Technology Assessment

By: Bureau of Safety and Environmental Enforcement

Technology development plays a critical role in every aspect of oil and gas, from improving safety to increasing ultimate recovery. In the United States, the federal government plays a unique role in promoting, overseeing, and approving new technology and procedures. With rapid changes in technology, both industry standards and governmental regulations lag technology development, but the Bureau of Safety and Environmental Enforcement (BSEE) is committed to embracing new technologies when they are safe and environmentally sustainable.

BSEE's regulations have a provision to allow the Bureau to approve the use of alternate procedures or equipment that provides a level of safety and environmental protection that equals or surpasses current BSEE requirements. An operator must demonstrate that the proposed technology or procedure is as safe or safer than the existing regulatory requirements.

There are multiple approaches to demonstrate that new technology is as safe or safer than currently accepted technology and procedures. The degree of analysis required depends on the complexity, the difference between the proposed and current technologies or procedures, and any potential consequence. Some new technologies may be simple barrier element replacements such as a new casing connection, while others may be complete system changes such as managed pressure drilling.

Research projects are one way BSEE gathers information to assess new technologies. BSEE actively researches and evaluates current and emerging technologies for operations ranging from the drilling of oil and gas exploration wells to the removal of platforms and related infrastructure in an ongoing effort to reduce risks across all offshore operations. BSEE's robust research program promote technology development, but also identifies potential risks, both known and previously unknown, quantifies risks, and proposes possible mitigations.

BSEE often begins by using risk assessments to determine the baseline risk exposure versus the risk exposure for a proposed technology. A risk assessment starts with a bowtie or success path analysis. Understanding both likelihood and consequence are essential for evaluating risk; i.e. likelihood of x consequence = risk. Technology applications may manage risk differently; some focus on the reduction of the likelihood of an event, others mitigate the consequence and more complex systems mange both aspects of risk reduction. Understanding which element of the risk equation is being affected aids in determining what approach is best.

BSEE uses numerous risk assessment methods to gauge the safety of new technology. Two recently used methods are the Failure Mode, Effect, and Criticality Analysis (FMECA) and the Probabilistic Risk Assessment (PRA).

When a proposed new equipment or procedure is complex and the potential consequence is severe (e.g., multiple fatalities or large hydrocarbon release), the PRA method is useful. Performing a relative risk PRA by comparing a currently known (approved) equipment/procedure to the one being proposed aids in determining whether the proposed equipment or procedure provides a level of safety and environmental protection that equals or surpasses current BSEE requirements (i.e., an alternate procedure or equipment). PRA provides a quantitative basis for discussion of the results as well as the assumptions (explicit and implicit) that went into an analysis. PRAs are time consuming for both the modeler and subject matter expert, and require data to drive the model. However, many of the best insights come via the communication between the team members throughout the process—what sounded plausible in a meeting does not always prove out during the early iterations of a model.

Through the entire technology development process, from concept to implementation, BSEE is focused on barrier integrity. The Bureau's ability to approve the use of alternate procedures or equipment allows industry to pursue, develop, and implement new technology and procedures while also ensuring barrier integrity is preserved and improved.