputy Secretary David J. Hayes,** Department of the Interior – January 10, 2013
- **Public Comments by Elmer P. "Bud" Danenberger,** Private Citizen – January 10, 2013
- **Public Comments by Kenneth E. Arnold,** Private Citizen – January 10, 2013
- **Public Comments by Ted D. Tupper,** Private Citizen – January 10, 2013
- **Public Comments by Claire Price,** The Sierra Club – January 10, 2013
- **Public Comments by David Aplin,** World Wildlife Fund – January 10, 2013
- **Public Comments by Cindy Shogan,** The Alaska Wilderness League – January 10, 2013
- **Public Comments by Ashley Gardena,** The Center for Biological Diversity – January 10, 2013
- **Public Comments by David L. Miller,** American Petroleum Institute – January 10, 2013

- **Public Comments by Leah Scull,** Oceana – January 10, 2013
- **Public Comments by Kenneth E. Arnold,** Private Citizen (2) – January 10, 2013

Additional Material Distributed at Meeting

- OESC Expectations and Objectives from January 9-10 2013 Meeting

Materials Received/Related to OESC Meeting

- OESC Recommendations to DOI/BSEE – January 25, 2013
- DOI/BSEE Response to OESC Recommendations – August 14, 2013

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
APPENDIX A – OIL SPILL PREVENTION SUBCOMMITTEE

- **Subcommittee Summary Report**
- **Membership**
- **White Papers**
  - Interim Report of the Prevention Subcommittee to the Ocean Energy Safety Advisory Committee (April 26, 2012)
  - Interim Research and Development Recommendations from the Spill Prevention Subcommittee
    - Memorandum to OESC Chair (August 20, 2012)
    - Draft Letter to Secretary (August 30, 2012)
    - Addendum: DRAFT Spill Prevention Subcommittee Report of Findings and Recommendations – Vector 1
  - Vector 2: Recommendations on Development and Implementation of Data Analysis, Alarm, and Automated Control Systems to Help Prevent Loss of Primary Well Control (December 19, 2012)
  - Vector 3: Recommendations on Implementing a Process for Best Available and Safest Technology

Ocean Energy Safety Advisory Committee
Spill Prevention Subcommittee
Summary Report

As part of the Ocean Energy Safety Advisory Committee (OESC), the Prevention Subcommittee (Subcommittee) identified three organizing vectors that framed spill prevention issues and could be used to define areas for further study by the OESC, as well as research by industry and government. While the mandate of the Subcommittee was broad, it was not to focus on every risk that exists offshore. An important tenant of risk management is the mandate to prioritize actions which, either separately or in combination, may have the greatest impact on increasing safety and spill prevention. Therefore the three vectors for the Subcommittee were:

- Vector 1 - Recommendations to identify research for government, industry, and academia that would bolster research and development for spill prevention
- Vector 2 - Recommendations on development and implementation of automated systems to improve prevention of loss of primary well control including instrumentation systems
- Vector 3 - Recommendations on how regulations and enforcement systems can be used to improve BSEE's program in regards to spill prevention, including an assessment of effectiveness

These vectors were presented to the OESC at the November 2011 meeting, after which notional priorities were given to the vectors based on the importance of the vector to the OESC's work as well as the perception of the ability of the Subcommittee to achieve progress on the vector in a reasonable time frame. The vectors above were ranked by OESC priority.

The recommendations and actions for these three vectors as submitted to the OESC are listed below.

Vector 1 - Recommendations to identify research for government, industry, and academia that would bolster research and development for spill prevention

1. *DOI should recommend that DOE collaborate with private industry to develop improved early kick detection systems which would increase the probability of responding to a well kick with minimal volume influx.*

2. *BSEE should facilitate a joint industry project (JIP) to develop technologies to enable continuous monitoring of well-bore integrity throughout the full depth extent of a well using real-time telemetry of temperature, pressure, acoustic, and other signals.*

3. *DOI/BSEE should facilitate a JIP with industry participants and academia to develop enhanced shearing technologies to completely cut drill pipe, tool joints, and casing strings, and to assure that the blind shear rams installed in the blowout preventer (BOP) stack are capable of shearing the pipe and/or sealing the wellbore under maximum anticipated pressures. The JIP should also consider unconventional severance and/or shut-in technologies.*

4. *BSEE should initiate a discussion with BOP manufacturers, operators, and drilling contractors to define the current state and future needs for technology in BOP instrumentation, monitoring, and data recording. BSEE should facilitate a JIP to fill any identified gaps.*

5. *DOI should recommend that DOE sponsor research on the viability of acoustic activation of BOPs and other submerged well-control equipment in the deepwater (DW) Gulf of Mexico (GOM). Further, the research should include the feasibility and viability of integrating the use of acoustics with independent/secondary BOP stacks (short stacks) similar to the capping stack. This could serve as a totally redundant and robust backup/emergency BOP stack.*

6. *Work is being carried out through the API Standards process to standardize remotely operated vehicles (ROV) connection ports for all subsea BOP stacks in the U.S. Outer Continental Shelf (OCS) and develop ROV pump capabilities to achieve closing time and volume requirements for all critical functions that meet or exceed current standards. BSEE should monitor these activities, and incorporate these standards into regulations as appropriate.*

Vector 2 - Recommendations on development and implementation of automated systems to improve prevention of loss of primary well control including instrumentation systems

1. The OESC recommends that a BSEE-facilitated Joint Industry Project (JIP) be formed to address the improvements needed in automated well safety systems. The JIP would:
    - Establish the ultimate goal of automated well safety systems
    - Establish a technology roadmap with a step-wise approach to the goal
    - Determine the gaps between existing projects and the need for additional work
    - Determine technology that should be adopted from other industries
    - Recommend appropriate parties for newly identified projects
    - Recommend an oversight and alignment mechanism to monitor and assure progress

    Participants in the JIP should include expertise from the following organizations:
    - Government agencies such as BSEE, U.S. Coast Guard (USCG), U.S. Geological Survey (USGS), Department of Energy (DOE), and National Oceanic and Atmospheric Administration (NOAA)
    - Industry companies from operators, equipment manufacturers, service companies and drilling contractors
    - Academia
    - National laboratories

    Funding for the JIP would be derived from either Federal appropriations or revenue from Federal royalties, rents, and bonuses on Federal offshore oil and gas leases issued under the Outer Continental Shelf (OCS) Lands Act. In addition industry would provide “in-kind” and monetary contributions.

    Monitoring/oversight of the JIP could be performed by the Offshore Energy Safety Institute (OESI) as recommended by the OESC.

Vector 3 - Recommendations on how regulations and enforcement systems can be used to improve BSEE's program in regards to spill prevention, including an assessment of effectiveness.

For this broad vector, the only area where a recommendation was developed involved Best Available and Safest Technology (BAST) regulations. The following describes how BAST identification by BSEE could be improved.

1. BSEE should establish a process for implementing the BAST provisions of the OCS Lands Act, through a partnership with the proposed OESI. Specifically*:*

   BSEE, with input from OESI, would identify and prioritize the technologies, equipment and/or processes to consider based on OESI's work to identify safety-critical technology and regulatory gaps, and the results of investigations into offshore incidents.

   For the chosen technologies, equipment and processes, industry standards organizations would develop testing protocols for establishing performance levels, failure points, and reliability. The criteria should be based on the operating environment in which the technology would be used.

   OESI would facilitate forums that convene the relevant expertise to provide input to BSEE on BAST-related topics, including the suitability of test protocols, establishing performance standards based on test results, and analyses of the costs and benefits of applying relevant standards across the OCS.

   These forums would recur on a regular basis to support the goal of an evergreen process. These forums could also be used to provide peer review to technology projects being carried out by other entities (e.g., oil and gas companies; manufacturers; research consortia), by reviewing testing and assurance data and advising on whether the technology is ready to be tested/used on the OCS.

   Based on input from OESI and the expert forums, BSEE would decide whether to accept the testing protocols and evaluation criteria.

   The critical technologies and equipment would be tested using BSEE-accepted protocols. Based on these tests, analyses of economic feasibility and input from the expert forums, OESI would recommend performance standards.

   The OESI recommendations would also address, based on the economic feasibility analyses, whether the standard would apply prospectively only or would also apply to existing facilities.

   BSEE would then adopt performance standards for BAST based on its consideration of these OESI recommendations. Operators would be required to meet BSEE-adopted performance standards.

   If an OESI is not established or charged with implementing the BAST process, BSEE should develop other options for obtaining third party expertise to manage the BAST process.

2. BSEE should revise its regulations at 30 CFR 250.107(c).

   The revision would remove the language stating that complying with BSEE regulations constitutes compliance with the BAST requirement.

   The revised regulation would specify that technologies and equipment that are evaluated through the BAST process recommended above, as adopted or adapted by BSEE, would be considered BAST.

   BSEE should incorporate performance standards identified through this BAST process into its regulations, as appropriate. Priority should be given to those items identified in the initial BAST gap analysis that are not covered by regulation.

   BSEE should maintain its existing regulations through which new technologies, processes and equipment can be approved, including approval of alternate procedures and equipment (30 CFR 250.141); approval of departures from the regulations (30 CFR 250.142); and incorporation of standards by reference (30 CFR 250.198).

   BSEE maintains its authority to require or authorize best available and safest technologies, equipment and/or processes through its existing rule-making process.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
OIL SPILL PREVENTION SUBCOMMITTEE MEMBERS

AFFILIATION	MEMBER	TERM
Subcommittee Lead	Christopher A. Smith	04/18/11 – Present
Academia	Nancy G. Leveson	04/18/11 – Present
Non-Governmental Organization	Lois N. Epstein	04/18/11 – Present
Non-Governmental Organization	Richard A. Sears	04/18/11 – Present
Offshore Energy Industry	Donald E. Jacobsen	04/18/11 – Present
Offshore Energy Industry	Paul K. Siegele	04/18/11 – Present
Offshore Energy Industry	Charles R. Williams II	04/18/11 – Present
Federal Government	Walter D. Cruickshank	04/18/11 – Present
Federal Government	Christopher A. Smith	04/18/11 – Present
Federal Government	Mathy Stanislaus	04/18/11 – Present
Federal Government	Stephen H. Hickman	04/18/11 – Present

Interim Report of the Prevention Subcommittee to the
Ocean Energy Safety Advisory Committee
26 April 2012

The Prevention Subcommittee (Subcommittee) had originally identified three organizing vectors that framed prevention issues and could be used to define areas for further study by the OESC, as well as research by industry and government. The three original vectors were:

- Recommendations to identify research for government, industry, and academia that would bolster research and development for spill prevention
- Recommendations on development and implementation of automated systems to improve prevention of loss of primary well control including instrumentation systems
- Recommendations to BSEE on how regulations and enforcement systems can be used to improve BSEE's program in regards to spill prevention: Include assessment of effectiveness

These vectors were presented to the full Ocean Energy Safety Advisory Committee at the November meeting, after which notional priorities were given to the vectors based on the importance of the vector to the Committee's work as well as the perception of the ability of the Committee to achieve some progress on the vector in a reasonable time frame. The vectors above are ranked by OESC priority.

The Subcommittee convened in January 2012 to reassess the proposed organizing vectors based on feedback received from the November 2011 Ocean Energy Safety Advisory Committee (Committee) meeting. The result of this work was a confirmation of the original vectors.

The Spill Prevention Subcommittee is reviewing work done by the JITF and the official post Macondo incident reports and other investigative commissions following the Macondo/Deepwater Horizon incident. While much has been done to discover, analyze, identify and define root-cause(s), mitigate future oil spill occurrences, and plan for better response, there are outstanding challenges.

In January of 2012, the subcommittee reviewed work done by Procedures & Equipment JIPT & the Containment JIPT. That review session included reviewing a complex list of technology research & development recommendations. The Subcommittee prioritized a list of potential key technology focus areas. From that list, SPS identified three key technologies that are currently both actionable now and would provide improved spill prevention response capabilities in the short term. The research areas are: Standardized ROV-BOP Interface, Acoustic Sensing, and Enhanced Shearing. SPS work remains to identify additional actionable ideas for near term action and identify some actions for longer term consideration. The subcommittee is continuing its work and has initiated a thorough review of recommendations from the President's Commission, the Chief Counsel's Report, Chemical Safety Board's report

and the nine post Macondo official incident reports. SPS plans to address and act on the preliminary recommendations and conclusions from these reports. The goal is that this effort will outline recommendations for both research direction and regulation change. In addition, the review will be looking to identify projects appropriate for the work of OESC.

The subcommittee recommended an analysis of the official post Macondo incident reports to determine recommendations proposed by other organizations and actions taken to date on those recommendations.

Upon review of the comprehensive set of post-Macondo incident reports, 309 recommendations were identified including 241 occurrences of recommendations regarding regulation or best practices, 62 recommendations regarding R&D, and 6 recommendations regarding automation. To eliminate redundancy among these subsets of recommendations, Areas of Interest covering R&D, Automation and Regulation which capture all of the material aspects of the recommendations identified from the incident reports.

The three vectors are discussed below. For each there is a summary of the issue, knowledge gaps and proposed research, and proposed actions.

- **Recommendations to identify research for government, industry, and academia that would bolster research and development for spill prevention**

As the challenges grow increasingly more complex for ultra deepwater (UDW) drilling, Government, Industry, and Academia should provide new technological solutions to address these complexities and enhance spill prevention measures. These solutions can be either new tools or new operating models that when properly implemented mitigate the risks of an oil spill incident.

The R&D areas for spill prevention are Well Management, Mobile Offshore Drilling Unit (MODU), and Blowout Preventer (BOP). They are characterized in the following way:

- Well Management: Needs associated with improving well control, design, diagnostics, cementing and other barriers to mitigate the risk of an oil spill
- MODU: Needs associated with operations on the surface including systems design, safety alerts, and risk management to mitigate the risk of an oil spill
- BOP: Needs associated with the BOP including reliability, design, instrumentation and backup systems to mitigate the risk of an oil spill

The research performed and the discussions by the subcommittee have identified areas of interest that this subcommittee reviewed to determine the list of actions:

Well Management

- Need for R&D to develop better meter accuracy and better placement of flow meters for kick detection.
- Need to research the effect of water depth on Kick Detection

- Need for improved instrumentation to diagnose status and integrity of the engineered well system, including wellhead housing, casing, hanger seals and cement.
- Need to develop better barriers and ways to use them especially during kill weight removal
- Need to develop better materials such as insulated production tubing (Cement is being well researched)

MODU

- Systems integration, safety culture, design options on MODUs that could protect MUX lines during an explosion incident,
- Determining the need to require third party surveys of the drilling packages on OCS rigs
- Study of proper rig design to have highly reliable instrumentation, expert decision aids, and safety systems under extreme operating conditions.

BOP

- Research the standardization of Remote Operating Vehicle (ROV) intervention panels, ROV intervention capabilities, and maximum closing times when using an ROV.
- Research the effects of a flowing well on the ability to shear pipe
- Research on BOP design including improved pipe centering in the shear ram, stack configurations to reduce elastic buckling, independent acoustically controlled systems, and instrumentation for continuous and robust monitoring of BOP status and functionality.

The R&D areas recommended above are sufficiently complex such that each could comprise a separate research program. Many R&D topics warrant a coordinated research effort between industry, government and academia due to the complexity of the topic and the specialized capabilities that are needed to conduct the R&D. BSEE should handle R&D that advances current state of the art while the National Labs should focus on transformational areas of R&D (e.g. BSEE can advance the use of ROVs, but the Labs should look at AUVs, which could replace ROVs altogether). BSEE should be included in the National Lab R&D dialogue to formulate future regulatory requirements which will enforce the use of transformative technologies and practices. The appropriate role of academic research institutions in addressing these issues will be determined in consultation with university research groups and academic funding agencies.

The following is a list of actions the Spill Prevention Subcommittee recommends and will further investigate for the final report:

Well Management

- The Navy may have subsea control systems that could advance offshore drilling safety
- The USGS may leverage expertise in characterizing OCS geology for UDW drilling
- The Subcommittee may need to pursue research covering the following unmet needs:
    - Meter accuracy required for reliable kick detection (sensors, acceptable performance metrics, numbers and placement)

- Non-cement barriers (materials, mechanisms, numbers, and placement)
- Instrumentation to monitor pressure (and perhaps temperature) between the various casing strings landed and sealed in the wellhead housing.
- Techniques for monitoring cement integrity behind casing, especially in proximity to the reservoir, perhaps using fiber optic temperature, pressure or acoustic sensors.

MODU (There are current RPSEA programs that may be modified to address some of the following unmet needs):

- Researching design options to protect control lines (MUX) to the subsurface equipment
- Research more highly reliable instrumentation including decision aids and safety systems
- General MODU safety and systems integration

BOP

- Research ROV standardization for intervention panels and other general ROV capability
- Develop a satisfactory emergency disconnect system with automated components
- Follow up on recommendation from the JITF to have LANL look into advancing acoustic control systems for subsurface equipment due to LANL's unique expertise
- Develop instrumentation to provide continuous data on ram position, status of mechanical components like locks and elastomeric sealing elements, and hydraulic control system pressures and volumes pumped (including by ROV's). Ideally, data should be stored in a "black-box" attached to the BOP and available for download when rig is not on location.

(Need SPS consensus and list of actions to be taken with recommendations for the OESAC)

• Recommendations on development and implementation of automated systems to improve prevention of loss of primary well control including instrumentation systems

As the challenges of drilling continue to grow in complexity the employment of automated safety systems and decision aids will empower rig operators to perform their work in ways that enhance spill risk mitigation.

The research performed and the discussions by the subcommittee have identified areas of interest that this subcommittee should take action on:

Well Management

- Need to develop and apply instrumentation and expert decision aids including automation to provide timely warning of loss of well control to drillers on the rig and operators onshore.

BOP

- Three step Emergency Disconnect System to shear, seal, and separate autonomously if warnings are not heeded by drillers in a timely manner.
- Automated instrumentation for expert decision aids to provide a timely warning of a loss of well control event.
- Three step Emergency Disconnect System to shear, seal, and separate autonomously if warnings are not heeded by drillers in a timely manner.

(Need SPS consensus and list of actions to be taken with recommendations for the OESAC)

- **Recommendations to BSEE on how regulations and enforcement systems can be used to improve BSEE's program in regards to spill prevention: Include assessment of effectiveness**

While Industry has significant incentives to prevent oil spill incidents, proper regulation and enforcement can further enhance Industry's ability to manage this risk. For example, there is a clear call for greater transparency of rig operations concerning information on near misses and other incidents. The general belief is that better sharing of information will develop a better knowledge base and promote safer UDW drilling practices.

There remains ambiguity on where regulation is necessary and how BSEE and Industry should best collaborate to identify proper scope and effectiveness of regulation and enforcement.

Better sharing of near miss information will develop a better knowledge base and promote safer UDW drilling practices. This database is supported by BSEE and the IADC. However, IADC stated that lack of progress against making information on incidents more available is a major obstacle to offshore safety improvement. There is also a fear that in expanding the scope of reporting incidents and near misses, companies will face fines and penalties. The question ahead for this subcommittee to discuss is who should own the database and how should it be used to enhance safety?

There is a lot of discussion about the extent to which Industry can be asked to self-regulate. Examples such as an INPO model have been recommended. If there is going to be a self-regulating entity, who would take on this responsibility? Can the Center for Offshore Safety be a logical entity?

Spill Prevention Subcommittee's list of references for Spill Prevention Recommendations:

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 1/11/2011

http://www.oilspillcommission.gov/final-report

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, Chief Counsel's Report 2/17/2011

http://www.boemre.gov/pdfs/maps/dwhfinal.pdf

Report Regarding the Cause of the April 20, 2010 Macondo Well Blowout / (BOEMRE/ Coast Guard Joint Investigation Team), 9/14/2011

http://www.boemre.gov/pdfs/maps/dwhfinal.pdf

National Academy of Engineering and National Research Council of the National Academies Interim Report on Causes of the Deepwater Horizon Oil Rig Blowout and ways to prevent such events, 11/16/2010

http://www.nationalacademies.org/includes/DH_Interim_Report_final.pdf

Department of Interior, Increased Safety Measures for energy Development on the Outer Continental Shelf, 5/27/2012

http://www.doi.gov/deepwaterhorizon/loader.cfm?csModule=security/getfile&PageID=33598

BP, Deepwater Horizon Accident Investigation Report, 9/8/2010

http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/incident_response/STAGING/local_assets/downloads_pdfs/Deepwater_Horizon_Accident_Investigation_Report.pdf

Transocean Investigation Report, June 2011

http://www.deepwater.com/fw/main/Public-Report-1076.html

Det Norske Veritas, Forensic Examination of Deepwater Horizon Blowout Preventer, 3/20/2010

http://www.uscg.mil/hq/cg5/cg545/dw/exhib/DNV%20BOP%20report%20-%20Vol%202%20%282%29.pdf

20 August 2012

MEMORANDUM

TO: THOMAS HUNTER
CHAIRMAN
OCEAN ENERGY SAFETY COMMITTEE (OESC)

FROM: SPILL PREVENTION SUBCOMMITTEE (SPS)

SUBJECT: Interim R&D recommendations from the SPS

The SPS is presenting the attached set of recommended interim findings and recommendations to the OESC for consideration and deliberation. The SPC recommends that these findings and recommendations, if accepted by the OESC, be submitted by the OESC to Secretary Salazar and Director Watson.

Attached Please find:

- A proposed letter from the OESC to Secretary Salazar and Director Watson, summarizing the spill prevention R&D findings and recommendations of the OESC.
- Draft Spill prevention subcommittee report of findings and recommendations, providing greater detail and support. This is a draft of the R&D vector chapter of the report which the SPS will present to the OESC in December.

During the OESC meeting in Anchorage on 29-30 August 2012 the SPS will lead a discussion on this topic in which the OESC will be invited to deliberate the findings and recommendations and vote on their adoption.

Attachments:

Draft letter from OESC to Secretary Salazar and Director Watson on spill prevention R&D findings and recommendations.

Draft Spill Prevention Subcommittee Report of Findings and Recommendations

To: Hon Ken Salazar
Secretary of the Interior

James Watson
Director, Bureau of Safety and Environmental Enforcement
Department of the Interior

From: Ocean Energy Safety Advisory Committee (OESC)

Subject: Spill Prevention Research and Development (R&D) Recommendations for DOI consideration and action

Date: August 30, 2012

Background:

The prudent, safe development of our Nation's offshore oil and gas resources will continue to be a key element in promoting economic development and energy security. Preventing catastrophic accidents offshore is the most important factor in maximizing the value of this resource. This will require a coordinated, cooperative partnership between government, industry, and academia.

Offshore exploration and production is a technology-driven enterprise that is dependent upon high quality information and data. Technical advances are allowing producers to find and develop oil and natural gas in increasingly challenging environments. Regulators need to ensure that research is conducted to appropriately identify and quantify the risks of these increasingly sophisticated operations, as well as develop new technical solutions to mitigate those risks. A successful approach will build on the core competencies of the Federal agencies and leverage the technical capabilities of the private sector.

The private sector has responded to the Macondo accident in many ways - creating joint industry task forces to address technical issues identified in the various Macondo investigations, committing capital and expertise to spill containment organizations like the Helix Well Containment Group and the Marine Well Containment Company, and establishing the Center for Offshore Safety, an industry sponsored organization focused initially on offshore deepwater safety. While still in its early stages, the Center will serve the U.S. offshore oil and gas industry by ensuring continuous improvements in safe and environmentally responsible offshore drilling, completions, and operations through leadership, communication, teamwork, utilization of disciplined management systems, and independent third-party auditing and certification.

There has also been a shift in R&D topics within Federal agencies, with recent activities focusing on assessing and reducing the risks and potential safety and environmental impacts of exploration and production operations. The Department of the Interior (DOI) has appropriated

funding for applied research related to operational safety and pollution prevention. The Department of Energy (DOE) has refocused its offshore R&D program towards greater emphasis on safety and environmental sustainability.

Findings:

As deepwater[1] drilling challenges grow increasingly complex, government, industry, and academia must provide new technological solutions to address these complexities and enhance spill prevention measures. These solutions can be either new tools or new operating models/concepts that, when properly implemented, mitigate the risks of a significant oil spill incident. Also important are technological challenges associated with shallow-water offshore drilling and production in environmentally sensitive frontier areas, such as the Arctic.[2]

The OESC rank-ordered the technology needed to prevent spills. The Committee reviewed the numerous reports that were completed in the wake of the Macondo accident.[3] The Committee also reviewed the results and conclusions of a risk analysis project commissioned by the DOE and conducted by the Los Alamos National Laboratory, and reviewed recommendations from the Secretary of Energy's Ultra-Deepwater Advisory Committee related to the DOE's ultra-deepwater research program.

The Committee concluded that the following six research areas are of the highest priority for achieving the goals of preventing oil spills in deepwater, listed in priority order (highest to lowest). Further details can be found in the draft Vector 1 Chapter of the Spill Prevention Subcommittee Report of Findings and Recommendations, which is included as an addendum to this memorandum.

1. ***Early kick detection***: Improved Instrumentation for Early Kick Detection to increase the probability of responding to a well kick with minimal volume influx. The earlier the kick is detected, the more options are available for addressing the problem before it becomes an emergency situation. Along with improvements to surface kick detection and smart alarm systems, further use of look-ahead seismic profiling to update pore pressure models and real-time downhole kick indicator data such as pressure at the bit, hydrocarbon inflow detection, and dynamic fluid densities enabled by high-rate transmission technologies will significantly improve the industry's ability to detect and rapidly respond to well kicks. In addition, there are existing technologies like managed pressure drilling (MPD) that can help minimize the size of any influx. There is room to improve upon MPD equipment design to make it more applicable to floating drilling operations.
2. ***Wellbore Monitoring***: Continuous monitoring of wellbore integrity to avoid hydrocarbon releases during normal operations, and, especially, during upset conditions when, for

[1] Defined as drilling in water depths of 1,000 feet or greater

[2] Arctic operations are complicated by harsh environmental challenges, to include seasonal ice flows, severe temperatures and remote locations.

[3] The Subcommittee reviewed the National Oil Spill Commission Report to the President, the National Oil Spill Commission Chief Council Report, the coast Guard Response Report and National Preparedness Report, the API Joint Industry Task Force report, the BOEMRE/Coast Guard Joint Investigation, the National Academy of Engineers report, and the DNV report on the blowout preventer

example, the blowout preventer is activated. Wellbore system integrity requires that there is no flow from the seafloor mechanical system, such as the BOP stack, wellhead housing, casing hangers or seals and lock-downs; between nested casing strings or directly through casing into surrounding formations; or along the cement sheath. The most critical data in assessing wellbore integrity are the pressures between the various casing strings landed and sealed in the wellhead housing, although distributed temperature, pressure and acoustic sensing (e.g., using fiber optic arrays) is also important.

3. ***Shearing***: Enhanced shearing capacity and nonconventional shearing to assure that the blind shear rams installed in the blowout preventer stack are capable of shearing the drill pipe under any pipe loading condition and at maximum anticipated pressures and sealing the wellbore. Also needed are secondary severance technologies such as lasers or explosive systems, which can cut the drill pipe and in some cases seal the borehole in case the BOP fails.

4. ***Blowout Preventer (BOP) Monitoring***: Real-time BOP monitoring to make informed decisions about maintenance or mitigation strategies during routine (non-emergency) operations; regarding secondary interventions during upset or emergency conditions; and decisions regarding spill response and containment strategies. This monitoring system would include information about whether or not the BOP has sealed against flow, position of the various rams, and rate of flow through the BOP in the event of a blowout. This information should be available whether or not the rig is still connected to the well.

5. ***Acoustic Activation***: Development of acoustic sources/sensors and actuators to remotely activate the BOP and other submerged well-control equipment during emergency situations when the rig is disconnected from the well or other modes of activation have failed.

6. ***BOP/ROV interface***: Development of standards for BOP/Remotely Operated Vehicle (ROV) interfaces and increased pump capabilities in order to provide an alternate method for BOP activation should a blowout occur and the BOP fail to close and contain it. This alternative depends upon a standard interface between the BOP and ROV for all equipment being used in the U.S. Outer Continental Shelf (OCS).

Recommendations:

The OESC has identified a number of steps that should be taken to address the gaps revealed in the findings, above. Some of these actions can be addressed directly by DOI by instructing the Bureau of Safety and Environmental Enforcement (BSEE) to act. Others will require DOI to collaborate with other Federal agencies, industry participants, or other entities:

1. *DOE should collaborate with private industry to develop an improved early kick detection system which would increase the probability of responding to a well kick with minimal volume influx.*

   As a first step, the National Energy Technology Laboratory should provide DOI with an update on current and future technology development plans for real-time kick detection and pore-pressure prediction using improved sensors in concert with high-rate data transmission equipment. This review should provide a detailed gap assessment, as well as

recommendations on how best to accelerate technology development underway in private industry to overcome these gaps. The OESC then recommends combining the development of an improved kick detection sensor system and a smart alarm system in a joint industry technology development project utilizing appropriate expertise from the National Laboratories, which would fast-track the effort by bringing in additional technical resources and integrating results from test programs on multiple rigs with different equipment trials. Joint public and private funding of recommended R&D is expected.

2. *BSEE should convene a joint industry project (JIP) to develop technologies to enable continuous monitoring of well-bore integrity throughout the full depth extent of a well using real-time telemetry of temperature, pressure, acoustics, and other signals.*

   The monitoring capability should be available both while connected to the well, and from retrievable data recording through a "black box" when disconnected from the well. The JIP team should be comprised of experts from downhole measurement service companies, wellhead and BOP manufacturers, operators, drilling contractors, DOE National Laboratories, academia, and BSEE/DOI. Joint public and private funding is expected with in-kind support from service companies and equipment manufacturers.

3. *Private industry participants should convene* a *JIP to develop enhanced shearing technologies to completely cut drill pipe, tool joints, and casing strings, and to assure that the blind shear rams installed in the BOP stack are capable of shearing the pipe and sealing the wellbore under maximum anticipated pressures.*

   The shearing capacity needs to cut the pipe in both compressed and uncompressed state. This should include better methods to test rams at higher pressures to ensure equipment performance readiness. This work should be funded through participant memberships – independent operators and some state-sponsored oil companies – and through contributor memberships – vendors, engineering firms, and others – who contribute through membership fees and in-kind work. In-kind work would be assigned to the appropriate vendors and suppliers, while the overall project scope would be managed by the JIP.

4. *BSEE should initiate a discussion with BOP manufacturers, operators, and drilling contractors to define the current state and future needs for technology in BOP instrumentation, monitoring, and data recording.*

   Instrumentation is required that will provide continuous data on the position of the rams, status of mechanical components like "locks" and sealing elements, hydraulic control system pressures and volumes, and wellhead temperature and pressure. This data should be available continuously during normal operations, as well as stored in a "blackbox" attached to the BOP and available for download when the rig is not on location. A JIP should then be initiated to fill any gaps identified during this discussion (i.e., that are not the focus of active industry R&D). This research should be funded by oil and gas companies, BSEE/DOI and DOE, with in-kind support from BOP manufacturers.

5. *DOE should sponsor research on the viability of acoustic activation of BOPs and other submerged well-control equipment in the deepwater Gulf of Mexico. Further, the research should include the feasibility and viability of integrating the use of acoustics with*

independent/secondary BOP stacks (short stacks) similar to the capping stack. This could serve as a totally redundant and robust backup/emergency BOP stack.

While this acoustic technology is widely used in the North Sea and the Campos Basin, renewed testing in the Gulf of Mexico would support application of the technology throughout the U.S. Outer Continental Shelf, and may lead to improved system and operational reliability. To enable the industry to commercialize a solution, these government researchers should work closely with oil and gas equipment manufacturers for incorporation into subsea field designs.

6. *Additional work should be carried out through the API Standards process to standardize ROV connection ports for all subsea BOP stacks in the U.S. OCS and develop ROV pump capabilities to achieve closing time and volume requirements for all critical functions that meet or exceed current standards.*

   Since the Macondo incident, the industry has been actively developing and deploying solutions to identified ROV-BOP interfacing challenges. Concurrent with the work of the API 17H, 16D, and S53 committees, the industry has moved forward to respond to the need for interface standardization, increased function testing, and achieving greater flow capacity. Industry, through the support of API and equipment manufacturers, should be responsible for funding of this effort.

Many of the research topics considered above will necessitate a coordinated research effort between industry, government, and academia due to the complexity of the topics and the specialized capabilities that are needed to conduct the research. The general roles and responsibilities of these cooperating entities are outlined below.

- *Department of the Interior*: The BSEE should sponsor near-term R&D that advances current state of the art technologies and the immediate requirements of the regulatory process. The proposed BSEE Ocean Energy Safety Institute could serve as a technical interface between the research community within other Federal agencies, industry and academia and BSEE's regulatory activities. As evidenced in the Macondo response, the United States Geological Survey (USGS) is a valuable scientific resource that will have a role supporting BSEE's research efforts.
- *Department of Energy*: DOE, with the support of DOE National Laboratories, should support longer-term transformational areas of R&D and quantification of risks. In addition, DOE should continue to manage public-private research partnerships that enable the Federal government to leverage expertise in the private sector.
- *Industry*: The private sector will continue to drive continuous improvement both in commercializing increasingly difficult resources and in innovating technological solutions to reducing the risks of these operations. Entities such as the Center for Offshore Safety, the Marine Well Containment Company, and the Helix Well Containment Group are examples of industry collaborations that will continue to drive technological change. The Federal government should not endeavor to replicate these efforts. It is important, however, that the Federal government builds and maintains sufficient technical

expertise to monitor and evaluate a continuously changing playing field in order to ensure that regulations effectively mitigate risks.

- *Academia*: Universities currently play a key role in executing much of the research sponsored by the various Federal agencies. The academic community should continue to serve as a primary resource for ongoing research activities. Additionally, both government and the private sector will rely on the academic community to provide the next generation of scientists and engineers.

Addendum: DRAFT Spill Prevention Subcommittee Report of Findings and Recommendations – Vector 1

Introduction/ Background OESC

The Ocean Energy Safety Advisory Committee (OESC) chartered on February 8, 2011 will advise the Secretary of the Interior, through the Director of the Bureau of Safety and Environmental Enforcement (BSEE), on a variety of issues related to offshore energy safety.

Spill Prevention Subcommittee Members

Chris Smith – DOE
Walter Cruickshank – BOEM
Steve Hickman – USGS
Paul Siegele – Chevron
Charlie Williams – Shell
Don Jacobsen – Noble Corp.
Richard Sears – Stanford
Lois Epstein – The Wilderness Society

Subcommittee Goal and Approach

The Chairman of the Ocean Energy Advisory Safety Committee asked the Spill Prevention Subcommittee to investigate a range of issues pertaining to spill prevention in offshore oil and gas development. The Spill Prevention Subcommittee reviewed the risks of offshore oil and natural gas exploration and production (E&P) activities to evaluate how those risks could be mitigated through development of effective technology and regulatory policy.

To achieve this goal, the Spill Prevention Subcommittee considered the following topics:

- State of existing operations and technology used to prevent blowouts and spills.
- State of the current R&D undertaken by government, industry and academia.
- What needs to be done or should be done to advance this topic area.
- Recommendations on future research

Detailed Findings and Recommendations

Vector 1: Recommendations to identify research for government, industry, and academia that would bolster research and development for spill prevention

Background

As the challenges grow increasingly more complex for deepwater drilling (1,000 feet and greater), government, industry, and academia should provide new technological solutions to address these complexities and enhance spill prevention measures. These solutions can be either new tools or new operating models that, when properly implemented, mitigate the risks of an oil spill incident.

The Spill Prevention Subcommittee rank-ordered the technology development needs described below using a qualitative assessment of impact to prevent another catastrophic event from happening in U.S. Outer Continental Shelf (OCS) waters. The Committee reviewed the numerous reports that were completed in the wake of the Macondo accident. The Committee also reviewed the results and conclusions of a risk analysis project commissioned by the DOE and conducted by the Los Alamos National Laboratory, and reviewed recommendations from the Secretary of Energy's Ultra-Deepwater Advisory Committee related to the DOE's ultra-deepwater research program.

The findings and recommendations included below are listed in rank order with 1.1 being highest ranked and 1.6 being lowest ranked.

Finding 1.1: Improved Instrumentation for Kick Detection

In addition to currently available mud-pulse telemetry equipment to detect and transmit downhole kick indicators, there is active development of higher data-rate transmitting systems (e.g., wired drillpipe) to significantly improve the speed of detection (see below for discussion). However, surface kick detection equipment and practices have largely gone unchanged over the last two decades.

The traditional approach to kick detection at the surface has been measurement of delta flow at the rig floor (outflow minus inflow.) A key element for successful detection of any kick is adequate rig instrumentation. The delta flow accuracy required to successfully detect a small formation fluid influx, or drilling fluid loss, during the drilling process is well beyond the capability of typical rig equipment. Flow meters with the desired reliability and accuracy exist, but the problem lies with practical application of these sensor technologies and acceptance by the industry. The challenge then is to provide a useful system for measuring delta flow that will be widely accepted and eventually found on every offshore drilling rig. This will require a system with the following characteristics: low impact on the drill rig hardware and instrumentation, low cost, easy installation, and maintenance by personnel that are normally present at the drill site, as well as minimum interference with the return flow.

In current practice, inflow measurements are almost always made on drill rigs by counting mud pump strokes over a period of time and calculating flow rate using volume per stroke and assumed pump efficiency. This method does not have the accuracy or response time desired for a good delta flow measurement. The most common means of measuring outflow is the paddle-meter, which measures the height of the flowing mud stream after it exits the wellhead. It is the instrument of choice not because of its ability to measure flow rate, but because it meets the requirements for practical application. In fact, it is often calibrated in percent of full scale deflection and is used more as a relative flow indicator

than as an accurate measurement of flow. Some rigs also include a radar FloSho meter to measure return mud flow, which, like the paddle-meter, measures the height of the mud flow in the rig's return flowline. Measurements at very low flow rates using paddle or radar flow meters are often unreliable due to the build-up of solids deposited in the flowline.

An improved method for measuring delta flow for the purpose of detecting kicks is to use an ultrasonic or magnetic flow meter and coupling it to inflow measurements to determine actual delta flow. A third possibility for measuring delta flow is to use a Coriolis flow meter in both the inflow and outflow lines (this meter can also provide mud density and mud temperature measurements). However, ultrasonic, magnetic and Coriolis flow meters require the line they are installed in to be fluid filled, which is not normally the case for the gently sloping return flowline on most drilling rigs.

Another common method of detecting delta flow is by monitoring changes in mud tank volume as measured by pit level meters. While this system provides a measure of the total pit volume gained or lost over a period of time, it does not permit rapid detection or accurate quantification of wellbore production or loss rates, which are essential data for rapid response to kicks or lost circulation.

Along with improvements to surface kick detection, further use of look-ahead seismic profiling to update pore pressure models and real-time downhole kick indicator data such as pressure at the bit, hydrocarbon inflow detection, and dynamic fluid densities enabled by high-rate transmission technologies will significantly improve the industry's ability to detect and rapidly respond to well kicks.

Recommendation 1.1

DOE should collaborate with private industry to develop an improved early kick detection system which would increase the probability of responding to a well kick with minimal volume influx. Technology development projects in this area are currently in progress between operating companies, drilling contractors and service providers; however these are separately managed projects.

As a first step, the National Energy Technology Laboratory should provide DOI with an update on current and future technology development plans for real-time kick detection and pore-pressure prediction using improved sensors in concert with high-rate data transmission equipment. This review should provide a detailed gap assessment, as well as recommendations on how best to accelerate technology development underway in private industry to overcome these gaps. The OESC then recommends combining the development of an improved kick detection sensor and smart alarm system in a joint industry technology development project utilizing appropriate expertise from the National Laboratories, which would fast-track the effort by bringing in additional technical resources and integrating results from test programs on multiple rigs with different equipment trials. Joint public and private funding of recommended R&D is expected.

The combination of enhanced surface kick detection through improved sensors and smart alarms along with significantly improved acquisition, transmittal and processing of downhole kick indicators and look-ahead seismic imaging for pore pressure prediction will significantly increase the likelihood that a kick will be detected and adequately dealt with in the US OCS.

Finding 1.2: Assessing Integrity of Wellhead Housing, Seals, Casing, and Cement

To prevent the accidental release of oil or gas from a sub-sea well – either during normal operations or when a Blowout Preventer (BOP) or other secondary sealing system is activated and the well is shut in -- the entire engineered well system must have integrity. This requires that there is no flow: 1) from the

surface mechanical system, such as the BOP stack, wellhead housing, casing hangers or seals and lock-downs, 2) between nested casing strings or directly through casing into surrounding formations, for example due to hanger seal failure, a casing connection leak, or a hole in the casing, or 3) along the cement sheath, either at the cement/pipe or cement/formation interface. Current technologies in wellhead housings and seals provide little data on integrity, and there is usually no method of measuring pressure in the casing strings that are hung and sealed in the wellhead housing.

