OFFSHORE SAFETY IN THE WAKE OF THE MACONDO DISASTER: BUSINESS AS USUAL OR SEA CHANGE?

Jacqueline L. Weaver[*]

[*] Professor Weaver is the A. A. White Professor of Law at the University of Houston Law Center. She thanks Christopher Dykes for his help as a reference librarian, Anneka Burdell (class of 2013) for her research assistance, and Kirk K. Weaver for his careful research and for putting the SEMS I and II regulations and the Center for Offshore Safety's auditing system into graphic form in Part Two of this article, forthcoming in the Spring issue of the Houston Journal of International Law (2014). Professor Weaver is also grateful to the University of Houston Law Foundation for providing summer research stipends that supported this work.

1. Jacqueline L. Weaver, *Offshore Safety in the Wake of Macondo: The Role of the Regulator*, 36 HOUS. J. INT'L L. (forthcoming Spring 2014) [hereinafter *Part Two*].

"Much has changed, but nothing has happened.
Or is it that much has happened but nothing has changed?"[2]

I. INTRODUCTION

Only two years after the lifting of the Gulf of Mexico moratorium on drilling exploratory deepwater wells, all seemed back to normal in the Gulf, as shown by the following headlines:

"Deepwater Gulf of Mexico Set to Be the World's Most Active Play"

-E&E News, October 4, 2012[3]

"Anadarko: It's Back to Black After Hit Related to Spill"

-Houston Chronicle, October 30, 2012[4]

"House Passes Expanded 5-Year OCS Plan; Senators Offer Similar Bill."

-Oil & Gas Journal, August 6, 2012[5]

Indeed, an investment analyst's report estimated that forty-five to fifty deepwater drilling rigs could be operating in the Gulf of Mexico in 2014, a nearly fifty percent increase over the thirty or so rigs drilling at the time of the BP-Deepwater Horizon-Macondo disaster.[6] By November 1, 2012, drilling

---

2. Luis Enrique Cuervo, *Colombia 2025 - Heaven or Hell?*, 77 TUL. L. REV. 1033, 1034 (2003) (quoting a phrase attributed to a popular Russian comedian, Mikhail Zhvanetski).

3. Nathanial Gronewold, *Deepwater Gulf of Mexico Set to Be World's Most Active Play - Analysts*, ENERGYWIRE, Oct. 4, 2012, *available at* http://www.eenews.net/energywire/2012/10/04/stories/1059970842.

4. Harry R. Weber, *Anadarko: It's Back to Black After Hit Related to Spill*, HOUS. CHRON., Oct. 30, 2012, at B6.

5. Nick Snow, *House Passes Expanded 5-Year OCS Plan; Senators Offer Similar Bill*, OIL & GAS J., Aug. 6, 2012, at 30.

6. *See* Emily Pickrell, *Gulf of Mexico Deep-Water Rigs Likely to Reach Record by 2014*, FUEL FIX (July 30, 2012, 12:25 AM), http://fuelfix.com/blog/2012/07/30/gulf-of-mexico-deep-water-rigs-likely-to-reach-record-by-2014.

This paper identifies the blowout and spill that occurred on April 20, 2010 in the Gulf of Mexico as the "Macondo" disaster or incident or event. "Macondo" is the name of the well

permit approvals were back to pre-spill levels.[7] BP had started oil production from a lease 140 miles southeast of New Orleans and under more than 6,500 feet of water, from a well that had received the first permit granted after the lifting of the moratorium.[8] BP also raised its dividends to shareholders, calling the move a "gesture of confidence" in BP's future.[9] Offshore drilling contractors posted higher-than-expected earnings in mid-November 2012 amidst a "frenzy" of deepwater discoveries around the globe, including in the Gulf of Mexico.[10] When China launched its first deepwater oil rig in 2012, the chair of state-controlled CNOOC declared deepwater rigs to be China's "mobile national territory and a strategic weapon" in China's quest for oil.[11]

In December 2011, only fourteen months after the moratorium was lifted, the Department of Interior held its first post-Macondo lease sale in the Gulf of Mexico and announced

---

being drilled by BP as the leaseholder of an offshore tract awarded to it by the federal government as owner of the resources on the Outer Continental Shelf of the United States. BP had two co-owners of the leased tract: Anadarko and MOEX, but BP, as owner of sixty-five percent of the leasehold tract, was the operator in charge of all leasehold operations. The drilling rig that was being used to drill the well was named the Deepwater Horizon, and it was owned by Transocean, a drilling contractor, and leased by BP to drill the Macondo well. This drilling rig was a Mobile Offshore Drilling Unit, or MODU, as distinct from a drilling platform permanently affixed to the seafloor. The blowout and spill are referred to in the voluminous writings about them as the "BP spill," the "Gulf of Mexico" spill, the "Deepwater Horizon" event or the "Macondo" incident.

7. Jennifer A. Dlouhy, *Drilling Permits Up as Gulf Trends Toward Bigger, Deeper Facilities*, HOUS. CHRON., Nov. 1, 2012, at D3.

8. Zain Shauk, *Production Begins at BP Deep-Water Gulf Project*, HOUS. CHRON., June 12, 2012, http://www.chron.com/default/article/Production-begins-at-BP-deep-water-Gulf-project-3629147.php.

9. Selina Williams, *BP Raises Its Dividend 13%*, WALL ST. J., Oct. 31, 2012, at B6.

10. Alison Sider, *No Sign Energy Boom Slowing*, WALL ST. J., Aug. 22, 2012, at B7.

11. *See* Brian Spegele & Wayne Ma, *For China Boss, Deep-Water Rigs Are a 'Strategic Weapon'*, WALL ST. J., Aug. 30, 2012, at B1 (describing the Chinese oil company's (CNOOC) acquisition of Nexen, a Canadian company with significant assets in the deepwater Gulf of Mexico). Rebecca Penty & Sara Forden, *CNOOC Said to Cede Control of Nexen's U.S. Gulf Assets*, BLOOMBERG, Mar. 1, 2013, http://www.bloomberg.com/news/2013-03-01/cnooc-said-to-cede-control-of-nexen-s-u-s-gulf-assets.html (discussing a condition of the CNOOC and Nexen deal requiring that CNOOC not serve as operator on co-owned leases in the Gulf of Mexico because of U.S. concerns over intellectual property theft and cyber-security attacks).

firm plans to hold more such sales in its upcoming Five Year Leasing Plan for 2012–2017.[12] The 2012 Annual Energy Outlook of the U.S. Energy Information Administration projected that crude oil production in the United States, largely from offshore resources in the Gulf of Mexico and the development of "tight oil" in shale plays, will increase through 2020.[13] In March 2012, the Pew Research Center reported that public support for offshore drilling had risen to the same level it was before the Macondo disaster.[14]

All seems back to normal in the Gulf of Mexico. Yet at the two-year anniversary of the end of the moratorium, a sheen of oil surfaced on the water from the site of the sealed Macondo well.[15] Was this sheen a sign of complacency—a warning signal to be cautious about the promise of deepwater drilling in the Gulf and indeed in many other areas of the world? While the Macondo disaster faded from the front page after the well was capped, other offshore oil spills and gas leaks, onshore pipeline spills, and fiery explosions from refineries and petrochemical facilities using crude oil and natural gas as feedstocks have often made headline news.[16] These incidents serve as a constant

---

12. Jennifer A. Dlouhy, *Feds Offer Details on Western Gulf Lease Sale*, FUEL FIX (Oct. 25, 2012, 1:15 PM), http://fuelfix.com/blog/2012/10/25/feds-offer-details-on-western-gulf-lease-sale.

13. *See* U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2012, at 2 (2012) *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2012).pdf.

14. Nathanial Gronewold, *Support for Offshore Drilling Increases—Pew*, ENERGYWIRE (Mar. 20, 2012), http://www.eenews.net/energywire/2012/03/20/stories/1059961653 (noting that Pew attributed the increase to higher gasoline prices and that sixty-five percent of those polled viewed additional offshore development favorably compared to forty-four percent the year before).

15. Harry R. Weber, *Capping Device Is Source of Sheen*, HOUS. CHRON., Oct. 19, 2012, at D1.

16. *See, e.g.*, *China Says ConocoPhillips Can Resume Production*, FUEL FIX (Feb. 18, 2013, 6:44 AM), http://fuelfix.com/blog/2013/02/18/china-says-conocophillips-can-resume-production (discussing two spills in June 2011 in the offshore Bohai Bay field operated by ConocoPhillips, resulting in Chinese government shutting in 235 wells in the field in September 2011 with a significant impact on ConocoPhillips earnings); Jennifer A. Dlouhy, *Arctic Project Carries Alaska-Size Challenges*, FUEL FIX (Nov. 12, 2012, 6:49 AM), http://fuelfix.com/blog/2012/11/12/arctic-project-carries-alaska-size-challenges (discussing a February 15, 2012 Repsol well blowout on the Alaskan North Slope, which proved difficult to shut in because the drilling mud and rig were

reminder of the ever-present dangers of a society and economy powered by the combustion of oil and gas.

When the *Exxon Valdez* spilled 260,000 barrels of oil into the scenic wonderland of Alaska's Prince William Sound in 1989,[17] Congress reacted quickly by passing the Oil Pollution Act of 1990 with near unanimity.[18] This Act imposed many new duties and liabilities on tanker owners for spills into U.S. waters.[19] The new Act also required the phasing-in of double-hulled tankers to build a "defense in depth" against oil spills, should future pilot errors or other untoward events result in the piercing of the outside hull.[20] The Macondo blowout and oil spill in the Gulf of

---

frozen solid); Paula Dittrick, *Chevron Asks Brazil Oil Regulator to Suspend Frade Operations*, OIL & GAS J., Mar. 16, 2012, http://www.ogj.com/articles/2012/03/chevron-asks-brazil-oil-regulator-to-suspend-frade-operations.html (discussing an oil spill in Frade field offshore Brazil in November 2011, resulting in suspension of Chevron's drilling activities by the Brazilian regulator and shutdown of the field by Chevron on March 16, 2012); Paula Dittrick, *Total Believes Kill Operation Has Stopped Elgin Gas Leak*, OIL & GAS J., May 16, 2012, http://www.ogj.com/articles/2012/05/total-believes-kill-operation-has-stopped-elgin-gas-leak.html (discussing an Elgin Field gas leak in the North Sea from March to May 2012); Nick Snow, *NTSB Finds Fusion Weld Variances in Pipe from San Bruno Blast*, OIL & GAS J., Dec. 15, 2010, http://www.ogj.com/articles/2010/12/ntsb-finds-fusion.html (discussing the PG&E gas pipeline explosion in San Bruno, California); Nick Snow, *CSB Draft Report Says Neglect Led to Chevron Richmond Refinery Fire*, OIL & GAS J., Apr. 15, 2013, http://www.ogj.com/articles/2013/04/csb-draft-report-says-neglect-led-to-chevron-richmond-refinery-f.html (discussing a vapor cloud released from a Chevron refinery in Richmond, California).

17. Robin Beckwith, *The Post-Macondo World: Two Years After the Spill*, J. PETROLEUM TECH., May 2012, at 36, 41.

18. Oil Pollution Act of 1990, Pub. L. No. 101-380, 104 Stat. 484 (1990) (codified as amended in 33 U.S.C. §§ 2701–62 (2012)). The House passed the bill by a vote of 375–5; the Senate passed it by voice vote. *Bill Summary & Status—101st Congress (1989–1990) H.R. 1465*, LIBR. OF CONGRESS, http://thomas.loc.gov/cgi-bin/bdquery/z?d101:HR01465:@@@R (last visited Dec. 22, 2013).

19. *See e.g.*, Oil Pollution Act of 1990, 33 U.S.C. § 2702 (2012) (elements of liability). A small section of the Oil Pollution Act applies to spills from offshore platforms, but this was not the Act's primary focus. *See* Presidential Statement on Signing the Oil Pollution Act of 1990, 26 WEEKLY COMP. PRES. DOC. 1265 (Aug. 18, 1990), *available at* http://bushlibrary.tamu.edu/research/public_papers.php?id=2169. Huge tanker spills had occurred in many parts of the world, and the Act aimed at preventing such spills and forcing tanker owners to pay for damages by imposing strict liability, a compensation regime, and stronger clean-up measures. *Id.*

20. *See* 46 U.S.C. § 3703(a) (2012) (requiring a vessel to be equipped with a double hull if it is constructed to carry oil).

Mexico in April 2010 have not led to a single new piece of offshore safety or environmental liability legislation in the United States. The only significant Congressional action has been to pass the RESTORE Act, which sends eighty percent of the civil fines to be paid by BP under the Clean Water Act to the five coastal states most impacted by the spill.[21] Indeed, most of the bills proposed by legislators since the Macondo spill have pushed to increase federal leasing offshore.[22]

Does this state of affairs reflect the highly polarized Congress of the last two election cycles and a lamentable inability to work together to improve the safety of offshore drilling and the environmental dangers that it presents? Or, does it reflect the lack of need for reform in these areas because other institutions have filled the legislative void and created a "best" offshore regime for the U.S. Outer Continental Shelf

---

21. Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012, Pub. L. No. 112-141, § 1602, 126 Stat. 405, 588 (2012) [hereinafter RESTORE Act] (codified at 33 U.S.C. § 1321 (2012)).

22. Only one year after the blowout, some members of Congress had proposed bills to force more offshore leasing. *See* CURRY L. HAGERTY & JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., R41407, DEEPWATER HORIZON OIL SPILL: HIGHLIGHTED ACTIONS AND ISSUES 1–2 (2011) (noting three proposals by House of Representative members to increase offshore leasing; the House passed H.R. 1230 directing the Secretary of Interior to conduct four lease sales within defined time framework). At the two-year anniversary, the Oil Spill Commission Action group, which includes seven members of the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, issued a two-year report card on progress made by industry, government and Congress in responding to its recommendations for greater safety offshore. OIL SPILL COMM'N ACTION, ASSESSING PROGRESS: IMPLEMENTING THE RECOMMENDATIONS OF THE NATIONAL OIL SPILL COMMISSION 1–2 (2012). Congress earned a "D" grade for failure to enact a single new law, escaping an F grade because Congress had authorized increased offshore inspection fees and funding. *Id.* at 2–4, 10. Industry received a C+, in part because of the three spills off the coasts of China, Brazil, and in Alaska in the previous year. *Id.* at 2. The Executive Branch received a B grade. *Id.* After three years, the Oil Spill Commission Action group raised the grade to D+ for Congress because it had passed the RESTORE Act. OIL SPILL COMM'N ACTION, ASSESSING PROGRESS: THREE YEARS LATER 3 (2013). Industry's grade was raised to a B- because no major new spills had occurred, more containment equipment was available, and internal safety management systems were being put into place. *Id.* The Action group continued to be concerned about the long-term independence (from the API's lobbying arm) of the industry's new Center for Offshore Safety that was created to raise offshore safety standards in the Gulf of Mexico. *Id.* This Center is discussed extensively in Part Two of this Article. *See Part Two*, *supra* note 1.

(OCS)? Is the current U.S. offshore safety regime the best it can be, or is it just "good enough" to stave off Congressional intervention?

This Article takes the position that the U.S. offshore drilling regime has been significantly changed without legislative action, but a key change—the role of the U.S. offshore safety regulator—is still very much a work in progress. The Article proceeds in two parts, in two successive issues of this journal. This first part, Part One, discusses three important changes that have, in the Author's opinion, significantly changed deepwater drilling in the United States and indeed globally. These three are:

The recognition of complacency as negligence.

The success of the moratorium in technology-forcing.

The development of "best practices"[23] globally, both by

23. The use of the word "best" in the context of industry "best practices" is often semantically confusing because "best" very often means "good" industry practices. For example, Brazil's 2004 model concession contract (Clause 21.1) requires that operators use oil industry "best" practice in protecting the environment and assuring worker safety, but the definition of "best" appears separately in the definitions section (Clause 1.2.22) as those practices and procedures generally used in the international petroleum industry by prudent and diligent operators. BRAZIL MODEL CONCESSION AGREEMENT 239, 281 (2004) (unofficial English translation), *available at* http://www.anp.gov.br/brasil-rounds/round8/geral/contratos/Contrato_R6_eng.pdf. The latter phrase is equivalent to the standard of using "good oilfield practice" or "internationally accepted petroleum practices." *See* Kyla Tienhaara, *Environmental Aspects of Host Government Contracts in the Upstream Oil and Gas Sector*, OIL GAS & ENERGY L. INTELLIGENCE, Nov. 2010, at 5–6 (defining good oilfield practice as "such practices and procedures employed in the petroleum industry worldwide by prudent and diligent operators"). In a few contexts, the word "best" actually means "best," i.e., better than good. For example, after the Piper Alpha disaster that killed 167 workers in the North Sea, the U.K. Oil Operators Association redrafted their pro forma Joint Operating Agreement that governs the rights and duties of the co-licensees of an offshore tract to intentionally require "best" practice standards in respect of health, safety and the environment, while all other policies and procedures and methods of operation were to be consistent with Good Oilfield Practice. *See* Peter Roberts & Renad Younes, *The Legacy of Deepwater Horizon: the UK Experience*, *in* THE INTERNATIONAL COMPARATIVE LEGAL GUIDE TO: OIL & GAS REGULATION 2013 1, 1–4 (8th ed. 2012). The U.K. Health and Safety Executive (HSE), the agency charged with regulating work-related health and safety, distinguishes the two terms as follows: "'Good practice,' as understood and used by HSE, can be distinguished from the term 'best practice' which usually means a standard of risk control above the legal minimum." *See Assessing Compliance with the Law in Individual Cases and the Use of Good Practice*, HEALTH & SAFETY EXECUTIVE

regulators and by the industry.

The second part of the Article is titled "Offshore Safety in the Wake of the Macondo Disaster: The Role of the Regulator" (hereinafter referred to as Part Two) and is forthcoming. It analyzes the role of the regulator in more detail by focusing on what the Department of Interior (DOI) has accomplished to date through regulation and executive order, independent of legislative action. This Part Two takes a careful look at the two new institutions created to further offshore safety, notably the industry-created Center for Offshore Safety (COS) and the Bureau of Safety and Environmental Enforcement (BSEE), the new department inside the DOI that is responsible for offshore safety and environmental protection. Part Two looks at the model of a good regulator by documenting those tasks and tools that reflect regulatory best practices used in the North Sea by the U.K.'s Health & Safety Executive (HSE) and Norway's Petroleum Safety Authority. It compares these regulatory regimes with the current structure and activities of BSEE and COS, focusing on the major new tool used to regulate safety in the U.S. offshore industry: the requirement that offshore operators in the United States implement Safety and Environmental Management Systems (SEMS) that will be audited by third parties certified through the Center for Offshore Safety as an accreditation body. Part Two then assesses the gap between what exists now in the post-Macondo U.S. regulatory regime for offshore safety and what best practice requires. This gap analysis describes the tasks that BSEE must learn to perform to become a competent regulator. Part Two concludes with a set of six recommendations that will help BSEE climb a steep learning curve to become a good regulator,

---

(May 2003), http://www.hse.gov.uk/risk/theory/alarp2.htm Within the HSE, good practice is generally defined as "those standards for controlling risk which have been judged and recognized by HSE as satisfying the law when applied to a particular case in an appropriate manner." *Id.* HSE further explains that sources of recognized good practice include HSE Guidance documents, Approved Codes of Practice, guidance from an industry association, and standards produced by accredited standard-setting organizations. *Id.* In the U.S. context, the laws governing petroleum operations on the OCS require that operators use "the best and safest technology," as discussed in Section II.B.3 of this Article and more fully in the forthcoming Part Two. *See Part Two*, *supra* note 1, secs. III.C.3, IV.C.4.

including an assessment of the role of a third, just-born entity: the Offshore Energy Safety Institute (OESI), created in November 2013. The conclusion also offers the Author's final observation: A good regulator is industry's best friend.

