

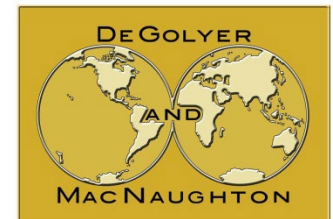
GEO INDIA 2022

Pitfalls and Writedowns

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Jaipur, Rajasthan, India



Worldwide Petroleum Consulting

Pitfalls and Writedowns

Overview

- Geoscience based pitfalls
- Reservoir Engineering based pitfalls
- Simulation application to reserve pitfalls

- Write Down Case Histories
 - ❑ Shell 2004
 - ❑ El Paso 2002
 - ❑ Stone Energy 2005
 - ❑ Repsol YPF 2006
 - ❑ Cairn 2013
 - ❑ Parallel
 - ❑ BP 2009
 - ❑ Genel Taq Taq 2011-2019
 - ❑ Wintershal Maria 2019

Pitfalls and Writedowns

Geoscience Based Pitfalls

■ Mapping Surfaces

- ❑ Multiple Geo Models for different reservoirs on single structures can result in non conformable surfaces
- ❑ Update of individual reservoir mapping rather than entire structure

■ Not using all available data, selectively using data

■ Property distribution

- ❑ Model porosity averages not tying to porosity observed in wells
- ❑ Distribution of properties does not reflect geologic setting, is statistical rather than geologic.
- ❑ Excessive geologic license applied, not necessarily incorrect but less likely.
 - Keep it simple, if you hear hoof beats, think horses not zebras!
- ❑ Use of zeroed out logs in property distribution

■ DOWNDIP LIMITS

Pitfalls and Writedowns

Decline Curve Pitfalls

■ Decline Curve

- ❑ Failure to specify minimum decline rates in hyperbolic projections
- ❑ Misalignment of ultimate recovery vs. volumetric estimates
- ❑ Appropriateness of exponential or hyperbolic decline and reservoir type and drive mechanism
- ❑ Not evaluating trends of secondary products

Pitfalls and Writedowns

Decline Curve and Operating Cost Pitfalls

■ Decline Curve

- ❑ Failure to specify minimum decline rates in hyperbolic projections
- ❑ Misalignment of ultimate recovery vs. volumetric estimates
- ❑ Appropriateness of exponential or hyperbolic decline and reservoir type and drive mechanism
- ❑ Not evaluating trends of secondary products

■ Operating Costs

- ❑ Operating costs should not include G&A expenses or other overhead costs
- ❑ Budgeted and projected operating costs are lower than actual long term historic costs
- ❑ Recurring well or facility costs that are removed and assumed to be single or one time events.
- ❑ Use of a per unit operating costs without correctly reflecting a fixed operating cost.

El Paso 2004 Reserve Write Downs

2002

- Following El Paso's acquisition of Coastal Corporation several articles appeared in the Houston Business Journal where veteran reservoir engineers stated engineers were asked to "clean up the books" and remove reserves volumes that did not meet SEC criteria. However, management interfered with the engineering decisions and the removed volumes were returned to the proved reserve category.

October, 2003

- El Paso's new CEO after performing a number of field reviews announced that he believed that it was necessary to have a fresh set of independent eyes recalculate reserves volumes for the end of the year 2004.

February 17, 2004

- El Paso announced a 1.8 Tcf reduction in proved reserves, approximately 40% of it's previously reported proved reserves. Multiple years earnings were restated resulting in a 1.7 billion USD decrease in stockholders equity. Share price dropped 18% in response to the reserves announcement.

Settlement

- 5 Executives were named in the SEC complaint, executives settled for 75,000 or 40,000 USD.
- El Paso as a company settled class action law suit for 273 million USD in 2006.

SPE 134014, Reserves Overbooking: The Problem We're Finally Going to Talk About

El Paso 2004 Reserve Write Downs

Reasons

Majority of Recategorization

- ❑ South Texas
 - Proved Undeveloped reserves were not updated with production results from new wells. PUD models were outdated and not reflective of performance, failed to reduce reserve volumes based on performance.
- ❑ Rocky Mountains/Coalbed Methane
 - Did not use current economic, operating, and cost conditions in order to create viable PUD locations. Booked 150 PUD locations on the basis of three test locations and two producing wells. Assigned reserves despite a lack of sufficient engineering and geological data.
- ❑ Brazil
 - Lack of gas sales agreement

SPE 134014, Reserves Overbooking: The Problem We're Finally Going to Talk About

Shell 2004 Reserve Write Downs

January 9, 2004

- ❑ Shell announced a 3.9 billion BOE reduction in proved reserves in a conference call with analysts.