Determination of integrity throughout the full depth extent of the well is also critical to devise effective well-containment strategies if well control is lost and a blowout occurs. If the well has maintained its integrity, then a capping stack can be installed to shut-in the well and stop all flow. Alternatively, if well integrity is poor or unknown, then two other well capping approaches can be employed: 1) "cap and flow", which allows the well to be capped but continue to flow to a surface capture system at a controlled rate; or 2) "cap with subsurface pressure relief", where the capping stack is used to fully shut in the well at seafloor but the well is flowing into the formation far below the mud line. In this case, there is sufficient geologic containment to prevent a sea-floor broach (this issue is being addressed by the OESC Spill Containment Subcommittee).

Downhole monitoring of various parameters indicative of sub-sea-floor fluid flow, pressure communication or mechanical failure can be used to assess wellbore integrity, using either discrete transducers or distributed fiber optic sensors installed outside or between casing strings. For example, fiber optic acoustic, temperature, strain and pressure sensors are currently being used to track fluid inflow/outflow zones during open-hole hydraulic stimulations, repeat seismic surveys (e.g., zero offset and walk-away Vertical Seismic Profiles), and monitoring reservoir and casing/cement response to long-term production. Although some off-shore installations have been completed, these "smart-well" technologies have been developed primarily for on-land applications and would need to be adapted for routine installation, remote operation, and data collection on the sea floor.

Recommendation 1.2

BSEE should convene a joint industry project (JIP) to develop technologies to enable continuous monitoring of well-bore integrity throughout the full depth extent of a well using real-time telemetry of temperature, pressure, acoustics, and other signals.

The most important data in assessing wellbore integrity is pressure between the various casing strings landed and sealed in the wellhead housing. It is particularly important to know the B annulus pressure, which is pressure in the annulus between the last two casing strings that were landed and installed in the wellhead, as an indicator of seal, casing or cement failure. Temperature in this annulus would also be useful to diagnose flow around the upper casing hanger seal. Methods exist or can be readily developed that allow for direct measurement of the B annulus pressure or measurement via embedded sensors in the annulus that communicate acoustically. It would also be useful to monitor this data in real-time via the active BOP system and in a retrievable "black box" mode rather than requiring the presence of an ROV.

Single- or multi-mode optical fibers installed outside or between selected casing strings offer significant advantages over traditional (discrete) sensors by allowing the precise location of a temperature, acoustic or pressure anomaly indicative of a casing/seal leak or fluid flow behind casing. Although installation of such a system is very challenging, this type of distributed sensing technology could also help determine whether or not the cement is acting as a seal between the formation and casing, especially in proximity to the reservoir. In the event that wellbore integrity is lost, direct measurement

of fluid loss rates into surrounding geologic formations will probably also require repeat sea-surface seismic profiling and other remote geophysical surveys, as discussed in the OESC Spill Containment Subcommittee report.

The Spill Prevention Subcommittee recommends that technologies be developed to enable continuous monitoring of well-bore integrity throughout the full depth extent of a well, using real-time telemetry of temperature, pressure, acoustics, and perhaps other signals (such as annular flow or fluid chemistry) while connected to the well and retrievable data ("black box") recording when disconnected from the well. The joint industry project should combine expertise from downhole measurement service companies (plus sensor R&D companies from other industries), wellhead and BOP manufacturers, operators, drilling contractors, National Laboratories, academia, and BSEE/DOI. Funding would come from oil and gas companies as well as BSEE/DOI and DOE, with in-kind support from service companies and equipment manufacturers.

Finding 1.3: Enhanced Shearing Capacity and Nonconventional Shearing

With the increased use of stronger and thicker walled tubulars in today's well construction, it is important to develop enhanced shearing technologies to assure that the shear rams installed in the BOP stack are capable of shearing the drill pipe under maximum anticipated pressures. Valve-design and low-force shearing remain the primary method of intervention, and equipment manufacturers are actively working on enhancing the capability of their proprietary designs. The challenge is to develop blind shear rams capable of cutting tool joints, which comprise a significant amount of pipe in a well, and capable of cutting multiple pieces of drill pipe in the BOP.

Assurance is needed that the shear rams are capable of performing their function at full pressure, in any environment and pipe-loading condition. Shearing strength and pipe management during shearing are critical to this assurance. Also needed are alternatives to the shear rams as secondary severance technologies. Some operators are currently working on proprietary designs such as laser technology and targeted explosive systems, which can cut the pipe and in some cases seal the wellbore in case the BOP fails. This is an opportunity for a joint industry technology development project.

Recommendation 1.3

Private industry participants should convene a JIP to develop enhanced shearing technologies to completely cut drill pipe, tool joints, and casing strings, and to assure that the blind shear rams installed in the BOP stack are capable of shearing the pipe and sealing the wellbore under maximum anticipated pressures. This technology R&D should be informed by risk assessments and mitigation strategies developed under a variety of compressive load situations. Also, better methods should be established to test rams at higher pressures to ensure equipment performance readiness. While there is a large focus on the ability to shear, equal focus and attention to sealing the wellbore – post shear – must be treated as part of all proposed solutions.

This work should be done as a joint industry technology development project focused on advancing the technologies for deepwater E&P and funded through participant memberships – independent operators and some state-sponsored oil companies – and through contributor memberships – vendors, engineering firms, and others – who contribute through membership fees and in-kind work. In-kind work would be assigned to the appropriate vendors and suppliers, while the overall project scope would be managed by the JIP.

Finding 1.4: Real-Time Blowout Preventer Monitoring

In responding to a well control incident it is important to have data on the mechanical status of the BOP (e.g., whether the rams are opened or closed), to inform decisions regarding secondary interventions such as activation of the BOP via remotely operated vehicles or acoustic actuators or application of nonconventional shearing/sealing technologies. Besides data to assess BOP integrity and function, data are also needed on rate of flow through the BOP in the event of a blowout in order to design effective oil containment and collection strategies.

Although BOP manufacturers are actively working on this problem, current BOPs offer little information on the status, position or functionality of key components, nor do they provide accurate information on wellbore pressure and temperature below the BOP stack. Current BOPs do collect data via the control pods that are part of the electro-hydraulic control system, but this data is primarily related to BOP operation. Also, the rig will likely be disconnected from the BOP in an emergency, and the pods will either be gone (in an emergency disconnect the LMRP containing the pods will have disconnected from the BOP stack) or will no longer be in communication with the rig. However, there are ROV access ports on some BOPs that allow gathering of limited temperature and pressure data from the BOP with the rig no longer on location.

Recommendation 1.4

BSEE should initiate a discussion with BOP manufacturers, operators, and drilling contractors to define the current state and future needs for technology in BOP instrumentation, monitoring, and data recording. A joint industry project should then be initiated to fill any gaps identified during this discussion (i.e., that are not the focus of active industry R&D), funded by oil and gas companies as well as BSEE/DOI and DOE, with in-kind support from BOP manufacturers.

Development of instrumentation to provide continuous data on position of the rams, status of mechanical components like "locks" and elastomeric sealing elements, hydraulic control system pressures and volumes pumped (including by ROVs), and wellhead temperature and pressure is required. Also needed is flow rate thru the BOP during a blowout. Ideally, these data should be stored in a "blackbox" attached to the BOP and available for download when the rig is not on location. With the exception of flow rate, all other data measurements and data storage and transmission needs should in principle be available via existing technology. However modifying existing BOPs for this is a challenging task. Flow rate might be estimated to an acceptable degree of accuracy from measurements of temperature and pressure at various positions within the BOP stack.

Finding 1.5: Acoustic Sensors/Actuators

In an emergency situation, it may become necessary to remotely activate BOPs and other submerged well-control equipment via acoustic sensors and actuators. Although U.S. regulations enacted in 2003 do not require acoustic triggers, Norway and Brazil require these devices in all offshore drilling operations. While they are not required with rigs operating offshore in the U.K. they are almost standard in U.K. North Sea operations.

The data that exists from research on acoustic triggers in the Gulf of Mexico is outdated. Early problems were generally related to background noise, and although existing devices can operate at ranges exceeding 3 miles (16,000 ft) operations in the Gulf of Mexico at the time this research was conducted were limited to around 2,000 feet. This area is congested with multiple engines, and has abundant sea life (dolphins and whales) - all creating sound waves, which interfere with the acoustic

signals. In addition, frequency flux occurs when other devices operate at similar frequencies and cause either interference or accidental triggering.

Currently there are digital acoustic systems available that have a high degree of functionality and reliability over the earlier, non-digital systems.

Recommendation 1.5

DOE should sponsor research on the viability of acoustic activation of BOPs and other submerged well-control equipment in the deepwater Gulf of Mexico. Further, the research should address the feasibility and viability of integrating the use of acoustics with independent/secondary BOP stacks (short stacks) similar to the capping stack. This could serve as a totally redundant and robust backup/emergency BOP stack. While this technology is widely used in the North Sea and the Campos Basin, renewed testing in the Gulf of Mexico would support application of the technology throughout the U.S. OCS and may lead to improved system and operational reliability.

The DOE National Laboratories should lead this research, as they have expertise in sonic controls, sensors, triggers and sonic sensing and some National Labs are already working on other drilling and well-control solutions. This government research should be funded by DOE. To enable the industry to commercialize a solution, these government researchers should work closely with oil and gas equipment manufacturers for incorporation into subsea field designs.

Finding 1.6: ROV – BOP Interface Standardization and Increased Capacity

When a blow-out occurs and the BOP fails to close and contain it, it may be possible for the BOP to be activated from a remotely-operated vehicle (ROV) by pumping fluid into the ROV access ports. This secondary activation depends on proper sizing of the ROV ports, availability of the seal stab to go into the port, and the pressure and volume pumping capability of the ROV. There is already activity in the industry to address this issue (discussed below). However, because of the difficulty of pumping at high rates and pressures in deep water, the topic of ROV/BOP interface standardization and increased capacity should be further pursued.

Currently there are three primary BOP stack suppliers. Based upon the configuration of the stack, several ROV suppliers can customize the panel interface on the BOP for each installation. Therefore, each installation may be different and often incompatible.

The standardization of connection and intervention ports for all subsea BOP stacks would ensure compatibility with ROV equipment being used in the U.S. OCS. With this standardization in place, any vessel with an ROV that is responding to a well control situation could quickly adapt its ROV to be compatible with the BOP on that well. In addition, improving the flow-rate capacity performance standards would ensure that the ROVs are capable of pumping fluid fast enough to generate the pressure needed to operate rams and unlatch the lower marine riser package (LMRP).

The challenge is to standardize the ROV/BOP interface so that all or most ROVs can service BOP stacks operating in the deepwater US OCS. There is also a need to increase volume capacity of ROV functionality. Current regulations require that: 1) all subsea BOPs have ROV intervention capability, 2) an ROV and a trained ROV crew must be maintained on each floating drilling rig when a BOP is installed and in operation on the wellhead, and 3) all ROV intervention functions on subsea BOPs must be tested to ensure they are capable of actuating, at a minimum, one set of pipe rams and one set of blind-shear rams and unlatching the LMRP.

Recommendation 1.6

Additional work should be carried out through the API Standards process to standardize ROV connection ports for all subsea BOP stacks in the U.S. OCS and develop ROV pump capabilities to achieve closing time and volume requirements for all critical functions that meet or exceed current standards. Industry, through the support of API and equipment manufacturers, should be responsible for funding.

Since the Macondo incident, the industry has been actively developing and deploying solutions to identified ROV-BOP interfacing challenges. Concurrent with the work of the API 17H, 16D, and S53 committees, the industry has moved forward to respond to the need for interface standardization, increased function testing, and achieving greater flow capacity. API Standard 53 has included the following requirements or guidelines, as they relate to these three specific points:

- Frequency of testing and acceptance criteria for all secondary and emergency systems are provided in the tables included in the document.
- A consistent means of measurement is required across all systems to determine their success or failure.
- The BOP stack must be capable of activating the following critical functions: each shear ram, one pipe ram, ram locks and unlatching of the LMRP connector.
- The BOP stack shall be equipped with ROV intervention equipment, which at a minimum allows execution of the critical functions.
- Hydraulic inputs for all critical functions shall be fitted with API 17H ROV hot-stab receptacles.
- Hydraulic fluid can be supplied by the ROV, stack-mounted accumulators or other external hydraulic power sources. The source of hydraulic fluid shall have the necessary pressure and flow rate to operate these functions at all times. This requirement means that whatever system is used to perform the testing must be available at the rig site at all times during drilling operations.
- If multiple receptacle types are used, a means of positive identification of the receptacle type and function shall be required.

Function Testing: BOP Intervention Skids were developed in response to the need for increased BOP function testing. These skids mount directly underneath any ROV and provide a dedicated fluid supply for BOP function testing. In emergency situations, these skids are able to pump seawater for unlimited volume. These skids are in use around the world.

Flow Capacity: In addition, the industry has developed and deployed multiple variants of sub-sea accumulator modules, dedicated for ROV Intervention. Sub-sea accumulation allows any ROV of opportunity to provide the necessary flow and pressure to close the rams quickly by way of connection to the ROV Intervention Panel on the BOP. Together, high-flow panels, intervention skids, and subsea accumulator modules comprise a complete system for BOP Intervention. Industry continues to develop and deploy these solutions to increase commonality and availability of ROV-accessible, high-flow fluid sources for BOP operation. Deployments will only increase as the work of the API committees draws to a close and industry-wide standards are finalized.

Final - 12/19/2012 -

Vector 2: Recommendations on development and implementation of data analysis, alarm, and automated control systems to help prevent loss of primary well control

Background

Drilling continues to grow in complexity, including not only the wells themselves but also drilling rigs and the types and volumes of data available from drilling operations. Thus the work and tools of the rig staff must also change to better inform and support decision making and provide improved well control and enhanced spill risk mitigation. This must be achieved thru a priority based road-map that follows a step-wise approach to developing and implementing automation technology. This approach must consider the key human factors for choosing the right level of automation and ensure that automation technologies and learnings from other industries are fully evaluated and transferred.

The safe and effective control of an offshore well requires dealing with many complex and highly varied activities. During drilling it is critical to detect and control influxes from the formation as early as possible, thus minimizing the total mass and volumetric size of formation hydrocarbons that are allowed to flow into the well (known as a "kick" or well control incident). Well control must also be maintained during other types of rig operations. Much of the time on a rig does not involve drilling of the well itself and is often called "flat time" (i.e., tripping pipe, running casing, circulating & conditioning, cementing, changing out mud systems, testing, etc.) Well control events can also occur during these flat time activities when the alignment of the fluid circulation system may be different and the instrumentation and data that are part of normal well control monitoring may not be available. For example, there are times when well fluids are not circulated and therefore no delta flow rate data are collected. Thus, consideration of improved monitoring and well control during flat times must be addressed in automated well safety systems.

Historically, there are many factors that prevented the application and use of automated control systems on drilling rigs. Among these are mistrust of the system based on perceived unreliability and concern regarding false alarms. In particular, there has been resistance to using an automated system that could result in activation of the shear rams and release of the drilling riser at the lower marine riser package (LMRP) without rig crew awareness or control. If this occurred as a result of a false alarm, it could result in additional risks to the rig crew and recovery of the well would be difficult and costly. If it happens during an actual well control event, it would eliminate many well control options that could be more effective, including the option of full well recovery. Lastly, an unplanned shut-in by the shear rams may result in high pressure build-up below the BOPs that could result in subsequent failures of the well system in even more uncontrollable ways, such as through an underground blowout and seafloor broach (discussed by the Containment Subcommittee). This high pressure build-up is avoided by normal well control responses that do not involve the shear rams. Thus, it is important to fully assess the most effective level of the automation to be used and implement control actions in a step-wise approach, with opportunities for human intervention at key decision points.

Findings

Robust instrumentation, data stream analysis, alarms and automatic control systems are critical components of an automated well safety system and should be incorporated into all rig operations where there is a risk of loss of well control. This automated well safety system should:

- identify abnormal well situations
- provide adequate, rapid, clear, and easily understandable information to the driller to remedy a well control situation
- take over well control and 'make the well safe' if the driller does not take appropriate action in a specified time frame

When an automated well safety system takes control it would shut down the drilling process (pumps, rotary drive, etc.), hoist the drill-bit off bottom and close the BOPs on the pipe – but without shearing the pipe.

In the past couple of decades automation of safety critical functions has gained prominence as a means to avoid catastrophic accidents due to human error. The Federal Aviation Administration (FAA) and the Nuclear Regulatory Commission (NRC) have both adapted 'automation' of safety critical systems, but levels of automation (LOA) are vastly different. LOAs vary between Fully Manual to Fully Automated. A simple 5-level system often used in these other industries is as follows:

Level of Automation	**Functional Description**
Fully Manual	Human decides and acts with no assistance from the computer in the decision making. Human may rely on computer monitoring of sensors and displays.
Decision Support	Human decides and acts but with suggestions from the computer systems. This is generally important for complex systems where dynamics of the system is not completely understood.
Consensual Control	Computer system decides and acts with concurrence of the operator. Human-machine-interface is vital in this case to facilitate effective operation and provide common situational awareness (SA) of the system.
Monitored Control	Computer system decides and acts unless vetoed by the operator. Operator complacency and skill degradation is a major issue
Fully Automated	Computer system decides and acts with no intervention from the operator. Operator may be a part of the recovery if safety critical functions were not executed properly.

Further refinement of LOA can be achieved by explicitly defining who or what (human or computer or both) is responsible for what tasks. Tasks in process control can be broadly divided into four categories: Detect and Alert, Contextualize (i.e., interpret what is happening based upon data received), Select (i.e., decide on actions), and Act.

Safety systems in a nuclear power plant are autonomous, and require no human interaction, thus they

are “fully automated”. While some non-safety systems in a nuclear power plant are “fully manual,” most systems fall somewhere in between “fully automated’ and “fully manual.”

For an automated well safety system, the suggested LOA is “decision support.” At this level both humans and the computer are detecting and contextualizing, whereas humans are selecting and taking action based on this contextualizing. In addition, for an automated well safety system, the computer should take action if the human fails to do so within a specified time frame. The “decision support” LOA for offshore drilling safety met the general criteria for selecting LOA’s in complex systems design: human performance, automation reliability, and cost associated with outcomes. Specifically, this LOA provides the following attributes:

1. It does not eliminate human responsibility for action which minimizes potential for operator complacency, vigilance decrements, and skill decay over time;
2. It moves the well to a “safe” state without going to an unrecoverable state of pipe shearing. This provides time for further analysis, intervention, and recovery; and
3. It allows human-only selection and action when moving to the unrecoverable state of pipe shearing.

As experience is gained with “decision support” automation and as technology changes, moving to higher levels of automation should be considered while taking into consideration human factors analyses for automation of safety critical systems.

To allow a move to a “decision support” LOA, the automated well safety system should include the following components and features:

Alarms - Current drilling rigs have too few alarms on critical data streams, and those that do exist are often poorly integrated. This situation requires too much reliance on humans for pattern recognition and the analysis of problems from the data presented. All data streams important for well control – including the determination of well influx or lost circulation - should be alarmed to alert the driller and other rig staff. These alarms must be tied to reliable sensors (as discussed under Vector 1), as trusting the alarm is a key to successful response on the rig. New alarming technologies need to be developed and added to rigs that take advantage of improved behavioral response and avoid “alarm fatigue” and complacency. Any new data streams should be alarmed if they are critical to well control awareness and recognition.

Computer-Based Displays & Data Stream Analysis - A modern rig floor already has multiple data displays of varying complexity, supporting simultaneous operations and both automated and remotely operated machinery. Humans are required to monitor, analyze, and take action on this vast array of data. To enhance awareness and decision-making by drillers and other rig staff, rig alarms and data streams must be interfaced with a computer system that performs effective pre-processing, analysis, and prioritization. Such a system could identify critical issues and support the decision-making process, perhaps including recommended actions. However, system-generated recommended actions could possibly lead to a practice of “blind acceptance” over time, which may lead to different operational problems and/or unintended outcomes. Development of improved methodologies for data stream

analyses and presentation in offshore drilling should take advantage of recent human/machine interface R&D from other industries, such as aviation.

Well Flow Detection Algorithms - Well control has historically been based on the fundamentals:

1. flow into the well should equal flow out of the well; and
2. the total pressure at the formation face imposed by drilling fluid density plus flow induced pressure exceeds the formation pressure.

However, with modern deep and complex wells – and especially deepwater wells where there is a small margin of difference between the formation fracture pressure and pore pressure – well inflow behavior can be quite complex and sometimes difficult to recognize. This recognition is made even more difficult by high density and/or synthetic mud systems, which can take considerable volumes of formation gas into solution and cause any free gas to be volumetrically small when deep in the well. Additionally, there is the effect of well "ballooning" or breathing, wherein a well can lose drilling fluid and then gain drilling fluid back without actual formation hydrocarbon influx or actual drilling mud loses. Although good models for many of these processes already exist, more work is needed to ensure that these models are effectively and correctly built into future automated rig safety systems. When combined with the enhanced kick detection sensors and technologies (both surface and downhole) described in Vector 1, improved well flow detection algorithms would provide a much more rapid and accurate well control system than presently available. Furthermore, these various models and algorithms must be adequately covered in well-control training and staff capability assessment exercises to ensure competency in understanding all types of well flow. Finally, new models need to be developed for how wells flow and how this flow can determined during cementing, testing and similar non-drilling operations where mud is not being circulated.

Automated Control Systems – Current drilling rigs have few automatic systems for well control. If judiciously applied, automated control systems could reduce well control hazards resulting from human-based pattern recognition and manual response times that can be too slow. As discussed above, there are various levels of automation that can be implemented to take control of an operation when human operators fail to do so. However, design of such automated control systems is complex and requires careful analysis of which tasks should be assigned to the automation and which to the humans. Many human factors must be considered in the determination of the appropriate LOA, such as the need to maintain skills and confidence in the staff. Automated control systems can potentially create new hazards by incorrectly responding to or overcompensating for a rapidly evolving situation, especially with multiple and/or contradictory data inputs. Thus, comprehensive hazard analyses and failsafe design techniques must be applied to any added automated control process. However, a minimum industry goal should be an automated well safety system that moves the well to a safe condition if the rig crew does not respond within a given time frame.

Summary - An automated well safety system should:

- Be reliable
- Provide automated alerts and recommended actions
- Initiate/support an Automated Well Control Response

- Be implementable by the rig contractor

Improvements are needed and should be applied in the areas of:

- Alarms
- Computer-based displays & data stream analysis
- Well flow detection algorithms
- Appropriate application of automated control systems

The system should advise the driller and other rig staff on well control using surface measurements, numerical flow models and control theory. The system should also support automatic well shut-in if the well control situation sufficiently escalates without other well control action.

A well safety automation system can be realized through a combination of R&D and technology development in the defined improvement areas and the application of existing technology from other industries. These improvements, when combined with the Vector 1 improvements in instrumentation and downhole detection, would result in a well safety automation system that focuses on delivering automation related to the initial well shut-in associated with well control events, i.e. shut-in on the annulars and pipe-rams. This well safety automation must be independent of the drilling operations control systems (control of normal rig equipment) and of the drilling optimization systems (control of the drilling process to reduce drilling times and protect the drill string). The automated well safety system should be owned and operated by the drilling contractor and be part of the drilling rig equipment. This should not change the responsibilities of the lease-holder/operator, or the responsibilities of any regulatory defined “person in charge”. Ownership of the automated well safety system by the rig contractor is intended to promote active and continuous training and competency of the contractor and their rig staff in the use, maintenance, and monitoring of the system. This is no different than the evolution of other rig equipment that has become more automatic with fewer human interactions. Lease-holder/operator staff should also be trained and competent regarding such systems via their well control training.

Recommendation

The OESC recommends that a BSEE facilitated JIP be formed to address the improvements needed in automated well safety systems. The JIP would:

- Establish the ultimate goal of automated well safety systems
- Establish a technology roadmap with a step-wise approach to the goal
- Determine the gaps between existing projects and the need for additional work
- Determine technology that should be adopted from other industries
- Recommend appropriate parties for newly identified projects
- Recommend an oversight and alignment mechanism to monitor and assure progress

Participants in the JIP should include expertise from the following organizations:

- Government agencies such as BSEE, USCG, USGS, DOE, and NOAA
- Industry companies from operators, equipment manufacturers, service companies and drilling contractors

- Academia
- National laboratories

Funding for the JIP would be derived from either Federal appropriations or revenue from Federal royalties, rents, and bonuses on Federal offshore oil and gas leases issued under the Outer Continental Shelf Lands Act. In addition industry would provide "in-kind" and monetary contributions. Monitoring/oversight of the JIP could be performed by the Offshore Energy Safety Institute (OESI) as recommended by the OESC.

Both the R&D and the implementation of new and existing technology on drilling rigs should follow a step-wise approach, prioritized on the basis of benefit and practicality and using the results from past and ongoing studies being conducted in these areas. Because of the large number of existing projects and the need for new projects, a single BSEE facilitated JIP should be formed to recommend what new projects are needed to close gaps. These gaps will be determined from the JIP compilation study of current projects in the industry and existing technologies from other industries. The single, unified report from this JIP will establish overall priorities and a road-map for the step-wise approach going forward. Additionally, BSEE should be a funding partner in the JIP.

The single JIP should combine industry, academia, and government labs. The resulting road-map should not only recommend new projects to fill gaps but also recommend the most appropriate parties to execute those projects. The OESI, or similar organization that the OESC recommends, should monitor progress of the established new projects and existing projects.

Vector 3: Recommendations on Implementing a Process for Best Available and Safest Technology

Background

The OCS Lands Act requires the use of Best Available and Safest Technology:

> …the Secretary … shall require, on all new drilling and production operations and, wherever practicable, on existing operations, the use of the best available and safest technologies which the Secretary determines to be economically feasible, wherever failure of equipment would have a significant effect on safety, health, or the environment, except where the Secretary determines that the incremental benefits are clearly insufficient to justify the incremental costs of utilizing such technologies. 43 USC 1347(b)

Current BSEE regulations (30 CFR 250.105) repeat this requirement. Subsequent sections of the regulations add:

> You must use the best available and safest technology (BAST) whenever practical on all exploration, development, and production operations. In general, we consider your compliance with BSEE regulations to be the use of BAST. 30 CFR 250.107(c)
>
> The Director may require additional measures to ensure the use of BAST:
> (1) To avoid the failure of equipment that would have a significant effect on safety, health, or the environment;
> (2) If it is economically feasible; and
> (3) If the benefits outweigh the costs. 30 CFR 250.107(d)

These are the only provisions of BSEE's regulations that specifically address BAST, but they are not the only means by which new technologies, processes and equipment can be approved. Existing regulatory processes include approval of alternate procedures and equipment (30 CFR 250.141); approval of departures from the regulations (30 CFR 250.142); and incorporation of standards by reference (30 CFR 250.198), all of which serve an important role.

In his letter of August 10, 2012, BSEE Director James Watson asked the OESC to address BAST:

> In particular, we would appreciate your input on the following:
> ***
> - In an effort to foster greater innovation for safety and oil spill prevention/response research and development both at BSEE and with industry stakeholders, we seek further guidance in how to best stimulate private sector interest and investment into BAST, as well as a procedure to determine BAST on rolling, real-time basis….

Findings

The current regulatory approach to BAST states, in general, that compliance with BSEE's regulations is sufficient to meet the BAST requirement. This raises certain issues:

- The current language can promote a compliance mentality in parts of the regulated community. Better and safer technologies than required in the regulations for safety critical operations may not be used by all operators even if they are available and are economically feasible.

- If better and safer technology becomes available, the regulations may not change quickly enough to incorporate them (see *Report to the President, National Commission on BP Deepwater Horizon Oil Spill and Offshore Drilling*, January 2011, p. 73).

- The onus is on BSEE to proactively identify BAST technologies for incorporation into the regulations.

While BSEE's regulations do not facilitate BAST, neither do they hinder the development of new technologies. Industry has been responsible for innovation and continuous technological improvement, as evidenced by the expanded frontiers in ultra-deep drilling and drilling in deep water. These advances, often at a rapid pace, underscore the need for an effective process that allows the regulator to keep pace with technology innovation while providing regulatory certainty for those proposing new technologies, equipment or processes.

By definition, BAST refers to available technology. However, there is also a need for a process by which new technology, processes and/or equipment can be efficiently evaluated by BSEE. In 2002, BSEE's predecessor bureau conducted a workshop with the Offshore Technology Center of Texas A&M University to address the issue of new technology. The conclusion of that workshop was that a process, and potentially a "standard," could be developed by industry and the regulatory agency to enhance and improve the assessment of technology. The output of this workshop was not a draft standard that determined or defined BAST, but one that assured the design, specifications and manufacturing of new technology would deliver a safe product.

The subcommittee reviewed approaches taken by other government agencies that have "best available technology" requirements, and identified three general approaches to identifying BAST: (1) the regulator identifies BAST; (2) a competent third party does so; or (3) a hybrid approach in which a competent third party provides information and advice to support decisions by the regulator.

In the first approach, the regulator sets objective, quantifiable performance standards and then allows any technology that meets or achieves those standards. The regulator also could identify acceptable BAST technologies and the performance levels of those technologies, and allow any other technology that performs at least as well. This approach works best when there is a technology or an objective performance standard

that captures the goal of the regulating agency, such as an emissions or effluent standard that is easily measureable. Where this approach is suited it should be used, but the subcommittee believes that this approach may not be well suited to many facets of offshore oil and gas exploration and development. While identifying technologies or setting performance criteria may be possible for some components of OCS facilities, there are too many components in an offshore operation to set such standards[1] for all of them. In addition, the value of such performance standards for key pieces of equipment may be difficult to ascertain when the events that define failure are rare.

The other two approaches are similar in concept, with the primary difference being who is responsible for identifying BAST – the regulator or the competent third party. Because BSEE is charged, by statute, with ensuring safety and environmental protection, the subcommittee believes that BSEE must be free to make final decisions within its areas of jurisdiction. However, the expertise that others can provide is essential to a robust BAST process. Therefore, the subcommittee believes that the best approach is one that abides by the following principles:

- The ultimate decision as to whether to accept an item as BAST rests with BSEE.
- The primary responsibility for qualification and development of technology processes and equipment lies with industry.
- A BAST process must include expertise from all sectors. As the source of technological innovation, industry must be included. But there is also considerable expertise among regulators, other government agencies, manufacturers, classification societies, testing laboratories, and academia that should be included.
- The process should not endorse discrete solutions or specific products, but provide a basis for establishing appropriate performance standards.
- BAST should focus on technologies, equipment and/or processes that are the most critical for safe operations.
- The BAST process must recognize the statutory language concerning the economic feasibility of BAST. A BAST process must consider:
    - The context of the operating environment, e.g., BAST for deepwater Gulf of Mexico might be unnecessary for shallow water, shallow depth operations or inappropriate for the Arctic OCS environment.
    - The practicality of retrofitting existing facilities.

[1] For this paper, the term "standard" is intended as a generic term to indicate a requirement imposed by the regulatory authority. A "standard" could take a variety of forms, such as specific performance criteria or a required practice. The type of requirement put in place will vary based on the specific circumstances of the technology, equipment or process being assessed. The decision on the type of standard to use for each circumstance is best determined by BSEE and is not further addressed in this paper.

- A BAST process must be evergreen – it will need to evolve as additional technologies are evaluated; as evolution in a given technology necessitates reconsideration of past evaluations; and as new technologies are developed in response to new challenges.

The competent third party partner for BSEE should be the Ocean Energy Safety Institute (OESI), which is the subject of a separate recommendation of the OESC. Such a function for the OESI would be symbiotic with other functions being considered for this Institute, such as developing a roadmap for research and fostering government/industry/academic collaboration to develop improved technologies and safety practices for the offshore energy industry. However, if an OESI is not established, BSEE should develop other options for obtaining third party expertise (for example, BSEE could contract with a National Lab or university to manage the BAST process).

Recommendation

The OESC Spill Prevention Subcommittee recommends:

1. <u>BAST Process:</u>

   BSEE should establish a process for implementing the BAST provisions of the OCS Lands Act, through a partnership with the proposed Ocean Energy Safety Institute. Specifically:

   a. BSEE, with input from OESI, would identify and prioritize the technologies, equipment and/or processes to consider based on OESI's work to identify safety-critical technology and regulatory gaps, and the results of investigations into offshore incidents.

   b. For the chosen technologies equipment and processes, industry standards organizations would develop testing protocols for establishing performance levels, failure points, and reliability. The criteria should be based on the operating environment in which the technology would be used.

   c. OESI would facilitate forums that convene the relevant expertise to provide input to BSEE on BAST-related topics, including the suitability of test protocols, establishing performance standards based on test results, and analyses of the costs and benefits of applying relevant standards across the OCS. These forums would recur on a regular basis to support the goal of an evergreen process. These forums could also be used to provide peer review to technology projects being carried out by other entities (e.g., oil and gas companies; manufacturers; research consortia), by reviewing testing and assurance data and advising on whether the technology is ready to be tested/used on the OCS.

d. Based on input from OESI and the expert forums, BSEE would decide whether to accept the testing protocols and evaluation criteria.

e. The critical technologies and equipment would be tested using BSEE-accepted protocols. Based on these tests, analyses of economic feasibility and input from the expert forums, OESI would recommend performance standards. The OESI recommendations would also address, based on the economic feasibility analyses, whether the standard would apply prospectively only or would also apply to existing facilities. BSEE would then adopt performance standards for BAST based on its consideration of these OESI recommendations. Operators would be required to meet BSEE-adopted performance standards.

2. BAST-Related Regulations:

a. BSEE should revise its regulations at 30 CFR 250.107(c). The revision would remove the language stating that complying with BSEE regulations constitutes compliance with the BAST requirement.

b. The revised regulation would specify that technologies and equipment that are evaluated through the BAST process recommended above, as adopted or adapted by BSEE, would be considered BAST.

c. BSEE should incorporate performance standards identified through this BAST process into its regulations, as appropriate. Priority should be given to those items identified in the initial BAST gap analysis that are not covered by regulation.

d. BSEE should maintain its existing regulations through which new technologies, processes and equipment can be approved, including approval of alternate procedures and equipment (30 CFR 250.141); approval of departures from the regulations (30 CFR 250.142); and incorporation of standards by reference (30 CFR 250.198).

The new BAST process should be incorporated into BSEE's regulations. Because the BAST process would be limited in scope – initially due to limited capacity to address all candidate technologies at once, and later due to decisions on what technologies to include – BSEE needs to maintain its current regulatory framework for OCS activities. BSEE maintains its rulemaking authority and should use it as appropriate.

BSEE should incorporate specific BAST requirements into its regulations, in the same manner that it incorporates standards and recommended practices of others into its regulations today. However, during the time it takes to make such regulatory changes, and for those instances where BSEE decides a regulatory change is not warranted, the new process for identifying BAST recommended above would apply and exist in tandem with existing BSEE regulations. In such cases where the BAST recommendation creates

an inconsistency with existing regulations, BSEE would need to determine, on a case-by-case basis, whether a regulatory change is needed or whether an NTL or other process can be used to resolve the issue.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
APPENDIX B – OIL SPILL RESPONSE SUBCOMMITTEE

- **Subcommittee Summary Report**
- **Membership**
- **White Papers**
  - Interim Report of the Response Subcommittee to the Ocean Energy Safety Advisory Committee (April 26, 2012)
  - Report of the Response Subcommittee to the Ocean Energy Safety Advisory Committee (August 29, 2012)
    - Response Subcommittee Vector 1: Facilitate Research and Development of Oil Spill Response Technology (August 28, 2012)
    - Response Subcommittee Vector 2: Oil Spill Planning, Preparedness, and Response in the Arctic OCS (August 28, 2012)
    - Response Subcommittee Vector 3: Interagency Coordination on Oil Spill Response Issues (August 26, 2012)
    - Vector 3 (Continued): Interagency Coordination Matrix (August 24, 2012)

Ocean Energy Safety Advisory Committee
Response Subcommittee
Summary Report

OVERVIEW

To help improve the Nation's ability to effectively plan, prepare and respond to offshore spills, the Ocean Energy Safety Advisory Committee (OESC) created a Response Subcommittee as one of the original four subcommittees and tasked them with developing recommendations that would improve and advance DOI's and BSEE's planning, preparedness, response and technology.

VECTORS AND RECOMMENDATIONS

In the initial meetings, the Response Subcommittee decided to organize recommendations around four general themes, or vectors. These vectors dealt with research and development, cascading equipment, arctic response and interagency coordination. After an initial presentation to the OESC on these vectors, the Subcommittee decided that the vector pertaining to cascading of oil response equipment be deleted. This decision was based on a number of factors, including the low notional priority assigned by the OESC, the recognition that this is much more than a DOI issue as other federal agencies and states have significant jurisdiction regarding equipment requirements and potential cascading decisions, and the realization that this issue has already been addressed in a number of reports prepared outside of OESC. The Subcommittee then worked on the remaining vectors and presented recommendations at the August 2012 meeting of the OESC. These vectors were:

Vector 1: Facilitate Research and Development of Oil Spill Response Technology

The Response Subcommittee performed an extensive review of existing research and development (R&D) activities related to technologies for oil spill response/cleanup in both government and industry. During this review, the Subcommittee felt that its work should not duplicate other efforts currently underway in groups such as the Spill Advisory Group (SAG) or the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR). From this review and subsequent discussion the Subcommittee developed and forwarded through the OESC seven recommendations. These recommendations are:

- That DOI support continued and dedicated research and development (R&D) funding from the Oil Spill Liability Trust Fund as a Department priority to support oil spill response research, including the National Oil Spill Response Research and Renewable Energy Test Facility (Ohmsett). DOI should maintain the Ohmsett facility under direction of BSEE's Oil Spill Response Division. Additionally, BSEE should work with the Department to secure long-term research funding, develop a R&D strategic plan to address various OCS operating conditions including those encountered in deepwater and in the Arctic, and upgrade the Ohmsett facility to support testing of new and improved oil spill response technologies.
- That DOI support the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) as the Federal coordinating body for oil spill research. BSEE should keep ICCOPR apprised of oil spill response R&D as intended under Oil Pollution Act of 1990 (OPA 90) as the primary means to leverage the efforts of other Federal agencies engaged

in similar research affecting offshore oil spill response. BSEE should also coordinate with ICCOPR to facilitate and better incorporate the knowledge from state and local agencies, academia, and industry into oil spill response R&D projects.

- The United States Geological Survey (USGS) is not a member of ICCOPR, but has research programs and interests relevant to the activities of this committee. It is recommended that USGS attend ICCOPR meetings and if supported by DOI apply to the committee for ad hoc or permanent membership.
- BSEE should continue to work with its interagency partners to develop a process to evaluate selected oil spill response equipment and tactics under realistic conditions and utilize this information to inform planning tools and requirements, and regulatory changes. Complementing this effort would include completing the BSEE/U.S. Coast Guard (USCG) co-funded study on improving the planning standards for mechanical recovery equipment (i.e., the effective daily recovery capacity, or EDRC), and publishing new regulations that implement improved standards by BSEE and USCG. These improved standards would: 1) provide a more realistic measure of a skimming system's potential to recover oil, and 2) improve the effectiveness of removal equipment by providing credit for innovations that result in greater oil recovery in planned offshore spill conditions.
- DOI should explore the use of periodically reviewed performance-based standards to spur innovation in oil spill response technology and ensure utilization of best available technology. BSEE should consult with industry and interagency stakeholders during development of such standards.
- BSEE, within its responsibility, should continue to play a strong role in conducting and/or supporting oil spill response research and technology development, both nationally and internationally. This pertains to all aspects of oil spill planning, preparedness and response related to offshore exploration, production, and development, and includes technology R&D related to mechanical recovery equipment and systems, in-situ burning, dispersants, cold weather and ice response, remote sensing technologies, etc.
- In compliance with statutory and permitting requirements, BSEE should work with federal partners and relevant authorities to encourage and facilitate controlled experimental releases of oil that benefit offshore spill response R&D and equipment testing. This would include coordination with regional response teams (RRTs) in the proposed areas of release. BSEE should also consider the possibility of international cooperation in this area, as the U.S. has participated and been invited to participate in controlled experimental releases in other countries such as Norway.

In addition, the Subcommittee also recommended that if the OESC is continued then future meetings occur between the Response Subcommittee and the designated implementation staff of DOI/BSEE. These meetings should focus on methods and opportunities for improved, innovative oil spill response research as well as testing and training at Ohmsett. The subcommittee also noted that the Ocean Energy Safety Institute (OESI) should not take on spill response R&D and this was later forwarded as a recommendation by the OESI Subcommittee.

Vector 2: Oil Spill Risk Assessment, Preparedness, and Response in the Arctic OCS

The Response Subcommittee did an extensive review of existing studies and reports related to oil spill response in the Arctic and considered the rapidly evolving nature of oil spill response

research and techniques relevant to Arctic waters. The Subcommittee agreed to narrow the scope and focus to the regulatory aspects of exploration and production. Subsequently the Subcommittee developed a set of recommendations that were discussed at the OESC. It was decided that one recommendation would go forward but the rest would be passed on to the newly formed Arctic Subcommittee for consideration and action. The one recommendations is:

- BSEE should evaluate the need for Arctic oil spill equipment deployment exercise(s) prior to beginning drilling operations.