The analysis contained in this two-part Article furthers the search for answers to two key questions: First, is drilling in the Gulf of Mexico safer now than it was pre-Macondo? And, second, is it "safe enough," especially when compared to international best practices? The conclusions reached here have implications for deepwater drilling globally. Deep water now accounts for more than fifty percent of all conventional new oil and gas reserves discovered worldwide.[24]

The Author has reviewed all the leading reports about the Macondo disaster. These reports have been prepared by commissions and agencies of the U.S. government and of other governments with offshore petroleum development, by National Academy of Sciences research boards, by industry task forces (both in the United States and abroad), individual companies, think tanks, university centers, and by leading academics with expertise in risk management and safety systems.[25] In this last

---

24. Kerri Nelson et al., *Deepwater Operators Look to New Frontiers*, OFFSHORE (May 1, 2013), http://www.offshore-mag.com/articles/print/volume-73/issue-5/international-report/deepwater-operators-look-to-new-frontiers.html.

25. Many of these key reports are gathered together and listed on the website of the International Drilling Contractors Association (IADC), with links to each report. *See Montara Macondo Investigations*, INT'L DRILLING CONTRACTORS ASS'N (IADC) (Sept. 3, 2013), http://www.iadc.org/iadc-committees/iadc-offshore-operating-division/montara-macondo-investigations. The IADC listing includes reports commissioned by other governments with offshore petroleum activity to assess their own safety and environmental frameworks in light of the Macondo disaster. *See, e.g.*, GEOFFREY MAITLAND, OFFSHORE OIL AND GAS IN THE UK: AN INDEPENDENT REVIEW OF THE REGULATORY REGIME (2011), *available at* http://webarchive.nationalarchives.gov.uk/20121217150421/http://decc.gov.uk/assets/decc/11/meeting-energy-demand/oil-gas/3875-offshore-oil-gas-uk-ind-rev.pdf; SINTEF, THE DEEPWATER HORIZON ACCIDENT: CAUSES, LEARNING POINTS AND RECOMMENDATIONS FOR THE NORWEGIAN CONTINENTAL SHELF (2011) [hereinafter SINTEF REPORT], *available at* http://www.ptil.no/getfile.php/Tilsyn%20p%C3%A5%20nettet/vrige/Deepwater%20Horizon%20-%20SINTEF%20-%20Executive%20summary.pdf (discussing lessons learned from the Macondo disaster and making 134 recommendations, including updating codes for drilling and production standards, in a report commissioned by Norway's offshore safety authority and performed by SINTEF, an independent research organization). *See also,* NORWEGIAN OIL INDUS. ASSOC. (OLF), DEEPWATER HORIZON: LESSONS LEARNED AND FOLLOW-UP (2012), *available at*

category is the book by Professor Andrew Hopkins, *Disastrous Decisions*,[26] which is, in this Author's opinion, the single best account of the engineering and management decisions made by BP that led to the Macondo disaster. In writing his account, Professor Hopkins faults the U.S. regulatory regime because U.S. offshore regulatory practices were so far removed from the best practices required for safe operations in deepwater drilling and production.[27] In his view, the current U.S. system still lacks essential elements of an adequate safety framework.[28] In sum, this Article assesses Professor Hopkins' bleak assessment of progress made in the United States to increase offshore safety. It also highlights where our current system has veered from the recommendations made by many of the expert groups noted above, especially the National Academies' reports.

A large number of actors other than Congress play key roles in assuring a safer offshore drilling environment. Their names, especially in acronym form, are often unknown to most U.S. citizens because they are industry trade associations and regulators centered in the North Sea, not in the United States. The offshore drilling industry is global and these "outside" groups have played a crucial role in reforming the offshore safety framework overseas. As this Article shows, they also play a key role in reforming the U.S. offshore regime, but this role is largely hidden from the general public's sight. In particular, the work of trade associations, such as the OGP (the Oil and Gas Producers forum)[29] and the IADC (the International Association

---

http://www.norskoljeoggass.no/Global/Publikasjoner/Rapporter/DWH-summary%20June%202012.pdf?epslanguage=no (containing forty-five recommendations from Norway's offshore trade association to be incorporated into industry practice and standards) and DAVID BORTHWICK, REPORT OF THE MONTARA COMMISSION OF INQUIRY (2010), *available at* http://www.ret.gov. au/Department/Documents/MIR/Montara-Report.pdf (examining the causes of the 2009 Montara blowout and oil spill which continued for more than ten weeks off the coast of Australia in the Timor Sea, the effectiveness of the Australian regulatory regime, and the adequacy of industry's and the operator's response to the blowout and spill).

26. ANDREW HOPKINS, DISASTROUS DECISIONS: THE HUMAN AND ORGANISATIONAL CAUSES OF THE GULF OF MEXICO BLOWOUT (2012) [hereinafter HOPKINS, DISASTROUS DECISIONS].

27. *Id.* at 145.

28. *Id.* at 148.

29. *See infra* Section II.C.2 (explaining the OGP and its role).

of Drilling Contractors),[30] is crucial to assessing the appropriate role of the government regulator and the overall safety of offshore operations, as is the activity of the leading domestic trade association, the American Petroleum Institute (API). These industry actors are not government regulators or official commissions charged with the duty to serve the public interest in promoting safety and environmental protection. Their work serves the interests of their industry membership. Nonetheless, the actions of these trade associations must be integrated into an assessment of how safe the U.S. offshore currently is, both because the associations' members are genuinely interested in safety and because the government regulator charged with the task may be the weakest player on the field.

This Article assumes that the reader has some level of knowledge about the Macondo disaster that killed eleven workers and spilled almost five million barrels[31] of oil into the Gulf of Mexico for eighty-seven days before the well was capped. However, because of the large number of entities involved as industry players and government agencies in the spill and its aftermath, Appendix A provides a guide to the key parties involved and to the acronyms frequently used in this Article. For example, when the blowout occurred, the federal offshore regulator was the Minerals Management Service (MMS), but this agency was quickly replaced and reorganized as BOEMRE (the Bureau of Ocean Energy Management, Regulation and Enforcement) and now exists as three separate departments inside the Department of Interior, named BOEM (the Bureau of

30. *See infra* Section II.C.2 (explaining the IADC and its role).

31. BP released a report in June 2013 disputing the five-million barrel number. Modelling Macondo: A Calculation of the Volume of Oil Released During the *Deepwater Horizon* Incident, *In re* Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico, on April 20, 2010, No. 2:10-md-02179-CJB-SS (E.D. La. June 27, 2013). BP had commissioned the report by an engineering professor at the Imperial College, which estimated that only 3.26 million barrels of oil had flowed from the Macondo well after the blowout rather than 4.9 million barrels alleged by the Department of Interior. *Id.* at 6. BP managed to collect 800,000 barrels of oil, so the releases to the sea were 2.4 million barrels according to BP's expert and 4.1 million barrels according to the DOI in its lawsuit against BP. Harry R. Weber, *Unsealed BP Report Could Slash Gulf Oil Spill Penalties by Billions*, FUEL FIX (June 27, 2013), http://fuelfix.com/blog/2013/06/27/bp-experts-report-could-cut-gulf-oil-spill-penalties-by-up-to-7b/.

Ocean Energy Management), BSEE (the Bureau of Safety and Environmental Enforcement) and ONRR, as explained in Appendix A.

One of the earliest reports released on the Macondo disaster (in January 2011, only eight months after the blowout occurred) was published by the National Commission on the BP Deepwater Horizon Oil Spill, a nonpartisan commission appointed by President Obama to determine the causes of the disaster and recommend reforms to make offshore production safer.[32] Despite some industry criticism that the Commission's members were not qualified or unbiased,[33] all subsequent reports have affirmed and confirmed the Commission's findings.[34] Indeed, regulators and industry associations in other countries have used this report to prepare "lessons learned" to help them advise and regulate their own offshore industry members better.[35] For this reason, this Article often cites to the National Commission (hereinafter called the National DWH Commission) report, but many other reports have similar findings and conclusions.

This Article only tangentially touches on the tsunami of litigation that has engulfed many of the players in the wake of the Macondo event. This litigation looks back in time, focusing on past acts, not on the safety of offshore operations today or in the future on the U.S. Outer Continental Shelf. The fact is that

---

32. 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 (2011) [hereinafter NAT'L DWH COMM'N REPORT].

33. *See, e.g.*, Bob Cavnar, *Missed Opportunity: No Industry Input Means Report Will Be Dismissed*, HOUS. CHRON., Jan. 16, 2011, at B6 (finding the Commission's conclusions "surprisingly astute for a panel that had no member from the oil and gas industry" and its recognition of "systemic failures" as "spot on"). However, Mr. Cavnar, a thirty-year veteran of the oil industry, feared that the report would not gain much traction within the industry itself because the White House had "ignored calls for a more inclusive commission including representatives from the technical disciplines and from the industry itself." *Id.* Therefore industry's lobbyists would not support the recommended reforms of the National Commission and Congress would not enact any recommended changes. *Id.*

34. *See, e.g.*, OIL SPILL COMM'N ACTION, ASSESSING PROGRESS: IMPLEMENTING THE RECOMMENDATIONS OF THE NATIONAL OIL SPILL COMMISSION 1 (2012) (finding wide acceptance of the findings and recommendations of the National DWH Commission).

35. *See, e.g.*, SINTEF REPORT, *supra* note 25.

BP will pay far more than $40 billion in clean-up costs, government penalties, and claims for economic losses to private parties.[36] This stunning number is signal enough to industry of the magnitude of liability that it can face if safety standards are not improved.[37] Even more critical to industry is the demonstrated fact that governments will impose moratoria on offshore drilling when any one member of industry experiences an event that kills many workers or causes significant oil spills.[38] Lack of access to new reserves and delayed production from existing fields are devastating to industry's bottom line. Industry knows well that it needs a social license to operate offshore.

This Article also does not address the ecosystem damage caused by the spill. Studies have shown that oil from the Macondo well has entered the ocean's food chain through zooplankton organisms; thus, the impact of the oil spilled will extend far beyond its eighty-seven days of flow.[39]

---

36. *See* Nathanial Gronewold, *More Financial Trouble Ahead for BP in Wake of Massive Settlement*, ENERGYWIRE (Nov. 16, 2012), http://www.eenews.net/energywire/stories/1059972645/print; *see also* Susanne Pagano, *Focus of BP Litigation Shifts to Civil Trial with Degree of Negligence a Key Issue*, DAILY REP. FOR EXECUTIVES, Nov. 19, 2012, at A29. BP pled guilty to felony manslaughter and environmental crimes and settled with the Department of Justice on November 15, 2012, paying a record fine of $4 billion. Press Release, U.S. Dep't of Justice Office of Pub. Affairs, BP Exploration and Production Inc. Pleads Guilty, Is Sentenced to Pay Record $4 Billion for Crimes Surrounding Deepwater Horizon Incident (Jan. 29, 2013). This agreement settles only criminal charges. *Id.*

In addition to the $4 billion fine, BP will be on probation for five years and must retain process safety and ethics monitors and develop an implementation plan that, *inter alia*, equips rigs with two blind shear rams. ENVTL. LAW INST., BP CRIMINAL PLEA AGREEMENT FACT SHEET (2012) (summarizing the plea details). It also must conduct and require its contractors to conduct Safety and Environmental Management Systems (SEMS) audits. *Id.*

37. Tony Hayward, the CEO of BP at the time of the blowout and spill, stated that BP came close to financial collapse. Jill Lawless, *Ex-CEO Says BP Was Unprepared for Oil Spill*, BOSTON GLOBE, Nov. 9, 2013, http://www.boston.com/business/articles/2010/11/09/ex_ceo_says_bp_was_unprepared_for_oil_spill/. He explained that capital markets had closed to BP, so it could not borrow. *Id.*; *see also* Guy Chazan, *BP's Dividend Takes Back Seat*, WALL ST. J., Nov. 3, 2010, at B1 (explaining that BP suspended dividends and sold off almost $30 billion in assets to raise money to pay for spill-related claims).

38. *See supra* note 16 and accompanying text.

39. Robin Beckwith, *The Post-Macondo World: Two Years After the Spill*, J. OF

The legal issue of most relevance to this Article may be found in how Judge Barbier answers two of the seven questions that he asked the parties to brief after the close of the first phase of the trial on the scope of BP's liability in April 2013.[40] One question asks if compliance with government regulations precludes a finding of gross negligence regardless of whether a defendant knew, or should have known, that its conduct or equipment was unsafe or violated accepted engineering standards. The second question asks whether a party acting in accordance with "industry standards" can nonetheless be found to be grossly negligent.[41] As this Article explains, the offshore safety regimes both abroad and in the United States rely heavily on industry standards and many government regulations incorporate industry standards by reference. If a company can be found either negligent or grossly negligent despite complying with industry standards or government regulations, then this result may have significant consequences for the procedures used to set standards in industry technical committees and for the substance of the standards themselves.

PETROLEUM TECH., May 2012, at 36, 45. Three years after the spill, the National Wildlife Federation reported that dolphins, bluefish tuna and sea turtles continue to be negatively affected. Annie Snider, *Ecosystem Still Reeling Three Years After Oil Spill - Report*, E&E NEWS (Apr. 2, 2013), http://www.eenews.net/eenewspm/stories /1059978786/print.

40. *In re* Oil Spill by Rig "Deepwater Horizon" in Gulf of Mexico, on April 20, 2010, MDL No. 2179 (E.D. La. Apr. 24, 2013) (order regarding phase one post-trial briefing), *available at* http://www.laed.uscourts.gov/OilSpill/Orders/4242013Order (PostTrialBriefing).pdf.

41. In general, compliance with a law or regulation does not prevent a finding of simple negligence if a reasonable person would have taken additional precautions. *See* RESTATEMENT (SECOND) OF TORTS § 288C (1979). For a detailed analysis of the distinctions between negligence and gross negligence, and an assessment of why BP may be found to be grossly negligent, see Blaine LeCesne, *Crude Decisions: Re-Examining Degrees of Negligence in the Context of the BP Oil Spill*, 2012 MICH. ST. L. REV. 103 (2012). Courts have found companies to be grossly negligent even though they complied with industry standards. *Id.* at 129–31 (discussing Mobil Oil Corp. v. Ellender, 968 S.W.2d 917 (Tex. 1998), which upheld a jury verdict that Mobil was grossly negligent by exposing plaintiff to an extreme degree of risk involving benzene exposure). The jurisprudence shows that a high degree of risk demands a high level of care. *Id.* at 151. Complacency shows a lack of concern for danger to others and can support a finding of gross negligence in high-risk situations, especially if accompanied by evidence that cost savings influenced decision-making. *Id.* at 152–53.

II. THREE CHANGES TO BUSINESS AS USUAL

A. Complacency as Negligence

One theme that runs through the many reports on the Macondo disaster is that the individual workers on the rig, BP as a company, and the offshore industry as a whole had become complacent about the safety of drilling in deep water where high pressure-high temperature (HPHT) wells[42] are common. The National DWH Commission's report bluntly concluded that "the Deepwater Horizon disaster exhibits the costs of a culture of complacency"[43] that extended beyond any one entity:

> Though it is tempting to single out one crucial misstep or point the finger at one bad actor as the cause of the Deepwater Horizon explosion, any such explanation provides a dangerously incomplete picture of what happened—encouraging the very kind of complacency that led to the accident in the first place.[44]

This complacency showed up in many ways. The National DWH Commission report pointed to many missed warning signals by industry players, not only about the Macondo well's precarious status, but also about near misses and similar disasters that had occurred recently in offshore drilling in the Gulf of Mexico, the North Sea, and off Australia's coast.[45]

Other investigative reports offer detailed and telling examples of complacency. For example, cited below is the U.S. Coast Guard Commandant's explanation for why he did not concur in one of the fifty-two recommendations made after the Coast Guard and BOEMRE completed a joint investigation of the Macondo incident,[46] many months after the National DWH

---

42. HPHT wells have bottom-hole temperatures of over 300°F (149°C) and pore pressures that require a blowout preventer with a rating in excess of 10,000 psi. *See Oilfield Glossary: HPHT*, SCHLUMBERGER, http://www.glossary.oilfield.slb.com/en/Terms.aspx?LookIn=term%20name&filter=HPHT (last visited Dec. 22, 2013).

43. NAT'L DWH COMM'N REPORT, *supra* note 32, at ix.

44. *Id.* at viii.

45. *Id.* at 110–12, 119–21, 124, 224–25.

46. The two U.S. agencies with jurisdiction over offshore drilling safety, BOEMRE (the former Bureau of Ocean Energy Management, Regulation, and Enforcement, now reorganized and renamed BSEE, the Bureau of Safety and Environmental Enforcement)

Commission's report had been released. The Joint Investigative Team (JIT) report recommended that the International Maritime Organization's MODU (Mobile Offshore Drilling Unit) Code be amended to strengthen the use of emergency drills by the crew, but the Commandant wrote:

> I do not concur with this recommendation. The report indicates that drills were being conducted, but that the crew was not taking the drills seriously. I believe this is not a problem with the standards identified in the MODU Code, but rather this represents a leadership problem where a climate of complacency was accepted.[47]

Because the technical specialists on the DWH rig and in offices and labs onshore represented three of the largest players in the offshore industry—BP, Halliburton, and Transocean—the National DWH Commission report's finding of complacency was directed at the industry as a whole, not just to those individuals involved in the Macondo event.

In response, the industry countered with the following kind of statement:

> We object to the Commission's insistence on there being a "systemic" problem throughout the industry . . . . Over 43,000 wells have been drilled in the Gulf of Mexico without a Macondo-like accident.[48]

---

and the Coast Guard, conducted an intensive joint investigation that was intended to support a list of recommended changes in regulations and practices under the control of their respective agencies. These reports are voluminous and will be referred to as the "JIT Reports" because they were prepared by the Joint Investigation Team of BOEMRE and the Coast Guard. Volume I of the JIT Report contains findings and recommendations to the U.S. Coast Guard Commandant. U.S. COAST GUARD, REPORT OF INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE EXPLOSION, FIRE, SINKING AND LOSS OF ELEVEN CREW MEMBERS ABOARD THE MOBILE OFFSHORE DRILLING UNIT *DEEPWATER HORIZON* IN THE GULF OF MEXICO APRIL 20–22, 2010 (2011) [hereinafter JIT REPORT VOLUME 1].

47. Action by the Commandant of the U.S. Coast Guard, at 11 (Sept. 9, 2011), *available at* http://www.uscg.mil/hq/cg5/cg545/dw/exhib/Volume%20I%20-%20Enclosure%20to%20Final%20Action%20Memo.pdf.

48. Press Release, Statement of NOIA President Randall Luthi on the National Oil Spill Commission's Final Report on Deepwater Horizon (Jan. 11, 2011), *available at* http://www.noia.org/statement-of-noia-president-randall-luthi-on-the-national-oil-spill-commissions-final-report-on-deepwater-horizon/. NOIA is the National Ocean Industries

Complacency is a rather innocent-sounding term, signaling a human character trait of smug self-satisfaction. Complacent people are satisfied with the current state of affairs, but they are not normally considered negligent or dangerous to others. Here is an editorial in the *Oil & Gas Journal* in May 2010, written at a time when very little was known about what had caused the Macondo disaster, which differentiated inexcusable and improbable negligence from complacency, the latter being understandable and seemingly excusable because it is a normal and probable reaction to years of success without a major blowout and spill:

Negligence in a drilling operation is inexcusable. It's also highly improbable . . . . Self preservation is more compelling than any regulation ever can be.

