Article 2 – COGEH Reserve Classifications

by Gary Metcalfe, P. Eng., Vice President Evaluations

In 2004, the Royal Dutch Shell Group reported five separate write-downs of 3,900 MSTB, 250 MSTB, 200 MSTB, 100 MSTB, and one undisclosed volume. In that same year, El Paso reported a 41% write-down in reserves from 4,500 BCF to 2,600 BCF. Where did the reserves go? The answer is ...nowhere! These write-downs resulted from misinterpretation of standards and guidelines for reserve classification. The reported oil and gas volumes likely exist; it was just a matter of premature classification into the proved reserves category.

The Canadian Securities Administrators (CSA), through National Instrument 51-101 (NI 51-101), sets the standards for disclosure of oil and gas activities for companies listed on Canadian stock exchanges. The definitions and standards for reserve appraisals and evaluations are defined in the Canadian Oil and Gas Evaluation Handbook (COGEH).

Reserves are the estimated remaining quantities of oil and natural gas and related substances anticipated to be recoverable from known accumulations based on analysis of drilling, geological, geophysical, and engineering data; established technology; and specific economic conditions.

Under the COGEH definitions, the reported proved reserves are those estimated with a high degree of certainty to be recovered, probable reserves are less certain to be recovered than proved, and possible are those less certain to be recovered than probable. The degree of certainty is defined as:

**Proved:** 90% probability of meeting or exceeding the estimated proved volume (P90).

**Proved plus probable:** 50% probability of meeting or exceeding the sum of the estimated proved plus probable volume (P50).

**Proved plus probable plus possible:** 10% probability of meeting or exceeding the sum of the estimated proved plus probable plus possible volume (P10).

Figure 2.1. COGEH reserves and resources classification.
Each of the reserve classifications can be divided into Developed and Undeveloped categories, with the developed category further subdivided into Producing and Non-producing.

**REQUIREMENTS FOR RESERVE CLASSIFICATION**

Within COGEH, there are requirements and procedures for classifying reserves. The conditions that must be met to assign reserves are:

- Drilling – accumulation must have a well;
- Testing – accumulation must have evidence of commercial production from a test;
- Economics – for producing reserves, cash flow and NPV must be positive; for undeveloped reserves, a reasonable return on investment must be demonstrated; and
- Regulatory – prohibitive government restraints must be incorporated when estimating appropriate levels of risk.

**METHODS OF ESTIMATING RESERVES**

Reserves can be estimated using deterministic or probabilistic methods:

**Deterministic:** A single value assigned for each input parameter of the reserves calculation is used. The appropriate value for each reserve category must be selected. The majority of reserves in Canada are estimated using this method.

**Probabilistic:** A full range of values are used for each input parameter into the reserve calculation. Reserve estimates can be extracted from a Monte Carlo type of analysis at the various confidence levels P90, P50, P10, etc. This method pertains mainly to volumetric evaluations prior to the onset of production.

Both the deterministic and probabilistic methods will be presented in subsequent articles.

**AGGREGATION OF RESERVES**

Under COGEH, the P90, P50, and P10 values are reported at the corporate level, not at the entity (well/property) level. When deterministic methods are used, simple summation of all individual entities within a portfolio provides the aggregate total.

With probabilistic methods, reserve distributions for the individual entities must be combined in accordance with the laws of probability to determine the correct distribution for the aggregate. The arithmetic P90 summation will be less than the P90 of the aggregate (i.e., too conservative) and conversely the arithmetic summation of P10 will exaggerate the upside and be optimistic compared to the P10 from the aggregate distribution.

For reserve reporting to an investment type audience, probabilistic aggregation poses a problem as a P90 aggregate type corporate disclosure cannot be allocated back or identified in any individual well or property or prospect.

**RESOURCES**

The NI 51-101 regulations also allow for the disclosure of information for properties with no attributed reserves. The general reserve/resource classifications as they are defined in COGEH (see Figure 2.1: COGEH Reserves and Resources Classification, p. 30), are as follows:

- Resources are limited to discovered (known) and undiscovered accumulations. Contingent resources are discovered but not currently economic. Prospective resources are undiscovered but are technically viable and economic to recover. These resources are further classified into Low (conservative), Best (realistic) and High (optimistic) estimates.