Vector 3: Interagency Coordination on Oil Spill Response Issues

The Response Subcommittee developed a list of regional, national and international organizations that were involved with oil spill response and analyzed the mandates, membership and functions of these groups. The Subcommittee then analyzed appropriate DOI participation in these organizations as well as the manner in which DOI Bureaus and Offices should share and distribute information on oil spill response issues. Based on this analysis, the Subcommittee developed four recommendations which were accepted and forwarded by the OESC. These recommendations take into account how DOI should improve internal communication and engage with these external groups to best prepare for and respond to offshore releases. The recommendations are:

- That DOI continue its participation with groups listed in Enclosure 8 (of the Committee's October 15, 2012 letter to BSEE). For groups in which BSEE is currently the lead for DOI, BSEE's Oil Spill Program should be the focal point for this participation.
- Because of their trustee role the U.S. Fish and Wildlife Service (USFWS) usually represents DOI at the RRT. USFWS should ensure that the views and mandates of BSEE and the other DOI Bureaus are represented adequately during all RRT discussions. This is especially important in areas such as cascading of response equipment, offshore logistics, use of subsurface dispersants, containment and protection strategies, as other DOI Bureaus such as BSEE, Bureau of Ocean Energy Management, National Park Service, USGS and Bureau of Indian Affairs manage federal land, determine lease sites, approve oil spill response plans and bring significant experience and expertise to spill response.
- That DOI and its Bureaus continue to monitor activities of the international organizations in which they are currently engaged (Enclosure 8), especially in the Arctic to ensure that BSEE's regulations and policy related to planning, preparedness and response can adapt to new information that will be obtained as Arctic oil exploration increases around the world. BSEE Oil Spill Response Division should be the focal point for this participation.
- That DOI determine the best way to pass information between Bureaus on spill response planning and preparedness. The DOI Emergency Operations Center and Emergency Management Council fill critical roles in preparing for and responding to spills at a high level, but do not provide the detailed, ongoing information exchange between Bureaus that is necessary to take maximum advantage of DOI expertise and activitiesin spill response planning and preparedness. Two possible means for implementing this increased communication are:
    - DOI identify an "oil spill group" consisting of one person per Bureau or Office who would serve as the single point of contact to represent that agency. These representatives would be responsible for receiving and passing information

related to spill response expertise and activities either through an identified DOI representative (e.g., from BSEE's Oil Spill Response Program) or as part of regular meetings (e.g., a subcommittee to the Emergency Management Council, using face-to-face or electronic meetings). This person would not have to be the subject matter expert for all activities related to oil spills, but would be responsible for bringing the appropriate assets of their Bureau to oil spill planning, preparedness, response and restoration.

- Develop a virtual "oil spill forum" that would include individuals throughout DOI with an interest and responsibility in spill response. Through such an interactive on-line forum, members could post information and exchange ideas related to spill-related expertise and activities.

SUMMARY

The Response Subcommittee felt it was important that a body such as the OESC keep track of issues that impact oil spill response, such as Estimated Daily Recovery Capacity, worst case discharge calculations, dispersants, response in extreme conditions, and response exercise and planning protocols. In addition, during the January 2013 meeting, Director Watson indicated one of the areas he needed assistance was with BSEE's Oil Spill Response Plan (OSRP) regulations. If the OESC continues, then it would be appropriate to continue the Response Subcommittee to focus on the evolution of the issues, follow up and assess the impact and effectiveness of the currently proposed recommendations and develop new vectors and recommendations that would assist BSEE in advancing their oil spill response program.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
OIL SPILL RESPONSE SUBCOMMITTEE MEMBERS

AFFILIATION	MEMBER	TERM
Subcommittee Lead	Patrick E. Little	04/18/11 – 07/31/12
Non-Governmental Organization	Lois N. Epstein	04/18/11 – Present
Offshore Energy Industry	Charles R. Williams II	04/18/11 – Present
Federal Government	Mathy Stanislaus	04/18/11 – Present
Federal Government	David G. Westerholm **(Assumed Lead 08/01/13)**	04/18/11 – Present
Academia	Donald W. Davis	01/04/12 – Present
Non-Governmental Organization	Marilyn R. Heiman	01/04/12 – Present
Non-Governmental Organization	Robert D. Martin, Jr.	01/04/12 – 03/31/12
Offshore Energy Industry	Peter K. Velez	01/04/12 – Present
Federal Government	Mary E. Landry	08/29/12 – Present
Federal Government	John R. Caplis II	08/29/12 – 05/31/13
BSEE Subject Matter Staff Lead	David M. Moore	N/A

Interim Report of the Response Subcommittee to the Ocean Energy Safety Advisory Committee 26 April 2012

The Response Subcommittee (Subcommittee) convened in January 2012 to reassess the proposed organizing vectors based on feedback received from the November 2011 Ocean Energy Safety Advisory Committee (Committee) meeting. After considering a number of factors, the Subcommittee decided that the organizing vector pertaining to cascading of oil response equipment should be deleted. This decision was based on a number of factors, including the low notional priority assigned by the Committee, the recognition that this is much more than a DOI issue (e.g. Environmental Protection Agency (EPA), U.S. Coast Guard (USCG) and that States have significant equities regarding equipment requirements and potential cascading decisions), and the realization that this issue has already been addressed in a number of reports (e.g. Incident Specific Preparedness Review, Presidential Commission, and Admiral Allen's report to the Department of Homeland Security) and needs to be resolved across the appropriate federal response agencies, states, and industry. Additionally, the Subcommittee made refinements to the focus and content of the remaining three vectors. The three revised organizing vectors are:

- Facilitate Research and Development of Oil Spill Response Technology
- Oil Spill Risk Assessment, Preparedness, and Response in the Arctic OCS
- Interagency Coordination on Oil Spill Response Issues

A revised prospectus for each of these topical areas is presented on the following pages - describing the problems to be addressed, identifying gaps in knowledge, capabilities or regulations (where known), and defining actions to be undertaken by the Subcommittee in addressing these issues.

A. Facilitate Research and Development of Oil Spill Response Technology

While research and development (R&D) into the enhancement of oil spill response occurs on an ongoing basis through a variety of mechanisms, it is important to have a robust process for supporting the creation of new ideas and the further development of those ideas that look the most promising. Areas that could benefit from additional research should be identified, prioritized, and funded; traditional and non-traditional approaches should be pursued to encourage invention, innovation, and implementation of new oil spill response methods. Approaches to oil spill response that are proven to work should be documented, shared widely through a consistent, stable clearinghouse of information, and their use encouraged or mandated. Lessons learned after actual spills should be communicated to the oil spill response community in as timely a fashion as possible. Continued support of innovation in oil spill response is in the best interest of all stakeholders, but there must be a clear and open process that allows new approaches to be critically evaluated and the resulting information rapidly disseminated to the spill response community.

Research on oil spills leads to a better understanding of the environmental conditions and oil discharge characteristics that determine the effectiveness of oil spill response methods (e.g., mechanical devices, chemical remediation, in-situ burning, herders, and other alternative techniques). This research relies upon a full spectrum of testing and validation ranging from bench- and meso-scale research in laboratories or purposely constructed wave tanks (e.g., Ohmsett – the National Oil Spill Response Research and Renewable Energy Test Facilty, EPA/Fisheries and Oceans Canada (DFO)) to larger-scale, open-water controlled field testing. Considerable research has already been done at the bench scale and wave tank levels. For example, Ohmsett plays an important role in testing, validating, and improving technology and supporting innovation, such as through the X Prize OSR Challenge. To determine whether conclusions drawn from smaller-scale research will hold true for larger-size oil discharges, testing in real-world conditions may provide important data on response equipment capacity and effectiveness, and may help drive innovation. To evaluate oil spill response equipment and tactics under realistic conditions, BSEE should work with its interagency partners to explore whether field testing is needed, as appropriate, and could be permitted by all applicable authorities, as has been useful in some nations (e.g. Norway and Canada). If so, tests should be performed with careful planning and approved plans and permits, and involve research institutions, academia, regulators, industry, public stakeholders and others.

The subcommittee will develop a paper recommending that BSEE should:

- Work with its interagency partners to evaluate oil spill response equipment and tactics under realistic conditions.

- Explore the use of periodically reviewed performance-based standards to spur innovation in oil spill response technology and ensure utilization of best available technology. BSEE should consult with interagency stakeholders during development to ensure consistency of such standards.

- Maintain the Ohmsett facility, and upgrade it as needed to support testing of new and improved oil spill response technology.

- Continue to play a strong role in leading and supporting oil spill response research and technology development.

The subcommittee will also investigate possible ways for BSEE to stimulate the offshore oil spill clean-up technology industry, and encourage research and development leading to best available technologies, and make recommendations, if appropriate.

B. Oil Spill Risk Assessment, Preparedness, and Response in the Arctic OCS

Oil and gas potential is significant in Arctic Alaska, with renewed interest in oil and gas exploration and production in the Beaufort and Chukchi seas of the Alaska Outer Continental Shelf (OCS). Beyond petroleum potential, this region also supports unique

fish and wildlife resources and ecosystems, with indigenous people who rely on these resources for subsistence, and who follow cultural traditions dating back thousands of years.

A key concern about development of oil and gas resources in the Arctic OCS is the need to ensure that scientific understanding and technological capability are sufficient for reliable oil-spill risk assessment, preparedness, and response under difficult environmental conditions with limited local infrastructure. Although there have been recent advances in oil-spill risk assessments in the Arctic OCS, scientific and technological challenges remain in a number of areas.

While developing this vector, the Subcommittee noted that there may be unique technological response and regulatory issues in the U.S. Arctic offshore. These include technologies for detecting, monitoring, and tracking oil around and under ice, and the efficacy of oil spill countermeasures such as mechanical recovery (e.g., skimmers), in-situ burning, bioremediation, and the use of chemical dispersants in Arctic waters.

This Subcommittee originally intended to assess the state-of-the-art in Arctic oil spill risk assessment, preparedness, and response. However, after further review and considering the evolving nature of oil spill response research and techniques relevant to Arctic waters, the Subcommittee agreed to narrow the scope and focus on the regulatory aspects.

The Subcommittee will develop a recommendation for BSEE to review existing Oil Spill Response Plan regulations, determine their adequacy for U.S. offshore Arctic environments, and revise as appropriate to ensure the availability of adequately trained personnel and equipment to respond effectively to a worst-case discharge.[1]

C. Interagency coordination on oil spill response issues

The National Contingency Plan outlines a framework for federal and state agencies to work with other organizations (e.g., industry committees) that are involved with oil spill planning, preparedness (including training and exercises), and response through the National Response Team (NRT), Regional Response Teams (RRT), and Area Committees. Other government and industry committees (e.g., Interagency Coordinating Committee for Oil Pollution Research - ICCOPR, American Petroleum Institute Spills Advisory Group, Interagency Arctic Research Policy Committee) provide additional avenues for public/private interactions. Although BSEE has primary responsibility for establishing and verifying compliance with offshore oil spill planning and preparedness requirements, they are not represented on some of the interagency and agency/industry committees. Additionally, there are other bureaus of the U.S. Department of the Interior (DOI), such as the U.S. Geological Survey, that demonstrated expertise during the

[1] Areas that these regulations might address include response techniques, detection, environmental monitoring, logistics, oil spill response organization competency, adequacy of response equipment (including seasonal limitations), and near-shore response.

Macondo spill that could be of value for future oil spill planning, preparedness, and response. Although DOI has multiple functions with respect to the interagency process, including trustee responsibilities, regulatory enforcement, licensing, scientific/applied research, and planning and preparedness for offshore response, these functions have not been fully represented in interagency deliberations.

The Subcommittee will specifically look at these existing committees, their originating authority and purpose, and how DOI bureaus are currently being engaged with these groups in spill planning, preparedness, and response. The Subcommittee will then make recommendations as to how DOI should engage with these groups in the future to best meet their needs in preparing for and responding to offshore releases, taking steps to ensure that the viewpoints of agencies such as BSEE, BOEM, USGS, and USFWS are adequately represented.

Additionally, the Subcommittee fully supports the increased coordination between BSEE, USCG, and NOAA on oil spill response planning and preparedness, and recommends this effort be maintained over time. The Subcommittee will outline the current status of this cooperation and outline potential improvements, if needed.

DRAFT
Report of the Response Subcommittee to the Ocean Energy Safety Advisory Committee
29 August 2012

In April 2012 the Response Subcommittee presented an interim report to the Ocean Energy Safety Advisory Committee (OESC). This report covers the period between that report and August 2012. The subcommittee members who helped prepare this report are listed below:

CAPT John Caplis (USCG)
Don Davis (LSU)
Lois Epstein (The Wilderness Society)
Marilyn Heiman (Pew Trusts)
Steve Hickman (USGS)
*CAPT Patrick Little (USCG)
David Moore (BSEE)
Mathy Stanislaus (EPA)
Peter Velez (Shell Oil)
David Westerholm (NOAA)

*Note: CAPT Little was instrumental in the work of this Subcommittee and contributed until recently, when he retired from the Coast Guard

After receiving input on the interim report from the OESC in April 2012, the Response Subcommittee (Subcommittee) convened in June 2012 to finalize the organizing vectors and develop general recommendations. These recommendations were drafted and agreed upon for forwarding from the Subcommittee as recommendations to the OESC. The Subcommittee's three organizing vectors are:

- Facilitate Research and Development of Oil Spill Response Technology
- Oil Spill Risk Assessment, Preparedness, and Response in the Arctic OCS
- Interagency Coordination on Oil Spill Response Issues

Each vector is described below with associated recommendations. These recommendations are being brought forth to the Committee for approval and if approved will be forwarded to the Department of Interior. Additionally each vector has background information that can be found in the Appendices, which amplify the topics, problems and issues associated with the vector, gaps to be addressed and actions and recommendations. These recommendations (below) are worded in the form of a memorandum to Secretary Salazar, to facilitate discussion and voting by the Committee at our August 2012 meeting.

To: Hon Ken Salazar
Secretary of the Interior

From: Ocean Energy Safety Advisory Committee (OESC)

Through: James Watson, Director, Bureau of Safety and Environmental Enforcement

Subject: Oil Spill Response Recommendations for DOI consideration and action

Date: August 30, 2012

Cleaning up offshore spills from oil and gas drilling and production activities will require continuing advances in oil spill response regulations, planning, and technology. To help improve the Nation's ability to effectively respond to these offshore spills, the OESC has developed recommendations organized around three general themes, or vectors. These three organizing vectors are:

- Facilitate Research and Development of Oil Spill Response Technology
- Oil Spill Risk Assessment, Preparedness, and Response in the Arctic OCS
- Interagency Coordination on Oil Spill Response Issues

Each vector is briefly described below with associated recommendations for consideration by the Department of Interior. Additionally each vector has background information that can be found in the indicated Appendices, which amplify the topics, problems and issues associated with the vector, gaps to be addressed and actions and recommendations.

Vector 1: Facilitate Research and Development of Oil Spill Response Technology

The OESC performed an extensive review of existing research and development (R&D) activities related to technologies for oil spill response/cleanup in both government and industry to develop the following set of recommendations (see Appendix 1 for additional details).

Vector 1 - Specific Recommendations

1. That DOI support continued and dedicated R&D funding from the Oil Spill Liability Trust Fund (OSLTF) as a Department priority to support oil spill response research, including the National Oil Spill Response Research and Renewable Energy Test Facility (Ohmsett). DOI should maintain the Ohmsett facility under direction of BSEE's Oil Spill Response Division. Additionally, BSEE should work with the Department to secure long-term research funding, develop a R&D strategic plan to address various OCS operating conditions including those encountered in deepwater and in the Arctic, and upgrade the Ohmsett facility to support testing of new and improved oil spill response technologies.

2. That DOI support the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) as the Federal coordinating body for oil spill research. BSEE should keep ICCOPR apprised of oil spill response R&D as intended under OPA 90 (rather than as part of the Ocean Energy Safety Institute or other entity) as the primary means to leverage the efforts of other Federal agencies engaged in similar research affecting offshore oil spill response. BSEE should also coordinate with ICCOPR to facilitate and better incorporate the knowledge from state and local agencies, academia, and industry into oil spill response R&D projects.

3. The United States Geological Survey (USGS) is not a member of ICCOPR but has research programs and interests relevant to the activities of this committee. It is recommended that USGS attend ICCOPR meetings and if supported by DOI apply to the committee for ad hoc or permanent membership.

4. BSEE should continue to work with its interagency partners to develop a process to evaluate selected oil spill response equipment and tactics under realistic conditions and utilize this information to inform planning tools and requirements, and regulatory changes. Complementing this effort would include completing the BSEE/USCG co-funded study on improving the planning standards for mechanical recovery equipment (i.e., the effective daily recovery capacity, or ERDC), and publishing new regulations that implement improved standards by BSEE and USCG. These improved standards would: 1) provide a more realistic measure of a skimming system's potential to recover oil, and 2) create incentives to improve the effectiveness of removal equipment by providing credit for innovations that result in greater oil recovery in planned offshore spill conditions.

5. DOI should explore the use of periodically reviewed performance-based standards to spur innovation in oil spill response technology and ensure utilization of best available technology. BSEE should consult with interagency stakeholders during development to ensure consistency of such standards.

6. BSEE should continue to play a strong role in leading and supporting oil spill response research and technology development, both nationally and internationally. This pertains to all aspects of oil spill planning, preparedness and response related to offshore exploration, production, and development, and includes technology R&D related to mechanical recovery equipment and systems, *in-situ* burning, dispersants, cold weather and ice response, remote sensing technologies, etc.

7. In compliance with statutory and permitting requirements, BSEE should work with federal partners and relevant authorities to encourage and facilitate controlled experimental releases of oil that benefit offshore spill response R&D and equipment testing. This would include coordination with RRTs in the proposed areas of release. BSEE should also consider the possibility of international cooperation in this area, as the U.S. has participated and been invited to participate in controlled experimental releases in other countries such as Norway.

Vector 1 - General Recommendation

The Subcommittee will continue to evaluate whether this vector should continue if the OESC is continued by DOI and BSEE. If continued it is recommended that if approved by the OESC and accepted by BSEE, that future meetings occur between the Response Subcommittee and the designated implementation staff of DOI/BSEE, plus the USCG, EPA, NOAA, USFWS and other agencies as needed. These meetings would help focus future recommendations by allowing all groups to discuss methods and opportunities for improved, innovative oil spill response research, testing and training at Ohmsett and elsewhere. The Subcommittee feels strongly that while OESC can bring a diverse set of backgrounds (academia, non-profit, industry and government) that work should not duplicate other entities such as the Spill Advisory Group (SAG) or ICCOPR.

Vector 2: Oil Spill Risk Assessment, Preparedness, and Response in the Arctic OCS

The OESC did an extensive review of existing studies and reports related to oil spill response in the Arctic and developed the following set of recommendations (see Appendix 2 for additional details).

This Subcommittee originally intended to assess the state-of-the-art in Arctic oil spill risk assessment, preparedness, and response. However, after further review and considering the rapidly evolving nature of oil spill response research and techniques relevant to Arctic waters, the Subcommittee agreed to narrow the scope and focus its recommendations on the regulatory aspects of exploration and production, as described below.

Vector 2 - Specific Recommendations

1. BSEE should evaluate the need for Arctic oil spill equipment deployment exercise(s) prior to beginning operations

2. BSEE should establish a formalized process with a fixed timeline for interagency review of Arctic Oil Spill Response Plans (OSRPs).

3. BSEE and BOEM should work with other agencies and stakeholders to increase their engagement in developing the Arctic Subarea Contingency Plans. BSEE should ensure that Arctic OSRPs are consistent with this Subarea Plan.

4. Once an OSRP is approved, BSEE should make the plan (or parts of the plan) publicly available.

5. BSEE should work with the U.S. Coast Guard, Environmental Protection Agency, Pipeline and Hazardous Materials Safety Administration, and other stakeholders to review the adequacy of the current OSRO (Oil Spill Removal Organization) construct for use in the Arctic environment.

6. BSEE and BOEM should review existing OSRP and permitting regulations, determine their adequacy for U.S. offshore Arctic environments, for exploration and production and revise as appropriate to respond effectively to a worst-case discharge. In particular, the OSRP and permitting regulations and associated approvals should address at least the following elements:
    a. Seasonal drilling limitations that consider the timing and adequacy of oil spill response operations, given available technologies and the type of drilling operation
    b. Prompt deployment of response equipment and adequately trained personnel.
    c. Ice capable equipment appropriate for expected conditions
    d. Adequate strategies and equipment to protect important ecological and subsistence areas

Other Issue

The subcommittee could not come to consensus on the issue of whether BSEE should provide a public review process for Arctic OSRPs prior to approval.

Vector 2 - General Recommendation

This vector should continue if the OESC is continued by DOI and BSEE. As Arctic challenges have implications for all OESC work, we recommend that the Arctic vector should be continued as a new stand-alone Subcommittee.

Vector 3: Interagency Coordination on Oil Spill Response Issues

The OESC developed a list of regional, national and international organizations that were involved with oil spill response and analyzed the mandates, membership and functions of these groups. The OESC then determined the scope of DOI participation in these organizations and looked at the Bureaus and Offices within DOI and the manner in which they share information internally. Based on this analysis, the OESC developed the following set of recommendations. These recommendations take into account how DOI should improve internal communication and engage with these external groups to best prepare for and respond to offshore releases (see Appendices 3 and 4 for additional details).

Vector 3 - Specific Recommendations

1. That DOI continue its participation with groups listed in Appendix 4. For groups in which BSEE is currently the lead for DOI, BSEE's Oil Spill Program should be the focal point for this participation.

2. That BSEE attend National Response Team (NRT) meetings and request to participate in NRT subcommittee work related to offshore response. BSEE should also work with the mandated DOI representative to the NRT (Office of the Secretary) to ensure that the NRT as a body adequately addresses the challenges related to offshore response.

3. That BSEE and BOEM regularly attend Regional Response Team (RRT) meetings in areas where they have interest (i.e., regions with offshore exploration and production) to ensure that regional and area contingency planning, preparedness and response are addressed appropriately. In these regions, BSEE and BOEM should meet with the current DOI representative to the RRT to ensure that all DOI equities are represented at the meetings. This is critical as the RRT has certain responsibilities under regulation, including using dispersants as an alternative response measure.

4. Because of their trustee role the USFWS usually represents DOI at the RRT. USFWS should ensure that the views and mandates of BSEE and the other DOI Bureaus are represented adequately during all RRT discussions. This is especially important in areas such as cascading of response equipment, offshore logistics, use of subsurface dispersants, containment and protection strategies, as other DOI Bureaus such as BSEE, BOEM, NPS, USGS and IA manage federal land, determine lease sites, approve oil spill response plans and bring significant experience and expertise to spill response.

5. That DOI continue to coordinate and engage with the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) to maximize investment of oil spill research dollars. We further recommend that the USGS attend ICCOPR meetings and determine if they want to petition to become a permanent member. Currently, the only DOI Bureaus represented on ICCOPR are BSEE, BOEM and USFWS. (See also discussion in Appendices 1 & 4)

6. That DOI and its Bureaus continue to monitor activities of the international organizations in which they are currently engaged (Appendix 4), especially in the Arctic to ensure that BSEE's regulations and policy related to planning, preparedness and response can adapt to new information that will be obtained as Arctic oil exploration increases around the world. BSEE Oil Spill Response Division should be the focal point for this participation.

7. That DOI determine the best way to pass information between Bureaus on spill response planning and preparedness. The DOI Emergency Operations Center and Emergency Management Council fill critical roles in preparing for and responding to

spills at a high level, but do not provide the detailed, ongoing information exchange between Bureaus that is necessary to take maximum advantage of DOI expertise and activities in spill response planning and preparedness. Two possible means for implementing this increased communication are:

a. DOI identify an "oil spill group" consisting of one person per Bureau or Office who would serve as the single point of contact to represent that agency. These representatives would be responsible for receiving and passing information related to spill response expertise and activities either through an identified DOI representative (e.g., from BSEE's Oil Spill Response Program) or as part of regular meetings (e.g., a subcommittee to the Emergency Management Council, using face-to-face or electronic meetings). This person would not have to be the subject matter expert for all activities related to oil spills but would be responsible for bringing the appropriate assets of their Bureau to oil spill planning, preparedness, response and restoration.

b. Develop a virtual "oil spill forum" that would include individuals throughout DOI with an interest and responsibility in spill response. Through such an interactive on-line forum, members could post information and exchange ideas related to spill-related expertise and activities.

Vector 3 - General Recommendation

The OESC recommends that this vector not continue, even if the OESC is continued by DOI and BSEE. With the current recommendations and information provided in Appendix 4, DOI should be able to continually evaluate and grow their participation in spill response organizations (existing and new) and continue to improve their ability to transmit information between DOI Bureaus and Offices.

Final Comments and Future Response Vectors for the OESC

Although the OESC had originally considered an organizing vector pertaining to cascading of oil response equipment, this vector has now been deleted. This decision was based on a number of factors, including the low notional priority assigned by the OESC, the recognition that this is much more than a DOI issue (e.g. Environmental Protection Agency (EPA), U.S. Coast Guard (USCG) and that States have significant equities regarding equipment requirements and potential cascading decisions), and the realization that this issue has already been addressed in a number of reports (e.g. Incident Specific Preparedness Review, Presidential Commission, and Admiral Allen's report to the Department of Homeland Security) and needs to be resolved across the appropriate Federal response agencies, states, and industry.

In the long term, it is important that a body such as the OESC keep track of issues that impact oil spill response, such as Estimated Daily Recovery Capacity, worst case discharge calculations, dispersants, response in extreme conditions, and response exercise and planning protocols. If the OESC continues, then it would be appropriate to continue

the Response Subcommittee to focus on the evolution of these issues and develop new vectors. It would also be appropriate for this subcommittee to follow up and assess the impact and effectiveness of the currently proposed recommendations.

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APPENDIX 1
Response Subcommittee Vector 1:
Facilitate Research and Development of Oil Spill Response Technology

While research and development (R&D) efforts into the enhancement of oil spill response occurs on an ongoing basis through a variety of mechanisms, it is important to have a robust process for supporting the creation of new ideas and the further development of those ideas and technology that look the most promising. Areas that could benefit from additional research should be identified, prioritized, and funded; traditional and non-traditional approaches should be pursued to encourage invention, innovation and implementation of new oil spill response methods. Approaches to oil spill response that are proven to work should be documented, shared widely through a consistent, stable clearinghouse of information, and their use encouraged. Lessons learned after actual spills should be communicated to the oil spill response community in as timely a fashion as possible. Continued support of innovation in oil spill response is in the best interest of all stakeholders, but there must be a transparent process that allows new approaches to be critically evaluated and the resulting information rapidly disseminated to the oil spill response community.

Research on oil spills leads to a better understanding of the environmental conditions and oil discharge characteristics that determine the effectiveness of oil spill response methods (e.g., mechanical devices, chemical dispersants, *in-situ* burning, herders, and other alternative techniques). This research relies upon a full spectrum of testing and validation ranging from bench- and meso-scale research in laboratories or purposely constructed wave tanks (e.g., Ohmsett, Environmental Protection Agency (EPA)/Canada DFO) to larger-scale, open-water controlled field testing. Considerable research has already been done at the bench scale and wave tank levels. For example, Ohmsett (the National Oil Spill Response Research and Renewable Energy Test Facility) plays an important role in testing and improving technology and innovation, such as through the Wendy Schmidt Oil Cleanup X Challenge. To determine whether conclusions drawn from smaller-scale research will hold true for larger-size oil discharges, testing in real-world conditions will provide important data on response equipment capacity and effectiveness, and may help drive innovation. To evaluate oil spill response equipment and tactics under realistic conditions, BSEE should work with its interagency partners to explore whether field testing is needed and how to facilitate the necessary permitting by all applicable agencies, as has been useful in some nations (e.g. Norway and Canada). If so, tests should be performed with careful planning and approved plans and permits, and involve research institutions, academia, regulators, industry, public stakeholders and others.

BSEE Oil Spill Research

For more than 25 years, BSEE has maintained and funded a comprehensive, long-term research program to improve oil spill response technologies through the Oil Spill Response Research (OSRR) Program. The major focus of the program, which is now a responsibility of the BSEE Oil Spill Response Division, is to improve the knowledge and technologies used for the prevention, detection, control, assessment, containment, treatment, and cleanup of oil spills that may occur on the U. S. Outer Continental Shelf. The OSRR program is responsive to the information and technological needs of the Bureau's offices and to specific requirements and limitations in the BSEE authority. Information derived from the OSRR program is directly integrated into BSEE's offshore operations and is used to make regulatory decisions

pertaining to environmental impact studies, permitting, reviewing and approving plans, safety and pollution inspections, enforcement actions, and training requirements.

Continuing an effective OSRR program means that BSEE and its Federal partners each have roles in identifying and developing the best available response technologies. Response technologies identified by the OSRR program focus on preventing offshore operational spills from reaching sensitive coastal environments and habitats and reducing overall environmental impacts. BSEE has always played a critical role in driving R&D studies, and reports from these studies can be found at the following link: http://www.bsee.gov/Research-and-Training/Master-List-of-Oil-Spill-Response-Research.aspx

On 31 January 2012 BSEE issued their annual request for white papers suggesting oil spill response research focused on dispersant use impact on worker safety, the application of dispersant at a point source subsea location, increasing encounter rate for *in-situ* burn operations, mechanical technologies in Arctic conditions, remote sensing technologies, recovery of sunken *in-situ* burn residue, subsea oil spill containment and removal, surface oil containment and removal, and feasibility studies for conducting subsea dispersant research at Ohmsett. Research priorities for the current fiscal year have largely been driven by lessons learned from the Macondo well blowout response and recommendations found in the Presidential Commission report, the Incident Specific Preparedness Review, and similar internal studies that assessed the multifaceted response that took place following the blowout. After selecting promising research and receiving full proposals, BSEE is now in the process of funding many projects that will serve to advance offshore spill response. In both the selection of research topics and in the determination of project funding, BSEE considered priorities discussed during meetings of the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) and considered the merits of specific proposals while seeking joint project opportunities involving multiple agencies. This practice of interagency discussion and collaboration should be encouraged to continue.

Interagency Coordinating Committee on Oil Pollution Research (ICCOPR)

The Oil Pollution Act of 1990 (Section 7001) established the ICCOPR. The purpose of ICCOPR is to coordinate a comprehensive program of oil pollution research and technology development among the Federal agencies, in cooperation and coordination with industry, universities, academia, research institutions, state governments, and other nations, as appropriate, and to foster cost-effective research mechanisms, including the joint agency funding of this research. The Chairperson of ICCOPR is the US Coast Guard representative, who is required to submit a biennial report to Congress on activities carried out under Section 7001 in the preceding two fiscal years, and on activities proposed to be carried out in the current two fiscal year period. The 14 members of ICCOPR are:

- U.S. Coast Guard (USCG)
- Bureau of Safety and Environmental Enforcement (BSEE)
- Bureau of Ocean Energy Management (BOEM)
- National Oceanic and Atmospheric Administration (NOAA)
- Environmental Protection Agency (EPA)
- National Institute of Standards and Technology (NIST)
- Department of Energy (DOE)
- U.S. Fish and Wildlife Service (USFWS)
- Maritime Administration (MARAD)
- Pipeline and Hazardous Materials Safety Administration (PHMSA)
- U.S. Corps of Engineers (COE)

- US Navy (USN)
- National Aeronautics and Space Administration (NASA)
- Federal Emergency Management Agency (FEMA) – US Fire Administration (USFA)

The Subcommittee believes that ICCOPR is the right group to establish national oil spill R&D priorities for the Federal Government that are consistent with each agency's mission and regulatory authority. The ICCOPR has recently updated their charter to reaffirm membership and commitment to national coordination of research initiatives. In this charter revision, BSEE will now serve as Vice Chair on a rotating basis with NOAA and EPA. The ICCOPR is also updating its existing Oil Pollution Research and Technology Plan and expects it to be finished in fiscal year 2013. The ICCOPR website and additional information can be found at:
http://www.iccopr.uscg.gov/apex/f?p=118:20:1030918118532892

Ohmsett Facility

The Ohmsett facility is a unique oil spill response research and renewable energy test facility located on the U.S. Naval Weapons Station Earle, in Leonardo, New Jersey. It is the only facility in the world that allows for the full-scale testing, training, and research with oil, in a controlled, simulated at-sea environment. The facility is critical to oil spill response technology development in the U.S.. Ohmsett is a government owned, contractor operated facility, and is available for use by State, Federal, and foreign government agencies, industry and academia. As part of its mandate to ensure that the best and safest technologies are used in offshore oil and gas operations, BSEE operates the 2.6-million gallon test tank for two essential functions related to oil spill response planning: 1) responder training and 2) full-scale equipment and chemical testing. Without Ohmsett, the testing and evaluation of equipment, systems and methodologies, as well as responder training would have to be conducted during actual oil spills, where conditions cannot be repeated and where such training would interfere with response operations.

Ohmsett provides a controlled environment for both warm- and cold-water testing and training, including the ability to simulate realistic broken ice conditions in the tank. This capability allows Ohmsett to remain operational year round, offering testing and training during the winter months. Over the past ten years, Ohmsett has become a world leader in realistic dispersant effectiveness testing. Large-tank dispersant experiments conducted at Ohmsett provide a critical link between small-scale laboratory and open-water experiments because they can simulate real-world conditions without the permitting problems or the cost of a field release. Recent testing and research activities include submerged oil detection and recovery experiments, testing of chemical herders to improve response countermeasures, *in-situ* burning, and verification of oil spill remote sensing and measurement systems.

Ohmsett is an ideal venue for training oil spill first responders in the deployment and operation of oil spill equipment and systems. Training emphasizes classroom exercises and practical hands-on use of oil spill equipment under realistic conditions. Hands-on exercises are conducted with real oil in a simulated at-sea environment. Ohmsett's training expertise allows participants to increase their recovery proficiency while receiving state-of-the-art training. Because of this, the USCG National Strike Force holds 3 to 4 training classes per year at Ohmsett. Training programs can be tailored to meet client's specific needs. In addition to the annual USCG oil spill response training and industry sponsored classes, BSEE has taught a Spanish language responder training class and a hands-on operational chemical dispersant training class.

Funding for the BSEE OSRR program, and operation and maintenance of Ohmsett are appropriated from the Oil Spill Liability Trust Fund (OSLTF). The OSLTF receives funds from a tax on each barrel of oil produced or imported into or out of the U.S.. As intended by the Oil Pollution Act of 1990, companies that produce and transport oil are directly supporting research to improve oil spill response capabilities. However, additional funding for operations, maintenance, and upgrades are required to ensure that Ohmsett continues to be the country's premier oil-spill response testing facility and that it can accommodate emerging technologies under a wider range of operating conditions.

Specific Recommendations

To increase the effectiveness of the research, testing, training and coordination activities discussed above, the Response Subcommittee makes the following specific recommendations:

1. That DOI support continued and dedicated R&D funding from the OSLTF as a Department priority to support oil spill response research, including Ohmsett. DOI should maintain the Ohmsett facility under direction of BSEE's Oil Spill Response Division. Additionally, BSEE should work with the Department to secure long-term research funding, develop a strategic plan to address various OCS operating conditions including those encountered in deepwater and in the Arctic, and upgrade the Ohmsett facility to support testing of new and improved oil spill response technologies.

2. That DOI support ICCOPR as the Federal coordinating body for oil spill research. BSEE should keep ICCOPR appraised of oil spill response R&D as intended under OPA 90 (rather than as part of the Ocean Energy Safety Institute or other entity) as the primary means to leverage the efforts of other Federal agencies engaged in similar research affecting offshore oil spill response. BSEE should also coordinate with ICCOPR to facilitate and better incorporate the knowledge from state and local agencies, academia, and industry into oil spill response R&D projects.

3. The United States Geological Survey (USGS) is not a member of ICCOPR but has research programs and interests relevant to the activities of this committee. It is recommended that USGS attend ICCOPR meetings and if supported by DOI apply to the committee for ad hoc or permanent membership.

4. BSEE should continue to work with its interagency partners to develop a process to evaluate selected oil spill response equipment and tactics under realistic conditions and utilize this information to inform planning tools and requirements, and regulatory changes. Complementing this effort would include completing the BSEE/USCG co-funded study on improving the planning standards for mechanical recovery equipment, or effective daily recovery capacity (EDRC), and publishing new regulations that implement improved response planning standards. These improved standards would: 1) provide a more realistic measure of a skimming system's potential to recover oil, and 2) create incentives to improve the effectiveness of removal equipment by providing credit for innovations that result in greater oil recovery in planned offshore spill conditions.

5. DOI should explore the use of periodically reviewed performance-based standards to spur innovation in oil spill response technology and ensure utilization of best available technology. BSEE should consult with interagency stakeholders during development to ensure consistency of such standards.

6. BSEE should continue to play a strong role in leading and supporting oil spill response research and technology development, both nationally and internationally. This pertains to all aspects of oil spill planning, preparedness and response related to offshore exploration, production, and development,

and includes technology R&D related to mechanical recovery equipment and systems, *in-situ* burning, dispersants, cold weather and ice response, remote sensing technologies, etc.

7. In compliance with statutory and permitting requirements, BSEE should work with federal partners and relevant authorities to encourage and facilitate controlled experimental releases of oil that benefit offshore spill response R&D and equipment testing. This would include coordination with the Regional Response Teams (RRTs) in the proposed areas of release. BSEE should also consider the possibility of international cooperation in this area, as the U.S. has participated and been invited to participate in controlled experimental releases in other countries such as Norway.

General Recommendation

The Subcommittee will continue to evaluate whether this vector should continue if the OESC is continued by DOI and BSEE. If continued it is recommended that if approved by the OESC and accepted by BSEE, that future meetings occur between the Response Subcommittee and the designated implementation staff of DOI/BSEE, plus the USCG, EPA, NOAA, USFWS and other agencies as needed. These meetings would help focus future recommendations by allowing all groups to discuss methods and opportunities for improved, innovative oil spill response research, testing and training at Ohmsett and elsewhere. The Subcommittee feels strongly that while OESC can bring a diverse set of backgrounds (academia, non-profit, industry and government) that work should not duplicate other entities such as the Spill Advisory Group (SAG) or ICCOPR.

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APPENDIX 2

Response Subcommittee Vector 2

Oil Spill Planning, Preparedness, and Response in the Arctic OCS

Oil and gas potential is significant in Arctic Alaska, with renewed interest in oil and gas exploration and production in the Beaufort and Chukchi seas of the Alaska Outer Continental Shelf (OCS). Beyond petroleum potential, this region also supports significant fish and wildlife resources and ecosystems, with indigenous people who rely on these resources for subsistence, and who follow cultural traditions dating back thousands of years.

A key concern about development of oil and gas resources in the Arctic OCS is the need to ensure that scientific understanding and technological capability are sufficient for reliable oil-spill risk assessment, preparedness, and response under difficult environmental conditions with limited local infrastructure. Although there have been recent advances in oil-spill risk assessments in the Arctic OCS, scientific and technological challenges remain in a number of areas.

Challenging conditions in the Arctic Ocean require fit-for-purpose technological response and regulatory approaches. These include technologies for detecting, monitoring, and tracking oil around and under ice, and the efficacy of oil spill countermeasures such as mechanical recovery (e.g., skimmers), in-situ burning, bioremediation, and the use of chemical dispersants in Arctic waters. There is potential for severe weather year round including high winds, dense fog, sea ice and freezing temperatures, which have the potential to cause operational difficulties during response activities. The near shore environment is shallow and Native communities rely in large part on these coastal waters for their way of life. In addition, the Arctic coastline is remote and lacks basic infrastructure. Equipment cannot easily be brought in to most areas, which requires operators to properly design their oil spill response programs to account for accessibility and prompt delivery of equipment and personnel.

BSEE regulations as written do not specifically address Arctic operating conditions. Instead, BSEE has put in place a new national Notice to Lessees (NTL) as an interim measure designed in part to improve spill response strategies. However, to codify these actions and ensure full system readiness for Arctic OCS exploration and production, the Response Subcommittee recommends that DOI develop and adopt spill response standards specifically for the Arctic OCS.

In addition to drawing on the knowledge of subcommittee members, there were a number of sources that were reviewed and analyzed in coming up with recommendations. These include:

U.S. Coast Guard's (USCG) Incident Specific Preparedness Review;
National Oil Spill Commission's report;
National Energy Board review for offshore drilling in the Canadian Arctic;
USGS Circular 1370, Report on Science Support in the Arctic.

This Subcommittee originally intended to assess the state-of-the-art in Arctic oil spill risk assessment, preparedness, and response. However, after further review and considering the rapidly evolving nature of oil spill response research and techniques relevant to Arctic waters, the Subcommittee agreed to

narrow the scope and focus its recommendations on the regulatory aspects of exploration and production, as described below.

Specific Recommendations

1. BSEE should evaluate the need for Arctic oil spill equipment deployment exercise(s) prior to beginning operations.

2. BSEE should establish a formalized process with a fixed timeline for interagency review of Arctic Oil Spill Response Plans (OSRPs).

3. BSEE and BOEM should work with other agencies and stakeholders to increase their engagement in developing the Arctic Subarea Contingency Plans. BSEE should ensure that Arctic OSRPs are consistent with this Subarea Plan.

4. Once an OSRP is approved, BSEE should make the plan (or parts of the plan) publicly available.

5. BSEE should work with the U.S. Coast Guard, Environmental Protection Agency, Pipeline and Hazardous Materials Safety Administration, and other stakeholders to review the adequacy of the current OSRO (Oil Spill Removal Organization) construct for use in the Arctic environment.