> Complacency is another matter. Before the Deepwater Horizon accident, the offshore producing industry had a solid safety record. Yes, blowouts and spills occurred. But they were infrequent in relation to total activity and usually did little damage. Maybe time without a harsh reminder of what can happen dulled, in some places, the careful edge essential in hazardous work. If so, a painful reminder is at hand. Regulation can help keep it ever in mind.[49]

Yet, in the world of HPHT wells, complacency *is* negligence. Dr. Nancy Leveson, a professor of Aeronautics and Astronautics Engineering at the Massachusetts Institute of Technology (M.I.T.) and a foremost expert in analyzing disasters such as the Challenger space shuttle, writes:

> As safety efforts are successfully employed, the feeling grows that accidents cannot occur, leading to a reduction in the safety efforts, an accident, and then increased controls for a while until the system drifts

---

Association, whose 300-plus member companies work in the U.S. offshore energy industry.

49. Editorial, *The Regulatory Response*, OIL & GAS J., May 17, 2010, at 16. The editorial continued: "Maybe everyone and everything on the Deepwater Horizon worked correctly, and the accident occurred anyway. If so, the industry and its regulators need to learn more than they know now about deepwater operating conditions. And deepwater operations under way now need to proceed with greatly enhanced caution if they proceed at all." *Id.*

> back to an unsafe state and complacency again increases[.]
>
> This complacency factor is so common that any system safety effort must include ways to deal with it.[50]

Complacency is formally defined as "self-satisfaction, especially when accompanied by unawareness of actual dangers or deficiencies."[51] The unawareness of danger is the very factor that leads to poor decision-making and dire consequences that can extend far beyond injury to the complacent actor. Thus, the industry's protestations that it was a systemically safe industry based on statistics about having drilled so many wells without a Macondo-like disaster, is as much a cause for concern as it is a source of reassurance.[52]

Indeed, the very framing by both industry and government regulators of the low probability of disastrous blowouts reflects a fundamental misconception of the nature of risk in such deepwater environments. Accidents like Macondo, involving complex systems in high-risk environments, are often characterized as "high consequence, low probability" events.[53] Professor Leveson characterizes them otherwise: they are "high

---

50. NANCY G. LEVESON, ENGINEERING A SAFER WORLD: SYSTEMS THINKING APPLIED TO SAFETY 383 (2011), *available at* http://mitpress.mit.edu/sites/default/files/titles/free_download/9780262016629_Engineering_a_Safer_World.pdf.

51. MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY 253 (11th ed. 2004).

52. *See also* Stephen Rassenfoss, *Drillers Find Themselves in a Tricky Spot at the Human/Machine Interface*, J. OF PETROLEUM TECH., May 2012, at 48, 50, 53 [hereinafter Rassenfoss, *Drillers Find Themselves in Tricky Spot*] (quoting comments from John Thorogood that "chronic unease" rather than complacency is a key attribute of High Reliability Organizations (HROs) that focus on safety management in hazardous situations). Thorogood, a Drilling Engineering Advisor with Drilling Global Consultant LLP, explains that HROs are constantly looking for missed signals of rising risk levels because "[t]rouble is often a byproduct of a long run of success. Workers lapse into dangerous practices because nothing bad happened when they failed to follow the safety standards and they assume past success validated existing practices and assured future safety." *Id.* at 50. Based on his observations working in the industry, he states: "It is not immediately obvious that these qualities [of HROs] are an inherent part of the culture of organizations that manage drilling operations today." *Id.*

53. Nancy Leveson, Professor, Mass. Inst. Tech., Presentation at Bureau of Ocean Energy Management, Enforcement, and Regulation Public Forum on Offshore Drilling: Reducing Accidents in the Oil and Gas Industry 98, 108 (Hous., Tex. Sept. 7, 2010) (transcript on file with author).

consequence, low frequency" events.[54] In reality, such infrequent accidents are quite probable, and complacency is a root causal factor. In Leveson's view, all complex systems migrate towards states of high risk.[55] As time passes, people decrease their estimates of how risky an operation is, lowering their estimates of the probability of an accident occurring.[56] Yet, risks are probably increasing rather than decreasing as the complacency factor sets in.

Moreover, repeated use by industry of the "43,000 wells safely drilled" number masks data that would more accurately portray the risks of drilling deepwater HPHT wells. The industry uses a Mechanical Risk Index (MRI) to classify wells by degree of risk, with categories 3, 4, and 5 wells being the most risky to drill in terms of factors such as well instability, which can lead to blowouts.[57] A report by the Center for Catastrophic Risk Management (CCRM) at the University of California at Berkeley presented data showing that only forty-three MRI category 3, 4, and 5 wells had been drilled to date offshore in the United States.[58] Thus, the risk of failure in deepwater drilling would seem to be more accurately depicted as one well in 43, not one well in 43,000.

Indeed, the authors of this report ask why industry ignored the warning signs of increased well instability events in deeper waters, especially when coupled with data showing a high rate of failure for blowout preventers (BOPs) and other key control barriers.[59]

Guarding against complacency is a critical factor in making offshore operations safer. Yet, it is exceedingly difficult to do

---

54. *Id.*

55. *Id.* at 109.

56. *Id.* at 108–09.

57. *See* CTR. FOR CATASTROPHIC RISK MGMT., DEEPWATER HORIZON STUDY GRP., THE MACONDO BLOWOUT 3D PROGRESS REPORT 43, 48–49, app. D p. 37 (2010) [hereinafter CCRM REPORT #3] (explaining MRI levels).

58. *See id.* at 43–44, 51 (presenting data showing that wells drilled in shallow water averaged 2.2 wellbore instability days out of the 35 days needed to drill each well, resulting in a 6.4% rate of instability; whereas deep subsalt wells averaged 9.8 days of wellbore instability out of the 97 days needed to drill them, or a 10.1% rate of instability from kicks, stuck pipe, loss of circulation, and other such events).

59. *Id.* at 39.

because complacency is the product of everyday practical experience. Very few workers ever experience a seriously frightening workplace incident. As Professor Hopkins explains: "The reality is that people learn that so-called complacent behaviour works."[60] The "failure to learn" from previous disasters, especially as time dims the memory of them, is a failure of the managers of organizations to have structures, reporting procedures, and performance incentives in place that embed "lessons learned" from a disaster into the daily routine of the organization itself.[61]

The leaders of High Reliability Organizations (HROs) that successfully embed safety management systems into all levels of their companies' operations are the opposite of complacent. [62] They are "preoccupied with failure,"[63] ever-anxious that workers in their organizations will hide bad news from them. These "mindful" leaders live in a state of "chronic unease."[64] In short, they understand that complacency kills.

So how does an industry overcome complacency? The *Oil and Gas Journal* editorial quoted earlier opined that "regulation" can help keep industry on the "careful edge" essential to work in hazardous environments.[65] Implicitly, the

60. HOPKINS, DISASTROUS DECISIONS, *supra* note 26, at 117.

61. *Id.* at 113–15 (citing three "failures to learn" involving blowouts and near misses that had recently occurred among the Macondo players: A BP blowout in the Caspian Sea due to a poor cement job that shut in the field for months; a Transocean blowout in U.K. waters of the North Sea under circumstances eerily akin to what took place on the Macondo (but brought under control); and a significant "kick" on the Macondo rig itself that went undetected for thirty-three minutes).

62. *See id.* at 26–27 (explaining that HROs are organizations with a relentless focus on recognizing and then mitigating the potential for hazardous incidents to occur). Hopkins does a masterful job of integrating the literature on organizational safety and behavior into the Macondo context to explain why such poor decisions were made by both the professional engineers and the drill crew aboard the drilling rig. The reasons include: assuming the competency of personnel, confirmation bias, group thinking to reach a "comfortable" consensus, and the normalization of deviations from standard procedures. *Id.* at 29–30, 37–38.

63. *Id.* at 29; *see also* Rassenfoss, *Drillers Find Themselves in Tricky Spot*, *supra* note 52, at 48, 50 (explaining that instead of celebrating a good safety record, an HRO will constantly seek out what has been missed).

64. HOPKINS, DISASTROUS DECISIONS, *supra* note 26, at 133.

65. Editorial, *The Regulatory Response*, *supra* note 49, at 16.

editorial undermined its own premise that complacency is excusable because it is the normal and inevitable consequence of the infrequency of offshore disasters. The Journal's call for regulation to shake industry out of complacency suggests a regulatory approach that penalizes the normalization of complacency so that it is no longer excusable. All the reports read for this Article ultimately recognize that complacency is fatal to offshore operations. This ground truth is a major step forward in building a safer offshore regime.

Section III of this Article, forthcoming in Part Two, looks at the role of the regulator whose job is to assure that industry overcomes the complacency factor that so naturally and unconsciously creeps into human and organizational decision-making. As explained there, the task demands a tireless Sisyphus who must harness industry's own quest for self-preservation to the huge rock that Sisyphus is fated to constantly roll up hill to improve safety standards. Much of Part Two on "The Role of the Regulator" discusses the quick arrival and the current implementation of a "Safety Case" type[66] of regulatory regime to U.S. shores. This regime seeks to embed a safety culture into every entity and individual operating offshore post-Macondo. Achieving this depends keenly on the relationship between the regulated industry and the regulator.

---

66. Many commentators state that the United States has now adopted a "Safety Case" regime similar to that used by offshore safety regulators in Norway and the United Kingdom. However, there are very significant differences between what the United States now requires and what a real Safety Case regime requires. Thus, the term "safety case" must be used with great caution. The United States now has rules requiring that offshore operators have a Safety and Environmental Management System (SEMS) in place to assess hazards and reduce risks. But, these SEMS rules do not equate to a Safety Case, as noted *infra* in Section II.C.1 and explained in depth in forthcoming Part Two. This Article will clearly distinguish the following terms: "SEMS" means the Safety and Environmental Management System now required in the United States in Subchapter S of 30 C.F.R. part 250 (2010). The "Safety Case" means the regulatory system adopted in the United Kingdom and Norway (although differences exist between these two jurisdictions). Reference to a general "safety management system" can mean either the U.S. approach or the U.K./Norway approach, depending on the context. Readers should be forewarned that much of the literature uses these three terms interchangeably, which makes it more difficult for readers to understand the different perspectives and opinions of experts and commentators in the area of safety management.

If these two parties are not able to carry out the task, more fatalities and ecosystem destruction await in the Gulf of Mexico, our Arctic offshore, along the east and west coasts should they be opened to leasing, and in many deepwater areas around the globe.

Before turning to forthcoming Part Two and its focus on regulation and the regulator, two other significant post-Macondo developments bear attention. The first is technology development; the second is the growth of global industry standards for both technology and for safety practices and procedures.

B. The Moratorium as a Technology Forcer

The Macondo disaster created a tsunami of invention in its wake. This section of the Article first describes the technology-forcing impetus of the Macondo spill, notably the rapid development of capping and containment systems and better blowout preventers. It then looks farther into the future at the projected technologies that the industry is developing. The envisioned future is that these technologies can make the offshore industry safer, regardless of the effectiveness of the regulatory regime adopted after Macondo. Finally, this section assesses the role of technology in the regulatory framework for offshore safety, including the use of "Best Available and Safest Technology," the U.S. regulatory standard for offshore operations since 1978. The Macondo disaster calls into question whether this standard was being implemented and how it will be implemented in the future.

1. The moratorium: Capping stacks and BOPs

The public watched with stunned amazement as one colorfully-named attempt after another—the Top Hat, the Junk Shot and the Top Kill—failed to staunch the flow from the Macondo well, despite the combined efforts of many companies in the industry.[67] So bereft was the industry in techniques for

67. *See* Editorial, *Image and Reality*, OIL & GAS J., May 10, 2010, at 16 (noting the "punishing image" of the offshore industry as unprepared and asking: "What is there about this accident that so thoroughly overwhelmed industry preparedness?").

effective oil spill cleanup, that BP called on the public to send ideas to its "skunk works" team of engineers to test out.[68] An industry, so proud of its technical ability, fell flat on its face while millions viewed the 24/7 video stream of the hemorrhaging well. Moreover, many of the operators in the Gulf had filed documents with the MMS stating that they had "proven technology" to deal with the consequences of well blowouts so that impacts from oil spills would be insignificant, should a blowout occur.[69] These statements turned out to be wishful thinking at best and outright deception at worst.

Nothing so concentrates the mind as a moratorium. On April 30, 2010, as oil washed ashore on coastal Louisiana, President Obama halted the start of any new offshore exploratory drilling until the causes of the Macondo disaster were better known and safeguards put in place (although existing exploratory drilling was allowed to continue).[70] He also directed the Secretary of

---

68. *Bag in a Cage Scoops Up Tar Balls as Super-skimmers Fail*, GREENWIRE, July 22, 2010, http://www.eenews.net/greenwire/ stories/93537 (describing how BP received more than 120,000 ideas, which were screened by a team of thirty engineers who then field tested twelve of them). A few worked better than anything the industry had invented to skim spilled oil. *Id.* The "A Whale," a huge oil tanker converted into a super-skimmer by a wealthy businessman, failed miserably, while a simple device, a mesh bag in a cage invented by an oil tanker captain, proved effective and was ultimately deployed by 593 ships. *Id.*

69. Mike Soraghan, *Industry Claims of 'Proven' Technology Went Unchallenged at MMS*, GREENWIRE, June 2, 2010, http://www.eenews.net/greenwire/stories/91665. Six companies' submitted documents to the MMS (the former federal regulator) that used nearly identical words indicating a blowout and spill were not likely to have a significant impact because of "industry wide standards for using proven equipment and technology for such responses." *Id.* One company stated in its MMS submission that there was no possibility of a spill due to the extent of MMS regulations imposed on the driller. *Id.*

70. *See Timeline of the Deepwater Horizon Oil Spill*, WIKIPEDIA, http://en.wikipedia.org/wiki/Timeline_of_the_Deepwater_Horizon_oil_spill#April (showing President Obama's action on April 30, 2010) (last visited Dec. 22, 2013). Obama's act preceded the official moratorium announced in a Notice to Lessees (NTL No. 2010-N04) that directed lessees to cease drilling and operations on all deepwater wells and announced that no new drilling permits for deepwater wells would be issued for six months. *See* U.S. MINERALS MGMT. SERV., NTL NO. 2010-N04, NOTICE TO LESSEES AND OPERATORS OF FEDERAL OIL AND GAS LEASES IN THE OUTER CONTINENTAL SHELF REGIONS OF THE GULF OF MEXICO AND THE PACIFIC TO IMPLEMENT THE DIRECTIVE TO IMPOSE A MORATORIUM ON ALL DRILLING OF DEEPWATER WELLS (2010), *available at* http://www.doi.gov/news/pressreleases/loader.cfm?csModule=security/getfile&PageID=33716&p=.pdf.

Interior to consult experts and report back within thirty days about what additional actions, if any, should be required to improve the safety of OCS operations.[71] The industry swung into action. Full-scale inter-company cooperation had already mobilized people and assets to assist BP in capping the gushing well.[72] By May 10, 2010, less than two weeks after the drilling moratorium was proclaimed, the offshore industry, under the auspices of the American Petroleum Institute (API), formed the Joint Industry Task Force (JITF) to recommend permanent improvements in two key areas: offshore operating procedures and offshore equipment.[73] Ultimately, four API task forces focused on four major areas of operation, the first two of which are technology-centered:

- Subsea Intervention and Containment
- Offshore Equipment
- Offshore Operating Procedures
- Oil Spill Response[74]

The JITF members were charged by the API with preparing immediately actionable recommendations on Gulf of Mexico deepwater drilling operations for the "30-day report" that would go to President Obama by May 28, 2010.[75] These recommendations were to: "(1) close any identified gaps in current blowout preventer operating practices, and (2) align industry standards with recognized industry best practices."[76]

---

71. *See* U.S. DEP'T OF THE INTERIOR, INCREASED SAFETY MEASURES FOR ENERGY DEVELOPMENT ON THE OUTER CONTINENTAL SHELF 1 (2010).

72. *Stopping the Spill: The Five-Month Effort to Kill the Macondo Well* 5–6 (Nat'l Comm'n on the Deepwater Horizon Oil Spill and Offshore Drilling, Working Paper No. 6, 2011) [hereinafter Nat'l DWH Comm'n WP6], *available at* http://permanent.access.gpo.gov/gpo2428/Containment%20Working%20Paper%2011%2022%2010.pdf; *see also* Paula Dittrick, *Oil Firms Across Industry Help With Oil Spill Response*, OIL & GAS J., May 17, 2010, at 30.

73. JOINT INDUS. TASK FORCE, WHITE PAPER: RECOMMENDATIONS FOR IMPROVING OFFSHORE SAFETY 1 (2010) [hereinafter JITF REPORT WHITE PAPER].

74. *See* JOINT INDUS. OFFSHORE OPERATING PROCEDURES TASK FORCE, JOINT INDUS. OFFSHORE EQUIP. TASK FORCE, JOINT INDUS. SUBSEA WELL CONTROL & CONTAINMENT TASK FORCE & JOINT INDUS. OIL SPILL PREPAREDNESS & RESPONSE TASK FORCE, EXECUTIVE SUMMARY 1 (2012) [hereinafter JITF EXECUTIVE SUMMARY].

75. JITF REPORT WHITE PAPER, *supra* note 73, at 1.

76. *Id.*; *see also supra* note 23 (explaining that "best" practices often means "good"

Longer term, within one year and after a thorough analysis determined the root causes of the Macondo blowout, the JITF was to provide a plan for revising API standards and federal rulemaking processes to reflect identified areas of improvement.[77]

By May 17, 2010, even before thirty days had passed, the JITF issued a "White Paper on Recommendations for Improving Offshore Safety" that focused on six key areas, including use of a Safety Case-type of process, requiring that two independent barriers exist across potential flow paths, and ensuring that BOPs have secondary control systems.[78] The JITF also proposed a Phase Two work group that would evaluate BOP shearing capabilities, the interface between BOPs and the remotely operated vehicles, called ROVs, that service subsea equipment, and the use of acoustic systems that would provide an alternate, redundant method of activating the BOP's shear rams from a portable control unit on the surface, apart from the drilling rig's primary activation controls.[79]

Meanwhile, the "30-day review" led President Obama to impose a six-month moratorium on deepwater exploratory drilling through November 30, 2010, the end of hurricane season in the Gulf.[80] On July 15, 2010, BP finally succeeded in placing a

---

practices).

77. JITF REPORT WHITE PAPER, *supra* note 73, at 1.

78. *Id.* at 3–5.

