Society for Mining, Metallurgy & Exploration Inc.

Meeting with Securities and Exchange Commission Regarding Mineral Resources and Reserves Reporting

December 16, 2011

What We Do

- **Professional Development**
- **Technical Information**
- **Networking**

A Community of Mineral Professionals

SME members represent all professionals serving the minerals industry including:

Mining Engineers, Geologists, Metallurgists, Chemists, Economists, Educators, Environmental & Safety Professionals, Executives, Quarry/Mine Managers, Researchers, Students, and Underground Construction Professionals

Who/What is SME

- SME has more than 14,000 members. As mining is international, so is SME. SME currently has members in 84 countries outside the United States.
- Additionally we have 56 Member Sections including 4 international sections in Peru, Mexico, Mongolia, and the Philippines.

Divisions

- Coal and Energy
- Environmental
- Industrial Minerals & Aggregates
- Mineral & Metallurgical Processing
- Mining & Exploration
- Underground Construction Association
- International Marine Minerals Society
- WAAIME

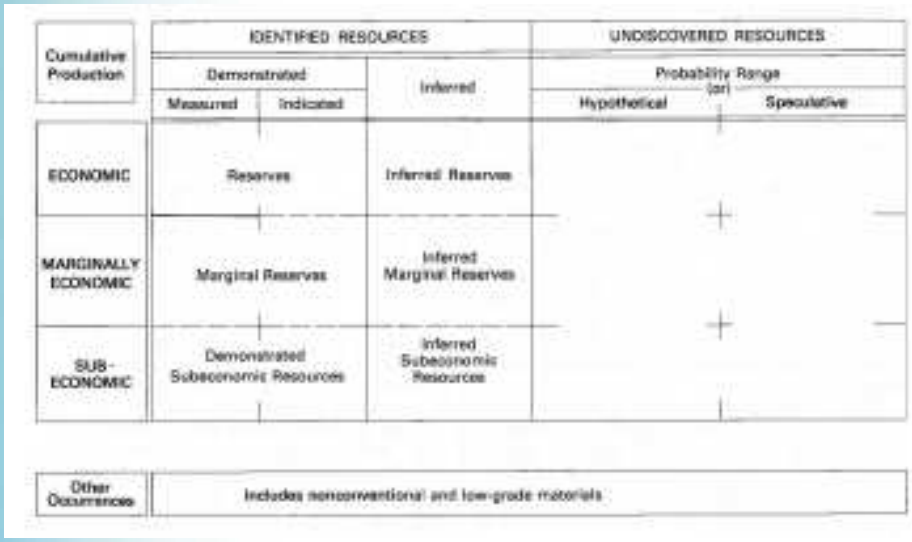
Comparison of US SEC Industry Guide 7 and SME Guide

Evolution of Resources and Reserves Definitions

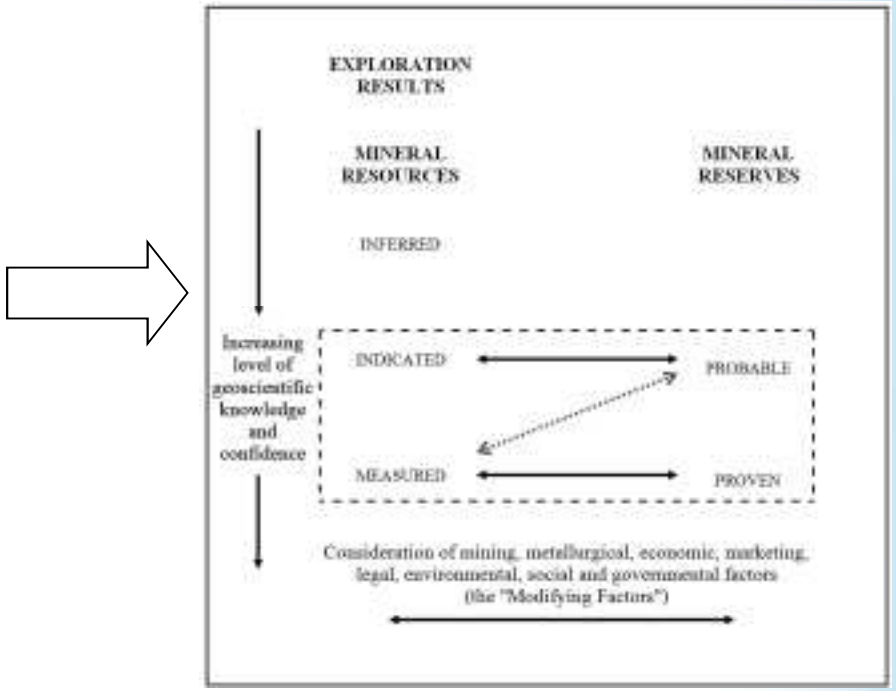
- 1909 – Hoover: Principles of Mining
- 1976 and 1980 – USGS Bulletin 1450 and Circular 831:
  - Principles of a Reserve/Resource Classification for Minerals
  - McKelvey Diagram
- 1981 – SEC Industry Guide 7 (IG 7): Description of property by issuers engaged or to be engaged in significant mining operations
- 1989 – First JORC Code
- 1991 – First SME Guide

