Reserves Overbooking: The Problem We Are Finally Going To Talk About

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Summary

Oil and gas reserves estimates that honor disclosure requirements of the US Securities and Exchange Commission (SEC) are critically important in the international oil and gas industry. Unfortunately, a number of exploration and production (E&P) companies have allegedly overstated and subsequently written down certain reserves volumes in recent years. In some cases, the consequences have been quite adverse. We document some of these cases of reserves overstatements and summarize the consequences. Reserves write downs are of obvious interest to numerous groups involved in the reserves estimation process and outcome, including estimators, managers, investors, creditors, and regulators. The magnitude and nature of recent overstatement cases, relative unfamiliarity with the SEC's inner workings, and the SEC's new reserves-reporting requirements increase the need to examine critically reserves disclosures and reserves overstatements.

Disclaimer

This paper discusses write downs and alleged overstatements of oil and gas reserves. Information used to write this report has been obtained from extensive examination of the public record. Overstatements and violations of federal securities laws and actions by a company or its representatives are only alleged in the public record, and, unless stated otherwise, any settlements discussed should be considered as made without admission of guilt. Write downs can readily happen with even the best of intentions. We authors—and you readers—are not judge and jury. Our intent is to raise awareness about write downs, overstatements, and observed consequences, and to promote the responsible reporting of oil and gas reserves.

Overview of the Reserves Overbooking Issue

A number of E&P companies have, in recent years, allegedly overstated and subsequently written down certain reserves volumes reported to the US SEC. Operators including Shell, El Paso, Stone Energy, and Repsol YPF, among others, have found themselves in the spotlight—and courtroom—for alleged overstatements of their oil and gas reserves. Overstatements and write downs have occurred for a variety of reasons and often have been accompanied by significant adverse consequences. A stigma and discomfort surrounding overstatements exists within industry, as the topic has been labeled "the problem no one wants to talk about" (McLane and Rose 2001).

The SEC has roles, investigative processes, and enforcement procedures unlike any other organization involved with the oil and gas industry. However, the SEC's inner workings are not frequently discussed or well understood by all of the groups that these rules affect. The SEC's Modernization of Oil and Gas Reporting Requirements has made certain standards more flexible (e.g., elimination of the "one offset rule" and allowance of "reliable technologies"). Accordingly, engineers must now adjust to these new guidelines and deal with the possibility of disclosing previously unrecognized asset value without overstating reserves. The difficulty of this task, along with the technical "liberalization" and an enhanced "principles-based" emphasis in the rules, could create even greater potential for reserves overstatements than in the past.

Therefore, the magnitude and nature of recent alleged overstatement cases, relative unfamiliarity with the SEC's inner workings, and the SEC's new reporting requirements together have created a need to discuss openly reserves disclosures and reserves overstatements. Overstatements are not confined to particular reserves categories, asset types or locations, or filer size. However, overstatements are most likely to occur within the proved undeveloped (PUD) category. Reserves write downs can create nearly instantaneous value destruction for shareholders. A study of case histories indicates that significant corporate and/or individual penalties may be associated with overstatements, along with the potential for class-action lawsuits.

Background

By a recent SEC definition, oil and gas reserves "are estimated remaining quantities of oil and gas and related substances anticipated to be economically producible, as of a given date, by application of development projects to known accumulations" (US SEC 2008c). Reserves may be subdivided into proved, probable, and possible categories according to the degree of uncertainty associated with recovery of the volumes. In addition to being dependent on the manner in which the term is defined, reserves are also a function of numerous known and assumed technical factors including reservoir parameters, project costs, ownership, and commodity prices.

Reserves volumes and values of publicly traded oil and gas companies (e.g., on the New York Stock Exchange) are not directly reported on a company's balance sheet but are rather attached to financial statements. Barry (1993) considered it "odd" for reserves not to be reflected in the balance sheet. Furthermore, he observed that "the volume of reserves is a corporation's Black Hole. It exerts a huge influence on everything else in its orbit, yet emits very little light." Because reserves are not part of the balance sheet per se, they are not subjected to audits by financial or accounting firms. However, filers commonly elect to have their reserves audited by third-party engineering firms.

Reserves are of significant importance to a variety of stakeholders including filers, investors, regulators, and politicians. An E&P company's financial health depends in large part on its stated oil and gas reserves. Financial measures such as finding and development costs, reserves-replacement ratio, reserves life index and depreciation, depletion, and amortization are all impacted by a firm's oil and gas reserves. Furthermore, reserves are a vital instrument toward gaining access to capital markets: Credit ratings depend on reserves volumes, and bankers will commonly lend funds based on reserves as collateral. In his prepared testimony before the US House Committee on Financial Services on 21 July 2004, Dharan (2004a) stated that reported reserves of oil and gas represented more than USD 3 trillion worth of value (and more than 70% of a typical E&P company's market value). In sum, many individuals and organizations have a great interest in the reporting of oil and gas reserves, and the quantities reported have important financial and geopolitical implications.

The Evolution of Reserves

Given the somewhat disparate users and uses involved with oil and gas reserves, along with continuous advances in engineering and geological technology, the definition of reserves has been a moving target. The American Petroleum Institute created

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definitions in 1936 as part of its annual studies of US oil reserves, and the American Gas Association joined these studies in 1946 (Harrell and Gardner 2005). The Society of Petroleum Engineers (SPE) first adopted definitions for proved reserves in 1964. In 1975, the Energy Policy Conservation Act was passed, which led to definitions for proved reserves from the SEC in 1978. SPE and the World Petroleum Council (WPC) published their "Petroleum Reserves Definitions" in 1997. That document had "seemingly subtle but often important divergences in interpretation" with the SEC definitions (Harrell and Gardner 2005). In 2007, the SPE/WPC/AAPG/SPEE released the Petroleum Resources Management System, which sets forth an international standard for the definitions, codification, and evaluation of oil and gas reserves (SPE/WPC/AAPG/SPEE 2007). Although numerous organizations have weighed in on reserves definitions and filers are free to report reserves internally as they see fit, the SEC definitions are the legal standard by which filers must report their proved oil and gas reserves if they list their securities on US Exchanges.

SEC Modernization of 2009

The 1978 SEC definitions came under ever-increasing fire over the next 3 decades. As Lee (2009) outlined, some of the key changes that occurred since the 1978 definitions include the following:

- Significant advances in the recovery and characterization of hydrocarbons
- Growth and improvement of both spot markets and transportation for oil and gas
- Establishment of economic production from nontraditional resources (e.g., bitumen from oil sands)

Some of the most noteworthy updates resulting from the Modernization (US SEC 2008a, 2008b, 2008c), along with the perceived benefits, are presented below:

- While proved reserves must still be reported, probable and possible reserves may be disclosed at the option of the reporting company. Because companies commonly make investment and strategic decisions on the basis of 2P reserves, disclosure of these additional categories should provide more transparency and relevancy for investors.
- Economically producible nontraditional resources, such as gas hydrates, synthetic oil and gas mined from coal and oil shale, and bitumen mined from oil sands, are now reportable as oil and gas reserves. A greater focus has been placed upon the end product than on the source of the product, and this will allow a broader view of a filer's reserves.
- Instead of requiring year-end pricing to calculate reserves, filers must use an average price that weighs equally the price on the first day of each of the 12 months of the fiscal year. This change has the potential to remove some of the effect of the volatility inherent in product prices and to serve as a more representative measure of recent oil and gas prices.
- Reserves may also be reported, at the filer's discretion, as a function of alternative price forecast(s). Such alternative pricing scenarios could give insight into the potential resiliency and/or upside of the filer's reserves portfolio.
- Reliable technologies may be used to determine reserves volumes. The regulations do not specify which technologies may be used, thereby implicitly allowing for the advent of new and incorporable technologies.
- PUD locations greater than one offset away from a proved developed producing (PDP) location, provided they meet the reasonable certainty criterion, may now be booked.