79. *Id.* at 11–13. Additionally, the Task Force recommended immediate changes in ROVs, the remotely operated vehicles that work as robots on subsea equipment. *Id.*

80. In response to the thirty-day report, Secretary Salazar issued a directive on May 28, 2010 to suspend exploratory drilling activities in water depths of 500 feet or more for six months. Press Release, U.S. Dep't of the Interior, Interior Issues Directive to Guide Safe, Six-Month Moratorium on Deepwater Drilling (May 30, 2010), http://www.doi.gov/news/pressreleases/Interior-Issues-Directive-to-Guide-Safe-Six-Mont h-Moratorium-on-Deepwater-Drilling.cfm. On July 12, 2010, the Secretary issued a second suspension, replacing the first one, applying to exploratory wells being drilled using subsea blowout preventers or BOPs located on a floating facility. Memorandum from Ken Salazar, Sec'y of the U.S. Dep't of the Interior, to Michael R. Bromwich, Dir. of the Bureau of Ocean Energy Mgmt., Regulation, & Enforcement (BOEMRE) 1 (July 12, 2010) [hereinafter Salazar Memo], *available at* http://www.doi.gov/ deepwaterhorizon/upload/Salazar-Bromwich-July-12-Final.pdf; *see also* Memorandum from Michael R. Bromwich, Dir., Bureau of Ocean Energy Mgmt., Regulation, & Enforcement, to Ken Salazar, Sec'y, Dept. of the Interior 32 (Oct. 1, 2010) [hereinafter

forty-ton capping device on the Macondo well to seal off the flow of oil and gas from the damaged subsea wellhead; the flow was stopped.[81] The capping stack was built on the fly with oilfield equipment taken off the shelves of suppliers.

With the well sealed, pressure mounted from the industry and oil-producing states on the Gulf Coast to end the moratorium early. By July 2010, it was clear that the moratorium was having an impact on the industry as some drilling rigs left the Gulf for foreign waters. Projected levels of U.S. crude production were falling at a time of both high gasoline prices and high unemployment.[82] The Obama administration was relentlessly and vociferously criticized by some industry players and politicians for imposing the moratorium.[83] Mid-term elections loomed on the near horizon.

Bromwich Memo] (on file with Author).

81. The capping device stopped the flow on July 15, 2010, eighty-seven days after the blowout. Nat'l DWH Comm'n WP6, *supra* note 72, at 32–34. On August 4th, the well was declared to be in "static condition" after drilling mud was inserted from the top of the well to fill up the well. *Id.* at 32–37.

82. Crude oil production in the Gulf of Mexico dropped about seventeen percent in fiscal 2011 because of the moratorium and permitting slowdown, but was expected to increase by fifty percent by 2020. Phil Taylor, *Safety Chief Focused on Permitting Predictability, Not Speed*, GREENWIRE, Mar. 16, 2012, http://www.eenews.net/greenwire/stories/1059961550.

83. Indeed, a coalition of companies filed suit against the moratorium even before the Macondo well had been capped. *See* Hornbeck Offshore Servs., L.L.C. v. Salazar, 713 F.3d 787, 790–92 (5th Cir. 2013) (summarizing the procedural history of the lawsuits). Hornbeck Offshore Services, joined by about forty other companies, brought suit in a Louisiana federal district court seeking an injunction against the May 28, 2010 moratorium, which became effective on May 30th through issuance of NTL-4, or Notice to Lessees No. 2010-N04. *Id.* at 787, 790. Judge Feldman of the federal district court in New Orleans granted the injunction to stay the moratorium on June 22, 2010. *Id.* at 790. Secretary Salazar filed for an immediate stay of the injunction, which the Fifth Circuit Court of Appeals denied. *Id.* at 791. Secretary Salazar then rescinded the May 28th moratorium directive and issued a second moratorium directive with a more thorough explanation of the emergency basis for doing so. *Id.* The plaintiff companies continued to litigate, now also seeking to hold Secretary Salazar in civil contempt for disobeying Judge Feldman's order by issuing the second moratorium that was arguably no different from the first one. *Id.* at 791–92. Judge Feldman found that the Secretary had acted in contempt of court. *Id.* at 792. Ultimately, in 2013, the Fifth Circuit Court of Appeals reversed the lower court's finding of contempt. *Id.* at 796. By that time, the moratoria were distant history. *See also* Laura Hall, *Calling on Experts: Industry's Perspective on the Regulatory Response to the BP Blowout*, 30 INT'L ENERGY L. REV. 95, 97–98 (2012)

In early September 2010, the industry's JITF project released its Draft Industry Recommendations[84] and the chairman of all four of the Joint Industry Task Forces announced publicly that "enough progress has been made to lift the drilling suspension now."[85] The Draft Reports documented areas where immediate action, near-term action, and longer-term research must be achieved to upgrade both equipment and procedures.[86] Virtually none of the listed actions had yet been completed, but the industry was committed to achieving them in the future.[87] The Obama administration lifted the moratorium in mid-October, six weeks before its scheduled end,[88] and Secretary of Interior Salazar announced: "We are open for business."[89]

(describing the lawsuit brought by Hornbeck Offshore Services and a second lawsuit brought by Ensco Offshore Company, which challenged the government's delay in issuing permits to drill).

84. JOINT INDUS. SUBSEA WELL CONTROL & CONTAINMENT TASK FORCE, DRAFT INDUSTRY RECOMMENDATIONS (2010) [hereinafter JITF SUBSEA DRAFT RECOMMENDATIONS]; JOINT INDUS. OIL SPILL PREPAREDNESS & RESPONSE TASK FORCE, DRAFT INDUSTRY RECOMMENDATIONS TO IMPROVE OIL SPILL PREPAREDNESS AND RESPONSE (2010) [hereinafter JITF OIL SPILL PREPAREDNESS DRAFT RECOMMENDATIONS].

85. Chevron Corp., *Chevron Demonstrates Leadership in Joint Industry Task Forces*, CHEVRON, http://www.chevron.com/news/currentissues/gulfofmexico/taskforce/ (last updated Sept. 2010) (statement of Gary Luquette, President of Chevron North America Exploration and Production, chair of the governing board overseeing the work of all four task forces and chairman of the American Petroleum Institute's Upstream Committee).

86. JITF SUBSEA DRAFT RECOMMENDATIONS, *supra* note 84, at 2–5.

87. *See, e.g.*, *id.* at 6–11 (providing a table that details the various work to be undertaken in the future); Chevron Corp., *supra* note 85.

88. *See* Bromwich Memo, *supra* note 80, at 32 (concluding that lifting the moratorium earlier than scheduled was a preferred option in a forty-five page internal memorandum to the Secretary of the Interior) (on file with Author). The memo found that new standards adopted by BOEMRE (mainly the SEMS rule) and the industry's commitment to containment capabilities and oil spill response initiatives justified lifting the suspension of drilling before November 30, 2010. *Id.* at 29, 32. The memo offered five options to the Secretary. *Id.* at 29–32. The Secretary had also requested a report by the Bipartisan Policy Center on progress made to date in offshore safety. BIPARTISAN POLICY CTR., BIPARTISAN POLICY CENTER RESPONSE TO THE OIL SPILL COMMISSION (2010). This Center's report provided additional political cover for the Obama administration to lift the moratorium without seeming to bow to the industry's demands. *Id.*

89. Peter Baker & John M. Broder, *U.S. Lifts the Ban on Deep Drilling, with New Rules*, N.Y. TIMES, Oct. 13, 2010, at A1.

At this time, by the industry's own account, much more work still needed to be done.[90] The industry's alacrity in recommending a suite of significant changes in both operating procedures and offshore equipment reflected its urgent need to "[restore] confidence in deepwater drilling operations."[91] That the JITF recommendations could be written so quickly and subsequently endorsed by an industry with a long tradition of opposing proposed regulations for greater safety and better equipment[92] reflects how deficient the Gulf of Mexico regulations had been; the recommendations were often practices already used in the North Sea offshore regimes or by some operators as a matter of global practice.

Many of the JITF recommendations, even those in draft reports, were promptly incorporated into Notices to Lessees by the new regulator, BOEMRE (now BSEE), and then into interim and final rules.[93] The industry was literally estopped to deny that these changes, many of which had been under consideration for years, were not necessary or were too costly. The new regulator, BOEMRE, seized the moment and institutionalized many new requirements through these Notices and through more formal notice-and-comment rulemaking.[94]

Thus, when the Gulf "opened for business" in mid-October, operators would face many new permit requirements in both

---

90. The Final Report of the Joint Industry Offshore Equipment and Operating Procedures Task Forces was not completed until March 13, 2012. JOINT INDUS. OFFSHORE OPERATING PROCEDURES TASK FORCE & JOINT INDUS. OFFSHORE EQUIP. TASK FORCE, FINAL REPORT ON INDUSTRY RECOMMENDATIONS TO IMPROVE OFFSHORE OPERATING PROCEDURES AND EQUIPMENT 1–3 (2012) [hereinafter JITF FINAL REPORT ON INDUSTRY RECOMMENDATIONS] (providing a timeline of safety and remedial measures taken by industry since the Macondo incident).

91. JITF EXECUTIVE SUMMARY, *supra* note 74, at 1–2.

92. NAT'L DWH COMM'N REPORT, *supra* note 32, at 71 (describing API's efforts to delay or thwart higher regulatory standards offshore).

93. *See* JITF FINAL REPORT ON INDUSTRY RECOMMENDATIONS, *supra* note 90, at 6–8 (depicting Table 2, showing JITF recommendations in one column and the related federal regulations and API recommended practices adopted in a second column).

94. *See, e.g.*, Oil and Gas and Sulphur Operations in the Outer Continental Shelf —Increased Safety Measures for Energy Development on the Outer Continental Shelf, 75 Fed. Reg. 63,346 (Oct. 14, 2010) (to be codified at 30 C.F.R. pt. 250) (providing the federal framework for BOEMRE's authority to issue Notices to Lessees and to institute rulemaking).

equipment and procedures used offshore, which their own expert Joint Industry Task Forces had endorsed. Many of these appeared in the new "Drilling Safety Rule," a largely prescriptive regulation that imposed tighter controls over the drilling process (such as requiring two independent barriers to flow paths) and new BOP inspection and testing requirements and ROV capabilities.[95] Operators were now required to obtain certification by a professional engineer of their drilling, casing, and cementing program to assure well integrity.[96] Independent third-party certification was required to show that the blind shear rams in the BOP were capable of cutting any drill pipe in the hole.[97]

An earlier Notice to Lessees, NTL-5, required that the Chief Executive Officer of every operating company certify on a one-time basis that his or her company was knowledgeable about and was in compliance with all existing offshore operating regulations and specifically listed four specific items requiring company review, including all well control equipment being used (especially BOPs and ROVs) and assurance that all personnel involved in well operations were properly trained and capable of performing their jobs under both normal and emergency conditions.[98]

---

95. *See* 30 C.F.R. pt. 250 (2013) (providing the federal regulations relating to oil, gas, and sulphur exploration operations, including regulations relating to BOP systems and ROV capabilities). Much of the Drilling Safety Rule makes mandatory the voluntary practices recommended in API Recommended Practice 65. *See, e.g.*, *id.* § 250.415(e)–(f) (requiring written statements from the operator/lessee about how it "evaluated the best practices included in API RP 65," as incorporated by reference in section 250.198, in its casing and cementing program).

Another Notice to Lessee, NTL-10, effective on November 8, 2010, directed operators to submit "a statement signed by an authorized company official stating that the operator will conduct all authorized activities in compliance with all applicable regulations, including the Increased Safety Measures for Energy Development on the Outer Continental Shelf rulemaking." BUREAU OF OCEAN ENERGY MGMT., REGULATION & ENFORCEMENT, NTL NO. 2010-N10, STATEMENT OF COMPLIANCE WITH APPLICABLE REGULATIONS AND EVALUATION OF INFORMATION DEMONSTRATING ADEQUATE SPILL RESPONSE AND WELL CONTAINMENT RESOURCES (2010) [hereinafter NTL-10], *available at* http://www.bsee.gov/Regulations-and-Guidance/Notices-to-Lessees/2010/10-n10.aspx.

96. 30 C.F.R. § 250.420(a)(6).

97. *Id.* § 250.416(e).

98. U.S. DEP'T OF THE INTERIOR MINERALS MGMT. SERV., NTL NO. 2010-N05,

Secretary Salazar had also made it clear in his moratorium orders that operators drilling in deep water would have to show that they had effective containment strategies if a blowout were to occur, although a full "build-out" might not be required to lift the ban on deepwater drilling.[99] After the Macondo well was capped, BOEMRE issued NTL-10, which alerted operators that BOEMRE would be evaluating whether they had submitted information showing their ability to access and deploy containment resources to respond to a blowout under existing regulations.[100] Operators would have to provide revised Oil Spill Response Plans that described their plans to use capping stacks, containment domes, subsea utility equipment, hydrate control, dispersant systems, risers, remotely operated underwater vehicles (ROVs with robotic arms and tools), and oil collection vessels.[101]

The path to permit approval to conduct new exploratory drilling would be considerably slower than in pre-Macondo days unless companies already had, or rapidly acquired, the technologies and processes in place to meet these new requirements and others that seemed likely to come.[102] Capping

---

INCREASED SAFETY MEASURES FOR ENERGY DEVELOPMENT ON THE OCS (2010) [hereinafter NTL-5], *available at* http://www.doi.gov/deepwaterhorizon/upload/FINAL-Safety-Measures-NTL.pdf. NTL-5 became effective June 8, 2010. *Id.*

99. Salazar Memo, *supra* note 80, at 4. Salazar noted that the industry had not yet contained the Macondo well and that industry executives admitted they were unprepared to stop deepwater blowouts effectively. *Id.* at 12–13. Therefore, it was reasonable to require the industry to develop effective containment methods, even though a "full build-out of this capability" may not be necessary or appropriate before resuming deepwater drilling. *Id.* at 4.

100. NTL-10, *supra* note 95, at 2.

101. *Id.*; *see generally* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-12-244, INTERIOR HAS STRENGTHENED ITS OVERSIGHT OF SUBSEA WELL CONTAINMENT, BUT SHOULD IMPROVE ITS DOCUMENTATION 10, 17 (2012) [hereinafter GAO-12-244] (describing the Department of the Interior's review of containment capability as part of its approval of applications for permits to drill).

102. Tom Fowler, *Deep Drills Set for Gulf*, HOUS. CHRON., Feb. 12, 2011, at A1. Michael Bromwich, the Director of BOEMRE, acknowledged that the pace of issuing shallow water permits for new offshore drilling had been slower than industry would like, and that no new permits for deepwater drilling had yet been issued, but noted that the latter was due to new requirements that the industry now had to comply with to avoid future incidents like the Deepwater Horizon blowout. *Id.*; *see also* U.S. House of Representatives: Natural Resources Committee, Chairman Hastings Statement on

and containment devices were the deepwater industry's tickets to drill. In February 2011, the newly formed Marine Well Containment Company (MWCC) unveiled its "sculpture in steel," a new capping device for deepwater wells that would be permanently stationed in the Gulf with a trained staff ready 24/7 to accompany the device to the site of a future blowout.[103] The MWCC was the rapid response of four major producers (ExxonMobil, Shell, ConocoPhillips, and Chevron) who contributed equally to an initial $1 billion fund as assurance that no future well would flow uncontrollably for eighty-seven days.[104]

A second group also formed quickly after the Macondo disaster: the Helix Well Containment Group (Helix).[105] Both

---

Lingering Impacts a Year After President Obama's Official Gulf Moratorium Lifted (Oct. 12, 2011), http://naturalresources.house.gov/news/documentsingle.aspx?DocumentID=263903 (stating that even after the official moratorium was lifted, it was another four-and-a-half months before any permits were issued). Some industry members complained that the moratorium had simply been replaced with a "permitorium." Fowler, *supra* note 102, at A1. On the other hand, environmental groups accused the Obama administration of allowing politics to triumph over science because permits were issued before testing the containment systems under realistic conditions. *See* Alan Kovski, *Environmental Attorney Says Lawsuits Likely After New Deepwater Drilling Permits Issued*, 42 ENV'T REP. 944 (Apr. 29, 2011).

103. *See* Tom Fowler, *Deep-Sea Heavy Hitter*, HOUS. CHRON., Feb. 18, 2011, at D1 (discussing MWCC's plans to station forty to fifty employees and equipment throughout the Gulf for quick deployment in an emergency). The MWCC is a stand-alone company whose ownership and voting rights are split evenly among its ten members. GAO-12-244, *supra* note 101, at 7–16, 20–25. Its members are the largest operators in the Gulf of Mexico and accounted for about seventy percent of all deepwater wells drilled in the Gulf from 2000 to 2009. *Id.* at 10. The capping device utilized by MWCC is part of a larger containment system that includes flexible risers to bring oil captured by the capping device to the surface of the sea where specially designed vessels can contain it. *Id.* at 11–13. This GAO report contains photos and graphics about the containment capability available in the Gulf. The report warns that well blowout response capability is more limited in Alaskan waters where drilling has been authorized but hazards due to ice, freezing temperatures, and lack of daylight create unique difficulties for offshore drilling. *Id.* at 21–25.

104. Angel Gonzalez, *Oil Firms to Deploy New Containment Device for Deepwater Spills*, WALL ST. J., Apr. 15, 2011, http://online.wsj.com/article/SB10001424052748704628404576265354207359680.html.

105. *See* GAO-12-244, *supra* note 101, at 9–10. The Helix Group was created on the foundation of the services of the company whose equipment was used to cap the Macondo well. *Id.* It is a consortium of twenty-four operators, representing about eighty percent of

MWCC and Helix now offer services to non-members on a fee basis and their members also commit to mutual aid agreements to assist members that experience blowouts.[106] Helix is building and will deploy more capping stacks to other major offshore oil centers globally.[107]

Containment capacity has continued apace. BP unveiled its own personal five-hundred ton containment device in May 2012, designed to fit into five huge cargo planes and two Boeing 747s to be flown anywhere in the world.[108] It is the size and shape of a townhouse and includes mechanical pincers and saws to cut through broken well equipment and remove debris so that the capping stack can be put on the damaged well.[109] The kit is said to be able to reach any of BP's well sites within ten days.[110] Total and Chevron have built containment devices for deepwater operations in Africa and Brazil, respectively.[111] The North Sea operators and regulators have adopted a similar framework for capping and containment in that area.[112]

Blowout preventers (BOPs) have also been remade. Put simply, they were found not to be the "fail-safe" device that many thought they were.[113] In retrospect, that anyone in the

---

all deepwater operators in the Gulf of Mexico. *Id*.

106. *Id.* at 10.

107. Nathanial Gronewold, *Offshore Drilling: New Day Dawns in Gulf of Mexico as Activity Nears Pre-Spill Levels*, EE NEWS, Aug. 20, 2012, http://www.eenews.net/energywire/stories/1059968980/print.

108. Angel Gonzalez, *Here Be Oil Plugs: Spill Containment Kits Go Global*, WALL ST. J., May 9, 2012, at B11.

109. *Id.*

110. *Id.*

111. *Id.*

112. *See Offshore Safety: Getting It Right Now and for the Long Term* 2, INT'L ASS'N OF OIL & GAS PRODUCERS (OGP), http://www.OGP.org.uk/index.php/download_file/view/404/2983 (last visited Dec. 22, 2013) (discussing the availability of the first of four capping and dispersant systems to be provided by Oil Spill Response Limited (OSRL), all of which are designed to be readily transportable by sea or air from one of four OSRL-operated strategic bases in Europe, Africa, South America and Asia Pacific); *see also* Simone Sebastian, *Spill Response*, HOUS. CHRON., June 8, 2011, at D1 (describing the 106-ton capping stack sited in Aberdeen, Scotland).