USGS Bulletin Was The Precursor to Modern Codes

USGS Bulletin 1450-A and USGS Circular 831



McKelvey Diagram: Introduction of Geologic Confidence and Economic Feasibility axes



JORC, CRIRSCO Template, SME Guide, and others

IG 7, Provides criteria for Proven and Probable Reserves as reportable. Measured, Indicated and Inferred Resources not reportable

Definitions for Reserves and Resources (M+I) – Key Points

	Industry Guide 7	SME Guide
Reserve	• economically and legally extracted or produced at the time of the reserve determination	• economically mineable part of a Measured and/or Indicated Mineral Resource…includes diluting materials • Assessments demonstrate at the time of reporting that extraction could reasonably be justified
Proven Reserve	• size, shape, depth and mineral content of reserves are well-established	• is the economically mineable part of a Measured Mineral Resource • ..is that part … for which both overall and local tonnages, densities, shapes, physical characteristics, grades and mineral contents can be estimated with a high level of confidence • … locations are spaced closely enough to confirm geological and grade continuity
Probable Reserve	• degree of assurance …. is high enough to assume continuity between points of observation	• … is the economically mineable part of a Measured Mineral Resource… • is that part … for which the overall tonnages, grades and mineral contents can be estimated with a reasonable level of confidence
Resources	• Estimates … shall not be disclosed	• A 'Mineral Resource' is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, quantity, and quality that there are reasonable prospects for eventual economic extraction • Portions of a deposit that do not have reasonable prospects for eventual economic extraction must not be included in a Mineral Resource

IG 7 Definitions

- Reserve. That part of a mineral deposit which could be economically and legally extracted or produced at the time of the reserve determination.
- Proven (Measured) Reserves. Reserves for which (a) quantity is computed from dimensions revealed in outcrops, trenches, workings or drill holes; grade and/or quality are computed from the results of detailed sampling and (b) the sites for inspection, sampling and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth and mineral content of reserves are well-established.
- Probable (Indicated) Reserves. Reserves for which quantity and grade and/or quality are computed form information similar to that used for proven (measured) reserves, but the sites for inspection, sampling, and measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for proven (measured) reserves, is high enough to assume continuity between points of observation.

IG 7 Guidance

- Estimates other than proven (measured) or probable (indicated) reserves, and any estimated values of such reserves shall not be disclosed unless such information is required to be disclosed by foreign or state law; provided, however, that where such estimates previously have been provided to a person (or any of its affiliates) that is offering to acquire, merge, or consolidate with, the registrant or otherwise to acquire the registrant's securities, such estimates may be included.

SME Comments:

- No definitions for Resources (could be confused with reserves; low confidence in conversion to reserves).
- Can have Measured and Indicated Reserves, when rest of world uses these terms to modify Resources
- Resources not allowed (informal exception for Mineralized Material = Measured + Indicated resources)

SEC “Other Mineralized Material”

- Not officially defined in Guide 7 but unofficially must be based on measured and indicated resources only
- Currently does not require a supporting technical study, lacks commodity pricing and other guidelines
- Should have the same requirements as reportable Mineral Resources under NI 43-101 to move toward comparable reporting standards

SME Core Definitions – Resources (1)

A ‘Mineral Resource’ is a concentration or occurrence of material of economic interest in or on the Earth’s crust in such form, quantity, and quality that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories. Portions of a deposit that do not have reasonable prospects for eventual economic extraction must not be included in a Mineral Resource.

An ‘Inferred Mineral Resource’ is that part of a Mineral Resource for which the overall tonnages, grades and mineral contents can be estimated with a reasonable level of confidence. It is based on geological evidence and apparent geological and grade continuity after applying economic parameters. It is derived from information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes, and which in some way is limited or of uncertain quality and reliability. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource. The term ‘overall’ means within that part of the deposit for which Measured, Indicated and Inferred Mineral Resources are reported.