6. BSEE and BOEM should review existing OSRP and permitting regulations, determine their adequacy for U.S. offshore Arctic environments, for exploration and production and revise as appropriate to respond effectively to a worst-case discharge. In particular, the OSRP and permitting regulations and associated approvals should address at least the following elements:

    a. Seasonal drilling limitations that consider the timing and adequacy of oil spill response operations, given available technologies and the type of drilling operation.
    b. Prompt deployment of response equipment and adequately trained personnel.
    c. Ice capable equipment appropriate for expected conditions.
    d. Adequate strategies and equipment to protect important ecological and subsistence areas.

Other Issue

The subcommittee could not come to consensus on the issue of whether BSEE should provide a public review process for Arctic OSRPs prior to approval.

General Recommendation

This vector should continue if the OESC is continued by DOI and BSEE. As Arctic challenges have implications in all other subcommittee work, this topic should be discussed with the entire Committee and whether arctic should be vectors under the Response and other existing Subcommittees or should be separate as a new stand-alone Subcommittee.

DRAFT

APPENDIX 3

Response Subcommittee Vector 3: Interagency coordination on Oil Spill Response Issues

The National Contingency Plan outlines a framework for federal and state agencies to work with other organizations (e.g., industry committees) that are involved with oil spill planning, preparedness (including training and exercises), and response through the National Response Team (NRT), Regional Response Teams (RRT), and Area Committees. Other government and industry committees (e.g., Interagency Coordinating Committee for Oil Pollution Research - ICCOPR, American Petroleum Institute Spills Advisory Group, Interagency Arctic Research Policy Committee) provide additional avenues for public/private interactions. Although the Bureau of Safety and Environmental Enforcement (BSEE) has primary responsibility for establishing and verifying compliance with offshore oil spill planning and preparedness requirements, they are not represented on some of the interagency and agency/industry committees. Additionally, there are other bureaus of the U.S. Department of the Interior (DOI), such as the U.S. Geological Survey (USGS), that demonstrated expertise during the Macondo spill that could be of value for future oil spill planning, preparedness, and response. Although DOI has multiple functions with respect to the interagency process, including trustee responsibilities, regulatory enforcement, licensing, scientific/applied research, and planning and preparedness for offshore response, these functions have not been fully represented in interagency deliberations.

From this background, the Response Subcommittee developed a list of organizations that were involved with oil spill response and analyzed the mandates, membership and function of these groups. The Subcommittee then determined if DOI and/or BSEE participated in these organizations in any way. Finally the Subcommittee looked at the Bureaus and Offices within the DOI and the interface they have with spill response. To best visualize this effort the Subcommittee developed a spreadsheet (Appendix 4) dividing the groups into categories (International, National, Regional, Industry and DOI Bureaus and Offices) describing the mandate or mission, lead agency and participation. This spreadsheet only documents existing activity and does not include recommendations. The recommendations based on this matrix are found below. These recommendations take into account how DOI should engage with these groups in the future to best meet their needs in preparing for and responding to offshore releases, taking steps to ensure that the viewpoints of agencies such as BSEE, Bureau of Ocean Energy Management (BOEM), USGS, and U.S. Fish and Wildlife Service (USFWS) are adequately represented.

Additionally, the Subcommittee looked at how DOI Bureaus and Offices shared information on spill response. This is key not only during a spill response but also in advance of an event, when planning and preparedness activities may be known to only a small subset of interested parties within DOI. These preparatory activities include such things as ongoing research on the efficacy of specific oil-spill response/cleanup tactics, a pending decision (for example preauthorization of dispersants), a joint industry project, an international agreement or an upcoming exercise. The Spill Response Subcommittee is not aware of a single entity within DOI that exists solely to coordinate oil spill response planning and preparedness functions across all DOI bureaus and agreed that a better job could be done of sharing this type of information. However, there are multiple groups within DOI that serve coordinating roles in planning for or responding to spills and other emergencies once they occur, some of which might be expanded to facilitate such pre-event coordination. For example, DOI has an Emergency Operations Center (EOC) that is the hub for orchestrating a coordinated Department response to an emergency such as a major oil spill. During DWH, the center held daily conference calls with all DOI Bureaus working

on the response and got daily reports from each Point of Contact on key activities. It also served as a location for Bureau staff working directly on the response. However, the EOC does not routinely exchange information between the various DOI Bureaus and Offices related to spill planning and preparedness, as outlined in Appendix 4. There was also some confusion within certain Bureaus on what and how they relayed information to the EOC during a spill; BSEE's Oil Spill Program understands the role of the EOC in oil spills but other Bureaus do not seem to be in the same position. There is also the DOI Emergency Management Council, which meets monthly and on which all Bureaus have leads and alternates. This may be the appropriate group to bring emergency coordination questions to, even if they relate to offshore oil spills, but these meetings may not be the best forum for a single DOI representative to routinely give and receive information on behalf of their Bureau. DOI recently formed the Strategic Sciences Group, which is less a coordination mechanism and more a rapid-response advisory group/think tank. There are also existing coordination mechanisms within DOI that are focused on the Natural Resources Damage Assessment (NRDA) process, for example through the DOI Office of Environmental Policy and Compliance, but this is different from response. While the Subcommittee does not necessarily favor establishment of another internal DOI group, the need to receive and transmit information to the appropriate DOI Bureaus, Offices and individuals is critical.

Specific Recommendations

To improve interagency coordination in oil spill response, the Response Subcommittee makes the following specific recommendations:

1. That DOI continue its participation with groups listed in Appendix 4. For groups in which BSEE is currently the lead for DOI, BSEE's Oil Spill Program should be the focal point for this participation.

2. That BSEE attend National Response Team (NRT) meetings and request to participate in NRT subcommittee work related to offshore response. BSEE should also work with the mandated DOI representative to the NRT (Office of the Secretary) to ensure that the NRT as a body adequately addresses the challenges related to offshore response.

3. That BSEE and BOEM regularly attend Regional Response Team (RRT) meetings in areas where they have interest (i.e., regions with offshore exploration and production) to ensure that regional and area contingency planning, preparedness and response are addressed appropriately. In these regions, BSEE and BOEM should meet with the current DOI representative to the RRT to ensure that all DOI equities are represented at the meetings. This is critical as the RRT has certain responsibilities under existing regulations, including using dispersants as an alternative response measure.

4. Because of their trustee role the USFWS usually represents DOI at the RRT. USFWS should ensure that the views and mandates of BSEE and other DOI Bureaus are represented adequately during all RRT discussions. This is especially important in areas such as cascading of response equipment, offshore logistics, use of subsurface dispersants, containment and protection strategies, as other DOI Bureaus such as BSEE, BOEM, NPS, USGS and IA manage federal land, determine lease sites, approve oil spill response plans and bring significant experience and expertise to spill response.

5. That DOI continue to coordinate and engage with the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) to maximize investment of oil spill research dollars. We

further recommend that the USGS attend ICCOPR meetings and determine if they want to petition to become a permanent member. Currently, the only DOI Bureaus represented on ICCOPR are BSEE, BOEM and USFWS. (See discussion in Appendix 4.)

6. That DOI and its Bureaus continue to monitor activities of the international organizations in which they are currently engaged (Appendix 4), especially in the Arctic to ensure that BSEE's regulations and policy related to planning, preparedness and response can adapt to new information that will be obtained as Arctic oil exploration increases around the world. BSEE Oil Spill Response Division should be the focal point for this participation.

7. That DOI determine the best way to pass information between Bureaus on spill response planning and preparedness. The DOI Emergency Operations Center and Emergency Management Council fill critical roles in preparing for and responding to spills at a high level, but do not provide the detailed, ongoing information exchange between Bureaus that is necessary to take maximum advantage of DOI expertise and activities in spill response planning and preparedness. Two possible means for implementing this increased communication are:

    a. DOI identify an "oil spill group" consisting of one person per Bureau or Office who would serve as the single point of contact to represent that agency. These representatives would be responsible for receiving and passing information related to spill response expertise and activities either through an identified DOI representative (e.g., from BSEE's Oil Spill Response Program) or as part of regular meetings (e.g., a subcommittee to the Emergency Management Council, using face-to-face or electronic meetings). This person would not have to be the subject matter expert for all activities related to oil spills but would be responsible for bringing the appropriate assets of their Bureau to oil spill planning, preparedness, response and restoration.

    b. Develop a virtual "oil spill forum" that would include individuals throughout DOI with an interest and responsibility in spill response. Through such an interactive on-line forum, members could post information and exchange ideas related to spill-related expertise and activities.

General Recommendation

The Subcommittee recommends that this vector not continue if the OESC is continued by DOI and BSEE. With the current recommendations and information provided in Appendix 4, DOI should be able to continually evaluate and grow their participation in spill response organizations (existing and new) and continue to improve their ability to transmit information between Bureaus.

Appendix 4 (Vector 3 Cont.) - Interagency Coordination Matrix

REGIONAL

	NAME	WEBSITE	MANDATE or MISSION	LEAD	MANDATED COMPOSITION (US AGENCIES ONLY)	OTHER AGENCY PARTICIPATION	DOI's CURRENT ROLE AND ENGAGEMENT
AC	Arctic Council - Emergency Prevention Preparedness and Response Working Group	eppr.arctic-council.org	The EPPR Working Group was established under the Arctic Environmental Protection Strategy (AEPS) in 1991. One of five working groups of the Arctic Council, which was established in 1996 to foster international co-operation on environmental protection and sustainable development in the Arctic. EPPR reports to the Arctic Council and Ministers through Senior Arctic Officials (SAOs). The EPPR Working Group receives its direction from Ministerial meetings held every two years.	DOS	USCG, BSEE, EPA, NOAA	As needed for special topics	BSEE as advisor to U.S. representative to Council
	Arctic Council - Protection of Arctic Marine Environment Working Group	www.pame.is	The Protection of the Arctic Marine Environment Working Group (PAME) is one of six Arctic Council working groups. PAME is the focal point of the Arctic Council's activities related to the protection and sustainable use of the arctic marine environment.	DOS	USCG, BSEE, EPA, NOAA	As needed for special topics	BSEE as advisor to U.S. representative to Council
	Arctic Council - Marine Oil Pollution Preparedness and Response Taskforce	eppr.arctic-council.org	The Emergency Prevention, Preparedness and Response Working Group (EPPR) addresses various aspects of prevention, preparedness and response to environmental emergencies in the Arctic. Members of the Working Group exchange information on best practices and conduct projects to include development of guidance and risk assessment methodologies, response exercises, and training. The goal of the EPPR Working Group is to contribute to the protection of the Arctic environment from the threat or impact that may result from an accidental release of pollutants or radionuclides. In addition, the Working Group considers questions related to the consequences of natural disasters.	DOS	USCG, BSEE, EPA, NOAA	As needed for special topics	BSEE/OSRD serve as member of U.S. delegation representing DOI bureaus
	Cook Inlet Regional Citizens' Advisory Council (CIRCAC) - Oil Spill Prevention and Response (OSPR) Committee	www.circac.org	Cook Inlet RCAC is an independent non-profit corporation guided by its mission: OPA 90 directs the Council in its efforts to improved marine transportation and oil facility operations and mandates action to that end. COOK INLET RCAC must provide advice and recommendations on policies, permits and site-specific regulations for terminal and tanker operations and maintenance; monitor environmental impacts of the operation of terminals and tankers; monitor terminals and tanker operations and maintenance that may affect the environment near terminals; review the adequacy of oil-spill prevention and contingency plans for terminals and tankers; provide advice and recommendations on port operations, policies and practices; and review standards for tankers bound for, loading at, or exiting from oil terminals among other duties. Congress envisioned this council and the PWSRCAC as a mechanism to foster long-term partnerships between industry, government, and the coastal communities of Alaska.	USCG assesses RCAC for compliance with OPA 90	The Oil Pollution Act of 1990 includes a provision calling for an annual review of Cook Inlet RCAC's activities by the United States Coast Guard (USCG). The recertification process is designed to insure that Cook Inlet RCAC is meeting the mandates spelled out in OPA 90 and is representing the interests of the communities within the vicinity of the terminal operations.	Ex Officio members include: USCG, USFS, EPA, NOAA, BLM, BSEE	DOI and BSEE through RCAC comments on planning and regulation related to their mandates
	Exxon Valdez Oil Spill Trustee Council	www.evostc.state.ak.us/	Oversees restoration of the injured ecosystem through the use of the $900 million civil settlement. The Council consists of three state and three federal trustees (or their designees). The Council is advised by members of the public and by members of the scientific community.			NOAA, DOI, USDA/USFS	DOI
	Interagency Arctic Research Policy Committee (IARPC)	www.nsf.gov/od/opp/arctic/iarpc/start.jsp	To survey Arctic research conducted by Federal State, and local agencies, universities, and other public and private institutions to help determine priorities for future Arctic research, including natural resources and materials, physical and biological sciences, and social and behavioral sciences. (Established by the Arctic Research Policy Act of 1984)	NSF	DOC, DOD, DOE, DOI, DOS, DOT, DHHS, NASA, EPA		DOI
	Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska	http://www.doi.gov/alaskaen	The Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska was established by Executive Order 13580, to coordinate the efforts of Federal agencies responsible for overseeing the safe and responsible development of onshore and offshore energy in Alaska.	DOI	DOD (Army Civil Works), DOC (NOAA), USDA, DOE, DHS (USCG), EPA, Federal Coordinator for Alaska Natural Gas Transportation Projects. EOP is represented through the Domestic Policy Council, CEQ, OSTP, OMB and NSS.		
	National Research Council Study on Responding to Oil Spills in Arctic Environments	http://dels.nas.edu/osb	The Ocean Studies Board of the U.S. National Research Council is soliciting nominations for individuals to serve on its new study committee on Responding to Oil Spills in Arctic Environments, co-led by the Polar Research Board and Transportation Research Board. This study is sponsored by API, the Arctic Research Commission, BOEM, BSEE, Marine Mammal Commission, NOAA, OSRI, the State of Alaska and U.S. Coast Guard. This study will assess the current state of the science regarding oil spill response and environmental assessment in the Arctic region (with a specific focus on the regions north of the Bering Strait), with emphasis on potential impacts in U.S. waters.	National Academies	None	NOAA and USCG are sponsors	BOEM and BSEE are sponsors
	North Pacific Research Board	www.nprb.org/about/board.html	A government, industry and academic board to recommend marine research initiatives to the U.S. Secretary of Commerce, who makes final funding decisions. Designated by Congress.	North Pacific Fishery Management Council (Chair)	NOAA (Executive Committee)	USARC, USGS, USCG (Member)	USGS
	North Slope Science Initiative (NSSI)	www.northslope.org	Developed by federal, state and local governments with trustee responsibilities for land and ocean management, to facilitate and improve collection and dissemination of ecosystem information pertaining to the Alaska North Slope region, including coastal and offshore regions.	BLM	Oversight Group (voting privileges): BLM, FWS, NPS, NOAA, BOEM.	Scientific Advisors to Oversight Group (non-voting): USGS, DOE, NOAA National Weather Service	BLM, NPS, BOEM, USGS
	Oil Spill Recovery Institute (OSRI)	www.pws-osri.org	The Oil Spill Recovery Institute (OSRI) was established by Congress in response to the 1989 Exxon Valdez. They were task with developing oil spill best available techniques, equipment and materials for dealing with oil spills in the Arctic and sub-Arctic marine environment. They also complement federal and state damage assessment efforts and determine, document, assess and understand the long-range effects of Arctic and sub-Arctic oil spills on the natural resources of Prince William Sound, and the environment, the economy and the lifestyle and well-being of the people who are dependent on those resources. OSRI is administered through and housed at the Prince William Sound Science Center, a non-profit research and education organization located in Cordova. The PWS Science Center facilitates and encourages ecosystem studies in the Greater Prince William Sound region.	DOI, NOAA, USCG	DOC (NOAA) chairs the advisory board. DOI and USCG are advisory board members	None	DOI is on advisory board

	Pacific States/British Columbia Oil Spill Task Force	www.oilspilltaskforce.org	To provide a forum where Task Force Members can work with stakeholders from the Western US and Canada to implement regional initiatives that protect 56,660 miles of coastline from Alaska to California and the Hawaiian archipelago.		Exec. Director selected by states on Task Force	USCG, NOAA, BSEE attend meetings	BSEE (Pacific Region)
	Prince William Sound Regional Citizens' Advisory Council (PWSRCAC) - Oil Spill Prevention and Response (OSPR) Committee	http://www.pwsrcac.org/	PWSRCAC is an independent non-profit corporation guided by its mission: citizens promoting environmentally safe operation of the Alyeska Pipeline marine terminal in Valdez and the oil tankers that use it. The Oil Spill Prevention and Response (OSPR) Committee works to minimize the risks and impacts associated with oil transportation through strong spill prevention and response measures, adequate contingency planning, and effective regulations. The council comments on and participates in monitoring and assessment of environmental, social, and economic consequences of oil-transportation activities, including comments on the design of measures to mitigate the impacts of oil spills and other environmental effects of terminal and tanker operations.	USCG assesses RCAC for compliance with OPA 90	Each year, the U.S. Coast Guard assesses whether the council fosters the general goals and purposes of the Oil Pollution Act and is broadly representative of the communities and interests as envisioned in the Act.		DOI and BSEE through RCAC comments on planning and regulation related to their mandates
	U.S. Arctic Research Commission (USARC)	www.arctic.gov	To develop and recommend an integrated national Arctic research policy. (continued in legislation)	USARC	NSF as a nonvoting member		None

Appendix 4 (Vector 3 Cont.) - Interagency Coordination Matrix

NATIONAL AND INDUSTRY

	NAME	WEBSITE	MANDATE or MISSION	LEAD	MANDATED COMPOSITION (US AGENCIES ONLY)	OTHER AGENCY PARTICIPATION	DOI's CURRENT ROLE AND ENGAGEMENT
	US National Response Team (NRT)	www.nrt.org	Under law and regulation, the NRT provides technical assistance, resources and coordination on preparedness, planning, response and recovery activities for emergencies involving hazardous substances, pollutants and contaminants, hazmat, oil, and weapons of mass destruction in natural and technological disasters and other environmental incidents of national significance.	EPA Chair, USCG Vice Chair	Dept of Agriculture, NOAA, DOD (Navy Supsalv) , DOE, DHHS, DOI, DOJ, DOL, DOT, GSA, FEMA, DOS, Nuclear Regulatory Commission	Other agencies as ad hoc	DOI (Office of the Secretary) sits on the NRT
	Regional Response Team (RRTs)	www.rrt.nrt.org	To protect public health and safety and the environment by ensuring coordinated, efficient, and effective support of the federal, state, tribal, local, and international responses to significant oil and hazardous substance incidents within the Region as mandated by law and regulation in the National Contingency Plan (NCP).	EPA & USCG Co-Chairs	Varies slightly, but usually: USDA, DOD (Navy, ACoE, Army), DOE, FEMA, GSA, DHHS, DOI, DOL (OSHA), DOC (NOAA), NRC, DOS, DOT, PHS, DOJ	Other agencies and states as ad hoc	DOI (USFWS, NPS, BLM, IA) and NOAA are the Federal trustees, with scientific input by the USGS. In areas with offshore activity BOEM/BSEE have contributed and is recognized as non-voting member
	International Oil Spill Conference (IOSC) - Executive Committee	iosc.org/charter.aspx	To promote an international exchange of information and ideas dealing with spill prevention, planning, response and restoration processes, protocols and technology. To promote international sharing of best practice as it relates to management of the varied impacts of oil spills and their aftermath.	API, BSEE, EPA, IMO, IPIECA, NOAA, USCG	Not mandated but by charter -EPA, USCG, NOAA, BSEE	API, IMO, IPIECA	BSEE represents DOI on the Executive Committee
	National Research Council - Marine Board	www.trb.org/MarineBoard/AboutMarineBoard.aspx	Serves the national interest by providing evaluations and advice concerning the ability of the nation's marine and maritime industries to operate safely and efficiently and in an environmentally responsible manner.	Sponsors: USCG, NOAA, BOEM, MARAD	None		BOEM (Sponsor)
	Ocean Energy Safety Advisory Committee (OESC)	www.boemre.gov/mmab/EnergySafety.htm	To advise the Secretary of the Interior, through the Director of the Bureau of Ocean Energy Management, Regulation and Enforcement, on a variety of issues related to offshore energy safety.	BSEE	BOEM**, BSEE**, USGS, DOE, NOAA, USCG, EPA ***When the FACA was established the Committee member came from BOEMRE. Currently that member is in BOEM but BSEE representatives support the subcommittees and provide all admin and logistical support to the FACA*		BOEM and USGS are respresented on the FACA. BSEE is represented on subcommittees.
	American Petroleum Institute (API)'s Spill Advisory Group (SAG)	www.api.org for info on API. The SAG does not have a website	The SAG is a discussion forum with industry, government and some state and private entities on spill response.	API*	None	USCG, EPA, NOAA, BSEE	BSEE
	Petroleum Environmental Research Forum (PERF)	www.perf.org	Joint industry forum to collect, exchange, and analyze information relating to practical and theoretical science and technology concerning the petroleum industry, and a mechanism to establish joint research and development projects in that field. Goal is to stimulate cooperative research and development of technology for environmental pollution control and waste treatment for the petroleum industry.	INDUSTRY	None	DOE, other agencies have attended meetings	
	Interagency Coordinating Committee for Oil Pollution Research (ICCOPR)	www.iccopr.uscg.gov/apex/f?p=118:20:1573393391937347	To coordinate a comprehensive program of oil pollution research, technology development, and demonstration among the federal agencies, in cooperation and coordination with industry, universities, research institutions, state governments, and other nations, as appropriate, and shall foster cost-effective research mechanisms, including the joint funding of the research.	USCG	DOC (NOAA, NIST), DOE, DOI (USFWS, BOEM/BSEE), DOT (MARAD, PHMSA), DOD (CoE, Navy), EPA, NASA, DHS (USCG, FEMA, USFA)	Other agencies attend meetings	USFWS, BSEE/BOEM
INDUSTRY GROUPS							
	Helix Well Containment Group	www.hwcg.org	The Helix Well Containment Group (HWCG) is a consortium of 24 deepwater operators in the Gulf of Mexico who have come together with the common goal of expanding capabilities to quickly and comprehensively respond to a subsea spill to protect employees, communities and the environment.	INDUSTRY	None	None	BSEE as interface to response community. BSEE has also been requested to sit on the HELIX advisory board.
	American Petroleum Industry CO-OP Managers (APICOM)	apicom.org	The Association of Petroleum Industry Cooperative Managers (APICOM) was founded in 1972 and is an association of unaffiliated petroleum industry oil spill cooperative managers. APICOM exists for the purpose of exchanging information related to the management of an oil spill response cooperative. It also serves as a forum for the exchange of ideas related to oil spill response technologies, operations, regulations and other issues of common interest to its members.	INDUSTRY	None	None	BSEE as interface to response community
	International Assocation of Oil and Gas Producers (*See International Section*)	www.ogp.org.uk		INDUSTRY	None	None	BSEE as interface to response community
	Marine Well Containment Company (MWCC)	www.marinewellcontainment.com	Marine Well Containment Company (MWCC) is a not-for-profit company that provides well containment equipment and technology in the U.S. Gulf of Mexico and is committed to being continuously ready to respond to a well control incident in the Gulf	INDUSTRY	None	None	BSEE as interface to response community
	Oil Spill Removal Organizations (OSROs)	Each OSRO has their own website	OSROs are organizations (companies and cooperatives) that have been established to meet industry regulations for spill response. There are a number of national and regional OSROs that provide response capability to the offshore industry such as (MSRC-Marine Spill Response Corporation, NRDC-National Response Corporation, Clean Gulf Associates, Alaska Clean Seas, Cook Inlet Spill Prevention and Response Incorporated (CISPRI), and others. Most of these OSROs are represented in SCAA or APICOM.	INDUSTRY	None	None	BSEE as interface to response community
	Spill Control Association of America (SCAA)	www.scaa-spill.org	Founded in 1973 to actively promote the interests of all groups within the spill response community, SCAA represents spill response contractors, manufacturers, distributors, consultants, instructors, government & training institutions and corporations working in the industry.	INDUSTRY	None	None	BSEE as interface to response community

** indicates non-government participant listed because of their lead or key role*

Appendix 4 (Vector 3 Cont.) - Interagency Coordination Matrix

INTERNATIONAL

	NAME	WEBSITE	MANDATE or MISSION	LEAD	MANDATED COMPOSITION (US AGENCIES ONLY)	OTHER AGENCY PARTICIPATION	DOI's CURRENT ROLE AND ENGAGEMENT
	Arctic Research Council of the United States (ARCUS), Canada - United States Northern Oil and Gas Research Forum	www.arcus.org/meetings/2010/northern-oil-and-gas-research-forum	ARCUS, a nonprofit consortium of educational and scientific institutions that have a substantial commitment to arctic research, facilitates discussion of important arctic research initiatives, produces reports with research community recommendations for arctic science priorities, and distributes information resources to the arctic research community. Among its activities, ARCUS hosts the Canada-United States Northern Oil and Gas Research Forum.	University of Alaska Fairbanks*	None	Navy on advisory board, USACE and USGS Associate members, ARCUS receives some grants from Federal agencies	USGS
	Canada-U.S. Joint Marine Pollution Contingency Plan	www.nrt.org/production/NRT/NRTWeb.nsf/PagesByLevelCat/Level2Canada?Opendocument	Provides a coordinated system for planning, preparedness and responding to harmful substance incidents in the contiguous waters.	USCG	This is an agreement between the USCG and Canadian CG. A similar agreement exists between EPA and Canada's Ministry of Environment.	NRT agencies would support the USCG FOSC.	DOI as part of NRT; DOI RRT reps (mostly F&W) covering AK, Great Lakes, Pacific and Atlantic where U.S. borders Canada
	International Assocation of Oil and Gas Producers (*also in Industry Group Section*)	www.ogp.org.uk	The International Association of Oil & Gas producers (OGP) is a unique global forum in which members identify and share best practices to achieve improvements in every aspect of health, safety, the environment, security, social responsibility, engineering and operations.	IOGP*	None	None	DOI (BSEE) as interface to response community
IMO	International Maritime Organization (IMO)	www.imo.org/About/Pages/Structure.aspx#3	To improve the safety and security of international shipping and to prevent marine pollution from ships. It is also involved in legal matters, including liability and compensation issues and the facilitation of international maritime traffic.	USCG	Selected U.S. agencies will be part of delegation. Other agency input is solicited on international issues that will be brought up in IMO forums.	NOAA, DOS, DOD, DHS, EPA, DOJ, NTSB, MARAD, DOI, DOT	IMO definition of ship includes offshore facilities - fixed and floating. DOI (BSEE) provides the U.S. delegation technical support on offshore facilities.
	IMO - Marine Environment Protection Committee (MEPC)	www.imo.org/About/Pages/Structure.aspx#3	To consider any matter within the scope of the IMO concerned with prevention and control of pollution from ships. In particular it is concerned with the adoption and amendment of conventions and other regulations and measures to ensure their enforcement.	USCG	Selected U.S. agencies will be part of delegation. Other agency input is solicited on international issues that will be brought up in IMO forums.	NOAA, DOS	DOI (BSEE) provides the U.S. delegation technical support on MEPC issues related to offshore facilities.
	IMO - Maritime Safety Committee	www.imo.org/About/Pages/Structure.aspx#3	To consider any matter within the scope of the IMO concerned with aids to navigation, construction and equipment of vessels, manning from a safety standpoint, rules for the prevention of collisions, handling of dangerous cargoes, maritime safety procedures and requirements, hydrographic information, log-books and navigational records, marine casualty investigations, salvage and rescue and any other matters directly affecting maritime safety.	USCG	Selected U.S. agencies will be part of delegation. Other agency input is solicited on international issues that will be brought up in IMO forums.	NOAA, DOS	DOI (BSEE) provides the U.S. delegation technical support on MEPC issues related to offshore facility safety.
	IMO - Facilitation Committee	www.imo.org/About/Pages/Structure.aspx#3	To ensure that the right balance is struck between maritime security and the facilitation of international maritime trade.	USCG	Selected U.S. agencies will be part of delegation. Other agency input is solicited on international issues that will be brought up in IMO forums.	DOS	None
	IMO - Technical Cooperation Committee	www.imo.org/About/Pages/Structure.aspx#3	To consider any matter within the scope of the IMO concerned with the implementation of technical co-operation projects for which the Organization acts as the executing or co-operating agency and any other matters related to the IMO's activities in the technical co-operation field.	USCG	Selected U.S. agencies will be part of delegation. Other agency input is solicited on international issues that will be brought up in IMO forums.	DOS, NOAA	None
	IMO - Legal Committee	www.imo.org/About/Pages/Structure.aspx#3	To deal with any legal matters within the scope of the IMO.	USCG	Selected U.S. agencies will be part of delegation. Other agency input is solicited on international issues that will be brought up in IMO forums.	NOAA, DOS	None
	International Tanker Owners Pollution Federation (ITOPF)	www.itopf.com/about	ITOPF offers a broad range of technical services to its Members and Associates, their pollution insurers and other groups around the world concerned with marine spills. These services include: Response to spills, Damage assessment, Contingency planning & advisory work, Training & education, Information	ITOPF*	None	NOAA has a MOU with International Group of P&I Clubs for NRDA	
	Interspill Steering Committee	www.interspill.org	Committee is concerned with marine pollution prevention, preparedness, response and restoration in Europe.	European Oil Spill Industry, IPIECA, European Maritime Safety Agency*	No U.S. Agencies, however USCG, NOAA, BSEE and EPA meet with interspill as part of tri-conference agreement.	None	DOI (BSEE) is on the Executive Committee of the IOSC and respresents this group as part of the Triconference agreement with Interspill and Spillcon
	International Petroleum Industry Environmental Conservation Association (IPIECA)	www.ipieca.org/vision-mission-and-membership-commitment	IPIECA's mission is developing, sharing and promoting sound practices and solutions; Enhancing and communicating knowledge and understanding; Engaging members and others in the industry; Working in partnership with key stakeholders	IPIECA*	None		DOI (BSEE) interfaces with this group on offshore related issues.
	Joint Industry Program - SINTEF	www.sintef.no/Projectweb/JIP-Oil-In-Ice/Program-overview	To develop knowledge, tools and technologies for environmentally beneficial oil spill response strategies for ice-covered waters.	SINTEF*	None	BSEE	DOI (BSEE) interfaces with this group on offshore related issues.

	NAME	WEBSITE	MANDATE or MISSION	LEAD	MANDATED COMPOSITION (US AGENCIES ONLY)	OTHER AGENCY PARTICIPATION	DOI's CURRENT ROLE AND ENGAGEMENT
JIPs	Joint Industry Task Force on Oil Spill Response (JITF)		JITF evaluates procedures and lessons learned during the Deepwater Horizon (DWH) oil spill response with the focus being to identify potential opportunities for improvement to the oil spill response system in the areas of planning and coordination, optimization of each response tool, research and development (R&D), technology advancement and training/education of all parties preparing for or responding to an oil spill.	API*	None	BSEE, USCG, NOAA, EPA	DOI (BSEE) interfaces with this group on offshore related issues abd has been briefed on the four task forces (Operating procedures, subsea well control and containment, offshore equipment and oil spill preparedness and response.
	Joint Industry Program - International Oil and Gas Producers (OGP)	www.ogp.org.uk/news/industry-programme-to-strengthen-arctic	To further enhance industry knowledge and capabilities in the area of Arctic oil spill response to advance dispersant effectiveness and environmental effects, in-situ burning, mechanical recovery and remote sensing	IOGP*	None	BSEE, USCG, NOAA	DOI (BSEE) interfaces with this group on offshore related issues abd has been briefed on the four task forces (Operating procedures, subsea well control and containment, offshore equipment and oil spill preparedness and response.
	Panama Canal International Coordination with the NRT	www.nrt.org/production/NRT/NRTWeb.nsf/PagesByLevelCat/Level2Panama?Opendocument	MOA between PCA (Panama Canal Authority) and NRT to facilitate international support to significant spills.	USCG/EPA	Through an agreement between the NRT and Panama Canal Authority (PCA) the NRT will provide spill support. The NRT has provided modeling, training and participated in exercises.	NRT agencies would support thePCA per agreement.	DOI (PMB, Office of Environmental Policy and Compliance) as part of NRT
	U.S. Mexico Joint Contingency Plan	www.nrt.org/production/NRT/NRTWeb.nsf/PagesByLevelCat/Level2Mexico?Opendocument	Provides a mechanism for cooperation between the U.S. and Mexico in response to a polluting incident that may pose a significant threat to both parties.	USCG	This is an agreement between the USCG and Mexico with annexes for both the Gulf of Mexico and Pacific Ocean.	NRT agencies would support the USCG FOSC.	DOI as part of NRT; DOI RRT reps covering Pacific and Atlantic where U.S. borders Mexico
	World Petroleum Council	www.world-petroleum.org/index.php?/Constitution/constitution.html	The principal purpose of the WPC is to promote the management, sustainable supply and use of the world's oil and gas resources for the benefit of mankind. It aims to encourage the application of scientific and technological advances and the study of economic, financial, management, environmental and social issues relating to the petroleum industry for the benefit of all, through taking into account the needs of both present and future generations.	API*	None	USGS	USGS

** indicates non-government participant listed because of their lead or key role*

Appendix 4 (Vector 3 Cont.) - Interagency Coordination Matrix

DOI BUREAUS AND INTERNAL SPILL RESPONSE GROUPS

	NAME	WEBSITE	MANDATE or MISSION
	Bureau of Land Management (BLM)	www.blm.gov/wo/st/en.html	The Hazard Management and Resource Restoration (HMRR) Program commonly known as Hazardous Materials Management (HAZMAT) supports the DOI's goals by protecting lives, resources and property, and improving the health of landscapes and watersheds. This group has responsibility for hazardous material response and Natural Resource Damage Assessment on BLM lands.
	Bureau of Ocean Energy Management (BOEM)	www.boem.gov	BOEM assess the potential environmental impacts from exploring and extracting resources. For oil and gas development, these efforts begin with the preparation of a Programmatic Environmental Impact Statement in support of the 5-year OCS Leasing Program. After the Secretary has decided on the size, timing, and location of lease sales for the 5-year period, lease sale specific EISs are prepared. The bureau assesses oil-spill risks associated with offshore energy activities off the U.S. continental coast and Alaska by calculating spill trajectories and contact probabilities.
	Bureau of Safety and Environmental Enforcement (BSEE)	www.bsee.gov	BSEE works to promote safety, protect the environment, and conserve resources offshore through vigorous regulatory oversight and enforcement. The Oil Spill Response division is responsible for developing standards and guidelines for offshore operators' Oil Spill Response Plans through internal and external reviews of industry OSRPs to ensure compliance with regulatory requirements and coordination of oil spill drill activities. The Oil Spill Response division also plays a critical role in the review and creation of policy, guidance, direction and oversight of activities related to BSEE's oil spill response. The division oversees the Unannounced Oil Spill Drill program and works closely with sister agencies such as USCG and EPA to continually enhance response technologies and capabilities.
	DOI Office of Emergency Management	www.doi.gov/emergency/index.cfm	The Office of Emergency Management establishes and disseminates policy and coordinates the development of bureau and office programs for an integrated and comprehensive program which spans the continuum of prevention, planning, response, and recovery. The program encompasses all types of hazards and emergencies that impact Federal lands, facilities, infrastructure, and resources; Tribal lands and Insular Areas; the ability of the Department to execute essential functions; and for which assistance is provided to other units of government under Federal laws, Executive Orders, interagency emergency response plans such as the National Response Framework, and other agreements.
	DOI Strategic Sciences Group (SSG)	www.doi.gov/news/pressreleases/loader.cfm?csModule=security/getfile&pageid=274267	SSG is intended to ensure that preparedness, response and recovery efforts by the department and its bureaus will utilize the best available science and lessons learned from past events, including the Deepwater Horizon oil spill and Hurricane Katrina. Leads are NPS and USGS.
	Indian Affairs (IA)	www.bia.gov	IA provides services (directly or through contracts, grants, or compacts) to approximately 1.9 million American Indians and Alaska Natives. American Indians and Alaska Natives are trustees for their lands.
	National Park Service (NPS)	www.nps.gov	The Associate Director for Natural Resources, Stewardship and Science has responsibility for Natural Resource Damage Assessment. Damage assessment and restoration within NPS involves providing guidance for the appropriate and consistent application of Federal damage assessment and restoration statutes (including the Park System Resource Protection Act), and coordinating and managing NPS damage assessment and restoration activities. National parks can and will assist with response within the parks themselves. During the Deepwater Horizon spill biologists, ecologists, and archeologists from those parks helped identify the most sensitive areas of coastline so the USCG could put protective measures in place such as absorbent boom and protection for nesting sea turtles and colonial seabirds.
	Office of Insular Affairs	http://www.doi.gov/oia/index.cfm	The Secretary of the Interior has administrative responsibility for coordinating federal policy in the territories of American Samoa, Guam, the U.S. Virgin Islands, and the Commonwealth of the Northern Mariana Islands, and the responsibility to administer and oversee U.S. federal assistance provided to the Freely Associated States of the Federated States of Micronesia, the Republic of the Marshall Islands, and the Republic of Palau under the Compacts of Free Association.
	U.S. Fish and Wildlife Service (FWS)	www.fws.gov	FWS personnel respond to spills of hazardous materials to provide scientific and technical advice relative to impacts on fish and wildlife and the environment. FWS maintains expertise in mitigating the effects of oil spills and hazardous materials. FWS is the primary trustee for DOI in Natural Resource Damage Assessments. FWS is also the DOI representative on most of the Regional Response Teams.
	U.S. Geological Survey (USGS)	www.usgs.gov	USGS is a scientific research agency within the Department of the Interior, providing impartial information on environmental health, ecosystem function, natural hazards, energy, mineral and water resources, and climate and land-use change. USGS supports the science needs of all DOI bureaus, as well as other federal, state and local agencies. USGS personnel assisted with the DWH response by providing real-time geographic information systems, leading flow-rate estimation efforts, conducting studies of the transport, fate and environmental impact of residual oil and dispersants, and providing scientific data and analyses in support of the NRDA and Gulf Coast Ecosystems Restoration Task Force.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
APPENDIX C – OIL SPILL CONTAINMENT SUBCOMMITTEE

- **Subcommittee Summary Report**

- **Membership**

- **White Papers**

    - Interim Report of the Containment Subcommittee to the Ocean Energy Safety Advisory Committee (April 26, 2012)

    - Recommendation: Workshop on Organizational and Systems Readiness for Containment Response – Supplemental Information (August 29, 2012)

    - Assessing and Mitigating Risks Posed by Underground Blowouts and Seafloor Broaches (January 9, 2013)

Ocean Energy Safety Advisory Committee
Containment Subcommittee
Summary Report

Containment was one of six Subcommittees established by the Ocean Energy Safety Advisory Committee (OESC) for the purpose of identifying areas of study for the OESC, and for proposing recommendations for consideration by the full OESC that could be forwarded to the Bureau of Safety and Environmental Enforcement (BSEE) Director and the Secretary of the Interior to help guide the agency's interaction with stakeholders. In approaching this work, the Subcommittee recognized the broad spectrum of issues and volume of information pertaining to subsea containment, and believed that it was essential to narrow our focus in order to provide meaningful results in a reasonable timeframe.

Accordingly, the Containment Subcommittee decided that its work would be focused specifically on "source control". In doing so, it was believed that the Containment Subcommittee would avoid overlap and duplication with the work of other subcommittees, specifically those on Spill Prevention and Spill Response.

Initially the Subcommittee chose five organizing vectors (or topics) around which to frame recommendations to the OESC. The five initial organizing topics were:

Topic 1: Organizational and System Readiness for Containment Response

Topic 2: Instrumentation and Data to Diagnose Mechanical Condition of Well after Loss of Control

Topic 3: Assessing and Mitigating Risks Posed by Underground Blowouts

Topic 4: Secondary Capabilities and Systems for Back-Up BOP Operation

Topic 5: Containment Scenario Planning

Based on input from the full OESC, the Subcommittee considered each vector's importance, as well as current industry capabilities and the regulatory environment, ongoing research and future R&D needs, and the work and organizing vectors of the other OESC Subcommittees. The result was a confirmation that the first, third and fifth vectors should be pursued by the Containment Subcommittee. The Containment Subcommittee determined that the second and fourth vectors had significant overlap with the Prevention Subcommittee and would be adequately and properly addressed there.

As a result of this input and deliberation, the final three containment vectors became:

1. Organizational and system readiness for containment response
2. Assessing and mitigating risks posed by underground blowouts and broaches
3. Containment scenario planning

The recommendations made to, and approved by, the OESC for each of these vectors are listed below.

Vector 1: Organizational and system readiness for containment response

- Workshop on Organizational and Systems Readiness for Containment Response: DOI/BSEE, in consultation with other federal agencies, should immediately commission the development of a workshop to debrief government, industry, and academic resources involved in the Deepwater Horizon (DWH) source control efforts to discuss lesson learned and chart a path forward in responding to future oil spills. *[Agreed by OESC April 2012, recommendation forwarded to BSEE May 2012.]*

This recommendation was originally presented to DOI/BSEE in a letter dated May 17, 2012. In August 2012, the OESC agreed to send supporting information to BSEE to amplify and clarify this recommendation by providing additional details on motivation and background, the issues to be addressed at the workshop, integration with other activities, and a bibliography of relevant reports. This material was forwarded to BSEE in October 2012.