Role of Third Party Firms

Third party engineering firms are commonly used throughout the oil and gas industry to audit reserves estimates made by filers, or to perform full reserves evaluations. As defined by the Modernization requirements of 2009 (US SEC 2008c), a reserves audit is "the process of reviewing certain of the pertinent facts interpreted and assumptions underlying a reserves estimate prepared by another party and the rendering of an opinion about the appropriateness of the methodologies employed, the adequacy and quality of the data relied upon, the depth and thoroughness of the reserves estimation process, the classification of reserves appropriate to the relevant definitions used, and the reasonableness of the estimated reserves quantities."

The Modernization guidelines do not require reserves audits of E&P companies. Should a filer indicate that a third party conducted an audit, process review, or any valuation of its reserves, however, the filer must make a number of disclosures regarding the third-party report. Specifically, the new regulations require "a brief summary of the third party's conclusions with respect to the reserves estimates" (US SEC 2008c). The guidance offered by SPE's 2007 Auditing Standards (SPE 2007), which does not have the force of law but is mentioned in the "Supplementary Information" section of the new SEC rules, states that in rendering an opinion on the reasonableness of the estimated reserves, quantities and value "should reflect a quantity and/or value difference of not more than plus or minus 10%, or the subject reserves information does not meet minimum recommended audit standards." This ± 10% variation may be interpreted as the amount by which qualified professionals can reasonably be expected to disagree when independently estimating reserves using identical information. Certain companies may elect to contract a third-party firm for a full evaluation of their oil and gas reserves, wherein the third party independently calculates the reserves on the basis of data provided by the filer.

Overstatements and Write Downs

From Proved to Unproved. A reserves write down is a negative revision to oil and gas reserves estimates. A write down should occur if and when it is discovered that reserves estimates are too high. According to Smith and Sheehan (1997), downward revisions of reserves are made "to reflect new information on existing well performance and/or changes in economic conditions (i.e., oil and gas prices, operating cost environment)." Write downs are not necessarily a cause for concern among regulators or shareholders. For instance, reserves may be subject to a negative revision if product prices decrease over a given year. Such an occurrence represents a macroeconomic-level event to which filers are simply subject and over which they are likely to have little control. Additional technical data regarding reservoir performance may necessitate a reserves write down. There are other potentially unavoidable or uncontrollable factors, both large and small, which may result in or contribute toward a reserves write down. This paper addresses reserves write downs and focuses in particular on reserves overstatements, which represent largely *avoidable* reserves write downs from the proved category to probable, possible, or subreserve "contingent resource" status. Overstatements can occur when there has been an intentional misapplication of or disregard for reserves booking guidelines.

A Mixed Record in the Industry. Previous articles have commented that reserves volumes for the US have a reputation for being conservative (Reservations About Reserves 2004), and congressional testimony offered by experts has indicated that reserves values are "generally stable and are subject to very few downward adjustments overall" (Dharan 2004b). A 1997 research article from the Energy Information Administration (EIA) (Morehouse 1997) had encouraging findings regarding audits of US reserves estimates submitted to the EIA since 1977: "most of the proved reserves estimates submitted to EIA are more than 90% certain to be recovered in the future and, in many cases, are more than 95% certain to be recovered." Proved reserves data requested by the EIA is "generally the same information" that filers must submit to the SEC (Wascak 2004.) However, the EIA data entail gross-operated reserves, while the SEC requires net reserves (operated and nonoperated). At the individual field level, the EIA believes that the proved reserves estimate "almost always" falls within the range of "professional competence," and that at the aggregate level for the total volume of proved reserves presented in their annual reports, companies have a "99.999% probability" of recovering at least the physical volume that is estimated (Wascak 2004).

On the other hand, reserves overstatements have been acknowledged as "the problem no one wants to talk about" (McLane and Rose 2001). A previous study by Spear and Lee (1999) indicated a high degree of uncertainty for reserves estimates of 106 "leading oil and gas firms" during 1985–1994. Furthermore, between 2003 and 2008, E&P companies reported negative revisions of more than 9.3 billion net BOE (Hodgin 2009).

"Honest mistakes" in reserves estimation can and do happen. Furthermore, a handful of alleged overstatements should not cast doubt upon the reserves estimates of the entire petroleum industry. As Meyer and Zorn (2004) aptly stated in a 2004 Simmons & Company International report, "to broadly ascribe significant reserves risk to all E&P companies simply on the basis of the specific circumstances of a few is a dangerous game." However, this same report also states that "incidences of noncompliance with SEC proved reserves guidelines are numerous, each with their own specific case history and set of root causes." In certain instances of reserves write downs from the recent past, the SEC and/or shareholder groups believed that the overstatements were not necessarily attributable to honest mistakes. A number of reserves write downs have equaled or exceeded 20% of a company's previously reported volumes. According to a former SEC Chief Accountant, "A 20% restatement of proved reserves is a humungous [sic] error…. not an oversight. It's an intentional misapplication of the SEC rules" (Macalister 2004).

So in light of the fact that alleged reserves overstatements and subsequent write downs have occurred on a number of previous occasions, it is naive to assume that there will not be further instances in the future. The following anecdote was relayed by an SEC employee in 1964 (White 1964):

> "A rather unusual filing… ascribed nearly 100 million bbl of oil and nearly 250 billion cu ft of gas to potential production from horizons 'not yet discovered.' This statement was volunteered in addition to an estimated 8 million bbl of proved undeveloped reserves which were subsequently reduced to 3 million bbl. Even this was a forced overestimation to allow for the remotest of contingencies. There had been only a little over 1 million bbl of developed reserves involved. After nine years, none of the 'potential' reserves has been discovered. Obviously this was not one of the better reports."

Although this comment was made nearly 50 years ago and the case predates modern regulations, the attitude conveyed is telling and its tone has echoed through history.

Causes of Overstatements. McLane and Rose (2001) presented a number of reasons why reserves overbooking may occur. First, they state that poor estimating practices and ignorance may be responsible. Such practices of unsound technical work represent unintentional "errors of omission." These errors persist, despite ample availability of technical material covering reserves estimation including comprehensive texts on the subject (Cronquist 2001) and papers which specifically address "recurring mistakes and errors" in reserves estimation (Harrell et al. 2004; Hodgin and Harrell 2006). When estimating year-end reserves for SEC reporting purposes, an insufficient understanding or improper application of SEC definitions would constitute a poor estimating practice and ignorance. A lack of adequate internal controls within a company would also be characteristic of shortcomings in this area.

