SEMS successes, challenges and recommendations based on analysis of 4th cycle SEMS audit results and SEMS corrective actions

February 2024

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Executive Summary

The Safety and Environmental Management Systems (SEMS) regulations issued by BSEE require that audits of each operator's SEMS be conducted within two years after initial implementation and every three years thereafter. This report assesses the fourth cycle[1] of SEMS audits since the SEMS regulation was promulgated, summarizing findings from audits conducted late-2020 to late-2023, advising BSEE staff on ways to improve oversight of operator conformance with the existing SEMS regulation, and recommending improvements in the SEMS regulation to close other gaps in SEMS performance. It builds on the analyses of prior reports[2] for preceding audit cycles, noting areas of progress, improvement, or the lack thereof.

Findings from analysis of the 4th cycle audit reports

50 audit reports were received during the 4th audit cycle period and analyzed for this report.

- Four SEMS elements (Hazard Analysis, Safe Work Practices and Contractor Management, Operating Procedures and Mechanical Integrity) were responsible for most of the identified deficiencies. The deficiencies in these elements were especially associated with significant operational risk including injury, damage to facilities or equipment, and environmental impact. A fifth SEMS element (Management of Change) also registered a significant number of deficiencies, particularly for deepwater operators. A similar prevalence and distribution of deficiencies was noted in prior SEMS audit cycles. This indicates stalled progress towards SEMS maturity and effectiveness.
- The remaining twelve SEMS elements showed improved conformance and effectiveness[3] compared to prior audit cycles, with fewer and less concerning findings on average.
- There are gaps in audit coverage of well abandonment, wireline, coiled tubing, hydraulic workover units, and other non-drilling well operations. The SEMS regulations apply to these operations, but they are rarely included in the scope of audits by audit service providers (ASPs).

[1] An **audit cycle** is a period during which all active OCS operators are required to initiate a SEMS audit per 30 CFR 250.1920(b)(5). Therefore, this report covers a full set of audits from all OCS operators that were active at the start of the 4th cycle. However, not all operators started their fourth SEMS audits during this period, such as those that had begun operating after 2014. Per the regulation, an operator's first audit must be initiated within 2 years of initial implementation of the operator's SEMS and every 3 years thereafter. For drilling on the Arctic, a SEMS audit must be conducted every year that drilling is conducted.

[2] SEMS successes, challenges and recommendations based on analysis of 3rd round SEMS audit results and SEMS corrective actions (bsee.gov)

[3] In this context, an **effective** management system is successful at identifying, addressing, and managing the safety and environmental hazards and risks of all relevant operations, and has processes in place to ensure the continuous improvement of the SEMS. **Maturity** describes the result of continuous improvement and development of the management system. Mature management systems have successfully established, implemented, and are maintaining the practices and procedures required for an effective SEMS.

- Although many drilling rigs were audited in the fourth audit cycle, the fraction of drilling rigs in operation during this audit cycle that had been included in the scope of a recent SEMS audit remained low. The typical drilling rig in operation has not had a SEMS audit in several years, if at all. However, in the Gulf of Mexico Region, the number of production facilities that have received at least one SEMS audit increased, and only a small fraction of deepwater platforms remain that have not received at least one SEMS audit.

Findings from analysis of the 4th cycle Corrective Action Plans (CAPs)

This report also includes a review of operator corrective action activity. 30 CFR 250.1920(d) requires that, following the completion of their SEMS audit, the operator must submit for BSEE review their Corrective Action Plan (CAP) to resolve all reported deficiencies. CAPs associated with the 4th cycle SEMS audits were analyzed to categorize the actions proposed by operators to address their SEMS deficiencies, and to assess ways that BSEE can push the operators to focus more on system-level fixes.

- Many corrective actions proposed by the operators were remedial or superficial in nature (e.g., correcting documents, restocking PPE supplies) and did not address the underlying cause of the management system deficiency or implement changes that would prevent recurrence.
- In rare cases, even after BSEE requests for more system-focused corrections, corrective actions did not appear to fully address the deficiency identified in the audit.
- Adding new or modifying existing processes to ensure that a corrective action is effective and maintained over time across all the operator's assets was rarely specified in corrective action plans. The recurrence of deficiencies from prior SEMS audits suggests that these processes need to be added or improved as a routine practice in CAPs.

Assessment of SEMS Successes and Challenges

The prevalence of audit findings in Hazard Analysis, Safe Work Practices and Contractor Management, Operating Procedures, Mechanical Integrity, and Management of Change, indicate that there is stalled progress in implementation of programs to manage operational risks. Supporting this assessment is the plateauing and occasional decline in safety and environmental normalized performance metrics as reported to BSEE annually by operators to comply with 30 CFR 250.1929 (See Data Tables with Safety and Environmental Performance Metrics and Graphs of Safety and Environmental Performance Trends for 2010-2022).

The audit reports show that operators have established programs for each of the 17 SEMS elements, have generally conformed with the documentation expectations for each, and are following their own practices to a large degree; however, improvements are needed to close the gaps identified by the auditors and improve overall SEMS effectiveness. Our assessment is that the existing SEMS requirements focus on documentation but do not emphasize what is needed to integrate all the SEMS elements into a unified risk management approach, one that can be custom fit to each unique operation with its own unique risk profile. For example, the current hazards analysis requirements are focused on infrequent facility hazard assessments and task-specific Job Safety Analyses (JSAs). However, effective risk management often requires broader, integrated approaches in which facility hazards analyses and JSAs could be just two components of a larger system.

Proposed BSEE Actions

Industry developed the fourth edition of API RP 75[4] ("Safety and Environmental Management System for Offshore Operations and Assets," December 2019) to close gaps such as noted above by integrating the principles "Commitment, Risk Management, Human Performance, and Continual Improvement" into every aspect of SEMS design, implementation, and maintenance. The plateauing of SEMS performance based on the current regulation supports a proposal to integrate API RP 75 fourth edition requirements and its principles into updated SEMS regulatory requirements.