- The OESC reaffirms its recommendation for a workshop on organizational and system readiness for source control. If a workshop as previously recommended by OESC is not or cannot be held, the OESC recommends that future containment exercises are designed to fully test the decision-making necessary for comprehensive source control, the interaction and leadership responsibilities of the agencies and industries involved in source control efforts, and the identification and deployment of critical technical experts. *[Agreed by OESC January 2013, recommendation forwarded to BSEE January 2013.]*

Vector 2: Assessing and mitigating risks posed by underground blowouts and broaches

- The OESC recommends that BSEE support an industry/government/academic workshop on the scientific, well-planning, and regulatory issues associated with underground blowouts and seafloor broaches. *[Agreed by OESC January 2013, recommendation forwarded to BSEE January 2013.]*

  In addition to the above recommendation, OESC discussions also revealed that this workshop could be sponsored by BSEE perhaps in conjunction with the Society of Petroleum Engineers and conducted under the auspices of the Offshore Energy Safety Institute, which is the subject of a separate recommendation by the OESC. Potential workshop leaders have been identified and this workshop is viewed as adding a critical dimension to the oversight and regulation associated with any containment of future events.

Vector 3: Containment scenario planning

- **Assessment and Development of Research Priorities for Containment of an Non-Capable Blowout:** DOI/BSEE would immediately begin synthesis of DWH reports on organizational and system readiness pertaining to source control. *[Agreed by OESC April 2012, recommendation forwarded to BSEE May 2012.]*

- In January 2013 several findings were presented to and approved by the OESC on source control options in the event of a loss of primary and BOP well control, and the variables that will inform decision-making on source control options. It was agreed by the OESC that these variables are addressed in the recommendations on Containment Vectors 1 and 2, which will provide a basis for informing on the decision-making leading to source control efforts and the understanding of the geologic integrity of surrounding formations. Further, it was agreed by the OESC that the Spill Prevention Subcommittee Recommendation on Vector 1, Technologies for Continuous Monitoring of Wellbore Integrity, would inform on variables in containment scenario planning related to the mechanical integrity of well system.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
OIL SPILL CONTAINMENT SUBCOMMITTEE MEMBERS

AFFILIATION	MEMBER	TERM
Subcommittee Lead	Richard A. Sears	04/18/11 – Present
Offshore Energy Industry	Charles R. Williams II	04/18/11 – Present
Federal Government	Walter D. Cruickshank	04/18/11 – Present
Federal Government	Christopher A. Smith	04/18/11 – Present
Federal Government	Mathy Stanislaus	04/18/11 – Present
Federal Government	Stephen H. Hickman	04/18/11 – Present

Interim Report of the Containment Subcommittee to the
Ocean Energy Safety Advisory Committee
26 April 2012

The Containment Subcommittee had originally identified five organizing vectors that framed containment issues and could be used to define areas for further study by the OESC, as well as research by industry and government. These five original vectors were:

1. Organizational and system readiness for containment response
2. Instrumentation and data to diagnose the mechanical condition of a well in the event of loss of control
3. Secondary capabilities and systems for back-up BOP operations
4. Assessing and mitigating the risks posed by underground blowouts
5. Containment scenario planning

These vectors were presented to the full OESC at the November 2011 meeting, after which notional priorities were given to the vectors based on the importance of the vector to the OESC's work as well as the perception of the ability of the OESC to achieve some progress on the vector in a reasonable time frame.

The Containment SC met in January 2012 to consider this feedback from the OESC and to agree on formal recommendations to the OESC for the vectors. Recommendations would consider each vector's importance and input from the full OESC, current industry capabilities and regulatory environment, ongoing research and future R&D needs, and the work and organizing vectors of the other OESC Subcommittees. The result of this work was a confirmation that the first and fourth vectors remain fully in the Containment SC. The fifth vector on scenario planning is also primarily a containment issue, but based on OESC feedback and Subcommittee discussion it was significantly limited in scope. The Containment SC determined that the second and third vectors had significant overlap with the Prevention Subcommittee. The result is that for the Containment SC the second vector on instrumentation is limited in scope to remote sensing and instrumentation to diagnose an underground blowout and merged with the underground blowout vector (other instrumentation systems should be covered by the work of the Prevention SC) and the third (back-up BOP operations) was eliminated.

As a result the Containment Subcommittee has the following three organizing vectors:

1. Organizational and system readiness for containment response
2. Assessing and mitigating the risks of an underground blowout
3. Containment scenario planning focusing on containment of a sea floor broach

These three vectors are discussed below. For each there is a summary of the issue, knowledge gaps and proposed research, and proposed actions.

<u>Organizational and systems readiness for containment response</u>

Following the Deepwater Horizon spill, there has been a significant effort by industry and government to improve the Nation's subsea containment capacity. Lease holders are now

required to address how they will conduct effective and early intervention in the event of a blowout as part of the permitting process. This requirement has spurred the establishment of industry cooperatives that provide the hardware and expertise needed to cap a subsea well.

In addition to the hardware, it is equally important that the industry and government maintain and exercise the capability and capacity necessary to effect containment operations. During the Deepwater Horizon spill response, it was apparent that a high degree of skill was needed to plan and execute source control operations. To sustain these complex operations that run 24/7, potentially for weeks on end, a significant pool of these skilled personnel is needed. Additionally, the complexity of the Deepwater Horizon source control operations underscored the need to bring together expertise from across government and industry to provide timely and effective command, control and oversight of source control operations. The skills and experience necessary to respond to a major incident offshore necessarily come from many companies, including the operator, other upstream operating companies, service companies, and consultants, as well as several government agencies. The number of organizations involved, and their relative contributions will depend to a great extent on the internal capabilities of the lease operator. As part of a preparedness regime, these capabilities and capacities need to be identified upfront and tested periodically to ensure they are effective when needed. A great deal of work was done assessing organizational and system readiness in the aftermath of the Deepwater Horizon incident and several reports were issued by industry, government and academia; a list of these reports is appended to this note for reference.

In order to review lessons learned from the Deepwater Horizon blowout and be better prepared in the event of a major offshore spill, it is recommended that a workshop be held to debrief government, industry and academic people involved in Macondo source control efforts, discuss lessons learned and chart a path forward. The focus of the workshop would be on source control only, since organizations responsible for response (e.g., USCG) are already well organized. Argonne National Lab would be effective facilitator for such a workshop, as they were for the 2011 Deepwater Galveston workshop. The main needs and issues to address at this workshop are:

- Managing infrastructure and capacity to ensure timely and effective command, control and oversight of source control operations,
- Identifying expertise needed and relevant people ahead of time
- Deployment of critical technical experts where decisions are being made with others engaged remotely to run models, provide advice, etc.
- Assigning leadership and responsibilities
- Facilitating information flow for timely and open exchange of data and ideas, allowing time for in-depth analysis and discussion of alternatives with minimum disruption to ongoing operations
- Facilitating and managing on-site interactions between scientists and engineers, both informally and through meetings
- Selection and management of external scientific and technical advisors

Ideally, this workshop would be held in September, 2012, with a report by the end of year. The cost of the workshop is estimated to be on the order of $100 K.

Assessing and mitigating risks posed by Underground Blowouts

When the mechanical integrity of a well has been compromised, shutting in (or capping) the well can lead to an underground blowout as fluids escape into surrounding geologic formations. Underground blowouts usually occur when low-pressure formations come into contact with oil or gas from the reservoir at pressures in excess of their fracture pressure. This can be due to poor well design or mechanical damage to the liner string, cement or other engineered barriers which can either lead to cross-flow between the high-pressure reservoir and lower-pressure (usually shallower) sands. Underground blowouts can also lead to upward migration of oil and gas along pre-existing faults or other structural discontinuities, or if these shallower sands are limited in storage capacity and vertical fracture growth is otherwise unimpeded, can result in a broach of hydrocarbons to the ocean.

Although underground blowouts represent a substantial fraction of oil and gas well blowouts reported worldwide, they are harder to detect than surface blowouts and thus pose a significant risk that is often unidentified until well control becomes difficult or a broach has occurred. This uncertainty can be exacerbated in a damaged well because downhole measurements typically used to diagnose underground blowouts cannot be employed due to internal blockage of the wellbore. In these cases, seismic profiling and oceanographic imaging techniques must be employed to look for signs of gas/oil charging or disruption of surrounding sediments, or for early signs of oil/gas emanation from the sea floor. If a broach does occur, flow rates to the ocean can increase substantially over a broad region, degrading sea-surface and sea-floor operating conditions and impeding oil containment and well-kill or cementing operations.

Two factors can exacerbate the risks posed by underground blowouts. First, a fracture can grow back into the well at shallower depth, leading to hydrocarbon flow and soft-sediment erosion (and possible cratering) alongside the cemented liner string. This can promote broaching and result in a loss of mechanical support for the wellhead. Second, an underground blowout – either as a fracture to the sea floor or as a washout around casing – would be particularly problematic if these vents were allowed to continue unabated for a long enough period of time that they would not heal (i.e., close up), even if a capping stack on the well was reopened to the ocean to relieve borehole pressure.

Improved understanding of and tools for modeling underground blowouts are important for improving regulatory oversight of blowout planning and containment activities. There are two key portions of the regulatory process that would benefit from additional work. First, worst-case discharge (WCD) analyses are required by BOEM's and BSEE's regulations. Both exploration plans (30 CFR 550.219) and development plans (30 CFR 550.250) require calculation of a WCD volume, and these volumes must be compared to the WCD scenarios required for oil spill response plans (30 CFR 254). The WCD analysis includes a broaching analysis, but it is currently a qualitative analysis. Quantifying this process requires a better understanding of the migration pathways and timing for the liquids to flow to the surface. The rate of migration needs to be modeled rigorously to determine the likelihood of hydrocarbons reaching the seafloor before a relief well can be successfully drilled.

Second, BSEE regulations at 30 CFR 254, as supplemented by NTL 2010 -N10 for instances of subsurface BOPs or surface BOPs on floating facilities, require each operator to submit

information demonstrating that it has access to and can deploy containment resources that would be adequate to promptly respond to a blowout or other loss of well control. To date, containment strategies have been based on capping stacks or cap and flow solutions; the scenarios and analyses have not identified the need for solutions to contain oil coming through the seafloor. However, as more is learned about the pathways for migration of oil to the surface, containment strategies may need to be developed to address broaching scenarios, particularly for deep water events, where the response to the Macondo blowout showed that traditional shallow water means for capturing oil seeping through the seafloor may not be effective at greater depths (see next Vector for additional detail).

To better assess and mitigate the hazards posed by underground blowouts, the Containment Subcommittee will address the state of the art in underground blowout and broach risk analyses and diagnosis, focusing on the following broad goals:

1. Better understanding the physical processes controlling upward propagation and arrest of two-phase (oil/gas) hydraulic fractures in poorly consolidated marine sediments.
2. Improving methods for remotely monitoring oil/gas leakage rates and upward migration below the mud line, using both remote geophysical/oceanographic sensing and improved wellbore instrumentation (e.g., annular pressure and continuous temperature monitoring).
3. Determining under what conditions hydrocarbon pathways to the sea floor can heal and after how much release.
4. Developing improved models for reservoir response and cross-flow during blowouts, to better assess the risks posed by underground blowouts (including total release) and help design and implement oil collection, well kill and cementing operations.

In addressing these goals, the Containment Subcommittee will conduct a literature search, carry out interviews with experts in industry, academia and government, and examine data and analyses from past underground blowouts in relation to geologic environment, well design, and whether or not (and under what conditions) those blowouts led to a broach. Most of this effort will focus on offshore operations, but data and analyses from onshore blowouts and broach incidents will be considered as appropriate. The Containment SC will also work with the Prevention SC to ensure that wellbore instrumentation needs most relevant to detection and analysis of underground blowouts are adequately addressed.

In addition, as a potential long-term research issue, this is an ideal place to engage the University community, probably through a thematic workshop. Such a workshop would help establish research priorities needed to better understand and prevent underground blowouts, and establish the case for new government funding and/or the establishment of industry research consortia. The Containment SC will identify current academic research programs and contact the faculty leading this research to gauge their interest in leading such a thematic workshop.

Containment scenario planning focusing on containment of a sea floor broach

In the wake of the Macondo blowout, a great deal of emphasis has been placed on the design and development of a well capping system and a “cap and flow” capture system for Macondo-like blowout scenarios, i.e., wells with subsea blowout preventers in deep water. The emphasis on this system raises the possibility of gaps in containment technology for other blowout scenarios.

The subcommittee has focused on one scenario, specifically a broaching scenario, where existing or planned equipment may be inadequate to contain a spill.

As discussed above, in a broaching scenario an underground blowout results in oil migrating to and broaching the seafloor at some distance from the well-bore. Oil and gas emanating from the sea floor in a broach could come from a single vent, or potentially from many points on the sea floor spread out over a very large area. In this scenario, or any other scenario where a capping stack cannot be successfully deployed, one means of capturing the oil flow is through a containment structure (e.g., a containment dome or tent). Although such structures have proven effective in shallow water, they have not been designed for deep-water containment. For example, in the case of the Macondo spill, attempts to use a cofferdam failed due to hydrate formation and the resulting buoyancy of the structure.

The subcommittee is concerned that this type of scenario has not received the same depth of analysis for containment planning as an event where a capping stack or cap-and-flow solution is appropriate. There should be no expectation that one single system or containment approach is appropriate or desirable in all circumstances. The subcommittee proposes to recommend a research mechanism to redesign containment domes/tents for use in deep water to help address this issue.

Organizational and systems readiness for containment response - Preliminary List of References for lessons learned, Revised 13 February 2012

The Incident Specific Preparedness Review, January 2011, (http://www.uscg.mil/foia/docs/DWH/BPDWH.pdf)

The National Incident Commander's Report: MC252 Deepwater Horizon, October 2010, (http://www.nrt.org/production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-1065NICReport/$File/Binder1.pdf?OpenElement)

On Scene Coordinator Report: Deepwater Horizon Oil Spill, September 2011, (http://www.uscg.mil/foia/docs/DWH/FOSC_DWH_Report.pdf)

"Deepwater: The Gulf Oil Disaster and the Future of Offshore Drilling", Report to the President, National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, January 2011 (http://www.oilspillcommission.gov/sites/default/files/documents/DEEPWATER_ReporttothePresident_FINAL.pdf)

"Decision-Making within the Unified Command", Staff Working Paper No. 2, National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, January 2011 (http://www.oilspillcommission.gov/sites/default/files/documents/Updated%20Unified%20Command%20Working%20Paper.pdf)

"Stopping the Spill: The Five-Month Effort to Kill the Macondo Well", Staff Working Paper No. 6, National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, January 2011 (http://www.oilspillcommission.gov/sites/default/files/documents/Updated%20Containment%20Working%20Paper.pdf)

"Macondo: The Gulf Oil Disaster", Chief Counsel's Report, National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, February 2011 (http://www.oilspillcommission.gov/sites/default/files/documents/C21462-407_CCR_for_print_0.pdf)

"Deepwater Horizon Containment and Response: Harnessing Capabilities and Lessons Learned", BP, September 2010 (http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/incident_response/STAGING/local_assets/downloads_pdfs/Deepwater_Horizon_Containment_Response.pdf)

The National Oil and Hazardous Substances Pollution Contingency Plan, 40 Code of Federal Regulations, Part 300 (http://www.gpo.gov/nara/cfr/waisidx_00/40cfr300_00.html)

Homeland Security Presidential Directive 5: Management of Domestic Incidents, February 2003 (http://www.dhs.gov/xabout/laws/gc_1214592333605.shtm#1)

The National Incident Management System, December 2008 (http://www.fema.gov/pdf/emergency/nims/NIMS_core.pdf)

The National Response Framework, January 2008 (http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf)

Ocean Energy Safety Advisory Committee, August 29, 2012

Recommendation:
Workshop on Organizational and Systems Readiness for Containment Response – Supplemental Information

The source control response to the Deepwater Horizon (DWH) blowout involved an unprecedented level of interaction and coordination among scientists, engineers and emergency response officials from the public and private sectors. This required bringing together the appropriate expertise from government, industry and academia and establishing protocols for information sharing, industry/government interactions and decision making.

The opportunity exists now to capture the organizational and system readiness lessons learned from source control efforts during the DWH blowout, to be prepared to respond more efficiently to future spills. This opportunity must be exercised soon, as memories of issues, events and interactions during this response are rapidly fading. This process should also include review of the numerous reports that have been prepared documenting the DWH source control efforts.

DOI/BSEE, in consultation with other federal agencies, should immediately commission the development of a workshop to debrief government, industry and academic personnel involved in the DWH source control efforts to discuss lessons learned and chart a path forward in responding to future oil spills.

Background Information:

Following the Deepwater Horizon spill, there has been a significant effort by industry and government to improve the Nation's subsea containment capacity. Lease holders are now required to address how they will conduct effective and early intervention in the event of a blowout as part of the permitting process. This requirement has spurred the establishment of industry cooperatives that provide the hardware and expertise needed to cap a subsea well.

In addition to the hardware, it is equally important that the industry and government maintain and exercise the capability and capacity necessary to effect containment operations. During the Deepwater Horizon spill response, it was apparent that a high degree of skill was needed to plan and execute source control operations. To sustain these complex operations that run 24/7, potentially for weeks on end, a significant pool of these skilled personnel is needed. Additionally, the complexity of the Deepwater Horizon source control operations underscored the need to bring together expertise from across government and industry to provide timely and effective command, control and oversight of source control operations. The skills and experience necessary to respond to a major incident offshore necessarily come from many companies, including the operator, other upstream operating companies, service companies, and consultants, as well as several government agencies. The number of organizations involved, and their relative contributions will depend to a great extent on the internal capabilities of the lease operator. As part of a preparedness regime, these capabilities and capacities need to be identified upfront and tested periodically to ensure they are effective when needed. A great deal of work was done

assessing organizational and system readiness in the aftermath of the Deepwater Horizon incident and several reports were issued by industry, government and academia; a list of these reports is appended to this note for reference.

To review lessons learned from the Deepwater Horizon blowout and be better prepared in the event of a major offshore spill, it is recommended that a workshop be held to debrief government, industry and academic people involved in Macondo source control efforts, discuss lessons learned and chart a path forward. The focus of the workshop would be on source control only, since organizations responsible for response (e.g., USCG) are already well organized. Argonne National Lab would be effective facilitator for such a workshop, as they were for the 2011 Deepwater Galveston workshop. The main needs and issues to address at this workshop are:

- Managing infrastructure and capacity to ensure timely and effective command, control and oversight of source control operations,
- Identifying expertise needed and relevant people ahead of time
- Deployment of critical technical experts where decisions are being made with others engaged remotely to run models, provide advice, etc.
- Assigning leadership and responsibilities
- Facilitating information flow for timely and open exchange of data and ideas, allowing time for in-depth analysis and discussion of alternatives with minimum disruption to ongoing operations
- Facilitating and managing on-site interactions between scientists and engineers, both informally and through meetings
- Selection and management of external scientific and technical advisors

This debrief of source control efforts from Deepwater Horizon is not intended as a stand-alone exercise. Recognizing that time has passed and additional work has been initiated, this workshop, which is intended to capture past learnings, will be undertaken in concert with recent exercises as well as ongoing and future activities within BSEE to identify best practices in source control that can be applied in any future incidents.

Ideally, this workshop would be held in 2013, with a report by the end of year. The cost of the workshop is estimated to be on the order of $100 K.

Organizational and systems readiness for containment response - Preliminary List of References in support of the Recommendation for a Workshop on for lessons learned from Deepwater Horizon, Revised April 2012

The Incident Specific Preparedness Review, January 2011, (http://www.uscg.mil/foia/docs/DWH/BPDWH.pdf)

The National Incident Commander's Report: MC252 Deepwater Horizon, October 2010, (http://www.nrt.org/production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-1065NICReport/$File/Binder1.pdf?OpenElement)

On Scene Coordinator Report: Deepwater Horizon Oil Spill, September 2011, (http://www.uscg.mil/foia/docs/DWH/FOSC_DWH_Report.pdf)

"Deepwater: The Gulf Oil Disaster and the Future of Offshore Drilling", Report to the President, National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, January 2011 (http://www.oilspillcommission.gov/sites/default/files/documents/DEEPWATER_ReporttothePresident_FINAL.pdf)

"Decision-Making within the Unified Command", Staff Working Paper No. 2, National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, January 2011 (http://www.oilspillcommission.gov/sites/default/files/documents/Updated%20Unified%20Command%20Working%20Paper.pdf)

"Stopping the Spill: The Five-Month Effort to Kill the Macondo Well", Staff Working Paper No. 6, National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, January 2011 (http://www.oilspillcommission.gov/sites/default/files/documents/Updated%20Containment%20Working%20Paper.pdf)

"Macondo: The Gulf Oil Disaster", Chief Counsel's Report, National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, February 2011 (http://www.oilspillcommission.gov/sites/default/files/documents/C21462-407_CCR_for_print_0.pdf)

"Deepwater Horizon Containment and Response: Harnessing Capabilities and Lessons Learned", BP, September 2010 (http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/incident_response/STAGING/local_assets/downloads_pdfs/Deepwater_Horizon_Containment_Response.pdf)

Organizational and systems readiness for containment response - Preliminary List of References in support of the Recommendation for a Workshop on for lessons learned from Deepwater Horizon, Revised April 2012 (continued)

The National Oil and Hazardous Substances Pollution Contingency Plan, 40 Code of Federal Regulations, Part 300
(http://www.gpo.gov/nara/cfr/waisidx_00/40cfr300_00.html)

Homeland Security Presidential Directive 5: Management of Domestic Incidents, February 2003
(http://www.dhs.gov/xabout/laws/gc_1214592333605.shtm#1)

The National Incident Management System, December 2008
(http://www.fema.gov/pdf/emergency/nims/NIMS_core.pdf)

The National Response Framework, January 2008
(http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf)

"Lessons Learned from the Perspective of the DOE Tri-Labs Team Deepwater Horizon Response Effort", September 16, 2010
(Document approved for public release, copy provided by Sandia National Labs.)

Assessing and Mitigating Risks Posed by Underground Blowouts and Seafloor Broaches

Background

Underground blowouts occur when oil or gas from a reservoir comes into contact with shallower geologic formations at pressures in excess of that formation's fracture pressure (see 1, 2, 3). Such a situation can result from poor well design, shut in of the well that exposes shallow formations to high pressure (e.g., before the well is fully cased and cemented), or mechanical damage to the casing or liner string, cement, or other engineered barriers. When the mechanical or geomechanical integrity of a well has been compromised, shutting in or capping the well can lead to an underground blowout as fluids escape into surrounding geologic formations, creating upward- and outward-propagating hydraulic fractures. Lithologic contrasts can inhibit or arrest vertical hydraulic fracture growth through associated stress contrasts, low-strength interfaces, or fluid leak-off (4-7). In an offshore setting, an underground blowout can also induce cross-flow between a high-pressure reservoir and lower-pressure, shallower sands. If these permeable sands are limited in storage capacity and vertical fracture growth is otherwise unimpeded, an underground blowout may result in uncontrolled hydrofraccing of hydrocarbons through overlying geologic formations and into the marine environment, creating a seafloor broach. Underground blowouts and broaches can also occur due to the upward migration of oil and gas along pre-existing faults or other geologic structures rather than along newly created hydraulic fractures (8, 9).

An underground blowout that broaches the sea floor can lead to large releases of hydrocarbons or other fluids into the ocean that are difficult to contain and can occur at some distance from the well head, such as during the 1969 Santa Barbara blowout (10), the 2008 Tordis, North Sea incident (11), and the 1974 and 1979 Champion Field, Brunei blowouts (12). Underground blowouts leading to surface broaches and extensive cratering have also been reported in association with drilling of geothermal energy wells (13) and steam flood operations in oil sands (14) and have been implicated in formation of the Lusi mud eruption in East Java (refs. 15 and 16 and references therein). If a seafloor broach does occur, flow to the ocean can occur over a broad region, impacting sea-surface and sea-floor operating conditions and impeding oil containment, well-kill and cementing operations.

Underground blowouts represent a significant fraction of oil and gas well blowouts reported worldwide (1, 17). During normal drilling operations their occurrence can be detected by monitoring fluid circulation volumes and pressures, although it can be difficult to detect the full extent of an underground blowout until well control becomes difficult or a broach has occurred. This uncertainty can be exacerbated in a damaged well if downhole measurements typically used to diagnose underground blowouts (i.e., temperature, acoustic, radioactive tracer or flow logging, see 18) cannot be employed due to internal blockage of the wellbore. In a well that has been shut

in under high pressure (relative to the fracture pressure at a potential leakage point) and whose mechanical or geomechanical integrity is poor or unknown, it can be difficult even to detect the occurrence of an underground blowout. In this case remote geophysical imaging must be used to detect and determine the extent of an underground blowout. In particular, time-lapse (4-D) seismic profiling techniques can be employed to look for increased seismic amplitudes associated with reversed-polarity reflections from an oil or gas charge zone, development of diffraction patterns (seismic chimneys) from a rising column of hydrocarbons, or an increase in two-way travel time to a particular reflector (seismic pull down) resulting from sediment disruption and charging (7, 19–22). Water column sonar can also be used to detect early signs of oil and/or gas emanation from the sea floor. These types of time-lapse geophysical imaging techniques in conjunction with well-head pressure recording and reservoir modeling were used in diagnosing geologic integrity during shut-in of the blown-out Macondo well (23).

Two factors can exacerbate the risks posed by underground blowouts. First, a growing fracture can progress upward along the wellbore annulus, or intersect the well at a shallower depth, leading to hydrocarbon flow and soft-sediment erosion (and possible sea-floor cratering) alongside the cemented liner string. This could reduce the time required for a broach to occur and also result in a loss of mechanical support for the wellhead. Second, an underground blowout – either as a fracture to the sea floor or as a washout around casing – might be particularly problematic if these vents were allowed to continue unabated for a long enough period of time that they would not heal (i.e., close up), even if a capping stack on the well was reopened to the ocean to relieve borehole pressure.

Most underground blowouts do not develop into a seafloor broach, as the subsurface flow is fully accommodated with cross-flow into lower pressure formations. In these cases there is no surface or seabed manifestation or risk to the environment. To better understand the nature of underground blowouts, and to assess and mitigate the hazards posed by underground blowouts and sea-floor broaches during offshore oil and gas drilling, new research should be carried out to address several key scientific goals, including:

1) Better understanding the physical processes controlling upward propagation and arrest of two-phase (oil/gas) hydraulic fractures in poorly consolidated marine sediments, leading to improved numerical models for leakage volumes required for a sea-floor broach under different geological settings, geomechanical conditions, and fluid properties.

2) Improving geophysical imaging techniques (e.g., seismic reflection surveys, and possibly passive microseismic monitoring) for remotely monitoring oil and gas leakage rates and upward migration below the sea floor and external to the wellbore. (Diagnosing well integrity below the sea floor would also be facilitated by improved wellbore

instrumentation for monitoring annular pressure, temperature and other parameters, which is the subject of a separate recommendation by the Prevention Subcommittee).

3) Determining under what conditions (e.g., in-situ stress, sediment rheology, fluid pressure, flow rate and blowout duration) hydrocarbon pathways to the sea floor established through hydraulic fractures and reactivated natural faults can heal and after how much hydrocarbon release.

4) Developing improved quantitative models for reservoir response and cross-flow during blowouts to better understand subsurface behavior in a cross-flow situation. Conventional reservoir simulators are not designed to model cross flow, although there may be some experience with models for industry water-flood operations.

These research priorities are intended to better assess the overall risks posed by underground blowouts (including total release) and to help design and implement well kill and cementing operations. These long-term scientific issues would be addressed most effectively through a collaborative research partnership involving academia, industry and government research labs, beginning with a focused thematic workshop (discussed below).

Implications for Well Containment and Regulation

Better scientific understanding and modeling of underground blowouts and seafloor broaches are needed to improve well design to prevent a seafloor broach from occurring, and if it does occur, devise more effective containment strategies. There are several aspects of the well-design and regulatory process for offshore oil and gas drilling that would benefit from this type of additional research, as follows.

BSEE regulations at 30 CFR 254, as supplemented by NTL 2010-N10 for instances of subsurface blowout preventers (BOPs) or surface BOPs on floating facilities, require each operator to submit information demonstrating that it has access to and can deploy resources adequate to fully contain the flow from an offshore blowout. These containment strategies have been based on use of a capping stack or secondary BOP either to allow collection of hydrocarbons to a surface vessel (“cap and flow”) or to completely shut in a well (“cap and shut in”). The industry is primarily focusing on cap and shut in because it is the most rapid and straight-forward containment method for a blowout. In this case, the well must be either designed to withstand the full shut-in pressure of the reservoirs penetrated by the wellbore without loss of mechanical or geomechanical integrity, or a case must be made that an underground blowout would be fully contained (e.g., through cross-flow into shallower permeable units) long enough for a relief well to be completed before a sea-floor broach occurs. Toward this end, some operators are researching the adaptation and use of traditional hydraulic fracturing propagation

models to simulate oil and gas migration to the sea floor through hydraulic fracturing, including the effects of soft-sediment deformation and charging of shallow sands, but validating this work is difficult given the current state of knowledge. Integrated case studies of oil-well broaches and natural seeps, laboratory and borehole geomechanical studies, and modeling should be done to assure that models, within the limits of current science, most accurately predict the migration pathways, likelihood and timing for hydrocarbons to reach the sea floor following an underground blowout.

Worst-case discharge (WCD) analyses are required by BOEM's and BSEE's regulations. Both exploration plans (30 CFR 550.219) and development plans (30 CFR 550.250) need to include calculation of a WCD total volume, and these volumes must be compared to the WCD scenarios included in an operator's Oil Spill Response Plan (30 CFR 254). A better understanding of the geologic and geomechanical processes controlling the ascent and discharge rate of hydrocarbons to the sea floor following an underground blowout and broach and the coupled reservoir and wellbore response to this discharge is needed to encompass all WCD scenarios.

Although numerous cases of sea-floor broaches have been reported in the literature (discussed above), they differ greatly in severity, areal extent, geologic setting and water depth and robust containment scenarios have not been adequately developed to cover this eventuality. As more is learned about the pathways and rates for possible migration of oil to the ocean following an underground blowout, containment strategies will need to be developed and modified to address a variety of broaching scenarios. This will be particularly challenging for losses of well control in deep water, as the response to the Macondo blowout showed that traditional means for capturing oil emanating a blown-out well in shallow water – such as tents or domes – may not be effective at greater water depths due to a variety of effects. These effects include hydrate formation, differential pressure effects on large surface areas, lack of capability to separate hydrocarbons from seawater, and inability to move hydrocarbons to the surface from capture systems without pumping.

Recommendation

The OESC recommends that BSEE support an industry/government/academic workshop on the scientific, well-planning, and regulatory issues associated with underground blowouts and seafloor broaches.

The goals of this workshop would be to: 1) identify gaps in understanding of underground blowouts and sea-floor broaches, 2) use this gap analysis to guide future funding and research efforts within academia, private industry, BSEE and other Federal agencies, and 3) to inform future regulations by BSEE that will be guided by new scientific work and technology. This workshop would cover a wide array of topics, including hydraulic fracture propagation under single- and two-phase conditions, geologic constraints on fracture height growth and

containment (e.g., due to cross-flow into shallower sands), the geomechanics of soft sediment deformation, worst-case discharge calculations under a broaching scenario, and well-bore completions to minimize risks of underground blowouts and seafloor broaches in the offshore environment.

This workshop could be sponsored by BSEE perhaps in conjunction with the Society of Petroleum Engineers and conducted under the auspices of the Ocean Energy Safety Institute (OESI, which is the subject of a separate recommendation by the OESC). Two leading professors in reservoir geomechanics – Peter Flemings, Univ. Texas Austin, and Mark Zoback, Stanford Univ. – have already been contacted and expressed an interest in co-leading such a workshop. Industry co-leaders would be identified once the workshop is approved, perhaps through the Center for Offshore Safety or the OESI.

In preparation for this workshop, we envision that participants would conduct an extensive literature search; carry out interviews with experts in industry, academia and government; and examine data and analyses from past underground blowouts in relation to geologic environment, well design, and whether or not (and under what conditions) those blowouts led to a sea-floor broach. Most of this effort would focus on offshore operations, but data and analyses from onshore underground blowouts and surface broaches could be considered as appropriate. Also, this effort should be carried out in concert with recommendations made by the Prevention Subcommittee to ensure that wellbore instrumentation needs most relevant to detection and analysis of underground blowouts are adequately addressed.

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OCEAN ENERGY SAFETY ADVISORY COMMITTEE
APPENDIX D – SAFETY MANAGEMENT SYSTEMS SUBCOMMITTEE

- **Subcommittee Summary Report**
- **Membership**
- **White Papers**
  - Safety Management Systems Subcommittee Safety Culture Recommendation [Vector 1] (April 10, 2012)
  - Safety Management Systems Subcommittee Safety Management System Enhancement Recommendation [Vector 2] (April 10, 2012)
  - Safety Management Systems Subcommittee Safety Culture Recommendation: Data Management [Vector 1 Recommendation 3] (August 15, 2012)
  - Safety Management Systems Subcommittee Stakeholder Engagement Recommendation (August 15, 2012)
  - Safety Management Systems Subcommittee Safety Management System Enhancement Recommendation [Vector 2] (August 29, 2012)
  - Safety Management Systems Subcommittee Safety Management System Enhancement Recommendation [Vector 2 Final] (January 9, 2013)

Ocean Energy Safety Advisory Committee
Safety Management Subcommittee
Summary Report

As part of the Ocean Energy Safety Management Committee, the Safety Management Subcommittee has developed recommendations for two vectors: Vector 1 – Safety Culture and Vector 2 – Safety Management Systems.

The Subcommittee focused on both of these vectors because just optimizing a safety management system may lower risk and improve performance over the short term, but long term and sustainable improvement in safety performance can only be realized if organizational values that underlie people's behavior are proactively addressed to develop a better safety culture. ***The combination of a strong safety culture and a strong and effective safety management system is essential for a strong safety performance.***

The subcommittee described the key elements of a strong safety culture, and highlighted that: 1) without extensive and repeated communication and collaboration across the industry and regulating agencies, a safety culture will not take hold; and 2) the leadership of all organizations involved, including operators, contractors, regulators and in some cases stakeholders, must be aligned on the safety culture, which underpins the safety objectives and safety values of the organizations involved.

Building on the elements and observations made on safety culture, the Subcommittee recommended: 1) establishing an Offshore Safety Leadership Council (OSLC); 2) developing leadership and communications safety training requirements that are cascaded to the industry workforce through the leadership of the industry; and 3) that DOI/BSEE put greater emphasis on data management with special focus on safety performance leading indicators.

Under the Safety Management Systems vector, the Subcommittee focused on enhancing the current SEMS regulations and enforcement methods. The Subcommittee believes that making modifications that resolve jurisdictional, applicability, implementation and enforcement issues with the current SEMS regulations will fortify and strengthen the regulations and further improve safety performance in the US OCS.

As part of this vector, the Subcommittee made recommendations to enhance the SEMS regulations to: (1) cover all operations and activities, not only activities under BSEE jurisdiction; (2) clearly identify the responsible parties: (3) place more focus on process safety management; (4) make the requirements less prescriptive; (5) provide a method for evaluating and enforcing the SEMS regulation; (6) require "major contractors" to have a SEMS program: (7) include an assessment methodology and/or audit protocol that tests the process safety focus of a SEMS program; and (8) ensure that it can be applied in a risk-based fit-for-purpose manner that differentiates between facilities

The Subcommittee also made recommendations that support the enhancement of SEMS and BSEE practices in the areas of: (1) inspection and audits practices, (2) third party audit requirements: and (3) review and approval processes for SEMS plans.

All of the above recommendations for both safety culture and safety management systems need to be taken as a whole as each reinforces the other and makes for a holistic approach to improving safety performance in the US OCS.

The Subcommittee recommended that one of the first steps in achieving these goals is for BSEE, USCG, other appropriate regulators, and the industry to participate in an update of American Petroleum Institute Recommended Practice 75 (API RP 75). In the interim, BSEE should continue to utilize the current API RP 75, incorporated by reference in the SEMS regulations, as the basis for SEMS. API RP 75 is robust and if modified properly it can be even more effectively used as the baseline document to support and develop optimum safety management systems for the U.S. OCS.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
SAFETY MANAGEMENT SYSTEMS SUBCOMMITTEE MEMBERS

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Ocean Energy Safety Advisory Committee
Safety Management Subcommittee
Safety Culture Recommendation

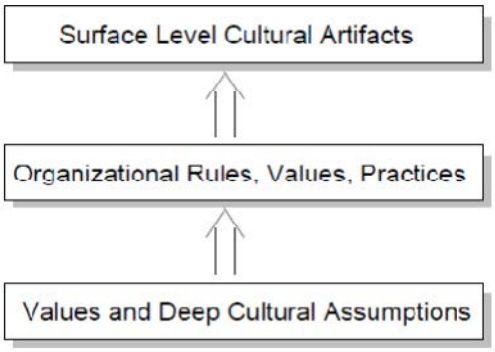
April 10th, 2012

Safety Culture

Organizational decision making always rests upon a set of industry or organizational values or assumptions. One of the best definitions of and treatises on culture can be found in Edgar Shein's *Organizational Culture and Leadership*[1] (Jossey-Bass Publishers, 2004). Shein defines *culture* (in general) as a set of shared values and norms, a way of looking at and interpreting the world and events around us and of taking action in a social context.

In the context of this recommendation, it is important to note that the word Safety is used to refer to Safety and Environmental Risks.

Shein divides organizational culture into three levels:
Safety culture can be defined as that subset of organizational culture that reflects the general attitude and approaches to safety and risk management.[2] At the top level are the surface-level organizational cultural artifacts or routine aspects of everyday practice including hazard analysis, operational procedures, and incident investigations. The second, middle level is the stated organizational rules, values, and practices that are used to create the top-level artifacts, such as safety policy, standards, and guidelines. At the lowest level is the often invisible but pervasive underlying deep organizational cultural assumptions upon which actions are taken and decisions are made and thus upon which the upper levels rest, also known or referred to as Safety Culture.



Trying to change safety outcomes by simply changing the organizational structures, including policies, goals, missions, job descriptions, and standard operating procedures, may lower risk over the short term, but superficial fixes that do not address the set of shared values and social norms are very likely to be undone over time. Changes are required in the organizational values that underlie people's behavior.

Safety culture is primarily set by the leaders of the organization as they establish the basic values upon which decisions will be based. In fact, management commitment to safety has been found to be the most important factor in distinguishing between organizations with high and low accident rates.[3]

Safety culture will affect communication, problem reporting, following procedures such as management of change, and just about every other aspect of an effective safety program. Therefore, improving the safety culture of an industry or organization is important in achieving process safety goals. But changing culture is very difficult. One important aspect of such change is providing appropriate incentives to change.

Participants in industries like commercial aviation understand the direct relationship between safety and their profits and future viability. The relationship is not consistently used in the off-shore oil industry, some operators and contractors do have the safety cultures that provide them the understanding of the direct relationship between safety and corporate profit and future viability.

The moratorium on GOM drilling[4] was a very strong signal to the industry that those companies with strong safety cultures and practices can be hurt by those without them and that companies

without strong safety culture need to participate in industry initiatives and cooperate in improving safety. There also need to be recognition and processes to recognize the need and take action to continuously develop technology required to enhance safety processes and safety outcomes along with the development of technologies that are normally developed by industry to enhance work efficiencies and to allow the exploration and production of more complex structure. More drastic measures have also led to changes in safety culture, such as civil penalties to executives in a firm, but this type of change incentive should be used as a last resort. Major accidents have also led to changes, as in nuclear power after the Three Mile Island incident.

BSEE and industry leaders need to update practices and technology as oil exploration and extraction conditions change. Recognition is normally a result of a safety culture that values proactive behaviors.

Safety culture goals for the regulators and industry participants in this industry include:

- Commitment to safety is valued by the leaders. Passionate, effective safety leadership exists at all levels of the organization (particularly the top of the industry companies and the associated regulatory bodies) and everyone is committed to safety as a value for the organization.
- Safety should always be considered a value and not a priority that is evaluated against cost or schedule.
- Safety concerns are surfaced without fear, and are communicated. Communication of not only lagging indicators but also leading indicators should be constructive and focused on building a strong safety culture.
- Incidents and accidents are investigated thoroughly, including management and systemic factors, and without blame. Deficiencies found during investigations, audits, and inspections are addressed properly and tracked to completion. In addition, there is follow through to ensure that the changes are effective in fixing the deficiencies. (A learning and improvement culture).
- Safety concerns are integrated into operational decision making and play important roles in advising management and operators at all levels of the organization on both long-term decisions during engineering and development of new platforms and on the safety implications of decisions during operations. Consistent long term behavior and decision making that clearly supports safety is a good indicator that an effective safety culture has developed in the organization.
- Early warning systems (leading indicators) of degradation in safety practices are established and effective. In a culture where safety is highly valued such warning systems are brought to the surface early and it does not take much debate when and to what cost should an organization go to before deciding on the remedy.
- Safety vision, values, and procedures are clearly articulated and shared among stakeholders. Executive management from regulators and industry companies should play an active role in portraying and supporting the values of the safety culture.
- All employees have full partnership roles and responsibilities regarding safety. Stakeholders are kept fully aware of industry developments related to safety and are invited to play an active role when and if necessary.
- There is effective and open communication about safety at all levels of the organization and between industry, regulator, and the public where appropriate or at the least within industry.
- High levels of visibility of the state of safety (that is, risk awareness) exist at all levels of the organization and industry through appropriate and effective feedback.