Second, according to McLane and Rose (2001), misguided incentives and competition for investors may be additional causes of reserves overbooking. Specifically, regarding misguided incentives, staff bonuses may set the tone for staff behaviors. If an engineer's compensation is dependent on achieving an aggressive level of reserves volumes, it may be difficult for the engineer to maintain objectivity during the estimation process. McLane and Rose discuss the significant pressure on managers to meet the high expectations of the equities market. McLane and Rose state that pressure exists "to push the envelope of credibility in efforts to buoy investor confidence and thus increase stock value." Michael Oxley, then-Chairman of the US House of Representatives Committee on Financial Services, quoted this same phrase during a Congressional Hearing on Oil and Gas Reserves in 2004 (Oxley 2004).

Third, McLane and Rose list a number of human biases that may contribute to reserves overbooking. He describes biases affecting judgment under uncertainty and also biases affecting risk decisions. Some of the biases affecting judgment under uncertainty include overconfidence, availability, and anchoring. To be sure, any reserves estimate should be construed as requiring "judgment under uncertainty." Biases affecting risk decisions are focused on the perception of risk with respect to investment decisions.

Last, according to McLane and Rose, reserves overstatements may reflect a lack of professionalism. They cite a number of behaviors, some of which are listed and consolidated below, that signify and encourage professionalism:

- Being fair and objective
- Accepting accountability for estimates and improving these estimates
- Disregarding the pressure to intentionally overbook reserves

Consequences of Overstatements and Write Downs. McLane and Rose (2001) observed that many companies that have used aggressive reserves booking no longer exist because the temporal benefits of the practice disappear when the reserves have to be removed from the books. While the prospect of a company going out of business as a result of reserves overbooking may sound severe, our analysis of public records from numerous cases indicates that other penalties may also be significant. Sections that follow illustrate the significant potential liability for both individuals and corporations. As evidenced by the share price responses to admissions of substantial write downs, overly aggressive booking practices can shake marketplace confidence. Reserves overbooking may lead to sudden and dramatic value destruction for shareholders. Shareholder groups, in turn, have occasionally sought redress through class action civil lawsuits.

In addition to the "external" costs described in the preceding, an operating company may feel other consequences. For instance, McLane and Rose (2001) believe that "overbooking creates stress and tension within an organization." Most engineers and geoscientists, if pressured by management to "push the envelope" of technical credibility, would likely harbor or express these sentiments. It is possible—and in some cases documented—that employees or managers have left or even, more specifically, have been asked to leave an organization because of reserves overbooking. Investigation of noteworthy cases even shows that management teams have been largely reshaped as a result of alleged overbooking.

Enforcement and the Regulatory Environment

The SEC. According to the SEC's website, its mission "is to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation," and "first and foremost, the SEC is a law enforcement agency" (US SEC 2010). The agency does not make claims regarding the preferrability of one investment over another but rather aims to promote clear and full corporate disclosure to the investing public.

General Enforcement Process. An investigation by the SEC may arise for a number of reasons: a routine review of SEC filings, tips from the public or news stories, referrals from other SEC investigations or government agencies (Larsen et al. 2008). Schaumann (2002) and Larsen et al. (2008) outlined the typical stages of an investigation. The investigation begins with an *informal inquiry*. At this point, the SEC does not have subpoena power, and witnesses cooperate voluntarily. On the basis of the informal inquiry, the investigating staff may request authority to conduct a *formal investigation*. If granted, the staff may then subpoena witnesses to testify.

The target of the investigation does not have the right to know that an investigation is being conducted, nor to make a statement. Typically, however, the target is issued a *wells notice*, which provides notification of the staff's intent. The target then has the option to respond by a *wells submission*, which may ultimately be used as evidence. After considering the wells submission, the staff makes a recommendation to the Commission. If a violation is believed to have occurred, the five-member Commission may elect to pursue any or all of these three options:

- *File an action in federal court*—Seeks an injunction (either temporary or permanent) or civil penalties, and may bar the

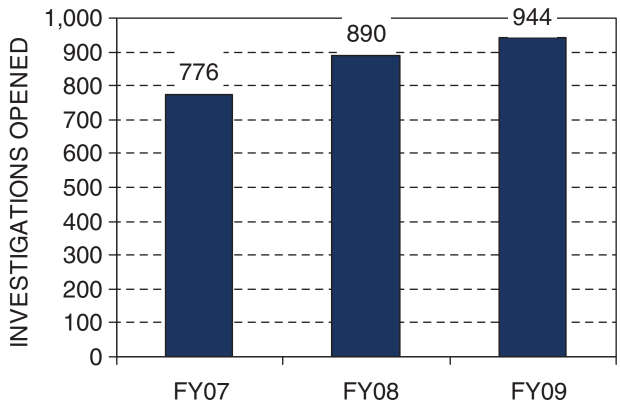

Fig. 1—Investigations opened by the SEC in 2009 are up 20% from 2007 (adapted from US SEC 2009).

subject from serving as an officer or director of an SEC-regulated company.

• *Begin an administrative proceeding*—Held before an administrative law judge (employed by the SEC), who has the discretion to impose an array of sanctions, "ranging from the relatively innocuous to the severe" (Schaumann 2002). Such administratively issued sanctions may include a cease-and-desist order, which is similar to an injunction.

• *Request that the Department of Justice (DOJ) bring a criminal action*—A DOJ investigation may be conducted in parallel to that of the SEC and may or may not be because of a referral from the SEC.

Enforcement Trends. The most significant securities regulation laws since 1934 have been those of the Sarbanes-Oxley Act (SOX) of 2002. Passed in the aftermath of Enron's historic collapse in 2001, SOX is an antifraud measure comprising numerous laws that address financial reporting by public companies. The act requires that executives take individual responsibility for the accuracy and completeness of financial statements, requires companies to certify internal controls, and mandates a triennial SEC review of each company's financial statements (Dharan 2004a). SOX, however, does not explicitly mention or discuss oil and gas reserves reporting (Ryder Scott 2003).

The following figures reveal a number of interesting observations regarding SEC enforcement trends. **Fig. 1,** from the SEC's 2009 Performance and Accountability Report (US SEC 2009), shows that the number of investigations opened by the SEC has increased steadily since 2007.

Fig. 2 displays that while enforcement cases brought by the SEC are distributed among a number of different areas, there is a historical concentration in the area of financial disclosure cases (US SEC 2009). (Statements pertaining to reserves constitute an example of "financial disclosure.")

Fig. 3, which should be of particular importance to reserves evaluators and executives who vouch for the legitimacy of publicly disclosed financial information, provides an indication of the frequency of individual and/or corporate SEC settlements for "misstatement cases" (Larsen et al. 2009). The data show post-SOX SEC settlements have included an individual component more often than not.

In summary, the authority and investigation count of the SEC are increasing, financial disclosure cases are the most common type brought by the SEC, and settlements are frequently made between the SEC and individuals.