- There are no detailed guidelines in COGEH for resource appraisals; however, COGEH does recommend probabilistic evaluation. If resources are submitted in an NI 51-101 report, disclosure must include volumes, net pay, areal extent, flow rates, land, seismic, wells, exploration / development programs, and capital expenditures. The explicit disclosure of risk and / or probability of success are also required. This is problematic in that a single probability estimate is not possible to calculate.

**PROJECT STATUS**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>Development on Hold</td>
</tr>
<tr>
<td>Development</td>
<td>Development Pending</td>
</tr>
<tr>
<td>Planning</td>
<td>Planned for Development</td>
</tr>
<tr>
<td>Production</td>
<td>On Production</td>
</tr>
</tbody>
</table>

**Figure 2.2. Project status categories / commercial risk (sourced from SPE Oil and Gas Committee Final Report - December 2005).**

**RECENT DEVELOPMENTS IN RESERVES CLASSIFICATIONS**

**International properties**

The scrutiny of oil and gas reserves continues to increase, especially as more and smaller Canadian issuers are competing in the U.S. and international markets. The financial world is attempting to create a set of global accounting standards through the International Accounting Standards Board (IASB). The IASB expects reserve estimates to reflect expected values rather than conservative (proved) estimates and believes reserve estimates should be presented as a range reflecting uncertainty.

**Petroleum Resource Management System (PRMS)**

Establishing a rigorous, harmonized, and universal reserves and resources classification system for all stakeholders (oil industry, accountants, regulators, business / financial analysts, investors, and governments) is an ongoing process. The recent 2007 SPE / AAPG / WPC / SPEE (et al., Respicce &mante;emt Sustc, (PRMS) has been proposed as the new standard for petroleum reserve and resource classification, definition, and guidelines. This system has a “commerciality” or “project maturity” subclass (see Figure 2.2: Project Status Categories / Commercial Risk).

The United Nations Economic Commission for Europe (UNECE) and the United Nations Framework Classification for Fossil Energy and Minerals Resources (UNFC) both recognize project maturity (along with economic viability and geological knowledge) as the basic criteria for categorization and alignment of energy management and financial reporting. To this end, it appears the UNFC and the PRMS definitions are compatible.
PRMS is an ongoing, long-term process. If these new standards are developed and implemented, Canadian and U.S. regulators must respond positively and provide regulatory enforcement in order to gain the trust of investors and have credibility in the marketplace.

Unconventional Reserves and Resources
The industry is investing heavily in technology to improve recovery and processes for unconventional extra heavy oil, tight gas sands, CBM, oil shales, and gas hydrates. The classification and technical standards for these unconventional reserves/resources must conform to the system used for conventional reservoirs.

The COGEH Volume 3 “Detailed Guidelines for Estimation and Classification of CBM Reserves and Resources” is in draft stage at the time of writing this article. This huge undertaking is likely the first publication dealing specifically with classifying, defining, and quantifying unconventional reserves and resources.

Reserves Evaluator Training
The SPEE/WPC/AAPG and SPE have formed the Joint Committee on Reserves Evaluator Training (JCORET) to investigate training courses for reserve evaluators that focus, in part, on reserves and resources definitions, classification, and applications. Discussions on qualifications and standards for professional reserve evaluators and auditors are ongoing.

CONCLUSION
The reason for NI 51-101 and COGEH is to provide the shareholder/investor/stakeholder with consistent and reliable reserves information using standardized reporting guidelines in a format that can be widely understood. While the COGEH framework allows for definitions and classifications for current conventional and unconventional reserves and resources, the classification and definition of reserves is an ever-evolving process. COGEH will continue to be modified to adapt to new technology and standardization in a global economy.

REFERENCES

Canadian Oil and Gas Evaluation Handbook, First Edition, November 1, 2005, Volume 2, Detailed Guidelines for Estimation and Classification of Oil and Gas Resources and