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Oil & gas: reserves measurement and reporting in the 21st century

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“Looking back, 2004 was a momentous year for the oil & gas industry globally.”

Strong oil demand growth, coupled with the tightest oil supplies in over 25 years, caused oil prices to surge upwards, averaging almost \$40 a barrel. Natural gas production declines in the US, and linkage to oil prices in Western Europe, led to higher natural gas prices and heightened the awareness that much more gas must be piped or shipped over much longer distances in the coming years. Against this backdrop of higher oil and gas prices and tight oil and gas supplies, there was renewed anxiety about political instability in some of the key producer countries and the related vulnerability to short term supply disruptions.

Amid the renewed interest in security and adequacy of oil and gas supplies came the revelation by Shell of a dramatic downward revision to its previously reported proved oil & gas reserves, announced initially in January 2004 and much exacerbated by a succession of subsequent further downgrades. Oil & gas reserves information is vitally important as a driver of market values of publicly quoted companies in the sector. It is also critical to the calculation of reported income, through its use in asset depletion and impairment calculations. The Shell revelation triggered a torrent of regulatory, analytical and journalistic scrutiny of oil & gas reserves reported by many other companies across the industry.

Some other companies have had to revise their own reserves figures downwards too and several more have engaged in technical debate with the authorities to rebut challenges that they too may have categorised some of their reserves inappropriately. In consequence there is evidence of a much wider breakdown in confidence about reserves disclosed by the oil & gas industry generally. This has afforded greater publicity once again to those geoscientists and analysts who continue to warn that the peak of global oil production is approaching rapidly.

Public concern has shifted to question the medium term availability of adequate supplies of oil & gas. Investors and consumers in the OECD countries are voicing anxieties over the industry's ability to access sufficient reserves of oil, which must increasingly be sourced from OPEC countries and Russia, and to meet growing natural gas demand in the major markets by piping or shipping gas over much greater distances at affordable cost.

It is in this context that we explore whether existing oil & gas reserves disclosure requirements applicable to public oil & gas companies really meet investor and consumer needs. We make several suggestions for improvements to enhance the usefulness of reserves disclosures and that will help to restore user confidence in this critical aspect of reporting by oil & gas companies.

Regulatory definitions for disclosure of oil & gas reserves

The role of the US Securities and Exchange Commission (SEC) is central in this context. Its requirements for disclosures about oil & gas reserves, amplified by the standards issued by the US Financial Accounting Standards Board, set the global benchmark in an industry dominated historically by US-based major oil companies.

The SEC's disclosure rules were introduced in 1978. They focus on 'proved reserves', which is just one category of the overall pool of oil & gas resources controlled by companies in the industry. The definition applicable to this category of reserves was originally based on that developed by the Society of Petroleum Engineers (SPE). Although the SEC staff has made public a range of interpretative guidance over the years, its original version of the actual reserves definition, and its emphasis on 'deterministic' estimation methods, have remained unchanged.

Meanwhile the techniques used across the oil & gas industry for the collection and analysis of scientific data have advanced in leaps and bounds. Recognising these advances, the SPE itself, working in close co-operation with the American Association of Petroleum Geologists (AAPG), and other scientists globally through the World Petroleum Council (WPC) and under the auspices of the United Nations Framework Convention (UNFC) on natural resources, has significantly updated the structure and wording of the definitions recommended for categorisation of oil & gas resources, including the sub-category of proved reserves. These SPE definitions and related estimation methods are essentially 'probabilistic', rather than 'deterministic' in their approach.

Geoscience, engineering and other professionals within the industry work on a daily basis with information calibrated and presented according to the framework established by the current SPE definitions and guidance. Increasingly this differs from that organized according to the SEC rules. This is illustrated particularly sharply by a recent announcement from the SEC that it will now accept the application of certain new techniques in 'proving' reserves...but only if these reserves fall within the deepwater areas of the US Gulf of Mexico. This position is scientifically indefensible and serves only to underline the weakness inherent in the SEC's continued adherence to a set of rules which have been outdated by technical progress over the last 25 years.

Around the world other market regulators and accounting standard setters have also made reference to the oil & gas reserves definitions established by the SPE as the basis for disclosures required in prospectuses and annual filings. Some of these regulations elsewhere, eg in Canada, already closely track current SPE definitions.

In our view the current joint SPE/AAPG/WPC framework for definition and categorisation of oil & gas resources, including proved reserves, should be generally adopted by market regulators and accounting standard setters globally as the single universal set of reserves definitions. We believe that this framework and set of definitions are based on sound principles that are already widely used by many companies and are sufficiently detailed to facilitate universal application.

