IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF LOUSISANA

IN RE: OIL SPILL BY THE OIL RIG MDL NO. 2179 "DEEPWATER HORIZON" IN THE GULF OF MEXICO, ON APRIL 20, 2010

Evaluation of Potential Impacts on Non-operators of a CWA Civil Penalty Against Non-operator Anadarko for the Macondo Incident

EXPERT REPORT OF

GARDNER W. WALKUP, JR.

ON BEHALF OF

THE UNITED STATES OF AMERICA

BERKELEY RESEARCH GROUP

15 AUGUST 2014

Gardner W. Walkup, Jr.

DATED: August 15, 2014

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1. Table of Contents

2. Information Required by the Federal Rules of Civil Procedure

The following is a list of items required by the Federal Rules of Civil Procedure:

1. This report contains my opinions, conclusions and the reasons therefore;
2. A statement of my qualifications is contained in Section II and Appendix A;
3. My compensation for the preparation of this report is included in Appendix B;
4. The data or other information I considered in forming my opinions is listed in the Documents Reviewed and References sections of Appendix C;
5. In the last four years, I have not been a witness in any case.

I reserve the right to revise or supplement these conclusions if additional relevant information becomes available to me.

3. Summary of Opinions

Anadarko, a non-operating participant in the drilling of the Macondo well, contends that the Court should consider the potential impacts, if penalties are imposed on non-operating parties, on (i) non-operator investment in offshore oil development, (ii) safety in offshore well exploration and production operations, and (iii) industry custom and practice, as well as the efficacy of penalties against "non-operating investors."[1] Anadarko's contentions require a discussion of current industry custom and practice in general, and industry best practice specifically, of non-operating parties in deepwater activities in order that the impact of any penalty in this case on future non-operating party's behavior can be assessed. Accordingly, I have been instructed to consider the potential impacts of two scenarios of material penalties imposed under the Clean Water Act ("CWA") for events related to the Deepwater Horizon Incident on future non-operating parties. Scenario A considers the impact to future non-operating party's behavior if material penalties are imposed on both BP (as operator) and Anadarko (as non-operating party). Scenario B considers the impacts to future non-operating party behavior if material penalties are imposed only on the operator. For completeness, I have not considered either the scenario of material penalties imposed only on Anadarko or the scenario of no material penalty imposed on either party.

The impacts of Scenario A CWA penalties (both parties) will, in my opinion, be significantly better for industry participants and better advance the public interest than the impacts of Scenario B CWA penalties (operator only). The key drivers of this opinion are:

- It is current industry practice for non-operating parties to be focused, active participants in deepwater activities.

[1] See, June 20, 2014 email from Thomas Lotterman to Nancy Flickinger (2:58 pm) and attachment thereto amending Section H of APC's March 3, 2014 submission to Judge Shushan listing "other matters" that APC believes are pertinent to this litigation.

- This active participation by non-operating parties is beneficial to the economic and health, safety and environmental ("HSE") performance of deepwater activities because it allows the valuable input of non-operating parties with unique capabilities and experience.
- Non-operating party behaviors consistent with being "passive investors" or "non-operating investors" is not consistent with the industry best practice.
- Non-operating parties mainly focus their active participation on design decisions (e.g. development of an exploration well plan) that are made significantly in advance of rig operations. Rig operation decisions are limited to implementing design decisions and require a more streamlined decision process and non-operating parties usually have limited input in these decisions unless there is a "management of change" event. Non-operators also have active participation through exercising their rights under model agreements and contracts.
- The active participation of non-operating parties is documented or memorialized in many ways including, but not limited to, the AAPL Deepwater Model JOA form, the extensive use of "integrated project teams" (IPT), regulatory requirements for active participation in HSE matters in non-USA jurisdictions, and the use of the AIPN Model JOA form outside of the USA.
- Industry participants have, by necessity, developed industry best practices for decision making under conditions of extreme uncertainty. Both technical uncertainties (e.g. hydrocarbons in place) and non-technical uncertainties (e.g. time for regulatory approval) are handled by these best practices. Deepwater non-operators have decided to be active participants because of a conviction that their active participation makes the projects more likely to be successful despite the uncertainties.
- Scenario B CWA penalties (operator only) will create a disincentive for future non-operating parties to be active participants because such a ruling may be perceived by industry participants as an endorsement for the passive participation that Anadarko has publically (and in Court material) declared. The combination of not being penalized and publically proclaiming passive behavior (e.g. use of "non-operating investor" term) would inform future non-operating parties that active-participation is more risky than passive behavior with respect to possible CWA penalties.
- Because active-participation by non-operating parties improves the economic and HSE performance of deepwater activities and because Scenario B penalties (operator only) will create a disincentive for active-participation, the best interest of the public and industry participants is better served by Scenario A penalties (both operator and non-operating party) than Scenario B.

I understand that Anadarko takes the position that its contentions are appropriate for expert opinion. The opinions expressed herein are my affirmative opinions but I reserve the right and expect to render further opinions in response to any expert report from Anadarko regarding these contentions.

4. Background and Credentials

4.1.Education

I received a BS in Chemical Engineering from the University of California at Davis in 1982 and a MS in Petroleum Engineering from Stanford University in 1984. My Petroleum Engineering program included petroleum engineering courses in reservoir, production and drilling engineering, as well as courses in geology and geophysics.

4.2. Professional

My professional career began at Chevron Oil Field Research Center (COFRC) in 1984 as a Research Engineer responsible for research in, and global technical support of, "pressure transient testing" or what is more commonly referred to as "well testing." Well tests involve initiating or changing flow rates in wells, and measuring the resulting pressure changes in the wells and interpreting this pressure data to characterize certain attributes of the reservoir (reservoir characterization). I designed and conducted tests at wellsites and interpreted hundreds of well tests globally. Many times this involved direct interactions with non-operating parties where Chevron was the operator or with the operator when Chevron was the non-operating party. Additionally, I developed and taught Chevron's in-house "The Art and Science of Well Testing" course to petroleum engineers from Chevron's global operations, published several technical papers, and was active within the Society of Petroleum Engineers (SPE).

I left COFRC in 1989 as a Senior Research Engineer and was seconded to Caltex Pacific Indonesia (CPI) in Sumatra, Indonesia. CPI was a joint venture between Chevron and Texaco and acted as operator for a large concession area for the Government of Indonesia. As a Senior Reservoir Engineer, I was responsible for long-term development planning for the Minas oil field that was producing about 200,000 barrels of oil per day. This included field supervision of a wide-range of field testing. In 1993, I moved to EOR (Enhanced Oil Recovery) Planning and was responsible for negotiating financial terms for EOR projects with the Government of Indonesia.

I returned to Chevron as a Senior Petroleum Engineer in New Orleans in 1994. I was part of a multi-disciplinary team responsible for the exploration and development of the Norphlet. The Norphlet is an offshore Gulf of Mexico trend (including multiple fields) that extends west to east from Mississippi Canyon to Destin Dome blocks. My responsibility focused on completion design. I also designed and conducted well tests of exploration wells. This required direct interaction with the non-operating parties at key points in the well design or well test design. In addition to my duties in New Orleans, I was the team leader for a company-wide interdisciplinary effort to improve Chevron's corporate financial evaluation and investment-decision processes.

I began my management consulting career in 1997 when I left Chevron to become a Principal in the consulting firm Applied Decision Analysis, Inc. of Menlo Park, California. ADA was acquired by PricewaterhouseCoopers (PwC) in 1999 and I became a Principal with PwC in 2000. I left PwC in 2001 and joined Strategic Decisions Group, LLC (SDG) of Palo Alto, California as a Principal. The oil and gas practice of SDG was acquired by IHS, Inc. in 2007. I worked in the Cambridge Energy Research Associates (CERA) subdivision of IHS until 2010 as Vice President and then Global Managing Director of Energy and Natural Resources Consulting.

My practice throughout my consulting career has focused on helping management teams manage investment decision making in mega-projects, portfolio management and development of unconventional fields (e.g. shale gas). Additionally, my consulting practice helped companies establish and improve internal "Decision Quality" ("DQ") and stage-gate Project Management Processes ("PMP") at a number of large oil and gas companies.