Before any change to the SEMS regulation is proposed and potentially adopted, BSEE can also promote improved risk management through the existing SEMS requirements as follows:

- Focus regular regional oversight and monitoring actions, and incident investigations, on the five SEMS elements listed above.
- When reviewing audit plans, recommend to operators that each type of facility/operation should be sampled during SEMS audits (e.g., drilling rigs, production platforms, workover operations). This will improve coverage of facilities that had been previously underrepresented or omitted from audits.
- Modify the BSEE review procedure for CAPs to require that (when applicable) operators describe the processes (new or pre-existing) that will be used to ensure that each corrective action is effective at addressing the deficiency at a systems level and will be maintained over time and across all operator assets to prevent recurrence.
- Communicate to the operators' leadership the expectation that their management has an essential role to play in effectively correcting deficiencies identified in their SEMS audits, and failure of management to correct deficiencies at a system level after being warned by BSEE of inadequate responses could initiate Failure to Correct enforcement actions by BSEE.

End of executive summary.

[4] Although the 4th edition of API RP 75 was published before the start of the 4th audit cycle, all audits covered in this report were required to conform with the 3rd edition, which is incorporated by reference at 250.198(e)(75). Unless noted otherwise, all references to API RP 75 in this document refer to the 3rd edition.

Regulatory History – SEMS and the SEMS audit process

The Mineral Management Service (MMS) (BSEE's predecessor) first issued an Advanced Notice of Proposed Rulemaking (ANPRM) to establish a SEMS in 2006. This ANPRM explored options for requiring that Outer Continental Shelf (OCS) Oil and Gas (O&G) operators adopt management system approaches such as described in the American Petroleum Institute (API) Recommended Practice (RP) 75 3rd Edition (2004). MMS then issued a Notice of Proposed Rulemaking (NPRM) in 2009 indicating an intent to require that OCS O&G operators adopt and implement four of API RP 75's thirteen elements, specifically Hazard Analysis, Management of Change, Operating Procedures and Mechanical Integrity. The reason the NPRM focused only on a subset of the API RP 75 elements was that MMS analysis of OCS incident reports indicated that OCS incidents were often characterized by inadequate risk awareness and poor discipline. Enhanced practices based on these chosen four elements were expected to address those deficits.

The Deepwater Horizon incident occurred in April 2010. To increase focus on major incident prevention, the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), the immediate successor to MMS, issued the first SEMS regulation in October 2010. This regulation, now referred to as SEMS I, required that all thirteen elements of API RP 75 be adopted by OCS operators. BSEE was established in October 2011 and BSEE issued the SEMS II regulation in April 2013. SEMS II defined four additional management system elements and established additional requirements such as the need for SEMS audits to be conducted by accredited Audit Service Providers (ASPs).

Management System Establishment, Implementation and Maintenance

The entirety of the SEMS regulation is published as 30 CFR 250 Subpart S. The need to follow API RP 75 and the four additional BSEE-established elements is important, but the overarching, primary requirement of Subpart S for lessees and designated operators on O&G leases is that they **establish, implement, and maintain** a systematic approach for risk management (§250.1900) throughout the life cycle of their operation on the OCS (§250.1901). The 17 elements that are required to be incorporated into each operator's SEMS are as follows:

1. General requirements
2. Safety and Environmental Information
3. Hazards Analysis
4. Management of Change
5. Operating Procedures
6. Safe Work Practices
7. Training
8. Mechanical Integrity (Critical Equipment)
9. Pre-startup Review
10. Emergency Response and Control
11. Investigation of Incidents
12. Auditing
13. Recordkeeping and Documentation
14. Stop Work Authority
15. Ultimate Work Authority
16. Employee Participation Plan
17. Reporting Unsafe Working Conditions

These 17 elements alone are not the SEMS, but rather provide a framework of practices that must be considered and integrated into each O&G operator's internal policies, procedures, processes, and management culture to guide their safety and environmental risk management, i.e., each operator is expected to explicitly and clearly define how it will develop, implement, monitor, and manage risk for its organization utilizing each of these elements.

The design of BSEE's SEMS requirements, especially the "establish, implement, and maintain" requirement of §250.1900, mirrors the "Plan→Do→Check→Act" (PDCA) cycle embedded in every other internationally recognized Quality Management System (QMS), e.g. ISO 9001 (*Quality management systems – Requirements*), ISO 14001 (*Environmental management systems – Requirements with guidance for use*) and ISO 45001 (*Occupational health and safety management systems – Requirements with guidance for use*)[5]. In the context of SEMS:

- the "**establish**" requirement of SEMS expects each oil and gas operator to design and promulgate policies and procedures that incorporate the 17 elements listed above to manage operational risks to the safety of personnel and the environment;
- the "**implement**" requirement expects operators to roll out these policies and procedures in an organized fashion, to promote that they be carried out as designed to the extent practicable, and when any specific policy or procedure cannot be followed as designed or needs to be changed for any other reason, to introduce revisions in a similarly organized fashion; and
- the "**maintain**" requirement expects operators to **monitor** performance regularly and **improve / revise** policies and procedures as needed – to continually improve the effectiveness of each SEMS-related policy and procedure in managing risks to personnel and the environment.

Evaluating the success of a SEMS therefore means assessing movement on the continual improvement path. The audits performed during the 3rd and 4th SEMS Audit cycle provide evidence of such movement, especially when compared to results of audits performed in the first two cycles. The benefits of a SEMS investment (e.g., better safety and environmental performance) will become clearer as companies increase efforts on the implementation and maintenance stages, for that is where increased awareness and creation of a learning culture begin to change human and organizational behaviors.

Management System Auditing

BSEE regulations currently require audits of each operator's SEMS using accredited Audit Service Providers (ASPs) at a prescribed frequency[6] and in response to a BSEE Directed Audit order (refer to 30

[5] ISO (International Organization for Standardization) is an independent, non-governmental international organization with a membership of 165 national standards bodies and a mission to develop "high quality voluntary International Standards which facilitate international exchange of goods and services, support sustainable and equitable economic growth, promote innovation and protect health, safety and the environment."

