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Addressing the Regulatory Collapse Behind the *Deepwater Horizon* Oil Spill: Implementing a "Best Available Technology" Regulatory Regime for Deepwater Oil Exploration Safety and Cleanup Technology

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Celebration was in the air. British Petroleum (BP) executives gathered in the gallery of the *Deepwater Horizon* oil rig to celebrate their safety record and the completion of drilling work on the rig.[1] As one could imagine, the sounds of champagne corks popping, laughter, and friendly banter filled the gallery. The sounds of celebration and hubris, however, were soon silenced as the *Deepwater Horizon* oil rig began to shake and disaster struck the Gulf Coast.

On April 20, 2010, the *Deepwater Horizon* oil spill occurred forty miles off the Louisiana coast.[2] The spill left eleven dead and caused unprecedented economic and ecological damage across the Gulf Coast.[3] The damage, however, was not entirely caused by the negligence of rig employees or the failure of rig safety equipment. The blame for the *Deepwater Horizon* spill ultimately rests on the federal government's failure to maintain proper regulatory oversight over deepwater oil exploration.

The *Deepwater Horizon* spill exposed a variety of regulatory failures by the federal government. After the spill, critics attacked regulators for an inadequate environmental review process under the National Environmental Policy Act (NEPA). Policymakers also attacked the Minerals Management Service's (MMS) numerous conflicts of interest with the oil industry.[4] This Comment, however, focuses on the federal government's failure to implement a regulatory regime mandating adequate safety and cleanup technology in deepwater oil exploration. Ultimately, this Comment seeks to remedy

1 Cain Burdeau et al., *Bubble of Methane Triggered Gulf Oil Rig Blast*, THE HUFFINGTON POST (May 9, 2010, 9:25 PM), http://www.huffingtonpost.com/2010/05/08/bubble-of-methane-trigger_n_568842.html (noting that BP executives were celebrating the company's safety record on the *Deepwater Horizon* the day of the rig's blowout).

2 NAT'L COMM'N ON THE BP DEEPWATER HORIZON OIL SPILL AND OFFSHORE DRILLING, DEEP WATER: THE GULF OIL DISASTER AND THE FUTURE OF OFFSHORE DRILLING 1 (2011) [hereinafter, DEEP WATER: THE GULF OIL DISASTER].

3 *Id.*

4 The Minerals Management Service was the regulatory agency within the U.S. Department of the Interior that oversaw offshore oil exploration and production at the time of the *Deepwater Horizon* oil spill. *See* CENTER FOR PROGRESSIVE REFORM, REGULATORY BLOWOUT: HOW REGULATORY FAILURES MADE THE BP DISASTER POSSIBLE, AND HOW THE SYSTEM CAN BE FIXED TO AVOID A RECURRENCE 21–27 (2010) [hereinafter, REGULATORY BLOWOUT].

this failure by proposing a regulatory regime that implements a Best Available Technology (BAT) standard for deepwater oil exploration safety and cleanup technology.[5]

Part I examines the deficiencies in safety technology that led to the *Deepwater Horizon* spill and the inadequate spill response that exacerbated the spill's harm to the Gulf Coast.[6] It also presents the Outer Continental Shelf Lands Act (OCSLA), the principal statute governing offshore oil exploration, and its regulatory failures.[7] Part I also discusses the BAT standard found in the Clean Water Act (CWA), and the BAT standard that ultimately serves as a guide for regulatory safety and cleanup technology schemes for deepwater oil exploration.[8] Part I concludes by presenting the European Union's (EU) call for increased regulatory oversight in offshore oil exploration.[9]

Part II applies the CWA's BAT standard to establish safety and cleanup technology standards for deepwater oil exploration through OCSLA.[10] Part II also addresses the need for a statutory prohibition on economic variances for the proposed BAT standard under OCSLA.[11] Finally, Part II suggests that the United States and the international community implement information disclosure mechanisms to ensure safe deepwater exploration worldwide.[12] In conclusion, this Comment urges Congress to amend OCSLA and charge the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) with the task of promulgating a BAT

5 This Comment advocates for the adoption of the CWA's BAT Standard. The CWA's BAT Standard requires the implementation of the "best available technology economically achievable. . . ." *See* Clean Water Act (CWA), 33 U.S.C. § 1311 (b)(2)(A)(i) (2011).

6 *See* discussion *infra* Part I. A–B (discussing the mistakes that led to the *Deepwater Horizon* Oil Spill).

7 *See* discussion *infra* Part I.C (discussing the Outer Continental Shelf Lands Act and its accompanying regulatory regime).

8 *See* discussion *infra* Part I.D.1 (discussing the "Best Available Technology Economically Achievable" standard under the CWA).

9 *See* discussion *infra* Part I.E (discussing the European Union's recent recommendations for greater regulatory oversight in offshore oil exploration).

10 *See* discussion *infra* Part II.A–D (applying the CWA's BAT standard and its promulgation procedure to deepwater oil exploration safety and cleanup technology).

11 *See* discussion *infra* Part II.E (discussing the need for a statutory prohibition on economic variances under any promulgated BAT standard for deepwater oil exploration safety and cleanup technology).

12 *See* discussion *infra* Part II.F.

standard for safety and cleanup technology for deepwater oil exploration.[13]

I
THE REGULATORY COLLAPSE

A. "The Well From Hell"[14]

The *Deepwater Horizon* oil spill occurred because of the lack of oversight by regulators and the oil industry at challenging deepwater oil exploration sites. Before the blowout, the *Deepwater Horizon* rig floated 4,992 feet above the Gulf Coast seafloor.[15] Initial plans called for the *Deepwater Horizon* rig to drill over 20,000 feet to reach oil deposits in the Macondo oil prospect reservoir.[16] In addition, at the time of the blowout, BP was six weeks behind schedule and fifty-eight million dollars over budget.[17] The Macondo well presented unexpected challenges that, when combined with the rig's time and financial difficulties, led to safety shortcuts that ultimately caused the *Deepwater Horizon* rig's deadly blowout.

The spill began when pressurized methane gas caused a gas kick within the *Deepwater Horizon* rig's wellbore.[18] The gas kick caused a marine riser to ascend and collide with the rig's base.[19] Rig employees likened the marine riser's collision with the platform to "a 550-ton freight train hitting the rig floor."[20] The explosion caused by the riser's collision resulted in a blowout on the well.[21] The blowout, however, worsened when the platform's blowout preventer (BOP), the device that seals a well in cases of emergency, malfunctioned.[22] The blowout preventer's failure to seal the well resulted in the catastrophic loss of valuable crude oil, ecological habitats, and human

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13 *See* discussion *infra* Part III.

14 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 2 (noting the nickname given to the Macondo exploration well by *Deepwater Horizon* rig employees).

15 *Id.* at 3.

16 *Id.* at 89.

17 *Id.* at 2.

18 *Id*. at 89–114 (explaining how immense pressure caused a gas kick that led to the well's eventual blowout).

19 *Id.*

20 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 114 (citing *Testimony of Bill Ambrose, Hearing before the Deepwater Horizon Joint Investigation Team*, May 28, 2010, 244).

21 *Id.*

22 *Id.* at 114–15.

life throughout the Gulf Coast.[23] The resulting explosion killed eleven rig employees and critically injured four others.[24] Over eighty-seven days, the damaged well leaked over 4.9 million barrels of crude oil into the Gulf Coast.[25] The massive amount of oil deposited into the Gulf decimated the shrimp and oyster habitats that Gulf fishermen depended on for their livelihood.[26] The spill also disturbed the fragile ecological balance of the Gulf Coast wetlands.[27]

The *Deepwater Horizon* disaster, however, was not a mere accident, but the culmination of multiple human and regulatory errors.[28] The primary error was BP's failure to construct sufficient barriers to control sudden gas flows or "kicks" that often occur in deepwater oil drilling.[29] Kicks occur when pressurized gas enters a wellbore and attempts to rapidly ascend to the surface.[30] Gas kicks that flow uncontrollably to the surface because the barriers within a wellbore fail can result in a blowout.[31] The typical industry practice to control kicks is the construction of multiple barriers throughout an exploration well.[32]

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23 *See* Bruce Barcott, *Forlorn in the Bayou*, NAT'L GEO., Oct. 2010, at 61 *available at* http://ngm.nationalgeographic.com/2010/10/gulf-oil-spill/barcott-text (discussing the plight of Louisiana's oyster beds and wetland in the wake of the *Deepwater Horizon* oil spill). "One-third of the United States oyster and shrimp crop comes out of the waters along the Louisiana Coast." Roughly ninety-eight percent of the fish, shrimp, crab, and oyster habitats depend on the four million acres of wetlands in the Barataria-Terrebone estuary southwest of New Orleans. *Id.*

24 Leslie Kaufman, *Search Ends for Missing Oil Rig Workers*, N.Y. TIMES, Apr. 23, 2010, *available at* http://www.nytimes.com/2010/04/24/us/24spill.html?_r=1&hpw.

25 Joel Achenbach & David A. Fahrenthold, *Oilspill Dumped 4.9 Million Barrels Into Gulf of Mexico, Latest Measure Shows*, WASH. POST. Aug. 3, 2010 *available at* http://www.washingtonpost.com/wp-dyn/content/article/2010/08/02/AR2010080204695.html.