Supporting management teams make decisions regarding large deepwater investment opportunities has been a large part of my practice. This has included helping major integrated oil and gas companies and large independent oil companies on deepwater exploration, project development, and portfolio management decisions.

In the Gulf of Mexico, I helped:

- One of the largest independent deepwater lease holders develop a multi-year portfolio strategy that included acquisition and divestments, partnering, exploration, and development decisions.
- One of the top global integrated oil and gas companies develop a portfolio strategy for technology development, partnering, leasing, acquisition, and exploration for the then-new "ultra-deepwater, lower tertiary" play.
- One of the top global integrated oil and gas companies manage the "Select Stage" for a large (greater than 500 million barrels of oil recovery) deepwater field. This included involvement of non-operating parties.
- One of the top global integrated oil and gas companies develop a field revitalization strategy for one of the first deepwater fields than included a regional exploration and development strategy to utilize available capacity in the existing production infrastructure. This strategy process included consideration of partnering options.

In deepwater Brazil, my team helped one of the major integrated oil and gas companies develop a well test design strategy for a high-risk well. This included consideration of non-operating parties' involvement.

In deepwater Malaysia, we helped one of the top integrated oil and gas companies develop an exploration strategy, including potential partnering.

In deepwater Nigeria, we helped:

- A major integrated oil and gas company manage the Feasibility and Concept Select phases of the industry standard stage-gate PMP for a deepwater project. This included consideration of partnering decisions.
- A major integrated oil and gas company manage the Concept Select phase for two different deepwater plays and the Define phase for one of those plays.

In deepwater Indonesia, we helped one of the leading independent deepwater exploration and production companies develop an exploration and project development strategy for a trend that included over six separate deepwater fields. We played a large role identifying and evaluating different partnering alternatives.

In deepwater China, we helped one of the largest independent deepwater exploration and drilling companies with both the Concept Select and Definition stage-gate phases. Concept Select included partnering considerations.

I left consulting to join the Executive Leadership team of AES Corporation in 2010 as a Senior Vice-President. I led the corporate strategy function and served as Chair of the Investment Committee. Leadership of the corporate safety culture was an important element for everyone on the Executive Leadership Team.

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I left AES in 2013 and founded the consulting firm Bridge Energy Partners, LLC that focused on dispute consulting and providing investment decision support to energy companies.

In April of 2014, I joined Berkeley Research Group, LLC. I provide global expert and advisory consulting services to Fortune 500 corporations, government agencies, and regulatory bodies. My main areas of focus are mega-project developments (including deepwater developments) and unconventional field transaction and development support.

I have taken professional courses in Decision Analysis, Financial Accounting, Reservoir Engineering, Geology, and Formation Evaluation during my career. My curriculum vitae is included in Appendix A.

5. Industry Best Practice: Active participation by non-operating parties

Anadarko takes the position that the Court should consider the impact of a penalty in this matter on industry customs and practices, safety, and investment, and also contends that the Court should consider the "efficacy of the penalty on non-operators." To fully consider and evaluate the impact of penalties on future non-operating party's actions, it is necessary first to understand the current role of non-operating partners in deepwater activities.

The frequency of partnering within exploration and production activities is extremely high when compared to other industries with similar capital intensive, high risk and long-lived investments. The reasons for partnering are many and discussed below. Due to the frequency of partnering, a set of common best practices between operators and non-operating parties has evolved.

As shown below, it is industry best practice for non-operating parties to be active participants in deepwater activities. Behaviors consistent with non-operating parties acting as "passive investors" or "non-operating investors" are not consistent with industry custom and practices.

To support my opinion, I present the following:

- A summary of current best practices (Section 5.1)
- The difference between design decisions and wellsite operational decisions and how this impacts the ways non-operators pursue active participation (Section 5.2)
- The drivers for why companies that are non-operating parties choose to be active participants (Section 5.3)
- A number of examples where the best practice of active participation by non-operating parties is documented or memorialized (Section 5.4)

5.1. Current state of non-operating party best practice

Shell was one of the first deepwater players and remains one of the top producers in the Gulf of Mexico deepwater. Initially, Shell was almost exclusively an operator; however, by 2001 the set of majors and large independents with deepwater operating experience had grown and Shell had gained experience as a non-operating party. Around that time, one of the Shell's deepwater experts summarized the company's view that non-operating parties should be actively involved in deepwater activities to maximize value:

> *The strategy for a non-operator to increase project value consists of [these] main steps: 1. Understand and align (to extent possible) the corporate business drivers that underpin the day-to-day behaviors of the project teams. 2.* ***Reach agreement on project objectives, including stakeholder relations and HSE principles. 3. Clearly understand your rights under the Joint Venture Operating Agreement. 4. Identify the key value contributors and risks in the project. 5. Objectively assess the strengths and weaknesses of the operator and other partners. 6. Focus your project participation on the high value and/or high-risk areas where you have a strength or the operator has a weakness (the critical activities).*** *7. Agree with the operator on how to manage formal technical reviews (or gates) to minimize duplication and timing disconnect. [Emphasis added.]*[2]

The identification of "critical activities" is crucial and is idiosyncratic to each project and involves an analysis of the strengths and weaknesses of both the operator and non-operating parties:

> *Given the value and risk profile of the project and the particular competencies of operator and non-operator, the non-operating party is ready to decide those critical activities where participation will be most fruitful.* ***Simply stated, a critical activity is a high value or high risk area where the operator lacks competency, or the non-operator feels an independent view, audit, or contribution are valuable or needed.*** *Once defined, the critical activities list should drive the focus, work, and staffing of the non-operator. [Emphasis added.]*

To Shell, one of the industry deepwater leaders, establishing these best practices for non-operating parties goes beyond a single well or project and has industry-wide implications:

> *The global deepwater continues to challenge the industry and pushes our capabilities to the limit.* ***Successfully tapping into the expertise that each company brings to a partnership*** *while avoiding value-reducing conflicts is mandatory to achieving improved industry success. [Emphasis added.]*[3]

Shell's statements exemplify the industry best practice of active participation for a non-operating party in deepwater activities. Being a "passive investor" who merely funds the operations and has no other role is not consistent with its strategy. Since 2001, when this article was written, the active role of non-operating parties has become standard across the industry and, as discussed below, codified in a number of ways (see Section 5.4). Other companies have also articulated similar models for active

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[2] Jeffris, Robert G. and Susan A. Waters. "Getting Deepwater Development Right: Strategies for the Non-Operator." OTC 14201, 2002 Offshore Development Conference. May 2002.
[3] *Id.*

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participation by non-operators. Chevron listed the following benefits of partnering beyond cost reduction purposes, in an exploration context[4]:

> *Risk management of the overall portfolio; Access to key resources, such as drilling rigs for ultra-deep water; Alignment with partners of like-interests and -drivers in a lease area;* ***Bringing in of partners with key technical or project experience;*** *Gaining access to data that may help to evaluate other opportunities. [Emphasis added.]*

As Chevron indicates, contributions by non-operating parties is a key reason to partner, and success requires active participation by non-operating parties, as it provides an opportunity to "leverage each other's skills."[5]

Similarly, Petrobras, one of the largest global deepwater players, emphasizes the importance of partnering in the deepwater Gulf of Mexico, noting that "given the complexity of the operations and size of the investments involved, the relationships tend to divert towards the cooperative track."[6]

Another example from literature, which involves Anadarko acting as a non-operator, concerns the Jubilee project offshore Ghana that has successfully navigated many challenges to become an important asset for all of its owners.[7] The early development of this area was discussed in the industry literature. This project utilized two operators, Kosmos Energy and Tullow Oil, and involved significant participation from the non-operator, Anadarko. As technical operator, Kosmos Energy led an Integrated Project Team (IPT) to plan and execute the project. Anadarko seconded a "significant number of experienced key project personnel to the IPT, enabling the IPT to fully leverage the capabilities of the major partners." This quote from the technical operator demonstrates that all parties, including the non-operating party Anadarko, were active participants[8]:

