UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF LOUISIANA

In re:	Oil Spill by the Oil Rig "*Deepwater Horizon*" in the Gulf of Mexico, on April 20, 2010	*	MDL No. 2179
		*	
		*	SECTION: J
		*	
Applies to: ***U.S. v. BP Exploration & Prod. Co.*, No. 2:10-cv-04536.**		*	JUDGE BARBIER
		*	MAGISTRATE JUDGE SHUSHAN
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Round 3 Report of Professor David L. Sunding

Prepared on behalf of Anadarko Petroleum Corporation

September 26, 2014

TABLE OF CONTENTS

In this report, I respond to the main arguments raised by Dr. Mason and Mr. Walkup and in the process clarify several points of my earlier report.

I. DR. MASON FAILS TO RECOGNIZE THE ESSENTIAL DISTINCTIONS BETWEEN PENALTIES AND DAMAGES.

There is an important distinction between the role of damages and penalties in punishing and deterring oil spills – a distinction that Dr. Mason fails to recognize. There is wide agreement among economists that **optimal deterrence** is attained whenever the enterprise responsible for the pollution fully compensates victims for damages. This is the theory of **cost internalization**. The prospect of *ex post* damages and penalties incentivizes enterprises to estimate, in advance, the costs of their activities and the probabilities that they will incur those costs. From those estimations, enterprises can make economically optimal decisions about their activities.

Pigou pioneered the concept of externalities in his 1920 work that laid the foundations of modern welfare economics.[1] Coase further elucidated the concept in his classic paper on social cost, the most widely cited law review article of all time.[2] The concept has been woven into the fabric of our society and its law. Judge Barbier noted the concept in an earlier decision:

> *Economically, it makes sense to place the cost of pollution on the enterprise ... which statistically will cause pollution and in fact does cause pollution.... This is the theory of cost "internalization," under which the social costs of an enterprise are attributed to that enterprise.*[3]

OPA damages for oil spills achieve cost internalization by aligning the private costs of an enterprise with social costs, thus achieving economically optimal deterrence. Anadarko shared in the potential benefits of the Macondo well with BP and also shared in the social cost through its liability for OPA damages. The magnitude of these damages, and Anadarko's willingness to contribute to payment of those damages, serves an important function for optimal deterrence.

Dr. Mason disagrees. He contends that Clean Water Act penalties are needed to achieve internalization of the social costs of oil spills.[4] That contention is incorrect: given the range of damages compensable under OPA, OPA by itself achieves internalization of social costs and economically optimal deterrence. Clean Water Act penalties, instead, punish and deter *culpable* conduct and thereby achieve absolute deterrence where OPA damages alone do not.

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[1] Pigou, A.C., *The Economics of Welfare*. 1920. London: Macmillan and Company.
[2] Coase, R. "The Problem of Social Cost." 1960. *Journal of Law and Economics* 3, pp. 1-44.
[3] *In re: Oil Spill by the Oil Rig Deepwater Horizon in Gulf of Mexico, on April 20, 2010*, 844 F. Supp. 2d 746, 759 (2012) (quoting *U.S. v. Tex-Tow*, 589 F.2d 1310, 1314–15 & n. 11 (7th Cir. 1978)).
[4] Mason Response Report at 34-36.

From his incorrect contention about the role of Clean Water Act penalties, Dr. Mason further contends that they are needed in this case because Anadarko's $4 billion settlement of OPA damages with BP is not an "accurate reflection of" Anadarko's share of "true damages."[5] There are two flaws in Dr. Mason's logic.

First, Dr. Mason's skepticism of the accuracy of Anadarko's $4 billion settlement payment is unfounded. BP and Anadarko are both sophisticated companies, with strong incentives to be accurate, engaged in a multi-billion dollar zero-sum game—the extent to which Anadarko under- or over-paid BP in the settlement is the same extent to which BP will over- or under-pay OPA damages to victims. It is reasonable to assume, therefore, that the $4 billion is a reasonable assessment of Anadarko's exposure to OPA damages under the relevant facts of the case.