SME Core Definitions – Resources (2)

An 'Indicated Mineral Resource' is that part of a Mineral Resource for which overall tonnages, densities, shapes, physical characteristics, grades and mineral contents can be estimated with high levels of confidence, and local tonnages, densities, shapes, physical characteristics, grades and mineral contents can be estimated with reasonable levels of confidence. An Indicated Mineral Resource is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings, and drill holes. The locations are too widely or inappropriately spaced to confirm geological continuity and grade continuity but are spaced closely enough for continuity to be assumed. An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource, but has a higher level of confidence than that applying to an Inferred Mineral Resource. The term 'overall' means within that part of the deposit for which Measured, Indicated and Inferred Mineral Resources are reported. The term 'local' means within selected parts of the deposit related to mining increments which are suitable for development of mine plans and financial analyses.

A 'Measured Mineral Resource' is that part of a Mineral Resource for which both overall and local tonnages, densities, shapes, physical characteristics, grades and mineral contents can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings, and drill holes. The locations are spaced closely enough to confirm geological and grade continuity. The term 'overall' means within that part of the deposit for which Measured, Indicated and Inferred Mineral Resources are reported. The term 'local' means within selected parts of the deposit related to mining increments which are suitable for development of detailed mine plans and financial analyses.

SME Core Definitions - Reserves

A ‘Mineral Reserve’ is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriately detailed assessments and studies have been carried out and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified. Mineral Reserves are sub-divided in order of increasing confidence into Probable Mineral Reserves and Proven Mineral Reserves.

A ‘Probable Mineral Reserve’ is the economically mineable part of an Indicated and, in some circumstances, Measured Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.

A ‘Proven Mineral Reserve’ is the economically mineable part of a Measured Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriately detailed assessments and studies have been carried out and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is reasonably justified.

Example Reserve and Resource Statements

				Resources /Reserves
Freeport McMoRan (Copper) (Equity)				
Reserves	14.6 Bt	0.39%	113 Blbs	
Resources (Measured Indicated)	14.4 Bt	0.44%	115 Blbs	102%
Barrick (Gold) (Equity)				
Reserves	3.6 Bt	0.039 opt	140 Moz	
Resources (Measured+Indicated+Inferred)	4.8 Bt	0.023 opt	113 Moz	81%
Rio Tinto (Fe) (Equity)				
Reserves	2.6 Bt			
Resources (Measured+Indicated+Inferred)	21.5 Bt			830%

- **Resources are being publicly disclosed on websites, annual reports, everywhere but Form 10K and 20F**
- **Disclosure indicates a pipeline of potential new or expansion projects to the investor; must be reasonable prospects for extraction**
- **Measured, Indicated and Inferred should and usually are being separately stated to indicate level of risk**
- **Investors have been accustomed to distinguishing between resources and reserves**

CRIRSCO FAMILY OF CODES

What is CRIRSCO?

- Committee for Mineral Reserves International Reporting Standards, Founded 1994
- Sponsors: Geological and Engineering Professional Societies in:

Australia (1989)	Europe (1991,2008)
USA (1991)	Chile (2004)
South Africa (2000)	Russia (2011)
Canada (2000)	

(year in parentheses indicates initial date of reporting code)

What Does CRIRSCO Do?

- Promotes best-practice standards for estimation of mineral resources and reserves
- Promotes common standards for public reporting through the CRIRSCO Template
- Strategic partner of International Council of Mining and Metals

Features of CRIRSCO Family of Codes (1)

- Competency: Competent Persons must prepare and sign public reports.
  - Must have at least 5 years relevant experience in estimation of resources and reserves in deposit type or mining method
  - Multiple CPs for large projects
  - Called Qualified Persons in Canada; Qualified Competent Persons in Chile
  - Must be members of self-regulating professional organization with ethics codes and power to discipline/expel a member. SME has 500 Registered Members
  - Reciprocity between countries
- Many companies are producing Competent Persons reports annually to demonstrate SOX-compliance; internal and external training courses being given

Features of CRIRSCO FAMILY Of Codes (2)