> *The Jubilee Project was a very ambitious challenge for the first significant development ever offshore Ghana. The Joint Venture used a split operatorship to execute a world-class deepwater project in an area with no existing infrastructure, in less than 3 years from the start of concept selection. This paper will highlight the approach used to manage the Jubilee risks and project execution, emphasizing the keys to success and lessons for this fast-tracked project.*
>
> *Kosmos Energy was appointed Technical Operator for the project with responsibility to assemble and lead the Integrated Project Team (IPT) in planning and executing the project. Tullow Oil was appointed the Unit Operator (UO) with the responsibility to drill and complete wells, build the in-country infrastructure and organization for production operations, and to subsequently operate and manage the field in the future.* ***Anadarko,***

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[4] Herman, A. et al. "Changing Dynamics in Deepwater Ownership." OTC 17783, 2006 Offshore Technology Conference. May 2006.
[5] *Id.*
[6] *Id.*
[7] Weinbel, R. Cory and Ronaldo Araujo. "Jubilee Field FPSO – A Fast Track Delivery Success." OTC 23439, 2012 Offshore Technology Conference. 2012.
[8] McLaughlin, Dennis. "Jubilee Project Overview." OTC 23430 2012 Offshore Technology Conference. 2012.

a non-operating partner, seconded a significant number of experienced key project personnel to the IPT, enabling the IPT to fully leverage the capabilities of the major partners. *(Emphasis added.)*

The literature indicates that non-operating parties can, and do, add substantial value to deepwater activities through targeted active participation. I have also observed this in my consulting practice. For example, I was engaged by a one of the two largest deepwater GOM producers to develop a strategy to extend the life of an aging deepwater facility located in a region with substantial potential but difficult exploration characteristics. This included the considerations of "partnering" where the quality of a partner included not only available nearby production to bring to a facility that had excess capacity, but also of the quality of exploration expertise.

The closeness of the relationship between operator and non-operating parties is revealed in the frequency of the word "partner" and the lack of the use of the terms "investor" or "lessee" to describe the non-operating party in my experience, the industry literature (see above quotes as examples), and model form agreements (discussed in section 5.4). For example, a very common interaction between operators and non-operating parties are usually called "partner meetings." "Investor meetings" do occur in E&P companies, but these are shareholder meetings or meetings with equity analysts.

5.2. Non-operators' role in design decisions versus wellsite operating decisions

Deepwater activities are expensive, risky and potentially very financially rewarding. It would not be uncommon for a deepwater project to cost over $5 billion to fully develop. There are a number of industry best practices (e.g., stage-gate process)[9] that have been developed to manage the thousands of interdependent decisions that have to be made and for the follow-on operations that implement these decisions. The role of non-operating parties in this complex set of decisions and operations is very important and, as discussed in Section 5.1, non-operating parties are active participants.

However, the active participation of non-operating parties is highly targeted. A useful segmentation of decisions is into:

- design decisions that are made far in advance (usually a matter of months) of the operations that implement these decision (e.g. the well plan); and
- operating decisions that are made during the implementation of the design decisions and consequently might be made immediately before implementation.

Design decisions include decisions like the casing design (e.g. long-string versus short-string), cementing program (e.g. foam cement versus conventional cement), cement integrity evaluation (e.g. prerequisites to run a cement bond log ("CBL")), and temporary abandonment procedures (e.g., fluid levels or negative pressure test design). Dozens of people will be involved in these design decisions given that deepwater wells routinely costs $100 million to $200 million. Months of elapsed time and

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9 Walkup, Gardner and J. Robert Ligon. "The Good, the Bad, and the Ugly of the Stage-Gate Project Management Process in the Oil and Gas Industry." SPE 102926 2006 SPE Annual Technical Conference and Exhibition. September 2006.

hundreds of man-months of effort will go into these decisions. Well design is an activity to which active non-operators will contribute. For example, Anadarko contractor and veteran drilling engineer Bob Quitzau explained a prior experience working for Mobil, where Mobil was a non-operator and a Japanese company was the operator. Quitzau testified that for that project, Mobil employees assisted in planning the well, and contributed to the operator's design.[10] Often, non-operators will have meetings with operators to discuss these design issues, commonly referred to as "partner meetings." In describing his early role at Anadarko managing non-operating properties, Anadarko Vice-President Darrell Hollek, discussed his participation in "partner meetings" as part of his responsibilities in managing those properties.[11]

Operating decisions, for the case of drilling, will commonly take place on the rig. Modern technology with real-time access of data from anywhere in the world is breaking down this paradigm, however. Making a decision to proceed with the temporary abandonment procedure after interpreting a negative-pressure test as successful is an example of an operating decision that is usually done at the wellsite. Operating decisions are usually limited to implementing design decisions and this why operators will usually have less than a handful of staff on the rig during operations, as opposed to having dozens or hundreds directly involved in design decisions.

Non-operating parties' ability to contribute to onsite operational decisions is limited because of the time sensitive nature of these decisions. The time sensitivity is predominately economic in nature; however, there are also safety issues that require that decisions on the rig are highly centralized in order to ensure timeliness in these decisions.

Non-operating parties' active participation is usually targeted to the pre-operational design decisions. Exceptions exist and can depend on the particular strengths and weaknesses of the operator and non-operating parties but would certainly include when significant design changes are required due to an unexpected event (e.g. needing to replace a rig damaged during a storm or casing string design changes). These major events usually will trigger a "management of change" event. Recent (since the events at Macondo) regulations regarding requirements for an operator's "Safety and Environmental Management Systems" (SEMS)[12] requirements have prompted changes to the industry standard deepwater Model JOA Form Agreement[13] to conform to the industry best practice of ensuring non-operators are fully informed of such actions.

Another example of non-operating parties' active participation beyond pre-operational design decisions is the exercising of their rights under the Model Form JOA. As discussed in Section 5.4.1, the Model Form JOA memorializes the industry custom and practice of active-participation by non-operating parties. For example, once the objective depth has been reached and all data provided to the participating parties, the operator will usually propose "exploratory operations at objective depth" which may include additional testing, deepening the well, temporary abandonment among other

[10] Deposition of Robert Quitzau. Vol. 1. May 25, 2011, page 20;line 18

[11] Deposition of Darrell Hollek. June 22, 2011.page 16; line 6

[12] " Oil and Gas and Sulphur Operations in the Outer Continental Shelf—Revisions to Safety and Environmental Management Systems DEPARTMENT OF THE INTERIOR Bureau of Safety and Environmental Enforcement 30 CFR Part 250 RIN 1014–AA04.

[13] "Deepwater JOA Revisions Update: Post Macondo Re-look" OCS Advisory Board. OCS 2013 Summer Seminar 27 June 2013

options. Participating non-operating parties have only 24 hours to respond. Importantly, these non-operating parties have the right to propose alternative operations that can differ significantly from the operators plan. Thus, it's possible that the operator may propose to temporarily abandon a well while a non-operating party proposes to deepen the well. The ultimate decision will depend on how the majority votes but the fact that a non-operating party has the right to force a vote on such an important proposal as whether to deepen a well versus temporary abandonment and that this must happen within 24 hours of receiving the operator's plan requires that a non-operating party be actively participating in order to be able to exercise the rights within the JOA.

5.3. Reasons why non-operating parties are active participants in deepwater activities

It is best practice for non-operating parties to be active participants in deepwater activities. There are a number of critical reasons for this. Understanding some of these reasons will help assess how the CWA penalties will influence future non-operating party behavior and investment and is important to any consideration of Anadarko's position.

The following five key reasons for active participation by non-operating parties are discussed below.

- The deepwater business is relatively new, and still evolving. Non-operating parties are active participants to learn from more experienced operators so as to increase their own opportunities in future projects. This "Strategic Learning" is discussed in Section 5.3.1.
- Deepwater opportunities can sometimes be very rewarding but they are always very expensive. For some independents, the financial exposure can create significant risks (e.g. ability to fund investment plans or meet investors' dividend expectations) and thus non-operating parties are actively engaged. This is discussed in Section 5.3.2.
- Because deepwater projects are so expensive, the investment community pays significant attention to spending and performance of these "mega-projects." It is critical in today's markets to ensure that the investment community receives "no surprises" on these investments and thus there is a significant Investor Relations ("IR") reason for non-operating parties' active participation as discussed in Section 5.3.3.
- The key to success in deepwater is that reservoirs are "high kh," which allows each well to have very high flow rates. However, the extreme costs of wells (about 70% of spending can be associated with wells) means that very few are drilled. Thus, non-operating parties are actively involved to ensure the success of wells especially in the Well Planning stages as discussed in Section 5.3.4.
- Gaining access to resources is one of the biggest challenges for the industry as a whole and for individual players. The reputational risk of either being directly involved in a major incident, or being within a region that sustains a major incident, will cause a detriment to the reputation of individual players and the industry as a whole. This will reduce future access and management of this reputational risk is another driver for active participation of non-operating parties as discussed in Section 5.3.5.