Second, the reasons Dr. Mason expresses for doubting the accuracy of estimates of the social costs of deepwater drilling—"fat tails" and victims' risk aversion—are unpersuasive and irrelevant.[6] According to Viscusi and Zeckhauser (2011),[7] the sole source relied on by Dr. Mason, extreme events are more likely when a probability distribution has fat tails. Viscusi and Zeckhauser believe "fat tails" are relevant to oil spills because actual damages from a spill may exceed the assets of the operator (the so-called "judgment-proof" enterprise). In the economics literature, that problem leads to consideration of extended liability—meaning the prospect of an investor being made to pay for harms that an insolvent operator cannot compensate. Against the benefit of fully compensating victims, extended liability creates costs that must be weighed—exacerbating the moral hazard problem and creating inefficient incentives for deterrence.

But when an operator has sufficient assets, there is no benefit of extended liability, only costs. Accordingly, it follows that any level of deterrence desired by society can be attained at lower cost by assigning strict liability for damages on the operator. Indeed, Viscusi and Zeckhauser explicitly characterize the optimal policy for deepwater drilling ventures along the lines of the economics literature (and along the lines of my report) by recommending that a single party be

> "*fully responsible for all financial harms directly associated with the spill. This ensures that there is one party overseeing the whole process, a party who coordinates and monitors the actions of those beneath it.*"[8]

By arguing that probability distributions must be known *ex ante* to assess the economic incentives of policies based on actual damages (and culpability for damages) determined *ex post*, and by arguing that risk preferences and fat tails are relevant for efficient deterrence, Dr. Mason mischaracterizes the economics literature and misconstrues the

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[5] *Id.* at 36.
[6] *Id.* at 35.
[7] Viscusi, W. K. and R.J. Zeckhauser. 2011. "Deterring and Compensating Oil-Spill Catastrophes: The Need for Strict and Two-Tier Liability." *Vanderbilt Law Review* 64(6), pp. 1717-1765.
[8] Viscusi and Zeckhauser, *supra* note 2, at 1722-23.

observations of Viscusi and Zeckhauser in particular. Fat tails and risk preferences have no bearing on Clean Water Act penalties, which are determined after an incident based on an entity's culpability.

Dr. Mason also fails to recognize the distinction between damages and penalties in achieving the objective of **absolute deterrence**, which differs from optimal deterrence, as discussed by Posner (1985).[9] To achieve absolute deterrence, Posner demonstrated it is necessary to impose a penalty that deprives culpable violators of all gains resulting from their violation.

Culpability and economic benefit are the central factors to be considered when assessing penalties to achieve absolute deterrence. If external damages from a violation are less than the economic benefit received by the violator, payment of damages will not be sufficient to deter violations. In such cases, penalties may be needed in addition to damages to achieve absolute deterrence. In the case of the *Deepwater Horizon*, however, the Court has already determined that Anadarko was not culpable and in fact was not responsible for drilling operations on the rig. The Government has acknowledged that Anadarko received no economic benefit from the alleged violations of the Clean Water Act. Thus, the objective of absolute deterrence cannot be achieved by imposing a civil penalty on Anadarko.

II. MORAL HAZARD ENCOMPASSES A MUCH MORE GENERAL CLASS OF PROBLEMS THAN MR. WALKUP AND DR. MASON SUGGEST.

Mr. Walkup states that "Dr. Sunding's appeal to the literature of 'moral hazards' [sic] is also flawed as it is based on the assumption of significant asymmetric information."[10] Dr. Mason states that, because Anadarko "was a participant in a joint venture and not in a Principal-agent relationship,"[11] and because Anadarko (supposedly) "had ample opportunity to observe a variety of key actions taken by BPXP," it is "inappropriate to apply the moral hazard model taken from economic theory to the relationship between Anadarko and BPXP."[12] These arguments are incorrect and inconsistent with the vast economics literature on moral hazard.

The moral hazard problem encompasses a general range of circumstances in which one party (here an operator) makes unilateral and costly decisions to reduce the chance of an undesirable outcome that affects the return of a second party (here a non-operating investor). The implication of the moral hazard problem is often clarified in economic models by placing it in the so-called "principal-agent" context, but this is a modeling artifact and not a required element of the problem. Thus, for this analysis, it is irrelevant whether for legal purposes a relationship is principal-agent or joint venture.