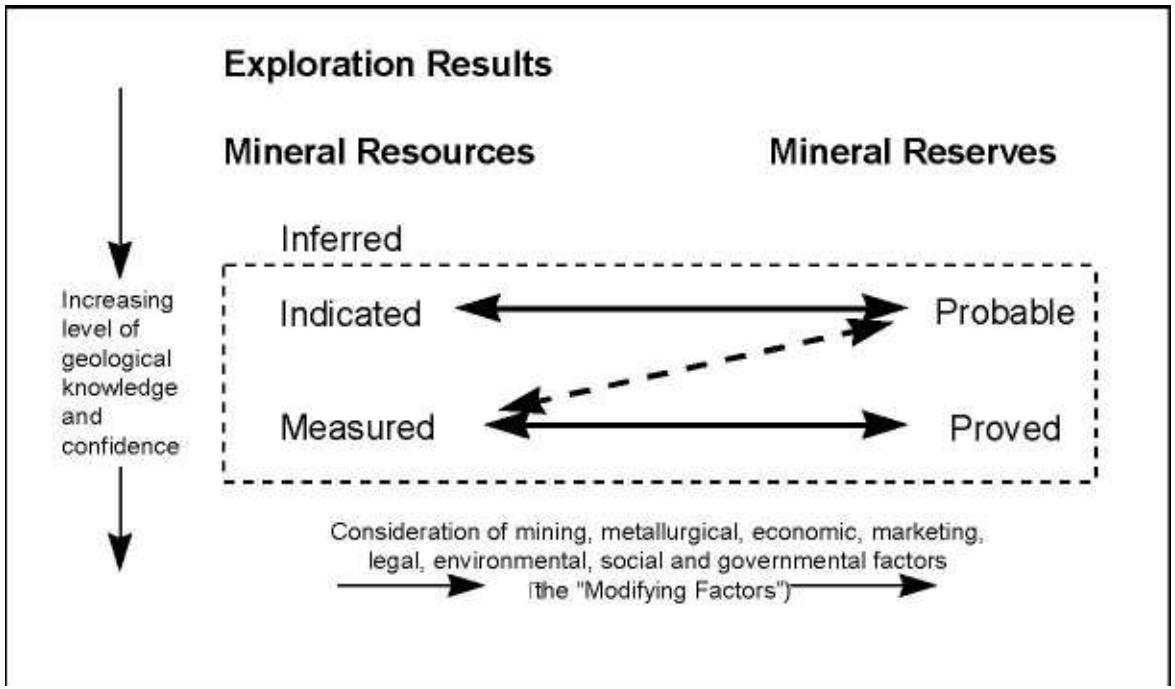
- Materiality
  - Materiality requires that a Public Report contains all the relevant information which investors and their professional advisers would reasonably require, and reasonably expect to find in a Public Report, for the purpose of making a reasoned and balanced judgment regarding the Exploration Results, Mineral Resources or Mineral Reserves being reported.
  - Checklist of assessment criteria, guidance are provided to assist the CP

Features of CRIRSCO Family of Codes (3)

- Transparency
  - Transparency requires that the reader of a Public Report is provided with sufficient information, the presentation of which is clear and unambiguous, so as to understand the report and not to be misled.