5.3.1. Strategic learning

The initial phase of deepwater developments saw only a few major integrated oil companies (e.g. Shell) operate. Independents and later-entering majors strategically used the role of non-operating party to learn. This was not accidental; rather, companies had deliberate deepwater learning strategies. This active-learning strategy was quite successful for certain players in the Gulf of Mexico.

Learning strategies require a high degree of participation by the non-operating parties. It is insufficient to simply "monitor" activities to learn how decisions are made. Each deepwater play is different and simply applying the drilling or development plan from a previous field cannot be done without creating an unacceptable level of risk. Rather, what an active non-participant learns includes not only how to interpret and use collected information, but also how this information informs assessments of uncertainty, what the range of possible alternatives can be and then how this totality is considered to identify the "best" alternatives to pursue. As discussed below, the Integrated Project Team (IPT) approach that has become standard industry practice and that is codified in most model form Joint Operating Agreements is a key means of ensuring non-operating parties can be active participants (by being on the IPT) and, as a result, learning.

The deepwater business in the Gulf of Mexico had effectively bifurcated by geologic age by 2010 in large part because of the success of the active-learning strategies of non-operating parties. The more mature, but still technically challenging, segment comprised the Miocene-aged reservoirs. The second business segment was the older (i.e. deeper) Lower Tertiary-aged reservoirs. The Lower Tertiary play is not only a deeper formation but is also typically found in deeper water. While the majors held, and operated, many of the older and largest fields in the Miocene portion of the Gulf, the independents had taken a dominant position, focusing on smaller fields or groups of fields where the traditional lower cost structure of the independents create a competitive advantage. The more technically challenging Lower Tertiary play was dominated by the majors. However, as was the case in the earlier Miocene developments, certain independents were again utilizing an active-learning strategy in the Lower Tertiary play.

A good summary of the learning strategy and bifurcation of the industry was provided in a 2008 joint-industry (Shell, Chevron, Anadarko, and Devon) and the federal government's Minerals Management Service (MMS) presentation made at the annual Offshore Technical Conference[14]:

> Only a few major oil companies extended ongoing production from a shallow water Miocene trend to deepwater fields in 1,000 foot up to 5,000 foot water depths. **The Miocene trend defines up to 24 million-year-old geological stratum in earth rock that has been a prolific producer so far in the GOM. A wave of large deepwater developments was completed by major oil companies in the mid-1990s to increase production from this trend. In the late-1990s to 2002 large independents moved in via partnering and farm-ins. They started a new wave of large developments by collaborating with infrastructure developers such as pipeline companies and deepwater service contracting firms.** They started "hub and spoke concepts", where the hub platforms were installed not only to capture the production from a specific field but also to serve as host for future production from nearby fields. Once such an

[14] Ford, Russ et al. "New Waves in the Gulf of Mexico." OTC 19259, 2008 Offshore Technology Conference. May 2008.

infrastructure was created, small fields became economically attractive using subsea tiebacks. In 2003, a parallel shift of small independents moved in to keep the wave of deepwater developments ongoing. At the same time foreign companies entered the arena in hopes of learning and advancing further. **As everything seemed to be maturing, a few optimistic companies believed in the "Lower Tertiary Trend" that occurred not only 10,000 to 30,000 feet deep below the earth's surface but in ultra-deepwater as well, in depths ranging from 5,000 to 10,000 feet.** *(Emphasis added.)*

The annual deepwater summaries the MMS provided describing the state of the industry also captured the strategic learning and phases of development in deepwater[15]:

> *In the past, major companies were responsible for the majority of discoveries and led the way into the deepest waters. However, the number of discoveries by non-major companies has surpassed that by major companies.*

The industry best practice of non-operators to be active participants as discussed above is in part due to the strategy of non-operators to learn from operators. This learning strategy allowed independents to take a leading role in the later developments of the Miocene deepwater business. In fact, research into the effectiveness of the operator/non-operating party approach revealed that the ultimate success of a project is more dependent on the non-operating party experience of the operator than the operator experience of the operator[16]:

> *With further investigation into experience type, however, my results are somewhat counterintuitive. Why is it more beneficial to the JV [Joint Venture, which includes JOA agreements] for the operator to have non-operational rather than operational experience? One possible explanation could lie in the nature of the operational and non-operational experience itself.* ***Operational experience hones a company's core internal processes, while non-operational experience provides an opportunity for a firm to learn new technologies and processes.***
>
> *As noted by Phka and Windrum (2003), there are two primary motives to form an alliance or JV. The first is to extend one's own resources by combining them with a partner. This is the primary motive of an operator, who often looks upon JV partners as a resource for capital. The second motive is to acquire organizational know-how and technology (Kogut, 1988, Prahalad and Hammel, 1990). This second motive is a primary driver for non-operators, who use the JV as a tool for learning about new regions and accessing new technology.* ***The JV is a particularly important learning tool for non-operators; the knowledge necessary for a non-operator to eventually become an effective operator is highly tacit and integrated with the operator's organizational***

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[15] Minerals Management Service. *Deepwater Gulf of Mexico 2008: America's Offshore Energy Future*. OCS Report. 2008.

[16] Sharma, Arun K. "'Will My Partners Slow Me Down?' The Effect of Partner Ownership and Experience on Deepwater Project Execution Time." SPE 116077, 2008 SPE Annual Technical Conference and Exhibition. September 2008.

structure or internal practices (Dosi, 1988). Thus, operators enter into a JV to hone existing skills (exploitation), while non-operators are in a JV to expand their skills.
(Emphasis added).

The above observations could not be the case if non-operating parties were only passive investors.

5.3.2. Financial exposure

The financial risk versus reward character of deepwater investments is significantly different than most other E&P opportunities. Costs for each individual deepwater project are extremely high. The number of wells drilled is very low. For example, the costs to drill and complete a single well can easily be in excess of $150 million. This compares with an expensive onshore well in a shale gas play or tight oil play costing less than $15 million. Total project costs for deepwater can easily exceed $5 billion. However, the rewards for deepwater can be huge as well. Clearly, deepwater is different. The financial impact of underperformance compels non-operating parties, particularly independents, to be actively engaged or risk a single investment that could pose a significant threat to their shareholders' equity.

It is typical for E&P companies to provide guidance on how they plan on reinvesting their shareholders free-cash flow. A portion of Anadarko's press release about its 2010 capital program demonstrates how material individual deepwater plays are regardless of whether they are operated or non-operated wells. In the summary of wells below, the wells in West Africa (Ghana) are instances where Anadarko was a non-operating party[17]:

> *Approximately 20 percent of the 2010 capital program is allocated to exploration, with much of it focused on the company's worldwide deepwater exploration program that includes plans to drill approximately 30 high-impact exploration/appraisal wells.* ***Up to 13 exploration/appraisal wells are expected to be drilled offshore West Africa,*** *7 to 10 wells in the Gulf of Mexico, 4 to 6 wells in Brazil, 4 to 6 wells in Mozambique and 3 to 5 wells in southeast Asia. "Given that at least 75 percent of the $1.1 billion allocated to exploration is directed to the drill bit, we expect to be one of the most active deepwater drillers in the world this year, testing up to 7 billion BOE of gross unrisked resources," said Hackett. "We are targeting approximately 400 million BOE of net discovered resources in 2010, a 12-percent increase over our record 2009 results. At the same time, we are actively appraising several of our recent discoveries – Wahoo in Brazil, Tweneboa in Ghana, and Lucius, Vito and Heidelberg in the Gulf of Mexico – as we work to convert these resources to production and value. (Emphasis added).*

Almost half of the exploration/appraisal wells (13 of 30) in Anadarko's 2010 program were wells in which Anadarko was a non-operating party. This is about 10% of the entire capital program which is certainly material and, as discussed in Section 5.1, Anadarko did not act as a passive investor on this part

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[17] Anadarko Petroleum Corporation. "Anadarko Announces 2010 Capital Program, Guidance and Highlights of Today's Investor Conference." News Release. March 2, 2010.

of its portfolio (i.e., Ghana's Jubilee field), but rather seconded its own employees who participated in the project team that designed and executed the project.[18]

5.3.3. Investor Relations

Many non-operating parties, including Anadarko Petroleum Corporation, are shareholder-owned organizations, and since the financial requirements of deepwater activities are so large, it is critical that companies are actively involved so that investor relations ensure "no surprises" to the investor community. This requires that non-operating parties be actively engaged, and at least actively monitoring all deepwater activity. The repercussions of "surprises" to share price can be extreme.

