Peer Review Plan

Date: October 31, 2023

BSEE Funding Source or Author's Division:

Office of Offshore Regulatory Programs
Emerging Technologies Branch 45600
Woodland Road
Sterling, VA 20166

Title: Evaluation of Technology Assessment Program (TAP) Project 781 - THERMAL SHOCK TECHNOLOGY.

Subject and Purpose: The subject of this study is PEER REVIEW OF REPORT " THERMAL SHOCK TECHNOLOGY." This peer review aims to verify the scientific and technical merit of the assumptions, inputs, methodologies, and results. This study reviews and assesses the methods, assumptions, data quality, and any inferences made regarding simulating the Failure Effect Analysis (FEA) modeling, understanding the cement and mechanical barrier failure modes, proposing mitigation techniques, etc. and the overall strengths and limitations of the study.

Offshore oil and gas drilling and production operations are occasionally conducted in high pressure (≥15,000 psi) high temperature (≥350^{o}F) (HPHT) and highly corrosive (H2S, Cl, S and CO2) conditions. These harsh environments pose operational challenges for equipment currently used by the oil and gas industry. The purpose of TAP 781 (awarded in 2016) was to further research: "If a High Temperature well (greater than 350^{o}F) is shut in, the well may go into thermal shock when the temperature of the well drops to equilibrium."

The advent of geothermal wells, HPHT wells, and thermal stimulation of viscous hydrocarbons greatly increased awareness of thermal-induced hazards. Instances of casing buckling or wellheads growing out of the ground emphasized the potential of thermal effects. Additionally, conventional wells were drilled deeper, hydraulic fracturing treatments were larger in volume, and workover operations became more frequent. All these factors increased the effect of temperature changes in the well.

In an outer continental shelf (OCS) deep water well, equilibrium could be as low as 35^{o}F (i.e., the seawater temperature at the seabed). The temperature of the well fluids could be as high as 350^{o}F. Therefore, large temperature gradients and temperature changes can exist during the operation of a well. The magnitude of temperature changes during well operations as well as the rate of change of temperature, could be considered a thermal shock. This peer review will evaluate and assess the TAP 781 project report.

Impact of Dissemination: This study is considered by BSEE to be influential scientific information, which requires a robust evaluation that the scientific community and stakeholders will accept. This study's findings may directly impact the production methods, industry specifications, best practices, and selection for equipment utilized for high-pressure and high-temperature offshore oil and gas

operations. The results from this study are essential for reviewing new projects in deeper waters for offshore operations.

Upon conclusion of the peer review, BSEE will post all possible contracted deliverables, tasks, data, analyses, and information, including the peer-review reporting, reports, and comments on BSEE's research records website: https://www.bsee.gov/research-record.

Timing of Review: July 31, 2023 – June 30, 2024 (Total peer review process of not more than 12 months is desired for this project.)

Manner of Review, Selection of Reviewers, and Nomination Process:

This peer review shall be conducted through the contract BSEE BPA Process. This process will provide for a panel of qualified subject matter experts (SMEs) selected by the agency in order to achieve an optimum level of expertise across the spectrum of issues. The SMEs will be required to maintain both balance and independence while minimizing any potential conflicts of interest. The public will not be consulted in the nomination of potential peer reviewers.

Primary criteria for peer reviewers include the following:

- Mechanical Engineering, Material Science, Structural Engineering, Petroleum Engineering, Metallurgical Engineering etc.
- Practical experience and knowledge specific to the evaluated technology with materials properties (steel, cement), mechanical testing, FEA for evaluating fatigue design, fatigue due to stresses and fracture behavior of metallic and cement material, data analysis and assessment skills, sour service environmental, familiarity, etc.
- Practical experience with offshore equipment design in deep water high-pressure and high-temperature environments, etc.

The secondary tier of criteria should include the following:

- No more than two persons from the oil and gas industry
- At least one from outside of the oil and gas industry

Reviewers may be selected from academia, industry, and federal government. The group of reviewers shall not include multiple reviewers from the same affiliation and shall strive to include various perspectives on the issue considered.

Expected Number of Reviewers:

Three reviewers, plus contractor oversight, and writing personnel.

Requisite Expertise:

- Subject Matter Experts with five years of experience in a relevant field and should also have some other strong credentials, e.g., a Ph.D. with a substantial publication or patent record specific to the evaluated technology, a young investigator award, or a strong pedigree (e.g., a Ph.D. from a high caliber institution or under a recognized leader in the field).

- Publications and Patents. Qualified experts often have many peer-reviewed journals and/or patents on the evaluated technology.
- Other evidence is that the person is a recognized expert in the field. Qualified experts have often managed a public policy program that has had a national impact, has a record of bringing innovations to the market or holds vital patents.
- In a relevant field, an advanced degree - Ph.D., Sc.D., D.Eng., MS, or MBA. Experts with only a bachelor's degree should have other experience and or a record of significant accomplishments indicating their expertise.
- Relevant awards. Qualified experts may have received a prestigious award such as the National Medal of Science, American Chemical Society National Award, Young Investigator Award, R&D 100 Award, or other awards specific to technology (e.g., Fuel Cell Seminar Award).
- Key Society Membership. Qualified experts may be members of a society like the National Academy of Sciences (NAS), the National Academy of Engineering (NAE), the American Physics Society, a National Laboratory Fellow, etc.

Opportunity for Public Comment:

At the time of this peer review plan's posting, the research report will be available on BSEE's Peer Review Public Posting website located here: https://www.bsee.gov/what-we-do/research/peer-review. BSEE welcomes public comment, especially from those with experience with materials and high pressure high temperature topics. BSEE invites the public to comment within the 30-day window indicated on the website through the process described below, which is consistent with the guidance on the website:

- For comments pertaining to this peer review plan, send emails to: bsee_peerreviewplancomments@bsee.gov
- For comments pertaining to the research, send emails to: bsee_researchpubliccomment@bsee.gov

In the subject line list of a public comment email, please state: "TAP 781 – Thermal Shock Technology" + the words "peer review plan" or "research" + the words "public comment."

- List out any comments, questions, feedback by number (ex. 1, 2, 3, etc.)
- If referencing any sources of published information, please list the complete source information in a recognized reference format (such as APA)
- Please include your name, contact information, and affiliation

The agency will provide public comments deemed significant and relevant to the peer reviewers to address during their review.

Agency Contact: Bipin Patel