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[9] Posner, R. 1985. "An Economic Theory of the Criminal Law." *Columbia Law* Review 85(6), pp. 1193-1231.
[10] Walkup Response Report at 8.
[11] Mason Response Report at 36-37.
[12] *Id.* at 38.

Similarly, while moral hazard problems often involve asymmetric information—where an "agent" is located at the site where decisions are made, and responds to "day-to-day" site information that is not available to an outside investor—this is not a necessary element of the problem. Moral hazard problems also exist without asymmetric information, and the assumption of asymmetric information is often used in economic models to exemplify a source of moral hazard. Mr. Walkup lacks proper understanding of economic incentives in moral hazard models and his argument along these lines makes no economic sense. Similarly, Dr. Mason fundamentally errs in contending that moral hazard models are irrelevant because Anadarko (supposedly) could "observe" some of BPXP's decisions.

The moral hazard problem does not depend on asymmetric information. To see this, suppose two parties, A and B, participate in a venture. The venture can involve many aspects of mutual collaboration, but also has some elements solely under the control of an operator, party A. Suppose party A operates behind a glass wall in full view of party B and needs to press a lever when a red light is lit as part of the arrangement between them. Pressing the lever is costly for party A in the sense that party A must give up private returns that could be earned by engaging in other productive activities in exchange for "watching the light." But watching the light is important to both parties A and B, because depressing the lever when the red light is lit leads to a joint payoff shared by both parties. This setting is economically interesting when the joint payoff to A and B from depressing the lever justifies the opportunity cost to party A of foregoing other productive activities to watch the light. A moral hazard problem exists in this case whenever the share of the joint payoff earned by party A when depressing the lever is less than the value of party A's time engaged in other productive activities, irrespective of asymmetric information or the assignment of one member of a joint venture as a principal and another as an agent (remember, there is a glass wall here). All that is required for the moral hazard problem is a particular, definable action that agent A controls that results in a payoff (cost or benefit) that is shared jointly with A's partners.

As an example, the moral hazard problem appears when agent A must give up $1 of private gain to watch for the red light to depress a lever that leads to a collective gain of $2. If agent A has only a 25% share of the collective benefit from depressing the lever ($0.50), then agent A is better off deploying effort towards individual private gain, even though it is in the collective interest of A and B for A to forego the $1 gain to acquire the $2 return for the partnership. An obvious solution to this problem is a contract that penalizes agent A by $0.50 or more when A fails to watch the light, as this would align A's incentive with watching the light. This solution is the one I mentioned in my earlier report that would emerge in private contracts absent transaction costs to reassign liability for CWA penalties to the culpable party for actions contributing to accidents. The desirability of such a contract absent transaction costs is widely recognized in the economics literature following Coase (1960).

But suppose such a contract is not possible and penalties must "stick where they are put." Now we are in the case examined by Pitchford (1995) when liability for watching the light is extended from party A to party B.[13] Party B must now try to contribute to party A's decision by foregoing other activities to watch party A watch for the light. Party B is in an inferior position to contribute to the joint effort, because party B must rely on party A to press the lever; however, B can pound on the glass wall, and perhaps to some effect. The reason extended liability for penalties results in inefficient deterrence is that achieving the socially desirable outcome ultimately relies on party A pressing the lever. The larger the implications of A's actions are placed on party B, the more time and effort B must spend watching over the actions of A, which reduces the benefit to both parties. Suppose the collective benefit of party A watching the light, which now involves an additional cost of party B watching party A, decreases the collective benefit of the project by $0.80 from $2 to $1.20. This reduces party A's share of the collective benefit of depressing the lever from $0.50 to $0.30, making it less worthwhile for party A to watch for the light.

This is the Pitchford effect of extended liability. A more efficient way to achieve deterrence in this example would be to impose the $0.80 cost of extended liability on party A rather than party B for failing to watch the light. In this case, party A would face a return of $0.20 for deploying effort towards private gain ($1 less the $0.80) and would otherwise earn a return of $0.50 by foregoing private gain in the collective interest of watching the light. The incentive of party A is then aligned with the interest of both parties for A to watch the light.