In the press release below, it is clear that even at the CEO level, Anadarko is clearly quite involved in the deepwater activities in both exploration and delineation drilling on the Jubilee asset where Anadarko is a non-operating partner:

> ***HOUSTON**, Jan. 12, 2009 – Anadarko Petroleum Corporation (NYSE: APC) today announced a successful drillstem test (DST) at the Hyedua-2 appraisal well in the deepwater Jubilee field offshore Ghana. ... **"Flowing nearly 17,000 barrels of high-quality crude oil per day from a test well is an outstanding success indicative of the world-class potential of this basin," Anadarko Chairman and CEO Jim Hackett said. "The high flow rates and relatively low pressure drawdown of this well demonstrate excellent productivity, and the data confirms we are connected to a large reservoir. While the partnership continues to evaluate the full impact of these results on the field's estimated gross recoverable resources, we are extremely pleased with the excellent fluid and reservoir quality we've encountered, the flow rate at Hyedua-2 and the recently announced success at the Mahogany-3 appraisal and exploration well."** (Emphasis added.)*

The above demonstrates that when results are from material non-operated properties, the CEO will become well versed and involved. Much of this is to keep the investment community aware and ensure no surprises.

Another example of senior management's involvement with the investment community regarding non-operated deepwater activity is provided by the following press release by Chevron:

> *NEW ORLEANS, Oct. 29 -- ChevronTexaco (NYSE: CVX) today announced a new deepwater oil discovery at the Saint Malo Prospect located in Walker Ridge 678. The block is located approximately 250 miles south of New Orleans.*
>
> *Operated by Unocal, the Saint Malo discovery well is located in approximately 6,900 feet of water and was drilled to a depth of 29,066 feet. The exploratory well encountered more than 450 net feet of oil pay over a gross interval of 1,400 feet.*

[18] Note that the Macondo well is not mentioned in the above press release. While it is not entirely clear why, the omission could be because Macondo did not meet Anadarko's standard to be "high-impact."

"The Saint Malo discovery is a very positive result. Our interest in the prospect was secured with a trade and is an example of our long-term strategy to acquire strategic assets and deliver superior exploration success from our Gulf of Mexico deepwater portfolio," said Ray Wilcox, president of ChevronTexaco Exploration and Production.

"We are excited by the results of this well," said Kathleen Arthur, vice president of ChevronTexaco's Gulf of Mexico deepwater business unit. "We have a good acreage position in the area and look forward to additional exploration drilling next year."

5.3.4. Managing risks to high rates through well design

The success case economics of deepwater developments are possible only because the flow rate from individual wells can be very high. This is also what makes deepwater very risky because very few wells are drilled per project. Significant damage to even a single well, which can happen during drilling operations from lost fluids and other events, can render an entire project uneconomic. Thus, industry best practice is that non-operating parties are involved in the well design, including well procedures, planning and well completion decisions.

This focus on well design, by both operators and non-operators is well summarized in industry literature[19]:

> *For a typical deepwater development, as much as 40% of the cost maybe spent on wells, with an additional 30% spent on subsea facilities. So with about 70% of the total development costs related to wells .... Sustainable high production rates and high-ultimate-recovery wells are absolutely key to deepwater viability.*

The reasons deepwater wells can have high rates and recoveries is because the rocks are both very permeable (a rock property that describes the relationship between fluid flow rates and pressure drop) and are thick. However, if during drilling improper well fluids are used or if large amounts of well fluids (e.g., drilling mud) are lost to the formation it is possible to "damage" the well. This occurs when the permeability near the wellbore is altered and becomes significantly less than the undamaged reservoir rock. Petroleum engineers use a mathematical concept called "skin" to represent the extra pressure drop that occurs near the wellbore that has the impact of reducing flow rates. Thus, even if the reservoir has high permeability (k) and is thick (H), and thus a "high kH" reservoir, a project can become uneconomic if wells are damaged during the drilling operation.

> *"High kH" reservoirs – those having large net thickness and high permeability -- have been critical for achieving the high flow rates and well ultimate recovery that are required for deepwater development economics...*

This is another reason why well design and drilling procedures are the target of much of a non-operating party's focus.

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[19] Colligan, John. SPE 57709, *The Economics of Deep Water*. Shell. Oil and Gas Executive Report

5.3.5. Reputational Risk Management

Deepwater development is highly concentrated into very few locations globally, with a majority of discovered resources in the Gulf of Mexico, Brazil and West Africa.[20]

Companies know that an egregious error by a single player can shut a significant portion of global deepwater off from industry development. This unsurprisingly happened in the Gulf of Mexico post-Macondo when a moratorium was put into place followed by the rollout of new regulations and oversight that resulted in much slower activity for a number of years.[21]

Thus, any incident could potentially strand significant existing assets, as well as access to new opportunities regardless of who was the operator of the incident. To avoid these "muddying the water" risks, deepwater non-operating parties are actively engaged to protect not only individual assets where they are non-operating parties, but also their remaining portfolio where they might be non-operating parties or might be operators. Access to future deepwater opportunities is granted by resource holders in most locations and being associated with an event risks these future opportunities.

5.4. Industry examples where non-operating party best practices are codified and documented

5.4.1. Joint Operating Agreement

Drafting the legal documents to implement the joint-ownership arrangements common in the E&P industry can be a time-consuming and expensive effort. The industry has for many years attempted to reduce this effort by cooperatively developing model form joint operating agreements (JOAs) that set out the rights and responsibilities of operators and non-operators. Various industry groups like the American Association of Professional Landmen (AAPL) have been instrumental in these efforts. The table below provides a short summary of only a sampling of key JOA model forms for onshore, outer continental shelf, deepwater, and international arrangements.

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[20] Pettingill, Henry and Paul Weimer. OTC 14024, "World-Wide Deepwater Exploration and Production: Past, Present and Future." 2002 Offshore Technology Conference. May 2002.
[21] IHS CERA. "Deepwater Drilling Permit Update." November 2011. Presented to the Gulf Economic Survival Team

	Model JOA			
	AAPL 610 (Onshore USA)	AAPL 710 (Outer Continental Shelf)	AAPL 810 (Outer Continental Shelf-Deepwater)	AIPN (non-USA)
Years Modified	1956, 1977, 1982, 1989	1984, 1996, 2002	2000, 2007, 2014 (expected)	1995, 2002, 2012

A key insight from the table above is that model forms need to evolve as industry practices evolve. It is particularly instructive to understand why the first model form for deepwater was needed, what the key changes were made and what changes are currently being affected. A common thread to many of these changes to the deepwater model form JOA has been the need to codify the increased active participation of non-operating parties because of the unique challenges of deepwater.

The industry cooperative effort to produce a deepwater model form JOA in 1996 originally had sixteen voting members, several non-voting members and the support of three lawyers. A paper co-authored by one of these lawyers summarizing this effort presented the key reasons the model form was needed[22]:

> *What makes the Model DWOA [deep water operating agreement] different from other model forms? The geographical extent of deepwater prospects which makes lease-by-lease application unwieldy, if not impossible, and hence the application of the agreement on a Contract Area basis, the selection of not only a successor Operator but also a substitute Operator, the "removal of Operator" clauses, approvals and notices, the frontier nature of deepwater exploration hence the extreme value of the information derived from geological and geophysical operations in deepwater and the lack of infrastructure therein, Appraisal Operations, the staggering Costs of developing a deepwater discovery and because of those high Costs,* ***the desire of Non-Operators to participate in the development process more significantly than most shelf Non-Operators****, the cycle time required for preparations for development, and the steps involved in preparations for development. Those are the key items. [Emphasis added.]*

Increased participation by non-operating parties was, and remains, a key to all deepwater model forms.