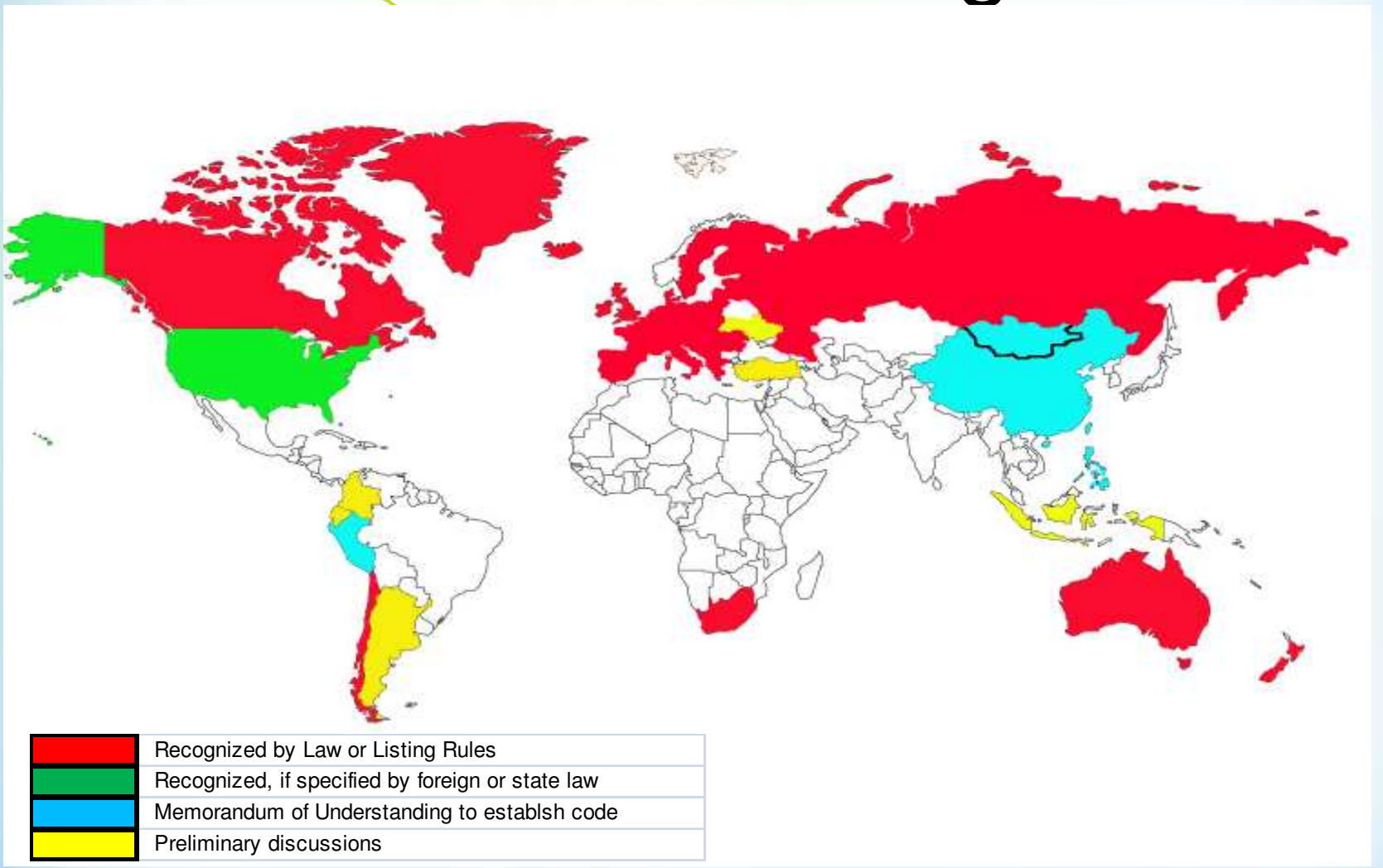
Features of CRIRSCO Family of Codes (4)

Common Definitions



- Pre-Feasibility Study (in progress)
- Feasibility Study (in progress)

CRIRSCO Code Usage



Securities Exchange Usage

Main Stock Exchanges	Permissible Reporting Codes							
	Australasia JORC	USA IG7	USA SME	Canada CIM	S. Africa SAMREC	Chile Chilean	Europe PERC	Russia NAEN
Canadian Securities Exchanges (TSX)	x	x		x(1)	x	x	x	
US Securities Exchanges (NYSE, American, NASDAQ)		x		x(2)				
European Securities Exchanges (LSE,Paris,Frankfurt),(3)	x		x	x	x	x	x	
South Africa (JSE)					x			
Australia and New Zealand (ASX, NZSE).	x							
Chile						x		
Singapore (Catalist)	x			x			x	
Hong Kong	x			x	x			
Russia								x

(1) CIM Definition Standards are preferred standards incorporated by reference in NI43-101

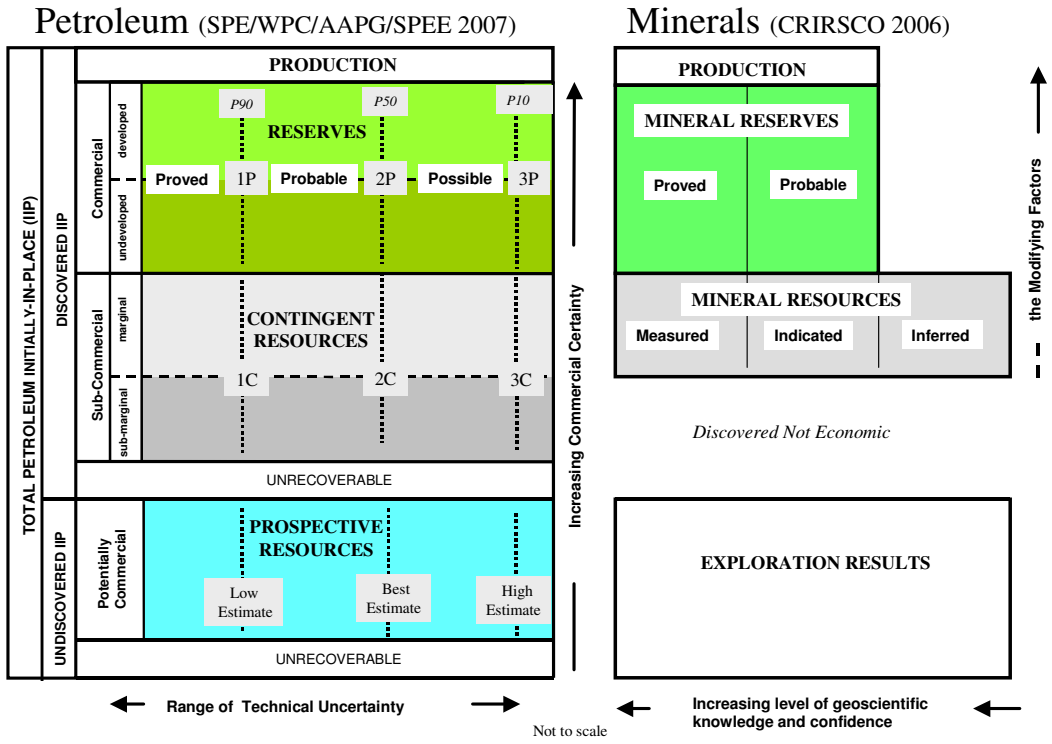
(2) Accepted for public reporting in USA by Canadian companies