[6] Audits must start within 2 years of initial implementation of an operator's SEMS (i.e., within 2 years of the start of operations for which the regulation is applicable) and every 3 years thereafter. For drilling on the Arctic OCS, an audit must be performed every year that drilling is conducted. Auditing requirements are found at 30 CFR 250.1920.

CFR 250.1920 and 250.1925 for more details). Note that the requirement to use an accredited ASP became effective in June 2015.

Since SEMS II was promulgated in 2012, over 240 audit reports have been submitted to BSEE per regulatory requirements:

- **Cycle 1**: 2012 to mid-2014 – 87 audit reports from 96% of the companies operating on the OCS in mid-2014, demonstrated that a SEMS was beginning to be established by the OCS oil and gas operators; however, a lack of report content standardization made it difficult to extract more intelligence on the effectiveness of the initial SEMS plans.
- **Cycle 2**: 2014 to mid-2017 – 60 audit reports were received representing 100% of the companies still operating on the OCS by mid-2017[7]. Most were generated by accredited ASPs, and all provided details that confirmed many companies were utilizing their SEMS; however, gaps still existed in the establishment and implementation of several key SEMS elements.
- **Cycle 3**: 2017 to mid-2020 – 52 audit reports were submitted, again representing 100% of the companies with operations on the OCS by mid-2020. For many companies operating on the OCS, this period covered their 3rd SEMS audit overall. Audits during this cycle demonstrated additional movement on the PDCA curve revealing that most SEMS deficiencies were in the implementation of their established procedures.
- **Cycle 4**: 2020 to early 2023 – 50 audit reports were submitted, again representing 100% of the companies with operations on the OCS by 2023. Audits during this period represented mixed results in terms of progress towards management system maturity, with some operators exhibiting incomplete or stalled progress towards implementation or maintenance of certain SEMS elements. In contrast, for other SEMS elements these audits indicated that most operators were approaching full implementation and maintenance.

[7] The reduction in the number of audit reports received by BSEE over the 11-year period since SEMS was first established is primarily the result of consolidation of active OCS operators, rather than a reduction in OCS drilling, production, and decommissioning activities.

Facility Coverage

During each audit, the establishment, implementation, and maintenance of SEMS is reviewed in the operators' offices; the SEMS regulation further requires that the ASP visit 15% of each operator's facilities to verify via interviews and observations that the SEMS procedures and programs referenced in their SEMS plan are in place and providing the anticipated performance results. For unstaffed facilities that are included in the offshore verification sample, the audit team can combine physical visits with interviews of maintenance personnel and review of documentation and photos to assess the safety and environmental adequacy of the operator's oversight practices. Audits including unstaffed platforms will also usually include the associated hub facility within the audit scope. The hub platform is often staffed and serves as a repository for SEMS documentation and records for the associated unstaffed platforms.

Table 1a highlights the number and percentage of drilling rigs and related well operation vessels that have been visited during SEMS audits since the beginning of the program. While 64 of such facilities were visited to-date in SEMS audits, only 24 of these were active on the US OCS as of 2Q FY2023. Although 38% of the rigs still active on the US OCS have received at least one SEMS audit, only 13 of the 48 rigs (27%) active in 2Q FY2023 received an audit in the 4th audit cycle, and 24 (50%) of those 48 rigs had never received a SEMS audit. Low audit coverage rates for rigs were common in prior audit cycles too.

Table 1a. Drilling Rig Coverage in SEMS Audits, All Regions (2012 to early-2023)		
# Rigs and related well operation vessels visited during all SEMS audits to-date:		64
# still active on the US OCS as of 2Q FY23:	24 (38%)	
# that had left the US OCS as of 2Q FY23:	40 (62%)	
# Rigs active on the OCS in Q2 FY2023:		48
# that had been sampled in a SEMS audit previously	**24 (50%)**	
# that had been sampled in a SEMS audit in the 4th audit cycle	**13 (27%)**	

There are at least two reasons for the low audit coverage rates for drilling rigs:

1. Many rigs are contracted for a limited period and then leave BSEE jurisdiction when the work is completed (either moving outside the OCS or disconnecting from OCS wells) but may later return and resume operations. They are less likely to be included in audits than production platforms, which almost always have an active OCS operator for their entire lifecycle.
2. Compared to production platforms, OCS operators may prefer to exclude an active rig from their audit plans, arguing that a rig that just came on contract would have minimal content to audit (e.g. JSA's, drill critiques, internal evaluations) or that the audit would have minimal value because the rig's contract is about to expire and the operator has no plans to use that rig contractor in the future. Even if these justifications may have been rejected, the current regulations may not support mandating the inclusion of active rigs in audits.

Table 1b below highlights the number and percentage of staffed and unstaffed production facilities that have been sampled during SEMS audits since the beginning of the program. These data indicate that priority has been given to sampling SEMS on staffed, deeper water facilities rather than on unstaffed assets. For example, approximately 84% of all production facilities in waters exceeding 200-meter depth have been visited during the SEMS audits to-date. Although more unstaffed structures have been audited (444 unstaffed vs. 341 staffed), only 32% of the 2022 inventory of unstaffed structures on the OCS have been audited.

Table 1b. Production Facility Coverage in SEMS Audits, All Regions (2012 to early-2023)			
Total # production **structures** on the OCS on December 31, 2012 (SEMS audits began):			2844
Total # production **complexes** on the OCS on December 31, 2012 (SEMS audits began):			2060
Total # production **structures** on the OCS as of January 1, 2023:			1622
Total # production **complexes** on the OCS as of January 1, 2023:			1119
# of staffed production structures on OCS visited during all SEMS audits to date:			341
Gulf of Mexico Region	Less than 200 meters depth (657 feet):	257	
	200 – 1000 meters depth:	27	
	Greater than 1000 meters depth:	37	
Pacific Region:		19	
Alaska Region (not counting Spy Island):		1	
Estimated % of existing staffed structures visited during these SEMS audits:			**63%**
Gulf of Mexico Region	Less than 200 meters depth (657 feet):	62%	
	200 – 1000 meters depth:	**79%**	
	Greater than 1000 meters depth:	**88%**	
Pacific Region:		**78%**	
Alaska Region (not counting Spy Island):		**100%**	
# un-staffed production structures / manifolds visited during all SEMS audits to date:			444
Estimated % of existing un-staffed structures sampled during these SEMS audits:			**32%**

A 43% decrease between 2012 and 2023 in the number of OCS facilities has further reduced the assets inventory that can be included in future SEMS audits. This is a result of removal from the OCS of aging and unneeded structures as well as industry's growing reliance on larger, higher producing deepwater production facilities.