In practice, asymmetric information can be an important source of moral hazard, although it is not a necessary source as my example demonstrates. Nevertheless, it is interesting to note that Mr. Walkup's discussion of typical arrangements for HSE outcomes in the oil and gas industry supports an interpretation of moral hazard in terms of asymmetric information. As Mr. Walkup ultimately concedes in his response report,

> *"I agree that non-operators may not have access to the same information as the operator about the day-to-day operations at a rig site."*[14]

Such an admission essentially places a degree of opacity in the glass wall between party A and party B in my example. As the glass wall becomes more opaque, it becomes more difficult for party B to observe the light and know whether to pound on the glass wall to correct the behavior of party A in time to receive the collective payoff. Lack of information by non-operating investors about the day-to-day operations of the operator at a rig site thus further decreases any potential gain to extended liability, creating even larger inefficiencies in deterrence. In other words, the moral hazard problem is further compounded by the fact that the non-operator does not have access to the same information as the operator about the day-to-day operations at the well site.

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[13] Pitchford, R. 1995. "How Liable Should the Lender Be?" *American Economic Review* 85(5), pp. 1171 – 1186.
[14] Walkup Response Report at 20.

III. MR. WALKUP'S DISCUSSION OF INDUSTRY PRACTICES AND THE ROLE OF NON-OPERATING INVESTORS IN POSITIVELY CONTRIBUTING TO HEALTH, SAFETY, AND ENVIRONMENTAL PERFORMANCE IS BESIDE THE POINT IN DETERMINING THE ECONOMIC IMPLICATIONS OF ASSESSING PENALTIES ON A NON-CULPABLE INVESTOR.

My opinion in part concerns **inefficient deterrence** and does not rely on non-operating investors' influencing Health, Safety, and Environmental ("HSE") outcomes. Of course, non-operating investors may be able to positively influence HSE outcomes, but this is unrelated to the question whether penalties for accidents caused by culpable operators, as a matter of basic economic principles, should be extended to non-culpable investors. My point is not that non-operating investors are incapable of positively affecting HSE outcomes or that penalties on non-operating investors "will have no deterrent effect,"[15] but that penalties on non-culpable non-operating investors result in harmful economic outcomes by providing inefficient incentives for accident deterrence.

The concept of inefficient deterrence has two economic interpretations. For a given total penalty assessed on an operator and non-operating investors, the incentive for accident deterrence is greatest when the entire penalty is assessed on the culpable party. A second, and equivalent economic interpretation, is that for a given level of accident deterrence, a policy that extends penalties from a culpable operator to non-culpable non-operating investors results in greater economic cost than a policy that achieves the same level of deterrence by penalizing only the culpable party. Mr. Walkup's response focusing on the capacity of non-operating investors to affect HSE outcomes[16] demonstrates a lack of understanding of the basic principle of economic efficiency.

To see this, consider the example of party B observing party A's actions through a glass wall. Party B can bang on the glass to alert party A, and economic theory suggests that B would be more likely to do so when facing a penalty for A's actions. But this penalty structure results in inefficient deterrence, because incentivizing party B to pound on the glass is *less* effective at preventing accidents than incentivizing party A directly to watch the light.

Such flawed economic thinking pervades Mr. Walkup's discussion of the role of non-operating investors in promoting HSE outcomes.[17] Because non-operating investors

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[15] Walkup Response Report at 19.
[16] *See id.* at 18-27.
[17] In another example of faulty economic reasoning, Mr. Walkup argues "Leasehold ownership, and changes to that ownership position, has very little impact on the economic contributions of deepwater activities." *Id.* at 16. In other words, he is asserting that changes in the source of investment capital are irrelevant to the level of economic activity. This assertion is not consistent with basic economic theory. My analysis of investor exit shows that there are changes occurring in the deepwater capital market that are consistent with non-operators being disincentivized as a result of the Government's unprecedented attempt to penalize investors in an offshore oil and gas operation. Such capital flight from the industry would surely have economic consequences, as even Mr. Walkup must recognize.

internalize the social cost of drilling activities by sharing in OPA damages, they already satisfy the theory of cost internalization and therefore have incentives aligned to "promote a culture of safety to achieve incident and injury-free performance."[18] Non-operating investors share in the cost of OPA damages from bad HSE outcomes and share as well in the opportunity to sell oil from good HSE outcomes. I agree that non-operating investors probably can and do contribute to desirable HSE outcomes, but this observation is beside the point. The issue at hand is whether a non-culpable non-operating investor should pay a penalty *in addition to* internalizing cost by assuming a share of OPA damages. As discussed above and in my earlier report, penalizing a non-culpable non-operating investor results in inefficient deterrence.