(3) 27 Countries in EU regulated by ESMA

- Standards of Disclosure for Mineral Projects may be separate: NI 43-101 in Canada, ASX is considering. Contains details as to report contents, report triggers

IASB Extractive Activities Project Discussion Paper (2010)

"Consistent definitions of minerals and oil and gas reserves and resources are needed as part of developing accounting and disclosure requirements that are comparable within and across the two industries [Oil and Gas, Minerals]".



IASB Extractive Activities Project Discussion Paper (2010) (2)

- "The project team recommends that the CRIRSCO Template and PRMS definitions of reserves and resources are suitable for use in a future IFRS for extractive activities. In the project team's view, the nature and extent of the similarities that exist between the CRIRSCO Template and the PRMS reserve and resource definitions indicates that these definitions are capable of providing a platform for setting comparable accounting and disclosure requirements for both minerals and oil and gas properties."

Current Issues

Confidence Levels for Inferred Resources

Definition of and Confidence Levels for Inferred Resources

Code/Guide	Key Terms	Reporting Status	Usage
USGS C-831 (basis of IG-7)	• …based on an assumed continuity… • …may or may not be supported by samples or measurements…	Not reportable	• Uncertain
SME 2007	• …overall tonnages, grades and mineral contents can be estimated with a reasonable level of confidence • derived from information…such as outcrops, trenches, pits, workings and drill holes…	Reportable, separated from Measured and Indicated	• Part of Resource base and future reserves • Most Mining companies use inferred in LOM and Strategic Planning
CRIRSCO 2011	• …reasonably expected that the majority…could be upgraded to Indicated..	Reportable, separated from Measured and Indicated	• Part of Resource base and future reserves

Inferred Resources – Old Practice

USGS Circular 831 (and source for IG 7)

- *Inferred* - Estimates are based on an assumed continuity beyond measured and(or) indicated resources, for which there is geologic evidence. Inferred resources may or may not be supported by samples or measurements.
- *Inferred Reserve Base* - Quantitative estimates are based largely on knowledge of the geologic character of a deposit and for which there may be no samples or measurements

Inferred Resources – Current Practice

- 2007 SME Guide - Inferred
  - ..the overall tonnages, grades and mineral contents can be estimated with a reasonable level of confidence..
  - ..derived from information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes..
- 2011 CRIRSCO core definitions – Inferred
  - …It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration

