

Inflating US shale gas reserves

New rules have accelerated the growth of US proved gas reserves in an unprecedented way. A New York Times article prompted the US Congress to ask for a Security and Exchange Commission (SEC) investigation. Ruud Weijermars and Crispian McCredie, Alboran Energy Strategy Consultants, outline the basis for reasonable doubts about the reliability and durability of US shale gas reserves under the new SEC rules.*

A core strategy for oil and gas companies is to optimise reserve replacement efficiency to increase their asset base and lower the cost of capital. The reserves booked need to be reliable to ensure national reserves estimates are correct as well as satisfying shareholders and lenders. Adding new gas reserves used to be a slow and costly process. Back in 2004, conventional oil companies that were optimistic about finding and reporting proved reserves in their existing production acreage, were severely penalised by the US Security and Exchange Commission (SEC) in what was commonly referred to as the 'reserves scandal'. In the aftermath, oil and gas majors became very conservative in their reserve accounting methods. The accelerated rise in US gas reserves over the past decade has been driven by an unexpected tripling of proved unconventional gas reserves and an even more spectacular doubling of proved undeveloped gas reserves, which has coincided with the introduction of new 2009 SEC rules.

The SEC regulates how companies report their oil and gas inventories or reserves. As such, it is expected to act as a watchdog to assure US investors that company reports are accurate. Following a *New York Times* article by Ian Urbina, which called into question the economics of shale gas plays, Congressman Maurice Hinchley (D-NY) sent letters to the SEC and the Energy Information Administration (EIA) questioning the manner in which both bodies had handled shale gas reserve

estimates.¹ Reuters reported that the SEC has requested a number of shale gas companies to provide documents relating to shale gas well production, so the SEC investigation is likely to compare actual well production versus well predictions to determine if gas reserves are being estimated correctly. Policymakers and governments worldwide want to see security of gas supply anchored in a stable business model and are closely following US developments.

The US has seen, after decades of decline, a steep recovery of reserve

replacement ratios for oil and gas. Figure 1 shows the steep rise of US proved unconventional gas reserves.² Such steep rises have not been reported by conventional gas operators. The new reserves relate to the result of the application of new fracking techniques for unconventional oil and gas fields. However, there are serious concerns that the rise in shale gas reserves are inflated by more lenient reserve reporting guidelines that were changed by the SEC in 2009.³ These changes had a profound effect on the proved reserves for reporting years 2009 and 2010.

New SEC rules

The new rules, the first changes for 30 years, will influence reserve reporting in two main ways – the new rules specifically state that oil and gas producing activities include the extraction of saleable hydrocarbons from oil sands, shale and coal beds.³ Secondly, the SEC's aim is to make the value of proved reserves less sensitive to short-term price fluctuations and in doing so, make investments in energy securities less volatile. To reduce the price volatility, the SEC rules require a 12-month average price to be used to value gas reserve inventory on a company's annual balance sheet, as opposed to the old system of year-end gas prices.

US total reserves for 2009 are based on EIA-23 company reports compiled and released in the US annual reserves report of November 2010, which included the addition of 2009 shale gas proved reserves in EIA data. The 2009 new rule coincided with a staggering 51% increase of US proved shale gas reserves (from 21.7tn cf in 2008 to