26 *See* Barcott, *supra* note 23.

27 *Id.*

28 *See* David Hammer, *5 Key Human Errors, Colossal Mechanical Failure Led to Fatal Gulf Oil Rig Blowout*, TIMES-PICAYUNE (New Orleans) (Sept. 5, 2010), *available at* http://www.nola.com/news/gulf-oil-spill/index.ssf/2010/09/5_key_human_errors_colossal_me.html.

29 *Id. See also Massive Oil Spill in the Gulf of Mexico: Hearing Before the S. Comm. on Energy and Natural Res.*, 111th Cong. 7-8 (2010) (testimony of Prof. F.E. Beck, Professor of Petroleum Engineering, Texas A&M University) [hereinafter *Massive Oil Spill in the Gulf of Mexico*].

30 *See Massive Oil Spill in the Gulf of Mexico*, *supra* note 29, at 7.

31 *Id.*

32 *Id.*

Initially, the *Deepwater Horizon* rig's crew planned to drill to depths over 20,000 feet.[33] The typical industry practice for such a well normally consists of a large tube lined with a shorter tie-back tube roughly 1,500 feet from the bottom of the well.[34] The tie-back tube serves as a secondary barrier to gas kicks that can cause blowouts similar to the one that caused the *Deepwater Horizon* rig's blowout.[35] BP, however, constructed a single tube running the full span of the wellbore.[36] While computer simulations and engineering experts raised concerns that the well's design allowed a significant amount of gas to escape to the top of the well, BP responded that "not running the tie-back saves a good deal of time/money."[37]

BP's utilization of the single tube design was not the sole error that led to the well's eventual blowout. The single tube model, while not the typical industry practice, could operate safely provided that a cement seal was applied to prevent gas from escaping and rising to the surface.[38] However, the cement seal solution is only effective if the wellbore is perfectly centered.[39] If not centered, the cement will be unevenly distributed throughout the well and leave parts of the well vulnerable to gas kicks.[40] To maintain the centralization of the well, devices known as centralizers are used throughout the wellbore.[41] Engineers advised BP that twenty-one centralizers were needed to ensure an adequate cement seal.[42] BP, however, installed only six centralizers in the wellbore.[43] Although further testing showed that the use of only six centralizers created a "severe risk of gas flow," BP ignored the warning and did not install additional centralizers.[44]

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33 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 89.

34 Hammer, *supra* note 28.

35 *Id.*

36 *Id.*

37 *Id.*

38 *Id.*

39 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 95–97.

40 *Id.* at 96.

41 *Id.*

42 Dan Farber, *BP CEO Hayward's Flimsy Ignorance Defense*, CBS NEWS (June 18, 2010), http://www.cbsnews.com/8301-503544_162-20008141-503544.html.

43 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 96 (After completion of the cement job, engineers conducted a successful test of the cement seal. Based on this single test, BP decided to forgo any additional tests of the seal's durability.).

44 Hammer, *supra* note 28.

Finally, BP concluded that a full evaluation of the cement seal was not needed based on the success of the cement job.[45]

In addition to the cement seal and tie-back methods, drilling fluid, often called drilling mud, is also used as a barrier to gas kicks.[46] Initially, the *Deepwater Horizon* rig utilized drilling mud to control any kicks that may occur.[47] Then, after misinterpreting test results regarding pressure building up inside the wellbore, BP abandoned drilling mud and used seawater as a barrier within the wellbore instead.[48] Seawater, however, provides less protection from gas kicks primarily because seawater is forty percent lighter than drilling mud.[49] BP's well site leader, Robert Kaluza, was confused by BP management's decision to use seawater and stated that "[m]aybe they were trying to save time. At the end of [a] well sometimes they think about speeding up."[50] Ultimately, the misinterpreted pressure test results along with the replacement of drilling mud with seawater prevented the *Deepwater Horizon* crew from noticing signs of gas kicks fifty minutes prior to the blowout.[51]

The most costly error, however, was BP's failure to maintain and inspect the well's blowout preventer.[52] The blowout preventer is the last line of defense for a well experiencing a possible blowout.[53] Blowout preventers allow platform employees to keep a gas kick from transforming into a blowout.[54] When the blowout preventer is activated, shears located near the wellbore cut and seal the wellbore.[55] However, the *Deepwater Horizon* rig's blowout preventer shears

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45 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 102–03.

46 *Massive Oil Spill in the Gulf of Mexico*, *supra* note 29, at 9.

47 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 103–04 (noting that *Deepwater Horizon* engineers first used drilling mud to control kicks before displacing drilling mud with seawater).

48 *See Massive Oil Spill in the Gulf of Mexico*, *supra* note 29, at 35 (noting that prior testing indicated that displacing drilling mud with seawater raised concerns about the wellbore's stability).

49 Hammer, *supra* note 28.

50 *Id.*

51 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 105–14.

52 *Id.* at 114–15.

53 *See Massive Oil Spill in the Gulf of Mexico*, *supra* note 29, at 23 (noting the importance of blowout preventer as a last resort mechanism for offshore rigs experiencing a potential blowout).

54 *Id.* at 89.

55 *Id.*

failed to cut or seal the well, allowing the gas kick to result in a blowout.[56]

The eventual failure of the blowout preventer was not a complete surprise. Prior to its failure, *Deepwater Horizon* employees reported that they were aware the blowout preventer contained leaks. In addition, error messages from the preventer were sent up to the blowout preventer's control station.[57] BP officials, however, ignored these warnings against the advice of rig officials and federal regulations.[58] Federal regulations mandate that platforms must suspend further drilling operations if a blowout preventer control station does not function properly.[59] BP, however, ignored this regulation despite multiple warnings regarding the viability of the blowout preventer. In addition, the *Deepwater Horizon* rig's blowout preventer had not been inspected and certified as stable by an independent third party since 2005.[60]

Ultimately, the shortcuts taken by BP management and engineers proved deadly for rig employees and the Gulf Coast. However, one shortcut alone did not cause the *Deepwater Horizon* spill. Rather, BP's failure to construct a tie-back tube or install extra centralizers, the replacement of drilling mud with seawater, and the failure to maintain the blowout preventer all combined to cause the worst disaster in the history of offshore oil exploration.

B. Unprepared for Response

The *Deepwater Horizon* spill shows that not only is the oil industry incapable of preventing major spills, but it is also incapable of responding to spills once they have occurred.[61] In the days following the spill, BP and MMS regulators remained positive about their ability to contain and stop the flow of oil into the Gulf.[62] Early

56 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 114.

57 *Id. See also* Hammer, *supra* note 28.

58 Hammer, *supra* note 28.

59 *See* 30 C.F.R. § 250.516 (2010).

60 Dina Cappiello, *Deepwater Horizon: Federal Engineers Mistakenly Thought Failed Equipment Received Independent Inspection, Is Now Mandating It*, HUFFINGTON POST (Aug. 30, 2010, 2:19 PM), http://www.huffingtonpost.com/2010/08/30/deepwater-horizon-federal_n_699506.html.

61 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 129–71 (explaining the difficulties faced by industry and regulators in responding to the *Deepwater Horizon* spill).

62 *Id.* at 132 (noting BP's belief that oil spill response contractors could adequately contain the oil spill's potential effects).

estimates predicted that only 1,000 barrels of oil would leak each day from the well,[63] but it was later determined that oil was leaking at a rate of 60,000 barrels per day.[64] BP further claimed that its contracts with oil removal companies could reclaim up to 500,000 barrels per day.[65] Unfortunately, oil spill response technology had not improved in the twenty years since the Exxon Valdez disaster, and spill response vessels were quickly overwhelmed.[66]

While spill response teams were outmatched at the Gulf's surface, they were completely unprepared for the challenges that lay thousands of feet below the rig. Although the federal government recognized the need for subsea oil containment technology after the Santa Barbara Channel spill in 1969, oil containment technology for deepwater wells, like the Macondo well, did not exist.[67] After realizing that the *Deepwater Horizon* rig's blowout preventer could not be revived, BP and regulators were forced to generate deepwater containment technology in order to cap the well.[68]

The lack of any existing deepwater containment technology prevented BP and regulators from capping the leaking well for eighty-seven days.[69] Initially, BP attempted to use a containment dome that would funnel leaking oil to containment ships at the surface.[70] However, partly due to the incorrect estimates regarding the amount of oil leaking from the damaged well, the containment dome proved unsuccessful.[71] After the failure of the containment dome, BP utilized

63 *Id.*

64 *Id.* at 146.

65 *Id.* at 132.

66 *Id.*

67 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 135. The Santa Barbara Channel oil spill occurred off the California coast in 1969 after a blowout on an offshore oil rig. The spill leaked over three million barrels of oil over a thirty-five-mile area between Isla Vista and Ventura, California. *See* Colby Frazier, *Locals Remember Oil Spill Like It was Yesterday*, DAILY SOUND, Jan. 28, 2009, *available at* http://www.thedailysound.com/012809Oil.

68 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 135.

69 *Id.* at 165.

70 *Id.* at 145–46.