As technologies continue to emerge and advance, continuation of the joint SPE/AAPG/WPC group working under the auspices of the UN may provide a reliable process for the definitions to be updated if and as needed in the future. In consequence the various national regulatory agencies may have no cause to issue further detailed prescriptive interpretative guidance; the geoscience and engineering professionals could be relied upon to exercise appropriate judgment in applying the guiding principles to the particular circumstances in each case.

Scope of reserve disclosures

The current joint SPE/AAPG/WPC framework for categorisation of resources clearly defines proved, probable and possible reserves. These sub-sets of reserves are most commonly expressed through varying degrees of probability that at least this level of estimated quantities will be commercially recoverable, often abbreviated as the **P90**, **P50** and **P10** categories.

The 'downgrades' to reserves announced by Shell and others during 2004 appear to have been widely misinterpreted by those outside the industry. The SEC's very strict and limiting rules for inclusion of reserves within the 'proved' category are designed to virtually eliminate the risk of downward revision; especially in a period of rising oil & gas margins. So it is easy to understand the huge public concern which has arisen. But the stance taken by some regulators, such as the SEC/FASB, limiting reserves disclosures to only the 'proved' category, has resulted in a widespread misperception that these 'downgraded' quantities have been effectively 'lost' to the reporting companies. The fact that these reserve revisions have essentially transferred estimated quantities from the 'proved' category to the 'probable' category has not been well understood by the public at large.

Clearly more knowledgeable investors and industry professionals understand that the reality, whilst a serious concern, is far less dramatic than the general public may perceive. Within the industry itself, management as well as engineers and other professionals routinely utilise estimates of proved AND probable reserves together, in making decisions about investments, in infrastructure planning, in portfolio management, in lending against projects and in commercial valuations. Industry executives make a clear distinction between the categories of proved and probable reserves, but never ignore the latter category.

In our view, it would be a very positive advance for market regulators and accounting standard setters to extend the required disclosures about reserves to embrace the category of probable reserves. We recommend that proved and probable reserves should be clearly distinguished in such disclosures, but that both categories should be reported.

Such disclosure could be set out in tabular form as illustrated in figure 1, distinguishing also developed and undeveloped reserves.

Content and format of reserve quantity disclosures

Existing regulatory requirements commonly focus on disclosure of the reserves quantities at the balance sheet date, with an analysis of the main sources of change since the previously reported figures. But contrary to the common language use of the term, 'reserves' of oil & gas are not quantities neatly held in 'storage' and available to bring to the market in the near term. The estimates that are made underlying the 'reserves' as disclosed are essentially forward-looking projections of future production of oil & gas, often over many years into the future. It follows that an appreciation of the likely timing of future production of reported reserves is of the utmost importance in evaluating the information.

In the US, the SEC/FASB have indirectly addressed this aspect through a requirement for disclosure of a 'standardised measure' of discounted future cash flows projected to arise from production of proved reserves. But, although users of accounts would not wish to lose this measure, there is widespread acknowledgement that it suffers serious limitations. Indeed several major companies publish warning messages and disclaimers to alert readers that the measure in no way represents the 'value' of their overall reserves. And in any case it still does not actually provide information about the expected timing of future production from disclosed reserves.

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Figure 1

	Country/Area A				Country/Area B				Worldwide			
	Oil*		Gas		Oil*		Gas		Oil*		Gas	
	Proved	Proved and Probable	Proved	Proved and Probable	Proved	Proved and Probable	Proved	Proved and Probable	Proved	Proved and Probable	Proved	Proved and Probable
Beginning of year (1 Jan 2004)												
Extensions and discoveries												
Improved recovery												
Revisions												
Reclassifications/transfers												
Production												
Purchases												
Sales												
End of year (31 Dec 2004)												

*Oil includes condensate and natural gas liquids.

We believe that disclosure of the expected timing of production from both proved and probable reserves would be of more value to investors and consumers. For companies following US regulations it is our suggestion that such disclosure would be additional to, not in place of, the 'standardised measure'. This new disclosure could be set out in a tabular format, again distinguishing between projected production of proved and probable reserves, as illustrated in figure 2.

Given the forward-looking nature of reserves disclosures we believe that such information should most properly be included within the narrative provided by the management accompanying the annual financial statements: for example in the 'Management Discussion and Analysis' (MD&A) in the US, or the 'Operating and Financial Review' (OFR) in the UK.