February 5, 2004

- ❑ Additional write downs and the necessity to revise previously announced financial statements.
- ❑ Announced that class action shareholder lawsuits had been filed.

March 2004

- ❑ US Justice Departments opened an investigation into Shell executives. Ultimately in 2006 no individual charges were filed.

Ultimate Write Down and Settlement

- ❑ Ultimate write down proved to be 4.47 billion BOE, about 23% of the company's total reserves
- ❑ Shell settled with US Regulators for 120 million US dollars
- ❑ Shell settled with UK Regulators for 28 million US dollars
- ❑ Shell paid more than 80 million US dollars to shareholders in 2008
- ❑ Shell paid 352.6 million dollar settlement to non US shareholders in 2009.

SPE 134014, Reserves Overbooking: The Problem We're Finally Going to Talk About

Shell 2004 Reserve Write Downs Reasons

Majority of 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”
- ❑ Oman
 - Reserves lacked a development plan on which to base reserve volumes; certain volumes were not supported by any identified projects

SPE 134014, Reserves Overbooking: The Problem We're Finally Going to Talk About

Shell 2004 Reserve Write Downs

Reasons

SEC noted Shell Causes for Reserve Overbooking

- ❑ Shell's desire to create and maintain the appearance of a strong Reserve Replacement Ratio
- ❑ Shell's failure of its internal reserves estimation and reporting guidelines to conform to applicable regulations
- ❑ Shell's lack of effective internal controls over the reserves estimation and reporting processes
- ❑ An additional comment regarding Nigeria was that Shell was likely under pressure from Nigeria's government to inflate reserves since OPEC production quotas are assigned to OPEC member countries on the basis of proved reserves.

SPE 134014, Reserves Overbooking: The Problem We're Finally Going to Talk About

Stone Energy 2005 Write Downs

Why reserves audits are necessary? – Famous reserves write-down cases



NGI THE WEEKLY GAS MARKET REPORT / NGI ALL NEWS ACCESS

Stone Energy Review Triggers Board Resignation, New Inquiry by Philadelphia Stock Exchange

December 12, 2005

EMAIL / PRINT

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An independent review of the oil and natural gas reserves booking system used by Stone Energy Corp. has triggered the resignation of board member and former CEO D. Peter Canty and directed management to request the resignations of an unnamed officer and senior manager associated with the reserve estimation process.

Canty was elected CEO of Stone on Dec. 31, 2000, and remained in that role until his retirement in April 2004.

Stone initiated an independent review of its internal booking system after revising downward its proven reserves by 171 Bcfe in October. A month later, it announced it would restate some of its financial statements, and the Securities and Exchange Commission (SEC) launched an informal inquiry of the company (see *NGI*, Nov. 14). Last Monday, Stone announced it now is cooperating with a new inquiry from the Philadelphia Stock Exchange regarding trading activity prior to the Oct. 6 announcement. Class action lawsuits already have been or will be filed in connection with the reserve revisions, Stone noted.

Among other things, the independent review conducted by the law firm Davis Polk & Waddell found a lack of "adequate internal guidance or training" on the SEC standard for estimating proved reserves, and found top management's "tone" in estimating reserves had been "optimistic and aggressive." There was "evidence that some former members of Stone management failed to fully grasp the conservatism of the SEC's 'reasonable certainty' standard of booking reserves." Also, "some on the Stone technical

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Briefs -- West Virginia, Stone Energy, Northern Natural Gas, ICE

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<http://www.naturalgasintel.com/articles/13897-stone-energy-review-triggers-board-resignation-new-inquiry-by-philadelphia-stock-exchange>

Stone Energy 2005 reserves write down:

- 161 Billion Cubic Feet Equivalent
- One Director, One Officer, and One Senior Manager resign
- Main investigation findings:
 - ❑ Lack of an adequate internal guidance or training on the SEC standard for estimating proved reserves
 - ❑ Evidence that management failed to fully grasp the conservatism of the SEC's "reasonable certainty" standard of booking reserves
 - ❑ Evidence of an optimistic and aggressive "tone from the top" with respect to estimating reserves

Repsol YPF 2005 Write Down

Why reserves audits are necessary? – Famous reserves write-down cases

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Last updated: January 26, 2006 11:48 pm

Repsol announces 25% reserves cut

By Mark Mulligan in Madrid

Share Print Clip Comments

Shares in [Repsol YPF](#) plunged nearly 8 per cent on Thursday after the Spanish oil and gas group announced a 25 per cent cut in its proven reserves and warned of reduced profits this year.