Regulation, Documents, and Guidance Related to Reserves Disclosures

The Energy Policy and Conservation Act of 1975 required the SEC to "take such steps as may be necessary to assure the development and observance of accounting practices to be followed in the preparation of accounts by persons engaged, in whole or in part, in the production of crude oil or natural gas in the United States" (*42 USC Chapter 77* 2008). "Rule 4-10" established definitions for "proved reserves" and other terms of interest used in the oil and gas industry. In 1978, Accounting Series Release Number 253 and Statement of Financial Accounting Standards 19, Financial Accounting and Reporting by Oil and Gas Reporting Companies, were released by the SEC and the Financial Accounting Standards Board (FASB), respectively. FASB published SFAS 69, Disclosures about Oil and Gas Producing Activities—an Amendment of FASB Statements 19, 25, 33, and 39, in 1982 (*Statement of Financial Accounting Standards No. 69* 1982). Other noteworthy documents include Industry Guide 2, SEC Staff Accounting Bulletin Topic 12 (1997), SEC Clarification of Oil and Gas Reserve Definitions and Requirements (2001), and SEC Exemption to Production Testing in Deep Water Gulf of Mexico (2004) (Etherington 2009).

Under powers granted by the 1934 Exchange Act, the SEC has the authority to establish financial reporting and accounting standards. Since 1973, the SEC has designated the FASB as being responsible for establishing such standards (*Financial Accounting Standards Board* 2010b). Through June 2009, FASB

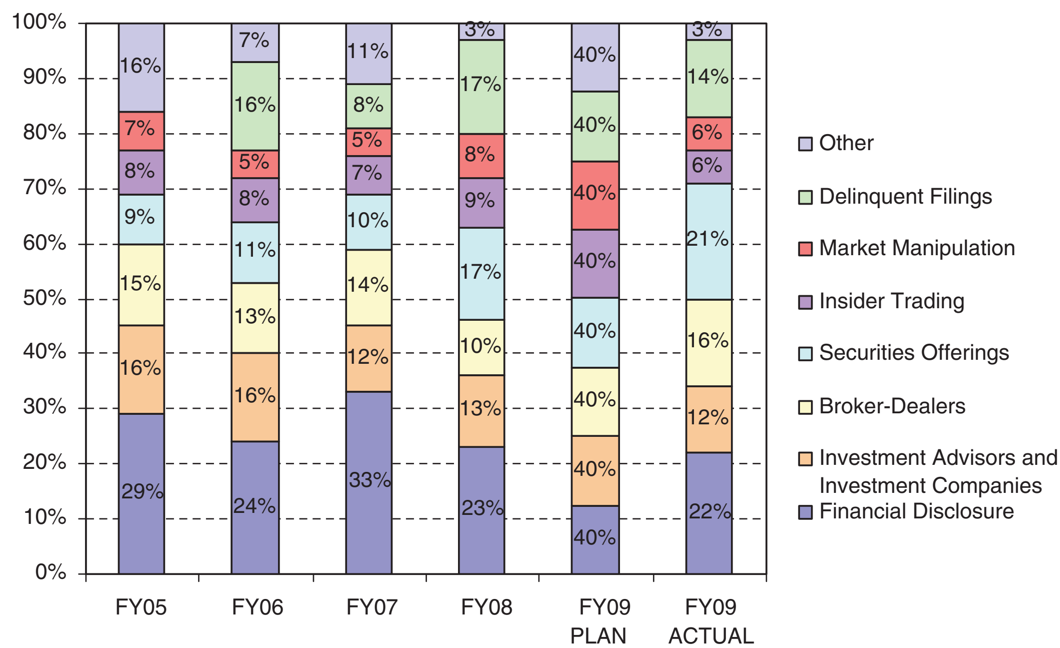

Fig. 2—Financial disclosure cases are the most common type brought by the SEC (adapted from US SEC 2009).

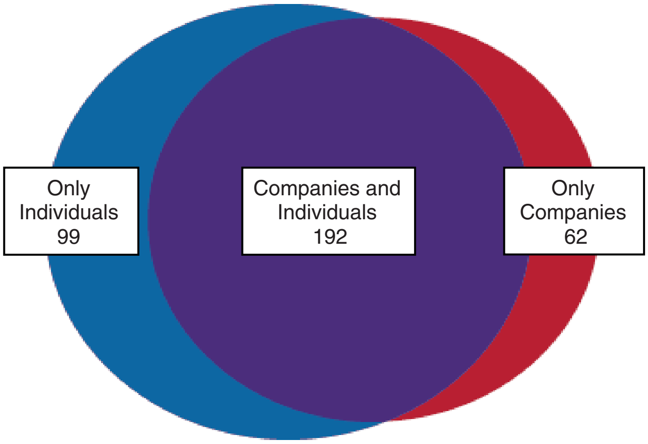

Fig. 3—SEC settlements for post-SOX misstatement cases most commonly include settlement with individuals (adapted from Larsen et al. 2009).

communicated accounting standards to all industries by issuing a number of "Pronouncements," including statements of financial accounting standards, interpretations, staff positions, and technical bulletins (such as those, just mentioned). As of July 2009, FASB has streamlined its communications with the Accounting Standards Codification, and any (previous) accounting literature outside of the Codification is nonauthoritative (*FASB Accounting Standards Codification* 2009). Oil and gas accounting guidelines were set forth in "Extractive Activities—Oil and Gas (Topic 932)." In January 2010, FASB revised the topic to be aligned with the SEC's Modernization of the Oil and Gas Reporting Requirements (*FASB Accounting Standards Update* 2010a).

Oil and gas reserves volumes for US-based companies are disclosed annually to the SEC and investors in conjunction with a *Form 10-K*. (Foreign issuers file a comparable document entitled *Form 20-F*.) Most companies are also required to file a quarterly report known as *Form 10-Q*. Certain intraquarter material events call for a *Form 8-K* to make the important information public to shareholders. If there are certain intraquarter material events, a *Form 8-K* ("current report") is filed to make public the important information to shareholders. *Form 8-K* filings are relatively common and may be necessitated by a variety of different events, but the information disclosed may have the potential to alter a corporation's share price significantly. The expectation or specifics of a reserves write down may be communicated by means of *Form 8-K*.

Potential "Triggers" for Reserves Inquiries. Although a previous section mentioned briefly some potential causes for an SEC investigation, the following is a more comprehensive list compiled from multiple sources (Hodgin 2009; Roesle 2007; Schaumann 2002) that gives insight into items that may serve—independently or in concert—as the impetus for a reserves inquiry or investigation:

- History of negative reserves revisions
- Partner activity, press release, or revision
- History of SEC infractions (e.g., in other, "nonreserves" areas)
- Potentially questionable press release issued by filer
- Annual reports that do not conform to press releases
- Negative publicity
- Mandatory triennial SOX review
- Self-reported problems
- Unusual stock volume or movement
- Whistleblowers
- Response to an SEC comment letter

The SEC currently employs two petroleum engineers who are responsible for monitoring compliance to the SEC's standards for reserves disclosures (Meyer and Zorn 2004).

Comment Letters. The SEC regularly issues *comment letters* in response to issuer filings. Any number of topics may be addressed in a comment letter, such as financial and accounting details, controls and procedures, executive compensation, legal proceedings, and reserves volumes. The comment letter requests a response to the questions raised by the SEC. Certain comment letters and response letters pertaining to disclosures made after 1 August 2004 are made public through the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system. (Other forms, including a company's 10-K, must be filed through EDGAR and are in turn also publicly available through the system.) However, if a company requests confidentiality, they may submit a redacted version—without the confidential information—to be made available publicly in addition to their unfiltered response to the Commission (US SEC 2004a).

