SAFESTACK TECHNOLOGY, LLC
William M. Caldwell, Principal
Caldwell@safestack.net
1211 Government Street
Ocean Springs, MS 39564

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Via U.S. First Class Mail, and electronic submission:
regs@bsee.gov; OIRA_submission@omb.eop.gov

Department of the Interior
Bureau of Safety and Environmental Enforcement
Attention: Regulation and Standards Branch
45600 Woodland Road
Sterling, VA 20166

Re: ***Blowout Preventer Systems and Well Control, RIN 1014–AA11***

I have reviewed the proposed rule concerning Oil and Gas Sulphur Operations in the Outer Continental Shelf--- Blowout Preventer Systems and Well Control, and applaud the proposed changes, but would recommend some additional revisions that will significantly increase the safety of BOP stack operations while reducing the likelihood of failure to timely contain uncontrolled well reservoir fluid. The proposed rule addresses recommendations of the investigative groups cited on page 4 of RIN1014-AA11. Although the recommendations stress systems, procedures and methods to reduce the likelihood of an uncontrolled or unforeseen event from occurring, more can be done to improve fluid control and containment subsequent to an unforeseen, uncontrolled event.

There are technological shortcomings of current components of the BOP stack. As stated by the National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling in its January 2011 report, *The Gulf Oil Disaster and the Future of Offshore Drilling*:

> As a result of the investigation, we conclude… The technology, laws and regulations, and practices for containing, responding to, and cleaning up spills lag behind the real risks associated with deepwater drilling into large, high-pressure reservoirs of oil and gas located far offshore and thousands of feet below the ocean's surface. Government must close the existing gap and industry must support rather than resist that effort.

(*Id*. at p. vii). The report acknowledges the government depends on private industry to contain and respond to a blown-out well. (*Id*. at p. 243). Neither the government nor private industry has invested sufficiently to improve containment or response technology. (*Id*.) We simply cannot allow any more environmental disasters to occur due to failed promises to improve spill prediction, prevention, and containment.[1]

Advances in spillage prevention and failure prediction alone will not sufficiently protect our federal and state waters. Error and unforeseen circumstances will continue to be factors that cannot be entirely mitigated through preventative and predictive methods and systems. We must also emphasize post-spill response, focusing on control and containment. Critical to environmental disaster prevention such as the Deepwater Horizon oil spill are measures to control and contain any future spills.

"The primary long-term goal of a spill containment company or consortia should be to ensure that an appropriate containment system is readily available to contain quickly spills in the Gulf of Mexico with the best available technology." (*Id*. at p. 245). The goal requires new systems and methods for containment to keep up with the times:

> As next-generation equipment is developed, industry must ensure that its containment technology is compatible with its wells. For instance, it may be useful to *consider design modifications to blowout preventer stacks* that would allow for more expeditious hook-ups of injection and evacuation networks and hoses, reducing the capital costs and increasing the flexibility of the spill containment companies or consortia. *Capping and containment options should also be developed in advance* to contain blowouts from platform wells.

(*Id*. at p. 245, emphasis added).

As progressive as the National Commission's report is concerning containment response, its recommendations are that Congress fund oil spill response research and development and incentivize private-sector research and development (*id*. at p. 270); develop source-control expertise (*id*. at pp. 272-73); require offshore operators to provided detailed source-control plans (*id*. at p. 273); and various environmental restoration and public measures not directly related to spill *containment*.

My comments concern aspects of the proposed rule that can be further improved by methods and systems for which my company, Safestack Technology, LLC, has recently been awarded patents. The new methods and systems will reduce potential

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[1] The National Commission's report also acknowledges the industry's forgotten promises to commit significant money to spill response technology research and

for leakage that exists in current oil well riser design packages, will allow for better spill containment, and will allow for safer and more efficient execution of drilling operations. My comments will follow a brief recitation of how existing unforeseen reservoir spills are commonly attempted to be controlled, followed by a description of Safestack's technology, and why its solutions, and those like it, would necessitate some revisions to the BSEE proposed changes.