Other Gaps in Facility and Operational Coverage

In addition to the low coverage of drilling rigs described in the previous section, there was also minimal coverage of non-rig well operation facilities (e.g., hydraulic workover units, derrick barges, coil tubing units, wireline units and lift boats) and decommissioning/abandonment operations. Coverage of these facilities and operations has been similarly low in the previous audit cycles, however, the increase in the intensity of decommissioning operations in the 4th audit cycle increased the magnitude of this gap in oversight. According to CY2022 BSEE-0131 data, worker hours in construction (of which decommissioning operations are a significant contributor) totaled 13.9 million hours, more than any of the preceding six years.

Analysis of 4th Cycle Audit Findings

"Findings" are the product of SEMS audits. Findings are classified as either Good Practices, Deficiencies (which include nonconformities and areas of concern), or Opportunities for Improvement.

Good Practices

Good practices (or in many cases, notably effective or compliant practices) were identified in 41 of the 50 audit reports reviewed; they accounted for 28% of the overall findings reported during the 4th cycle audits. The few cases where audit reports did not call out any positive SEMS attributes typically involved operators with many SEMS deficiencies across multiple SEMS elements. In other words, a large deficit existed in SEMS-related practices by that operator, and the elements where auditors identified conformance with the SEMS requirements did not provide a robust enough base upon which to expand their SEMS practices.

57% of the identified good / notable compliant practices identified in the audit reports were associated with the following four SEMS elements— General (organization and leadership), Safe Work Practices, Auditing, and Mechanical Integrity, a distribution similar to the 3rd audit cycle's reports.

Recurring Good Practice/Strength Findings

Although good practice findings can provide useful insights into the strengths of the management systems, certain auditors/ASPs appear to be including very general strength findings that provide questionable value to the operator. In some cases, specific auditors appear to be including very similar strength findings in many of their audit reports.

Below are some examples of the most common recurring good practice findings:

- General element
    - High level of leadership/organizational commitment, engagement, and transparency in their SEMS program/audit process (10 findings)
    - Auditors were provided with unrestricted access to SEMS documents in a centralized repository, and appreciated the openness and transparency during the audit (6 findings)
- Auditing element
    - High level of leadership/organizational commitment, engagement, and transparency in their SEMS program/audit process (15 findings - note that this finding is identical to the first General element finding listed above)
    - Compliments for the effectiveness of the operator personnel that facilitated the audit (e.g., the HSE team) (3 findings)
- Safe Work Practices and Contractor Selection element
    - Operator had a full set of documented safe work practices and a system to provide access to them from all work locations (6 findings)
    - General comments about the good relationship between the operator and their contractors (2 findings)

These good practice findings were not necessarily included to the exclusion of more meaningful and operation-specific findings – many audit reports included both. However, some good practice descriptions were overly general. Good practice findings that provide specific examples or reference specific management system components and describe how they led to better risk management, may be more valuable to operators and could potentially be shared with others as best practices. The COS-1-06 (August 2023) definition of a 'strength' finding supports this recommendation: 'A management system component that has been identified by the auditor as exceeding requirements and, if agreed with the auditee, could benefit industry by being shared.'

Deficiencies

Deficiencies include both non-conformances with specific SEMS requirements, and areas of concern where failure to address the finding could lead to a non-conformance. Both non-conformances and areas of concern are treated equally for the following analysis and BSEE regulations require that both be addressed in a Corrective Action Plan (CAP)[8].

Over 60% of the documented deficiencies were associated with five SEMS elements: Safe Work Practices, Mechanical Integrity, Hazard Analysis, Operating Procedures, and Management of Change. The deficiencies were further analyzed to determine whether they reflected a gap in the establish, implement, and/or maintain requirement of SEMS.

Table 2. Top 5 SEMS Elements with Deficiencies across Audit Cycles

	2nd Audit Cycle		3rd Audit Cycle		4th Audit Cycle	
	%	Count	%	Count	%	Count
Hazards Analysis	11%	56	12%	58	10%	35
Management of Change	8%	37	9%	43	6%	22
Operating Procedures	7%	36	10%	51	12%	42
Safe Work Practices	12%	61	17%	83	16%	56
Mechanical Integrity	11%	52	14%	72	19%	65
Total of Top 5 Elements	**49%**	**242**	**62%**	**307**	**63%**	**220**
Deficiencies per Audit						
All Elements	9.4		9.2		7.8	
Top 5 Elements	**4.7**		**5.7**		**4.9**	
Bottom 12 Elements	4.8		3.6		2.9	

In the table above, although later audit cycles had fewer deficiencies per report, it is notable that the fraction of deficiencies in the top five elements has increased over time – from 49% in the 2nd audit cycle to 62% in the third and 63% in the fourth. However, this does not indicate that these deficiencies are becoming more prevalent but are instead due to the fraction of deficiencies in the bottom 12 elements decreasing over time, from 4.8 deficiencies per audit report in the 2nd cycle to 2.9 deficiencies per report in the 4th cycle. This indicates that the progress towards maturity is inconsistent across elements.