Reserves volumes are commonly questioned in comment letters to oil and gas companies. A search for reserves-related comments on EDGAR clearly illustrates that the SEC is indeed actively examining the reserves data provided by issuers. Questions posed by the SEC can be general (e.g., a request for a company's detailed reserves report) to very specific (e.g., requests about particular assets or wells). Company responses can yield further questions and requests for clarification. Two examples of reserves-related inquiries from SEC comment letters are presented in the next paragraph. These are only two brief examples of many that pertain to reserves volumes.

In a comment letter to American Oil and Gas regarding filings from 2005–2006, the SEC required further commentary on reserves revisions (Feiten 2007): "We note significant oil reserve revisions in 2004 and significant gas reserve revisions in 2005. Please provide us with the reasons for these revisions."

Regarding Cabot Oil and Gas Corporation's 2006 *Form 10-K,* the SEC wrote a comment letter and sought additional details regarding Canadian PDP reserves (Schroeder 2008): "Please provide us with a graph over time of production through the latest month the data is available for each your wells in Canada. Include on each graph your forecast of future production and reserves as of December 31, 2006."

Types of Write Downs. Comment letters may result in a reserves write down. Roesle (2007) identified two different types of negative revisions: a debooking and a restatement. A debooking "typically results from [an] SEC request to remove certain reserves from the next annual filing" and is "rather common." A restatement "is a much more serious result, particularly under SOX, as it requires the issuer to retroactively 'correct' past reserves disclosures and recalculate earnings." In the event of a reserves restatement, the DOJ will likely open an investigation into the matter. The DOJ can issue both civil and criminal charges (Labaton and Gerth 2004). Additionally, corporate penalties may be triggered under SOX (Hodgin 2009).

Corporate and Individual Liability. The SEC's Division of Corporation Finance has issued reminders about individual liability that have been directed specifically to those involved with the reserves estimation process (US SEC CF Accounting Staff 2001):

> The SEC staff reminds professionals engaged in the practice of reserve estimating and evaluation that the Securities Act of 1933 subjects to potential civil liability every expert who, with his or her consent, has been named as having prepared or certified any part of the registration statement, or as having prepared or certified any report or valuation used in connection with the registration statement. These experts include accountants, attorneys, engineers or appraisers.

Schaumann (2002) provides details on the legal liability associated with securities disclosures. Information that is said to rely on subjective analysis and judgment is referred to as "soft" information. Because of the potential of soft information to mislead investors, the SEC established safe harbor rules in 1979 for forward-looking statements containing soft information. These statements are to be made "in good faith," and the company has a duty to provide updates as new information becomes available. Further legislation brought an additional safe harbor act, the 1995 Private Securities Litigation Reform Act. Under this act, protection is afforded according to two alternative means: a plaintiff cannot "prove that the forward looking statement was made with

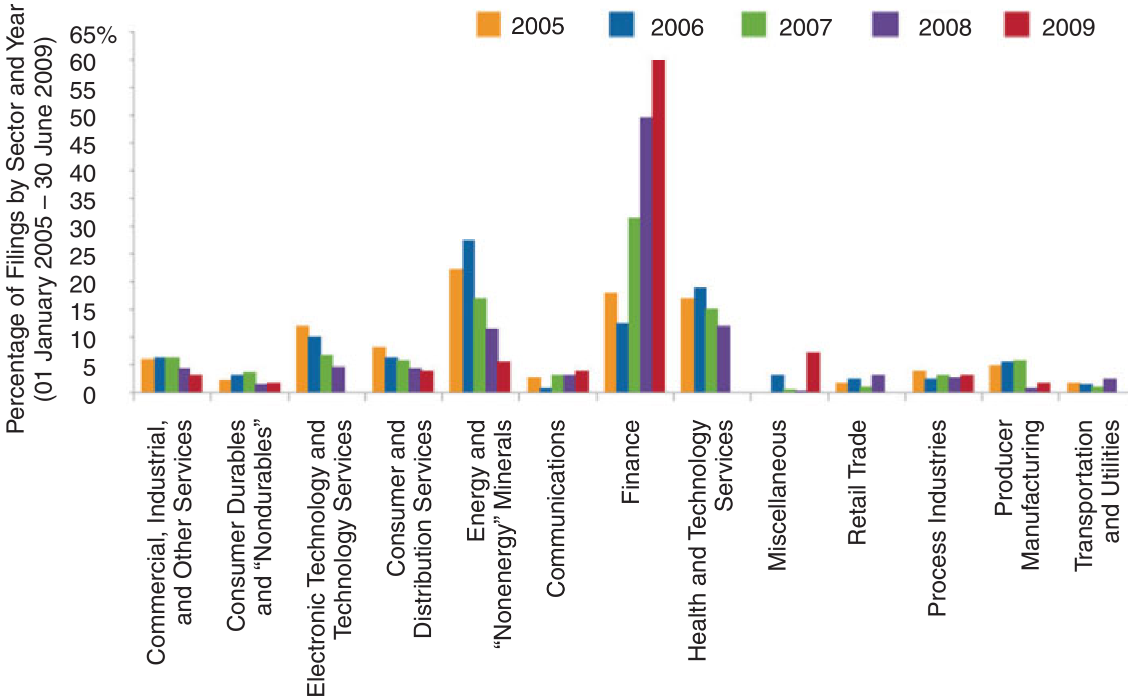

Fig. 4—Preponderance of energy-related class action lawsuits is decreasing but is historically high compared to those filed in other sectors (Plancich and Starykh 2009).

actual knowledge that it was false or materially incomplete"; and adequate cautionary statements made by the defendant.

According to Larsen et al. (2008), 88% of individual settlements made with the SEC include a disgorgement payment. As previously mentioned, the SEC may also seek an injunction, which is "awarded for the purpose of requiring a party to refrain from doing or continuing to do a particular act or activity….The injunction is a preventative measure which guards against future injuries rather than affording a remedy for past injuries" (Gifis 1996). Certain parties in the El Paso reserves overstatement case, for instance, were enjoined in the 2008 SEC complaint.

Shareholder Lawsuits

Class Action Trends. In light of the fact that reserves overstatements have been a principal or contributing factor in a number of class action lawsuits, it is necessary to make a few brief comments regarding their unique nature. A class action is defined as "a lawsuit brought by a representative member(s) of a large group of persons on behalf of all the members of the group" (Gifis 1996). McArthur (1996) has written extensively on class action lawsuits in the petroleum industry and commented that "the oilfield is no stranger to class actions." He claims that class actions have been used in drilling fund and partnership fraud cases, stock cases, and royalty cases. The "archetypal" class action involving securities entails stock price inflation by means of a misrepresentation or omission.

Recent documentation from the National Economic Research Associates (NERA), presented in **Fig. 4,** shows that class action lawsuits have been relatively common in the energy industry when compared to filings in other industries (Plancich and Starykh 2009).