1. Conventional Practice For Unforeseen Deepwater Reservoir Flow

A conventional setup used on subsea oil wells has a marine drilling riser ("MDR") connected from the mobile offshore drilling unit ("MODU") to a subsea blowout preventer stack ("BOP"), with the stack attached to the subsea wellhead at the water's floor. The MDR is connected to the BOP stack by a riser adapter, such as a flexible ("flex") joint that is attached to the uppermost annular BOP on the stack. Two flanged joints (one between the flex joint and the MDR and one between the flex joint and the uppermost annular BOP) are commonly used for the connection.

The BOP stack is formed of a lower marine riser package ("LMRP") and a lower stack. The MDR is connected to the LMRP and the LMRP is situated above the lower BOP stack. A hydraulically actuated connector usually adjoins the LMRP and the lower BOP stack. Most often, the LMRP includes, for example, one or two annular BOPs, while the lower stack has a one or a series of ram BOPs of different types (shear, blind, pipe, etc.).

Under emergency situations (such as was attempted in *Deepwater Horizon*) there may be an attempt to disconnect the LMRP from the *lower* BOP, expose the connector mandrel that is on the top of the uppermost BOP of the lower BOP stack, and attempt to contain the spewing oil by attaching a capping stack (or other containment device) to that connector mandrel.

This requires submerging and piloting a remotely operated vehicle ("ROV") to unbolt/disconnect the riser adapter above the flex joint, and then bolting a mandrel onto the flange of the flex joint.[2] Another method, when the flex joint must be removed, requires unbolting the flex joint from the uppermost annular BOP, and then bolting a mandrel to the flange of the uppermost annular BOP. If the mandrel is successfully installed under the uncontrolled flow conditions, another BOP, capping stack or other containment system is then connected to the mandrel.

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[2] Attaching a capping stack or containment device directly to the flex joint may be the only feasible option during uncontrolled oil spillage, but due to the 5,000 psi working pressure of the commonly used flex joint of today, there is significant risk of failure of this option. Safestack's flex joint, in any of its variations, is rated for 15,000 psi, thus risk of failure due to exceeding pressure limitations is vastly reduced.

There are situations when it is impossible to disconnect the LMRP from the lower BOP (as it could not during the *Deepwater Horizon* disaster). In such a circumstance, disconnecting the MDR from the LMRP may be the only feasible solution. To do this, the flex joint must be unbolted from the uppermost annular BOP. A mandrel would then be bolted onto the uppermost annular BOP, and another BOP, capping stack or containment system then installed atop the uppermost annular BOP. One of the significant obstacles that must be overcome when attempting to place a "hovering" dome over a spill is the buildup of methane hydrate (also called methane clathrate) inside the dome. This occurred during when BP attempted to recover the spewing oil from the Macondo well blowout. Basically, because of the system that was (and is still presently) used, ice formed in the dome and obstructed flow of oil into it.[3] The " hovered" dome must be removed from the spill site and attempt to be de-iced. Reservoir fluid flows unimpeded and uncontained while the iced dome problem is addressed. The operation is complex, hazardous, inefficient, costly and time-consuming.

In order to access to the LMRP and its controls, the MDR may have to be disconnected from the LMRP and brought up to the MODU. This operation is hazardous, costly, time-consuming and challenging because of the MDR's substantial size and weight, among other things. In deepwater, this operation could take several days and, therefore, significantly delay the installation of well control equipment. All the while, oil flows unmitigated into the Gulf.

2. Recommended Changes To The Proposed Rule

Under the proposed rule, there is thorough revision to requirements for a subsea BOP system, including limited BOP stack component improvements such as implementing technology that "ensures the drill pipe is centered in the shear ram" (RIN 1014–AA11 at p. 86), and that "two BOPs equipped with shear rams are used in stack." (*Id*. at p. 83). However in addition to technology that ensures cutoff of uncontrolled flow up from the wellhead, there should be discussion on technology to reduce the number of mechanically fastened joints in the BOP stack and make disassembly and reassembly of components of the BOP stack more versatile. Fewer mechanically fastened joints not only reduce leakage potential, but reduce time required to assemble (and in the case of an emergency, disconnect) and install components in the BOP stack. The entire subsea system would be safer to operate, easier to disassemble/reassemble and control, more effective and cost-efficient, whether during normal or emergency operations.