71 The containment dome ultimately failed due to the large amount of hydrates present near the leak. It is believed that the incorrect estimates regarding the amount of oil leaking from the well prevented response teams from designing the containment dome to withstand the massive hydrate amounts causing the containment dome to rise towards the surface. *Id.* at 46.

the "top kill" and "junk shot" methods to seal the well.[72] These methods called for the pumping of excess drilling mud into the wellbore to force oil back into the oil reservoir and then the pumping of rubber materials to clog the well to prevent oil from leaking into the ocean.[73] Like the containment dome, the top kill ultimately failed; after three attempts, the method was discontinued.[74] BP then attempted to control the well's leakage via a "static kill."[75] The static kill method is similar to the top kill method because it utilizes drilling mud to force oil back into the oil reservoir.[76] The static kill, however, requires lower pumping rates of drilling mud than the top kill because oil and gas in the well are static.[77] After completing the first relief well, BP executed the static kill, and on August 4, 2010, regulators announced the static kill's success.[78]

BP also utilized dispersants to prevent oil from spreading to the Gulf's beaches and wetlands.[79] Dispersants help contain the spread of oil reaching the surface by breaking down oil's composition, allowing it to dissolve into the water column.[80] Although dispersants were alleviating the harms of the spill at the ocean's surface, deepwater dispersants were needed to break down oil at the wellbore's leak site.[81] Response teams, however, could not utilize deepwater dispersants to break down oil prior to its ascent to the surface.[82] Deepwater dispersant technology, like deepwater containment technology, was untested by federal agencies and industry.[83] Thus, response teams anxiously waited while the EPA established directives

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72 *Id.* at 148–50.

73 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 149.

74 *Id.* at 150.

75 *Id.* at 166–67.

76 *Id.* at 166.

77 *Id.*

78 *Id.* at 167.

79 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 143–45 (explaining the initial use of oil dispersants after the *Deepwater Horizon* spill).

80 *Id.* at 143.

81 Concerns existed over the toxicity of dispersant use at the Gulf's surface. Although the Occupational Safety and Health Administration (OSHA) stated dispersants were safe, spill response workers reported headaches and nausea after coming into contact with dispersants. Response teams believed that using deepwater dispersants would alleviate potential health risks to workers in addition to breaking down oil at the oil leak source. *Id.* at 144.

82 *Id.* at 144.

83 *Id.* at 144–45, 135.

and guidelines on deepwater dispersant use.[84] Almost three weeks after the spill, EPA Administrator Lisa Jackson approved deepwater dispersant use in what she would later describe as "the hardest decision she ever made."[85] Deepwater dispersants were successful and never exceeded the EPA's toxicity guidelines, and their use continued until BP successfully capped the well weeks later.[86] It is still unknown, however, if earlier use of the dispersants would have alleviated the oil leak's effects on the Gulf.

While BP and regulators did not implement the proper prevention mechanisms prior to the *Deepwater Horizon* spill, their response mechanisms were also inadequate. Thus, the *Deepwater Horizon* disaster provides the public with a glimpse of the devastation that can occur when federal regulators and industry do not prepare for disaster. Most importantly, the *Deepwater Horizon* disaster calls for a reform of the entire regulatory and industry mindset with respect to deepwater oil exploration safety and cleanup technology standards.

C. Regulatory Failure Under the Outer Continental Shelf Lands Act

The Outer Continental Shelf Lands Act is the primary statute regulating oil and gas exploration in the Outer Continental Shelf (OCS). The purpose of OCSLA states that

> operations in the Outer Continental Shelf should be conducted in a safe manner by well-trained personnel using technology, precautions, and techniques sufficient to prevent or minimize the likelihood of blowouts, loss of well control, fires, spillages, physical obstruction to other users of the water or subsoil and seabed, or other occurrences which may cause damage to the environment or to property, or endanger life or health.[87]

OCSLA safety compliance is now administered by the Bureau of Ocean Energy Management, Regulation and Enforcement after the breakup of the MMS.[88] Under OCSLA, oil and gas explorations are regulated in four ways: (1) the development of leasing plans,[89] (2) the

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84 *Id.* at 145.

85 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 145.

86 *Id.*

87 Outer Continental Shelf Lands Act, 43 U.S.C. § 1332(6) (2010).

88 REGULATORY BLOWOUT, *supra* note 4, at 12.

89 *See* Outer Continental Shelf Lands Act, § 1334.

issuance of oil or gas leases,[90] (3) the approval of a lessee's exploration plan,[91] and (4) the approval of a lessee's development and production plan.[92]

In the aftermath of the *Deepwater Horizon* spill, critics cited several concerns over the statutory provisions within OCSLA as well as its administration by the MMS. First, critics noted that OCSLA lacks clear mandates for safety and cleanup technology standards in deepwater exploration.[93] Second, safety regulations under OCSLA did not respond to increased and more hazardous deepwater oil exploration activity in the Gulf Coast.[94] Finally, many argued that the MMS failed to adequately enforce regulations because of insufficient resources and conflicts of interest with the oil industry.[95]

Under OCSLA, Congress charged the MMS with ensuring that offshore oil exploration was conducted in a safe manner "by well-trained personnel using technology, precautions, and techniques sufficient to prevent or minimize" the risk of accidents in offshore oil exploration.[96] Because of the extensive language regarding safety under OCSLA, the MMS was given broad discretion to promulgate regulations for deepwater oil exploration safety and cleanup technology. While the MMS did promulgate detailed regulations for safety technology on offshore platforms, their regulations lagged behind the rapid advances made in offshore drilling safety technology.[97] Furthermore, the MMS largely relied on the oil industry to provide information regarding standard industry technology practices and characterized their relationship with the oil industry as "a partner [rather] than a policeman."[98] Deepwater oil exploration, however, required more technology to accommodate greater drilling pressures and increasing distances from shore-based safety and environmental resources. Unfortunately, MMS regulations did not

90 *See id.* §§ 1337, 1345.

91 *See id.* § 1340.

92 *See id.* § 1351.

93 REGULATORY BLOWOUT, *supra* note 4, at 13.

94 *See generally* DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 68–85.

95 *See id.* (discussing how the MMS's failed to adequately enforce its regulations because of insufficient enforcement resources).

96 Outer Continental Shelf Lands Act, § 1332(6).

97 *See* DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 68–85 (discussing the MMS's failure to adopt sufficient regulatory reforms to counter increased and more difficult oil exploration in the Gulf Coast).

98 *Id.* at 71–72.

mandate that the oil industry adopt these advances in technology.[99] Without any type of standard mandating advanced technology, the oil industry possessed no incentive to pursue safer drilling technology.[100]

Congress and the MMS also failed to promulgate stringent standards for oil spill cleanup technology. OCSLA and MMS regulations both lack a clear and enforceable cleanup technology standard.[101] While the Oil Pollution Act (OPA) requires lessees to have spill response plans that clean oil spills "to the maximum extent practicable,"[102] MMS regulations weakened this requirement by defining "maximum extent practicable" as "within the limitations of available technology."[103] Furthermore, the MMS only required that lessees prepare response plans for oil spills that continue for up to thirty days.[104] In the aftermath of the *Deepwater Horizon* spill, regulators noted that spill response plans did not require the oil industry to address deepwater containment at an oil leak's source.[105] The lack of a clear and enforceable cleanup technology standard—along with other inadequate regulations—shows the federal government's laissez-faire attitude towards spill cleanup, which ultimately led to the inadequacies in BP's spill response plan and cleanup efforts.

Besides lacking strong regulatory standards for safety and cleanup technology, the MMS also lacked adequate enforcement resources.[106] Although blowout preventers are the last line of defense for offshore oil disasters, the MMS cut inspection requirements because of inadequate staffing and mounting pressure from the oil industry.[107] As oil industry activity increased in the Gulf Coast, MMS regulators

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99 *Id.* at 73.

100 *See generally* REGULATORY BLOWOUT, *supra* note 4, at 13.

101 *Id.* at 14.

102 Federal Water Pollution Control Act, 33 U.S.C. § 1321(j)(5)(A)(i) (2010).

103 30 C.F.R. § 254.6 (2010).

104 *Id.* at § 254.47. The requirement that spill response plans only address spills lasting up to thirty days represents a failure by the federal government to mandate responses plans that address worst case scenarios similar to the *Deepwater Horizon* blowout.

105 OUTER CONT'L SHELF SAFETY OVERSIGHT BD., U.S. DEP'T. OF THE INTERIOR, REPORT TO SECRETARY OF THE INTERIOR KEN SALAZAR 28 (2010).

106 *See* DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 72–82 (discussing the MMS's lack of adequate enforcement resources).

107 *Id.* at 73-74 (noting that the MMS cut the number of required blowout preventer inspections by fifty percent despite reports that technical studies showed that the possibility of high blowout preventer failure rates under deepwater conditions).

responsible for permit approval and compliance were overwhelmed with an increased influx of permit requests.[108] Faced with an amplified workload, MMS regulators often failed to give the necessary scrutiny to permit applications.[109] Not surprisingly, the oil industry would "permit shop" until an approving MMS regulator was found.[110] In the end, the MMS lacked sufficient resources to properly enforce its weakened and inadequate regulatory scheme, even as oil exploration in the Gulf Coast increased and became more hazardous.[111]

The *Deepwater Horizon* disaster shows how a weak regulatory scheme without sufficient enforcement resources, when combined with an increase in oil exploration and industry influence, can result in disaster. The lack of a clear and enforceable safety technology standard hinders OCSLA's ability to prevent offshore oil platform accidents. Inadequate cleanup technology standards and lax worst-case response plans leave the oil industry unprepared to respond to spills. In addition, insufficient enforcement resources prevent regulators from keeping pace with increased deepwater exploration and industry influence. Thus, Congress must reform OCSLA and its accompanying regulatory scheme as well as provide strong regulatory standards and the resources needed to enforce those standards.