113. In its Summary Findings, the National Academy's report on the Macondo well states that "The BOP system was neither designed nor tested for the dynamic conditions" that existed in the deepwater Gulf and the BOP system was "not consistent

industry or government thought they were fail-safe is incomprehensible in light of the failure rates reported in pre-Macondo studies commissioned by the Department of the Interior.[114] The final forensic report on why the BOP failed concluded that the drill pipe in the well bore was pushed to the side as the surge of gas and oil flowed up the well.[115] The BOP shear rams[116] closed, but could not seal off the flow because of the buckling of the drill pipe inside the well.[117] The report recommended that the industry redesign BOPs and conduct many new tests to assure that future BOPs can seal off a well in light of the multiple issues discovered by the forensic study of the Macondo BOP.[118] In other words, if future BOPs are to be "fit for purpose" under conditions that arise in deepwater

---

with a high-reliability, fail-safe device." NAT'L ACAD. OF ENG'G & NAT'L RESEARCH COUNCIL, FINAL REPORT, MACONDO WELL DEEPWATER HORIZON BLOWOUT: LESSONS FOR IMPROVING OFFSHORE DRILLING SAFETY 6 (2012).

114. *See, e.g.*, WEST ENG'G SERVS., INC., MINI SHEAR STUDY FOR U.S. MINERALS MANAGEMENT SERVICE 3–4 (2002), *available at* http://www.bsee.gov/Research-and-Training/Technology-Assessment-and-Research/tarprojects/400-499/455AA.aspx. In this study commissioned by the U.S. Minerals and Management Service in 2002, to test BOP shear rams on new rigs, West Engineering found that only three of the six rigs effectively tested had BOPs that were able to successfully shear pipe and seal the well under conditions approximating those found in the real world, a failure rate of fifty percent. *See id.* While the study included fourteen rigs, seven opted to forgo capability testing and another test produced inconclusive results. *Id.* The study concluded that the data set painted a "grim picture" of the lack of preparedness in the industry to shear and seal a well as the last defensive barrier against a blowout. *Id. See also* Jennifer A. Dlouhy, *Feds Lay Out Plans for New Blowout Preventer Mandates*, FUEL FIX (May 22, 2012, 9:10 AM), http://fuelfix.com/blog/2012/05/22/feds-lay-out-plans-for-new-blowout-preventer-mandates (quoting Roger McCarthy, a member of the National Academy of Engineering, that "the industry had plenty of warnings" that blowout preventers had problems shearing even under "benign conditions" before the 2010 oil spill). Industry had long known that the BOPs in use could not shear through drill pipe at the joint ends where the two pieces of pipe screw together and are doubly thick. Thus industry appears to have accepted the odds that a BOP's shear rams would not have to close on the pipe joints that make up three feet of each thirty-foot piece of pipe.

115. DET NORSKE VERITAS, FINAL REPORT FOR U.S. DEP'T OF INTERIOR, BOEMRE, FORENSIC EXAMINATION OF DEEPWATER HORIZON BLOWOUT PREVENTER 5 (2011).

116. *See id.* at 14–16 (explaining that the blind shear rams on BOPs are "the only set of rams designed to cut drill pipe and seal the well in the event of a blowout").

117. *See id.* at 5–6 (identifying a number of contributing secondary causes as well).

118. *See id.* at 177–80 (listing a number of areas where further study could be performed to improve industry safety).

drilling, much more development, design, and testing must take place.

BSEE has not yet issued final regulations to assure the reliability of BOPs as a last line of defense "when all hell is breaking loose."[119] However, it seems clear that a new regulation will require that BOPs cut whatever is in their way, even if the rams close on a drill pipe's joint section. Maintenance of BOPs will become like that done on jet engines—more demanding and more frequent.[120] The next generation of BOPs will have to be self-revealing about temperature readings, flow information, and other data, so operators know what is going on inside the well bore.[121] Engineers had spent weeks trying to determine the state of the valves inside the failed Macondo BOP because no indicator mechanism had been built into the device.[122]

The new regulations may require the use of two sets of blind shear rams, but many operators are already using two sets to increase the odds of cutting through drill pipe no matter what equipment is inside the pipe.[123] Orders for new BOPs have surged.[124] Drillers are doubling up on BOPs to reduce maintenance delays and cut drill times, an important consideration when renting a deepwater drill rig that costs more

---

119. Dlouhy, s*upra* note 114 (quoting Roger McCarthy).

120. *Id.*

121. Jennifer A. Dlouhy, *Updating Rig Equipment Focus of Spill Investigation*, HOUS. CHRON., Dec. 27, 2010, at F1. Secretary of Energy Steven Chu (a physicist) was shocked to discover that there was no clear indicator of whether the rams on a BOP had operated correctly. *Id.* The sole pressure gauge on the Deepwater Horizon well was accurate to plus or minus 400 psi (pounds per square inch). *Id.* The government required BP to install gauges accurate to plus or minus two psi on the capping stack used to stem the well's flow. *Id.*

122. NAT'L DWH COMM'N REPORT, *supra* note 32, at 137–38.

123. Jennifer A. Dlouhy, *Regulatory Revival Near for U.S. Energy Industry*, HOUS. CHRON., Jan. 6, 2013, http://www.houstonchronicle.com/business/energy/article/Regulatory-revival-near-for-U-S-energy-industry-4169100.php.

124. David Wethe, *Rig Shortage Means Record $4.5 Billion Blowout Binge: Energy*, BLOOMBERG, Aug. 10, 2012, 3:35 PM, http://www.bloomberg.com/news/2012-08-09/rig-shortage-means-record--billion-blowout-binge-energy.html [hereinafter Wethe, *Rig Shortage Means Blowout Binge*]; *see also* Dennis Denney, *Reciprocating Submersible Pump Improves Oil Production*, J. PETROLEUM TECH., July 2012, at 92–94 (containing technical summaries of the increased reliability features of BOPs).

than $600,000 a day.[125] Half of the new rigs under construction will carry a second BOP that can be lowered while maintenance is done on the first BOP.[126] Retrofitting older rigs to accommodate two BOPs is a booming business.[127] Oilfield equipment suppliers see market opportunities for upgraded equipment as the industry becomes mindful of government and public scrutiny of safety.[128] Halliburton has built an Advanced Perforating Flow Lab, which allows it to reproduce conditions found in deepwater fields, so equipment for HPHT wells can be realistically tested.[129]

Maersk's newest offshore drilling rig can be hit by a rogue wave that knocks it up to 360 feet off target and still continue to drill safely.[130] Statoil will use this rig to drill in ultra-deep waters of the Gulf.[131] Daily tests check that the BOP is operational, with secondary controls installed in case the main BOP fails.[132] If the secondary equipment fails, the Maersk rig has a third one on board to swap out.[133] A fourth one is

---

125. Wethe, *Rig Shortage Means Blowout Binge*, *supra* note 124.

126. *Id.* A spokeswoman for a major drilling contractor, Rowan Companies Plc., said that having two BOPs is the "new standard." *Id.* She continued: "We felt it was something our customers liked, given the increased demand for safety and decreasing risk tolerance by regulators and operators in general." *Id.*; *see also* Jeannie Kever, *Noble Energy's New Drillship Headed for the Mediterranean*, FUELFIX (Sept. 27, 2012, 1:34 PM), http://fuelfix.com/blog/2012/09/27/noble-energys-new-drillship-headed-for-the-mediterranean (comparing dual BOPs to airbags and seatbelts, arguing that no company can afford to go without both of them).

127. Wethe, *Rig Shortage Means Blowout Binge*, *supra* note 124.

128. *See* Dlouhy, *supra* note 114 (noting that GE now sells rams capable of cutting through tool joints as evidence of industry response to the Deepwater Horizon disaster).

129. Jeannie Kever, *Halliburton Lab Will be Going to Extremes*, HOUS. CHRON., Oct. 11, 2012, http://www.houstonchronicle.com/business/energy/article/Halliburton-lab-will-be-going-to-extremes-3937156.php.

130. Nathanial Gronewold, *Statoil Stresses Safety as It Pushes Out Into Gulf*, ENERGYWIRE, Mar. 7, 2012, http://www.eenews.net/energywire/stories/1059961000/print. At a day rate of about $1 million, costs of drilling will be higher, but downtime for BOP maintenance and failures should be minimized.

131. *See id.* The Maersk rig can operate in 10,000 feet of water and drill to 40,000 feet deep (about 7.5 miles). *Id.*

132. *Id.*

133. *Id.*

positioned onshore in a warehouse.[134] This four-layered system of defense is what Statoil considered necessary to put the U.S. government and public at ease with its deepwater offshore expansion plans in the Gulf.[135] Many more examples of the technology-forcing impact of the Macondo disaster exist.[136]

2. The future vision of technology

In the longer term, the industry will replace humans with robots.[137] Norway's Robotic Drilling Systems is designing robots to take over the repeatable tasks now done by roughnecks and pipe handlers.[138] It has contracted with NASA to learn the secrets of the Martian explorer, the Curiosity Rover.[139] The company predicts that fully automated rigs will someday travel to drill sites guided by satellite coordinates and construct a fourteen-story steel tower, drill wells, and then move on to the next job.[140] Wave-powered and solar-powered robots already roam the world's oceans autonomously for as long as a year, acquiring data on ocean currents crucial to deciding where to site an offshore rig.[141] They can also perform seismic monitoring and detect seepage from oil drilling.[142] Shell is developing "flying nodes," small aquatic drones that will swim in schools and collect seismic data from the seafloor.[143] RPSEA, the

134. *Id.*

135. *Id.*

136. *See* Paula Dittrick, *Industry Seeks New Offshore Rigs, Longer Onshore Laterals in Shale*, OIL & GAS J., Feb. 14, 2011, at 16 (increasing demand by oil companies for more advanced rigs stems from need "[to] fulfill increasingly stringent deepwater drilling safety standards and regulations").

137. David Wethe, *Transformers in the Oil Patch*, BLOOMBERG BUSINESSWEEK, Sept. 3–9, 2012, at 48 [hereinafter Wethe, *Transformers*] (describing a ten-foot tall robot with a jointed arm that can extend ten feet and use fifteen interchangeable hands, made by Robotic Systems).

138. *Id.* at 49.

139. *Id.* at 48.

140. *Id.*

141. *About the Wave Glider*, LIQUID ROBOTICS OIL & GAS, http://www.lrog.com/the-wave-glider/about.html (last visited Dec. 22, 2013).

142. *Id.*

143. David Wethe, *The Oil Industries Race to the Bottom*, BLOOMBERG BUSINESSWEEK, June 3–9, 2013, at 51, 52 [hereinafter Wethe, *Race to the Bottom*].

Research Partnership to Secure Energy for America, is working on a next-generation autonomous robot drone that can spiral around an aging platform and spot anomalies in a mere six days.[144] The head of the new subsea engineering program at the University of Houston envisions "underwater oil cit[ies] overseen by swimming robots" in the not-too-distant future.[145]

Many in the industry are looking to eliminate human error by eliminating humans in the drilling process.[146] Field tests of Schlumberger's Drilling Advisor System reported that drilling with a computer in control "easily outperformed" human control.[147] Computers can manipulate data on fifteen factors, while a human driller can only handle about five factors.[148] While this technological invention aimed primarily at reducing costs of drilling rather than increasing safety in response to Macondo, the company reported the unexpected benefit of a sharp drop in equipment failures.[149]

The industry envisions a surge of unmanned facilities by

---

144. Stephen Rassenfoss et al., *Industry Focuses on Operational Integrity, Safety Issues at OTC*, 64 J. PETROLEUM TECH. 66, 69 (2012) [hereinafter Rassenfoss et al., *Industry Focuses*].

145. Wethe, *Race to the Bottom*, *supra* note 143, at 52.

146. Wethe, *Transformers*, *supra* note 137, at 48 (stating Apache Corp., National Oilwell Varco, and Statoil are all looking for ways to drill without workers because the Macondo disaster changed attitudes against automation).

147. Rassenfoss, *Drillers Find Themselves in Tricky Spot*, *supra* note 52, at 48–49. The computer-controlled drill bit dug into the formation fifty-three percent faster than when a human operator made decisions. *Id.* at 48. In addition to the increased speed, computer control also led to a decrease in equipment breakdowns. *Id.* at 48–49.

148. *Id.* at 49.

149. *Id.* at 48–49. Not all oil companies share the view that computerized controls and automated drilling are the key to success. *Id.* ExxonMobil achieved an eighty percent increase in drilling productivity since 2005 without using automated drilling. *Id.* at 52. ExxonMobil instead increased productivity by relying on drill crews to closely observe operations to look for ways to do things better and then applied those observations to change key pieces of hardware. *Id.* In its opinion, using a computer can lock in a practice that does not continuously improve performance by identifying dysfunctions. *Id.*; *see also* Steven Rosenbush, *A Novel Ship Extends Shell's Reach*, WALL ST. J., Jan. 3, 2012, http://online.wsj.com/article/SB10001424127887323874204578217643344492014.html (describing Shell Oil's project of interviewing legendary drillers to try and capture their judgment and intuition in algorithms that can be used in automated drilling).

2030.[150] A company's best technical experts will be working from home base, looking after facilities around the world.[151] Drillers will be like pilots and "manage the flight" rather than actually fly the plane, which is done by the autopilot system.[152] Computer-controlled devices can execute certain procedures better than a person because human reaction times are too slow to make constant, small adjustments.[153] The driller's role will be to accurately program the system, monitor progress, anticipate problems, and intervene in an emergency.[154] Drilling technology will parallel the innovations proceeding apace in self-driving cars.[155]

3. Assessment of technology's role

Government regulation can play a significant role in spurring the invention and use of better and safer technologies and more effective oil spill response. Many of our

150. Rassenfoss et al., *Industry Focuses*, *supra* note 144, at 67.

151. "There is absolutely no reason why you couldn't operate an LNG facility in Australia from Houston," said Eamon McCabe of Woodside Energy at the May 2012 Offshore Technology Conference in Houston, Texas; he anticipates that its LNG projects coming on stream in 2017–2020 will be capable of operating this way by 2030. *Id.*

152. *See* Rassenfoss, *Drillers Find Themselves in Tricky Spot*, *supra* note 52, at 52–53 (discussing drilling consultant John Thorogood's research on the similarities between drilling and the airline industries, and how drilling companies can learn and benefit from the airlines' move toward automation).

153. *Id.* at 48–49, 52.

154. *See* Kristen Ulveseter & Peder Andreas Vasset, *The Next Generation Safety Approach Post Macondo*, OFFSHORE UPDATE, No. 2, at 46, 47 (2012), *available at* http://www.dnv.com/binaries/offshoreupdate2_2012_tcm4-525562.pdf (explaining that the driller will still have a role to play, but that human intervention to activate the BOP may be replaced with automation).

155. *See* John Markoff & Somini Sengupta, *Drivers with Hands Full Get a Backup: The Car*, N.Y. TIMES, Jan. 12, 2013, http://www.nytimes.com/2013/01/12/science/drivers-with-hands-full-get-a-backup-the-car.html?pagewanted=all&_r=1& (explaining that digital electronic stability control systems in cars are superior to humans in attentiveness and have already automatically reacted to save lives; new digital sensor systems already allow a car to detect other cars around corners where drivers cannot see); *Look, No Hands*, ECONOMIST, Sept. 1, 2012, at 17 (describing vehicles that warn the driver if the car starts to drift, as well as other autonomous driving technologies which aid the human operating the vehicle); *Clean, Safe and It Drives Itself*, ECONOMIST, Apr. 20, 2013, at 11 (quoting a co-founder of Google who predicts driverless cars will be ready for sale within five years).

pollution-control statutes seek to ratchet up industry performance by requiring more advanced control technologies for new plants than is required for existing ones.[156]

The current statutory framework for U.S. offshore leasing was constructed in 1978 at a time of great upheaval in the Mideast oil markets that had raised the price of crude oil imports to record levels.[157] The 1978 amendments to the Outer Continental Shelf Lands Act (OCSLA) aimed to increase domestic offshore leasing and production, but with strong safeguards, one of which required using the "best available and safest technologies" found by the Secretary of Interior to be "economically feasible wherever failure of equipment would have a significant effect on safety, health or the environment."[158] Only if the Secretary determined that the "incremental benefits are clearly insufficient to justify the incremental costs of utilizing [the best and safest] technologies," was something less than the best to be used.[159]

The Macondo disaster clearly calls into question whether this provision was being implemented offshore for blowout preventer technology. As already noted, a number of technical studies had questioned the adequacy of BOPs, especially when used in HPHT wells. Yet regulators and the industry alike ignored the warnings that BOPs needed more development, design, and testing for deepwater operations. In addition, while the industry may be lauded for its rapid response in building capping and containment systems, it is clear that had laws or industry's own risk management analyses and performance standards required such systems earlier, the massive Gulf oil

---

156. DAVID R. WOOLEY & ELIZABETH M. MORSS, CLEAN AIR ACT HANDBOOK § 2 (20th ed. 2013); *see also* Am. Coatings Ass'n v. S. Coast Air Quality Dist., 278 P.3d 838, 849 (Cal. 2012) (upholding a technology-forcing rule based on technologies that do not currently exist but that are expected to exist by the compliance deadline).

157. Outer Continental Shelf Lands Act Amendments of 1978, Pub. L. No. 95-372, 92 Stat. 629 (1978); U.S. COMM'N ON OCEAN POLICY, AN OCEAN BLUEPRINT FOR THE 21ST CENTURY: FINAL REPORT 52 (2004) (explaining the history of the Outer Continental Shelf Lands Act and its amendments), *available at* http://govinfo.library.unt.edu/oceancommission/documents/full_color_rpt/000_ocean_full_report.pdf.

158. Outer Continental Shelf Lands Act Amendments of 1978, 43 U.S.C. § 1347 (2012).

159. *Id.*

spill could have been contained in a far shorter time period. Stopping the Macondo well's flow did not require a breakthrough invention; it was capped using off-the-shelf technology.

The Secretary of Interior has the statutory authority needed to push the industry to use the "best and safest" technology. Indeed, the Macondo incident has opened up profitable markets for safer equipment. Still, one can expect the industry to oppose the required use of technologies that may cost more but offer greater redundancy or safety. Sparkless tools are commonly used in Norwegian waters, but have been slow to cross the Atlantic because of their higher costs, despite the many fires on offshore facilities and the significant fatality rates among workers in the Gulf.[160] Acoustic transponders that can activate a BOP from an offsite location are also used in the North Sea, but have been opposed by the industry in the United States.[161]

BSEE's role as a safety regulator is critical to assuring that the statutory mandate of "best and safest" is honored, both in the Gulf and in the Arctic, where huge equipment challenges face operators in the sub-zero temperatures and darkness of the north. Part Two of this Article discusses this critical role for BSEE and recommends actions that must be taken to assure that new performance standards for industry equipment are adopted with proper regulatory review.

Two major cautions arise in assessing the role of technology, even if the best and safest equipment is used offshore. First, a

---

160. *See* Loren Steffy, *Tools Without Sparks Could Save Lives Offshore*, HOUS. CHRON., Dec. 5, 2012, at D1. The Steffy article was written after three workers on an offshore platform operated by Black Elk used a torch while doing routine maintenance. *Id.* The torch ignited vapors in the line and the fire then spread and caused two connected oil tanks to blow up. *Id.* After Macondo, BP began using sparkless tools in the Gulf. *Id.* Sparkless tools that reduce the risk of explosions on rigs where gas releases often occur, have been used in the North Sea for a decade under Norway's more stringent safety regime. *Id.* The new SEMS rule in the Gulf should force operators and drilling contractors, if asked by an auditor or inspector, to explain why they are not using sparkless tools in their operations, even if prescriptive regulations do not require this practice.