An effort to "tune-up" the AAPL 810 form for deepwater was begun shortly after it was put into place in 2000. The "OCS Advisory Board" is the industry non-profit group that coordinated these changes. Since 2004, Anadarko has hosted the bi-annual OCS Advisory Board Workshops at their headquarters in The

[22] Moore, Bill and J. Lanier Yeates. "The Birth and Status of the Deepwater Offshore Model Form Operating Agreement." BP Amoco. August 16, 1999.

Woodlands, Texas. More than 200 landmen typically attend these meetings. Developments in the deepwater model form JOA has been a topic at most of these meetings.

The OCS Advisory Board Workshop held in 2006 provided a summary for the update to Form 810 that was finalized in 2007 and became the basis for the JOA executed by BP and Anadarko for Macondo. Two items identified as "Conceptual Issues on which we are focusing"[23] are important to this discussion. The first was to ensure the model form corresponded to industry practice and nomenclature with respect to the use of integrated project teams (IPTs) and state-gate decision processes. The second key item was identified as "Exhibit - Heath Safety and Environment (HSE)." This Exhibit ultimately became Exhibit K to the 2007 Model Deepwater JOA.

The 2007 AAPL JOA Model Form (810) as finalized provides for significant participation by the non-operating parties. The most explicit realization of this best practice is found in the parts of the JOA that deal with the different "phases" of development. During each of these phases, a project team (e.g., Feasibility Team) is envisioned that includes technical staff from both operating and non-operating parties. There are other examples of where the best practice are explicitly encountered, such as in "Exhibit K – Health, Safety and Management ("HSE")" where the non-operator is explicitly provided the right to require that the operator demonstrate that their "Health, Safety & Environmental Management Plan" is compliant with API RP75 guidelines.

The Macondo incident prompted the adoption of new regulations and a reevaluation of industry practices. The deepwater model form is again under modifications by the OCS Advisory Board. Although the new model form has not been published, most of the key modifications have been identified and discussed. At the 2013 OCS Advisory Board Summer Seminar a key agenda item was a presentation titled "Deepwater JOA Revisions Update: Post-Macondo Re-look."[24] The following were identified as "Key Provisions Reviewed and Revised":

- Well Planning Article 2.68 (Well Plan)
    - Article 5.7 (Information to Participating Parties)
    - Articles 10.1.1/11.1.1/13.1.1 (Pre-exploratory Well AFE meeting,Revision of Well Plan)
    - Articles 10.1.2/11.1.2/13.1.2 (Automatic Revision of Well Plan)
    - Articles 10.1.4/11.1.4/13.1.4 (AFE Overruns & Substitute Well)
- Article 22 (Liabilities)
- Article 24 (Transfer of Interest)

Most of the changes to the Well Planning Article (it applies to both exploration and delineation wells) are to make it very clear that non-operating parties have to be informed, at the very least, as to the full well plan before an AFE is even submitted.[25] For example, item 10.1.1 "Pre-Exploration AFE Meeting, requires that operators have a meeting with non-operating parties to discuss many of the details of the "well design" where the definition of the well design is quite broad.

[23] OCS Advisory Board, "Deepwater OA - Model Form Update 2006" 2006 OCS Advisory Board Workshop, The Woodlands, 19 January 2006.
[24] "Deepwater JOA Revisions Update: Post Macondo Re-look" OCS Advisory Board. OCS 2013 Summer Seminar 27 June 2013
[25] OCS Advisory Board, "Well planning articles 2013 compared to 2007 AAPL form" 2013 OCS Advisory Board Summer Seminar Program, The Woodlands, 27 June 2013.

In the 2014 OCS Advisory Workshop held in February of 2014, the status of the revisions was again discussed.[26] One of the four basic principles of the JOA that were reaffirmed and noted would not change was the "phased-gate approach" of decision making. This phased-gate (or stage-gate) approach involves project teams comprised of members of all key parties and preserves the ability of non-operators to actively participate.

5.4.2. Mandated active participation of non-operating parties in non-USA jurisdictions

Anadarko has contended that the court should consider the impact of penalties on a non-operating party to future practices of non-operators and the HSE performance of deepwater activities. The deepwater business is global and in many non-USA jurisdictions, more active participation is required. In many jurisdictions this best practice is mandated by "health, safety and environmental" ("HSE") regulations by ensuring that responsibility for HSE belongs to all parties—both operators and non-operating parties. These requirements are founded on the industry understanding that the active participation of non-operating parties improves HSE performance.

5.4.2.1. "See to it" in Norway

In July 1988 an explosion on the offshore platform, the Piper Alpha, caused the death of 167 men. The facility was also lost. This was a turning point for the industry in general and in the North Sea in particular.

After the incident, many new practices were adopted. Among other things, these practices make it very clear that the licensee (non-operating party) has to be actively engaged in all HSE activities. A plea that these HSE activities are the sole role of the operator is against the regulations and the operating culture. In Norway, the following "see to it" requirement is part of the governing regulations, and imposes a duty on non-operators to ensure that the operator is operating safely and to take action if there are unsafe operations. The following is provided by the Petroleum Safety Authority of Norway[27]:

[26] "Deepwater JOA Revisions Update." OCS Advisory Board. OCS Workshop. January 23, 2014.
[27] Petroleum Safety Authority of Norway. "Requirements Applicable to the Licensee." http://www.psa.no/requirements-applicable-to-the-licensee/category958.html

A licensee must facilitate the operator's work in the production license and verify that the latter is fulfilling its obligations.

The licensee must therefore be able to document that it has sufficient resources and expertise to determine the quality of the operator's HSE management.

The "see to it" duty (*påseplikt*) also requires the licensee to supervise the operator in a systematic manner. Its management system must clearly show how this obligation is met.

The licensee's "see to it" duty includes ensuring that:

- the operator has a functioning management system
- the operator has an adequately qualified organisation with sufficient capacity
- the operator deals with problem areas and other conditions attracting the attention of the authorities
- key applications are submitted to the authorities.

In addition, the licensee has:

- a duty to take action if it discovers that conditions fail to comply with the regulations
- an independent duty to obtain adequate information.

Duty to audit
The licensee must take a risk-based approach to discharging its "see to it" duty. This means that the licensee, depending on the specific case, may have a duty to audit the operator.

It is generally accepted that the cooperation between regulators and industry participants in the North Sea has significantly improved the safety culture. Many other global jurisdictions are emulating these types of practices.

5.4.2.2. "Safety case" in UK

Offshore regulations in the UK regarding HSE are provided by the "Health and Safety Executive." The "Health and Safety Executive Guide to Offshore Installations" that defines the safety case regulations also provides the responsibility of the licensee[28]:

> *The licensee has a duty to monitor the appointed operator to ensure he carries out his functions satisfactorily.*

This requirement clearly mirrors the "see to it" requirement in Norway and is equally incompatible with non-operating parties acting as "passive investors."

6. Conclusion regarding the impact of CWA penalties on future non-operator behavior

The E&P industry is extremely capital-intensive. It is estimated that in 2014 E&P spending will exceed $723 billion. E&P is also a global business with the USA accounting for only about 22% of total E&P spending.[29] This spending is made under conditions of extreme uncertainty and as a result, the industry

[28] Health and Safety Executive. *A Guide to the Offshore Installations (Safety Case) Regulations 2005*. January 2006. http://www.hse.gov.uk/consult/condocs/offshore.pdf

[29] "Global 2014 E&P Spending Outlook", Barclays Equity Research, 9 December 2013

has developed best practices for decision making under conditions of uncertainty. Many of these approaches are grounded in decision analytic theory and are documented in the industry literature.[30]

At the core of these approaches is the fundamental idea that a decision is a choice among alternatives that yield uncertain futures, for which decision makers have preferences. The drivers of the uncertain future include what are called in the E&P industry both technical uncertainties (e.g. hydrocarbons in place, permeability, viscosity, well costs) and non-technical uncertainties (e.g. the likelihood and duration of significant delays due to injunction on a major source air permit, the possibility of expropriation of production rights, significant changes to fiscal terms or tax rates, the ability to attract non-operating parties with strong technical knowledge to contribute to a project). Non-technical uncertainties are also called "above-ground risks" in the industry.