The following are examples of the most common deficiencies identified in each of these five elements:

Safe Work Practice (SWP) deficiencies

Most SWP deficiencies derived from inconsistencies between the SEMS program expectations and field observations, e.g., gaps in SEMS implementation. This can be summarized as a lack of operational discipline. These findings came from observations on one or more of the operator's facilities (not the

[8] See BSEE's regulatory interpretation at https://www.bsee.gov/guidance-and-regulations/regulations/regulatory-interpretations#sems

totality of an operator's facilities) visited by the auditors, potentially reflecting localized vs. company-wide implementation gaps. Most common SWP implementation deficiencies included:

- Inconsistent Implementation: Safe Work Practices such as working at heights, lock out tag out (LOTO), hot work permits, crane operations, were not being followed "as designed" or consistently.
- Inconsistent contractor management processes: Many instances of lack of processes to review and update bridging agreements or ensure activities are conducted according to their requirements; inconsistent processes or adherence to procedures when hiring or evaluating the performance of contractors.
- Incomplete documentation: Job Safety Analyses (JSAs) and Permit to Work packages did not always document the required use of various Safe Work Practices.
- Undisciplined chemical management practices: Safety Data Sheets are not kept updated, inventories on-site not properly maintained or tracked, lack of labeling on chemical and hazardous materials.

All the above deficiencies were also noted in the 3rd audit cycle summary report as significant and common SWP deficiencies. However, while "Poor housekeeping" was a common deficiency in the 3rd audit cycle reports, it was not common in the 4th cycle.

Mechanical Integrity (MI) deficiencies

Most deficiencies identified by the auditors concerned "implementation" requirements:

- Insufficient or incomplete implementation of routine maintenance and inspection processes for critical equipment:
    - Insufficient records documenting the inspections and inconsistent processes for timely communication of inspection results
    - Issues with completion and tracking of MI program action items to closure (including instances where action items were left unaddressed)
    - Gaps in programs and plans in place to test, inspect, calibrate, and monitor critical equipment and systems, including out-of-date annual calibration certifications
    - Instances where critical equipment inspections were not performed
- MI of contractor equipment not verified or consistently implemented
- General corrosion management issues, often noted for multiple facilities of the same operator

Hazard Analysis deficiencies – facility level hazard analysis

Most operators had established hazard analysis processes, but the auditors' identified deficiencies in how they were implemented and maintained. Examples include lack of documentation and recordkeeping of process hazard analyses, including validation procedures or measures to ensure that HA recommendations are addressed in a timely manner (e.g., action items from previous PHAs are still open or lack of records to verify the status of action items). Compared to the previous audit cycle, the facility level hazard analysis deficiencies show signs of progress – fewer operators had absent, deficient,

or improperly conducted facility level hazard analyses. However, the auditors at times noted that communication of the results and closure of action items from these hazards analyses was deficient.

Hazard Analysis deficiencies – task level hazard analysis

Most operators had established task level hazard analysis programs, but the auditors' identified deficiencies in implementation. Examples include:

- Gaps in identifying key hazards associated with the job being performed (e.g., dropped objects, working from heights/fall protection, weather conditions, tripping hazards)
- Inconsistencies in implementing procedures for JSA requirements on routine and non-routine work
- Evidence that not all personnel involved with the job participated in the pre-job safety review

Operating Procedure deficiencies

Many deficiencies were related to documentation and maintenance, such as issues with reviewing or ensuring operating procedures are kept updated, including after MOC closure. There were also several implementation and establishment deficiencies, such as:

- Lack of written operating procedures or inclusion of instructions sufficient for the task
- Operating procedures not followed during facility operations (examples: startup/shutdown, SIMOPs etc.)
- Instances where hard copy procedures available on the facility are inconsistent with procedures available on facility/company electronic databases

Management of Change (MOC) deficiencies

Most operators had established their MOC processes, but in many cases a review of the documentation indicated that the process was not being implemented consistently or thoroughly. Examples include:

- Improper documentation or communication in the close out of MOCs: changes not communicated to personnel, plans or diagrams not updated following installation of new or modified equipment
- Validation of completion of MOC actions not indicated
- Instances of MOCs not done for personnel changes
- Deficiencies in the MOC process for modifications of operating procedures or changes in equipment

Relationship between deficiencies and SEMS maturity

The existence of deficiencies such as those identified above rarely means that a SEMS element was entirely ineffective. Auditors often revealed both good and deficient practices in each SEMS element. The existence of both good and deficient practices in a company is to be expected as their experience with SEMS matures. Table 3 and the discussion that follows is presented to generally demonstrate this.

Table 3. Relative prevalence of deficiencies in the top 5 SEMS elements

SEMS Element	% of total Deficiencies identified during 4th Audit Cycle	% of 4th cycle audits where one or more Deficiencies are identified for this element	% of 4th cycle audits where one or more Good Practices are identified for this element
Mechanical Integrity	18%	48%	20%
Safe Work Practices	16%	60%	32%
Operating Procedures	11%	40%	12%
Hazard Analysis	10%	48%	12%
MOC[9]	6%	49%	11%

- The first column lists the elements most often associated with a deficiency.
- The second column shows the percent of all 4th cycle deficiencies associated with that element.
- The third column shows the percent of 4th cycle audit reports that listed at least one deficiency in that same SEMS element.
- The fourth column shows the percent of 4th cycle audit reports that also listed at least one good practice in that element.

[9] MOC actually had the 6th highest quantity of deficiencies in the 4th audit cycle - the 5th element was General. However, the difference between the two elements was less than one percent. MOC is included here instead of General for the sake of comparison with the prior audit cycles, in which MOC was the 5th most prevalent.

To further explore the concept of growth in SEMS maturity among OCS operators, all deficiencies were categorized independent of the SEMS element under which they were identified. Table 4 compares the audit findings over time; the results indicate that there is a continued OCS-wide movement on the maturity path from the initial challenges of designing and documenting SEMS to implementing and maintaining SEMS. However, it is concerning that "establishment" findings still make up over ¼ of deficiencies.

Table 4. Comparison of Audit Cycles and the Establish, Implement and Maintain deficiencies

Audit Cycle	Time Frame	General Comment	Identified Deficiencies in SEMS…		
			Establishment	Implementation	Maintenance
1	2012-2014	Companies were beginning to establish their SEMS	No standard reporting format; strict adherence to COS Checklist; fear of reporting details and receiving INCs		
2	2015-2017	Requirement for Accredited auditors began in June 2015	41%	39%	20%
3	2018-2020	Findings indicate movement on maturity path	26%	50%	24%
4	2020-2022	Mixed or stalled progress towards maturity	27%	44%	30%

Repeat Findings Noted in Audit Reports

Three audit reports noted that deficiencies from prior ASP audits or internal audits had not been corrected by the operator. In these cases, sufficient time had passed during which the deficiency could have been corrected.