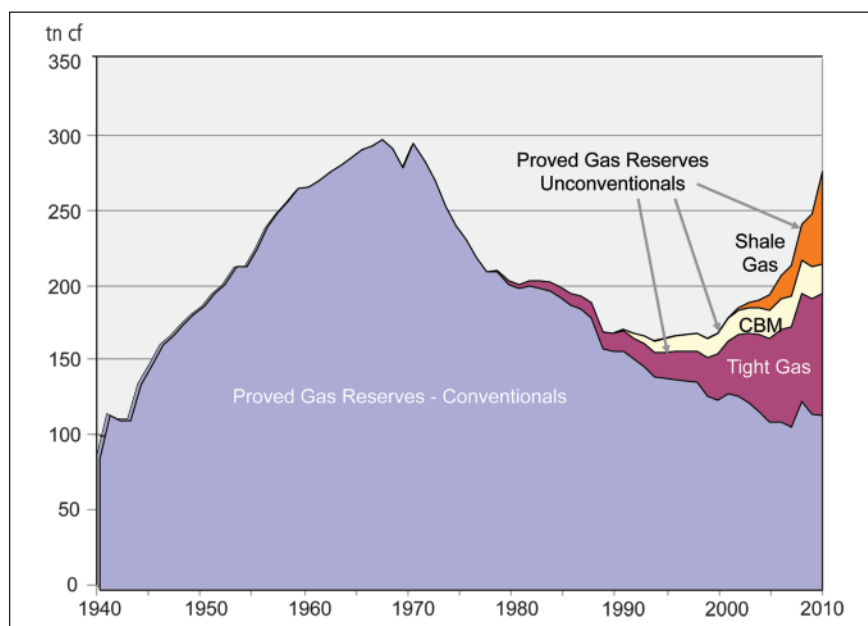


Figure 1: US proved gas reserves

Source: see Ref 2

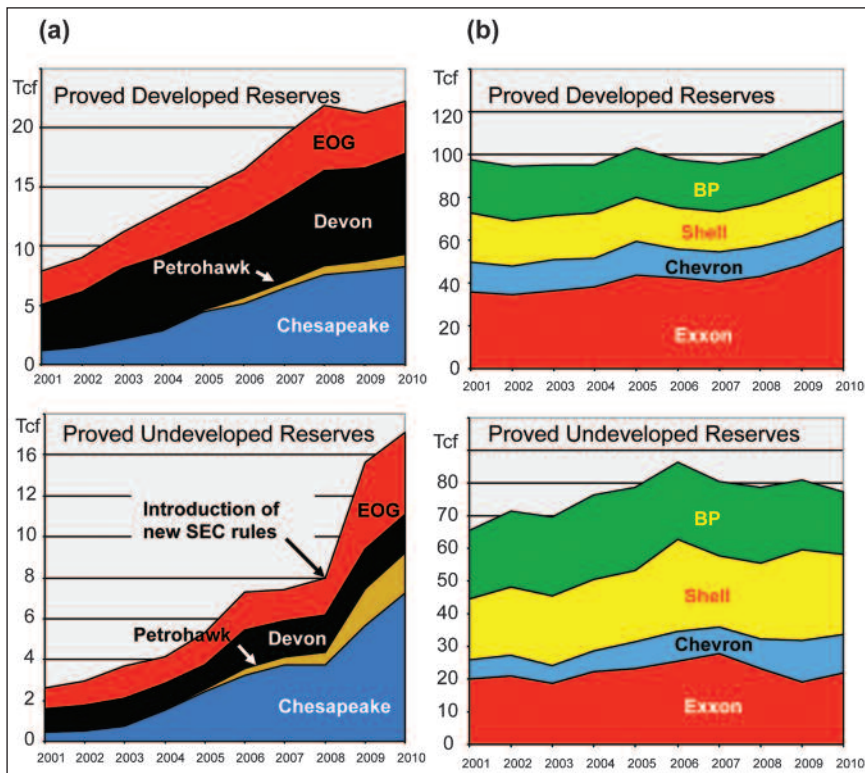


Figure 2: Proved developed gas reserves and proved undeveloped gas reserves for (a) shale gas, and (b) conventional gas majors Source: see Ref 6

32.8tn cf for 2009), as reported by US shale producers under the new rules.⁴ This growth is remarkable in itself, but even more so because gas prices fell by 59% in 2009 (from \$7.74/mn Btu at year-end 2008 to \$3.16/mn Btu used in 2009 reserves reporting). Proved gas reserves normally grow when gas prices rise and may be lowered when gas prices fall. It is unprecedented that gas reserves in existing fields grew as much as 51% in a year where paid gas prices fell by 59%.⁵ The 12-month 2009 average and year-end prices both hovered between \$3 and \$4/mn Btu.