The industry best practice of targeted active participation in deepwater activities by non-operating parties is the result of explicit decisions that non-operators have taken. As discussed in Sections 5.1, 5.2 and 5.3, historically leading deepwater participants have made the decision to be active participants when non-operators because of a conviction that this makes the uncertain future of deepwater projects more likely to be successful. This decision is consistent with the industry best practices of general decision making briefly discussed above.

I have considered two scenarios of CWA penalties as defined in Section 3. Scenario A considers the case of material CWA penalties imposed on both BP as operator and Anadarko as non-operating party. Scenario B considers the case of material penalties imposed solely on the operator. The future decisions of non-operating parties will be influenced by whichever of these scenarios occurs.

Scenario B will create a disincentive for non-operating parties to be active participants because this outcome could easily be interpreted by future non-operating parties as an endorsement for the passive behavior the non-operating party in this case (Anadarko) has been declaring both publically and in court proceedings. For example, the creation[31] and consistent use of the term "non-operating investor" that Anadarko has used can easily be interpreted as not being active participants. The industry is aware of this positioning of Anadarko and, if Scenario B occurs, then a logical conclusion that can be reached by future non-operating parties is that not being active participants reduces the risk of CWA penalties.

In summary, Scenario B will create a deterrent for future non-operating parties to be active participants in deepwater activities as compared to Scenario A. This would lower the quality of deepwater activities (including HSE) by limiting the valuable input non-operating parties and is not in the interest of the public or to industry participants.

[30] Bratvold, R.B. and Begg, S. "Making Good Decisions", 2010 Society of Petroleum Engineers

[31] To my knowledge the term "non-operating investor" is not used by any other industry participant. The term also does not show up in search of the industry's technical literature.

7. APPENDIX A – CURRICULUM VITAE OF GARDNER W. WALKUP, JR.

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SUMMARY

Mr. Gardner W. Walkup, Jr., a Director in BRG's Energy and Natural Resources Practice, is a global energy executive, innovative strategist, trusted advisor to corporate management and boards, and energy expert for law firms, industry clients and regulatory agencies. He has developed and implemented strategic transformations and led the alignment of corporate culture and competencies necessary to implement these strategies. He has a deep understanding of the entire energy value-chain, from land acquisition and exploration through power distribution and energy marketing. He brings a keen understanding of geopolitical, economic, commercial, operational, and technical risks, and experience in over 30 countries representing capital investments of more than $300 billion.

As a corporate executive, Mr. Walkup has chaired an Investment Committee directing overall corporate capital allocation, led the development of a new corporate strategy that drastically narrowed investment focus and reduced costs, and lead the design and implementation of culture change and capability building efforts in response to new strategies and major acquisitions.

Mr. Walkup is a recognized expert in energy asset valuation and mega-project management. He has advised corporate boards and executives investing globally in unconventional resource plays, including shale gas, tight oil, and coal-bed methane, and investments in global mega-projects with capital requirements of more than $5 billion. He has significant experience supporting LNG and deepwater development. In addition, Mr. Walkup has advised corporate leadership on portfolio management, transaction support, business-unit growth strategies and project management leadership capability building.

Mr. Walkup's expert advisory experience includes international litigation and arbitration matters concerning industry practices in mega-project development, offshore operations, and Operating Party/Non-Operating Party industry best practices.

Mr. Walkup started his career at Chevron. During his tenure, he served as Senior Reservoir Engineer for a 250,000-barrel-a-day oil field in Indonesia, led strategic planning and petroleum engineering for a major offshore Gulf of Mexico development, led a corporate project to improve economic valuation methodologies of large capital projects, and developed novel reservoir characterization approaches.

EDUCATION

M.S., Petroleum Engineering Stanford University

B.S., Chemical Engineering University of California at Davis

PREVIOUS POSITIONS

2013-2014	*President,* Bridge Energy Partners, Alexandria, VA
2010–2013	*Senior Vice-President,* The AES Corporation, Arlington, VA
2007–2010	*Vice-President and Global Managing Director of Consulting,* IHS CERA, Palo Alto, CA
2001-2007	*Principal,* Strategic Decisions Group, Palo Alto, CA (SDG's Oil & Gas practice was acquired by IHS CERA in 2007)
1999-2001	*Principal,* PricewaterhouseCoopers, Menlo Park, CA
1997-1999	*Principal,* Applied Decision Analysis, Menlo Park, CA (ADA was acquired by PwC in 1999)
1984 – 1997	*Senior Petroleum Engineer,* Chevron Corp., New Orleans, LA; Sumatra, Indonesia, La Habra, CA

PROFESSIONAL EXPERIENCE

Corporate Leadership - Corporate Strategy

As Senior Vice President at The AES Corporation, a Fortune 200, global power company with distribution businesses and generation facilities in 27 countries, Mr. Walkup led the development of a new corporate strategy that narrowed investment focus to several core markets with clear competitive advantages versus a prior focus on more than 30 markets. The refocusing yielded a 30% reduction in corporate overhead and enabled the company to de-leverage its balance sheet and initiate a dividend.

Portfolio Management

Mr. Walkup was Chair of the Corporate Investment Committee directing corporate capital allocation. He established a new capital investment stage-gate decision process and a new portfolio management approach to guide long-term capital allocation decisions.

Post-acquisition Integration and Culture Change

Mr. Walkup was responsible for creating a single high-performing global consulting team from a group of experts and staff from four recently acquired legacy consulting firms in his role as global managing director of consulting at IHS.

Selected Project Investment Advisory and Management Experience

Africa

- Angola: Multiple deepwater field developments; LNG development; Oil export facility development
- Cameroon: Exploration, Oil field development
- Equatorial Guinea, Offshore gas field development, LNG development
- Nigeria: Multiple deepwater developments, LNG development, Gas monetization and flare reduction

Asia

- China: Deepwater gas field development
- India: Power generation (coal, wind, solar)
- Indonesia: Deepwater field development, LNG development, Mature field revitalization, Geothermal
- Jordan: Power generation (gas, wind)
- Kazakhstan: Sour gas field development
- Malaysia: Gas field development, LNG development
- Philippines: Geothermal development, Power generation (coal)
- Russia: Onshore gas field development
- Saudi Arabia: Onshore field development
- Turkey: Power generation (hydro, gas, coal)

Australia/Oceania

- Australia: LNG development (Northwest Shelf and Queensland), CBM development (Queensland)
- New Zealand: Geothermal development
- Papua New Guinea: Exploration

Europe

- France: Power generation (solar)
- Norway: Offshore field developments
- Poland: Power generation (wind)
- UK: Offshore field developments, Onshore CBM field development, Power generation (wind)

North America

- Canada: Shale gas field developments (British Columbia, Alberta); Oil sands field developments, Onshore gas field developments (Alberta), Offshore gas field development (Nova Scotia), Pipeline developments
- Central America & the Caribbean: Power generation (hydro, gas), Distribution

- Mexico: Power generation (gas, wind), Geothermal development
- USA: Unconventional gas (Shale, CBM, tight) field developments (Barnett (TX), Marcellus (PA), Piceance (CO), Utica (PA), Upper Devonian (PA); Shale/tight Oil field developments (Bakken (ND), Monterey (CA); Multiple deepwater Gulf of Mexico field developments; Multiple EOR field developments; Artic field developments, Power generation resource planning (PJM, MISO, ERCOT); Geothermal development (CA)

South America

- Brazil: Multiple deepwater field developments
- Venezuela: Heavy oil field development

SELECTED PUBLICATIONS AND PRESENTATIONS

"The Role of Natural Gas for Central American Power Sector", Presentation at LNG and Natural Gas in Central America, Institute of the Americas, (Panama City, September 2012)

"Global Reach", Presentation at Platts Global Power Markets Conference, (Las Vegas, April 2011)

"Growing Unconventional Gas Outside of North America: Keys to Success", Presentation at CERAWeek (Houston, 2010)

"CSG Outside of Queensland: Keys to Success", Presentation to QUPEX, (Brisbane, April 2009)

"Stage-Gate Project Management Process in the Oil and Gas Industry", Journal of Petroleum Technology, December 2006

"The Good, the Bad, and the Ugly of the Stage-Gate Project Management Process in the Oil and Gas Industry" With Bob Ligon, SPE 102926 Proceedings of the 2006 Annual Technical Conference (2006)

"Choosing an International Strategy" Oil and Gas Investor, Hart Energy Publishing, (Jan. 2006)

"Realizing the Potential of Real Options Valuation – Keys to Successful Implementation" Proceedings of Real Options Valuation Conference, IQPC, (September, 2003).