Furthermore, the same NERA research indicates that for class action settlement values in 2008, the median was USD 8.0 million and the average was USD 43 million. Settlement values have, on average, increased significantly since the passage of SOX. Investor losses are said to be the most influential factor in determining settlement amounts. Another interesting finding, again courtesy of NERA (Plancich and Starykh 2009), is presented in **Fig. 5**, which shows that investors commonly arrive at settlements that are a mere fraction of their losses. Additionally, the data indicate a nonlinear relationship between losses and settlements. Investors who suffer higher losses will likely settle for a disproportionately lower amount relative to those suffering lower losses.

Case Studies

Royal Dutch Shell Group (Shell). Shell's international recognition and the magnitude of its 2004 reserves write down make it likely the best-known alleged reserves overstatement case. The company announced a 3.9 billion BOE reduction in proved reserves on a 9 January 2004 conference call (Shell/Fair Disclosure 2004a). The Group Chairman was not on the conference call in which the reserves write downs (or "recategorizations") were communicated to analysts, and he received criticism as a result (Davis 2004). The E&P Chief Executive Officer (CEO) was also absent from this call. Company representatives acknowledged that reserves audits were completed internally, with the aid of a contract reservoir engineer, and the write down was associated with a review prompted by "part of our normal stewardship of the assets." Furthermore, representatives stated "there is no material effect on financial statements for any year up to and including 2003," and that "most of the reserves will be rebooked in the proved category over time" (Shell Transport and Trading Company 2004a). The value of Shell Transport's American Depository Receipts dropped 6.9% on 9 January 2004 as a result of the announcement (*Pennsylvania Employees Retirement System v. Royal Dutch/Shell Transport* 2005).

On 5 February 2004, Fourth Quarter 2003 results and additional write down details were presented in a conference call (Shell Transport and Trading Company 2004b). As part of this call, the Group Chairman apologized for his absence on the previous month's conference call and it was disclosed that the Group was "on credit watch," that class action shareholder lawsuits had been filed, and that it would be necessary to revise previously filed financial statements. Regarding the recategorizations, the group chairman stated, "As soon as that came to my attention, it was a matter of all hands on deck, and I remember writing down the words 'get the facts and do the right thing….'" Later in the call, an analyst asked the Shell team if it would be appropriate for the Group Chairman to resign.

At the time of the alleged overstatement, the company allegedly had a "Byzantine dual holding structure," in which Royal Dutch Petroleum Company was based in the Hague, and Shell Transport and Trading Company was headquartered in London. Some observers believed this structure led to lax oversight (Mouawad 2009). These parent companies owned shares in holding companies ("the group") that engaged in operational activities

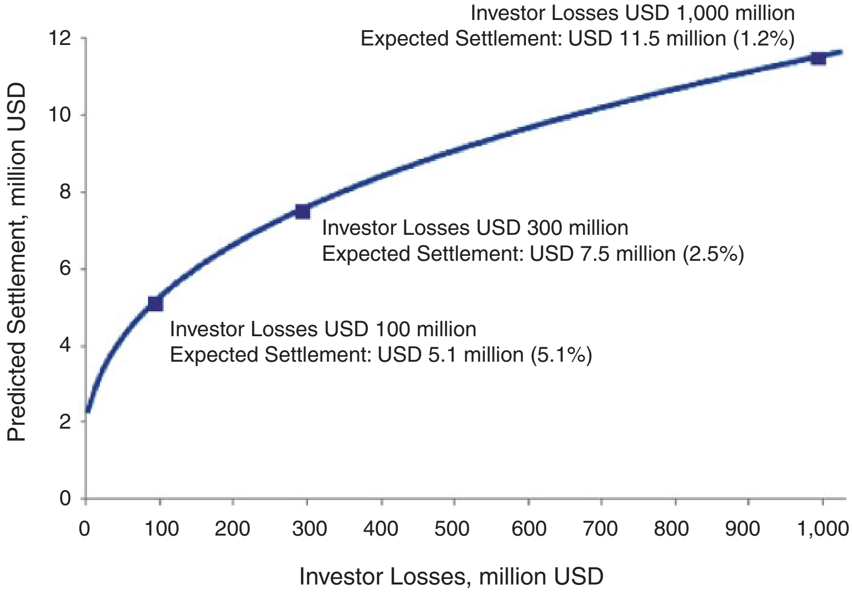

Fig. 5—Class action settlements increase nonlinearly with investor losses (Plancich and Starykh 2009).

(*SEC v. Royal Dutch Petroleum Co. et al.* 2004). Early reports, including one from Meyer and Zorn (2004), stated that the write down resulted in large part from the fact that projects booked as proved undeveloped between 1996 and 2002 in areas such as Australia and Nigeria had not, in fact, "progressed to their expected technical and commercial maturity." Reportedly, Shell and its partners had yet to receive government approval for a natural-gas development, known as Gorgon, in Australia. (ChevronTexaco, a partner in this project, did not include Gorgon estimates as part of its proved reserves.) Additionally, securities analyst Fadel Gheit commented that companies with operations in Nigeria were likely under pressure from that nation's government to inflate reserves. Because production quotas are assigned to Organization of the Petroleum Exporting Countries (OPEC) member countries on the basis of proved reserves, "it is in an OPEC country's best interest to put pressure on filers to motivate them to book more reserves" (Kopytoff 2004).

Ultimately, the alleged overstatement would prove to be 4.47 billion BOE, or approximately 23% of the company's total. A joint investigation was conducted by the SEC and Financial Services Authority, and Shell settled claims with the regulators for USD 120 million and BP 17 million (or USD 28 million), respectively, without admitting to or denying the findings of the SEC. The SEC alleged that Shell's overstatement stemmed from:

- "Its desire to create and maintain the appearance of a strong Reserve Replacement Ratio."
- "The failure of its internal reserves estimation and reporting guidelines to conform to applicable regulations."
- "The lack of effective internal controls over the reserves estimation and reporting processes."

The SEC complaint stated that Shell had internal "excessively permissive" guidelines that did not adhere to those of securities regulators. Furthermore, Shell did not maintain adequate internal controls and did not ensure that its employees were well trained regarding SEC disclosure requirements. The complaint also alleges that Shell did not ensure timely compliance with Rule 4-10 by lowering proved reserves estimates despite internal events and relevant signals dating back to January 2002.

Furthermore, the SEC complaint shed light on the areas that constituted the majority of the recategorization:

- Australia—Shell carried reserves on the Gorgon project dating back to 1997, despite the lack of a market, development plan, and firm commitment to invest in the project.
- Nigeria—Reserves did not acknowledge license expiration, and estimates were not made according to "existing conditions" as defined in Rule 4-10.
- Oman—Petroleum Development of Oman, partly owned by Shell, lacked a development plan on which to base reserves volumes; certain volumes were "not supported by any identified projects."

After settling with the Shell Group, an SEC official vowed, "As our investigation continues, we intend to focus on, among other things, the people responsible for Shell's failures" (US SEC 2004b). Furthermore, it was reported in March 2004 that the US DOJ opened an investigation into whether Shell executives violated any laws (Labaton and Gerth 2004). In June 2005, the DOJ investigation was closed and no action was taken against Shell. Then, in August 2006, it was announced that the SEC would not pursue charges against the (former) Group Chairman (Robertson 2006).