IV. THE GOAL OF EMPIRICAL ANALYSIS IS TO IDENTIFY TRENDS IN DEEPWATER DRILLING THAT ARE CONSISTENT WITH THE ECONOMIC ARGUMENT ON EFFICIENT DETERRENCE.

In Section III.C of his report, entitled "Identifying Causal Factors," Dr. Mason argues that "there are other scenarios that provide alternative possible explanations for the observed pattern. The results Dr. Sunding presents do not demonstrate causation."[19] In the empirical section of my original report, I *never* argued that the estimated effects shown were caused by the government effort to impose penalties on Anadarko. There is no (natural) experiment that could estimate a causal effect in the real world like this.[20] Hence neither the proposed estimated coefficients, nor models based on factors hypothesized by Dr. Mason, can be interpreted as causal. Rather, I showed that the realized trends in deepwater drilling are *consistent* with my argument on efficient deterrence—that real world events do not rule out my hypothesis.

Dr. Mason further argues that "it is implausible that key technologies remained relatively unchanged … the use of a linear time trend is ill suited to capture relevant technological aspects in oil and gas markets."[21] To evaluate the merits of this objection, I ran the entry and exit regressions with a nonlinear time trend. The results are provided below:

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[18] *Id.* at 12.
[19] Mason Response Report at 41.
[20] In order to attach a causal interpretation to any of our estimated coefficients, one would need to randomly assign lawsuits extending liability to non-operating investors across different and isolated deepwater markets. This experiment cannot be run in this universe.
[21] Mason Response Report at 43-44.

Table 1

Generalized linear model Poisson entry and exit regression results for leases at 1,000+m

	Entering Non-operating Investor Counts	Exiting Non-operating Investor Counts
Estimated Change post 2010:	-1.667 (0.092)	1.704 (0.899)
Observations	31	31
AIC	3.20	2.93

Newey-West HAC robust standard errors in brackets are listed below the coefficients, which are reported as marginal effects. The regressions control for a second order time trend.

*** The Estimated Poisson Coefficients are Significant at the 1% level

The results of the nonlinear time trend *strengthen*, rather than *weaken*, my original results, indicating that Dr. Mason's objection does not validly undercut my analysis. The coefficient for entering firms is more negative and the coefficient on exiting firms is even larger than in my original report. In other words, replacing the linear trend with a nonlinear trend provides even stronger support for a decrease in non-operating investor entry rates and an increase in non-operating investor exit rates in deepwater leases. I take this as evidence of robustness of my results, which are consistent with the theoretical arguments made in the original statements and appear in alternatives with both linear and nonlinear time trends.

Dr. Mason also theorizes that a number of possible alternate explanations might be driving these observed outcomes in the data, yet he does not provide any evidence (statistical or otherwise) supporting any of these alternate explanations. He simply asserts that other factors *might* be responsible for or contribute to the estimated effect. Dr. Mason is careful "not to argue that either the increase in tight oil production or the emerging wedge between Brent and WTI spot prices is the correct reason for the observed change in the pattern of next entry."[22] That is, Dr. Mason concedes that he does not know whether his proposed alternative explanations are valid or not. So his theories are simply conjecture, provided without any attempt to substantiate conjecture with supporting evidence.