"ROV from A to Z", Proceedings of Real Options Conference, IQPC, (October, 2001)

"Case Studies of a Real Option Approach to Asset Valuation in the Petroleum Industry", SPE 52952 Proceedings of 1 Hydrocarbon Economics and Evaluation Symposium, (March, 1999)

"Discovering Real Options in Oil Field Exploration and Development", with J. Claeys, SPE 52956 Proceeding of Hydrocarbon Economics and Evaluation Symposium (March, 1999)

"Screening a Reservoir for Horizontal Well Application: A Case Study of the Minas Field" Proceedings of the International Symposium on Horizontal Well Technology, (1994)

"Analysis of Pressure Transient Tests for Composite Naturally Fractured Reservoirs", with J. Kikani, SPE 19786 Proceeding of the Annual Technical Conference & Exhibition, (1989).

"Improving Polymer Injectivity at West Coyote Field", with Shuler, P. J. et al., SPE Reservoir Engineering, (Aug. 1987)

"Application of the Parallel Resistance Concept to Well Test Analysis of Multilayered Reservoirs", with M.J. Mavor, SPE 15117 Proceedings of the Annual California Regional Meetings, (April, 1986)

"Forecasting Thermal Breakthrough of Reinjected Water Using a Dispersion-Retention Model for Tracer Test Interpretation", with R. Horne, Proceedings International Symposium on Geothermal Energy, Geothermal Resource Council, (August, 1985)

Selected Technical and Professional Contributions

- 2009 SPE Forum Series: Frontiers of Technology – "Offshore EOR: It's About Time" 26-31 October 2009, La Romana, Dominican Republic:
    - Organizing Committee and Session Co-Chair
- 2007 SPE Annual Technical Conference and Exhibition, 11-14 Nov 2007, Anaheim CA:
    - Program Committee Member and Management Section Committee Member
- 2006 SPE Annual Technical Conference and Exhibition, 24-27 Sep 2006, San Antonio TX
    - Program Committee Member and Management Section Chairperson
- 2003 SPE Annual Technical Conference and Exhibition, 5-8 Oct Denver CO
    - Program Committee Member and Management Section Committee Member
- 2003 SPE ATW (Advanced Technical Workshop) – "The Theory and Art of Asset Valuation: Building a Case for Change" 14-17 Sep 2003
    - Technical Committee Member and Session Chair
- 2002 SPE Annual Technical Conference and Exhibition,
    - Program Committee Member and Education and Professionalism Section Committee Member, Session Co-Chair "Distance Learning and Processes for Technology Transfer"
- 2002 SPE Forum Series: Decision-Driven Asset Development and Management, 14-19 Jul 2002, Park City, UT
    - Steering Committee and Session Chair

PROFESSIONAL MEMBERSHIPS

Society of Petroleum Engineers (SPE)

Tau Beta Pi

8. APPENDIX B – STATEMENT OF COMPENSATION

I have been compensated at a rate of $400 per hour for my services to the United States Department of Justice (USDOJ) in this matter. For any deposition or trial testimony the USDOJ will compensate me at a rate of $550 per hour.

Appendix C to Expert Report of Gardner Walkup
Consideration Materials
(Documents Cited in Report are Consideration Materials even if Not Listed Below)

Bates, Exhibit, TREX, or Other Description
ANA-MDL-000037846-ANA-MDL-000037848
ANA-MDL-000039054 - ANA-MDL-000039056
ANA-MDL-000258759 - ANA-MDL-000258769
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Appendix C to Expert Report of Gardner Walkup
Consideration Materials
(Documents Cited in Report are Consideration Materials even if Not Listed Below)

Deposition Exhibit 1215
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Appendix C to Expert Report of Gardner Walkup
Consideration Materials
(Documents Cited in Report are Consideration Materials even if Not Listed Below)

Deposition Exhibit 2310
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Appendix C to Expert Report of Gardner Walkup
Consideration Materials
(Documents Cited in Report are Consideration Materials even if Not Listed Below)

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Appendix C to Expert Report of Gardner Walkup
Consideration Materials
(Documents Cited in Report are Consideration Materials even if Not Listed Below)

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Appendix C to Expert Report of Gardner Walkup
Consideration Materials
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Deposition Exhibit 9952
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Deposition Transcript Cunningham, Erick
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Deposition Transcript Gwin, Robert
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Deposition Transcript Hollek, Darrell (PP)
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Deposition Transcript Peyton, Dawn
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Deposition Transcript Quitzau, Robert (P2)
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Deposition Transcript Vernon, Roger
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US_PP_WAL002561-US_PP_WAL002562
US_PP_WAL002563-US_PP_WAL002564
US_PP_WAL002565-US_PP_WAL002566
US_PP_WAL002567-US_PP_WAL002569
US_PP_WAL002570-US_PP_WAL002580
US_PP_WAL002581-US_PP_WAL002583
US_PP_WAL002584-US_PP_WAL002586
US_PP_WAL002587-US_PP_WAL002589
US_PP_WAL002590-US_PP_WAL002639
US_PP_WAL002640-US_PP_WAL002657
US_PP_WAL002658-US_PP_WAL002714
US_PP_WAL002715-US_PP_WAL002741
US_PP_WAL002742-US_PP_WAL002744
US_PP_WAL002745-US_PP_WAL002763
US_PP_WAL002764-US_PP_WAL002802
US_PP_WAL002803-US_PP_WAL002803
US_PP_WAL002804-US_PP_WAL002825
US_PP_WAL002826-US_PP_WAL002844
US_PP_WAL002845-US_PP_WAL002847
US_PP_WAL002848-US_PP_WAL002855
US_PP_WAL002856-US_PP_WAL002868
US_PP_WAL002869-US_PP_WAL002886
US_PP_WAL002887-US_PP_WAL002887
US_PP_WAL002888-US_PP_WAL002891
US_PP_WAL002892-US_PP_WAL002901
US_PP_WAL002902-US_PP_WAL002905
US_PP_WAL002906-US_PP_WAL002909
US_PP_WAL002910-US_PP_WAL002915
US_PP_WAL002916-US_PP_WAL002928
US_PP_WAL002929-US_PP_WAL002939
US_PP_WAL002940-US_PP_WAL002950
US_PP_WAL002951-US_PP_WAL002952
US_PP_WAL002953-US_PP_WAL002954
US_PP_WAL002955-US_PP_WAL002975
US_PP_WAL002976-US_PP_WAL003024
US_PP_WAL003025-US_PP_WAL003098
US_PP_WAL003099-US_PP_WAL003118
US_PP_WAL003119-US_PP_WAL003199
US_PP_WAL003200-US_PP_WAL003212
US_PP_WAL003213-US_PP_WAL003247
US_PP_WAL003248-US_PP_WAL003265

Appendix C to Expert Report of Gardner Walkup
Consideration Materials
(Documents Cited in Report are Consideration Materials even if Not Listed Below)

US_PP_WAL003266-US_PP_WAL003284
US_PP_WAL003285-US_PP_WAL003303
US_PP_WAL003304-US_PP_WAL003327
US_PP_WAL003328-US_PP_WAL003332
US_PP_WAL003333-US_PP_WAL003336
US_PP_WAL003337-US_PP_WAL003373
US_PP_WAL003374-US_PP_WAL003376
US_PP_WAL003377-US_PP_WAL003420
US_PP_WAL003421-US_PP_WAL003433
US_PP_WAL003434-US_PP_WAL003608