Commodity Pricing

For the Reporting of Reserves

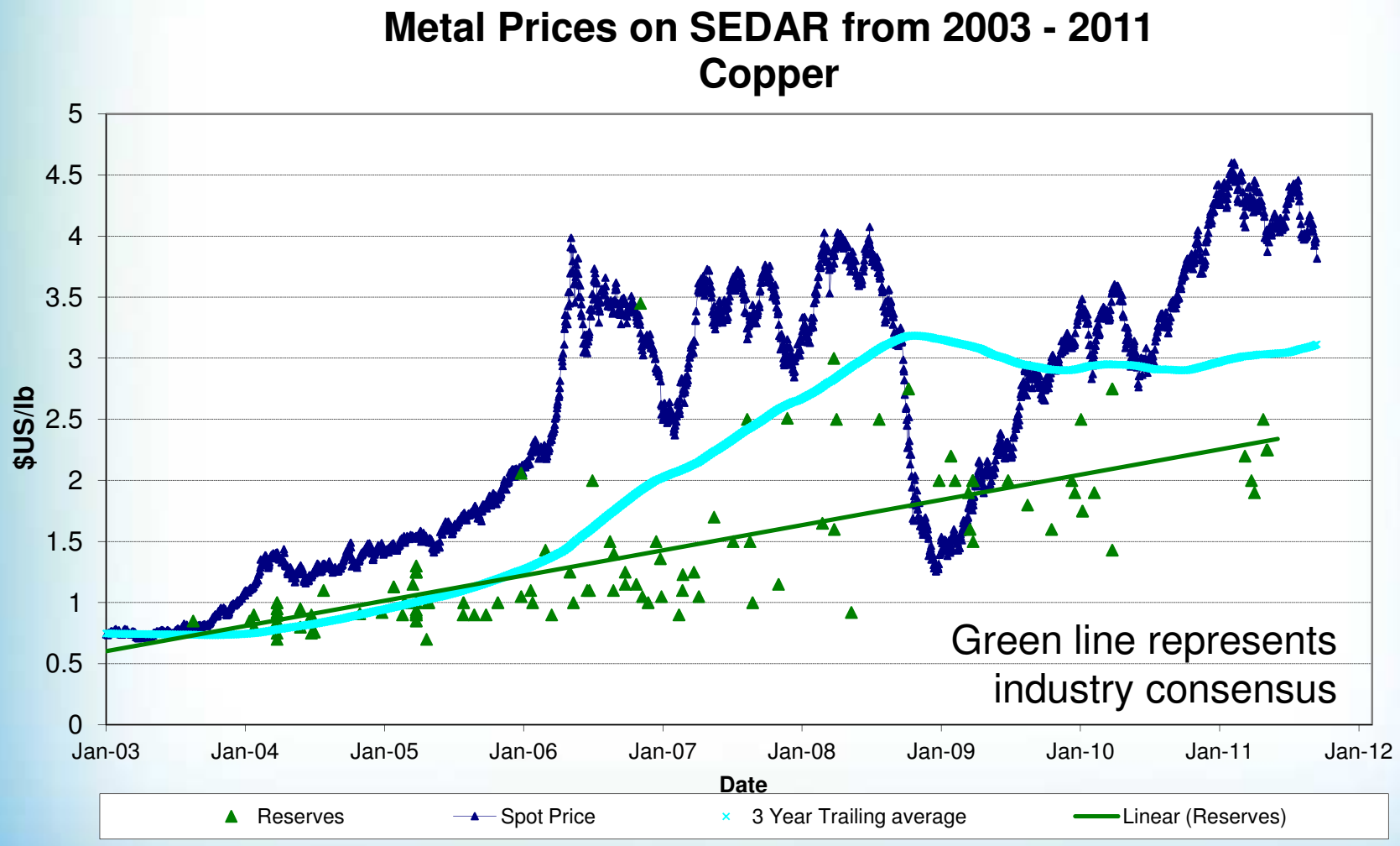
Current Guidelines

- Guide 7 and SEC interpretation stipulates reserves in LOM must be economic using the average price of the preceding three years
- NI 43-101 leaves the selection of a reasonable long-term price to the company's outlook of future prices and marketing strategy, and the QP reviews and provides an opinion as to whether the prices used are reasonable

Pricing Volatility

- Conservative and consensus approach to long-term metal pricing is less volatile than an arbitrary 3-year average.
- A 5 to 10-year average is a more conservative approach and more consistent with consensus pricing as currently used by major base metal mining companies
- Require an approach that counters short-term low and high price peaks

Published Copper Price Series



Current 10K Practices

- Most major US Companies use their own long-term metal price forecasts for the determination of reserves in the USA.
- A reserve test is carried out on the life-of-mine plan using the past three-year metal price averages to ensure that the plan is economic

Supporting Studies

For Mineral Resources, Other Mineralized Material and Reserve Reporting

Current Study Types

- Conceptual (Scoping) Studies – used to support PEA (Preliminary Economic Assessment) for NI 43-101 Technical Report (+/- 35%)
- Pre-Feasibility – used to support Mineral Reserve declaration for NI 43-101 Technical Report (+/-25%)
- Feasibility – used to support Mineral Reserve declaration for NI 43-101 Technical Report and for first time US reserve declarations (+/- 15%) coupled with other reserve qualifiers

Additional Considerations

- NI 43-101 Mineral Resource Declarations require the disclosure of parameters and assumptions used to estimate these resources (not a block model-geologic inventory) demonstrating reasonable prospects of economic extraction
- Pre-Feasibility and Feasibility studies - not necessarily economic at the metal prices selected
- Resource and Reserve reporting requires a study/assumptions demonstrating both technical and economic feasibility for the level of accuracy stated – e.g., equivalent to Bankable FS for reserve reporting

Legal and Permitting Issues

Legal and Permitting Issues (1)

- Industry Guide 7 - Paragraph (a) (1)

  A reserve is:"That part of a mineral deposit which could be economically and legally extracted or produced at the time of the reserve determination".