D. Finding a Regulatory Solution

The primary goal of a regulatory scheme for deepwater oil exploration safety and cleanup technology is the prevention of future oil spills, while still providing adequate response mechanisms for when spills do occur. While the goal of such a venture is clear, it is necessary to find a regulatory scheme that best reaches this goal.

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108 "The oil and gas industry works 24/7, but MMS regulators generally work regular office hours, requiring 'on-call' responsibility to be assigned to individual senior engineers. Those engineers, however, work at a marked disadvantage because they cannot gain access to the permit database from off-site locations due to security concerns." *Id.* at 74–75.

109 *Id.* at 74–75.

110 *Id.* at 74 (discussing how a seventy-one percent rise in the number of offshore oil permits in the Gulf Coast between 2005 and 2009 forced the oil industry to seek permit approval from MMS regulators outside of their jurisdiction).

111 *Id.* at 73 (discussing how MMS regulations lagged behind advances in safety technology and did not address the changing nature of offshore oil exploration).

1. The Clean Water Act's "Best Available Technology" Standard

The Clean Water Act utilizes technology-based CWA standards to control pollutant discharges into navigable waterways.[112] Under the CWA, technology-based standards require point sources that discharge pollutants to implement technology and practices in accordance with the best available technology in their industry.[113] The process for establishing technology-based standards requires four basic steps: (1) identification of potential polluters, (2) classification of polluters into industry categories,[114] (3) determination of technology available to each industry category, and (4) the establishment of control standards for each industry with respect to available technology and cost considerations.[115]

The technology-based approach possesses several regulatory advantages. First, technology-based standards achieve regulatory goals much quicker than other regulatory schemes.[116] Second, technology-based standards establish uniform control settings across an entire industry, thereby avoiding the excess regulatory cost of establishing standards on a case by case basis.[117] Third, technology-based standards ensure a market for industries that develop more advanced control technology.[118] Fourth, standards based on available

112 *See generally* 33 U.S.C. § 1311.

113 *Id.*

114 *Id.* at § 1316(b) (2011) (establishing a non-exhaustive list of industry categories to be regulated under the CWA).

115 *Id.* at § 1314(b)(2) (establishing a procedure that requires the EPA to determine the best available technology economically achievable with respect to cost considerations for each industry).

116 *See* Kenneth M. Murchison, *Learning From More than Five-and-a-Half Decades of Federal Water Pollution Control Legislation: Twenty Lessons for the Future*, 32 B.C. ENVTL. AFF. L. REV. 527, 590–91 (2005) (noting that technology-based standards are the most effective way of achieving a prompt reduction of water pollution); Karen M. Wardzinsky et al., *Water Pollution Control Under the National Pollutant Discharge Elimination System*, *in* THE CLEAN WATER ACT HANDBOOK 8, 16 (Partenia B. Evans ed., 1994) (noting that technology-based standards have been credited with helping to achieve relatively quick reductions in discharges of some pollutants).

117 Joshua D. Sarnoff, *The Continuing Imperative (But Only From a National Perspective) for Federal Environmental Protection*, 7 DUKE ENVTL. L. & POL'Y F. 225, 252 (1997) (noting that uniform control settings avoid the excess costs of tailoring regulations to local conditions and also protect interstate commerce by preempting state and local governments from promulgating diverse regulatory requirements).

118 Wardzinsky et al., *supra* note 116, at 14; Robert L. Glicksman & Stephen B. Chapman, *Regulatory Reform and (Breach of) the Contract with America: Improving Environmental Policy or Destroying Environmental Protection?*, 5 KAN J. L. & PUB.

technology allow regulators to keep pace with the advancements and challenges that face specific industries.

Technology-based standards, however, have been attacked on several grounds. Some argue that technology-based standards require certain industries to implement expensive and unnecessary control mechanisms.[119] Critics also note that technology-based standards, in reality, impede future control technology development because industries fear that improved technology will result in more stringent regulations in the future.[120]

The primary technology-based standard under the CWA is "Best Available Technology Economically Achievable" (BAT).[121] Under the CWA, the BAT standard requires the implementation of "the best control measures and practices achievable including treatment techniques, process and procedure innovations, operating methods, and other alternatives."[122] To determine best practices and control measures, the EPA evaluates optimal plant operations[123] and conducts pilot plant studies.[124] After indentifying best practices, regulators take into account the following factors: (1) age of equipment and facilities; (2) processes employed; (3) the engineering aspects of applying various types of control techniques; (4) process changes; (5) implementation costs; (6) non-water quality environmental impact; and, (7) other factors deemed appropriate.[125] Unlike other technology standards, Congress does not require regulators to compare the costs and benefits of implementing the BAT standard.[126] Regulators are

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POL'Y, Winter 1996, at 9, 12 (noting that technology-based standards have the potential to force the development of better pollution control technology).

119 Karen M. Rimmele, *Do Removal Credits Deserve Credit? An Analysis of POTWs and the CWA Removal Credit Program*, 8 TUL. ENVTL. L.J. 223, 256 (1994) (discussing that technology-based standards often over-regulate certain industry members and force them to implement costly and unneeded pollution technology).

120 Evans, *supra* note 116, at 14 (noting the criticism that technology-based standards stifle innovation over the fear that improved technology will result in more stringent future regulations).

121 33 U.S.C. § 1311(b)(2)(A).

122 *Id.* at § 1314(b)(2)(A).

123 *See* Nat'l Ass'n of Metal Finishers v. EPA, 719 F.2d 624, 657 n.51 (3d Cir. 1983).

124 *See* Kennecott v. EPA, 780 F.2d 445, 448 (4th Cir. 1985); FMC Corp. v. Train, 539 F.2d 973, 983 (4th Cir. 1976).

125 33 U.S.C. § 1314(b)(2)(B).

126 EVANS, *supra* note 116, at 20 (noting that the Best Practicable Control Technology Currently Available (BPT) and Best Conventional Pollutant Control Technology (BCT) standards require a stricter cost-benefit analysis than BAT standards).

only required to "take into account" costs in setting BAT limits.[127] The BAT standard, like other technology-based standards, does not specify particular technologies that must be implemented on all members of an industry. Instead, the standard outlines a range of technology that members of an industry may choose from to be in compliance.[128]

The BAT standard encountered much of the same praise and criticism directed towards other technology-based regulations. One criticism is that the BAT standard prompts massive amounts of complex litigation and adversarial rulemaking proceedings by industry due to the high costs of regulatory compliance.[129] Additionally, the BAT standard inherently requires regulators to make political and economic trade-offs in implementing and enforcing the standard.[130] Critics also note that the BAT standard, in particular, encourages a freeze in technology[131] and invites influence by special interests.[132] On the other hand, the BAT standard has drastically limited water pollution in navigable waters.[133] In addition, the BAT standard reduces water pollution more quickly than other regulatory methods.[134]

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127 33 U.S.C. § 1314(b)(2)(b).

128 EVANS, *supra* note 116, at 16.

129 BAT involves the centralized determination of complex scientific, engineering, and economic issues regarding the feasibility of controls on hundreds of thousands of pollution sources. Such determinations impose massive information-gathering burdens on administrators, and provide a fertile ground for complex litigation in the form of massive adversary rulemaking proceedings and protracted judicial review. Given the high costs of regulatory compliance and the potential gains from litigation brought to defeat or delay regulatory requirements, it is often more cost-effective for industry to "invest" in such litigation rather than to comply.

See Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1337 (1985).

130 Michael P. Vandenbergh, *An Alternative to Ready, Fire, Aim: A New Framework to Link Environmental Targets in Environmental Law*, 85 KY. L.J. 803, 841 (1997).

131 *Id.* at 842–43; *see* Cass R. Sunstein, *Administrative Substance*, 1991 DUKE L.J. 607, 627–29 (1991) (arguing that the BAT standard discourages citizen and representative debate about environmental ends and penalizes new and improved technology by only requiring its implementation on new sources).