The price accounting method could not have triggered a major shift in reported reserves of shale gas companies. Lower gas prices in 2009 did not create new proved reserves for conventional operators. Oil and gas companies operating conventional gas fields cannot rapidly mature potential gas plays. They are progressively upgraded over time via possible and probable resources into contingent reserves, and ultimately from proved undeveloped reserves to developed and producing proved reserves. This traditional reserve maturation process requires extensive seismic exploration, well testing and reservoir modelling before a prospect becomes an economic proved reserve. The lead time from prospect to proved reserves is at least

three to five years.

The individual company reserves for each year are based on form K-10 company filings to the SEC. **Figure 2a** shows time series for the increase of total proved reserves of representative US unconventional gas operators over the past decade.⁶ Total proved reserves have increased by 350% over the past decade for the four shale gas operators studied. Most of the rise over the 2009 and 2010 reserves is due to a doubling of the proved undeveloped reserves. For comparison, **Figure 2b** shows that the conventional gas reserves of the majors increased less than 30% over the past decade. Their proved undeveloped gas reserves declined when gas prices dropped from 2008 onwards.

SEC reserve reporting rules require that proved reserves reported by companies can, with reasonable certainty, be economically produced by them. The depressed gas price has put severe financial pressure on US gas production companies. The median break-even price of \$8/mn Btu for 45 US gas operators has not been met in any one year by Henry Hub prices, which averaged less than \$4/mn Btu in 2009.⁷ Monthly averaged US gas prices have not recovered in 2010 and 2011 sees continuing weakness.

Analysts would suggest with reasonable certainty that economic production

from a significant portion of US shale gas plays is presently not warranted. Over 50% of the wells in shale gas fields are less than two years old and well productivity has not been benchmarked for the full 30-plus year lifecycle of these wells. Reliable type curves for well productivity are not yet available for half of the US shale gas production areas.⁸ The Crisman Institute for Petroleum Research at Texas A&M University is developing sophisticated models for shale gas well productivity, but has not yet been able to affirm the production volume with 90% certainty as required by SEC.

Reserves reported by unconventional gas operators are the main driver for the steep increases in US proved gas reserves. The 2009 introduction of the revised SEC rules helped US gas shale operators to report a steep rise in their proved undeveloped gas reserves. The new SEC rules provided room to include proved undeveloped reserves and contingent reserves in the corporate balance sheet. The collateral provided by increased proved reserves was much needed by the shale gas companies. A downgrading of their proved reserves could have arguably led to financial liquidity problems for operators, due to the already high debt gearing of many shale gas companies, secured by proved reserves.

Shale gas remains unique in the sense that infill drilling programmes can add new reserves without the need to acquire new acreage. Well density has decreased significantly in recent years, further optimised by multilateral drilling, for enhanced production from one entry hole. Studies of the well productivity and tighter well spacing show that the upper limit has been reached, because commingled production between adjacent wells has started to reduce individual well productivity in many fields.

The 51% increase of 2009 proved reserves from US shale gas can be attributed to several strategy drivers. Firstly, adding reserves by infill drilling programmes in sweet spot areas. Secondly, rapidly moving contingent resources into economic proved undeveloped reserves under new SEC rules, and thirdly, an assumption that future well productivity under low prevailing gas prices (as mandated by SEC) can still be developed economically, partly counting on supplementary income from gas derivative trades.

Auditing and reporting of reserves by shale gas companies needs to be improved. The pressure on company management to improve income flow and boost asset value by adding proved reserves is enormous, which could lead

to an overly optimistic interpretation of reserves that can with reasonable certainty be economically produced. If those reserves need later to be downgraded after becoming reclassified, then the reputation of the upstream gas business will be impaired in the eyes of the global investor community. If natural gas prices do not recover and the shale gas bubble were to burst, then the possibility exists that companies could become insolvent due to the evaporation of capital sunk in wells that will never reach break-even at full-cost accounting.

Once investors get burned on gas investments, the shale gas E&P companies now emerging around the world will have a hard time raising the venture capital needed to develop prospective shale gas resources into proved reserves. With more than \$430bn of combined market capitalisation in the US alone,

any concerns about the business fundamentals of shale gas operations need to be mitigated swiftly and decisively – a call for action on US stewardship.⁹ ●

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