The company partly blamed last year's increase in production royalties from 18 per cent to 50 per cent in Bolivia, where it was forced to write off 659m barrels of oil equivalent (boe) of gas – half of its total there. However, it also admitted that “new information” about gas deposits in Bolivia and Argentina had forced it to reassess the probability of extraction.

<http://www.ft.com/intl/cms/s/0/9e7e60be-8e4f-11da-ae63-0000779e2340.html#axzz48pggnY15>

Repsol YPF YE2005 reserves write down:

- Announced a reduction of 1.25 billion BOE in proved reserves (25% less than 2004 YE values)
- Repsol justification:
 - ❑ Changes in legal and contractual terms (new Hydrocarbon law in Bolivia)
 - ❑ Field performance and new data yielding a better understanding of reservoirs
- Shares plunged nearly 14% in the following 2 days
- A \$8 million settlement with shareholders in 2007

Cairn 2007 Write Down

Why reserves audits are necessary? – Famous reserves write-down cases

Cairn in the red after reserves downgrade

What the analysts say

Oil and gas company **Cairn Energy** posted a loss for 2006, after writing down the value of its operations in Bangladesh.

The group, which floated its Indian arm last December, made a pre-tax loss of £90.6m last year, compared with a pre-tax profit of £101.2m in 2005. This was primarily due to a £71.5 writedown on the value of its reserves in Sangu, Bangladesh, and costs associated with its Indian IPO.

Sangu has yielded a steady supply of gas since production started in 1998, but is now in decline. The company has been forced to reduce its forecast for its gas reserves at the complex by 26bn cubic feet, after an appraisal drill discovered water within one gas reservoir – showing that the deposit is not commercially viable.

Although production of oil and gas fell by 13.2% last year, its revenues rose by 9% thanks to the increase in the price of oil.

The flotation of Cairn India raised \$1.98m (£1bn), of which £481m is being returned to shareholders. The oil firm, which retained 69.5% of its Indian arm, plans to declare an expected gain of \$1.1bn from the IPO in its 2007 results.

<https://www.theguardian.com/business/2007/mar/27/6>

2007 and forward:

■ 2007:

- ❑ Cairn Energy writes off 213 BCFE
- ❑ Parallel Energy removes hundreds of horizontal PUD locations

■ 2009: BP writes off ~350MMBOE of U.S. Assets for 5 year rule violation

Other Notable Writedowns

Reasons

Kurdistan-Genel-Taq Taq Field

- ❑ Fractured Carbonate in the Zagros
- ❑ Lower Net to Gross, more ductile, limited matrix
- ❑ Initial production 15,000 bbl/day wells no water
- ❑ When water hits wells are finished
- ❑ Multiple similar examples on trend

Write Down

- ❑ 2011-- 647 MMbbl Proved + Possible
- ❑ 2013-- 650 MMbbl Proved + Possible
- ❑ 2015-- 172 MMbbl Proved + Possible and 1 billion impairment charge
- ❑ 2017—Reserves not noted but an additional 181 million impairment charge
- ❑ 2018—59.1 MMbbl Proved + Possible Estimated by McDaniel and Associates, and they note there is still significant uncertainty due to fracture porosity in the Shiranish Reservoir, major water influx issues.
- ❑ 2019—54.7 MMbbl Proved + Possible RPS Estimated

Other Notable Writedowns

Reasons

Norway-Wintershall 2017-2019

- Maria Field in the North Sea
- Five producers and two water injectors
- Producing wells don't see pressure support from injection wells, poor connectivity
- 8 out of 10 adjacent fields have seen similar problems with over 50% reserve reductions once online
- Reserves cut 76% since coming online from 207 MMbbl to 50 MMbbl
- Poor Analogy recognition

Oil & Gas Resources and Reserves Evaluation

Causes of overstatement

- Common causes of overstatement include:
 - ❑ Bad practices:
 - Poor estimating practices and ignorance
 - Ignorance or improper application of SEC definitions
 - Lack of internal controls
 - ❑ Internal misguided incentives (i.e. bonuses based on reserves booking)
 - ❑ Human biases of uncertainty and risk determination
 - Uncertainty: anchoring, overconfidence, availability
 - Risk: perception of risk with respect to investment decisions
 - ❑ Lack of professionalism