161. Russell Gold et al., *Oil Well Lacked Safeguard Device—Officials Say Leak Grows Fivefold*, WALL ST. J., Apr. 29, 2010, http://online.wsj.com/news/articles/SB10001424052748704423504575212031417936798.

focus on fool-proof hardware and software can lull the industry into the very complacency that is a root cause of high-consequence accidents. It is easier for an industry steeped in engineering, math, and technical prowess to manufacture a gizmo or develop an algorithm than it is to embed a safety culture into the minds of thousands of individual workers and to implement the training and procedures that will result in ever-mindful decision-making by every person at every level of daily work activity. A process safety management system can exist on paper, but it will accomplish little unless it is used by managers and workers alike. A safety system is not like an autonomous drone that can be turned on at the switch of a button. In fact, the more that automated systems are used, the less experience a worker has in actually responding to an emergency situation, except in simulated training sessions.

Second, both hardware and software malfunction. Relying on more complex technical and automated systems demands better and more frequent testing protocols as part of safety management.[162] The systems can malfunction because of design flaws that go undetected until the equipment is used for a period of time.[163] The "impossible" fires that developed in the Boeing Dreamliner's new lithium batteries are an example.[164] The

---

162. *See, e.g.*, Magne Torhaug, *Risk Management After Deepwater Horizon*, OFFSHORE UPDATE, No. 2, at 4 (2010) (describing how risks due to extrapolation of design principles "typically occur when engineers alter the dimensions of their designs," using the example of heavier BOPs which may cause the Eigen frequency of a floating rig/riser/BOP/wellhead combination to be close to typical surface wave frequencies, which can lead to wellhead fatigue challenges).

163. *See* Nathaniel Popper, *Errors Mount at High-Speed Exchanges in New Year*, N.Y. TIMES, Jan. 11, 2013, at B1 (citing a programming error in a stock exchange platform that caused 435,000 errors before it was discovered four years later).

164. In fact, the fires were not "impossible" to plan against. The lithium ion batteries in Boeing's 787 Dreamliner were not subjected to the more stringent testing recommended by the Federal Aviation Authority's (FAA) standard setting organization. Andy Pasztor, *Air Safety Group Urged Tougher Battery Tests*, WALL ST. J., Jan. 28, 2013, at A1. The stricter safety testing rules were issued in 2007, but the FAA and Boeing decided that applying them to the Boeing 787 at that time would unduly delay its production. *Id.* The now-adopted, industry-wide 2007 standard requires testing to ensure that the batteries will not burn even if all backup circuits fail. *Id.* The Boeing 787's standards assumed that this possibility was "extremely remote" and therefore did not test for it. *Id.* In a recent report, the GAO concluded that FAA officials cannot keep pace with industry changes and cannot easily understand the standards that they are to

executive vice president of Shell Oil in charge of large projects and technology stated in May 2013 that the four-fold increase in petroleum mega-projects in the last decade had seriously challenged the engineering industry.[165] Their scale and complexity created "potential safety problems" that forced companies to delay completion and incur increased costs.[166] The projects' "large and demanding" strains on engineers resulted in poorly designed components and lack of quality in contractors' assigned work.[167]

---

approve. Andy Pasztor, *Dreamliner Prompts New Look at Aircraft Safety Reviews*, WALL ST. J., May 6, 2013, at B3. Airline industry executives on the other hand, have argued for greater industry control over certification. *Id.* Boeing has acknowledged that its testing underestimated battery risks by not including the possibility of manufacturing flaws. Matthew L. Wald & Jad Mouawad, *Boeing Acknowledges Tests Underestimated Battery Risks in 787*, N.Y. TIMES, Apr. 24, 2013, at B3. The FAA had approved the batteries based largely on tests and analysis done by Boeing rather than by independent agencies. Andy Pasztor, *Boeing Had Say on Dreamliner Tests*, WALL ST. J., Apr. 24, 2013, at B3. All Nippon Airways had told Boeing about problems it had with the batteries, but these problems were not required to be reported to regulators because no flights had to be cancelled. Christopher Drew et al., *Boeing Battery Led to Concern Before Failure*, N. Y. TIMES, Jan. 30, 2013, at A1. The National Safety Transportation Board has concluded that the FAA accepted Boeing's test results without properly assessing the risks independently. Christopher Drew & Jad Mouawad, *U.S. Official Says Tests by Boeing Fell Short*, N.Y. TIMES, Feb. 8, 2013, at B1.

The Boeing 787 battery story clearly parallels many of the findings about government and industry failure in the Macondo disaster. It also highlights the problems that agencies face when new and complex technologies require assessment and testing. *See* Loren Steffy*, Offshore Drillers Could Learn from Aviation*, HOUS. CHRON., Jan. 30, 2013, at D1 (explaining that safety experts view incidents like the "impossible" fires on Boeing aircraft as "risk indicators" that may suggest a bigger problem is at hand). Boeing is now attracting customers by pitching an enhanced version of its 777 jet rather than pushing them to buy the new 787 Dreamliner. *See* Christopher Drew*, Jet Makers Avoid Risk by Redoing Old Models*, N.Y. TIMES, May 6, 2013, at B1. Airbus has dropped its plans to use lithium ion batteries in a new A350 jet because the risk is too high. *Id.*

It should be noted that passenger fatalities in accidents on U.S. airlines have declined significantly in the last ten years because of advances in navigation technology, the detection of wind shears, redundancy in engines and many other improvements. Jad Mouawad & Christopher Drew, *Airline Industry at Its Safest Since the Dawn of the Jet Age*, N.Y. TIMES, Feb. 12, 2013, at A1. The FAA and pilot associations have succeeded in reducing accident rates by adopting several voluntary programs, like intense analysis of near miss data and flight recording information. *Id.*

165. Jennifer Dlouhy & Zain Shauk, *Meeting of Minds Behind Closed Doors*, HOUS. CHRON., May 9, 2013, at M1.

166. *Id.*

167. *Id.*

Systems can also go haywire because of cyber-security attacks from hostile intruders. Already, the malicious installation of malware into Saudi Aramco's 30,000 computers disrupted its operations.[168] Individual offshore rigs have also been attacked by cyber-terrorists, causing shutdowns of the targeted facilities.[169] While federal regulations appear to require that companies ensure that their safety systems are secure against malware, many rig operators do not seem to have checked their digital files, and most companies that perform independent certifications of safety systems do not address computer viruses or information technology (IT) security protocols, reports a manager for Lloyd's Register Drilling Integrity Services.[170] In his view, the biggest risk to offshore operators is now their information technology systems, not their mechanical systems.[171]

Thus, all the booths showing new equipment and software at the Offshore Technology Conference in Houston every May are not a substitute for implementing better safety practices by changing human behavior.[172] Organizational and human factors constitute up to eighty percent of the causes of major accidents.[173] Dazzling as the new capping stack equipment may be, the most difficult stages of capping and containment are training workers in response protocols, maintaining their readiness, and coordinating the logistics of assembling response

---

168. Zain Shauk, *Malware Dangers on Rigs a Threat to Lives*, HOUS. CHRON., Apr. 29, 2013, at A1.

169. *See id.* (stating that malware on new drilling rig infected computers controlling the BOP, forcing the rig to shut down for nineteen days).

170. *Id.*

171. *Id.* The Department of Homeland Security reported that forty percent of all online cyberattacks were aimed at energy companies in 2012. *Id.*; *see also* Robert B. Schwentker, *Cyber Warfare—The New Reality*, 52 INFRASTRUCTURE, no. 3, 2013, at 1 (detailing dangers of cyber warfare from a business perspective).

172. Zain Shauk, *Exxon Mobil Leader Knows the Risks*, HOUS. CHRON., Apr. 4, 2013, at D1. ExxonMobil is targeting its employees' computer habits because of the "extraordinary" importance of preventing disasters and safety risks from infected computers. *Id.* The CEO stated: "At the end, it all comes back to people, regardless of how great the technology is." *Id.*

173. DET NORSKE VERITAS, KEY ASPECTS OF AN EFFECTIVE U.S. OFFSHORE POLICY 4 (2010) *available at* http://www.dnv.com/binaries/1008-001%20offshore%20update_key%20aspects_tcm4-430982.pdf.

crews and equipment to the site of a blowout. A "sculpture in steel" sitting in the Houston Ship Channel is just an interesting piece of metal.

Once again, as the previous section on complacency concluded, changing human patterns of behavior and implementing new procedures are the most important factors in improving offshore safety. The work of the JITF task forces on offshore procedures is critical to greater safety offshore, perhaps even more critical than the work of the task forces on equipment. In proposing adoption of the SEMS rule, BOEMRE (now BSEE) pointed to an analysis of ten years of data from 2000 to 2009 showing that human factors, and not equipment failure, were most often the cause of both small and large incidents offshore.[174] In other words, it is not hardware standards that most need addressing; it is human and organizational failure. That is the purpose of the SEMS rule, discussed in the next section.

C. Best Practices Go Global: Safety Management Systems

> *The Macondo disaster is a "laboratory of learning" for the global industry.*
>
> *-Ken Salazar, Secretary of the Interior 2010*[175]

Global technology, global performance standards, and global training: all of these are riding the crest of large waves in the wake of the Macondo disaster. This section of the Article describes the globalization of regulatory "best practices" that transcend national boundaries.

1. Safety management systems come to U.S. waters

While Secretary Salazar is correct about the Macondo disaster being a global lab of learning, the lessons being exported out of the Gulf of Mexico were largely about how to

174. Safety and Environmental Management Systems, 75 Fed. Reg. 63,610, 63,612 (Oct. 15, 2010) (to be codified at 30 C.F.R. pt. 250).

175. Nick Snow, *US Agencies Treated Spill as Catastrophe from Outset, Panel Told*, OIL & GAS J., Oct. 4, 2010, at 31, 34 (quoting Secretary Salazar's testimony to the National Commission on the DWH Spill, the bipartisan commission established by President Obama to investigate the Deepwater Horizon event and make recommendations about the future of offshore petroleum operations).

cope with well failure and its aftermath. The most important effect of Macondo was the rapid importation into the Gulf of lessons learned from the North Sea to better assure that well failure would not occur in the future. Virtually overnight, a safety management system, often likened to the "Safety Case" regime used in the North Sea, was transported from European waters to the Gulf of Mexico.[176] While differing significantly from the Safety Case regime actually used in Norway and the United Kingdom, the new American "Workplace Safety Rule," also called the "SEMS rule" (for Safety and Environment Management System), requires offshore operators, for the first time, to have in place a "comprehensive management program for identifying, addressing and managing operational safety hazards and impacts."[177] As explained by BSEE, the SEMS rule gives the agency "oversight and enforcement of SEMS provisions" that address "human factors behind accidents" and provides a "flexible approach to systematic safety that can keep up with evolving technologies."[178]

For many years, the industry had successfully lobbied against even a modest introduction of four of the twelve standard safety management practices, called "SEMS factors" into U.S. offshore regulations, and the Minerals Management Service had failed to follow through with its safety management

---

176. BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT, FACT SHEET: THE WORKPLACE SAFETY RULE ON SAFETY AND ENVIRONMENTAL MANAGEMENT SYSTEMS (SEMS) (2010) [hereinafter SEMS FACT SHEET]. Again, the reader is cautioned that the SEMS rule adopted in the United States is not the same as the Safety Case regimes used in Norway and the United Kingdom, even though many commentators treat them as if they are the same. *See* discussion *infra* Section II.D for a summary of the key differences. Part Two of this Article (forthcoming in the next issue of the *Houston Journal of International Law*) focuses on the role of the regulator and explains the differences in detail.

177. SEMS FACT SHEET, *supra* note 176. Under the SEMS I rule, operators are required to have a safety management system that addresses thirteen mandatory elements, taken from API Recommended Practice 75. *Id.* The elements include: provisions for a facility-level hazard analysis, management of change procedures, operating procedures, manuals on safe work practices, preventive maintenance programs for mechanical integrity, pre-start up review of all systems, emergency response and evacuation plans, safety training, investigation of incidents, audits, and recordkeeping. *Id.*

178. *Id.*

initiatives.[179] Yet, on May 17, 2010, less than a month after the Macondo blowout, the API's Joint Industry Task Force (JITF) White Paper issued an "immediately actionable" recommendation that a safety management system be adopted for all operations using a subsea blowout preventer stack on the OCS.[180] Both the drilling contractor and the lease operator were to have safety management systems in place and a new "Well Construction Interfacing Document" was to integrate the two parties' systems into a seamless operation.[181]

This recommendation by the JITF's Operating Procedures Task Force described the "safety case" as a written demonstration that the facility and the operation are "capable of providing a safe working environment for personnel and that there are sufficient barriers to reduce identified hazards and risks to "as low as reasonably practicable" or "ALARP," the common European standard for environmental and safety risk reduction.[182] This JITF Task Force also recommended other immediately actionable procedures, such as requiring two independent barriers for each flow path.[183]

The industry's experts essentially gave the federal agency in charge of offshore safety a list of key areas where new regulations should be promulgated immediately. The API's job was an easy one because it had already developed Recommended Practices for safety management and for aspects of deepwater well construction that the federal regulator could simply convert from "recommended" to "required."[184] That the MMS had not

179. NAT'L DWH COMM'N REPORT, *supra* note 32, at 71–72.

180. JITF REPORT WHITE PAPER, *supra* note 73, at 7. The White Paper recommended that the "safety case" be produced by the owner of the drilling rig and reviewed by a "competent and independent regulator," using the IADC's existing document titled "Health, Safety and Environmental Case Guidelines for Mobile Offshore Drilling Units," but the operator was also to have a safety management system. *Id.*

181. *Id.* at 8.

182. *Id.* at 7.

183. *Id.* at 4.

184. JITF FINAL REPORT ON INDUSTRY RECOMMENDATIONS, *supra* note 90, at 5–7. Table 2 in the Final Report lists the API Task Force Recommendations, the status of each, and whether the federal regulator (then known as the MMS) had adopted the recommendation. *Id.* at 5. This table shows that three of the API's Recommended Practices (RPs), had been adopted as federal requirements: API's RP 75 on "Development

been able to require earlier what the industry considered as a recommended good practice is an indictment of both of these key actors in the Gulf.

The Safety Case approach to offshore safety is recognized as a best global practice, adopted by regulators in the United Kingdom and Norway after the tragic Piper Alpha disaster in 1988 killed 167 people on a production platform in the North Sea.[185] The investigative report by Lord Cullen that followed this disaster strongly argued for performance-based regulations rather than prescriptive, "check the list" rules that resulted in a compliance mentality rather than a continuous improvement mentality.[186] The Safety Case squarely places the duty on the operator to assure safety. The regulator merely "accepts" rather than "approves" the safety case submitted to it, and the operator's duty is to continuously assess risks as conditions change and adapt operations to new conditions. The president of one U.S. operator, Apache Corporation, explained the Safety Case approach thusly:

> There's no excuse for you if things go wrong because you are the one who wrote the plan . . . . It's harder on the well operator . . . . It requires you to write the rules and figure out the chance of this happening or that . . . . [I]t makes you plan very well, makes you look at every aspect of what could potentially happen out there. [187]

In a tacit acknowledgment that the industry had a risk assessment and safety problem, the Apache president continued:

> [O]bviously we need to change something, and I think this has a better chance of protecting the environment and people's lives.[188]

---

of a Safety and Environmental Management Program for Offshore Operations and Facilities" became the SEMS Final Rule; API RP 65 on "Isolating Potential Flow Zones during Well Construction"; and API RP 96 on "Deepwater Well Design and Construction" became the federal Drilling Safety Rule. *Id.* at 6–7.

185. Knut Kaasen, *Post Piper Alpha: Some Reflections on Offshore Safety Regimes from a Norwegian Perspective*, 9 J. ENERGY NAT. RESOURCES & ENVTL. L. 281, 289 (1991).

186. *Id.* at 286.

187. Neela Banerjee, *U.S. Looks Abroad to Cut Spill Threat*, L.A. TIMES, Oct. 24, 2010, at A18.

188. *Id.*

The first phase of the final SEMS rule, called SEMS I, was published in the Federal Register on October 15, 2010.[189] The moratorium on deepwater drilling was lifted on October 12th.[190] At that time, the Drilling Safety Rule (incorporating API Recommended Practice 65, or RP 65) and the SEMS I rule (incorporating API Recommended Practice 75, or RP 75) essentially became law on the U.S. Outer Continental Shelf. These best practices, so long stalemated by politics, had reached U.S. waters, carrying the imprimatur of being like the rules put into use in the North Sea after it experienced a safety disaster.

2. Globalization of other practices and standards

The Macondo disaster swept like a pandemic through offshore oil-producing provinces of the world, with nations hurrying to assure that they were inoculated against such an incident occurring in their areas. Norway, often recognized as the leader in offshore safety, put a temporary ban on new permits for deepwater drilling in the North Sea until the energy minister considered the results of a full investigation of the Macondo incident.[191] Brazil's environmental agency and navy drafted a national contingency plan for responding to offshore oil spills to complement a federal law enacted in 2000 that made operators on Brazil's offshore platforms responsible for spill prevention and clean-up.[192] The U.K. regulator announced it

189. Oil and Gas and Sulphur Operations in the Outer Continental Shelf—Safety and Environmental Management Systems, 75 Fed. Reg. 62,609, 63,610 (Oct. 15, 2010) (codified at 30 C.F.R. pt. 250) (to become effective November 15. 2010).

190. Memorandum from Ken Salazar, Sec'y of the U.S. Dep't of the Interior, to Michael R. Bromwich, Dir. of the Bureau of Ocean Energy Mgmt., Regulation, & Enforcement (BOEMRE) 1 (Oct. 12, 2010), *available at* http://www.doi.gov/news/pressreleases/loader.cfm?csModule=security/getfile&PageID=64767.

191. Paul Voosen, *U.K., Norway Tighten Controls on Oil Rigs*, E&E NEWS, June 8, 2010, http://www.eenews.net/eenewspm/ 2010/06/08/full.

192. Michael Kepp, *Brazil Perfecting Oil Spill Contingency Plans in Wake of BP Accident in Gulf of Mexico*, DAILY REP. FOR EXECUTIVES, June 21, 2010, at A12; *see also* Rick Mitchell, *IEA Warns U.S. Drilling Moratorium Could Severely Curtail Crude Production if Extended*, DAILY REP. FOR EXECUTIVES, June 11, 2010, at A6 (discussing an International Energy Agency (IEA) warning that the U.S. drilling moratorium could severely curtail oil production if extended, and noting that Canada, the United Kingdom, Norway, Brazil and China were all examining their existing laws and procedures).

would double its rates of inspection,[193] and gave a strong warning to operators of the unsatisfactory increase in major injuries offshore in 2009-2010 and the 443 "dangerous occurrences" reported during that period.[194]

The European Union's top energy official suggested banning any new deepwater exploration in the North Sea, Black Sea, and Mediterranean Sea until the industry knew more about the causes of the Macondo blowout.[195] By November 2011, the European Commission had issued a draft regulation on the safety of offshore petroleum activities, based on the Safety Case approach used in Norway and the United Kingdom.[196] One section of the draft obligated EU-based licensees, operators, and major contractors to "endeavor" to conduct offshore activities outside the EU in accordance with the principles of the draft regulation. [197] That is, the EU operators would be required to try and export best EU practices around the world.

As in the United States, overseas industry trade associations sprang into action as regulators abroad questioned their domestic legal regimes for offshore safety. By the beginning of June 2010 (less than two months after the Macondo blowout), Oil & Gas U.K., the offshore industry association in the United Kingdom analogous to the American Petroleum Institute, had formed OSPRAG, the Oil Spill Prevention and Response Advisory Committee, to work with U.K. regulators and the two trade unions (RMT and Unite) who represent workers in the offshore industry.[198] In October 2010, OSPRAG took control

193. *UK to Double Inspection Rate for Offshore Rigs*, OIL & GAS J., June 14, 2010, at 30.