- Audit Report 1: Mechanical Integrity – Issues with the effective closure of identified deficiencies from various types of structural inspections.
- Audit Report 2: Mechanical Integrity – MI program found to not have systematic process for effectively identifying, reporting, tracking, managing, and completing action items - including 3rd party audits (Level 1 inspections, NDT testing, Hazard Analysis)
- Audit Report 3: Recordkeeping and documentation – Contract operator documents adopted by the OCS operator had missing dates of revisions.

These are concerning examples of operators failing to correct identified SEMS deficiencies. In future cases, BSEE should devote special attention to ensuring that deficiencies identified in audits are corrected. Corrective action plan verification, directed audit, and/or enforcement actions could be used for this objective.

Discussion of implementation gaps

A recurring audit review result, theme, or finding highlights the challenges faced in consistent and sustained SEMS procedures implementation and closing the gap between "work as planned or imagined versus work as actually performed or executed." This phrase describes the underlying challenge that all operators face when work is planned primarily by persons with in-depth understanding of risk but executed in the field by those who may have competing priorities, an innate comfort and familiarity with alternative work procedures, or operating experience that conflicts with the newer guidance.

BSEE and industry continue to search for possible solutions to close the gap between work as planned and work as performed.

Opportunities for Improvement

Opportunities for Improvement (OFIs) are the third type of finding included in many SEMS audit reports. OFIs are identified when an element appears to be established, implemented, and maintained, but levels of efficiency or sustainability could potentially be improved. Five SEMS elements were responsible for more than half of the OFIs during the 3rd Audit Cycle: Management of Change, Training, Mechanical Integrity, Emergency Response and Control, and Hazards Analysis.

In reviewing some OFI descriptions, they read similarly as those that could be interpreted as deficiencies. However, our discussions with the ASPs indicate that they take extra effort to ensure that any OFI identification is not reflective of a systemic deficiency and that OFI designation is made via an audit team consensus process. In other words, the element for which an OFI is issued either meets the operator performance expectation, or the finding reflects normal, non-critical variation that is to be expected in any system, e.g. the absence of a signature or a detailed description of a risk on a Job Safety Analysis form, and is not the same as the workforce being unaware of their risks and their responsibilities to manage them.

Differentiation of Operators based on Audit Findings

The above analysis provides an overview of findings (good practices, deficiencies, and opportunities for improvement) that characterize the overall OCS O&G industry. However, there are large differences among operating companies in how effectively they establish, implement, and maintain their SEMS.

For this analysis, we chose average water depth of production operations as a differentiator, largely because most OCS O&G production in 2023 comes from "deep water" (greater than 200 m water depth, or 656 ft) Gulf of Mexico operations, yet most of the facilities that SEMS apply to (see Table 1b) are in "shallow water". There were fifteen deepwater operators[10] and approximately 75 deepwater platforms in the fourth audit cycle, along with a significant volume of deepwater drilling and other well operations.

[10] The fifteen operators with average water depths > 200 m were: Anadarko, BP, Chevron/Unocal, Eni, EnVen, Equinor, ExxonMobil, Hess, LLOG, MC Offshore, Murphy, Shell, and Woodside (formerly BHP Billiton). Beacon Growthco and Kosmos were also included because they operate deepwater wells that are hosted on the platforms of other operators but operate no deepwater platforms themselves. EnVen was acquired by Talos in February 2023, but Talos did not meet the deepwater criteria before or after the acquisition.

As shown in Table 5, auditors reported that deepwater companies (those operating in > 200 meters water depth on average) versus those operating older, closer to shore assets had fewer SEMS deficiencies covering fewer SEMS elements; these deficiencies were also much more likely to be in the implementation aspects of their SEMS rather than in its establishment, perhaps indicating more experience, maturity, or comfort by operators in deep water with the use of SEMS tools to manage risks.

There was a significant decrease in the fraction of deficiencies in the "maintain" aspect for deepwater operators from the 3rd to the 4th audit cycle (30% to 9%) with an increase in "implement" deficiencies (58% to 77%). This may have been because the "maintain" deficiencies of the 3rd audit cycle were eventually corrected and resolved, but other implementation deficiencies persisted.

The fraction of "establish" deficiencies for deepwater and shallow water operators was nearly unchanged between the audit cycles (12% to 14% for deepwater operators, 29% for shallow water operators in both cycles), suggesting stalled progress towards full implementation of SEMS. However, several elements which were commonly cited as deficient across operators in the 3rd cycle were more rarely cited in the 4th cycle (Safety and Environmental Information, Management of Change, Emergency Response and Control)

Table 5. Comparison of 4th Cycle Audit Results for Deepwater vs Other Operators

	Audit Cycle	Required SEMS improvement focus			Prevalence of SEMS Deficiencies	
		Establish	Implement	Maintain	Avg. # of Deficiencies per report	SEMS Elements with >50% likelihood of having a deficiency
Deepwater Operators	3rd	12%	58%	30%	5	1. MOC 2. SWP 3. Operating Procedures
	4th	14%	77%	9%	9.5	1. SWP 2. MOC 3. Hazard Analysis 4. Operating Procedures 5. General
Shallow Water Operators	3rd	29%	48%	23%	11	1. SWP 2. MI 3. Hazard Analysis 4. Operating Procedures 5. SEI 6. MOC
	4th	29%	63%	8%	11.5	1. SWP 2. MI 3. Hazard Analysis 4. Operating Procedures 5. General 6. Training

Tracking and analysis of associated corrective actions

BSEE requires that deficiencies identified in a SEMS audit be addressed by the operator through developing, implementing, and closing out a Corrective Action Plan (CAP). Each CAP must include "the name and job title of the personnel responsible for correcting the identified deficiency(ies)", as well as steps to "effectively address the audit findings" (see 30 CFR 250.1920(d)). BSEE is also authorized to verify the corrective actions are in place and validate that the actions effectively address the audit findings (30 CFR 250.1920(e)). Accordingly, BSEE requires that each CAP be updated every 90 days and resubmitted to BSEE until all identified actions are complete. As many corrective actions involve implementing a procedure or driving a change in safety culture, BSEE recognizes that some corrective actions may take longer to complete. In those cases, the progress of the activities taken to implement the change(s) should be included in the CAP updates submitted every 90 days to BSEE.