Is SEMS enough?

As described in the figure above, at the top level of the graph we can see what is required on a daily basis including hazard analysis, operational procedures, incident investigations and the list can go on to include all elements of SEMS and other Safety Management Systems.

All the elements of a Safety Management System are necessary but not sufficient to change the safety outcomes of an organization, it is important to note that even when combining the implementation of a safety management system with changes in the organizational structure, including policies and goals one may lower the risk but unless you are able to change the shared values that underlie people's behavior you are not able to create a sustainable positive change in the safety outcomes.

Changes in the organizational values that underlie people's behaviors require engagement and commitment from the leaders of the organization for which the safety outcomes need to be changed.

Safety As a Core Value

As individuals develop in their safety knowledge and safety beliefs they go through four stages which can be described as follows:

- Level 1 – Comply when it is convenient
- Level 2 – Comply when I have to
- Level 3 – Believe for me and my family
- Level 4 – Believe for me, my family and my teammates.

This progression of Individuals through the levels is effected by their organization leader's behavior and communication skills. To reach level 4, an individual would have reach a point where safety is a core value, that is not to be compromised, as more individuals reach this level within an organization, the organization would have reach a culture where safety is a core value and a deep safety culture.

Prescriptive vs. Behavior Based Culture

It can be reduced from the above that to reach a level where to reach a positive change to the safety outcomes in an organization it is important to:

1. Move from compliance to believe, an individual and an organization's behavior should be based on belief of doing the right thing, rather than compliance because it is required or convenient, and
2. Move from where we are relying solely on organizational rules and operational procedures, to a safety culture that is rooted in the organization through leadership and communication of safety values starting from the top leaders of the organization. These values should be implemented in the organizational rules and procedures.

Achieving this higher level of safety performance is better supported by an environment where behavior based criteria is developed and used to measure the belief and the level of commitment of the leaders in communicating the message. In contrast with a prescriptive regime where the driver is compliance when and because we have to.

What it takes

Developing a safety culture starts at the top of an organization and then cascades down the organization by action and personal example, not merely by words. There are examples of comprehensive approaches how to teach leaders to establish this culture. Each organization needs to be an owner of its safety culture and safety problems, not just comply with regulations.

It is key to observe that:

1- Without extensive and repeated communication and collaboration across the industry and regulating agencies, safety culture will not take hold.

2- The leadership of all organizations involved, including operators, contractors, regulators and in some cases stakeholders should be aligned on the safety culture, which underpins the safety objectives and safety values of the organizations involved.

The above highlights the importance of setting company behavioral norms and encouraging individual motivation, which raises the question as to what is the appropriate level for such norms and individual motivators to be established.

Recommended Path Forward

As a path forward the safety management subcommittee has developed the following recommendations.

1- Offshore Safety Leadership Council

Establishing an Offshore Leadership Safety Council (OSLC), as part of the Offshore Energy Safety Institute, that includes: key executive members of regulatory bodies involved in offshore drilling and operations; key executives from industry, operators and contractors; as well as key representatives from stakeholder organizations. The role of the OSLC is to focus on:

a. Developing, communicating and fostering a safety Culture for the industry which provides a common value and common set of objectives, which will evolve regularly.

b. Formulating a safety culture recognition program that motivates organizations to develop and foster their safety culture. Focusing on leadership behaviors and leadership communication of the safety values of their organization

c. Encouraging and incentivizing engineering schools to include elements of safety engineering in their programs. Focusing not only on process safety, or systems safety, but also on safety awareness and engraving safety mentality early in the engineering education process.

d. Ensuring that industry is developing a structure for conducting independent, consistently detailed accident and near accident investigations and reporting them to the industry and regulators.

The OSLC is meant to be the forum at which the leaders of all stakeholders and regulators will come together on a regular basis, quarterly, or yearly to check the pulse of the safety in the industry and to provide direction and leadership.

Key Regulator Role

The regulator can help establish a stronger safety culture in the industry, by a number of ways, including:

e. How it evaluates the effectiveness of SEMS and checks for compliance of the mechanisms (SEMS). Regulators can encourage change in culture by focusing more on a cooperative mentality (consultation and advice) and requiring audits, and moving away from a compliance mentality (punishment).

f. Reliance more on leading indicators appropriate use of processes and procedures, rather than lagging indicators, safety or environmental incidents for enforcement.

2- Leadership and Communication Training

Industry along with the support and guidance of the OSLC as well as the regulators develop leadership and communications safety training requirements that will ensure that the safety values and objectives that are agreed at the OSLC are communicated, discussed and cascaded to the industry workforce through the leadership of the industry starting from the Secretary of the Department of Interior, , the Director of BSEE, the top executives of the operating companies , the top executives of contractors, and all the way to the value members of the facility operating staff. The message should be carried and disseminated through all levels of the organization from managers by managers and supervisors to the workforce.

The focus of the OSLC should be on developing the requirements and ensuring a proper environment exists within industry to foster the development of the right safety culture.

The OSLC is encouraged to work closely with the Center for Offshore Safety (COS) which can support managers and supervisors with the required training for them to be able to properly communicate the changes in values and behaviors necessary to achieve a strong safety culture.

3- Data Management

Data is one of the essential management tools that is needed to ensure that trends can be analyzed and proper management decisions are made to reduce or eliminate certain unwanted consequences. The challenges so far in relations to data management in the management of offshore safety are many, and hence the flurry of initiatives that are ongoing on this subject.

This subcommittee's work in this area was mainly focused on emphasizing key recommendations as related to data management; these recommendations should not be considered comprehensive as they are not covering such areas as data needed for prevention. The focus in this section is on data as related to checking that the safety culture which is being developed and followed is leading to the desired safety outcomes. The subcommittee considers that the following items are important:

a. It is important that industry continues to work through the international initiatives and the center for offshore safety on the consolidation of the format of reporting leading and lagging indicators. The data collection process is the foundation of all future analysis and recommendations that are made and as such should be well structured and organized in an international guideline or standard that would allow the largest data set for the analysis of trends. Such data collection process provides important feedback to the OSLC to assist them in better understanding how behaviors and values are changing and to help drive to a stronger safety culture.

b. More emphasis should be made on Leading indicators rather that the historically required reporting of lagging indicators. As the subject of leading indicators has been discussed a number of clarification factors have come up that need to be taken into consideration.

i. The focus should be on leading indicators that can be measured weeks if not months prior to the potential hazard occurring and which are focused on measuring people's behavior and decisions early in the process that may lead to a hazard. These would be more effective than simply relying on indicators that occur immediately prior to an incident where intervention is limited, more reactive and usually less effective.

ii. Near miss reporting should be considered a lagging indicator

iii. Contractors and operators should be allowed to present their leading indicators in a neutral format and in a safe environment that would allow the development of more mature and a stronger safety culture and that would not be based on punishment of individuals or organization for sharing their data. The COS is a good example where such data can be analyzed and shared in a neutral environment.

c. Data should be gathered and analyzed in a consistent manner by all organizations using the same standard or guideline or maybe more appropriately analyzed by the COS or a similar organization and shared with regulators and stakeholders in a consistent format. This highlights the importance of an organization such as the COS, as well as its responsibility to provide unbiased analysis of the data.

Ocean Energy Safety Advisory Committee
Safety Management Subcommittee
Safety Management System Enhancement Recommendation

April 10th, 2012

Introduction

At the full OESC meeting in November 2011, the SMS Subcommittee recommended developing an informed recommendation on the optimum safety management system for the U.S. OCS and whether a Safety Case should be mandated as part of the safety management system.[1] The OESC supported further development of this recommendation (Vector #2) along with suggestions for improvement in safety culture being addressed in Vector #1. The subcommittee held an interim meeting in Houston, Texas on January 10-11, to review current Safety Management System requirements (SEMS and SEMS II) and look into the Safety Case regulatory approach. During this meeting, the subcommittee members took part in presentations on the performance-based regulatory regimes used in the United Kingdom (UK) and Norway, SEMS and safety culture. The following recommendations are based on the subcommittees work over the last six months.

Topic #1: Optimum Safety Management System

The SMS Subcommittee has revised its task statement to focus on enhancing the current SEMS regulations and enforcement methods rather than adopting a wholesale change to a different safety management system as recommended in November.

The SMS subcommittee proposes the following recommendation for consideration by the OESC committee. This recommendation should be considered now, rather than waiting until the final OESC report is issued in December 2012.

> **Recommendation:** Bureau of Safety and Environmental Enforcement (BSEE) should suspend any further work on the SEMS II as proposed and concentrate its effort on addressing four critical issues with the current SEMS regulations; jurisdiction, responsible party, performance-based approach and process safety management. If these four issues are not addressed first, they could have a negative impact on the overall safety of offshore personnel and the OCS environment.[2] We further recommend that BSEE then find a means to implement those elements of SEMS II that are consistent with the views of this Subcommittee on the optimal safety management system

The SMS subcommittee feels that this recommendation and its subparts will fortify and strengthen the current SEMS regulations to significantly improve safety on the OCS. Focusing on the current SEMS regulations first will allow BSEE to resolve the numerous jurisdictional,

[1] See the Safety Management Systems White Paper that was submitted to OESC on October 24, 2011.

[2] SEMS II was published on September 14, 2011 in the Federal Register. BSEE closed the public comment period for this pproposed regulations in November, 2011. BSEE is currently evaluating comments received on this proposal and plans to publish a SEMS II final rule in the near future.

applicability, terminological, implementation and enforcement issues with the SEMS regulations before they issue new regulations that may compound these problems. The subcommittee believes that BSEE needs to work with other regulatory agencies to ensure that SEMS covers all operations and activities, clearly identifies responsibilities and requirements, places more focus on process safety management, and makes the SEMS regulations less prescriptive.

The SMS subcommittee understands this recommendation will delay the proposed safety elements found in the SEMS II regulations. However, it is the opinion of the subcommittee that the SEMS II regulations, if published as proposed, would have to be overhauled to make them more performance based which would cause them to conflict with the original SEMS regulations and delay the critical work on improving the structure of SEMS. For any elements of SEMS II that are clearly performance based and fully aligned with the recommendations in this Vector summary, the subcommittee supports BSEE to implement these aspects of SEMS II in the near future, as long as work on the vital improvement areas recommended below is not delayed.

The SMS Subcommittee feels strongly that BSEE needs to focus on the key issue of how to improve the SEMS regulations and its implementation process. The subcommittee believes that BSEE can achieve this by better utilizing the American Petroleum Recommended Practice 75 (API RP 75), incorporated by reference in the SEMS regulations. API RP 75 is robust and if implemented properly it can be used as the baseline document to develop an optimum safety management system for the U.S. OCS. The Department of Interior should seriously consider this recommendation and begin to address the following four areas that have been identified by the SMS subcommittee as shortcoming and areas of confusion in the current BSEE SEMS regulations and the application of API RP 75;

1) Jurisdiction: The term "system", when used in conjunction with the term "safety management system" typically represents a complete structure such as vessel or a fixed facility, and therefore encompasses all operations, processes, activities and systems that make up each structure. As currently written, the BSEE SEMS regulations do not follow this logic because the SEMS regulations only apply to operators, and only cover operations and activities that fall under BSEE jurisdiction.

   An ideal safety management system for an offshore unit[3] should be a single document that analyzes, evaluates, and describes all operations and activities, not just ones that fall under the jurisdiction of one specific regulatory agency. Numerous daily and emergency operations, activities and systems onboard offshore units have the tendency to blur jurisdictional lines. Under the current SEMS regulations only a portion of the hazards associated with these operations and activities will be identified and addressed. For example; all of the areas where the USCG has jurisdiction onboard an offshore unit, as outlined in the USCG/MMS MOA OCS-01, do not have to be included in a SEMS plan and are therefore not evaluated.

[3] For the purposes of this paper, the term "offshore unit" means a vessel, installation, structure, or other apparatus engaged in OCS activities, including all fixed and floating facilities, MODUs, FPSO, FPS, and drillships.

The Department of Interior should review the jurisdictional limitations of each regulatory agency involved in the management of safety and environmental protection of the OCS (i.e. BSEE, USCG, BOEM, EPA, etc.). The Department of Interior should amend the current SEMS regulations to incorporate all operations and activities that take place on an operator's facility in addition to the ones only covered by BSEE's jurisdiction.

2) Responsible Party: As currently written the SEMS regulations state that only Operators are responsible for developing and implementing a SEMS program. In fact the preamble for the SEMS regulations specifically states, "This final rule does not require that a contractor have a SEMS program." This is very confusing.

   As currently written, SEMS requirements apply only to operators and cover all OCS oil and gas operations under BSEE jurisdiction. This includes drilling; production; well construction; well completion and/or servicing; and DOI pipeline activities; when they take place on production facilities as well as mobile offshore drilling units (MODUs).

   Depending on the operation, many of the activities that are supposed to be covered in a SEMS program are actually performed by contractors and not the operator. In particular, almost every MODU operating on the OCS and some floating production units are not owned by an operator, but rather owned and operated by a contractor. Under the current SEMS regulations, the operations and activities being conducted by these contractors, for example work being conducted on a MODU, are supposed to be addressed in an Operator's SEMS program. This means that each Operator is responsible for addressing safe work practices, job safety analysis, mechanical integrity and training on requirements onboard contracted MODU or production units. Further confusion as to who is ultimately responsible for each requirement under the current SEMS regulations is compounded by the fact that BSEE decided to use the term "you" instead of clearly defining who the "you" means in their regulations.

   The SMS subcommittee believes that the Operator should be ultimately responsible for operations and activities that take place in their own leased area. However, certain "major contractors"[4] should be responsible for developing and implementing a facility specific SEMS program since they are the ones performing the operations and activities on the OCS. The Department of Interior should consider amending the original SEMS regulations so that "major contractors", in addition to operator, are responsible for having a SEMS program that holistically covers operations and actives that take place on the OCS. In addition the SEMS should be amended so that it clearly states for what an "operator" and "major contractor" are responsible.

   In the interim, while these regulatory changes are being made, the Department of Interior should work with its regulatory partners to encourage and facilitate "major contractors" to voluntary SEMS compliance. By demonstrating compliance with SEMS, contractors can greatly enhance offshore safety and assist operators with compliance.

[4] For the purposes of this paper, the term "major contractor" means drilling contractors and production facility owners/operators when not considered to be the leaseholder.

3) Prescriptive regulations and requirements: The Department of Interior has claimed that the SEMS regulations are "performance-based standards similar to those used by regulators in the North Sea."[5] The SMS subcommittee disagrees, but feels that modifications to the existing SEMS regulations could help the Department of Interior reach their goal of having SEMS be a performance-based regulation.

   Practically speaking, the SEMS regulations are written in such a manner that operators are not given the freedom to develop a management system that best fits their specific operations. Unlike the performance based regulations found in Norway and in the UK, the Department of Interior elected to prescribe specific items to be addressed, list items that need to be verified, and even specify what records to keep in the current SEMS regulations. If SEMS was truly a performance-based regulation, the Department of Interior would not have needed to use the words "must" and "shall" throughout the regulation.

   The SMS subcommittee believes that the prescriptive approach found in the current SEMS regulations promotes the idea that operators only have to meet the minimal requirements in order to comply with the regulations. This is reinforced by the fact that BSEE recently published the Potential Incident of Noncompliance (PINC) list for SEMS audits that can be used by operators to help ensure that they do not receive any penalties. In addition, the PINC list focuses more on whether or not an operator has the correct documentation rather than the practical operation of safety measures.

   The SMS subcommittee has written a detailed discussion on performance-based regulations under "Topic #2" of this paper. Based on that discussion the SMS subcommittee believes that the Department of Interior should amend the current SEMS regulations so that they are more performance-based. In addition, the Department of Interior should work with industry to develop effective guidance document(s) on how to comply with the current and future amended SEMS regulations rather than create more prescriptive compliance requirements like those include in the SEMS II rule. For example, a leading practice for major risk analysis of typical operations would be useful to both the industry and the regulators.

4) Reinforcing process safety focus and responsibilities: The SMS subcommittee feels that the current SEMS regulations and API RP 75 on which they are based includes the necessary process safety controls and requirements to be a major barrier in preventing catastrophic events from occurring (e.g. hazard analyses, management of change, safe work practices, etc.), but strongly believes that reinforcement of process safety management is needed from the regulators and industry to create the necessary change in performance and effectiveness of process safety to assure the desired outcomes. As evident in recent catastrophic events, too much attention and effort by senior management and regulators was directed toward ensuring and recognizing good occupational health and personal safety performance. For example, BP senior management were on board the Deepwater Horizon on the day of the disaster to celebrate a personal safety milestone, yet did not inquire about the integrity and

[5] Stated by Director Bromwich at the last International Regulators Forum meeting in Stavanger, Norway and at the Ocean Energy Safety Advisory Committee meeting in Washington in November of 2011.

operational readiness of the risk management controls nor the robustness of decision-making on the rig.

A change to this management bias towards occupational health and safety requires a fundamental shift in approach, possibly utilizing a separate safety management system focused solely on process safety management. The SMS subcommittee has debated this idea vigorously, but could not agree whether different systems are essential for success. The argument for a separate process safety management system is that the processes and measurements are very different for this type of risk management. When combined, it is possible for process safety not to get the attention it deserves because occupational safety is so well defined and established while process safety is less so. The argument for the other side is that better definition of and focus on process safety in SEMS would overcome this bias.

Consistent with the approach to optimize SEMS rather than introduce a new safety management system, the SMS subcommittee recommends that industry work with the regulators to develop an assessment methodology and/or audit protocol along with appropriate performance measures that test the process safety focus and controls as part of a regular SEMS review. Currently, the SEMS Potential Incidence of Non-compliance List[6] used by BSEE is geared towards verification that the elements of SEMS are in place rather than assessing whether the process safety controls are effective. This performance assessment could be developed in conjunction with the Center for Offshore Safety and should be supported by appropriate leading indicators that are regularly reported. (See KPI discussion in Vector 1 recommendation.)

Topic #2: Use of performance-based regulations

Over the last eighteen months, the idea of using performance-based regulations to enhance the safety of the offshore oil/gas industry within the United States has been heavily debated, documented and researched. Specifically, there has been interest in using a more performance-based approach, similar to the ones used in the UK and Norway.[7] Opponents claim that performance-based regulations rely too heavily on the use of probabilistic risk analysis, inflict high costs onto small operators, and don't consider low frequency and high consequence events like the ones that led to the Deepwater Horizon incident. On the other hand, supporters claim that performance-based regimes allow for regulatory compliance adaptability, facilitate system and technological innovation and place safety responsibility onto those who create the risks.

Regardless of the arguments for or against performance-based regulations, countries interested in switching to this type of regulatory regime must first establish a suitable regulator structure, one that is sufficiently funded, well-resourced and skilled enough to handle the responsibilities that come with implementing and ensuring compliance with a performance-based regulatory regime. The SMS Subcommittee has identified three main characteristics that are vital to the

[6] See BSEE webpage: http://www.bsee.gov/Inspection-and-Enforcement/Inspection-Programs/Potential-Incident-of-Noncompliance---PINC.aspx

[7] Both regimes are considered performance based regimes because the regulator provides independent assurance that the operational and facility risks are properly controlled by challenging the operator's risk management system and verifying by audit/inspections that the operator has implemented its risk management commitments. The tool or vehicle for demonstrating that the risks are managed in the UK and AU regimes is via a Safety Case.

successful implementation of performance-based regulatory regimes in both the UK and Norway. These same three features also make the use to performance-based regulations very difficult to implement here in the United States:

1) *Well-resourced and competent regulator***.** The UK and Norway employ a large number of highly educated personnel and technical specialists to perform audits, inspections and review required documents. In Norway, the PSA has approximately 160 employees, of which, approximately 100 perform compliance and audit related tasks regulating 105 offshore units (MODUs, FPSOs, fixed faculties, etc.). Each of these 100 employees has a postgraduate (Masters Degree), or equivalent level of training, in one or more areas of expertise, including drilling, petroleum engineering, structural engineering, and reliability engineering. In contrast, BSEE and the USCG share approximately 60 offshore inspectors for over 3,500 offshore installations.

2) *A single regulatory agency, responsible for offshore safety*. Following the occurrence of major accidents and the adoption of performance-based regimes, both Norway and the UK established single offshore regulatory agencies (Offshore Division of the Health and Safety Executive in the UK, and the Petroleum Safety Administration in Norway). Each of these regulatory agencies were established with jurisdiction over all operations/activities and tasked exclusively with ensuring offshore safety in the oil and gas sector.[8] Partially driven by the need to split responsibilities of revenue collection and safety regulation, both countries decided that the "single regulator" approach would reduce industry confusion, condense the number of overlapping acts and regulations and ensure a consistent compliance/enforcement techniques. In the U.S., both the BSEE and the USCG have significant authorities and jurisdictions in regulating offshore oil and gas operations and activities. In addition, there are several agencies, such as the EPA, PHMSA, BOEM that play a smaller role in offshore oil and gas regulation.

3) *A single, well defined, responsible party for each offshore unit*. Under the UK approach, a single "duty holder"[9] is held responsible for all operations and activities that take place onboard each offshore unit, regardless of whether or not it is contracted or owned by a leaseholder. In Norway, the "operator"[10] is responsible for ensuring safety for all operations and activities that take place within their leased area. Whether this person is called the "duty holder" or "operator", performance-based regulations in the UK and Norway operate under the concept that there should be a single responsible party in charge. For example, if "Company X" was listed as the "Operator" on the oil/gas license in Norway, then they would be the single responsible party in charge of managing the safety of all operations that take place within their leased area, including those conducted on a contracted MODU and any third parties performing work on that MODU.

[8] In the UK the HSE is responsible for all operations related to offshore safety; this does not include environmental response or environmental safety.

[9] Under the UK regulations, a "duty holder" is person, whether the owner or the operator of an installation, on whom duties are placed by the regulations in respect of installations, particularly to prepare the safety case.

[10] In Norway, the "operator" is considered the lease holder. In cases, where more than one company invests in the lease, there will be a single designated operator listed that has the overall responsibility to ensure safety.

In the U.S., this is not as simple or clearly defined. Not only is there confusion regarding who is actually in charge on each offshore unit[11], but there is even greater uncertainty as to who is ultimately responsible.[12] For example, a contracted MODU performing work in a leased OCS area under the direction of operator (as defined by 30 CFR 250), must comply with both USCG and BSEE regulations. The MODU owner may be considered responsible since they are regulated by the USCG and must demonstrate compliance with regulations found in 33 CFR Subpart N (140-147) and 46 CFR Subpart I-A (107-109) regulations. The Operator, who BSEE regulates, contracted the MODU and could be considered responsible since they own the lease and developed the required drilling plan that the MODU must use. In addition, there are third party contractors who perform operations and activities onboard the MODU have responsibilities to report to both the leaseholder and the drilling company and could be held accountable for violations or accidents.

While these characteristics make it hard to fully implement a performance-based regulatory approach in the U.S., the SMS subcommittee recommends incorporating several essential elements from the UK and Norwegian regulatory regimes into an enhanced SEMS approach. In particular;

1) a holistic approach (health, safety, environment for all operations under one safety management system);
2) requirements for safety management system for both operators and rig owners;
3) requirements for qualitative risk assessments for Outer Continental Shelf (OCS) installations (vessels, facilities, MODUs);
4) use of mitigation strategies and barrier selection to reduce risk and hazards in safety management systems;
5) risk based approach/frequency inspections/audits;
6) accident/near miss investigation and reporting requirements;
7) productive dialogue between regulatory and regulated community (post inspection or audit) ; and
8) Inspector qualifications and knowledge regarding SMS.

Long Term Work-plan on Vector #2:

In addition to the recommendation mentioned under the Optimum Safety Management System topic, the SMS subcommittee has identified other potential enhancements to the current SEMS regulations that need to be further reviewed and defined for inclusion in the final OESC report due in December 2012. The SMS subcommittee members feel strongly that improvements can be made in the submittal and review process for a SEMS and in the inspection and feedback protocols. These changes would improve the effectiveness of the SEMS requirement and reinforce the performance-based approach that, together, would greatly reduce the likelihood of another catastrophic event in the US OCS.

[11] Issues with command and control onboard the DWH was one of the key findings in the USCG/BSEE Joint Investigation into the incident.

[12] Two recent rulings show how difficult it is to understand who has responsibility when it comes to the offshore oil/gas industry. A federal judge ruled that BP must indemnify Halliburton for damage claims under its drilling contract and another federal judge ruled that Transocean will not have to pay many of the pollution claims because it was shielded in a contract with well-owner BP.

1) Submittal and review: Current SEMS regulations require operators to develop, implement, and maintain a SEMS program consistent with the 13 elements described in API RP 75. However, the regulations do not require submittal of the SEMS plan to the regulators for review and comment. While this approach can be viewed as performance-based, the regulators miss opportunities to better understand the risks and controls of an operation and/or facility and generate a proactive dialogue with the industry. The SMS subcommittee plans to evaluate the pros and cons of requiring this step including the following factors: methodology/format for submittal, review requirements, and regulatory resources required along with funding. To accomplish this task, the SMS subcommittee proposes to further review the submittal and approval process used by the UK, Norwegian, and Australian regulators.

   A critical part of the SEMS regulations is the hazard analyses, particularly the facility level analysis that addresses process safety risks and controls. While the SMS subcommittee supports the requirement for qualitative evaluation of the risks rather than a quantitative approach, there is little definition as to how to conduct these evaluations. The SMS subcommittee recommends looking further into the facility risk assessment requirements in the UK, Norway and Australia, as well as other industries involved in technically challenging, high risk operations (e.g. nuclear Navy, civil aviation, etc.)

2) Audits, inspections and feedback: In other offshore oil and gas regulatory systems, facility inspections are carried out by 2-3 person teams over multiple days. Following the inspection, the regulators meet with the facility operator to review findings, agree immediate improvement actions, and discuss any gaps in the SEMS plan and actions to close those gaps. The SMS subcommittee recommends further study of the audit practices carried out by other countries as well as the team based approach in BSEE's Focus Facility Reviews and the California State Land facility evaluations. The subcommittee will need to evaluate the following factors: frequency and approach, regulatory agency resource needs and funding requirements including transportation needs. A critical part of this review would be to identify best practices around proactive feedback and improvement planning to move away from the current PINC list approach.

   The SMS subcommittee also recommends a further review of the requirement for independent third party audits instead of current requirements for independent internal audits. With improved facility inspections as proposed above, the subcommittee believes that independent internal audits to supplement the regulatory inspections would be adequate, but additional discussion and review on this subject is warranted.

3) Process safety focus: Further to the earlier discussion on improving process safety management, the SMS subcommittee will consider if revisions to API RP 75, and subsequently to the SEMS regulations, would help support a greater focus on and management of process safety risk in the oil and gas industry.

Additional item for full OESC Consideration:
While reviewing and researching these two topics (Safety Management Systems and performance-based regulations), one topic came up numerous times that has critical impact not only to the issues being addressed by the SMS Subcommittee, but also to the other work being

tackled by the fellow OESC subcommittees. That is, whether the U.S. should revise its current offshore safety regulatory regime and regulate through one independent regulatory agency that combines all of the offshore safety related oil and gas authorities that are currently split between BSEE and the USCG. A brief discussion on this issue, as it relates to performance-based regulations can be found under Topic #2.

The SMS subcommittee believes that this could have alleviated the four key issues that have been identified with the current SEMS regulations, and it is also a necessity as we begin to move from prescriptive regulations into a more performance-based approach. The SMS Subcommittee recommends that the full OESC committee further discuss the concept and if more action is needed, task an appropriate subcommittee, or create a new subcommittee to further develop a formal recommendation on this concept. It is important to note that Norway, the UK and Australia have created a single regulatory agency as they moved to performance based regulation.

Ocean Energy Safety Advisory Committee
Safety Management Subcommittee Safety Culture Recommendation

Recommendation 3 – Data Management

August 15th, 2012

Introduction

At the full OESC meeting in April 2012, the SMS Subcommittee proposed three recommendations to the OESC relating to Offshore Safety Culture [1]. The OESC supported two of the three recommendations, which were subsequently submitted to DOI/BSEE by Chairman Hunter in a letter dated May 17, 2012, and requested that the third recommendation be reworded and re-submitted to the committee for approval.

In the following section the re-worded recommendation is presented to the Committee for approval

3- Data Management

Data is one of the essential management tools needed to ensure that safety performance indicator trends can be analyzed and proper management decisions made to reduce or eliminate certain unwanted consequences. The challenges so far in relation to use of data in offshore safety management are many, hence the flurry of initiatives that are ongoing on this subject.

This subcommittee's work in this area was mainly focused on emphasizing key recommendations as related to data management; these recommendations should not be considered comprehensive as they are not covering such areas as prevention. The focus in this section is on data as related to checking that the safety culture which is being developed and followed is leading to the desired safety outcomes. The subcommittee recommends the following:

a. That DOI/BSEE put greater emphasis on performance indicators of the health of the safety management systems rather than on lagging personal safety indicators. The focus should be on leading indicators measured weeks if not months prior to the potential hazard occurring and measuring people's behavior and decisions early in the process that may lead to a hazard. This would be more effective than simply relying on indicators that occur immediately prior to an incident where intervention is limited, more reactive and usually less effective. The key is in finding measures of how completely the elements of SEMS are being actually implemented in the operations. The recommendations of the National Academy report on "Evaluating the Effectiveness of Offshore Safety and Environmental Systems" might form a basis for defining these indicators.

b. That both near miss reporting and hydrocarbon release data could be included as indicators to be reported. BSEE should work with other regulators and industry to better define the specifics of such indicators before they can be implemented.

c. That once indicators are defined, contractors and operators should be allowed to present their safety performance leading indicators in a neutral format and in a safe environment that would allow the development of a stronger and more mature safety culture, one that would not punish individuals or organizations for sharing their data. The Center for Offshore Safety (COS) is a good example where such data can be analyzed and shared in a neutral environment.

A process should be developed to allow the data to be made available to the public in a neutral format.

d. We recommend that BSEE and the industry work through international initiatives and the COS on consolidating the format of reporting these indicators. The data collection process is the foundation of all future analysis and recommendations that are made, and as such should be well structured and organized according to an international guideline or standard. This would allow the largest data set for the analysis of trends. Such a data collection process would provide important feedback to the previously recommended Offshore Safety Leadership Council to assist them in better understanding how behaviors and values are changing and to help drive to a stronger safety culture.

References

[1] - SMS Subcommittee Vector #1 recommendation document dated April 10, 2012

Ocean Energy Safety Advisory Committee
Safety Management Subcommittee
Stakeholder Engagement Recommendation

August 15th, 2012

Stakeholder Engagement

The Safety Management Systems Subcommittee proposes the following recommendation for consideration by the OESC:

The Ocean Energy Safety Advisory Committee (OESC) recommends that BSEE utilize the OESC and any successor federal advisory committee as a resource for input and early stakeholder feedback on major BSEE issues and initiatives. BSEE could ask OESC to provide recommendations on specific issues of concern to the Bureau. Major initiatives on which BSEE might solicit input from the OESC include regulatory proposals (prior to the start of the formal regulatory process and during open comment periods), use of industry standards, policies and procedures (e.g., Notices to Lessees, enforcement approaches), and research-related decisions.

Ocean Energy Safety Advisory Committee
Safety Management Subcommittee
Safety Management System Enhancement Recommendation

August 29, 2012

Introduction

At the full OESC meeting in April 2012, the Safety Management Systems (SMS) Subcommittee recommended that DOI/BSEE redirect its work on the proposed Safety and Environment Management Systems (SEMS) II rule in order to address four critical issues with the current SEMS regulations:

- Jurisdiction
- Responsible party
- Performance-based approach
- Process safety management

The OESC supported this recommendation and the Chairman submitted the recommendation to the Department of Interior (DOI) and the Bureau of Safety Environmental Enforcement (BSEE) in a letter dated May 17, 2012.

During and after the April 2012 meeting, the Subcommittee identified several additional improvement topics that required further analysis and debate before bringing them forward as firm recommendations. These focused on whole system safety management, hazard identification & mitigation, and performance based approach to safety. In June 2012 the SMS Subcommittee met and discussed SEMS, Safety Culture and other related topics. Based on this meeting and the subcommittee's continued work on safety management systems, five new recommendations for DOI/BSEE have been generated and are now submitted to OESC for consideration.

New Recommendations

1) Management and Facility Level Approach: The SMS Subcommittee believes that the current SEMS regime could be more effective if amended to provide focus on two different levels. This amended approach would provide the necessary balance between management, engineering, and operational activities and thus would significantly enhance barriers to major incidents and worker/environmental safety on the OCS. A graphical depiction of this dual level approach is shown below in Figure #1.

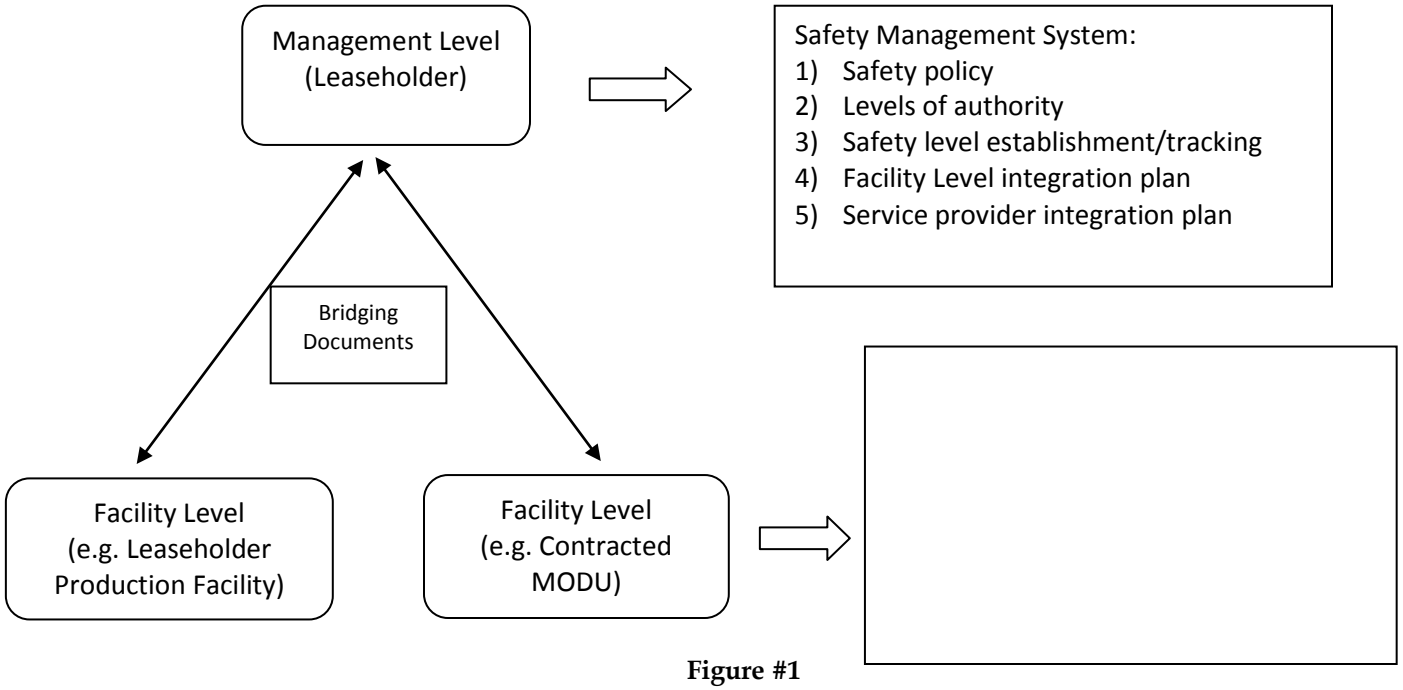


Figure #1

The SMS Subcommittee believes that leaseholders should be considered as the "Management level" for this new approach. Leaseholders should be tasked with setting general safety policies; defining achievable safety levels, developing bridging documents with facility and service providers, and managing the overall safe operation of their leased area(s). These and other elements are key components of an effective safety management system. Furthermore, it should be the responsibility of a leaseholder to bridge all of the "Facility Level" Safety Managements Plans (SMP).

Owners and/or operators of facilities[1] must be given the responsibility to develop and implement their own Safety Management Plans that are facility specific. In particular, these parties need to be responsible for all equipment on the facility and all activities performed on the facility. Job safety analyses, facility level hazard analysis, operating procedures and mechanical integrity program need to be developed, implemented, and owned by the people at the Facility level. This would include integrating subcontractors that provide equipment plus personnel on that facility. It should be noted that these SMPs must be appropriately bridged with a "Management Level" SMS prior to the start of any activities.

Portions of this new approach follow what is currently being implemented in the United Kingdom. Under UK Health and Safety law, the primary responsibility for ensuring safety on a facility is placed on a "duty holder." This "duty holder" is typically considered to be the operator for production installations (fixed and floating facilities) and owners of non-production installations (contracted MODUs). "Duty holders" are responsible for the overall safety of their individual facility and must coordinate the health and safety of all the companies and personnel present.

[1] As defined by 33 CFR 250.105

Recommendation: Proper safety management on the U.S. OCS needs focus on delegating of appropriate SMS responsibilities to both the leaseholder and the owner/operator of each facility. This requires the implementation of a dual level concept consisting of a "Management Level SMS" that covers safety policy, delegation of authorities, integration of safety plans, etc. and a "Facility Level SMP" that includes operational procedures, facility design/engineering, resource and personnel, emergency preparedness, integration planning, etc.

BSEE should continue regulating the leaseholders and should develop/implement the "Management Level" portion of this approach, however the "Facility Level SMP" portion of this approach may fall outside of BSEE's current authority/jurisdiction. The subcommittee recognizes that BSEE has jurisdiction over specific systems that may be on a "facility," however; the "Facility Level SMP" should be regulated and developed by the appropriate regulatory agency that has jurisdiction over the safety of the entire facility.

2) SEMS Program submittal and approval: The SMS subcommittee members feel strongly that improvements can be made to the current SEMS regime by developing a submittal and approval process of a leaseholder's SEMS Program. These changes would improve the dialogue and learning and thus effectiveness of SEMS and reinforce the performance-based approach.

   In the United Kingdom and Australia, safety management plans are submitted to the Health and Safety Executive (HSE) and National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), respectively, as part of their "Safety Case" requirements. These plans are then assessed on an individual basis to ensure that all aspects involving safety are being properly managed, and to confirm whether or not the regulator is satisfied that there is sufficient robustness in the safety management system. For certain vessels[2]operating on the U.S. OCS, the Coast Guard requires that their Safety Management Systems be certificated. This certification process involves a systematic review of the management system, including emergency preparedness, incident investigation and risk management procedures.

   The current SEMS regulations do not require leaseholders to submit their SEMS Program to BSEE for approve or comment. BSEE does, however, have the right to request a leaseholder to make their program available for evaluation, when requested. The SMS subcommittee feels that this is a missed opportunity to understand the risks and controls of an operation and/or facility and therefore provide better oversight. The Subcommittee also feels that this best practice would also help the Bureau more quickly develop its knowledge and capabilities regarding safety management systems. It will be necessary for BSEE to implement this recommendation over a period of time to allow BSEE to obtain the necessary resources to perform this approval.

   Recommendation: BSEE should develop and implement a submittal and approval process for leaseholder SEMS plans.

3) Audits, inspections and feedback: In other offshore oil and gas regulatory systems, as well as in other industries such a nuclear, facility inspections/audits are carried out by 2-3 person teams over multiple days, often proceeded by discussions with leadership and support staff in the office. These include an in-depth audit of the safety management system. Following the inspection/audit, the regulators meet with the facility operator to review findings, discuss gaps and develop an improvement plan of actions to close those gaps. This collaborative and interactive approach helps both the regulator and operator to identify and address any key gaps in the safety management system being used on the facility and helps

[2] See 33 CFR 96.210 for applicability.

foster a cooperative safety culture where the regulator and operator are working together towards a safer industry. Right now, SEMS audits by BSEE inspectors are not performed this way. The SMS Subcommittee believes that there should be a close-out review meeting between BSEE and the leaseholder to allow for an open discussion on any written/official citations and the development of an improvement plan.

Recommendation: BSEE should review inspection/audit practices carried out by other countries and other industries, as well as the team based approach in BSEE's Focus Facility Reviews and the California State Land facility evaluations and revise their approach. This review should include an evaluation of the following factors: frequency and approach, regulatory agency resource needs and funding requirements including transportation needs. A critical part of this review would be to identify best practices around proactive feedback, and improvement planning to move away from the current PINC list approach. This recommendation is not meant to take away from BSEE's traditional inspections and ability to issue immediate citations for any egregious safety violations.