I agree, of course, that a statistical model should not omit potentially relevant variables. But the main variable Dr. Mason proposes—the spread of WTI and Brent Spot prices—is likely to be endogenous here. What this means is that activities in the Gulf might

[22] Mason Response Report at 41.

indirectly affect this spread, so including the spread as an independent variable in my regression would lead to "simultaneous equation bias" that would render the estimated coefficients unreliable. Nevertheless, to evaluate this objection, I ran the models controlling for the WTI price provided by Dr. Mason (which is a longer series than the Brent price) as an independent variable for the purpose of comparison. The results are given in Table 2 below:

Table 2

Generalized linear model Poisson entry and exit regression results for leases at 1,000+m

	Entering Non-operating Investor Counts	Exiting Non-operating Investor Counts
Estimated Change post 2010:	-1.293 (0.078)	1.359 (0.806)
Observations	28	28
AIC	3.03	3.12

Newey-West HAC robust standard errors in brackets are listed below the coefficients, which are reported as marginal effects. The regressions control for a second order time trend and the annual average WTI price as supplied by Dr. Mason.
*** Estimated Poisson Coefficients are Significant at 1% level

The results are still highly statistically significant and large in magnitude, indicating a net decrease in firms of 2.65 (a decrease in entry of 1.29 and an increase in exit of 1.36). For comparison, the results shown in Table 1 that do not control for WTI price indicate a net decrease in firms of 3.37 (a decrease in entry of 1.67 and an increase in exit of 1.70). Thus, the effect when WTI price is included is slightly smaller yet still within a reasonable margin of error and economically significant, indicating that my analysis is not flawed as Dr. Mason suggests.

The only way to understand whether Dr. Mason's theoretical alternative explains the increased exit from and decreased entry into deepwater in the Gulf of Mexico would be to assess the complex and often non-public motives of third-party non-operating investors. We have one very reliable data point, which is not sufficient to do any statistical analysis with, but which still provides us with a case study—MOEX. MOEX was a first-time non-operating investor in the Gulf of Mexico through its lease share in the Macondo Prospect. Along with Anadarko, it was named as a codefendant in the government's Clean Water Act penalties complaint on December 15, 2010. MOEX subsequently abandoned its lease shares in the Gulf of Mexico, as recorded by BOEM in

October 2011. It has not returned as an investor in any deepwater lease in the Gulf of Mexico since then or participated in lease auctions. In other words, MOEX is one of the non-operating firms that exited the relevant deepwater market after December 2010, very likely as a result of the government's effort to impose penalties on it.

The lag between the date that MOEX was named a codefendant and the abandonment of lease shares is not surprising. Large corporations do not surrender assets potentially worth hundreds of millions of dollars overnight. First, a complex corporate structure has to reach a decision that the asset should be sold. In a next step, a suitable buyer has to be found and a price negotiated. The transaction itself at this point could be delayed even further as contracts have to be drafted and signed. In some settings, regulatory approval is required. If it takes the most exposed non-operating investor, MOEX, over a year to do this, it is not surprising that "no firms exited the Gulf of Mexico between 13 May 2010 and 7 September 2011" as Dr. Mason notes.[23] Other non-operating investors with no direct exposure may or may not take even longer to arrive at a decision to surrender their shares in these deepwater leases.

What I argue using the empirical entry and exit evidence and the MOEX case study is simply the following: the threat of extending penalty liability to non-operating investors provides negative incentives to this type of investor. These investors with a smaller capital base will no longer invest in this now riskier asset and will search for investment opportunities elsewhere.[24] As Dr. Mason correctly indicates, there are ample opportunities for capital investments in the oil and gas sector. I note that these opportunities need not be US offshore or onshore projects, but can certainly be investment opportunities abroad. Extending liability to non-operating investors provides further incentives for such capital migration on top of the reasons named by Dr. Mason.

V. DR. MASON'S NEW MARKET CONCENTRATION ANALYSIS IGNORES NON-OPERATING ENTITIES COMPLETELY AND HENCE IS IRRELEVANT TO THE ISSUE AT HAND, WHICH IS THE CHANGE IN CONCENTRATION WITHIN LEASES.