Corrective Actions by SEMS Element

Actions taken to address SEMS deficiencies can be classified into four categories:

- **Remedial** corrections fix the observable symptoms of the deficiency without addressing the underlying systemic causal factors that led to the deficiency or preventing recurrence. Examples: updating outdated procedures, replacing expired first aid supplies, distributing missing Safety Data Sheets for hazardous chemicals.
- **Establish** corrections involve the design (or re-design) and documentation of management system processes and procedures. It may also include implementing new verifications or oversight practices to ensure compliance.
- **Implement** corrections address the incomplete or ineffective implementation of a previously established management system process. This may also include corrective actions related to the documentation created when the process is used offshore. Examples: distributing a procedure to offshore personnel, (re)training personnel, revising a JSA form to encourage workers to document their PPE use.
- **Maintain** corrections address the monitoring and improvement of the implementation, including the collecting of data and feedback to determine if a process is effective, and responding to those findings to improve the process. Example: improving an internal audit process to better capture the safety performance of third-party contractors and regularly reporting those results to management for review.

Corrective actions from multiple categories may be used to address a single deficiency.

Table 6 provides an assessment of the frequency in which these three types of corrective action tasks have been proposed to BSEE to address deficiencies. This analysis only examines the five elements with the most proposed corrective actions; these are the same five elements with the most identified deficiencies. This analysis reflects BSEE's judgement as to the type of each proposed corrective action.

Table 6. Corrective Actions proposed to correct SEMS deficiencies during the 4th Audit Cycle					
SEMS Element	**Percent of all corrective actions**	**Types of corrective actions**			
		Remedial	**Establish**	**Implement**	**Maintain**
Safe Work Practices	21%	27%	29%	**37%**	8%
Mechanical Integrity	13%	34%	**37%**	25%	5%
Hazards Analysis	13%	22%	**36%**	**36%**	6%
Management of Change	10%	17%	**40%**	38%	5%
Operating Procedures	7%	28%	**37%**	26%	10%

Corrective Action Tracking – Common Types of Actions

Examples of corrective actions that qualified as "remedial" follow:

- Portable eye wash station installed and made available in Pump Room Area. Refresher communications included in the next regularly scheduled safety meeting on the proper storage of welding materials to protect the environment.
- Email sent to incident investigation leads reminding them to include corrective actions on their investigation reports and assign responsible parties.
- Operator management met with the management of their scaffolding service contractor to stress the importance of fall rescue and water rescue plans, and rescue plans were provided by the contractor for their current jobs.
- Administered a one-off re-training session for personnel involved with gas detector testing and calibration, to clarify the training frequency requirements.
- The slings that were found by the auditors to have unreadable ID tags (i.e. unknown service life and testing history) were removed from platform.

Examples of corrective actions that were counted in the "establish" category follow:

- Established new goals and performance indicators for the SEMS program including recordable injury rates and added them to the annual management SEMS review form.
- Created a checklist to verify that future Process Hazard Analyses (PHAs) will account for incident history and MOCs.

- Created a server location and document tracking and identification system for managing SEMS documents.
- Created a SEMS policy document that defines which person on the platform has ultimate work authority.

Examples of corrective actions that were counted in the "implement" category follow. Some involved updating or reworking procedure documents but were counted as "implement" actions because they were primarily focused on field implementation and improved risk identification:

- Updated pipeline pigging procedure to accommodate different sizes and types of pigs.
- Personnel trained on mitigation procedure for out of service radar and updated daily compliance reports for the associated job positions.
- Improvements to existing MOC process to check for closure of all action items and ensure operational readiness before new or modified equipment are used.
- Distributing updated operating procedures to offshore facilities and training personnel on the new procedures.
- Evaluate and improve the current mechanical integrity tracking system to better capture deficiencies in specific equipment and track them to closure, including better tracking of equipment numbers and spare parts and train relevant personnel on the improved systems.

Examples of corrective actions that were counted in the "maintain" category follow. These included improvements to processes that will verify that the SEMS processes (either previously existing or established/implemented by the CAP) are effective:

- Evaluate verification processes to ensure that facility design changes are updated in the records and drawings and conduct periodic facility walkdowns to verify current documentation.
- Job Safety and Environmental Analyses (JSEAs) will be reviewed on a quarterly basis to discuss findings and potential improvements to hazard analysis processes with operations personnel. Rig contractor will add a training specialist to their HQ office to oversee GOM training record accuracy and monitor training gap reports. Operator will verify that the training databases have been updated and will spot check for completeness and accuracy. Revalidation of operating procedures to be added to the compliance calendar on a 5-year interval.
- Software updated to perform an annual review process to check for compliance with the lock-out tag-out procedure requirements.

Discussion and Next Steps

The audit reports and CAPs analyzed for this report provide BSEE valuable insights. The purpose of this report is to share those insights with the regulated industry and to guide future discussions on how to further unleash the power of SEMS to drive safety and environmental performance.

SEMS adoption and implementation by operators

As of the end of the 4th audit cycle, about three quarters of the 4th audit cycle operators had completed at least three 3rd party SEMS audits. They have had sufficient time and opportunities to establish a SEMS

that conformed with the basic requirements of the standard and regulations, and most operators have progressed beyond basic compliance and documentation requirements. The path forward for these operators is to identify and correct implementation and maintenance deficiencies and to adapt and improve their SEMS to address the risks of their operations more effectively. Specifically:

- Operators should critically examine the components of their SEMS that have had persistent or recurring deficiencies or have produced unacceptable results over time (e.g., elements that have been found deficient across multiple SEMS audits and other internal and external management system evaluations), particularly for components with the most direct implications for safety and environmental consequences.
- Operators should focus their efforts to improve the effectiveness of their SEMS for risk management, utilizing their SEMS processes to target their efforts and resources on operations where the risks may not be effectively addressed, where the aging of structures may lead to new risks, or where unknown risks may be present.