4) Independent third party audits:
The SMS subcommittee also recommends that BSEE revise the requirement for independent third party audits as included in the proposed SEMS II rule and stay with the current practice of using internal auditors. Use of a competent and well-documented internal team would help to ensure a quality audit that also encourages an appropriate culture of safety. BSEE, in consultation with the industry through the Center for Offshore Safety (COS), should develop an approach to certify auditors (including internal auditors), develop audit standards, and establish the process by which audits are conducted. Along with improved facility inspections and interactive feedback sessions as proposed above, the subcommittee believes that internal audits by qualified auditors would significantly improve audit and SEMS effectiveness.

Recommendation: BSEE should revise the requirement in the SEMS II proposed rules for independent third party SEMS auditors to allow qualified internal SEMS auditors.

The SMS Subcommittee recognizes that the first recommendation would require a large regulatory change and organizational shift; nevertheless the Subcommittee advocates that DOI/BSEE not delay action on the remaining recommendations while working on the first one. The Department of Interior should request additional resources and funding to implement these recommendations if needed.

Ocean Energy Safety Advisory Committee
Safety Management Subcommittee
Safety Management System Enhancement Recommendation

Introduction

At the previous OESC meeting in August 2012, the Safety Management Systems (SMS) Subcommittee submitted four recommendations to enhance the effectiveness of the current SEMS regulations. Three of the recommendations concerning submittal and approval of SEMS plans, revision of the inspection and audit process, and use of qualified, internal auditors for SEMS audits were supported by the Committee and subsequently submitted by Chairman Hunter to the Department of Interior (DOI) and the Bureau of Safety Environmental Enforcement (BSEE) in a letter dated October 15, 2012. However the fourth recommendation dealing with implementation of a dual level concept consisting of a "Management Level SMS" and a "Facility Level SMP" was challenged by some OESC members as being too confusing and/or burdensome, so the SMS Subcommittee agreed to work the concept further and resubmit the proposal.

The Subcommittee met on October 17, 2012 in Houston and agreed to revisit previous work and recommendations submitted by the Subcommittee and address the issue more holistically starting with the API standards that form the basis of the current SEMS regulations.

Optimum Safety Management System

As previously established, the SMS Subcommittee has focused on enhancing the current SEMS regulations and enforcement methods rather than suggesting that BSEE make a wholesale change to a different safety management system. The SMS Subcommittee believes that making modifications which resolve jurisdictional, applicability, implementation and enforcement issues with the SEMS regulations will fortify and strengthen the current SEMS regulation and will further support improving safety on the OCS.

The Subcommittee is making the recommendations below to ensure that SEMS (1) covers all operations and activities, (2) clearly identifies the responsible parties, (3) places more focus on process safety management, (4) makes the SEMS regulations less prescriptive, and (5) provides a method for evaluating and enforcing the SEMS regulation. These recommendations need to be taken as a whole as each reinforces the other and makes for a holistic approach to improving SEMS.

The subcommittee recommends the first step in achieving these goals is for BSEE, USCG, API, and the industry to participate in an up-date of API RP 75. In the interim, BSEE should continue to utilize the current American Petroleum Institute Recommended Practice 75 (API RP 75), incorporated by reference in the SEMS regulations, as the basis for SEMS. API RP 75 is robust and if modified properly it can be even more effectively used as the baseline document to support and develop optimum safety management systems for the U.S. OCS.

1) Covering All Operations and Activities: An ideal safety management system for an offshore unit[1] should be a single plan that analyzes, evaluates, and describes all operations and activities, not just ones that fall under the jurisdiction of one specific regulatory agency. Numerous daily and emergency operations, activities and systems onboard offshore units have the tendency to blur jurisdictional lines. Under the current SEMS regulations only a portion of the hazards associated with these operations and activities fall specifically under BSEE jurisdiction. Other aspects where the USCG has jurisdiction onboard an offshore unit, as outlined in the USCG/MMS MOA OCS-01, are not specifically required to be in a SEMS plan. However, operators are currently building SEMS plans to cover all facets of the operations regardless of jurisdictional responsibility. This situation can be confusing and/or inefficient, could contribute to plans that do not cover the entire system, and could provide opportunity for significant variability between operators.

   Recommendation
   The Department of Interior (DOI) working with the USCG and other appropriate agencies should request and work with industry to amend the current version of API RP 75 to incorporate all operations and activities that take place on an operator's facility in addition to the ones only covered by BSEE's jurisdiction. BSEE, USCG, Department of Transportation (DOT) and others could then request that responsible parties (to be defined below) have a Safety Management System which is consistent with API RP 75. Each agency could then decide how it will assure the adequacy of the Safety Management Systems in so far as it pertains to the agency's individual responsibilities. MOUs between the agencies should address issues of review, inspection, and/or audit of various aspects of the Safety Management Systems.

   In this manner there will be no need for the agencies to alter their jurisdictional responsibilities which can continue to be addressed via MOUs and MOAs. We will discuss below specifically how BSEE can carry out its jurisdictional responsibilities under this recommendation and also address the issues of responsible party, placing more focus on process safety, make the requirement less prescriptive and assure enforcement.

2) Responsible Party: As currently written the preamble for the SEMS regulations specifically states, "This final rule does not require that a contractor have a SEMS program." At the same time BSEE has stated its intention to hold "contractors" responsible for compliance with the operator's SEMS plan. However, SEMS requirements cover all OCS oil and gas operations under BSEE jurisdiction including drilling; production; well construction; well completion and/or servicing; and DOI pipeline activities; whether they take place on production facilities or contractor owned and operated MODUs. This is very confusing.

   Many of the activities that are supposed to be covered in a SEMS program are actually performed by contractors and not the operator. In particular, almost every MODU operating on the OCS and some floating production units are not owned by an operator, but rather owned and operated by a contractor. Under the current SEMS regulations, the operations and activities being conducted by these contractors, for example work being

[1] For the purposes of this paper, the term "offshore unit" means a vessel, installation, structure, or other apparatus engaged in OCS activities, including all fixed and floating facilities (e.g. FPSO, FPS, etc.) and mobile offshore drilling units (MODUs).

conducted on a MODU, are supposed to be addressed in an Operator's SEMS program. This implies that each Operator is responsible for addressing safe work practices, job safety analysis, mechanical integrity and training on requirements onboard contracted MODUs or production units. BSEE introduced further confusion as to who is ultimately responsible for each requirement under the current SEMS regulations by using the term "you" instead of clearly defining the responsible party in the regulations.

Currently, many operators require major contractors to have a SEMS plan along with appropriate bridging documents. This practice is effective, but not consistently applied. Further the auditing of major contractor's SEMS is not clear. The SEMS of a major contractor should be audited by the operator or via a centralized process like that provided by the Center for Offshore Safety.

The SMS Subcommittee supports the principle that the Operator is ultimately responsible for operations and activities that take place in their own leased area. However, certain "major contractors" should be responsible for developing and implementing a facility specific SEMS program since they are the ones performing the operations and activities on the OCS. For the purposes of this paper, the term "major contractor" means drilling contractors and production facility owners/operators when not considered to be the leaseholder.

Recommendation
DOI should amend the SEMS regulations such that "major contractors", in addition to the operator, are responsible for having a SEMS program that holistically covers operations and activities that take place on the OCS and that bridging documents are required between Operators and these "major contractors" to adequately detail linkages between respective safety management systems and specific roles and responsibilities. The term "major contractor" means drilling contractors and production facility owners/operators when not considered to be the leaseholder.

In the interim, while these regulatory changes are being made, DOI should work with its regulatory partners to encourage and facilitate "major contractors" to voluntary SEMS compliance. By demonstrating compliance with SEMS, contractors can greatly enhance offshore safety and assist operators with compliance[2].

3) Reinforcing process safety focus and responsibilities: The current SEMS regulations and API RP 75 on which they are based includes the process safety controls and requirements necessary to provide major barriers to prevent catastrophic events from occurring (e.g. hazard analyses, management of change, safe work practices, etc.). However, reinforcement of process safety management is needed from both the regulators and industry to create the change in performance and effectiveness of process safety to assure the desired culture of safety. As evident in recent catastrophic events, too much attention and effort by senior management and regulators was directed toward ensuring and recognizing good occupational health and personal safety performance rather than inquiring about the

[2] Note: contractor members of the Center for Offshore Safety have agreed to have their safety management systems certified as SEMS compliant.

integrity of the risk management controls or the robustness of decision-making in the operations.

A change to this management bias towards occupational health and safety requires a fundamental shift in approach, possibly utilizing a separate safety management system focused solely on process safety management. The SMS subcommittee debated this idea vigorously, but could not agree whether different systems are essential for success. The argument for a separate process safety management system is that the processes and measurements are very different for this type of risk management. When combined with occupational safety management, it is possible that process safety does not get the required attention because occupational safety is so well defined and established, while process safety is less so. The opposing argument is that better definition of and focus on process safety in SEMS would overcome this bias.

Recommendation

Consistent with the approach to optimize SEMS rather than introduce a new safety management system, the SMS subcommittee recommends that BSEE work with industry to develop an assessment methodology and/or audit protocol along with appropriate performance measures that test the process safety focus and controls as part of a regular SEMS review. This performance assessment could be developed in conjunction with the Center for Offshore Safety and should be supported by appropriate leading indicators that should be regularly reported.

4) Making a Less Prescriptive Regulation: BSEE has claimed that the SEMS regulations are "performance-based standards similar to those used by regulators in the North Sea." The SMS subcommittee does not fully agree with this statement, but feels that the right kinds of modifications to the existing SEMS regulations could help DOI reach their goal of SEMS being a more performance-based regulation.

Practically speaking, the SEMS regulations are written in such a manner that operators are not given the freedom to develop a management system that best fits their specific operations. Unlike the performance based regulations found in Norway and in the UK, BSEE elected to prescribe specific items to be addressed, list items that need to be verified, and even specify what records to keep in the current SEMS regulations. If SEMS was truly a performance-based regulation, BSEE would not have needed to use the words "must" and "shall" throughout the regulation.

The SMS subcommittee believes that the prescriptive approach found in parts of the current SEMS regulations could promote the idea that operators only have to meet the minimal requirements in order to comply with the regulations. This is reinforced by the PINC list which focuses more on whether an operator has the correct documentation rather than the practical operation of safety measures.

Opponents of performance-based regulations claim that they rely too heavily on the use of probabilistic risk analysis, are difficult to oversee without an extensive and technically-sophisticated governmental workforce, do not adequately consider low frequency and high consequence events like the ones that led to the Deepwater Horizon incident, and inflict

high costs onto small operators. On the other hand, supporters claim that performance-based regimes allow for regulatory compliance adaptability, facilitate system and technological innovation and better place safety responsibility onto those who create the risks. Said another way, prescriptive-based regulations tend to encourage a "culture of compliance" while performance-based regulations tend to encourage a "culture of safety". The 1990 Marine Board Report on "Alternatives for Inspecting Outer Continental Shelf Operations" addressed how existing enforcement mechanisms employed by the predecessor of BSEE, the Minerals Management Service, encouraged a culture of compliance.

The diversity in the size of the operating companies in the Gulf of Mexico as well as in the size and type of facilities and the associated production that flows through or is produced by each facility creates a challenge to the regulators and the operators.

Recommendation

The SMS subcommittee recommends that the safety regulations assure that SEMS can be applied in a "fit-for-purpose" way that differentiates between facilities based on criticality and consequence. SEMS should be performance based and adapted to the needs and requirements of the business and the operating systems. For example, the regulation should not impose the same prescriptive requirements on a free standing caisson with minimal production and facilities as on a platform with complex facilities, high production rates, and living quarters.

In switching to a less prescriptive based regulation, the regulatory body must first establish a suitable regulator structure, one that is sufficiently funded, well-resourced and skilled enough to handle the responsibilities that come with implementing and ensuring compliance with a performance-based regulatory regime. The SMS Subcommittee identified the following four characteristics that are vital to the successful implementation of performance-based regulatory regimes in both the UK and Norway. These same three features also make the use of performance-based regulations very difficult to implement here in the United States:

a) *Well-resourced and competent regulator***.** The UK and Norway employ a large number of highly educated personnel and technical specialists to perform audits, inspections and reviews of required documents. In Norway, the PSA has approximately 160 employees, of which, approximately 100 perform compliance and audit related tasks regulating 105 offshore units (MODUs, FPSOs, fixed faculties, etc.). Each of these 100 employees has a postgraduate (Master's Degree), or equivalent level of training, in one or more areas of expertise, including drilling, petroleum engineering, structural engineering, and reliability engineering.

b) *A single regulatory agency, responsible for offshore safety.* Following the occurrence of major accidents and the adoption of performance-based regimes, both Norway and the UK established single offshore regulatory agencies (Offshore Division of the Health and Safety Executive in the UK, and the Petroleum Safety Administration in Norway). Each of these regulatory agencies were established with jurisdiction over all operations/activities and tasked exclusively with ensuring offshore safety in the oil and

gas sector.[3] Partially driven by the need to split responsibilities of revenue collection and safety regulation, both countries decided that the "single regulator" approach would reduce industry confusion, condense the number of overlapping acts and regulations and ensure a consistent compliance/enforcement techniques. In the U.S., both the BSEE and the USCG have significant authorities and jurisdictions in regulating offshore oil and gas operations and activities. In addition, there are several agencies, such as the EPA, PHMSA, BOEM that play different roles in offshore oil and gas regulation.

c) *A single, well defined, responsible party for each offshore unit.* Under the UK approach, a single "duty holder"[4] is held responsible for all operations and activities that take place onboard each offshore unit, regardless of whether or not it is contracted or owned by a leaseholder. In Norway, the "operator"[5] is responsible for ensuring safety for all operations and activities that take place within their leased area. Whether this person is called the "duty holder" or "operator", performance-based regulations in the UK and Norway operate under the concept that there should be a single responsible party in charge. For example, if "Company X" is listed as the "Operator" on the oil/gas license in Norway, then they would be the single responsible party in charge of managing the safety of all operations that take place within their leased area, including those conducted on a contracted MODU and any third parties performing work on that MODU.

In the U.S., this is not as simple or clearly defined. Not only is there confusion regarding who is actually in charge on each offshore unit[6], but there is even greater uncertainty as to who is ultimately responsible.[7] For example, a contracted MODU performing work in a leased OCS area under the direction of operator (as defined by 30 CFR 250), must comply with both USCG and BSEE regulations. The MODU owner may be considered responsible since they are regulated by the USCG and must demonstrate compliance with regulations found in 33 CFR Subpart N (140-147) and 46 CFR Subpart I-A (107-109) regulations. The Operator, who BSEE regulates, contracted the MODU and could be considered responsible since they own the lease and developed the required drilling plan that the MODU must use. In addition, there are third party contractors who perform operations and activities onboard the MODU have responsibilities to report to both the leaseholder and the drilling company and could be held accountable for violations or accidents.

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[3] In the UK the HSE is responsible for all operations related to offshore safety; this does not include environmental response or environmental safety.

[4] Under the UK regulations, a "duty holder" is person, whether the owner or the operator of an installation, on whom duties are placed by the regulations in respect of installations, particularly to prepare the safety case.

[5] In Norway, the "operator" is considered the lease holder. In cases, where more than one company invests in the lease, there will be a single designated operator listed that has the overall responsibility to ensure safety.

[6] Issues with command and control onboard the DWH was one of the key findings in the USCG/BSEE Joint Investigation into the incident.

[7] Two recent rulings show how difficult it is to understand who has responsibility when it comes to the offshore oil/gas industry. A federal judge ruled that BP must indemnify Halliburton for damage claims under its drilling contract and another federal judge ruled that Transocean will not have to pay many of the pollution claims because it was shielded in a contract with well-owner BP.

d) *Extensive workforce involvement into safety oversight*
In the both the UK and Norway, the offshore workforce is actively involved in creating the safety case for a particular vessel or facility and has a continuing responsibility to ensure that the safety management system is robust and "owned" by everyone on that facility. During ongoing operations, members of the offshore workforce get elected to fill recognized positions as safety representatives (UK) and safety delegates (Norway) with defined roles and responsibilities such as participation in accident investigations. In the U.S., while some operators have voluntarily created similar opportunities for workforce involvement, there are no regulatory requirements to do so.

While these characteristics make it hard to fully implement a performance-based regulatory approach in the U.S., the SMS subcommittee believes that the recommendations discussed in the previous sections will enable these barriers to be overcome.

5) Evaluating the Effectiveness of a Less Prescriptive-based Approach: The 2012 Transportation Research Board special report, "Evaluating the Effectiveness of Offshore Safety and Environmental Management Systems" describes a holistic approach to evaluating a SEMS program which enables the less prescriptive approach described above to be implemented in the US regulatory environment. The SMS Subcommittee strongly supports the recommendations made in this report which agree closely with previous formal recommendations made by this subcommittee which were subsequently submitted to DOI. For completeness these are repeated below.

Previous Recommendations
Finally, the SMS subcommittee feels it's important to restate the following recommendations that were submitted by the OESC to DOI/BSEE on 15 October 2012 as being aligned and fully complementary to the recommendations listed above. Detailed write-ups on these recommendations can be found in the enclosures of that letter.

- *BSEE should develop and implement a submittal and approval process for leaseholder Safety and Environmental Management Systems (SEMS) programs. In addressing this recommendation BSEE should (a) implement this requirement over a period of time to obtain the necessary resources, and (b) consider the dynamic nature of a leaseholder SEMS program, and recognizing that this program changes, develop an adequate approval process for program amendments.*

- *BSEE should review inspection/audit practices carried out by other countries and other industries, as well as the team based approach in BSEE's Focus Facility Reviews and the California State Lands Commission facility evaluations and revise their approach to audit and inspection. In developing this revised approach, BSEE should consider the recommendations of the National Research Council report "Evaluating the Effectiveness of Offshore Safety and Environmental Management Systems."*

- *The proposed SEMS II rule requires the use of independent third party SEMS auditors. BSEE should revise this requirement and allow leaseholders to (a) perform qualified, independent internal auditing and/or (b) use a third party auditor.*

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
APPENDIX E – ARCTIC SUBCOMMITTEE

- **Subcommittee Summary Report**
- **Membership**
- **White Papers**
  - Subcommittee Recommendations for Oil Spill Risk Assessment, Preparedness and Response in the Arctic OCS
  - Arctic Recommendation on Spill Prevention, Containment and Response (August 30, 2012)

Ocean Energy Safety Advisory Committee
Arctic Subcommittee
Summary Report

Background

With renewed interest in development of oil and gas resources in the Beaufort and Chukchi Seas, the Ocean Energy Safety Advisory Committee (OESC) recognized early on the importance of addressing environmental and infrastructure challenges associated with oil-spill prevention, containment and response on the Alaska Outer Continental Shelf (OCS). This includes dealing with severe weather, seasonal sea ice and remote locations, which can cause difficulties during drilling, source control operations, oil spill tracking and remediation, and long-term production. The Prevention, Containment and Response subcommittees of the OESC made recommendations specific to the Alaska OCS, which were discussed at the August 29-30, 2012, OESC meeting in Anchorage. Most of these recommendations originated from the Response Subcommittee.

In Anchorage, the OESC approved a general recommendation on the need for Arctic-specific regulations and incorporation of standards, which was forwarded to the BSEE Director on October 15, 2012. However, the OESC felt that most of the Arctic recommendations from the Prevention, Containment and Response subcommittees needed to be better integrated, explained and justified. Among other things, this would require discussing the intended impact of these recommendations on Arctic OCS operations, including details on how recommended actions would either differ from or strengthen current practice. The Arctic Subcommittee was created at the August 2012 OESC meeting to address these concerns, and was given the charge of formulating input from the other subcommittees into an integrated and more compelling set of recommendations for the Arctic OCS. These recommendations would be presented to and voted on by the OESC at its January 2013 meeting.

Members

The Arctic Subcommittee included representatives from industry, government, academia and non-governmental organizations, including 10 members of the OESC and 3 specialists brought in as subject matter experts.

The Arctic Subcommittee included balanced representation from the original OESC subcommittees, with the Prevention, Containment, Response and Safety Management Systems Subcommittees represented by 5, 4, 8 and 4 members, respectively. This representation helped maintain a broad base of expertise on the Arctic Subcommittee, and ensured that knowledge of Arctic OCS issues discussed previously by other OESC subcommittees was carried over into the new Arctic Subcommittee.

Timetable and Approach

Following the August 2012 OESC meeting, the Arctic Subcommittee held its first fare-to-face meeting in Houston on October 18, 2012. Writing teams were then assigned for each of the recommendations and other sections to be included in the final report to the OESC. Conference calls involving the entire Arctic Subcommittee were held on October 31, November 27 and December 14, 2012, with ongoing communication at the subcommittee level and the among the

various writing teams via email and smaller conference calls. A final face-to-face subcommittee meeting was held January 8, 2013, immediately before the OESC meeting in Washington DC.

Given the need for a rapid turnaround on its report, the Arctic Subcommittee primarily focused on existing Arctic OCS recommendations from the Oil Spill Response, Prevention and Containment Subcommittees. These recommendations were modified, clarified and expanded upon in response to OESC concerns raised in Anchorage and subsequent detailed discussions within the Arctic Subcommittee. Severe environmental conditions in the Arctic OCS introduce additional safety management and human factor challenges that were also considered by the Arctic Subcommittee, in consultation with the Safety Management Systems Subcommittee. As described in the full report, the Arctic Subcommittee and these other OESC subcommittees drew upon the knowledge of their own members, consulted with experts in the field, and reviewed and analyzed a number of written reports in formulating their recommendations for the Arctic OCS.

Scope of Recommendations

Prior to formation of the Arctic Subcommittee, the other OESC subcommittees considered assessing the current state-of-the-art in oil spill risk assessment, prevention, containment and response in Arctic waters to identify gaps and inform their recommendations. However, given the broad range of research and development activities and evaluations underway by other organizations, both in the U.S. and abroad, these subcommittees decided to narrow their scope and focus recommendations on government regulations and incorporation of standards. This same focus on development of Arctic-specific regulations and incorporation of standards was adopted by the Arctic Subcommittee in preparing its integrated set of recommendations, which are presented in detail later in this report.

In addition to the recommendations prepared by the Arctic Subcommittee, many of the recommendations by the Prevention, Containment, Response and Safety Management Systems Subcommittees are also critical in ensuring the safe and environmentally responsible development of oil and gas resources on the Arctic OCS. In the final section of our report, we illustrate these critical linkages by highlighting technical and procedural recommendations from these other OESC subcommittees that are particularly relevant to the Arctic OCS operating environment.

List of Recommendations

- To ensure common standards for Arctic OCS exploration and production, the OESC recommends that DOI develop Arctic-specific regulations and/or incorporate standards for prevention, safety, containment and response preparedness in the Arctic OCS. In particular, to ensure full system readiness for Arctic OCS exploration and production, BSEE/DOI (in coordination with other agencies, as appropriate) should do the following:
    - Spill Prevention - adopt spill prevention standards specifically for the Arctic OCS. These standards should apply to, for example, designs for wells, pipelines, rigs, vessels, blowout preventers (BOPs) and other equipment suitable for Arctic OCS conditions.
    - Safety Management - commission a study on the human factors associated with working in the Arctic OCS to identify specific regulations needed to support

development of Arctic-specific work practices, technologies and operating procedures.
    - Spill Containment - adopt spill containment standards specifically for the Arctic OCS. These standards should include, for example, capping stacks, relief rigs, and other containment equipment designed for Arctic OCS conditions and positioned for prompt deployment.
    - Spill Response – review Oil Spill Response Plan (OSRP) regulations, associated permitting regulations, and past approvals and revise regulations as appropriate to respond effectively to spills in the U.S. Arctic OCS, including a worst-case discharge.

- BSEE in coordination with the USCG, Environmental Protection Agency (EPA), and Pipeline and Hazardous Materials Safety Administration (PHMSA), should review and assure the adequacy of Oil Spill Removal Organizations (OSROs) for the Arctic OCS.

- BSEE should evaluate the need for Arctic oil spill equipment deployment exercise(s) prior to beginning drilling operations.

- DOI should enhance its engagement with other agencies and stakeholders, including the Alaska Regional Response Team (ARRT) and the North Slope Subarea Planning Committee, in support of ongoing development of the North Slope Subarea Contingency Plan (SCP). BSEE should continue to ensure that Arctic OSRPs are consistent with the SCP.

- BSEE should formalize a process with a fixed timeline for interagency review of Arctic OSRPs. Once an Arctic OSRP is approved, BSEE should make a version of the plan publicly available, wherein proprietary or confidential information has been removed.

- If the charter of the OESC is renewed, then an Arctic subcommittee should be continued to advise DOI on issues related to implementation of the Arctic OCS recommendations presented in this document and to consider additional Arctic OCS issues, as appropriate.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
ARCTIC SUBCOMMITTEE MEMBERS

AFFILIATION	MEMBER	TERM
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- DRAFT -

To: Ocean Energy Safety Advisory Committee (OESC), Spill Response Subcommittee

Re: Ocean Energy Safety Advisory Committee (OESC)
Subcommittee Recommendations for
Oil Spill Risk Assessment, Preparedness and Response in the Arctic OCS

In its Interim Report, the Spill Response Subcommittee determined that it would develop a recommendation for the Bureau of Safety and Environmental Enforcement (BSEE) to review existing OSRP regulations, determine their adequacy for U.S. offshore Arctic Environments and recommend as appropriate changes to ensure the availability of adequate trained personnel and equipment to respond to a worst case discharge.

We have prepared for the Subcommittee's consideration a list of standards that are not included in existing regulations but are necessary to ensure adequate response in the event of an oil spill in the Arctic Ocean. Most of these items have been addressed by BSEE in approving Shell's plans to drill in the U.S. Arctic Ocean in 2012-2013. The recommendations in this document in no way address the adequacy of those plans. However, we believe the regulations that are in place presently do not require many of these recommendations and they should be part of an overall regulatory framework as decisions are made for future exploration and development by any party planning operations in the U.S. Arctic Ocean.

In developing these draft recommendations for Arctic standards we relied on:

- U.S. Coast Guard's (USCG) Incident Specific Preparedness Review;
- National Oil Spill Commission's report;
- National Energy Board review for offshore drilling in the Canadian Arctic; and,
- Concerns raised by regulators and stakeholders regarding current U.S. Arctic projects.

We also consulted with experts in the field and reviewed other standards and approaches employed in other countries to identify new and innovative ways of improving Arctic oil spill response standards. We recommend that Arctic-specific regulations below be developed and adopted by BSEE. These regulations should require careful planning for all aspects of oil spill prevention, containment and response along with the availability of adequate equipment and trained personnel to respond to any spill including a Worst Case Discharge (WCD) in the U.S. Arctic Ocean.

ARCTIC SPILL RESPONSE

1. Ice Class Vessel Requirements

Proposal: Operators should be required to provide a sufficient number of icebreaking vessels in the U.S. Arctic Ocean region to support safe operation, source control and spill response and recovery. A sufficient number of shallow draft, ice capable vessels should be provided to allow oil spill responders to recover oil spilled into shallow marine waters and along remote shorelines.

Rationale: To be successful, arctic oil spill response operations need to be supported by ice class vessels, especially if spill response activities could continue into freeze-up conditions, and ice management support is necessary to cover well control operations such as containment and/or relief well drilling. To ensure that oil recovery can continue during these vital operations, Oil Spill Response Plans (OSRPs) should include ice-class vessels with the primary responsibility of supporting spill response efforts.

2. Mandatory Minimum Arctic Oil Spill Response Organization Standards

Proposal: BSEE should establish and be the authority for mandatory minimum Arctic marine Oil Spill Response Organization (OSRO) standards including requirements for ice class vessels, arctic grade skimmers, in situ burning equipment, and personnel qualifications and training. Arctic OSRO training and qualifications standards should be established, with guidance from the USCG, to ensure sufficient ability to remove oil in a range of ice conditions. OSROs

serving multiple members in separate geographic areas should be required to have equipment and personnel depots in each geographic area they serve. Unlike existing USCG voluntary OSRO standards, these standards would be mandatory and verified through inspections and field tests of equipment and tactics.

The OSRO must keep records of its equipment inventory, maintenance records, and drills and training exercises to demonstrate its capability to respond to a WCD, or a portion of a WCD.

Rationale: USCG regulations[1] establish OSRO standards and allow OSRP holders to list an OSRO if it has been classified by the USCG to meet the response planning requirement. DOI relies on the USCG OSRO classification scheme in its assessment of whether OSRP holders in the OCS meets its obligations under 30 CFR §254.

OSRO classification areas include rivers/canals, Great Lakes, inland, nearshore, offshore, and open ocean areas. The offshore classification scheme is focused on mechanical equipment for temperate regions. OSROs operating in Arctic regions can obtain OSRO certification without ice class vessels, arctic skimmers, ice capable boom, proper in situ burning equipment, and remote logistical support capabilities, all of which are critical response equipment for the Arctic marine environment.

3. In Situ Burning Equipment and Training Standards for the Arctic

Proposal: Arctic in situ burning (ISB) equipment and training standards should be established to ensure that there is sufficient in-region capability to respond to at least the first 30 days of an oil spill. The amount of ISB equipment required should be established using enhanced recovery calculation methods. Personnel must have training and qualifications in arctic ISB deployment and operation, and vessel captains and pilots must have experience navigating in the Arctic.

Arctic-grade ISB equipment should include, but not be limited to: ice-boom capable of thickening oil to the required 2-5mm thickness to sustain a burn; aircraft and helitorch system systems that are designed to operate in subzero temperatures; vessel-based ignition systems that are designed to operate in subzero temperatures; landing craft capable of accessing remote shores where docks are not present; equipment to recover burn residue; and cold weather personal protective equipment.

Rationale: ISB is an important oil spill response tool for the Arctic, but DOI and the USCG do not currently require a minimum amount of ISB equipment or training. Sufficient stock piles of ISB equipment are needed in the Arctic to ensure that equipment is available at the scene and that the ISB response will not be impeded by logistical delays.

4. Seasonal Drilling Limitations When Oil Spill Response is Not Possible in the Arctic

Proposal: Until there is proven technology to effectively remove oil from the full range of ice conditions, Arctic offshore drilling operations into hydrocarbon bearing zones should be limited to periods of time when the drilling rig and its associated oil spill response system is capable of working and cleaning up a spill in arctic conditions, minus the time required to drill a relief well before ice encroaches on the drill site.

Rationale: Drilling restrictions in the U.S. Arctic Ocean that limit offshore operations to summer only could ensure that there is sufficient time left in the operating season to cap a blown out well, drill a relief well and clean up spilled oil in open water, thereby providing a critical margin of safety into the proposed plan. Arctic environmental conditions – including sea ice and extreme cold –prohibit offshore exploratory drilling operations during most of the year and present unique challenges for oil spill cleanup operations. Routine drilling operations that extend to the very last day that it is safe to drill do not allow time to respond to a well control event before winter conditions set in and

[1] 33 CFR §154.1035 and 33 CFR §154.1035.

equipment must leave the Chukchi and Beaufort seas because it becomes unsafe to operate in ice, freezing conditions, and darkness. A spill in the Arctic not contained by freeze-up could continue unabated through the winter.

DOI effectively applied seasonal drilling limits to Shell's 2012 Chukchi Sea OCS Drilling Project, however, specific standards to the level of detail proposed here are not found in existing regulations. Winter drilling restrictions have also been effectively employed in the Beaufort Sea for decades to limit drilling and are currently codified in the North Slope Borough Municipal Code, Title 19 for all offshore drilling operations within 3 miles of the coastline.

5. **Arctic Offshore Field Tests to Verify Spill Response Tactics and Strategies Prior to OCS Operation**
Proposal: To verify that arctic spill response techniques, equipment, and methodologies will be effective and are the best available technology for use in the Arctic environment, OSRP holders must plan for, and conduct field demonstrations in the particular environments in which they will operate, or in which a spill from their operations could reach.

Rationale: Currently, there is no requirement for an OSRP holder, or the OSRO(s) it relies upon, to field-test and verify that it's proposed "on-paper" tactics and strategies are efficient and effective in the Arctic. Field tests will validate response technologies and strategies, and the training of oil spill responders. Increased Arctic field testing will aide in identifying system and equipment deficiencies and provide an incentive for continuous improvement. 30 CFR §254.41 requires field tests to be conducted during the OSRP term, but not ahead of receiving plan approval.

6. **Protection of Arctic Resources of Special Economic, Cultural or Environmental Importance**
Proposal: BSEE should ensure that, in addition to identifying these areas that OSRPs describe strategies for protecting resources of special economic, cultural or environmental importance. OSRPs planning to drill in the Arctic Ocean should be required to demonstrate that they have adequate response equipment and personnel dedicated to carrying out these protection strategies and that this equipment is located in the U.S. Arctic Ocean region.

Rationale: Because areas of the Arctic Ocean are so remote and fragile and have such cultural importance, it is critical to identify areas of economic, cultural or environmental importance and ensure there is adequate equipment, trained personnel and strategies dedicated to protecting those resources. This includes having adequate nearshore and shoreline capability to protect those resources located in the U.S. Arctic Ocean region. Current regulation requires OSRPs to include strategies for the protecting these special areas, but does not require that equipment and personnel be dedicated for this purpose.

7. **Public and Joint Agency Review Process for Arctic Oil Spill Response Plans**
Proposal: BSEE should ensure that there is a process, similar to the Exploration Plan, for joint-agency and public review, before approval, of Arctic oil spill response plans. In addition, oil spill response plans should be made available to the public after approved by BSEE.

Rationale: While not currently in regulation, there is a heightened, broad public interest in Arctic Ocean oil spill response by academics, non-governmental organizations, local government and other federal agencies. OSRPs are complex and extensive documents that can benefit from public and joint agency review. Unlike most federal plans and permits, there is no formal public review or inter-agency review and comment period established. The National Commission on the BP Deepwater Horizon recommended joint agency and public review of oil spill response plans and that the plans are made available to the public once they are approved.

8. **90 day and Time Series Arctic Oil Spill Trajectory Analyses and Maps**
Proposal: Arctic OSRPs should be required to examine a 90 day oil spill trajectory. Within the 90 day trajectory, the OSRP should provide a range of oil spill trajectories over the course of the 90 days to represent a breadth of recovery and weather conditions, as well as the extent of an oil-spill impacted area.

Rationale: Current OSRPs are required to examine only 30 day trajectories; however, as evidenced by the 2009 East Timor and 2010 Gulf of Mexico well blowouts, spills can persist for more than 90 days. Providing a range of oil spill trajectories over a range of recovery and weather conditions provides insight into the potential range of oil spill-impacted area.

9. Minimum Standards for Arctic Oil Recovery Storage

Proposal: BSEE should require a minimum amount of on-site ("in-region") recovered oil storage capacity. The planning standard should account for emulsification, free water collection, and remote logistical access and weather delays. Storage systems should also have the capability to heat and separate oil-water emulsions and decant water to maximize oil recovery and storage.

Rationale: There are currently no minimum storage standards. The remote location of drilling operations, limited logistical access and adverse weather delays can preclude arrival of additional storage. Finland's oil recovery systems include heating and winterization.

10. An Enhanced Method for Calculating Oil Removal and Oil Removal Benchmarks in the Arctic Ocean

Proposal: BSEE should develop and enhanced method for calculating oil removal based on encounter rate modeling that includes Arctic spill response operating parameters such as ice and adverse weather. OSRPs should establish benchmarks for oil spill removal, utilizing an enhanced method for calculating oil removal. Oil removal should be given the highest priority over other spill response methods (e.g. dispersant application) that merely move oil, thereby leaving it in the marine environment. Both mechanical and ISB oil removal estimates must be based on previous, actual oil spill removal estimates achieved during an actual oil spill.

Rationale: The current method for calculating oil removal efficiencies is inaccurate, as evidenced by the Deepwater Horizon spill. An enhanced method for calculating oil removal should be based on encounter rate modeling that includes spill response operating parameters such as ice and adverse weather. The USCG's Deepwater Horizon Incident Specific Preparedness Review recommended a review of Effective Daily Recovery Capacity calculations and planning standards, and that this review should ensure that adverse weather considerations are included as part of the planning standards.[2]

11. Arctic Dispersant Use Guidelines

Proposal: Dispersant use should be co-managed by the Environmental Protection Agency and BSEE. BSEE should establish limitations regarding the terms, conditions and circumstances in which dispersant use would be allowed in Arctic waters.

Rationale: Dispersants came under scrutiny in response to extensive surface and subsea application during the Gulf of Mexico oil spill response. Work is still needed to establish limits on dispersant use, to limit its application to periods of time when it is more environmentally beneficial than mechanical or ISB oil removal methods or allowing oil to persist in the environment. The National Oil Spill Commission recommended that dispersant testing protocols for product listing or pre-approval should be periodically reviewed and updated and that the pre-approval process should be modified "to include temporal duration, spatial reach, and volume of the spill."[3]

[2] U.S. Coast Guard. Deepwater Horizon ISPR Final Report (2011) p.30

[3] National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling (2011) p. 271

DRAFT

Arctic Recommendation on Spill Prevention, Containment and Response
Offshore Energy Safety Committee

Oil and gas potential is significant in Arctic Alaska, with renewed interest in oil and gas exploration and production in the Beaufort and Chukchi seas of the Alaska Outer Continental Shelf (OCS). In addition to the petroleum potential, this region also supports significant fish and wildlife resources and ecosystems, with indigenous people who rely in large part on these resources for their way of life.

A key concern about development of oil and gas resources in the Arctic OCS is the need to ensure that scientific understanding and technological capability are sufficient for reliable oil-spill risk assessment, prevention, containment and response under difficult environmental conditions with limited local infrastructure.

Challenging conditions in the Arctic Ocean require fit-for-purpose technological response and regulatory approaches. There is potential for severe weather year round including high winds, dense fog and sub-zero temperatures that can persist for weeks at a time. Most importantly, seasonal sea ice has the potential to cause operational difficulties during capping, relief well drilling and other source control and response activities. The Arctic Ocean and shoreline is remote and lacks basic infrastructure. Equipment and specialized personnel cannot easily be brought in during adverse weather conditions and vast transportation distances may result in long or delayed delivery times for needed equipment, replacement parts, and trained personnel.

Although exploratory drilling will only take place offshore during the short open-water season, sea ice can still be present. Additionally, this exploration can eventually lead to year-round production. The Arctic Ocean's challenging environment requires different standards than currently exist to ensure safe, effective, and consistent operating standards.

Certain GOM containment equipment is not technically suitable for Arctic conditions. For example, in shallow water ice scouring prevents use of domes, and capping stacks must be installed in deep enough cellars to be below scour depth. Also, seasonally limited access and icing conditions decrease the time frame during which relief wells can be drilled.

Although there have been recent advances in the Arctic OCS, scientific and technological challenges remain in a number of areas. The following are recommendations by the Offshore Energy Safety Committee regarding operating in the Arctic Ocean.

General Recommendations

1) BSEE regulations as written do not specifically address Arctic operating conditions. Instead, BSEE has put in place national Notice to Lessees (NTLs) to improve safety and spill response strategies. However, to codify these actions and ensure full system readiness for Arctic OCS exploration and production, the Committee recommends that DOI develop and adopt Arctic Specific regulations for prevention, safety, containment and response in the Arctic Outer Continental Shelf (OCS).

Prevention

2) Drilling facilities must be properly designed for safe operations that account for adverse weather and lack of accessibility. Facilities need to be engineered with sufficient strength to withstand the force of moving pack ice and Arctic pipelines will need to be protected from ice gouging, scouring and permafrost thaw. The committee recommends that DOI develop and adopt drilling and prevention standards specifically for the Arctic OCS.

Containment/Source Control

3) Source control equipment such as capping stacks, domes, collection systems and relief rigs must be properly designed to account for adverse weather, lack of accessibility and the need for prompt delivery of containment equipment and associated trained personnel. In particular, rigs for drilling of relief wells should be designed to operate in ice and adverse Arctic weather conditions and be located for rapid deployment in response to a blowout or other loss of well control.

Response

4) BSEE and BOEM should review existing oil spill response plans (OSRPs) and permitting regulations, determine their adequacy for U.S. offshore Arctic environments and revise as appropriate to respond effectively to a worst-case discharge. In particular, the OSRP and permitting regulations and associated approvals should address at least the following elements:

    a. Seasonal drilling limitations that consider the timing and adequacy of oil spill response operations, given available technologies and the type of drilling operation.
    b. Prompt deployment of response equipment and adequately trained personnel.
    c. Ice capable equipment appropriate for expected conditions.

d. Adequate strategies and equipment to protect important ecological and subsistence areas.

5) BSEE should work with the U.S. Coast Guard, Environmental Protection Agency, Pipeline and Hazardous Materials Safety Administration, and other stakeholders to review the adequacy of the current OSRO (Oil Spill Removal Organization) construct for use in the Arctic environment.

6) BSEE should evaluate the need for requiring oil spill equipment deployment exercise(s) located in the Arctic environment prior to beginning operations.

7) BSEE and BOEM should work with other agencies and stakeholders to increase their engagement in developing the Arctic Subarea Contingency Plans. BSEE should ensure that Arctic OSRPs are consistent with the Subarea Plan.

8) BSEE should establish a formalized process with a fixed timeline for interagency review of Arctic Oil Spill Response Plans (OSRPs).

9) Once an Oil spill response plan (OSRP) is approved, BSEE should make the plan (or parts of the plan) publicly available.