132 Vandenbergh, *supra* note 130, at 852–53 (discussing the impact of special interest groups on the BAT standard).

133 Evans, *supra* note 116, at 24.

134 *Id.*

2. A Truly Uniform BAT Regulatory Scheme?

Although the BAT standard establishes uniform control settings across an industry, the CWA's acceptance of variances erodes BAT's uniformity. The CWA allows administrators to issue modifications, called variances, to the technology standards that are required under a point source discharge permit.[135] The two most common variances under the CWA are the economic incompatibility variance and the fundamentally different factors (FDF) variance. Administrators are allowed to issue an economic incompatibility variance for BAT when a point source shows that the variance "will represent the maximum use of technology within the economic capability of the owner or operator" and "will result in reasonable further progress toward the elimination of the discharge of pollutants."[136] FDF variances are allowed when an owner or operator shows that its "facility is fundamentally different with respect to factors (other than cost)."[137]

Critics raise concerns over the potential for economic variances to erode the viability of the BAT standard. Initially, regulators viewed economic variances as a mechanism that allowed small business owners and marginal polluters to achieve minimal pollution reduction, while also avoiding massive layoffs and plant closures.[138] Although Congress intended for economic variances to largely benefit businesses with limited resources, special interest groups for large-scale polluters now use the economic variance as a powerful tool to obtain numerous exemptions for pollution control standards and implementation deadlines to the point where BAT is rendered useless.[139]

FDF variances also exclude certain industry members from the BAT standard. Unlike economic variances, however, regulators grant FDF variances on factors other than economic capability.[140] The CWA's technology-based standards are based on the technology used at model plants.[141] Every regulated member of an industry, however,

135 *Id.*

136 Clean Water Act, 33 U.S.C. § 1311(c) (2010).

137 *Id.* at § 1311(n)(1)(A).

138 *See* Weyerhaeuser Corp. v. Costle, 590 F.2d 1011, 1036 (D.C. Cir. 1978) (noting legislative concerns over the Clean Water Act's ability to hurt small businesses through the imposition of strict pollution control standards).

139 EPA v. Nat'l Crushed Stone Ass'n, 449 U.S. 64, 81 (1980).

140 Clean Water Act, 33 U.S.C. § 1311(n) (2010).

141 *See* CRAIG N. JOHNSTON ET AL., LEGAL PROTECTION OF THE ENVIRONMENT 212 (3d ed. 2010).

does not resemble the model plants used by the EPA to establish BAT.[142] When a regulated plant is vastly different from the model plant, it is deemed to possess fundamentally different factors that allow for a variance in the pollution control standards it must follow.[143] Although some view the FDF variance as an escape mechanism for would-be polluters, the United States Supreme Court upheld FDF variances, characterizing them as a "laudable corrective mechanism" for standards that are implemented without taking into account all relevant factors.[144] After approval of FDF variances by the EPA and the Supreme Court, Congress codified the FDF variance in the CWA.[145]

The FDF and economic variances, while similar, are also dissimilar in a number of ways. Although both variances allow for a modification in the level of technology required under the CWA, the purpose of each variance is significantly different.[146] The economic variance operates as an exemption mechanism for *properly* classified regulated entities without the financial resources to implement the BAT standard. FDF variances, however, create a mechanism for entities "to demonstrate that they were *improperly* classified in the first place."[147] The FDF variance allows one to prove its improper classification by showing that it is fundamentally different from other point sources in its specific industry and requires modified regulation.[148] Thus, the FDF variance does indeed serve as a corrective mechanism under the CWA,[149] as opposed to the economic variance that exists purely as an exemption device.

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142 *Id*.

143 Clean Water Act, 33 U.S.C. § 1311(n) (2010).

144 *See* EPA v. Nat'l Crushed Stone Ass'n, 449 U.S. 64, 81 (1980). *See also* Chemical Mfg. Ass'n v. NRDC, 470 U.S. 116 (1985) (stating that, "An FDF variance does not excuse compliance with a correct requirement, but instead represents an acknowledgement that not all relevant factors were taken sufficiently into account in framing that requirement originally, and that those relevant factors, properly considered, would have justified—indeed, required—the creation of a subcategory for the discharger in question").

145 Clean Water Act, 33 U.S.C. § 1311(n) (2010).

146 *See* Clean Water Act, 33 U.S.C. §§ 1311(c), 1311(n) (2010); Jay D. Wexler, *The (Non)Uniqueness of Environmental Law*, 74 GEO. WASH. L. REV. 260, 308–16 (noting the similarities and differences between the economic and FDF variances).

147 Wexler, *supra* note 146, at 309 (emphasis added).

148 *Id.*

149 *Id.*

E. *Recognizing the International Call to Action*

The regulatory collapse behind the *Deepwater Horizon* spill resulted in proposed reform in jurisdictions outside of the United States. Recently, the European Union's (EU) European Commission (Commission) issued its report on needed regulatory reform to the European Parliament and Council.[150] The Commission's recommendations focused on the implementation of safety and environmental protection technology in offshore oil exploration, both in Europe and worldwide.[151] Like the feasibility standards under the CWA, the Commission's recommendations included a regulatory regime that incorporated uniform technology standards "inspired by the state of the art" technology available to the offshore oil exploration industry sector.[152] Similar to the EPA's approach in promulgating the BAT standard, the Commission argued that uniform technology standards must consider the financial and technical capabilities of industry.[153] Finally, the recommendations suggested that promulgated standards be updated in accordance with technological advances and apply to all existing and future offshore oil operations.[154]

The Commission's recommendations, however, did not stop at the implementation of a BAT-like regulatory standard. In fact, the Commission determined that offshore oil exploration needed a complete regulatory overhaul much like the one needed under U.S. law.[155] In addition to uniform technology standards, the Commission suggested that EU member states establish a voluntary consultation/reporting process allowing adjacent states to peer review other states' licensing procedures for offshore oil exploration.[156] The recommendations also endorsed an information disclosure mechanism to give citizens easy access to "continuously updated information on

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150 *See generally Facing the Challenge of the Safety of Offshore Oil and Gas Activities*, SEC (2010) 1193 final (Dec. 10, 2010) [hereinafter *Facing the Challenge*], *available at* http://eur-6x.europa.eu/LExUriServ/LexUriServdo?uri=com:2010:0560:FIN:EN:PDF.

151 *See id.*

152 *Id.* at 6.

153 *Id.*

154 *Id.*

155 *See Facing the Challenge*, *supra* note 150, at 5–14 (noting the need for (1) responsible licensing procedures, (2) liability regimes, (3) new models for public oversight, (4) precautionary mechanisms, (5) regional initiatives to promote international cooperation in offshore oil exploration, and (6) greater responsibility on the industry and global communities).

156 *Id.* at 9–10.

safety measures, risk management, contingency plans and company-specific statistics on key safety indicators."[157] The Commission also agreed to work with EU member states "to provide a framework for independent evaluation of the performance of national regulators."[158]

The Commission also stated that the European Union should assist industry in responding to future oil spills.[159] Currently, the European Maritime Safety Agency (EMSA) focuses on pollution from vessels and emergency response activities.[160] The Commission, however, suggested that the EMSA could "meaningfully intervene" in cases of oil spills at offshore platforms because the EMSA staff "can cope with an oil spill irrespective of its source."[161] The Commission also proposed that oil companies with headquarters located in the European Union's jurisdiction comply with uniform safety and environmental policies in all offshore operations worldwide.[162]

The final and possibly most important recommendation of the Commission was its call for globalized efforts to implement uniform control technology in offshore oil exploration.[163] The Commission specifically urged the European Union to join forces with the United States, Norway, Russia, and OPEC members to set safety benchmarks[164] that achieve two primary objectives: (1) the implementation of strict rules on safety and accident prevention in all jurisdictions with offshore oil exploration activities; and (2) coordinated efforts by jurisdictions in accordance with the United Nations Convention on the Law of the Sea (UNCLOS) to implement safety standards beyond a nation's jurisdiction.[165]

The European Union's call for reform signals the need for action by the United States. Like the European Union, the United States must reform its offshore oil exploration regulatory regime to prevent future disasters in not only the Gulf Coast, but in all territorial waters.

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157 *Id.* at 10.

158 *Id.*

159 *Id.* at 10–11.

160 *Id.* at 11.

161 *Facing the Challenge*, *supra* note 150, at 11.

162 *Id*. at 13. Interestingly enough, British Petroleum (BP) and Royal Dutch Shell (Shell) both are headquartered within EU territory. BP maintains its headquarters in London and Shell is headquartered at The Hague, Netherlands, and also maintains a registered office in London.

163 *Id.*

164 *Id.*

165 *Id.*

In doing so, the United States must encourage change from government, industry, and the general public in order to formulate a regulatory scheme that both prevents offshore oil accidents and adequately responds to future disasters.

II
A BAT REGULATORY SCHEME FOR OFFSHORE OIL EXPLORATION

The *Deepwater Horizon* oil spill was an event that cues the need for environmental reform. The regulatory and human failures behind the spill were avoidable if a proper safety and cleanup technology scheme existed. To prevent future disasters, Congress and the BOEMRE must cooperate and establish a statutory and regulatory regime requiring technology that adequately responds to the challenges of deepwater oil exploration.

A. Identifying the Regulated Industry Players

To properly mandate any type of technology-based standard, Congress and regulators must first identify which entities to regulate. While one may think that deepwater oil exploration only requires regulation of major oil corporations like BP, Shell, and Exxon Mobil, deepwater oil exploration is conducted by a number of industrial entities. Although major oil corporations do invest billions of dollars each year into deepwater exploration, their operations are often conducted by numerous independent contractors.