A number of lawsuits in the US followed the recategorization announcement. The reference class action complaint alleges a number of shocking details (*Pennsylvania Employees Retirement System v. Royal Dutch/Shell Transport* 2005). In October 2002, an email from the E&P CEO to the group chairman stated that "I must admit that I become sick and tired about arguing about the hard facts and also cannot perform miracles given where we are today….If I was interpreting the disclosure requirements literally (Sorbanes [sic]-Oxley Act etc) we would have a real problem." The E&P CEO wrote the Group Chairman in November 2003 that he was "becoming sick and tired about lying about the extent of our reserves issues and the downward revisions that need to be done because of far too aggressive/optimistic bookings." In December 2003, a "script" was prepared that discussed the need to disclose noncompliant reserves volumes. The E&P CEO replied that "this is absolute dynamite, not at all what I expected and needs to be destroyed." The Group Chairman, Chief Financial Officer (CFO), and E&P CEO left the company soon after the reserves revelations (Shell settles case for $150 M 2004).

The class action lawsuit named and aligned claims against certain defendant groups: "Shell Group Defendants" Royal Dutch, Shell Transport, the former Group Chairman, the former E&P CEO, and former CFO; "Individual Defendants" former Group Chairman, former E&P CEO, and former CFO; and financial auditors PwC UK and KPMG International. The first two counts, against the Shell Group Defendants and financial auditors, respectively, alleged violations of Section 10(b) of the 1934 Securities Exchange Act and Rule 10b-5 Promulgated Thereunder. The third count was against the individual defendants for Violations of Section 20(a) of the 1934 Securities Exchange Act.

Certain analysts had believed that Shell would need to merge with another company by the end of 2004 as a result of the scandal (Mouawad 2009), although this did not come to pass. Reserves booking procedures of other major integrated oil companies were questioned by the SEC in the wake of the Shell overstatement (Kopytoff 2004). Analyst J.J. Traynor of Deutsche Bank commented, "We remain convinced that reserves bookings are a sector-wide issue, albeit amplified at Shell" (Shell difficulties 'could spread' 2004).

In September 2008, a settlement with US investors was approved in which Shell paid more than USD 80 million to shareholders (Egoy 2008). In 2009, an Amsterdam court declared binding a USD 352.6 million settlement with non-US shareholders (Stichting Shell Reserves Compensation Foundation 2009).

El Paso Corporation. El Paso's reserves data attracted much attention after the publication of a November 2002 *Houston Business Journal* article (Perin 2002). In this article, a veteran reservoir engineer with the Houston-based company stated that after El Paso acquired Coastal Corporation, engineers at the company were asked to "clean up the books" and remove reserves volumes that did not meet SEC criteria. However, the engineer reported that "management interfered with engineering decisions" and issued an order to return the reserves to the proved category. The company, according to the engineer, was in some cases attributing reserves to projects that would not be developed for 10 years. A second engineer claimed that El Paso had recently been questioned by the SEC regarding proved undeveloped locations greater than one offset location away from proved developed locations.

On 17 February 2004, the company disclosed a write down of 1.8 Tcf, or approximately 40% of its previously reported proved reserves. The organization's new CEO announced that in October 2003, after performing a number of field reviews, he believed that it was necessary to have a "fresh set of independent eyes" recalculate reserves volumes for the end of the year (El Paso to Review Reserve Revisions Conference Call 2004a). The majority of the negative revision involved proved undeveloped locations that no longer met key technical and commercial hurdles (Meyer and Zorn 2004). The company later restated earnings for a number of prior years, resulting in a USD 1.7 billion decrease in stockholders' equity (US SEC 2008d).

Alleged details emerged from a SEC complaint that was filed more than 4 years later against El Paso Corporation, two of its subsidiaries, and five former employees of El Paso Exploration and Production Company (EPEP) (*SEC v. El Paso* 2008). The complaint stated that a former EPEP President and former Senior Vice President "aggressively sought to maximize oil and gas reserves….The three Divisional vice presidents, in response to the pressure to maximize reserves, overstated reserves totals" in the following ways:

- Recording proved reserves to unproved reservoirs
- Assigning reserves despite a lack of sufficient engineering and geological data
- Failing to reduce reserves volumes on the basis of performance

Furthermore, the company failed to maintain adequate internal controls. Financial statements dating back to 1999 were restated. Details on the degree to which certain assets were affected can be gleaned from the SEC complaint and preliminary data announced in the February 2004 conference call. Selected highlights are presented below:

- South Texas—The largest revision, in which Vicksburg sands for PDP and PUD reserves were adjusted to account for smaller drainage areas in low-permeability sands and well interference owing to larger drainage areas in high-permeability sands. Reserves data for PUD reserves were not immediately adjusted to account for post-drill expected ultimate recoveries, which indicated that the company would recover only 67% (subsequently lowered to 39%) of predrill estimates for particular locations. 25% of the South Texas write down was because of the company using an outdated study on a single field to justify a 7% minimum decline rate when a 12 to 13% minimum decline rate was more accurate.
- Rocky Mountains/Coalbed Methane—In part because of Raton Basin locations found to be draining only 80 acres (as opposed to historical bookings at 160 acres). Also, to create viable locations, did not use current economic, operating, and cost conditions in accordance with Rule 4-10. Booked 150 PUD locations on the basis of three test locations and two producing wells.
- Gulf of Mexico—Mechanical failures, performance, and revised geologic interpretation. (Not cited in SEC complaint.)
- Brazil—Lack of gas sales agreement for Camamu basin. (Not cited in SEC complaint.)

By the end of June 2004, EPEP had "a new leadership team not only at the top, but at least two levels down" and seven new members on the El Paso Corporation's Board of Directors (El Paso Corp. to Review Plan for Production Business Conference Call 2004b). The five EPEP executives named in the SEC complaint settled with the Commission for either USD 75,000 (EPEP President) or USD 40,000 (EPEP Senior Vice President (VP) and three divisional VPs) (Plourd 2008). Despite settling for USD 235,000 with the five employees (who did not admit guilt), the SEC did not fine the company (Gold 2008). El Paso and each of the executives did, however, agree to injunctions against future violations of the securities laws at issue. (US SEC 2008d).

Beginning in 2002, approximately 1½ years before the reserves write down, a number of class action lawsuits were filed against El Paso (and related parties) for various securities law violations (*Wyatt v. El Paso Corporation, et al*. 2006). The reserves write down resulted in additional lawsuits, which were ultimately consolidated. The suit claims that El Paso's share price dropped approximately 18% in response to the reserves announcement in February 2004. El Paso agreed to pay USD 273 million to settle the case (*Wyatt v. El Paso Corporation, et al.* 2006).

Stone Energy Corporation. Stone Energy Corporation, based in Lafayette, Louisiana, and with assets concentrated in the Gulf of Mexico, Rocky Mountains, and Williston basin, announced on 6 October 2005 that the company had recently retained services of a third-party firm to perform a reserves review of all its fields (Stone Energy Corporation 2005a). The company stated that it would need to revise previous estimates by 171 Bcf equivalent, or approximately 20% of its reported total at year-end 2004.