The scope and content of these sections of corporate annual reports have changed significantly in the years since disclosure standards were first introduced requiring oil

& gas reserves to be included as unaudited accounting footnote information. Indeed most management teams already provide important commentary on their oil & gas reserves within the MD&A/OFR. We believe that the oil & gas reserves data disclosed is qualitatively very different from other information included within footnotes to the financial statements. In our view it has no place there at all. Combining the narrative and unaudited tabular quantitative disclosure within the MD&A/OFR would be much more appropriate and effective in communicating to investors and other users of annual reports.

Economic assumptions underpinning reserve quantity estimates

Estimation of reserve quantities entails selection and application of economic assumptions, principally about price and cost levels. This is acknowledged in the SPE/AAPG/WPC definitions which require that estimates reflect 'current economic conditions'. For investment planning purposes, for lending decisions and for

commercial valuations, engineers and other industry professionals apply price and cost level projections that they assess to be appropriate to the circumstances. As few oil & gas wells are produced to physical extinction, the selection of economic assumptions is important in projecting the effective economic cut-off point for production, and hence the overall quantities of oil & gas reserves. In circumstances where cash operating costs are relatively high, the economic cut-off point can be especially sensitive to the selection of such assumptions, particularly as regards future oil or gas prices.

In interpreting the term 'current economic conditions' the SEC/FASB have insisted on the application of prices prevailing exactly at the balance sheet date, both in estimating reserve quantities and then in computing the 'standardised measure' of discounted future cash flows. The principle repeatedly emphasized by the SEC in arguing its position is that 'judgment' should be minimised in estimating proved oil & gas reserves for disclosure to investors.

Figure 2

	Country/Area A				Country/Area B				Worldwide			
	Oil*		Gas		Oil*		Gas		Oil*		Gas	
	Proved	Proved and Probable	Proved	Proved and Probable	Proved	Proved and Probable	Proved	Proved and Probable	Proved	Proved and Probable	Proved	Proved and Probable
Projected Production												
2005												
2006												
2007												
2008												
2009												
Thereafter												

*Oil includes condensate and natural gas liquids.

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The SEC argues that ideally it would expect different engineers to arrive at essentially similar estimates of reserves given the same set of technical data.

Arguments for a less prescriptive approach have been put forward over the years, especially during periods of high short term price volatility, by many companies, economists and other commentators. Even in relatively stable periods, the economic planning assumptions generally used within the industry internally rarely if ever coincide exactly with the price and cost levels prevailing at a balance sheet date.

In our view it would be preferable to permit managements to select the economic assumptions that they believe to be most appropriate to the circumstances of their own companies. These should be clearly disclosed and explained within the disclosures related to their oil & gas reserve quantity estimates. Indeed, it is already quite common for executives to brief investors publicly as regards their corporate views on the development of oil & gas price curves into the medium term.

Such views underpin corporate strategy, budgets and longer range financial plans. It is proper in our view that they be used to estimate reserves, even though they reduce the consistency of estimates across different companies within the industry. We believe that coherence and consistency as between disclosures about a company's reserves and the other information about its strategy and plans are more important.

Restoring investor confidence in reserve information disclosed

There has been an unprecedented level of public debate during 2004 concerning the processes of collection, analysis and interpretation of the complex technical data required to develop estimates of oil & gas reserves data. Daunted by this complexity, many commentators have focused on the absence of regulations requiring independent assurance of the reserves figures as estimated by the geoscientists and engineers directly involved. Much less has been heard about the absence of regulation or standards covering the professional competence of the preparers of reserves estimates, whether they be internal or 'independent', and the processes they use in reaching their conclusions about reserves.

Again the SPE/AAPG/WPC have been at the forefront of development of relevant standards and guidance in this regard, in this context also in collaboration with the Society of Petroleum Evaluation Engineers (SPEE). There is currently a joint workgroup active at a global level to ensure that standards and guidelines are in place for the professional 'certification' of the competence of engineers involved in preparation of reserves estimates. This body of material is intended to provide for appropriate courses of study, for testing, and for Continuing Professional Education of those who are 'qualified' in respect of this work.

In our view, the first and most important step in improving assurance and restoring confidence is for market regulators and accounting standard setters to require that reserves estimates disclosed in annual reports and used in accounting calculations be prepared by suitably 'certified' engineers in accordance with the standards and guidelines set out by the SPE/SPEE. 'Certified' engineers in this context will thus include oil companies' internal employees and/or those engaged through petroleum engineering consulting firms.

Internal controls over reserves estimation and reporting

We believe that the regulatory requirement for reserves information to be prepared by 'certified' engineers should help to restore investor confidence. This in no way reduces the responsibility of the management and the Board to ensure that reserves disclosures comply with all aspects of the regulatory requirements.