The *Deepwater Horizon* oil spill provides an insight to the corporate structure of offshore oil exploration.[166] Although BP was the primary financier of activities at the Macondo well, exploration was carried out by Transocean, an independent offshore oil exploration contractor.[167] Transocean provided the *Deepwater Horizon* platform, drilling equipment, and rig support staff. Transocean's services at the Macondo well cost BP roughly half a million dollars a day.[168] BP also utilized other independent contractors

166 On the day of the *Deepwater Horizon*'s blowout, approximately 126 people were onboard the rig including eighty Transocean employees, several BP executives, cafeteria and laundry staff, and independent contractors. DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 3.

167 *Id.* at 2.

168 *See* Braden Reddall, *Transocean Rig Loss's Financial Impact Nulled*, Reuters, Apr. 22, 2010, *available at* http://www.reuters.com/article/2010/04/22/transocean-impact-id USN2211325420100422 (noting BP's costs for usage of the *Deepwater Horizon* and Transocean staff).

on the *Deepwater Horizon* rig.[169] Depending on the status of the well, independent contractors included Halliburton for cementing jobs, Sperry Sun (a Halliburton subsidiary) for drilling mud loggers, and M-I SWACO (a subsidiary of the international oilfield services provider, Schlumberg) for drilling mud engineers.[170]

To implement a successful technology-based regulatory regime, technology standards must extend to each phase of deepwater oil exploration. Because offshore oil ventures often involve a number of independent entities, regulators must enforce technology standards against all entities to maintain proper oversight over the entire offshore oil exploration process. By emphasizing regulatory oversight over every entity involved in each phase of deepwater oil ventures, regulators can better maintain compliance over deepwater exploration from cradle to grave.

B. Classifying the Regulated Industry Players

OCSLA charges BOEMRE with the authority to regulate offshore oil exploration in the Gulf Coast of the OCS; BOEMRE's jurisdiction also extends to the Alaskan and Pacific outer continental shelf regions.[171] The geographic distinctions within OCS regions are important because each region possesses its own advantages and challenges in offshore oil exploration. In order to implement sufficient technology in deepwater oil exploration, statutory language and promulgated regulations must take into account the factors particular to each OCSLA geographic region. Therefore, it is essential to understand the different dynamics at play in each of OCSLA's geographic regions.

The Alaska OCS spans approximately one billion acres and contains conditions that regulators must take into account when

169 DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 2–3.

170 *Id.* at 3.

171 BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION, AND ENFORCEMENT, WHO IS BOEMRE? (Nov. 11, 2010), http://www.boemre.gov/aboutBOEMRE/. OCSLA also regulates oil and gas activities in the Atlantic OCS as well. The Atlantic OCS has been inactive since 1983. Between 1976 and 1983, only ten oil leases were granted in the Atlantic OCS; since 1983 all exploration wells under the ten granted leases have been abandoned or deemed noncommercial. *Atlantic Information*, BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION, AND ENFORCEMENT (Nov. 9, 2010), http://www.boemre.gov/offshore/atlantic.htm.

granting drilling permits to prospective drillers.[172] The Alaska OCS is home to extreme sea ice and ocean current conditions that may aggravate the effects of oil spills.[173] In addition, offshore oil ventures also must take into account the effects of exploration on specific species that native Alaskans depend on for sustenance.[174] Finally, BOEMRE expressed concerns about offshore oil exploration's effect on heavy metal and hydrocarbon levels, specifically within the Beaufort Sea.[175]

The Pacific OCS currently has forty-nine active oil and gas leases spanning over 240,000 acres.[176] The Pacific OCS differs from the other OCS regions in several ways. The region is home to numerous regional rockfish and southern sea otter populations.[177] Furthermore, the federal government is currently researching improved topography information regarding the location of pipeline and anchorage sites in the Pacific.[178] The effects of hydrocarbons and other air emissions are also a major concern because of the Pacific OCS's proximity to California.[179] Finally, concerns exist regarding the risk of an oil spill on the rocky intertidal zones and coastlines of Pacific states.[180]

The Gulf of Mexico OCS, the site of the *Deepwater Horizon* spill, contains over thirty-two million acres leased for offshore oil

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172 ALASKA ANNUAL STUDIES PLAN, BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT, 1 (Oct. 2010), *available at* http://alaska.boemre.gov/ess/essp/sp2011.pdf.

173 *Id.* at 17.

174 *Id.* BOEMRE is currently conducting studies on the effects of oil exploration in the Alaska OCS on bowhead whale, beluga whale, and polar bear populations in the region. *Id.* at 17–18.

175 *Id.* at 7.

176 BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT, PACIFIC REGION, FACTS & FIGURES (last updated June 10, 2011), http://www.boemre.gov/omm/pacific/offshore/currentfacts.htm [hereinafter, PACIFIC REGION, FACTS & FIGURES].

177 MINERALS MANAGEMENT SERVICE, FISCAL YEARS 2010–2012 STUDIES DEVELOPMENT PLAN PACIFIC OCS REGION 7 (2009), *available at* http://www.boemre.gov/omm/pacific/enviro/2010-2012_Studies_plan.pdf (noting the risks that offshore oil exploration may pose to rockfish and sea otter populations in the Pacific OCS).

178 *Id.* at 17–18.

179 *See* PACIFIC REGION, FACTS & FIGURES, *supra* note 176 (noting offshore oil exploration's affect on air quality in Pacific states and BOEMRE's work in cooperation with the EPA to mitigate air quality problems through the Clean Air Act and BOEMRE regulations).

180 *See* BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION, AND ENFORCEMENT MULTI-AGENCY ROCKY INTERTIDAL NETWORK (MARINE) STUDY OF ROCKY INTERTIDAL COMMUNITIES ADJACENT TO OCS ACTIVITIES—FINAL REPORT (2007–2010) (2010), *available at* http://www.boemre.gov/omm/pacific/enviro/Enviro-Studies/2010-005_MARINe_Raimondi.pdf.

exploration.[181] Exploration in the Gulf encounters numerous conditions not found in other OCS regions. Varied weather patterns, especially the risk of hurricanes, are often present in the Gulf.[182] In addition, exploration can affect the commercial fishing and tourism industries vital to the Gulf Coast.[183] The risk of a major oil spill and its effects is a genuine concern regarding exploration in the Gulf OCS. In Environmental Impact Statements,[184] the MMS specifically addressed the risk of major oil spills and noted the dangers that spills posed to Gulf Coast beaches and wetlands.[185] Although increased risks exist in the Gulf, exploration has grown in the region because of the Gulf's potential for production wells.[186]

The *Deepwater Horizon* disaster shows how a failure to account for specific geographic risks can result in catastrophic losses. In the wake of the spill, regulators discovered that BP's oil spill response plan did not adequately consider the effects of an oil spill on the Gulf Coast and included irrelevant information on risks related to exploration in OCS regions other than the Gulf.[187] Under the plan, BP

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181 *BOEM Gulf of Mexico OCS Region Blocks and Active Leases by Planning Area*, BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT (Oct. 1, 2011), *available at* http://www.gomr.boemre.gov/homepg/lsesale/mau_gom_pa.pdf.

182 LESLEY D. NIXON, ET AL., DEEPWATER GULF OF MEXICO 2009: INTERIM REPORT OF 2008 HIGHLIGHT, MINERALS MANAGEMENT SERVICE 33–34 (May 2009), *available at* http://www.gomr.boemre.gov/PDFs/2009/2009-016.pdf.

183 GULF OF MEXICO OIL AND GAS LEASE SALES: 2007–2012, MINERALS MANAGEMENT SERVICE (Nov. 2006), *available at* http://www.gomr.boemre.gov/PDFs /2006/2006-062-Vol1.pdf (noting the potential risks to the commercial fishing and tourism industries of the Gulf Coast from the sale of offshore oil and gas leases in the Gulf).

184 Environmental Impact Statements are reports that consider the environmental costs and benefits of major federal actions that significantly affect the environment under the National Environmental Policy Act. *See* National Environmental Policy Act, 42 U.S.C. § 4332 (2010) (establishing the criteria that must be included in reports considering the costs and benefits of major federal actions significantly affecting the environment).

185 Among the specific risks addressed in the MMS 2006 Environmental Impact Statement was the risk of a major oil spill in the Gulf and its affect on the Gulf of Mexico and Gulf Coast states. *Id.*

186 *See BOEMRE Gulf of Mexico OCS Region Blocks and Active Leases by Planning Area*, *supra* note 181 (showing the vast amount of offshore oil production ventures in the Gulf of Mexico OCS).

187 BP's Oil Spill response plan, which was approved by MMS regulators without much attention to detail, included spill response plans that were directly copied from government agency websites. The spill response plan was not specifically catered to the realities of deepwater exploration in the Gulf of Mexico. In addition, the spill response plan included information on biological effects on wildlife not found in the Gulf including sea otters, sea lions, and walruses. *See* Nixon et. al., *supra* note 182, at 84. *See also* BRITISH PETROLEUM, GULF OF MEXICO REGIONAL OIL SPILL RESPONSE PLAN (June 30,

assured regulators that the company was fully prepared for spills ten times worse than the one that occurred at *Deepwater Horizon*.[188] The company stated in its contingency plans and spill scenarios that beaches would remain pristine and that fish, marine mammals, and migratory birds would escape serious harm.[189] BP's overly positive assumptions, however, were proven wrong in the months following the *Deepwater Horizon* spill. The company was ultimately ineffective at mitigating the damage to the Gulf Coast due, in part, to their failure to address the specific risks to the Gulf.[190]

The failure of BP's response to the *Deepwater Horizon* spill shows the need for geographic categorization when promulgating safety and cleanup technology standards. While the three OCS regions do ultimately possess a number of similar problems, their distinct differences cannot simply be brushed aside. The different risks to each region require that adopted safety and cleanup technology standards properly mitigate specific harms. Therefore, regulated deepwater oil exploration companies must be categorized with their specific geographic locations in mind. Regulators will be forced to recognize the realities of offshore oil exploration and promulgate regulations that require the oil industry to implement spill prevention and response mechanisms that are narrowly tailored to the challenges present in each OCS region.