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[3] The conventional dome merely rests above the point of spillage and pulls all liquids into it, be it oil, seawater, methane, and any other fluids. This system is inefficient since it literally vacuums the sea, with the goal of pulling reservoir fluids along with it.

a. How Safestack Technology Affects Component Assembly

Unlike the present BOP stack configurations, the bolted connection between the flex joint and the upper annular BOP may be eliminated. Thus the MDR can be more easily and quickly disconnected from the LMRP, without an ROV, providing access to the uppermost connection point of the LMRP and facilitating the installation of well control/containment apparatus such as a capping stack, containment dome, or similar equipment.

Safestack's system is straightforward. First, the traditional flanged flex joint which connects the MDR to the BOP stack is replaced with a flex joint built with either (1) an integral release connector or (2) an integral mandrel, depending on the particular needs of a drilling setup. The release connector and mandrel are complimentary, *i.e.*, for every release connector there is a corresponding mandrel. So, rather than having two flanged joints on the flex joint (one connected to the MDR and one connected to whatever is below the flex joint), there will only be one, which connects the MDR to the flex joint. The release connector and mandrel can also be configured to either be facing up or down.[4] In the setup where the release connector is integrated into the flex joint, a mandrel will be integrated into the component directly below it, traditionally the upper annular BOP. Likewise, when the mandrel is integrated into the flex joint, the release connector will be inverted (*i.e.*, facing up), on the device below the mandrel.

Additionally, a seal plate can be added to either component anywhere along the BOP stack, so that a dome or other containment device can be installed directly onto the targeted component. This is extremely significant and quite revolutionary from a containment perspective, for several reasons. First, since Safestack's dome seals around the component, ambient seawater will not intrude into the extraction process, thus there is little likelihood that methane hydrate ice will form and obstruct the process. Unlike conventional domes which guarantee an icing/obstruction problem, Safestacks's sealed dome will pull reservoir fluid unrestricted. Second, because the dome does not have to be removed from the leak site to melt obstructing ice, there is no breach in containment of the reservoir fluid. Third, because the dome seals, the reservoir fluids at any given leak will be fully contained and extracted. Conventional "hovering" domes fail to collect all of the reservoir fluid, thus a large percentage of the fluid continues to contaminate the surrounding subsea environment even when the dome is in place. Fourth, Safestack's sealed dome eliminates the need to spray dispersant around the spill site once the dome is in place. Because the conventional dome cannot capture all of the spewing reservoir fluid, dispersant is liberally employed, at great cost to the environment. Since the reservoir fluid is contained, the need for dispersant is greatly reduced.

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[4] When the release connector is facing up, it is referred to as being in an "inverted" position.

An additional consideration the BSEE should make is how to address the bent BOP stack scenario. Given the depth at which wells are drilled, it is not uncommon for a BOP stack to not be completely vertical. When an unforeseen event occurs, the degree to which the BOP stack is bent from its vertical position can increase. This situation, with conventional technology, may make it impossible to install a capping stack. The reason for this is that a bent BOP stack is greatly stressed at the point of the bend; when a capping stack is placed (assuming that a connection point can be made with the use of conventional components), the weight of the capping stack will greatly increase the stress on the bend, causing potentially catastrophic results (i.e., toppling of the entire assembly). Safestack's system allows for containment even in the bent stack scenario.

Safestack's combination of multiple mandrel/release connector joints with seal plates available along the BOP stack allows installation of its lightweight, fully sealed dome to be installed without adding critical weight to the bent stack. Further, given components of the bent stack can be removed hydraulically above the bend, and the lightweight dome attached, Safestack's system can actually reduce the weight and stress on the bent area.

Assembly and disassembly of the LMRP components at the release connector-mandrel joint can occur remotely and hydraulically without the need for an ROV. Thus new BOP stack components, or capping/containment devices can be installed relatively quickly, timely, and with more certainty, anywhere along the BOP stack where the release connector-mandrel joint exists.

Finally, in regard to the ROV, conventional systems do not have an ROV residing continuously on the BOP stack. Safestack's system does. This is significant because a resident, working-class ROV allows the operator to view the BOP stack continuously and eliminates the time required to submerge a conventional ROV. Safestack's resident, working-class ROV allows immediate viewing, assessing, and addressing of any problem that may arise.