- SME Guide – Section 33

  A 'Mineral Reserve' is the economically mineable part of a Measured and/or Indicated Mineral Resource… assessments and studies have been carried out and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.

Legal and Permitting Issues (2)

- Consideration of legal and permitting requirements in reserve accounting varies within industry.
- In the U.S. and elsewhere, reserves are commonly declared before obtaining perfect legal authority to mine.
- Common outstanding permits, ancillary rights and authorizations:
  - State mining permits (earth disturbance, water discharge, air emissions)
  - Surface property rights
  - Water extraction or UG injection
  - Local zoning approval
  - Highway occupancy

Legal and Permitting Issues (3)

SME Guide – Section 56 Requires:

- Before a Mineral Reserve can be reported it is required that:
  - Legally enforceable mineral title sufficient to allow eventual extraction is controlled by the reporting entity at the time of determination.
  - There must be no known obstacles to mining or failure to obtain operating permits.
  - There must be a reasonable expectation that all permits, ancillary rights and authorizations required for mining can be obtained in a timely fashion.
- Information which materially increases or decreases the risk that the necessary legal rights or permits will be obtained must be publicly disclosed.

Coal, Stone and Industrial Minerals

- More numerous and different compared to metal mines

2010 U.S. Mines and Quarries

Metals		Other	
50	Gold Mines	4,191	Crushed Stone Mines
28	Copper Mines	1,400	Coal Mines
13	Iron Ore Mines	820	Clay Quarries
12	Zinc Mines	249	Dimension Stone Quarries
11	Lead Mines	124	Silica Sand Mines
8	Molybdenum Mines	55	Gypsum Mines

Source: USGS and NMA

Major Differences Compared to Metal Mining

- Geological
  - Less complex (thick, tabular, sedimentary deposits)
  - Persistent over wide areas
  - Less variability
- Marketing
  - Low-value (per ton or unit volume) products
  - Not sold under exchange or published commodity pricing
  - Generally sold on the basis of product specification and transport distance
  - Sold under private competitive bid or negotiated contract
- Development
  - Lower capital investment
  - Long-term coal reserves required for energy supply reliability

Coal

- Geologic similarity allows:
  - Simpler demonstration of Coal Resource for neighboring deposits
  - Reduced study requirements to demonstrate techno-economic viability of Coal Reserve next to an operating mine
- <u>The only commodity with government sponsored reserving guidelines.</u>

Coal Reserves (1)

- U.S. Government Reserve Guidelines
  - *1976 - Coal Resource Classification System of the U.S. Bureau of Mines (USBM) and U.S. Geological Survey (USGS),*
  - *Geological Survey Bulletin 1450-B, Published jointly by USBM and USGS*
- Class definitions but no criteria for:
  - Measured, Indicated and Inferred Reserves
  - Identified Resources
  - Subeconomic Resources
  - Undiscovered Resources
    - Hypothetical Resources
    - Speculative Resources

Reserve – “That portion of the Identified Coal Resource that can be economically extracted at the time of determination.”

Coal Reserves (2)

- U.S. Government Reserve Guidelines
  - *1983 - Coal Resource Classification System of the U.S. Geological Survey, Geological Survey Circular 891, USGS*
- Reserve – “Virgin and (or) accessed parts of a coal reserve base which could be economically extracted at the time of determination considering, environmental, legal and technologic constraints.”
- Provided limiting criteria for various classes
  - Minimum thicknesses
  - Maximum depths
  - Distances to data points (drill hole, outcrop, mine measurement, etc.)
- Allowed for determination of “reserves by analogy”
- Widely adopted by industry as a “rules based” method

Coal Reserves (3)

- Similar USGS-type rules based methodology for coal was adopted by other countries and incorporated by reference into public reporting regulations:
- Canada
  - GSC Paper 88-21 (1989)
    - → CIM Definition Standards
      - » → National Instrument 43-101
- Australia
  - Australian Coal Guidelines (2003)
    - → The JORC Code
      - » → ASX and NZSE Listing Rules
- South Africa
  - South African Guide (SANS 10320:2004)
    - → SAMREC Code
      - » → JSE Listing Requirements

Path Forward

- Update IG7
  - Adopt the Common Definitions
  - Disclosure based on Competency, Materiality and Transparency
- Update SME Guide
  - Restate as Industry Best Practice Standards and Guidance

Questions/Comments