C. Finding the Best Available Technology

In promulgating a BAT regulatory standard, regulators must find the best available technology for each industrial category. Within the context of deepwater oil exploration, regulators must specifically identify the best spill prevention and spill response technology. The identified technology, however, must adequately respond to the particular risks associated with deepwater exploration in each OCS region. The *Deepwater Horizon* disaster presents a unique opportunity that regulators can utilize to compare and contrast the effects of utilizing substandard technology instead of the best available technology.

2009), *available at* http://www .boemre.gov/DeepwaterHorizon/BP_Regional_OSRP _Redactedv2.pdf [hereinafter BP GULF OIL SPILL RESPONSE PLAN].

188 *BP's Spill Contingency Plans Vastly Inadequate*, CBS NEWS, June 9, 2010, http://www.cbsnews.com/stories/2010/06/09/national/main6563631.shtml.

189 *Id. See* BP GULF OIL SPILL RESPONSE PLAN, *supra* note 187.

190 *See* discussion *supra* Part I.B (describing BP and the federal government's inadequate cleanup response to the *Deepwater Horizon* spill).

In order to identify the best technology, however, regulators must proactively investigate what measures can truly improve deepwater exploration technology. To achieve this end, regulators may look to a variety of sources: (1) oil industry members with stellar safety records, (2) safety regulations from nations with strict safety compliance standards, (3) industries that have a primary business interest in advancing deepwater safety and cleanup technology, and (4) research and development of what technology hypothetical model platforms would implement. Although such testing is currently in progress, the following sections suggest several technology mandates that could resolve the technology gaps present at the *Deepwater Horizon* disaster.

1. The Best Available Safety Technology

In the years leading up to the *Deepwater Horizon* spill, regulators failed to keep pace with the advances in safety technology and best practices in deepwater exploration. Regulators' lack of oversight allowed the oil industry to cut corners in not only their implementation of safety technology, but their exploration practices as well. Thus, regulators should consider implementing the following technology advances and best practices on all future deepwater exploration ventures.

The implementation of secondary preventive technology in cases of blowout preventer failure is the primary technology improvement needed in deepwater exploration. Blowout preventers currently serve as the last line of defense in deepwater exploration. The *Deepwater Horizon* spill shows, however, that blowout preventers are not fail-safe devices. Blowout preventers are normally activated automatically by platform employees from a control station, but sufficient manual control technology and training is needed for platform employees to manually seal wells in cases where the automated components of a blowout preventer fail. Finally, regulators must mandate the construction of backup blowout preventers in cases where a primary blowout preventer fails.

Regulators must also mandate best practices that ensure engineering decisions on deepwater exploration rigs are scientifically sound. Engineers' actions at the *Deepwater Horizon* rig show that a failure to mandate best practices allows the oil industry to give undue deference to time and cost factors as opposed to safety factors.[191] Thus, regulators must serve as a watchdog over industry decision-making. To maintain watchdog status, however, regulators must mandate strict permitting requirements and give necessary scrutiny to all actions by rig employees that deviate from previously approved drilling plans.

Greater emphasis on best practices may have mitigated or even prevented the damage caused by the shortcuts taken by platform employees. For example, regulators may have prevented BP from utilizing only six centralizers, as opposed to the recommended twenty-one, when applying the cement seal to the wellbore.[192] In addition, regulators could have provided interpretation guidance on the pressure test results and the potential risks associated with BP's decision to replace drilling mud with seawater.[193] BP engineers knew the risks involved with each of these decisions, but there were no regulatory mandates or incentives for them to consider the negative impacts of risky engineering choices. Therefore, future deepwater exploration requires an intense oversight program where regulators are constantly in contact with platform employees to ensure sound decision-making.

In order to achieve an adequate level of oversight between regulators and industry, the federal government must overhaul the structure of its regulatory operations. The inability of the MMS to maintain twenty-four hour supervision over deepwater exploration because of insufficient resources signals the need for greater agency funding and oversight.[194] Because deepwater exploration requires companies to deviate from their original exploration plan at times, regulators need adequate resources to evaluate the decision making of platform employees. Therefore, the government must provide adequate funding to BOEMRE to enable the agency to hire a sufficient number of regulators and maintain minimum staffing levels

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191 *See* discussion *supra* Part I.A–B (discussing the various engineering decisions by BP and Transocean engineers that led to the *Deepwater Horizon*'s blowout).

192 *See* Hammer, *supra* note 28 (describing BP's decision to cement seal the *Deepwater Horizon*'s wellbore without a sufficient number of centralizers). *See also* DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 95–97 (describing the risks posed by BP's inadequate cement seal on the *Deepwater Horizon* rig).

193 *See* Hammer, *supra* note 28; DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 102–04; *Massive Oil Spill in the Gulf of Mexico*, *supra* note 29, at 35 (describing the risks posed by BP's decision to displace drilling mud with seawater prior to the blowout).

194 *See* DEEP WATER: THE GULF OIL DISASTER, *supra* note 2, at 72–82 (describing the MMS inability to enforce its regulatory regime because of inadequate resources).

around the clock due to the twenty-four hour a day pace of deepwater exploration.

2. The Best Available Cleanup Technology

One of the few positive effects of the *Deepwater Horizon* spill was the significant development of cleanup technology for offshore oil spills. Because the *Deepwater Horizon* spill occurred at greater depths than any spill in history, it prompted a rapid development of cleanup technology.[195] To adequately respond to future deepwater spills, regulators must further research and mandate the implementation of this technology.

The first priority of any major oil spill response effort is to stop the flow of oil into the ocean. The inability of BP and regulators to solve this problem at the outset of the Deepwater Horizon spill resulted in eighty-seven days of uncontrolled oil seepage into the Gulf. Future deepwater exploration ventures can avoid this setback by maintaining contingency plans that allow for the quick and efficient execution of static kills for deepwater wells containing large amounts of pressure and hydrates. Such plans must also allow for the implementation of the top kill and containment dome methods in situations where those methods are most effective. Finally, the federal government should encourage and incentivize the development of more advanced spill containment technology.

The *Deepwater Horizon* spill also prompted the development and greater use of deepwater dispersant technology. Although the use of deepwater dispersants was initially stifled at the *Deepwater Horizon* spill site, EPA mandates and guidelines now exist for their use. Therefore, response teams are able to attack and break down leaking oil at the source of a spill before oil reaches the surface. Regulators should require that spill response plans also contain plans for the immediate use of deepwater dispersants in response to future spills. In addition, the EPA must continue its study of deepwater dispersant toxicity and determine if deepwater dispersants may be used in greater quantities than allowed at the *Deepwater Horizon* spill site.

By continually evaluating and implementing advances in safety and cleanup technology, regulators can ensure that deepwater exploration safety stays on the cutting edge. While it must be noted

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195 *See* discussion *supra* Part I.B (discussing the cleanup response to the *Deepwater Horizon* spill).

that the suggested technology implementations are not the only advances that deepwater explorations may utilize, the aforementioned suggestions do, however, provide a sound basis for future technological development that regulators and industry must foster.

D. Settings Control Ranges and the Role of Costs

The primary source of industrial backlash against proposed regulatory change is its costs to industry. This concern is not unexpected because the requirement of greater technology implementation of regulatory oversight likely requires greater initial investments by the oil industry and time delays. Because costs play such a role in industry decision-making, regulators must give less deference to costs in order to achieve the goals of a regulatory scheme. The Best Available Technology (BAT) standard serves as the primary technology standard mechanism for limiting the influence of cost of regulatory mandates. The BAT standard only mandates a *consideration* of costs when promulgating control settings as opposed to other settings that adhere more closely to a strict cost benefit analysis.[196] By promulgating a standard that does not strictly adhere to cost-benefit principles, regulators can ensure that safety and cleanup standards are not eroded by cost-benefit factors. Therefore, regulators can ensure that deepwater exploration regulatory reforms truly implement the best available technology as opposed to technology that is only economically convenient.

E. Addressing the Risk of Variances

Because costs play a minor role within the BAT standard, industry often seeks to avoid the standard in order to limit their own costs.[197] With the issuance of economic and FDF variances, industry found its most useful mechanism in escaping uniform technology standards. It is more than likely that the oil industry will seek to employ a similar strategy to avoid excess costs imposed under a BAT safety and cleanup technology standard. Therefore, it is necessary to examine

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196 The BAT standard in the CWA mandates only a consideration of costs in setting control technology ranges as opposed to other standards under the CWA which adhere to a stricter cost-benefit analysis. *See* 33 U.S.C. § 1314(b)(2)(B).