Other Issue

The subcommittee could not come to consensus on the issue of whether BSEE should provide a public review process for Arctic OSRPs prior to approval.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
APPENDIX F – OCEAN ENERGY SAFETY INSTITUTE SUBCOMMITTEE

- **Subcommittee Summary Report**
- **Membership**
- **White Papers**
  - Ocean Energy Safety Institute (April 13, 2012)
  - Ocean Energy Safety Institute Subcommittee Recommendation (January 10, 2013)

Ocean Energy Safety Advisory Committee
Ocean Energy Safety Institute Subcommittee
Summary Report

When Secretary of the Interior Ken Salazar established the Ocean Energy Safety Advisory Committee (OESC), he tasked it with developing recommendations to aid in the creation of an Ocean Energy Safety Institute (OESI or Institute). The Secretary envisioned an independent institute that would facilitate research and development, training, and implementation of operational improvements in the areas of offshore drilling safety and environmental protection, blowout containment and oil spill response. The Institute would be a collaborative initiative involving government, industry, academia and scientific experts.

In developing its recommendation for an Institute, the Subcommittee recognized that some of these objectives are being addressed by other parties, including the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR), the Center for Offshore Safety, the International Regulators Forum, the Department of Energy, the new National Academy of Sciences (NAS) program funded by the BP settlement, and within the Bureau of Safety and Environmental Enforcement (BSEE) itself. The Subcommittee considered the benefits of avoiding duplication of effort among new and existing entities, and the availability of resources and technical expertise to support proposed activities. As a result, the Subcommittee focused on creating an Institute that would assist BSEE by taking a leadership role in ensuring collaboration among the various entities addressing offshore safety and in addressing critical gaps in offshore safety research.

In keeping with this approach, the recommended role for OESI focuses on research, analysis, and collaboration surrounding offshore safety and environmental management. The recommendation outlined below is designed to afford DOI/BSEE flexibility in building OESI. The recommendation is scalable, allowing OESI to evolve as resources become available and additional priorities are identified.

The final recommendation approved by the OESC is below; the subcommittee whitepaper provides additional detail on the structure, governance and roles of the proposed Institute.

> *The Department of the Interior should establish an Ocean Energy Safety Institute, reporting to the Director of BSEE, through a competitive request-for-proposal process that is repeated every several years. The Institute would support BSEE's missions regarding offshore safety and environmental management through various means, which may include:*
>
> - *research and development, including development and maintenance of a technology research and development (R&D) roadmap and dissemination of research results;*
> - *facilitating a new BAST process;*

- *facilitating communication and collaboration among entities involved in offshore safety and environmental management through workshops and other methods; and*
- *other topics as may be identified in the future.*

BSEE should establish a board or steering committee consisting of relevant government agencies, industry, academia, non-governmental organizations, and other centers of expertise that would help to develop the OESI's initial goals and strategies, and provide ongoing strategic and technical advice to the Institute.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
OCEAN ENERGY SAFETY INSTITUTE SUBCOMMITTEE MEMBERS

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Federal Government	Christopher A. Smith	08/30/12 – Present
Federal Government	David G. Westerholm	08/30/12 – Present
Federal Government	Stephen H. Hickman	08/30/12 – Present

Ocean Energy Safety Institute

When Secretary of the Interior Ken Salazar established the Ocean Energy Safety Advisory Committee (OESAC or Committee), he tasked it with developing recommendations to aid in the creation of an Ocean Energy Safety Institute. This independent institute would be designed to facilitate research and development, training, and implementation of operational improvements in the areas of offshore drilling safety and environmental protection, blowout containment and oil spill response. The Institute would be a collaborative initiative involving government, industry, academia and scientific experts.

In announcing the Ocean Energy Safety Institute, the Secretary identified the following specific objectives (DOI press release, Nov. 2, 2010):

- Advancing safe and environmentally responsible offshore drilling through collaborative research and development in the areas of drilling safety, containment and spill response;
- Developing advanced drilling technology testing and implementation protocols;
- Understanding full-system risk and reliability for the offshore environment;
- Developing an enduring R&D capability and an expertise base useful both for preventing and responding to accidents;
- Developing training and emergency response exercises;
- Increasing opportunities for communication and coordination among industry, government, academia and the scientific community;
- Developing a larger cadre of technical experts who can oversee or otherwise participate in deepwater drilling-related activities;
- Establishing cost-effective advances in technology for industry;
- Creating a framework for regulatory predictability in a global market.

While the OESAC has been asked to develop recommendations for the Institute, none of the four current subcommittees has been charged with this task, given that any such recommendations would cut across the topic areas of each subcommittee. However, the work of these subcommittees is relevant to the full Committee's task.

There are a variety of ways in which the roles of an institute could be met. In some cases, other entities are already working to achieve these goals. Examples include the Center for Offshore Safety (http://www.centerforoffshoresafety.org/main.html); the International Regulators Forum (http://www.irfoffshoresafety.com/), and the Research Partnership to Secure Energy for America (http://www.rpsea.org/). Some combination of these bodies and others, either new or already existing, could fulfill the various

objectives identified above. In developing a recommendation, the Committee will consider the benefits of avoiding duplication of effort among new and existing entities, and the availability of resources and technical expertise to support proposed activities.

This paper does not intend to address the design and operating principles of an institute. Rather, it seeks to identify roles that could be filled by such an entity or entities to inform the Committee's deliberations. Each subcommittee is developing recommendations for the OESAC's consideration; several of these recommendations could be implemented by an institute, however constructed, and in some cases, the recommendations demand identification of an entity to be a focal point for implementation. The following describes particular recommendations that could fit within such a mandate.

1. Develop and foster a safety culture in the industry

Safety culture can be defined as that subset of culture that reflects the general attitude and approaches to safety and risk management. Trying to change safety outcomes by simply changing organizational structures including policies, goals, job descriptions and standard operating procedures may lower risk over the short term, but long-term success requires change to the organizational values that underlie people's behavior. Safety culture is primarily set by an organization's leaders, who then instill it throughout the organization.

The Safety Management Systems Subcommittee is developing recommendations to encourage the development of safety culture. A primary recommendation is the formation of an Offshore Safety Leadership Council, which would focus on:

- Developing, communicating and fostering a safety culture for the industry.
- Formulating a recognition program that motivates organizations to develop and foster their safety culture. Key components would include leadership behaviors and leadership communication of the safety values of their organization.
- Encouraging and incentivizing engineering schools to include elements of safety engineering and safety culture in their programs. The goal of institutionalizing safety culture throughout industry would be aided by ensuring that the next generation of professionals and leaders receive appropriate education on safety systems and culture while earning their degrees. This would include focusing not only on process safety, or systems safety, but also on safety awareness and instilling a safety mentality early in the engineering education process.

Possible roles for an institute:

- Support a leadership council by providing a facility to host regular council meetings and dedicated staff to support agenda-setting and follow-up.
- Facilitate the development of performance measures, leading indicators, and tools for assessing safety culture in an organization.

- Provide a forum for feedback on industry and regulator performance. Feedback could be shared with the public or among industry members, both as an incentive for improved performance and a means for identifying best practices.
- Develop a safety culture recognition program for use in the offshore energy sector.
- Provide a forum for promoting the growth of safety engineering programs (e.g., through leadership council or by sponsoring conferences that highlight work in the field).
- Recommend/direct financial support to engineering schools with safety engineering programs through research grants, scholarships, etc.

2. Develop a structure for detailed reporting of accident and near accident investigations

All independent reviews of the Macondo blowout have identified the need for improved risk assessment and risk management. A key component of filling this need is the reporting, tracking and analysis of incidents and near-misses (see for example, the Report to the President of the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, recommendation A.3, p. 254). While reporting of accidents is required, near misses are not subject to comprehensive reporting. Nearly all accidents are preceded by warnings or other indicators that, if recognized, could have resulted in actions that would have prevented the accident. Both the Safety Management Systems and Prevention Subcommittees have discussed the establishment of a mechanism, through a new or existing independent entity, to collect reports of such events and to analyze the resulting data, including leading indicators that can be measured far in advance of any event. These analyses would be shared with both regulators and industry to inform changes to regulations and practices with a goal of reducing the number of incidents in the offshore oil and gas industry. Reporting would be subject to internationally-developed standards to ensure data and analyses would be useful globally. An independent third-party is necessary to remove any fear of punishment/enforcement in the reporting entity and to ensure that proprietary data is protected.

Possible roles for an institute:

- Facilitate the development of international reporting standards
- Collect and analyze the data
- Disseminate the results of the analyses

3. Facilitate Collaborative Research and Development

One of the Secretary's primary objectives for an institute is to promote collaborative research in drilling safety and spill containment and response. The work of the Subcommittees illustrates the value of this collaboration:

- The Prevention Subcommittee is developing specific recommendations for areas of priority research.
- The Containment Subcommittee identified a need for better tools to assess the risks of underground blowouts and diagnose them when they occur.
- The Response Subcommittee emphasized the importance of a robust process for supporting creation and development of innovative ideas for response methods.

In addition to research and development of technological solutions, development of standards for risk assessment associated with drilling safety, spill containment and response or procedural best practices would benefit from similar collaboration.

However, the Secretary's objectives suggest an institute with a more robust R&D role than encouraging collaboration. Such a role could include ongoing assessment of risk and reliability of offshore technology and operations, and using such assessments to maintain a roadmap for technology R&D. In this scenario, the institute would provide a strategic direction for the allocation of government R&D funding. A direct role in sponsoring and conducting research would help agencies develop and maintain expertise on rapidly evolving technology.

Possible roles for an institute:

- Provide a permanent forum for ongoing discussions among industry; Department of Energy research programs, including the National Labs; regulators; and academic research programs. The forum would be structured to facilitate the identification of research priorities, possible sources of funding, and collaborative opportunities for conducting the research.
- Sponsor workshops or other mechanisms to identify gaps in research and to disseminate the results of research.
- Develop risk assessments and roadmaps for technology R&D.
- Sponsor or conduct research consistent with identified priorities.

Ocean Energy Safety Institute

Subcommittee Recommendation

January 10, 2013

Introduction

When Secretary of the Interior Ken Salazar established the Ocean Energy Safety Advisory Committee (OESC), he tasked it with developing recommendations to aid in the creation of an Ocean Energy Safety Institute (OESI or Institute). The Secretary envisioned an independent institute that would facilitate research and development, training, and implementation of operational improvements in the areas of offshore drilling safety and environmental protection, blowout containment and oil spill response. The Institute would be a collaborative initiative involving government, industry, academia and scientific experts.

In announcing the Ocean Energy Safety Institute, the Secretary identified the following specific objectives (DOI press release, Nov. 2, 2010):

- Advancing safe and environmentally responsible offshore drilling through collaborative research and development in the areas of drilling safety, containment and spill response;
- Developing advanced drilling technology testing and implementation protocols;
- Understanding full-system risk and reliability for the offshore environment;
- Developing an enduring R&D capability and an expertise base useful both for preventing and responding to accidents;
- Developing training and emergency response exercises;
- Increasing opportunities for communication and coordination among industry, government, academia and the scientific community;
- Developing a larger cadre of technical experts who can oversee or otherwise participate in deepwater drilling-related activities;
- Establishing cost-effective advances in technology for industry; and
- Creating a framework for regulatory predictability in a global market.

In developing its recommendation for an Institute, the Committee recognized that some of these objectives are being addressed by other parties, including the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR), the Center for Offshore Safety, the International Regulators Forum, the Department of Energy, the new National Academy of Sciences (NAS) program funded by the BP settlement, and within the Bureau of Safety and Environmental Enforcement (BSEE) itself. The Committee considered the benefits of avoiding duplication of effort among new and existing entities, and the availability of resources and technical expertise to support proposed activities. As a result, this recommendation focuses on

creating an Institute that will assist BSEE by taking a leadership role in ensuring collaboration among the various entities addressing offshore safety and in addressing critical gaps in offshore safety research.

In keeping with this approach, the recommended role for OESI focuses on research, analysis, and collaboration surrounding offshore safety and environmental management. The OESC Subcommittee on Spill Response reviewed the topic of oil spill response research and development, and has concluded that there are adequate structures already in place that were created by the Oil Pollution Act of 1990, namely the ICCOPR. The purpose of ICCOPR is to coordinate a comprehensive program of oil pollution research and technology development among Federal agencies, in cooperation and coordination with industry, academia, research institutions, state governments, and other nations, and to foster cost-effective research mechanisms, including joint agency funding of this research. The Spill Response Subcommittee recommended that the Ocean Energy Safety Institute should avoid duplicating ICCOPR's efforts in this area.

The recommendation outlined below is designed to afford DOI/BSEE flexibility in building OESI. The recommendation is scalable, allowing OESI to evolve as resources become available and additional priorities are identified. The recommendation also attempts to be responsive to issues raised by OESC membership, including:

- Ensuring coordination with existing entities with a significant role in offshore safety
- Minimizing duplication of effort and competition for scarce expertise
- Providing a defined role in research and development, but not one that undercuts other research programs
- Providing a home for those OESC recommendations that would benefit from diverse technical oversight for implementation.

The Ocean Energy Safety Institute

Structure

OESI would be established by contract, funded by BSEE, and report to the Director of BSEE. The Institute would be located at an existing institution (e.g., a National Lab or university), selected through a competitive request-for-proposal (RFP) process, and the contract would be re-competed every several years. A relatively small number of BSEE staff, co-located with OESI, would serve as liaison between OESI and the bureau, overseeing the contract, facilitating meetings and workshops, and ensuring that OESI and BSEE priorities are integrated.

As discussed below in the section Role of OESI, the winning institution would be responsible for managing OESI, managing the process of setting yearly objectives, conducting certain work to

further the attainment of those objectives, and being a focal point for collaboration on issues within the OESI mandate.

A significant challenge in creating the Institute will be to establish a structure that encourages an institution with appropriate expertise to compete for the role of host, without then being unduly restricted in conducting the type of research that made it an attractive candidate to host OESI. The Committee believes that the winning institution should not be the exclusive recipient of research and other funding from BSEE or other sponsors. Other institutions with relevant expertise should be able to compete for research and other grant opportunities. Likewise, the other divisions of the host institution, as a pre-existing entity with expertise in safety-related matters, should be able to compete for projects from other sources. However, this could create an appearance of a conflict of interest, in which the OESI component of an institution is helping to set priorities for research projects for which other components of the institution may compete. BSEE will need to establish a firewall between OESI, which manages projects on BSEE's behalf, and the rest of the host institution that competes for research funding. The firewall should be clearly addressed in the RFP, as potential competitors will want to know of any such mechanisms before deciding whether to bid. Other aspects of this recommendation also help to mitigate this potential conflict issue, including a governance board (see next section) that provides independent oversight of OESI, and the requirement to re-compete the contract every several years. The re-competition of the OESI contract would both provide an opportunity for BSEE to make adjustments to the program and create an incentive for host institutions to treat research competitors equitably since the roles could be reversed in the future.

Additionally, the RFP should address patent and other issues pertaining to the relationship between the host institution, OESI and any corporate or non-profit entity that might be created or spun off as a result of funded research.

Governance

As noted above, OESI reports to the Director of BSEE, and would be subject to the usual oversight that comes with a government contract. However, to meet the Secretary's objectives for collaboration and leadership in offshore safety and environmental management, the Committee recommends the creation of a governance board/steering committee for OESI. The role of this board/committee would include:

- Helping to build OESI and develop its strategy, detailed mission statement and initial objectives.
- Once established, providing strategic and technical guidance to OESI.
- Facilitating exchanges between various entities working in OESI subject areas to minimize duplication and identify opportunities for collaboration.
- Facilitating dissemination of OESI results and recommendations to the user community (industry, local/state/Federal agencies, academia, etc.)

The board/committee should consist of both permanent and rotating members. Certain organizations with a fundamental and ongoing role in promoting offshore safety should have permanent representation on the Board. Such organizations include: BSEE; the host institution; the Center for Offshore Safety, the Department of Energy, the U.S. Coast Guard, and the National Academy of Engineers (both for its own expertise and representing the new NAS program mentioned above). Rotating members would be individuals with appropriate expertise representing industry (including major and independent operators, drilling contractors and Engineering, Procurement and Construction contractors), academia, government labs, non-governmental organizations and other centers of expertise – both domestic and international – on subjects relevant to OESI's mandate.

Role of OESI

Consistent with the Secretary's vision, OESI would facilitate research and development, training, and implementation of operational improvements in offshore drilling safety. While this is a broad mandate, this Committee, through its past recommendations and ongoing work, has identified gaps in existing processes and programs, discussed below, that would benefit from an entity such as OESI as a focal point for implementation. OESI's role would be expected to evolve over time as OESI, its governance board, and BSEE identify other priorities.

- *Research and Development*: Roles for OESI would include:
    - Develop and maintain a technology R&D roadmap – Through a collaborative, multi-agency and stakeholder process, OESI would identify, solicit, and prioritize research topics and potential sources of funding. The roadmap would provide guidance to relevant federal research institutions to ensure that those institutions are conducting or funding research that is relevant to BSEE's challenge of ensuring that regulations mitigate risks that have been appropriately quantified.
    - Help ensure that safety technology is keeping up with drilling and production technology.
    - Regularly conduct gap analyses on key technologies.
    - Provide forums for ensuring that research results are disseminated.

  On behalf of BSEE, the OESI should facilitate coordination with other federal agencies that have ongoing research and development programs which are relevant to safe offshore exploration and production. To illustrate, the Department of Energy (DOE) sponsors research and development that is relevant to the challenge of scientifically quantifying risks associated with offshore exploration and production activity. Historically, DOE has collaborated with BSEE to guide priorities and select research topics. The OESI should formalize this relationship by establishing and leading sustainable interagency cooperation. This will ensure that DOE is focused on the research that is most directly relevant to BSEE's regulatory mission.

The Committee recommends that research be managed in a similar manner as Deepstar, which manages its research through the use of sponsor groups that oversee each research topic. These sponsor groups consist of industry, government and other stakeholder groups.

- *Best Available and Safest Technology*: In his letter of August 10, 2012, BSEE Director James Watson asked the OESC to provide guidance on how to best stimulate private sector interest and investment into BAST, as well as a procedure to determine BAST on a rolling, real-time basis. The OESC's Spill Prevention Subcommittee has prepared a recommendation for implementing BAST that includes a specific role for OESI to facilitate the BAST process, including building on OESI's roles in prioritizing research and identifying gaps discussed above. A BAST recommendation was approved by the full Committee in its January 2013 meeting.

- *Collaboration/communication*: OESI would sponsor and facilitate the Offshore Safety Leadership Council recommended by OESC (see "Safety Culture" recommendation approved by OESC at its April 26, 2012, meeting), and similar efforts for leadership communication and collaboration. It would also develop and host workshops relevant to the OESI mandate, such as the containment workshops recommended by OESC (i.e., Workshop on Organizational and Systems Readiness for Containment Response, approved at the April 26, 2012, OESC meeting). Other workshops would focus on technical issues, such as oil and gas development in frontier areas (e.g., the Arctic OCS, ultra-deepwater drilling, high-pressure and high-temperature reservoirs). Through these workshops, OESI would facilitate collaborative problem solving.

- *Data Management & Analysis*: There's a general consensus on the need to report certain types of data (e.g., incidents, near-misses), develop and report performance measures, and analyze the data to identify trends and issues. The OESC previously recommended work related to safety culture performance indicators (i.e., "DOI/BSEE should put greater emphasis on measuring the health of the safety culture by requiring the reporting of safety performance indicators," approved by OESC at its August 29-30, 2012, meeting). Other groups, such as the Center for Offshore Safety and the International Regulators Forum, also are working on performance measurement issues. To the extent that there are gaps in these efforts, or a need for additional coordination or independent analysis, OESI could help to facilitate development of performance measures, develop/host data storage and management tools, and analyze data.

- *Training*: BSEE has established a National Offshore Training Program (NOTP) to provide ongoing training and development for its staff. However, in keeping with one of the Secretary's original goals for the Institute to help develop a cadre of technical experts throughout government and industry, there are potential roles for OESI to augment the NOTP. One possible role would be to periodically review BSEE's training programs and recommend adjustments to ensure that they are in line with new technological developments and requirements. The OESI could also carry out specialized training for non-BSEE personnel to ensure that a broad base of technical expertise exists throughout the government, as may be needed during oversight of future well-control events. OESI could also supplement the regular curriculum through professional development opportunities and special training

of BSEE and other personnel related to “leading edge” research being conducted through the Institute.

Summary of Recommendation

The Department of the Interior should establish an Ocean Energy Safety Institute, reporting to the Director of BSEE, through a competitive request-for-proposal process that is repeated every several years. The Institute would support BSEE’s missions regarding offshore safety and environmental management through various means, which may include:

- research and development, including development and maintenance of a technology research and development (R&D) roadmap and dissemination of research results;
- facilitating a new BAST process;
- facilitating communication and collaboration among entities involved in offshore safety and environmental management through workshops and other methods; and
- other topics as may be identified in the future.

BSEE should establish a board or steering committee consisting of relevant government agencies, industry, academia, non-governmental organizations, and other centers of expertise that would help to develop the OESI’s initial goals and strategies, and provide ongoing strategic and technical advice to the Institute.

Note: The foregoing paper should be attached to any transmittal of this recommendation to provide the context for and details of the recommendation.

OCEAN ENERGY SAFETY ADVISORY COMMITTEE
APPENDIX G – CD CONTENT

- **List of Documents in Order of Appearance on CD**
- **CD Located Inside Back Cover of Report Contains:**
  - ***Federal Register* Notices**
  - **Committee Charters**
  - **Meeting Minutes**
  - **Meeting Material**
  - **Public Comment**

Ocean Energy Safety Advisory Committee (OESC)
CD Content

1. ***Federal Register*** **Notice Establishing the Committee and First Meeting** – Published January 24, 2011
2. **OESC Charter** – Established/Filed (Effective) February 8, 2011
3. **OESC Charter** – Renewed/Filed (Effective) February 6, 2013
4. **OESC Fact Sheet –** 2011
5. ***Federal Register*** **Notice of Meeting –** Published April 01, 2011
6. First OESC Meeting Preparatory Information – April 8, 2011
7. Tasking Memorandum from the Director to the OESC – April 16, 2011
8. OESC Meeting Minutes – Washington, D.C. (April 2011)
9. OESC Meeting Agenda – April 18, 2011
10. Members/Representatives in Attendance – April 18, 2011
11. Public and Press in Attendance – April 18, 2011
12. **Remarks by Deputy Secretary David J. Hayes**, Department of the Interior – April 18, 2011
13. **Presentation by Dr. Cherry A. Murray**, Commissioner, National Commission on the BP Deepwater Horizon Oil Spill and Deepwater Drilling – April 18, 2011
14. **Presentation by Dr. Donald C. Winter,** Chair of the National Academy of Engineering/National Research Council Committee Examining the Probable Causes of the Deepwater Horizon Explosion – April 18, 2011
15. **Presentation by Mr. Sean C. Grimsley,** Deputy Chief Counsel to the National Commission on the BP Deepwater Horizon Oil Spill and Deepwater Drilling – April 18, 2011
16. **Remarks by Secretary Kenneth L. Salazar,** Department of the Interior – April 18, 2011
17. **Remarks by Mr. Michael R. Bromwich,** Director, Bureau of Ocean Energy Management, Regulation and Enforcement – April 18, 2011
18. **Presentation by Mr. James H. Dupree,** BP Regional President, Gulf of Mexico – April 18, 2011
19. **Presentation by Rear Admiral Roy A. Nash,** Deputy Federal On-Scene Coordinator, Deepwater Horizon Response for New Orleans, Louisiana – April 18, 2011
20. **Presentation by Mr. Lars T. Herbst,** Regional Director, Gulf of Mexico Region, Bureau of Ocean Energy Management, Regulation and Enforcement – April 18, 2011
21. **Public Comments by Michael Gravitz,** Oceans Advocate, Environment America – April 18, 2011
22. **Public Comments by James Pappas,** Vice President, Ultra-Deepwater Program, Research Partnership to Secure Energy for America – April 18, 2011
23. **Public Comments by James Pappas,** Vice President, Ultra-Deepwater Program, Research Partnership to Secure Energy for America (Follow-up E-mail) – April 22, 2011
24. Building a Master Oil Spill Prevention and Response Facility in St. Martinville, LA Binder – April 18, 2011
25. ***Federal Register*** **Notice of Meeting** – Published June 27, 2011
26. OESC Meeting Minutes: New Orleans, Louisiana (July 2011)
27. OESC Meeting Agenda – July 13-14, 2011
28. Members/Representatives in Attendance July 13-14, 2011

29. Public and Press in Attendance July 13-14, 2011
30. Remarks by Mr. Michael R. Bromwich, Director, Bureau of Ocean Energy Management, Regulation and Enforcement – July 13, 2011
31. Presentation by Mr. Martin W. Massey, Chief Executive Officer, Marine Well Containment Company – July 13, 2011
32. Presentation by Mr. Hani Sadek, Director, DeepStar – July 13, 2011
33. Presentation by Mr. Bryan A. Domangue, Bureau of Ocean Energy Management, Regulation and Enforcement – July 13, 2011
34. Report by Oil Spill Prevention Subcommittee – July 14, 2011
35. Report by Oil Spill Containment Subcommittee – July 14, 2011
36. Report by Oil Spill Response Subcommittee – July 14, 2011
37. Report by Safety Management Systems Subcommittee – July 14, 2011
38. Report by National Oceanic and Atmospheric and Oceanic Administration – July 14, 2011
39. Report by Department of Energy – July 14, 2011
40. Report by U.S. Geological Survey – July 14, 2011
41. Report by U.S. Coast Guard – July 14, 2011
42. Report by Bureau of Ocean Energy Management, Regulation and Enforcement – July 14, 2011
43. Public Comment by Mr. Gabriel Scott, Public Citizen – July 14, 2011
44. Public Comment by Mr. Paul Sawyer, Director of Federal Programs, Louisiana Department of Economic Development – July 14, 2011
45. Public Comment by Messiah Darryl Paul Ward, Public Citizen – July 14, 2011
46. Public Comment by Mr. Phil C. Nugent, Attorney at Law, Phil C. Nugent and Associates – July 14, 2011
47. Public Comment by Matthew Welsh, Public Citizen – July 14, 2011
48. *DeepStar™ 20 Years of Deepwater Innovation*
49. Public Comment Card and Attachment Received by Phil C. Nugent, Attorney at Law, Phil C. Nugent and Associates – July 14, 2011
50. PowerPoint Presentation Distributed by Phil Nugent during His Public Comments – July 14, 2011
51. Written Comment Received from Darlene Eschete (E-mail) – July 13, 2011
52. OESC Questions to Consider Document/Handout for Each Subcommittee – July 13, 2011
53. Spill Response Subcommittee Working Paper – July 12, 2011
54. Letter/Package from Sine Rivali LLC
55. ***Federal Register*** **Notice of Meeting** – Published October 18, 2011
56. OESC Meeting Minutes: Washington, D.C. (November 2011)
57. OESC Meeting Agenda – November 7-8, 2011
58. Members/Representatives in Attendance – November 7-8, 2011
59. Public and Press in Attendance – November 7-8, 2011
60. Remarks by Mr. David J. Hayes, Deputy Secretary, Department of the Interior – November 7, 2011
61. Presentation by Dr. Taduesz W. Patzek, University of Texas at Austin (OESC Member – Academia) – November 7, 2011
62. Report by Oil Spill Prevention Subcommittee – November 7, 2011
63. Report by Oil Spill Containment Subcommittee – November 7, 2011

64. **Report by Oil Spill Response Subcommittee** – November 7, 2011
65. **Report by Safety Management Systems Subcommittee** – November 7, 2011
66. **Presentation by Mr. Alan E. Spackman, Vice President,** Offshore Technical and Regulatory Affairs, International Association of Drilling Contractors – November 7, 2011
67. **Summary of Vectors for Committee's Consideration** – November 8, 2011
68. **Remarks by Mr. Kenneth L. Salazar,** Secretary, Department of the Interior – November 8, 2011
69. **Remarks by Mr. Michael R. Bromwich,** Director, Bureau of Safety and Environmental Enforcement – November 8, 2011
70. **Presentation by David O. Izon,** Petroleum Engineer, Operational Safety Branch, BSEE – November 8, 2011
71. **Presentation by David N. Nedorostek,** National SEMS Coordinator, Operational Safety Branch, BSEE – November 8, 2011
72. **Presentation by Frank M. Chapman,** President, Ashford Technical Services – November 8, 2011
73. **Presentation by Gene P. Cella,** Corporate Health, Safety and Environmental Manager, Stone Energy Corporation – November 8, 2011
74. **Presentation by W.E. "Skip" Koshak,** U.S. Environmental and Regulatory Manager, Shell Exploration and Production Company – November 8, 2011
75. **Public Comment by Ian S. Sutton,** Petroleum Engineer, Process Risk Management, Amec Paragon – November 8, 2011
76. **Public Comment by Michael Craig,** Independent Citizen – November 8, 2011
77. **Presentation by Rick Graff,** Senior Drilling Engineer Consultant, Chevron Gulf of Mexico Deepwater Exploration – November 8, 2011
78. ***Federal Register* Notice – Oil and Gas and Sulphur Operations in the Outer Continental Shelf—Revisions to the Safety and Environmental Management Systems** – Published September 14, 2011
79. **NTL No. 2011 – N09 National Notice to Lessees and Operators of Federal Oil, Gas, and Sulphur Leases, Outer Continental Shelf** – October 21, 2011
80. **International Containment Summit April 2011 Washington, D.C. – Tom Hunter's Notes**
81. **Letter from Gary Kenny Managing Principal** – October 27, 2011
82. **The Use of Safety Cases in Regulation by Professor Nancy Leveson,** Aeronautics and Astronautics/ Engineering Systems, Massachusetts Institute of Technology
83. **Written Comment Received From Ted Tupper** (E-mail) – October 31, 2011
84. **Safety: Integrated Disaster Prevention For the Offshore Driller: Rapid Engaging Blowout Emergency Capture and Control Apparatus –** October 22, 2011
85. **Public Comment Email from Carlisle on Prevention Safety** – November 4, 2011
86. **Public Comment Email from Kevin Turpin** – November 4, 2011
87. **Public Comment Email from Myron Engell Jensen** – November 4, 2011
88. **Public Comment Email from Myron Sullivan** – November 4, 2011
89. OESC Recommendation Vector Matrix – November 8, 2011
90. ***Federal Register* Notice of Meeting** – Published April 05, 2012
91. OESC Meeting Minutes: Houston, Texas (April 2012)
92. OESC Meeting Agenda – April 26, 2012
93. Members/Representatives in Attendance – April 26, 2012
94. Public and Press in Attendance – April 26, 2012
95. **Remarks by Mr. James A. Watson,** Director, Bureau of Safety and Environmental Enforcement – April 26, 2012

96. **Report by Oil Spill Prevention Subcommittee** – April 26, 2012
97. **Interim Report of the Prevention Subcommittee to the Ocean Energy Safety Advisory Committee** – April 26, 2012
98. **Report by Oil Spill Containment Subcommittee** – April 26, 2012
99. **Interim Report of the Containment Subcommittee to the Ocean Energy Safety Advisory Committee** – April 26, 2012
100. **Report by Oil Spill Response Subcommittee** – April 26, 2012
101. **Interim Report of the Response Subcommittee to the Ocean Energy Safety Advisory Committee** – April 26, 2012
102. **Draft Ocean Energy Safety Advisory Committee (OESC) Subcommittee Recommendations for Oil Spill Risk Assessment, Preparedness and Response in the Arctic OCS** – April 20, 2012
103. **Report by Safety Management Systems Subcommittee** – April 26, 2012
104. **Ocean Energy Safety Advisory Committee Safety Management Subcommittee Safety Culture Recommendation** – April 10, 2012
105. **Ocean Energy Safety Advisory Committee Safety Management Subcommittee Safety Management System Enhancement Recommendation** – April 10, 2012
106. **Presentation on Proposed Ocean Energy Institute –** April 26, 2012
107. **Ocean Energy Safety Advisory Committee Recommendations** – Adopted April 26, 2012
108. **Public Comment by Steven Cutchen,** Chemical Incident Investigator, U.S. Chemical Safety and Hazard Investigation Board **–** April 26, 2012
109. **Public Comment by Donald W. Davis,** Director Emeritus, Louisiana State University, Sea Grant Program **–** April 26, 2012
110. **Public Comment by Robin Pitblado,** SHE Risk Management Service Area Registered Safety Professional, Governance & Global Development Division, Det Norske Veritas (U.S.A) Inc. **–** April 26, 2012
111. Spill Containment Subcommittee Recommendation and Resource Presentation **–** April 26, 2012
112. Ocean Energy Safety Institute Whitepaper **–** April 26, 2012
113. **OESC Recommendations to DOI/BSEE** – May 17, 2012
114. **DOI/BSEE Response to OESC Recommendations** – August 10, 2012
115. ***Federal Register* Notice of Meeting** – Published August 10, 2012
116. OESC Meeting Minutes: Anchorage, Alaska (August 2012)
117. OESC Meeting Agenda **–** August 29-30, 2012
118. Members/Representatives in Attendance **–** August 29-30, 2012
119. Public and Press in Attendance **–** August 29-30, 2012
120. **Remarks by Mr. James A. Watson,** Director, Bureau of Safety and Environmental Enforcement – August 29, 2012
121. **Remarks by Chairman Thomas O. Hunter,** Ocean Energy Safety Advisory Committee – August 29, 2012
122. **Spill Prevention Subcommittee Report** – August 29, 2012
123. **Spill Prevention Subcommittee Memorandum to Chairman Hunter** on Interim Research and Development Recommendations with Proposed Draft Letter to Secretary Salazar and Director Watson for Committee Consideration and Action **–** August 20, 2012

124. **Spill Prevention Subcommittee's Artic Recommendation** – August 22, 2012
125. **Spill Prevention Subcommittee Vector 1 Interim Recommendation**
126. **Spill Containment Subcommittee Report**
127. **Spill Containment Subcommittee's Artic Recommendation**
128. **Spill Containment Subcommittee Vector 1**
129. **Spill Containment Subcommittee Vector 1 Supplemental Information**
130. **Spill Containment Subcommittee: Tri-Labs Lessons Learned Report**
131. **Spill Response Subcommittee Report**
132. **Spill Response Subcommittee Draft Appendix 1:** Vector 1: Facilitate Research and Development of Oil Spill Response Technology
133. **Spill Response Subcommittee Draft Appendix 2:** Vector 2: Oil Spill Response Planning, Preparedness, and Response in the Arctic OCS
134. **Spill Response Subcommittee Draft Appendix 3:** Vector 3: Interagency Coordination on Oil Spill Response Issues
135. **Spill Response Subcommittee Appendix 4** (Vector 3 Continued) Interagency Coordination Matrix
136. **Draft Report of the Spill Response Subcommittee** to the Ocean Energy Safety Advisory Committee
137. **Draft Response Subcommittee Comments on an Ocean Energy Safety Institute**
138. **Safety Management Systems Subcommittee Report**
139. **Safety Management Systems Subcommittee** Vector 1
140. **Safety Management Systems Subcommittee** Vector 2
141. **Safety Management Systems Subcommittee Stakeholder Recommendation**
142. **Safety Management Systems Subcommittee: Safety Culture Presentation**
143. **OESC Discussion on Proposed Ocean Energy Institute**
144. **Safety Culture**
145. **Public Comment by Chris Storhok,** Community Economic Development Specialist, Fairbanks North Star Borough – August 30, 2012
146. **Public Comment by Tom Lokash,** Parker Associates/Private Citizen – August 30, 2012
147. **Public Comment by Delice Calcote, Alaska InterTribal Council** (Read by Nikos Pastos) – August 30, 2012
148. **Public Comment by Carl Wassilie,** Alaska Big Village Network – August 30, 2012
149. **Public Comment by Thomas Tse Kwai Zung,** Buckminster Fuller, Sadao, & Zung Architects – August 30, 2012
150. **Public Comment by Fran Ulmer,** Arctic Research Council – August 30, 2012
151. **Public Comment by Nikos Pastos,** Private Citizen/Center for Water Advocacy – August 30, 2012
152. **Public Comment by John Chase,** Northwest Arctic Borough – August 30, 2012
153. **Public Comment by Rick Steiner,** Oasis Earth – August 30, 2012
154. **Public Comment by Earl Kingilie,** Private Citizen/Native Village of Point Hope – August 30, 2012
155. **Public Comment by Peter Van Tuyn,** Private Citizen – August 30, 2012
156. **Public Comment by Doreen Lampe,** Inupiat Community of the Arctic Slope – August 30, 2012
157. **Public Comment by Tina Robinson, Private Citizen** – August 30, 2012
158. **Public Comment by Betsey Beardsley, Alaska Wilderness League** – August 30, 2012

159. Written Request for Public Comment with Technology Abstract: *ORCoD Oil Recovery Containment Geodesic Dome* (Email - Thomas T.K. Zung) – August 22, 2012
160. Written Public Comment on *Advancement of Advisory Committee Activities and Mandate* by Tom Lokash, Private Citizen/Parker Associates
161. Release: Alaska Big Village Network: Alaska Tribal and Indigenous Groups Ban and Oppose Use of Chemical Dispersants in Oil Spills – August 30, 2012
162. OESC Expectations and Objectives for the August 29-30, 2012 OESC Meeting/End of Current Charter's Term
163. OESC Arctic Recommendations Voting
164. Resolution 11-28 from the Northwest Arctic Borough Presented to Committee for Review and Consideration by John Chase – July 26, 2011
165. Public Comment Card from Royce O'Brien on Oil Spill Response Organizations – August 30, 2012
166. Public Comment Card from Royce O'Brien on Enhance Safety Environmental Management Systems – August 30, 2012
167. Public Comment Card from Royce O'Brien on Safety Culture – August 30, 2012
168. Letter from Rick Steiner, Oasis Earth, to Royal Dutch Shell PLC and Shell Alaska Regarding Confirmation/Clarification of Issues Regarding Shell's 2012 Arctic Ocean Drilling Plans Off Alaska – May 15, 2012
169. **OESC Recommendations to DOI/BSEE** – October 15, 2012
170. **DOI/BSEE Response to OESC Recommendations** – January 4, 2013
171. ***Federal Register* Notice of Meeting** – Published December 12, 2012
172. OESC Meeting Minutes: Washington, D.C. (January 2013)
173. OESC Meeting Agenda **–** January 9-10, 2013
174. Members/Representatives in Attendance **–** January 9-10, 2013
175. Public and Press in Attendance **–** January 9-10, 2013
176. **Remarks by Director James A. Watson,** Bureau of Safety and Environmental Enforcement – January 9, 2013
177. **Remarks by Secretary Kenneth L. Salazar,** Department of the Interior – January 9, 2013
178. **Remarks by Chairman Thomas O. Hunter,** Ocean Energy Safety Advisory Committee – January 9, 2013
179. **Spill Prevention Subcommittee** Vector Recommendations for OESC Review
180. **Vector 2: Recommendations** on Development and Implementation of Data Analysis, Alarm, and Automated Control Systems to Help Prevent Loss of Primary Well Control
181. **Vector 3: Recommendations** on Implementing a Process for Best Available and Safest Technology
182. **Containment Subcommittee:** Review and Recommendations for OESC Review
183. **Assessing and Mitigating Risks Posed by Underground Blowouts and Seafloor Broaches Safety Management Systems (SMS) Subcommittee Report**
184. **Ocean Energy Safety Advisory Committee Safety Management Subcommittee:** Safety Management System Enhancement Recommendation (Vector #2)
185. **Arctic Subcommittee:** Recommendations for OESC Review
186. **OESC Arctic Subcommittee Report Enclosure 6:** Ocean Energy Safety Advisory Committee: Recommendations on Oil Spill Prevention, Safety, Containment and Response on the U.S. Arctic Outer Continental Shelf

187. **Ocean Energy Safety Institute Recommendation Report**
188. **Ocean Energy Safety Institute Recommendation White Paper**
189. **Ocean Energy Safety Institute Recommendation**
190. **Remarks by Deputy Secretary David J. Hayes,** Department of the Interior – January 10, 2013
191. **Public Comments by Elmer P. "Bud" Danenberger,** Private Citizen – January 10, 2013
192. **Public Comments by Kenneth E. Arnold,** Private Citizen – January 10, 2013
193. **Public Comments by Ted D. Tupper,** Private Citizen – January 10, 2013
194. **Public Comments by Claire Price,** The Sierra Club – January 10, 2013
195. **Public Comments by David Aplin,** World Wildlife Fund – January 10, 2013
196. **Public Comments by Cindy Shogan,** The Alaska Wilderness League – January 10, 2013
197. **Public Comments by Ashley Gardena,** The Center for Biological Diversity – January 10, 2013
198. **Public Comments by David L. Miller,** American Petroleum Institute – January 10, 2013
199. **Public Comments by Leah Scull,** Oceana – January 10, 2013
200. **Public Comments by Kenneth E. Arnold,** Private Citizen (2) – January 10, 2013
201. OESC Expectations and Objectives from January 9-10 2013 Meeting
202. **OESC Recommendations to DOI/BSEE** – January 25, 2013
203. **DOI/BSEE Response to OESC Recommendations** – August 14, 2013

Website:

http://www.bsee.gov/About-BSEE/Public-Engagement/OESC/Index/