Deepwater Operators – Management of Change and Mechanical Integrity

In 2022, deepwater (water depth > 200 m) production platforms accounted for over 90% of liquid hydrocarbons and over 75% of natural gas production of the OCS. Deepwater operators also account for most of the higher risk well operations, due to higher POB, greater distance to shore, more complicated well architectures and equipment, dynamic positioning, and geologic challenges like HPHT and shallow water flows. Although the other recommendations of this report apply to all operators, deepwater operators face special challenges due to the complexity and elevated risk of their operations.

As mentioned in earlier sections, Management of Change was noted as a SEMS element where many deepwater operators had significant deficiencies in SEMS audits. This is likely due to the increased frequency of changes and the greater complexity of operations and facilities of deepwater operators. Typical MOC programs for complex deepwater facilities are more sophisticated, requiring multiple levels of approval from onshore and offshore personnel and multiple close out actions. It is expected that Management of Change programs will continue to require active involvement from many levels within these operator's organizations to be effective.

Over the course of the four audit cycles, the deepwater production facilities have aged significantly. At the start of the first audit cycle in 2012, the median deepwater production platform was less than 12 years old, and only 11 platforms (17%) were 20 years or older. By the end of the fourth audit cycle, there were 34 platforms (47%) older than 20 years and the median age was nearly 20 years old. Among the floating deepwater platforms the trend was even more pronounced – there were only 2 floating platforms (4%) over 20 years old in 2012 and 18 platforms (33%) in 2023.

Newer platforms can usually remain in good condition for some time even if routine maintenance is deficient. The deteriorated and unsafe conditions of older platforms is often the result of the accumulation of years of deferred maintenance and neglect, particularly for surface coating systems and corrosion prevention. However, even for generally well-maintained facilities, maintenance gaps may begin to impact safety and operations over time. Therefore, effective Mechanical Integrity programs

that can adapt to changing facility conditions will be essential for the future success of deepwater operators' SEMS.

SEMS audit processes

The quality of the SEMS audit reports was generally very good in the 4th audit cycle compared to the prior cycles. However, opportunities exist to improve the SEMS audit process and impacts.

- SEMS audits have been focused on assessing conformance with a 19-year-old management system standard and a 13-year-old regulation. Accredited auditors often use checklists (e.g., COS 1-01) to verify conformance with the 17 SEMS elements defined by these documents. For the audits to help guide increased effectiveness of SEMS, BSEE and industry should consider the following actions:
    - Evaluate (through research and public comment) the applicability and desirability of using updated performance-based management system definitions, requirements, and audit practices, including the 4th edition of API RP 75 (issued in 2019), and adopt updated COS guidance documents that refocus audits on system performance rather than the prescriptive requirements for documents found in the SEMS regulation.
    - If API RP 75 4th edition is adopted for future audits, the checklists that have been used in the past, including COS 1-01, may no longer be applicable. COS 1-01 has not been updated since the publication of the 4th edition, which is unlikely to change. BSEE is investigating adopting these revised standards and guidance in an update to the SEMS regulation, which DOI has put into its Regulatory Agenda (Regulatory Identification Number 1014-AA60),to bring the SEMS audit process closer in practice to other international safety and environmental management system processes and to promote surveillance audits as part of the CAP close out process. Surveillance audits can be performed by the operator, ASP, or other independent assessors, and can assess whether the corrective actions were completed, if the corrections addressed the systemic gaps identified by the audit, and if the correction was effective throughout the operator's facilities.

Corrective action processes

Most CAPs examined during this audit cycle contained potentially impactful action steps; however, the overall corrective action planning and implementation process could be improved by modifying BSEE's published expectations for CAPs, either by rulemaking or changes to existing procedures.

- Recently, the Center for Offshore Safety (COS) revised a guidance document for corrective action plans (COS-1-07[11]). This document is intended to help operators develop and implement CAPs that combine corrections, better implementation, and system improvements addressing root causes for both SEMS deficiencies and performance deficits. In the 3rd audit cycle summary report, the 1st edition of this document was promoted to improve the quality of every CAP, and

[11] COS-1-07 Guidance for Developing a SEMS Corrective Action Plan, 2nd edition (May 2023) for API RP 75 3rd edition. A parallel guidance document was also published in August 2023 to accompany RP 75 4th edition.

broad adoption of the 2nd edition's guidance may also drive improvements. Although both documents contain useful guidance and good practices, considering the previously discussed issues with corrective action plans, promotion and adoption of the 2nd edition may not be sufficient.

- BSEE's corrective action plan review procedure should require that proposed corrective actions explain how the system-level deficiencies that contributed to the audit report's finding will be addressed. If applicable, the corrective action should also explain how it will be applied to all facilities and operations where the deficiency may be present, even if those facilities or operations were not included in the audit plan.
- Should surveillance audits become routine SEMS practice, they can begin by focusing on operator corrective actions undertaken in response to their SEMS audit.

BSEE's new approach to SEMS oversight, SEMS as risk management, and improving operator SEMS maturity and effectiveness

- Convene a broad group of SEMS personnel and subject matter experts to form a consensus on a path forward that will:
  - Address the principal conclusions of this report.
  - Influence operators to adopt more comprehensive approaches to operational risk management, which go beyond basic conformance and compliance and enable continuous improvement in safety and environmental protection outcomes, and which allow for different approaches for accomplishing the above depending on the circumstances (e.g., deepwater vs. shallow water operators).
  - Communicate to industry BSEE's new expectations for SEMS and vision for the improvement of operator SEMS effectiveness, primarily through a proposed update to the SEMS regulation, but also through creation and adoption within BSEE of Directive Supplements that BSEE staff assigned SEMS oversight responsibilities will follow.