In this context it is pertinent to note the SEC's preliminary response to enquiries concerning the applicability of Section 404 of the Sarbanes-Oxley Act to the internal control processes surrounding the estimation and disclosure of oil & gas reserves. Whilst it is considering whether there is a need for further rulemaking the SEC asserts that, for the time being, 'internal control over the preparation of this supplementary information need not be encompassed in management's assessment of internal control over financial reporting'.

In our view oil & gas reserves estimates are of fundamental importance to the annual report and financial statements of an upstream oil & gas company. As such we believe that those internal control processes in operation for financial reporting purposes that surround the reserves compilation should certainly be subject to the corporate governance regulations applicable in the reporting jurisdiction. For example we would expect that these control processes should be encompassed by the section 404 provisions of the Sarbanes-Oxley Act in the US, by the Turnbull requirements in the UK and other similar regulations elsewhere. We would recommend that the SEC's initial conclusion in this regard should be revised during 2005.



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If the scopes of Section 404 of the Sarbanes-Oxley Act or other corporate governance regulations are extended to include internal control processes for the estimation of oil & gas reserves and the related disclosures, then the role and responsibilities of financial statement auditors should be clarified. Financial statement auditors are required to examine and report on management's assertions on internal controls; however, they do not normally have the competencies to opine on the actual oil & gas reserves estimates themselves. If companies seek third party opinions on the oil & gas reserves figures, then this is properly the business of independent petroleum engineering consulting firms.

Independent audit of reserves disclosures

The issue of whether reserves disclosures should be audited was extensively considered when the SEC/FASB first introduced disclosure requirements in the 1970's. The troubling series of reserves restatements during 2004 has suddenly resurrected the question. Market regulators in many jurisdictions already require the inclusion in prospectuses for natural resources companies of reports prepared by engineering consultants. Some, mainly smaller companies, routinely and voluntarily include reports of external petroleum engineers along with their published annual oil & gas reserves information.

The development and acceptance of international standards are essential pre-requisites in governing the audit or review of oil & gas reserves information. For the time being, however, compared for example with the regulations surrounding financial statement audits, there is relatively very little in the way of relevant standards in any jurisdiction.

To begin with there is no widely accepted definition of 'independence', applying to the engineering firms themselves or to their owners and staff as individuals in the context of audit or review work undertaken. Also, there is no body of standards setting out the qualifications required of reserves auditors or of the essential processes to be completed in order to undertake an 'audit' or a 'review' of reserves estimates prepared by management. And there is no standard form of report wording that clearly and consistently identifies the role and scope of the audit work and the form of the professional opinion to be given.

In our view, until and unless a framework of such standards and guidelines is established governing the independent audit or review of reserves information, it is neither practicable nor desirable for regulators to introduce mandatory audit requirements in respect of disclosures of reserves in annual reports.

In the medium term we recommend that efforts are made to develop such a body of standards. Companies who choose to have their reserve disclosures audited or reviewed will be better placed to define and explain to investors exactly what the 'independent' professional opinion entails and investors will be able to gain greater levels of assurance than at present.

In conclusion

We believe there is a need for considerable improvement in disclosures about oil & gas reserves in annual reports and financial statements as this information is so important to users in assessing business performance and in the calculation of reported income.

Regulators globally should co-operate to seize the opportunity to embrace the comprehensive and current reserves definition and categorisation structure, already endorsed by petroleum engineering professionals worldwide. Mandatory disclosures should be expanded to include probable, as well as proved reserves, and information about the projected production of proved and probable reserves should be given.

In estimating reserves, managements should be permitted to interpret the phrase 'current economic conditions' so as to apply reasonable price and cost assumptions that are consistent with their overall plans and budgets. Reserves information is essentially 'forward-looking' and should be disclosed within the MD&A/OFR, not as an unaudited footnote to the financial statements.

Regulators should support the petroleum engineering profession in completing the current international exercise to establish a body of standards and guidelines to govern the competence of reserves estimators and the processes applied in their work. It should be a requirement that reserves information included in annual reports be compiled by appropriately certified professionals, whether internal employees or external consultants.

Corporate governance regulations concerning internal financial control processes generally, such as Sarbanes-Oxley 404 and Turnbull, should apply to the controls over the compilation and reporting of oil & gas reserves as they are so fundamental to the accounts of upstream companies.

Independent audit of oil & gas reserves disclosures should continue to be optional, but it should be undertaken against a much better developed framework of standards and guidelines governing independence, competence, audit procedures and prescribed forms of reporting.

These recommendations will improve the usefulness of oil & gas reserves information disclosed publicly to investors and will be a big step in restoring investor confidence in reserves information.

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