A press release issued on 8 November 2005 announced that certain financial statements dating back to 2001 would need to be restated (Stone Energy Corporation 2005b). Another press release, issued just 2 days later, announced that the company had received notice that the reserves revision would be the subject of an informal investigation by the SEC (Stone Energy Corporation 2005c). In December, Stone detailed the preliminary findings of an independent review on the reserves revision (Stone Energy Corporation 2005d). The negative revision resulted from a number of factors, including

- Lack of "adequate internal guidance or training on the SEC standard for estimating proved reserves."
- "Some former members of Stone management failed to fully grasp the conservatism of the SEC's 'reasonable certainty' standard of booking reserves."
- "There was an optimistic and aggressive 'tone from the top' with the respect to estimating reserves. Some on the Stone technical staff felt pressure to interpret the geological and engineering data in an aggressive manner.…"

Subsequently, Stone's former CEO left the company's Board of Directors. Furthermore, management was advised by the board of directors to request resignations of two other individuals involved with the write down (Snow 2006). No fewer than 16 law firms announced class action lawsuits in the months following the negative reserves revision. A consolidated class action complaint was filed in June 2006 in US District Court for the Western District of Louisiana (*El Paso Fireman and Policeman's Pension Fund v. Stone Energy Corporation* 2006). Along with Stone, it also named the former and subsequent CEOs and CFOs as defendants. The complaint stated that the company overstated its reserves for 4½ years despite using the services of a third-party firm, and that the former CEO

- "Redrew geological maps of oil and gas reservoirs to manufacture false reserves numbers."
- "Violated SEC requirements for booking proved reserves"
- "Intimidated and verbally abused Stone employees for calculating proved reserves that were lower than [the CEO] wanted"

According to the complaint, Stone's Senior VP for exploitation and its reservoir-engineering manager aided the former CEO in orchestrating the overstatement. Also, it states that "company insiders with knowledge of the fraud were selling their personal holdings of Stone common stock at prices they knew were artificially inflated by the proved reserves overstatement," and that shares dropped 30% as a series of announcements revealing the truth about Stone's reserves were made between 6 October 2005 and 10 March 2006.

Stone received notice from the SEC in April 2007 that it would not pursue an enforcement action in connection with the alleged reserves overstatement (Stone Energy Corporation 2007). Class action claims against two of the individual defendants were dismissed in August 2007 (Stone Energy Corporation 2008). In January 2010, a class action settlement was preliminarily approved for USD 10.5 million (Stone Energy Corporation Securities Litigation 2010).

Repsol YPF. Repsol YPF, based in Madrid, Spain, announced in January 2006 that reserves volumes for year-end 2005 would be reduced by 1.25 million BOE, or approximately 25% of the volume reported at year-end 2004 (Repsol YPF S.A. 2006). Most revisions were in Bolivia (659,000 BOE) and Argentina (509,000 BOE). When disclosing the revision, the company cited "changes in legal and contractual framework (New Hydrocarbon Law in Bolivia)" and "field performance and new data yielding a deeper understanding of the affected reservoirs" as the two main reasons for the write down. Projected economics deteriorated for certain Bolivian opportunities as a result of the new hydrocarbon law, and estimates in various Argentinian fields were reduced. After the announcement, Spain's securities regulator, the Comisión Nacional del Mercado de Valores, opened an investigation into the overstatement.

A consolidated class action complaint filed with the US District Court for the Southern District of New York alleged securities law violations against the company, its CEO, and former CFO (*Reynolds v. Repsol YPF* 2006). According to the lawsuit, an internal investigation by the company found

- "The process for determining reserves…was flawed from 1999 to 2004."
- "A lack of proper understanding of and training on the requirements of the SEC for booking proved reserves."
- "An unwillingness to accept personal responsibility for reporting internally adverse facts regarding reserves."
- "Undue optimism regarding the technical performance of the fields and (for Bolivia) commercialization."
- "Systemic flaws in the company's internal control structures."

The consolidated class action alleged per-share price decreases of 7% (USD 2.12) and 4.79% (USD 1.34) on the day of and day following the revision announcement, respectively. A settlement of USD 8 million was reached with shareholders in 2007.

Analysis of Cases. Arguably, the most important factor regarding some alleged reserves overstatement cases is that they were entirely avoidable. Through more education on SEC regulations, stronger internal controls, and/or a greater emphasis on ethics, many of these overstatements would not have occurred. The write down or recategorization of certain volumes rapidly destroyed significant shareholder value as few events can. Allegedly, overstatements have, in certain cases, erased as much as 30% of share prices. Although not discussed at length here, legal expenses and attorney's fees can be significant in class action litigation and are further costs ultimately borne by shareholders. In light of this value destruction, shareholders with a sizable position in an E&P company are concentrating their risk for reserves overstatement.

Implications of Modernization

The reserves booking guidelines under the modernized SEC rules are more flexible than the previous standards. For example, filers may now book PUD locations that are greater than one well spacing away from a producing well. Additionally, the requirements make allowance for using "reliable" technologies. The new regulations are, in effect, more "principles based" than those previously employed by the SEC.

More disclosure is required as a result of this enhanced flexibility. For example, reliable technology must be disclosed, at least in general ways. Additionally, information is required regarding the concentrated geopolitical political risk facing a filer. Subpart 229.1200 (Items 1201 through 1208) of Regulation S-K is new under the Modernization and focuses entirely on reserves-related disclosures. PUD locations are limited to a 5-year development time frame. Certain filers may have PUD locations that will need to be debooked at the end of 2009.

However, the new regulations do not address certain issues or solve problems that were alleged to have been key factors in certain overstatement cases we have highlighted, such as a disregard for the rules, weak internal controls, or human biases. No matter the definitions, the principles of the industry and its members will ultimately determine how "level" the playing field is. Companies may ignore the rules, just as they have allegedly done in the past. They may do so in particular with the new flexibilities afforded under the PUD booking and reliable technology guidelines just mentioned. Furthermore, the reliable technology principle may inadvertently lead to the incorporation of technologies (into reserves calculations) before those technologies are genuinely understood by certain engineers. Probable and possible reserves represent additional areas of disclosure that may be reported too aggressively and without using proper evaluation procedures.

For these reasons, some believe that the risk of reserves write down may increase under the new regulations. According to Darbonne (2009a, 2009b), Geoff Roberts of the Oil and Gas Asset Clearinghouse believes that "the [modernization] regime opens the company-reporting process to serious potential for misuse or abuse by aggressive public companies." It is now, of course, too soon to gather any empirical evidence to support or refute such intuitive claims.

Regardless of the requirements in place, estimating reserves will likely always be an inexact and subjective science. Authors have acknowledged that "The mere physical attributes of the asset class—miles below the surface, significant natural variability within the oil and gas reservoir—make conventional engineering precision an impossible standard to achieve…. The lack of precise definitional and engineering standards can naturally lead to a range of interpretive outcomes, both conservative and aggressive" (Meyer and Zorn 2004).

Conclusions

We draw the following conclusions from this study:

- Reserves overstatements have occurred on a number of occasions, and for a variety of reasons, in the oil and gas industry.
- There is potential for significant corporate and/or employee penalties for cases of reserves overstatements, along with the possibility of class action shareholder lawsuits.
- There may be a greater risk for reserves write downs as a result of the 2009 Modernization of Oil and Gas Reporting Requirements.
- Accurate reserves reporting should be an ethical and corporate mandate because doing otherwise can destroy the credibility of management teams and produce significant civil penalties for both corporations and employees.

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