Having described the conventional technology and Safestack's solutions to conventional shortcomings, Safestack proposed changes to the BSEE rule as follows.

b. Recommended changes concerning BOP component assembly

There are several sections in the proposed rule which may be revised to include consideration for new technology such as Safestack's. They are as follows:

> ***Regulator Flexibility Act, 3. Description and Estimate of Compliance Requirements (o) New subsea BOP system requirements*** **(pp. 157-58)**

There is discussion concerning costs of future use of two shear rams, but nothing concerning costs of other components of the BOP stack where components may be disconnected and to which containment and capture equipment may be attached.

What should be included

Costs concerning revision and/or retrofitting current equipment to include components such as seal plates that may be integrated into such equipment in the BOP stack should be included.

Why it should be included.

Shearing technology alone does not guarantee containment of effluent. Flanged connections at any point in the BOP stack require ROV use to unbolt and reassemble. Providing for technology which potentially reduces the use of ROVs and flanged joints will remove one more mechanical (and/or electromechanical) device from the system, thus will reduce the probability of failure in the sense that fewer moving parts equates to lessening the likelihood that one of those parts will malfunction and/or break. Further, requiring seal plates at each component in the BOP stack allows for containment at multiple places. Should any particular joint be unable to be disassembled, there will be other locations and options for containment available. Thus, again, there is a reduced probability for containment failure, as well as increased options for a successful first containment attempt, depending on a particular failure scenario. Although it may be unnecessary from a regulatory perspective to assess costs (or savings) in terms of probabilities, retrofit costs and/or costs for equipment integrated with seal plates and/or new connection systems should be included.

§ 250.731 What information must I submit for BOP system and system components?* (pp. 233-235*)

Regarding the table on pp. 234-235, part (a), there is a list of what must be included to completely describe the BOP system and system components, but nothing that addresses how the devices along the BOP stack are connected. Nor is there any mention of capping or containment points along the BOP stack.

What should be included

The BOP system description should address technology that enables better containment, but falls between the traditional BOP devices, and/or which become integrated with those devices. Locations along those devices at which containment and capture equipment may be attached should also be included in the system description.

Why it should be included

In order to complete the BOP system description, and address present shortcomings in the BOP stack assembly.

§ 250.734 What are the requirements for a subsea BOP system?
(pp. 241-245)

The table on pp. 243-45 lists several requirements, but does not address connections between devices in the BOP stack, or methodology for disconnection and/or reassembly or capping or containment points on those devices.

What should be included

A separate section describing equipment and/or devices used to connect each component in the BOP stack. An additional separate section describing capping containment points and methods at all such locations on the BOP stack.

Why it should be included

Since safety and environmental protection are at the heart of the revisions to the proposed rule, no matter how failsafe the equipment and procedures may seem, there is always the possibility of failure. Points of connection between the devices, as well as capping and containment points, must be addressed in order to make the procedures used in the event of failure less uncertain.

§ 250.462 What are the source control and containment requirements? **(pp. 207-09)**

Under paragraph (2)(b), there is discussion on what must be done and included for Source Control and Containment Equipment (SCCE). Among the equipment listed, there is no line item for equipment used for device connections or that otherwise transition from one component to another. Further, although there is a line item (1) for containment and capture equipment, there is no line item for devices to which such equipment connects.

What should be included.

A line item for subsea connection systems.

Why it should be included.

In order for the industry to progressively address safer, more efficient, more timely, more certain methods and systems to contain and capture reservoir fluid, BOP connections and containment points must be considered as potential SCCE.

§ 250.738 What must I do in certain situations involving BOP equipment or systems? **(pp. 252-254)**

The table lists various situations, none of which include unforeseen failure or loss of control of the reservoir fluid.

What should be included

Unforeseen failure situations and procedures to address the same.

Why it should be included

Although failure of any device in the BOP stack may be unforeseen, the systems and procedures to address unforeseen events can be predetermined. It is critical to successful management of a crisis to have systems and procedures in place to address them. It is also critical that the BSEE, as an environmental sentinel for our waters, encourage progressive, sound technology through its rule changes.

Thank you for considering our recommended changes to the proposed rule. Please contact me for any further clarification.

Safestack Technology, LLC

/s/

William M. Caldwell, Principal