194. Jane Wardell, *British Oil Regulator Gives Warning*, HOUS. CHRON., Aug. 25, 2010, at D6.

195. *EU Official Urges Ban on Deep-Water Drilling*, HOUS. CHRON., July 15, 2010, http://www.chron.com/business/energy/article/EU-official-urges-ban-on-deep-water-drilling-1623513.php.

196. Proposal on Safety of Offshore Oil and Gas Prospection, Exploration and Production Activities, EUR. PARL. DOC. (COM 688) 1 (2011).

197. *Id.* at 6. In May 2013, the European Parliament approved a final EU directive that requires offshore operators to have major hazard reports identifying risks, among many other requirements. Stephen Gardner, *EU Moves to Require Offshore Drillers to Prove They Can Pay for Damages*, DAILY REP. FOR EXECUTIVES, May 22, 2013, at A8.

198. *OSPRAG Picks Concept for Well-Capping Device*, OIL & GAS J., Nov. 1, 2010,

of two containment devices developed by BP in the Gulf of Mexico to be stationed in the United Kingdom under the auspices of the industry cooperative Oil Spill Response Ltd.[199] By November 1, 2010, OSPRAG had selected a design for a modular well-capping device adapted to the harsher weather of the North Sea, with a projected manufacturing time of eleven months.[200]

Oil & Gas U.K. also formed a permanent body, the Well Life Cycle Practices Forum, to focus on well integrity issues.[201] This Forum expeditiously published two new sets of guidelines on well examination procedures and the competency of well examiners.[202] In Norway, similar industry action launched the Joint Industry Project on structural integrity of drilling and well systems.[203]

On a supra-national level, two international industry organizations stand out in the globalization of best drilling practices and standards. The first is the International Association of Oil and Gas Producers, referred to as the OGP. The second is the International Association of Drilling Contractors, or IADC. Despite their names, both producers and drilling contractors are members of each group. The IADC's membership consists of 420 drilling and well service contractors, 62 producers (including national oil companies), and 996 oilfield service and supply companies.[204] IADC leaders participated in multiple initiatives in response to the Macondo disaster. Its representatives served on the API's JITF teams, testified in U.S.

---

at 44 [hereinafter *OSPRAG Picks Concept*]; *UK Action on Oil Spill Capability and Response*, WIRELINE, Oct. 2010, at 10.

199. *OSPRAG Picks Concept*, *supra* note 198, at 44.

200. *Id.*

201. Press Release, Oil & Gas UK: New Guidelines on Well Control, Integrity and Abandonment, Offshore Energy Today (July 31, 2012).

202. *Well Examination Guidelines Published in UK*, OIL & GAS J., Jan. 9, 2012, at 12.

203. *Joint Industry Project on the Structural Integrity of Drilling and Well Systems*, DET NORSKE VERITAS (Aug. 24, 2010), http://www.dnv.com/industry/oil_gas/publications/updates/oil_and_gas_update/2010/02_2010/jointindustryprojectonthestructuralintegrityofdrillingandwellsystems.asp.

204. *See About IADC*, IADC, http://www.iadc.org/about-iadc/ (last visited Dec. 22, 2013).

Congressional inquiries, and provided input into the investigative reports being prepared by the National DWH Commission, the Chemical Safety Board, the National Academy of Engineering, and many others.[205]

OGP membership consists of private and state-owned oil and gas companies, industry associations and major upstream service companies. OGP was formed in 1974 to enhance communications between the upstream industry and a growing network of international regulators.[206] OGP represents the industry before the European Union, the United Nations, the International Maritime Organization, the ISO (a non-governmental organization of the national standard-setting bodies of 164 countries and the world's largest developer of voluntary international standards), and regional bodies, like the Helsinki Commission.[207] It views itself as a "global forum in which members identify and share best practices" to improve health, safety, the environment, social responsibility, and engineering and operations.[208]

These two industry associations had long pressed for global technical standards to be adopted by both industry and government regulators for offshore operations. In pursuit of this goal, the OGP undertook a thorough analysis of the degree to which regulators in fourteen different countries incorporated the technical standards developed by Standard Development Organizations (SDOs), such as the API's technical unit, into their national regulations.[209] If many countries, for example, mandated the use of API RP 96 on Deepwater Well Design, then industry-developed standards would become global standards. The ensuing OGP report showed that regulators did often

---

205. *Annual General Meeting Special: Post-Macondo Efforts Extensive, Ongoing*, DRILLING CONTRACTOR (Nov. 8, 2011), http://www.drillingcontractor.org/annual-general-meeting-special-post-macondo-efforts-extensive-ongoing-11648.

206. *About OGP*, INT'L ASS'N OF OIL & GAS PRODUCERS, http://www.ogp.org.uk/about-ogp (last visited Dec. 22, 2013).

207. *Id.*

208. *Id.*

209. INT'L ASS'N OF OIL & GAS PRODUCERS, REGULATORS' USE OF STANDARDS, REPORT NO. 426, 46, 51–52 (2010) [hereinafter OGP REPORT NO. 426], *available at* http://www.ogp.org.uk/pubs/426.pdf.

incorporate such standards into their regulations; indeed, references to 1,140 different standards appeared in the petroleum regulations of these fourteen countries.[210] However, eighty-seven percent of the 1,140 different standards were referenced by only one regulator, indicating that standards are still largely national rather than international.[211] The referenced standards came from more than sixty different international, regional, national and industry standards-setting organizations.[212] Regulatory references to industry association standards dominated, amounting to forty-four percent of the total references, with API and ISO standards leading the count.[213]

A second OGP study surveyed the technical specifications used by eighteen of its member companies (accounting for about one-third of global petroleum production) to ascertain the degree of standardization used within the industry.[214] Lamentably, the OGP documented that these eighteen companies used more than 5,000 different titles of specifications from 132 Standard Development Organizations (SDOs).[215]

The OGP stressed the importance of working to align and rationalize the technical standards used internationally for offshore operations.[216] The equipment used in offshore drilling and production is marketed globally and it is essential that these devices have standardized settings. For example, the underwater robots (called ROVs, for Remote Operating Vehicles) that did the "hot stabs" on the Macondo well in an effort to activate the damaged BOP, must be able to work on any BOP anywhere in the world. Therefore, valves and flange sizes must

---

210. *Id.* at 1.

211. *Id.*

212. *Id.*

213. *Id.*

214. INT'L ASS'N OF OIL & GAS PRODUCERS, BENCHMARKING ON THE USE OF INTERNAL TECHNICAL SPECIFICATIONS AND EXTERNAL STANDARDS BY SOME OIL & GAS COMPANIES, REPORT NO. 450, 8–10, 12 (2011) [hereinafter OGP REPORT NO. 450], *available at* http://www.ogp.org.uk/pubs/450.pdf.

215. *Id.* at 12.

216. *See* OGP REPORT NO. 426, *supra* note 209, at 2 (summarizing the study's main conclusions that the references to so many standards is a challenge for operators working in different countries; harmonization could reduce the number).

be standardized globally. Standardization also allows for easier maintenance and training.

After calling for greater harmonization of standards, the OGP concluded with this message to its members concerning their relationship with petroleum regulators that use industry standards in their regulations:

> The oil and gas industry is able to directly influence the content of 380 of the [1,140] standards listed in this report and therefore is largely responsible for their development and maintenance.[217]

These two trade associations also have considerable expertise in safety management systems. The IADC's experience derived from its work with the International Maritime Organization's (IMO) regulation of vessels. The IMO had implemented international safety and environmental standards for Mobile Offshore Drilling Units (MODUs) that operate as vessels when moving from one drill site to another.[218] The offshore industry has now become as global as the shipping industry, so the use of an international code of standards that transcends national regulations is a natural development. The IADC already had a SEMS regime in place for MODUs when the Macondo blowout occurred. [219] In response to Macondo, the IADC updated its HSE (Health, Safety, and Environment) Case Guidelines in December 2010 to enhance the bridging arrangements that mesh the operator's well construction practices with the drilling contractor's.[220] This is the same type

---

217. *Id.*; *see also* OGP REPORT NO. 450, *supra* note 214, at 8–10, 12 (noting that the petroleum industry is directly responsible for about twelve percent of the 5,237 standards promulgated by Standard Development Organizations and used by the surveyed industry members as technical specifications).

218. International Convention for the Safety of Life at Sea (SOLAS) ch. IX, reg. 2.1.3 , 3.1, Nov. 1, 1974, [1979–1980] U.S.T. 47, T.I.A.S. No. 9700 (requiring MODUs to comply with the International Management Code for the Safe Operation of Ships and for Pollution Prevention, Annex to IMO Res. A741(18) Nov. 3, 1993).

219. *See, e.g.*, INT'L ASS'N OF DRILLING CONTRACTORS, HEALTH, SAFETY AND ENVIRONMENT CASE GUIDELINES FOR OFFSHORE DRILLING CONTRACTORS app. 1 (2007), *available at* http://www.iadc.org/hsecase/MODU%20Offshore%20Appendix%20Issue%203.3.1%20Final.pdf.

220. *See* INT'L ASS'N OF DRILLING CONTRACTORS, HEALTH, SAFETY AND ENVIRONMENTAL CASE GUIDELINES FOR MOBILE OFFSHORE DRILLING UNITS, ISSUE 3.3

of bridging document that the API's Joint Industry Task Force recommended to the U.S. regulator as an immediately actionable item to enhance safety in the Gulf.[221]

Training the global workforce for deepwater offshore work became a special focus of the IADC after the Macondo disaster. The National Academies' report on the Macondo disaster found that industry-wide training standards for offshore workers were "relatively minimal."[222] The Transocean drilling crew were mostly trained on the job, with some short, one-week courses on well control every few years. Their training was consistent with the industry's standard practice and current regulations, but it was not adequate for a safety-critical industry.[223] The IADC significantly increased the minimum amount of time that drilling personnel must spend on simulators to meet best industry practices.[224] It conducted "SWAT-team" audits of all U.S. training providers and adopted more rigorous instructor qualifications and re-qualifications as global standards.[225] It updated its competency assessments for specialized positions like Subsea Engineer, and launched a project to develop enhanced competency guidelines for virtually all rig personnel positions based on its Knowledge, Skills and Abilities (KSA)

---

pt. 5, at 8 (2010), *available at* http://www.iadc.org/hsecase/MODU%20HSE%20Guidelines%20ALL.pdf. In 2011, the IADC further updated this publication to Issue 3.4. INT'L ASS'N OF DRILLING CONTRACTORS, HEALTH, SAFETY AND ENVIRONMENTAL CASE GUIDELINES FOR MOBILE OFFSHORE DRILLING UNITS, ISSUE 3.4 (2011), *available at* http://www.iadc.org/wp-content/uploads/2011/11/MODU-HSE-Case-Guidlines-Issue-3.4.pdf.

221. The API and the IADC released a final Well Construction Interface Document in 2013. AM. PETROLEUM INST. & INT'L ASS'N OF DRILLING CONTRACTORS, WELL CONSTRUCTION INTERFACE DOCUMENT GUIDELINES, BULLETIN 97, at 1 (2013).

222. NAT'L ACAD. OF ENG'G AND NAT'L RESEARCH COUNCIL, INTERIM REPORT ON CAUSES OF THE DEEPWATER HORIZON OIL RIG BLOWOUT AND WAYS TO PREVENT SUCH EVENTS 15 (2010).

223. *Id.*

224. Steve Kropla, Group Vice President, Operations and Accreditation, Int'l Ass'n Drilling Contractors, Powerpoint, IADC Global Perspective presented at International Regulators' Forum, Offshore Safety Summit Conference, Stavenger, Norway slide 6 (Oct. 4, 2011) [hereinafter Kropla Norway Presentation]. Newly designed drilling simulators are touted as leaving experienced rig workers "soaked in sweat." Rassenfoss, *Drillers Find Themselves in Tricky Spot*, *supra* note 52, at 48–54.

225. Kropla Norway Presentation, *supra* note 224, slide 7.

templates.[226] OPITO, the Offshore Petroleum Industry Training Organization, expanded to bring global training competencies to many more countries from its base in the United Kingdom.[227]

After many studies on the causes of the Macondo blowout had been concluded, the IADC presented its global perspective on the top five areas requiring attention by offshore regulators at a meeting of the International Regulatory Forum in October 2011.[228] This Forum includes regulators from eleven countries that meet to share experiences and practices in offshore regulation.[229] The IADC urged Forum members to assure that their national regulatory initiatives had an international focus on global standard-setting and sharing of best practices. Two of the IADC's top five areas of concern were training-related, and all five involved information sharing and learning, as listed below:[230]

---

226. *Id.* slide 13; Press Release, Int'l Assoc. of Drilling Contractors, New IADC Project Will Enhance Competency Guidelines for Drilling Rig Personnel (June 4, 2012).

227. *See generally* OPITO, http://www.opito.com (last visited Dec. 22, 2013). OPITO certifies accredited training providers, develops standards for work competency requirements for certain tasks (such as lifting loads), and provides training courses in partnership with governments like Iraq and Malaysia. *Id.* OPITO created a Minimum Industry Safety Training (or MIST) program for worker competency in the North Sea, which OPITO will offer to thirty countries in the coming years as its International Minimum Industry Safety Training (or IMIST) program. UK OPITO, STRENGTH TO STRENGTH, UK/NORTH SEA ANNUAL REPORT 1 (2010) . Much of the training is online, using 3-D animations of rigs and platforms and blueprints of the new equipment used offshore. Nathaniel Gronewold, *Worker Training Struggles to Keep Up with Technology*, ENERGYWIRE, Mar. 12, 2012, www.eenews.net/energywire/stories/1059961210/print; Nathaniel Gronewold, *Workers Get a Taste of NASA Technology at Underwater Training Sessions*, ENERGYWIRE, Apr. 23, 2012, www.eenews.net/energywire/stories/1059963255/ print.

A study by an independent safety consultant determined that about two-thirds of all oil and gas-related fatalities occur in the first year of employment, showing the importance of pre-job training. Gayathri Vaidyanathan, *Safety: Death on the Gas Field Illustrates High Risks of the Rush to Drill*, E&E NEWS, Feb. 21, 2013, http://www.eenews.net/ stories/1059976658.

228. Kropla Norway Presentation, *supra* note 224, slides 16–21. The International Regulatory Forum has no standard-setting authority, but became more active after the Macondo and Montara spills. BSEE represents the United States in the Forum.

229. *About International Regulators Forum*, IRF, http://www.irfconference2011. org/aboutirf.cfm?FuseAction=GenPage&pWebprofilfunkid=53003 (last visited Dec. 22, 2013)

230. Kropla Norway Presentation, *supra* note 224, slides 16–21.

1. Effective organizational learning in an era of information overload.
2. Dissemination of information about offshore incidents in their jurisdiction to the industry globally.
3. Integration of safety management systems between the operator and contractor globally.[231]
4. Assuring competence and training of workers, noting that the effort to develop industry-wide, global standards for competence and assessment was not going smoothly.
5. Responding to the need for highly trained crews on the new rigs with even more advanced technology, especially in critical positions like subsea engineers.

The IADC spokesman then called on the regulators to fill in gaps that industry association efforts were not able to fill, through their membership's adoption of codes of best practice. In particular, the IADC stated:

> If perceived legal impediments to industry's sharing of incident information cannot be overcome, IRF [Forum] members and other regulatory bodies should work aggressively to investigate incidents and place their learning from incidents in the public domain.[232]

It is hardly typical to find industry associations asking government regulators to aggressively investigate incidents, but the IADC's message reflected the limits of the power of a trade association to coerce its members into reporting incidents that could be studied and analyzed to continuously improve offshore safety globally. As discussed more fully in Part Two of this Article, this type of data gathering is a key component of a regulatory system run by a competent and nimble safety agency staffed with the requisite expertise.

The OGP, for its part, undertook to carry out the very type of industry-wide, global reporting system of well incidents that

---

231. The IADC noted that the Bulletin 97 bridging document that the API and IADC had developed post-Macondo focused on deepwater operations in the United States and a more global guidance document was needed. *Id.* slide 19.

232. *Id.* slide 22.

the IADC considered to be a critical component of offshore safety. In July 2010, the OGP formed the Global Industry Response Group, or GIRG, to monitor the outcomes of the official investigations into the Macondo and Montara spills and to ensure that the lessons learned from these and other accidents are applied around the world in offshore operations, incorporating both technical and behavioral factors.[233] Its final report, issued in May 2011, made many key recommendations and urged its members to commit to implement them.[234]

Most importantly, the OGP recommended that a permanent Wells Expert Committee (WEC) be created under the OGP.[235] This WEC would create and maintain a secure database of serious drilling incidents.[236] All companies should undertake to swiftly send notice to an elected Third Party of defined types of drilling incidents.[237] The WEC would then categorize the events, analyze the database for trends, and write practical guidance to feed back to the industry to better prevent similar occurrences.[238] The WEC would also send regular reports to regulators.[239] The database would allow industry to share learning, to harmonize international standards and to prioritize research and development needs.[240]

In February 2013, the OGP posted its summary of the milestones the organization had accomplished through its

---

233. INT'L ASS'N OF OIL & GAS PRODUCERS, DEEPWATER WELLS: GLOBAL INDUSTRY RESPONSE GROUP RECOMMENDATIONS, REPORT NO. 463, 4–5 (2011) [hereinafter OGP REPORT NO. 463].

234. *Id.* at 5–7. The recommendations included strong self-auditing by operators of their own safety systems and operations and those of the contractors and service providers that they used. *Id.* Well design and drilling procedures should be subject to independent oversight by a registered engineer from within the company or from a third party. *Id.* Because of the acute shortage of qualified engineers, priority in oversight should go to HPHT wells. *Id.* Training and competency systems should be strengthened, wells should always be drilled with two independent barriers against major hazards, and a bridging document should integrate the well design and procedures of the operator with those of the drilling contractor. *Id.*

235. *Id.*

236. *Id.* at 20.

237. *Id.* at 8.

238. *Id.* at 8, 20.

239. *Id.* at 20.

240. *Id.* at 7.

Global Industry Response Group (GIRG) in "keeping to [its] promise" to the EU to enhance safety offshore.[241] To improve well safety, it had created an industry-wide database of well control incidents, assessed BOP reliability and improvements, improved training and competencies with a targeted focus on human factors, and developed and implemented key international standards on well design and well operations management.[242] It had created capping stack intervention capability that spanned several continents and was in the process of creating a proposal to members for Mutual Aid Agreements to assist an operator with a blowout.[243] OGP's GIRG had organized an Oil Spill Response-Joint Industry Project that was preparing sets of recommended practices on environmental risk assessment and response planning and would ultimately rewrite the existing seventeen volumes of good practice guidance on oil spill response, adding an additional eight volumes on topics like in situ burning, satellite observation, and tracking of subsea plumes with 3-D modeling.[244]

In sum, around the world, industry task forces produced an outpouring of new recommended practices, industry standards, targeted research, and a global database for shared learning. Equipment suppliers and service providers found profitable business opportunities in providing advanced software and hardware that promised greater safety in drilling and production. This very outpouring from all offshore industry quarters, and the rapidity with which regulations changed in the United States (and sometimes abroad), show that many gaps existed between what was considered a satisfactory state of safety and the higher level of safety that better reflected a reduction of risks to as low as reasonably practicable.

241. *See* INT'L ASS'N OF OIL & GAS PRODUCERS, OFFSHORE SAFETY: GETTING IT RIGHT NOW AND FOR THE LONG TERM 1–4 (2013).