In his report, Dr. Mason collects "information on deepwater activities over the past several years."[25] He uses "the number of permanent drilling platforms in water depths greater than 1,000 feet, by operator, and the number of subsea boreholes in water depths greater than 1,000 feet, by company as of July 1, 2014."[26] He also argues that my

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[23] Mason Response Report at 39.
[24] Moreover, imposing a penalty on a non-operating investor would limit that company's ability to invest the money used to pay the penalty as capital into its business. Thus, a penalty could prevent or limit a non-operator's investment into capital-intensive projects that are already underway and that are necessary for the company's financial health. Anadarko's First Supp. Resps. to the United States' First Set of Disc. Reqs. for the Penalty Phase at 1-2; R. Gwin Dep. (July 11, 2014) at 244-45.
[25] *Id.* at 45.
[26] *Id.*

"definition of 1,000 meters is more restrictive than the cutoff used by BOEM (1,000 feet)."[27]

As I show in my original report, BOEM's statistics on depth break down leases into 0 to 200 meters, 201 to 400 meters, 401 to 800 meters, 801 to 1000 meters, and 1000+ meters. I chose 1000+ meters because that is the category the Macondo Well falls into. Whether one calls this deepwater or ultradeepwater is semantics; it is the relevant depth category to this case.

Dr. Mason presents a new analysis, which calculates each company's share of permanent deepwater platforms by dividing the number of platforms each company operates by the total number of platforms (49). He then calculates an HHI based on these shares. The problem here is that this simply calculates the concentration of platform and borehole operators across the entire Gulf of Mexico and does not account for the role of non-operating investors, which is the central point of my analysis. For example, in the data he uses, Exxon-Mobil is listed as the operator of the A-Hoover Spar Structure in area AC and block 25 at a water depth of 4,825 feet. The corresponding lease for area AC and block 25 is G10380. If we look up the ownership structure of this lease, it indeed lists Exxon Mobil as the operator with a title interest of 66.67%. It also lists PXP Offshore LLC with a title share of 33.33%. Dr. Mason's analysis ignores the role of PXP Offshore LLC because it is based solely on concentration of operators. Likewise, Mason's assertion that "concentration in Gulf of Mexico oil production has been falling steadily"[28] is off-point because Mason looks only at the concentration of oil production among operators. Thus, neither his analysis of the concentration of platform and borehole operators nor his observation based on operators' oil production have any bearing on whether non-operators are leaving the Gulf of Mexico drilling industry.

Furthermore, neither my original nor current report is concerned with industry concentration for platforms or boreholes across the entire Gulf of Mexico. This number would be relevant to determining market power, yet as Dr. Mason notes, that is not even close to the task at hand. The main point I raise is that, for the average lease, the concentration of lease holders has gone up since December 15, 2010, which is consistent with the hypothesis that firms are exiting the relevant market. In other words, I am concerned about trends in HHI over time *within leases*, not the HHI across operators for the entire Gulf of Mexico. These trends are important for economic outcomes irrespective of whether the initial Herfindahl index is above or below the Department of Justice cutoff.

VI. DR. MASON WRONGLY STATES THAT MY ANALYSIS SUGGESTS A BLEAK FUTURE FOR THE GULF.

Nowhere in my original report do I argue that investment in the entire Gulf of Mexico has become unattractive and that this "suggests a bleak future for the Gulf, with smaller

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[27] *Id.*
[28] Mason Response Report at 45.

levels of investment and activity going forward."[29] In my original report, I argue that there is increased concentration of lease shares, increased exits, and decreased entry after December 15, 2010. These empirical results are carefully explained in the empirical section and underlined with examples.

Dr. Mason assumes that investment in oil and gas exploration is a zero-sum game, whereby funds are invested in either the Gulf or onshore tight plays. He presents a false dichotomy that is inconsistent with how natural resource markets work. If another resource extraction opportunity with high returns comes along, it will attract investors from a broad range of sources. Those investors will compare the new investment opportunities to others, and make an investment decision based on expected returns and variances. Capital can stream into the entire oil and gas sector, leading to growth in both Gulf of Mexico and onshore tight play exploration and production.

The key insight here is that the expected returns *relative to other investments* are what determine capital flows in and out of the Gulf of Mexico. Increased risk for investors (as from being held liable for Clean Water Act penalties above and beyond OPA damages) will lower expected returns from investing in deepwater wells in the Gulf. This reduction of expected returns is what leads to an outflow of capital, not the newly discovered onshore tight play opportunities. The theoretical and empirical portions of my original report show that the evidence is consistent with this phenomenon.

Dated: September 26, 2014

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[29] *Id.* at 41.