197 *See Nat'l Crushed Stone Ass'n*, 449 U.S. 64, and accompanying text (describing the use of variances by industry to avoid and or delay the implementation of strict technology standards).

what role variances should play in a reformed deepwater exploration regulatory scheme.

Economic variances pose a significant risk to the viability of a BAT safety and cleanup technology standard. Because increased technology requirements often necessitate increased expenditures by industry, it is likely that the oil industry will argue that it is not economically capable of implementing the BAT standard.[198] It is important, however, that regulators recognize that the oil industry is vastly different than industries with economic variances under the CWA and other statutes. Under the CWA, the economic variance was partly upheld because it allowed small businesses and marginal polluters to avoid mass layoffs and plant closures. Deepwater exploration, on the other hand, is undertaken by large corporations with large amounts of investment capital.[199] Unlike small businesses and marginal polluters affected by the CWA, members of the oil industry are capable of bearing the costs associated with the BAT standard.

Basic principles of justice also suggest that it is fairer to require that actors enjoying economic benefit from an activity also bear the economic costs of their activity as opposed to innocent bystanders.[200] By allowing the oil industry to delay or avoid technology implementation through economic variances, future oil spills may not

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198 In response to the promulgation of the BAT standard under the Clean Water Act, regulated industries engaged in an aggressive litigation campaign against the EPA. The implementation of increased regulatory oversight over deepwater exploration may result in a similar backlash. The oil industry will likely argue that new technology standards only apply to future deepwater oil projects to avoid the excess costs of retrofitting existing platforms. In addition, the oil industry may attempt to avoid implementation timelines. Thus, regulators must prepare to face a barrage of judicial and political resistance upon the establishment of a BAT safety and cleanup technology standard.

199 *See* Phuong Lee & John Flesher, *Oil Companies Spend Little on Cleanup Technology*, CBS NEWS (June 26, 2010), http://www.cbsnews.com/stories/2010/06/26/business/main6621098.shtml (noting that in the past three years BP, Exxon Mobil, Conoco Phillips, Chevron, and Shell Oil spent a combined $33.8 billion on oil and gas exploration).

200 *The Big Bailout Prevention Liability Act of 2010: Hearing on S. 3305 Before the S. Comm. on Environment & Public Works*, 111th Cong. 5 (2010) (statement of Prof. Kenneth Murchison) (noting the aspect of moral fairness that requires the oil industry to bear the burdens of liability as opposed to society). Although the cited testimony was in regards to liability for the damages caused by the *Deepwater Horizon* spill, the same principle of fairness must be considered when determining if economic variances have a role in a reformed regulatory regime for deepwater exploration safety and cleanup technology.

be averted, leaving society to bear the costs of the oil industry's avoidance of strict regulatory standards. Therefore, economic variances under a deepwater oil exploration BAT standard are not only poor public policy in economic terms but in moral fairness as well. In order to avoid future oil spills and industry exploitation of the economic variance, Congress must statutorily prohibit regulators from issuing economic variances under promulgated BAT standards.

While the issuance of economic variances poses significant public policy concerns, FDF variances can still serve an important function in deepwater exploration. As previously stated, FDF variances differ from economic variances because they serve as a corrective mechanism for improperly classified entities instead of a mere safety valve.[201] The proposed BAT standard, under the regulatory regime explained above, categorizes regulated deepwater exploration ventures by their respective OCS region. It is important to note, however, that OCS regions may contain varied topographical, climate, and environmental conditions within their boundaries.[202] Considering that each OCS region covers massive amounts of territory, one could easily conjecture that each region may contain different challenges within its own boundaries.

With the potential for varied conditions within a single OCS region, a uniform BAT standard may require the implementation of technology that serves no benefit to the safety of a a specific deepwater exploration venture. The FDF variance may serve as a viable corrective mechanism to avoid the implementation of unnecessary technology in this scenario. Importantly, the FDF variance rests on more sound policy grounds than economic variances. FDF variances exempt deepwater exploration ventures from implementing *unnecessary* technology, as opposed to the economic variance, which may exempt ventures from implementing truly *necessary* technology. Therefore, regulators should issue FDF variances, albeit in a limited number of circumstances, when the variance can serve as a corrective mechanism to avoid unnecessary technology implementation costs.

201 *See* Chemical Mfg. Ass'n v. NRDC, 470 U.S. 116 (1985) (describing the FDF variance's role under the Clean Water Act). *See also* Wexler, *supra* note 146, at 309 (noting that FDF variances serve as a mechanism that benefits industry members that were improperly classified under the CWA's regulatory scheme).

202 *See* discussion *supra* Part II.B (discussing the three OCS regions currently under BOEMRE jurisdiction).

F. Encouraging Deepwater Exploration Safety at Home and Abroad

Regulatory oversight over deepwater oil exploration cannot simply be a domestic issue for the United States. Deepwater exploration accidents are not just limited to U.S. waters but occur in international and other jurisdictional waters as well.[203] In addition, the corporations and independent contractors that conduct deepwater exploration are based in jurisdictions throughout the world. Thus, while massive spills like *Deepwater Horizon* may only ecologically affect a limited number of jurisdictions, they possess the potential to affect other corporations and entities throughout the world. Because of the international risks posed by deepwater exploration, jurisdictions must cooperate and maintain an adequate level of international oversight over deepwater oil explorations. The United States must, therefore, charge BOEMRE with an additional obligation under OCLSA to promulgate programs that emphasize international cooperation among nations with an interest in deepwater oil exploration. To achieve this goal, the United States should follow the European Commission's call for increased international cooperation regarding offshore oil exploration.[204]

To achieve international oversight over deepwater exploration, Congress should charge BOEMRE with the responsibility of establishing information disclosure mechanisms in cooperation with other nations. These mechanisms should include information regarding advances in safety and cleanup technology, best practices, and industry compliance. Ideally, the implementation of disclosure mechanisms will create a marketplace of ideas from which other nations' regulatory agencies can draw or contribute information regarding technology and best practices. By disclosing such information, jurisdictions and international governing bodies can achieve more uniform technology standards, regardless of whether a

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203 Notable offshore oil blowouts include the Ixtoc I disaster off the coast of Mexico, the Ekofisk Bravo blowout in the Norwegian Continental Shelf, the Funiwa No. 5 blowout off the coast of Nigeria, and the Hasbah 6 blowout in the Gulf of Arabia. For a brief summary of these incidents and other oil spills see OIL SPILL CASE HISTORIES 1967–1991: SUMMARIES OF SIGNIFICANT U.S. AND INTERNATIONAL SPILLS, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (Sept. 1992), *available at* http://response.restoration.noaa .gov/book_shelf/26_spilldb.pdf.

204 *See Facing the Challenge*, *supra* note 150, at 10–11 (noting several European Commission recommendations for increased international oversight).

deepwater exploration project is undertaken in territorial or international continental shelf areas.[205]

III
CONCLUSION

While the promulgation of a BAT standard for deepwater safety and cleanup technology and international disclosure mechanisms may not serve as a panacea for all of the regulatory and industry failures that led to the *Deepwater Horizon* disaster, reformed regulatory oversight of deepwater exploration is a necessary starting point. The federal government must answer this call to action by implementing preventative and reactionary measures to mitigate the future risks of deepwater exploration. Thus, Congress should amend OCSLA to charge BOEMRE with the responsibility of promulgating BAT standards for deepwater oil exploration safety and cleanup technology. Furthermore, Congress must provide BOEMRE with the necessary fiscal resources to enforce any promulgated standards.

If Congress accepts this call to action, then BOEMRE must ensure that its relationship with the oil industry stresses oversight at all times. Regulators must actively research and continually evolve the BAT standard to keep pace with new challenges that arise from increased deepwater exploration. In addition, regulators must avoid industry influence and give necessary scrutiny to all actions that could adversely affect safety or cleanup response technology.

Finally, the oil industry and society at large must recognize the need for greater deepwater exploration regulation. The *Deepwater Horizon* disaster cues a certain immediacy, at the present time, for increased regulatory oversight. The call for reform, however, must continue after the *Deepwater Horizon* spill has faded from recent memory. Society must prepare to shoulder the burdens that industry may pass along because of greater regulatory oversight. This burden, however, must be constantly weighed against the potential for the

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205 Under the United Nations Convention on the Law of the Sea,

> the continental shelf of a coastal State comprises the seabed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured where the outer edge of the continental margin does not extend up to that distance.

United Nations Convention on the Law of the Sea art. 76, Dec. 10, 1982, 1833 U.N.T.S. 397.

great harm seen in the aftermath of the *Deepwater Horizon* disaster. Therefore, society and industry each bear the responsibility of maintaining a precautionary perspective that elevates long-term safety and adequate oil spill response above short-term economic burdens.

By implementing the calls to action suggested in this Comment, the federal government, the oil industry, and society can make a significant initial stride in preventing disasters similar to *Deepwater Horizon*. We have seen firsthand the devastation that occurs when these entities fail to maintain their status as watchdogs. Although the effects of the *Deepwater Horizon* spill cannot be reversed, its effects can be avoided in the future. This fact demands proactive governance beginning with regulatory change that adequately prevents and responds to potential oil spills in the future.