242. *Id.* at 1.

243. *Id.* at 2–3.

244. *Id.* at 3.

D. Concluding Comments on Three Changes to Business as Usual: Is the Gulf of Mexico Safer Now?

This Article has reviewed three significant changes that have occurred in the Gulf of Mexico since the Macondo disaster in April 2010. First, is the recognition that complacency is negligence, which means regulators and industry must devise operating procedures that guard against complacency and keep industry always on edge. An effective safety management system can provide this edge, but only if the plan's procedures are actually practiced by workers at all levels, a condition that regulators must monitor for compliance. Second, technology has advanced, not only in capping and containment equipment, but in blowout preventers, testing labs, robots, and software algorithms that promise greater accuracy, more redundancy, and less hazardous workplaces. The third is a step-change in the globalization of "best" technical standards, safety management practices and procedures, and training requirements to all offshore areas of the world.

The API's JITF teams, comprised of industry professionals who knew the many gaps that existed in the U.S regulatory framework for offshore safety, presented the Obama administration with a list of immediately actionable recommendations to enact into requirements. In a nanosecond compared to years past, the newly restructured federal safety regulator passed requirement after requirement, many based on industry recommended practices and standards that it had not been able to implement before crude oil started washing ashore in Louisiana. International industry trade associations, notably the IADC and the OGP, were agents of change in all three areas, pushing the United States to move to Europe's higher standards while also strengthening Europe's safety framework.

It might seem easy to conclude, then, that Gulf of Mexico deepwater drilling is safer today than it was pre-Macondo. However, adopting a safety management system on paper does not assure that it will be implemented adequately. After all, BP is headquartered in England and had decades of experience with the Safety Case regime in the North Sea, but its U.S. operations

did not reflect this approach.[245] Even ExxonMobil's famed Operations Integrity Management System (OIMS), put into place in all global operations after the *Exxon Valdez* spill, has notably failed at some of its facilities.[246]

As time goes by without a disaster, complacency will inevitably creep into decision-making unless some force works against it and keeps the industry on the "careful edge essential in hazardous work."[247] Using fail-safe technology can itself breed complacency, and in reality, no piece of equipment or software program is absolutely fail-safe. Global standards are just that: standards written in a document. Unless implemented and enforced, they have no effect. Trade associations can develop "best" standards, share lessons learned, and provide training to industry members in such practices, but they cannot fine or penalize members, except by barring bad actors from membership. And if the standards themselves reflect a consensus approach to self-regulation, the standards may be significantly below what best practice would demand.

All of these factors caution against a firm conclusion that the Gulf of Mexico is "safe enough" today. An accurate assessment requires analysis of the role of the regulator in performing many essential tasks: enforcing implementation of safety management systems and many other offshore regulations; assessing the degree to which technical standards reflect the best and safest technologies; finding gaps in industry practices and procedures; and pushing for continuous improvement as the offshore frontier expands. Yes, a disaster can sharpen industry's attention to safety, even without a regulator's push, as the Macondo experience shows. But "greater-safety-through-post-disaster-industry initiatives" is hardly a best practice for a regulatory framework.

Part Two of this Article looks at the role of the regulator and

---

245. HOPKINS, DISASTROUS DECISIONS, *supra* note 26, at 67, 75, 105.

246. *See* ANDREW HOPKINS, SAFETY, CULTURE AND RISK: THE ORGANISATIONAL CAUSES OF DISASTERS 3–5 (2005) (describing the company's Longford gas plant explosion as evidence of the poor implementation of OIMS). The Longford plant had a "virtual" safety management system that diverted workers' and management's attention from the real-world, practical functioning of the plant. *Id.*

247. Editorial, *The Regulatory Response*, *supra* note 49.

assesses the two major institutions now responsible for offshore safety in U.S. waters: BSEE as federal regulator and the industry's own Center for Offshore Safety. Professor Hopkins has already assessed the current U.S. regulatory system and has found it seriously deficient in meeting best practice.[248] In his view, there are four essential features of a successful Safety Case regime as used in the North Sea, of which the United States has adopted only the first one listed below: [249]

1. *A risk management framework*. The U.S. SEMS rule does require identification of major hazards and plans to manage the risks arising from such hazards.
2. *The requirement that operators "make their case" to the regulator*. The U.S. SEMS rule provides no licensing or approval role for BSEE in accepting the operator's SEMS plan.
3. *A competent and independent regulator*. The safety regulator must be independent of Executive branch politics and funded independently from Congressional appropriations. BSEE is neither. Nor does it yet have the expertise or competence required to regulate and oversee offshore operations effectively.
4. *A general duty of care imposed on the operator to reduce risks "as low as reasonably practicable" (the ALARP standard).* Even if no specific rule governs an operator's specific act, a general duty to manage risk exists under a real Safety Case regime. This general duty moves the industry away from a compliance mentality to a risk

248. HOPKINS, DISASTROUS DECISIONS, *supra* note 26, at 137.

249. *Id.* at 138–39, 145–49 (describing the need for an independent regulatory agency). Chapter 10 of the Hopkins book on "Regulation" is a damning account of the U.S. regulatory approach under the MMS. It describes how the prescriptive MMS rules did not require BP to have a strategy to address a possible blowout. *Id.* at 137–49. The effect of MMS rules on the cementing decisions made by BP engineers for the Macondo well is described in unforgettable detail. *Id.* at 142–44. This chapter should be required reading for both regulators and operations in offshore operations.

awareness mentality.[250]

In so many ways, large and small, North Sea safety regulation and practices were, and still are, superior to those used in the United States.[251] Yes, some regulatory progress has definitely been made in the Gulf of Mexico, often through the use of prescriptive rules like the quickly issued NTL-5 requiring that a professional engineer certify that two independent test barriers exist across each possible flow path in the well.[252] This certification works to prevent some of the gravely deficient decision-making documented in the Macondo disaster by replacing group think (i.e., consensus decision-making) with the expertise of one person who can be held singly accountable and who has been certified as professionally competent.[253]

Still, much remains to be done, as described in Part Two of this Article forthcoming in the next issue of the *Houston Journal of International Law*. Because our federal offshore regulator has never collected or analyzed the types of data that can assess trends in risk levels in offshore operations, one cannot empirically answer the question: Are operations in the Gulf of Mexico safer now than they were pre-Macondo? The newly mandated SEMS II audits of operators' offshore safety management systems and the data collection protocols that

---

250. BP's compliance mentality is evident in the decision tree it used for cementing decisions. *Id.* at 65–66, 142–43, 168–71, app. 1 (containing an explanation and duplication of BP's decision tree).

251. *Id.* at 65 (stating that the U.K. Safety Case regime would not have accepted the lack of an automatic (versus manual) shutdown of the drilling rig in response to the detection of high gas levels, having learned from the Piper Alpha disaster); *Id.* at 148 (U.K. offshore fire protection standards are higher because of the general duty of care imposed on duty holders in U.K. waters).

252. *See* NTL-5, *supra* note 98, at 6.

253. HOPKINS, DISASTROUS DECISIONS, *supra* note 26, at 37–51. Similarly, in November 2010, NTL-10 was issued, requiring a Statement of Compliance certified by an authorized company official (not necessarily the CEO) that the operator would conduct all activities in compliance with the new Drilling Safety Interim Final Rule. NTL-10, *supra* note 95. This practice of imposing individual accountability on corporate officers for compliance is also an organic part of the Sarbanes-Oxley Act, which was enacted to improve the reliability of financial reporting, to improve audit quality, and to strengthen corporate governance, following the bankruptcies of major U.S. companies like Enron and World Com. Sarbanes-Oxley Act of 2002, Pub. L. No.107-204, 116 Stat. 745, §§ 1, 801–07.

accompany this audit process hold great promise for allowing regulators, and ultimately the public and policymakers, to assess risk levels and operator performance shortcomings in offshore operations. But these mandatory SEMS II audit protocols are not required to be used by operators in audits submitted to BSEE until 2015. Also discussed in Part Two are other tasks that our federal regulators must learn to perform, such as playing a more active role in standard setting, both for equipment and technologies used offshore and for safety practices and procedures, such as fatigue risk management. In short, until BSEE, the primary offshore safety regulator in the Gulf of Mexico, develops the expertise and competence that offshore regulators in the North Sea have acquired, the Gulf of Mexico cannot be said to be "safe enough." As Part Two concludes, a good regulator is indeed industry's best friend.

APPENDIX A
OFTEN USED ACRONYMS

ALARP – As Low As Reasonably Practicable (or Practical). A risk reduction standard commonly used in Europe for environmental protection and worker safety; also recommended for use by the API's JITF's Operating Procedures Task Force in response to the Macondo disaster.

API – American Petroleum Institute. The U.S. trade association that represents all sectors of the oil and natural gas industry and lobbies on their behalf. The API has a technical arm that is accredited as a Standards Development Organization to engage in standards development for equipment and recommended practices for operations in all sectors of the oil and gas industry.

BAST – Best Available and Safest Technologies. The required standard for offshore equipment established in the 1978 amendments to the Outer Continental Shelf Lands Act (OCSLA).

BOEMRE – Bureau of Ocean Energy Management, Regulation and Enforcement. BOEMRE replaced the former Minerals Management Service (MMS) in mid-June, 2010 (less than two months after the Macondo blowout). The Office of Natural Resources Revenue (ONRR) became a separate office under the Assistant Secretary for Policy, Management and Budget on October 1, 2010. On October 1, 2011, BOEMRE was divided into two different bureaus: the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE). See also MMS.

BOP – blowout preventer. This safety device is a large valve at the top of a well used to control the flow of liquids and gasses during drilling operations. The blind shear rams on a BOP are designed to cut through the drill pipe and seal the well in the event that an uncontrolled surge of fluids and gasses occurs, thereby preventing a blowout.

BP – BP plc, formerly British Petroleum, is a British multinational oil and gas company and is a major producer of oil and gas in the Gulf of Mexico.

BSEE – Bureau of Safety and Environmental Enforcement. BSEE is responsible for safety and environmental oversight of offshore oil and gas operations, including permitting and inspections of offshore oil and gas operations and the development and enforcement of safety and environmental regulations. See also BOEMRE.

CCRM – Center for Catastrophic Risk Management at the University of California, Berkeley. The Center has experts in the study of catastrophic risks; a group of experts formed a Deepwater Horizon Study Group and wrote many research papers on the Macondo blowout.

COS – Center for Offshore Safety. An industry organization (part of the API) formed to adopt and promote safety standards in deepwater Gulf of Mexico operations. It assists its member companies to improve safety practices and provides certification of third-party audit service providers who will conduct the audits of the safety management systems that are now required by the federal SEMS regulations.

DNV – Det Norske Veritas. Headquartered in Oslo, Norway, DNV is one of the world's leading certification bodies and provider of services for risk management.

DOI – U. S. Department of the Interior, the ministry with jurisdiction over all federal offshore land and leasing.

DWH – Deepwater Horizon. The name of the MODU (Mobile Offshore Drilling Unit) that was drilling the Macondo well. The well experienced a blowout (an uncontrolled surge of gas) that quickly caused an explosion and fire on board the MODU, which later sank to the sea floor.

EU – European Union.

FAA – Federal Aviation Administration. Regulator of civil aviation in the US; part of the Department of Transportation.

GAO – Government Accountability Office. Investigative arm of Congress.

GIRG – Global Industry Response Group of the OGP. GIRG's aim is to ensure that the lessons learned from Macondo, Montara and other accidents are applied globally.

HPHT wells – High pressure, high temperature wells.

HRO – High Reliability Organizations. A key attribute of an HRO is that it effectively manages inherently risky technologies

through organizational control of risks and hazards. HROs have a culture of safety and constantly seek to improve performance by collecting and analyzing data and observations about risk levels and learning from mistakes and failures.

HSE – In the UK, refers to the Health and Safety Executive, whose mission is to prevent death, injuries and ill health in Great Britain's workplaces. Otherwise, generally refers to Health, Safety and the Environment.

IADC – International Association of Drilling Contractors. Trade association of the global oil and gas drilling industry.

IMIST – International Minimum Industry Safety Training. This is an OPITO training standard designed to support worker safety in the global oil and gas industry.

IMO – International Maritime Organization. The IMO is a specialized United Nations agency with responsibility for the safety and security of shipping and of workers serving on vessels. Its duties also include the prevention of marine pollution by ships. The IMO has adopted a *Code for the Construction and Equipment of Mobile Offshore Drilling Units* (MODU Code).

IRF – International Regulators' Forum. The IRF is a group of eleven regulators of health and safety in the offshore upstream oil and gas industry who meet to share ways to perform their regulatory duties. The Forum itself has no regulatory enforcement power. BSEE is the U. S. representative to the IRF.

ISO – International Organization for Standards. ISO is an independent, non-governmental organization made up of members from the national standards development bodies of 164 countries. The ISO is the world's largest developer of voluntary international standards and has published over 19,000 international standards.

JIT – Joint Investigation Team. The two U.S. agencies with responsibility over offshore drilling safety, BOEMRE and the U.S. Coast Guard, formed a team that conducted an intensive joint investigation of the Macondo disaster, resulting in final reports and recommendations to improve offshore safety.

JITF – Joint Industry Task Force. An expert group (with a number of subgroups) drawn from industry and formed by the

API in May 2010 to recommend improvements in offshore operating procedures and offshore equipment to federal regulators and to industry members.

MMS – Minerals Management Service. The MMS was created in 1982 and managed offshore leasing and resource management, safety and environmental protection, and revenue collection until 2010. Shortly after the Macondo blowout, MMS was renamed BOEMRE. The MMS's functions have now been transferred to three separate organizations with clearly defined missions: the Bureau of Safety and Environmental Enforcement (BSEE); the Bureau of Ocean Energy Management (BOEM) (in charge of offshore leasing, resource evaluation and the review of exploration and development plans); and the Office of Natural Resources Revenue (ONRR) (the revenue collection arm). See also BOEMRE.

MODU – Mobile Offshore Drilling Unit. MODUs are vessels (including drillships, semisubmersibles, submersibles, and jack-up rigs) that can be moved without substantial effort (either with or without self-propulsion on board), designed to engage in offshore drilling and exploration.

MRI – Mechanical Risk Index. This index is an industry standard point of reference that classifies wells by the degree of risk involved in drilling them. The MRI risk index uses a point system based on six primary variables and 14 qualitative indicators to characterize wellbore complexity.

MWCC – Marine Well Containment Company. This company was formed in July 2010 by ExxonMobil, Chevron, ConocoPhillips and Shell to provide a deepwater well containment response capability in the Gulf of Mexico. MWCC now has 10 member companies.

NTL – Notice to Lessees. Notices to Lessees and Operators (NTLs) are formal documents that provide clarification, description, or interpretation of the agency's offshore regulations or standards.

OCS – Outer Continental Shelf. These are the submerged lands lying seaward of state coastal waters which are under U.S. jurisdiction as defined in OCSLA.

OCSLA – Outer Continental Shelf Lands Act of 1953. This Act is the statutory basis for Department of Interior regulation

of OCS mineral exploration and development. Under OCSLA, the Secretary of the Interior is responsible for the administration of mineral exploration and development of the OCS. The Act, as amended, provides guidelines and requirements for implementing an offshore oil and gas exploration and development program.

OESAC – Offshore Energy Safety Advisory Committee. The Ocean Energy Safety Advisory Committee (OESAC) was chartered on February 8, 2011 for a two-year term to advise the Secretary of the Interior, through the Director of the Bureau of Safety and Environmental Enforcement (BSEE), on a variety of issues related to offshore energy safety. The OESAC was a public federal advisory body and included some of the nation's leading scientific, engineering and technical experts. Chaired by former Sandia National Laboratory Director Dr. Tom Hunter, the group consisted of 15 members from federal agencies, the offshore oil and gas industry, academia, and nongovernmental organizations.

OESI – Offshore Energy Safety Institute. OESI was created by the Department of Interior to continue the work of OESAC in areas such as: facilitating research and development; training federal workers to identify, verify and adopt the use of Best Available and Safest Technology (BAST) offshore; and implementing improvements in offshore drilling, safety and environmental protection, blowout containment and oil spill response. In November, 2013, Texas A&M was selected to manage OESI, in partnership with the University of Houston and the University of Texas. The formation of OESI was one of the recommendations of OESAC to continue collaboration among government, academe, scientific experts and industry.

OGP – International Association of Oil and Gas Producers. OGP is a global forum created to share best practices in health, safety, environment, security, social responsibility, engineering and operations in oil and gas exploration and production. Its membership is comprised of upstream oil and gas producers from around the world, including national oil companies, and trade associations (such as the API and IADC). Its associate members are equipment and service providers to the industry. The OGP has 82 members and is headquartered in London. In

addition to its mission of improving industry performance and knowledge sharing, the OGP represents the industry in front of international regulators and legislators, including the EU, World Bank, IMO, ISO and the Commission on Sustainable Development.

OIMS – Operations Integrity Management System. ExxonMobil's management system for addressing safety, security, health, environmental, and social risks. OIMS provides a systematic and disciplined approach to measure progress and track accountability across business lines, facilities, and projects.

OLF – Norwegian Oil and Gas Association. OLF is the industry trade association for oil companies engaged in exploration and production on the Norwegian Continental Shelf, including their suppliers.

OPA – Oil Pollution Act of 1990. This act was passed largely in response to the *Exxon Valdez* oil spill in Alaska. It created a system of strict corporate liability for oil spills, a compensation regime with a dedicated fund for oil spill damages, and mandates for oil spill response plans.

OPITO – Offshore Petroleum Industry Training Organization that promotes global training.

OTC – Offshore Technology Conference. The conference and exhibition held annually each May in Houston for the offshore oil and gas industry.

RMT – The National Union of Rail, Maritime, and Transport Workers. A U.K. trade union with more than 80,000 members, including offshore workers.

ROV – Remotely operated vehicle. In offshore applications, ROVs are tethered, underwater vehicles that are unoccupied, highly maneuverable and operated by a crew aboard a vessel, using an umbilical cable that carries electrical power and transmits video and data signals.

RP – Recommended Practice. One of the types of API standards. API standards include manuals, standards, specifications, recommended practices, bulletins, guidelines and technical reports.

RPSEA – Research Partnership to Secure Energy for America. Non-profit organization set up to manage a ten-year,

$375 million program designed to enable the development of new technologies necessary to produce domestic energy supplies. R&D program areas include Ultra-Deepwater and Unconventional Resources.

SDO – Standards Development Organization. These are organizations whose primary activities are developing, coordinating, and promulgating technical standards that are intended to address the needs of a relatively wide base of affected adopters of the standards.

SEMS – Safety and Environmental Management Systems. Offshore operators in the Gulf of Mexico are now required to have these safety management systems in place. The SEMS I regulations were effective November 15, 2010, and SEMS II (the "SEMS Final Rule") became effective June 4, 2013.

SINTEF – SINTEF is the largest independent research organization in Scandinavia. It is a non-profit, Norwegian "think tank."

SOI – Secretary of the Interior of the United States. Kenneth Salazar was Secretary of the Interior during the Macondo disaster.

WCID – Well construction interface (or interfacing) document. This document connects the operator's safety management system and other well design and construction documents with those of the drilling contractor. The goal is to align the systems, with particular reference to management of change and hazard and risk analysis. API Bulletin 97 addresses Well Construction Interface Document Guidelines.

WEC – Wells Expert Committee. This is one of the three technical teams established by OGP's GIRG in the aftermath of the Macondo incident. The WEC was created to analyze well incident report data, advocate harmonized standards, communicate good practices, and promote continued R&D.