Updated COGEH Highlights

SPEE
SOCIETY OF PETROLEUM EVALUATION ENGINEERS

October 2018

Agenda

Introduction – History, Feedback, Goals, and Format

New and Updated Content

History of COGEH

1998 – Identified the need

June 2002 – Volume 1 published

- Reserves Definitions and Evaluation Practices and Procedures
- September 2003 – NI 51-101
- Standards of Disclosure for Oil and Gas Activities (Replacing National Policy No. 2-B)

2005 – Volume 2 published

- Detailed Guidelines for Estimation and Classification of Oil and Gas Resources and Reserves
- September 2007 – Volume 1 Second Edition published

September 2007 – Volume 3 published

- Detailed Guidelines for Estimation and Classification of Coal Bed Methane (CBM) Reserves and Resources
- Reserves Recognition for International Properties
- Detailed Guidelines for Estimation and Classification of Bitumen and Steam Assisted Gravity Drainage (SAGD) Reserves and Resources (Updated October 2013)

June 2014 – Resources Other Than Reserves (ROTR) published

  - Addendum to Volume 2

September 2018 – Consolidated Volume published (including all volumes and ROTR discussed above)

October 18, 2018 – Minor changes to 3.6.4 and 3.6.4.1. Next update expected May 31, 2019

Industry Feedback and Goals

Industry Feedback

- Duplication and inconsistency between volumes
- Information out of date
- Create a digital document
- Consolidate the documents
- Alignment of definitions of reserves, resources and product types with NI 51-101
- Additional guidance on operating costs
- Clarity on the inclusion of Abandonment and Reclamation costs
- Clarity on Type Curve creation

Goals

- COGEH is to be a guidance document of industry best practices
- Combine existing documents into a single consolidated document
- Use hyperlinks where possible when referring to regulations and/or examples
- Create an “Evergreen” document
- Digitize and update distribution of the materials
- Remove any redundant material

Format

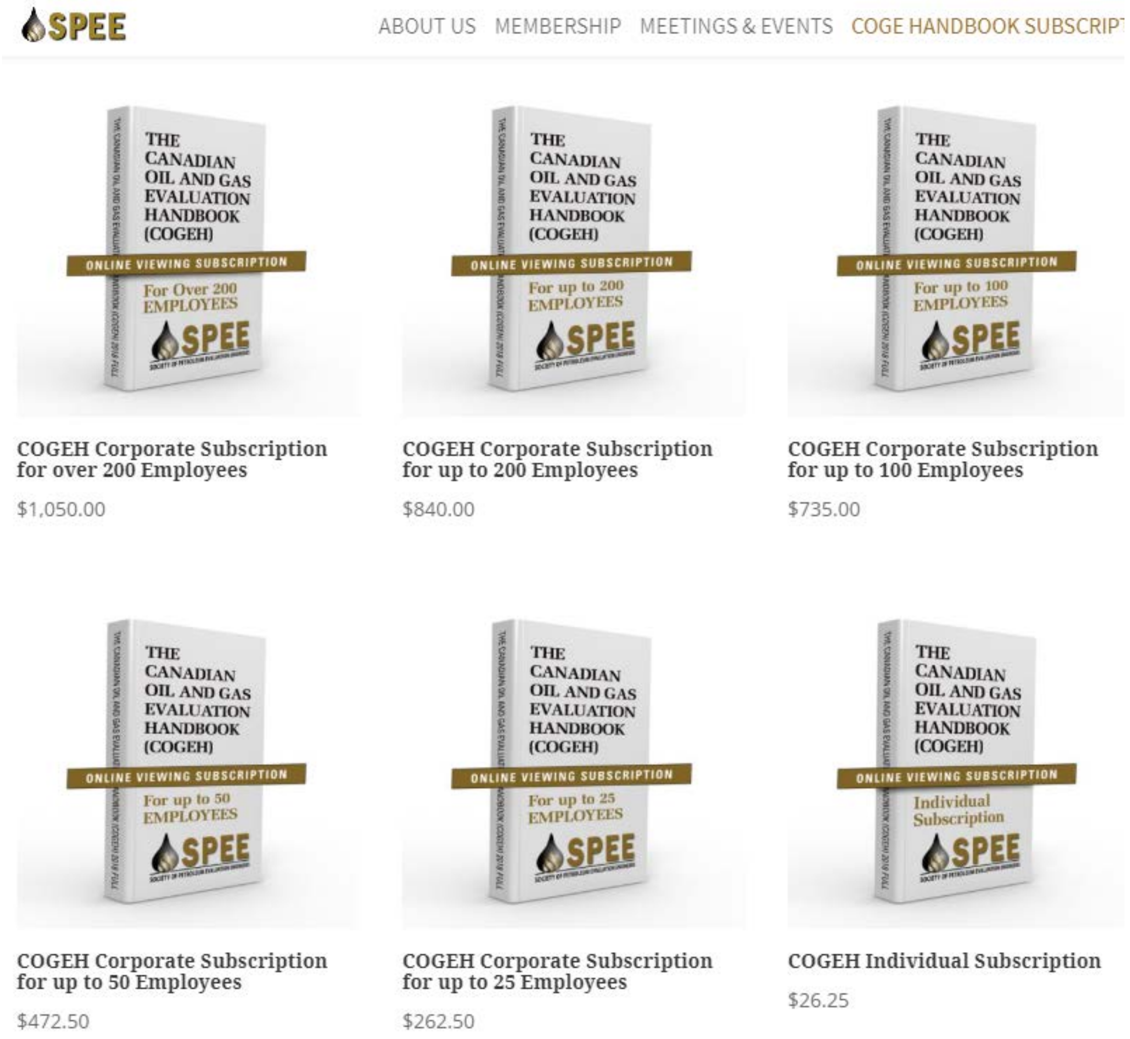
PDF or Subscription

Available as PDF or online subscription

With the subscription:

- Allows for easy searches of the materials for topics of interest.
- Allows SPEE Calgary to keep it “evergreen” and users do not need to purchase updates as that will be included in the subscription.
- Using hyperlinks for some materials allows the information to be up to date.

Subscription Options



Agenda

Introduction – History, Feedback, Goals, and Format

New and Updated Content

Summary

Changes that will likely require changes to year end 2018 evaluations

- Undeveloped Reserve Bookings and Timing – clarified that for on going development of resource developments, can include up to 5 years of drilling in the proved case and 10 years in the probable undeveloped case, if additional conditions are satisfied
- Guidance on Operating, Abandonment and Reclamation Costs
  - Recommendation to include full ARO but can still include partial ARO if clearly stated
  - Inactive operating costs – recommendation to include inactive costs in active areas
  - Maintenance capital – to include all maintenance capital

Changes that may not require changes to year end 2018 evaluations (but should still be reviewed in detail)

- Type Curve Generation – additional best practice materials. Note that a lot of this material is consistent with SPEE Monograph 3 and 4.
- Product Types – simplified product types, however, reporting requirements for NI 51-101 or reporting jurisdiction (this is unlikely to change our evaluations unless NI 51-101 changes product types)
- Statistical Methods – additional material but not prescriptive
- Social and Environmental Considerations - additional material but overall similar to Chance of Development factors previously included
- For conventional evaluations, updated undeveloped reserve bookings and timing not substantially changed
- Reconciliation categories – clarified A&D
- Infrastructure and markets – for expansions, market required to book reserves

Undeveloped Reserves (1/2)

Key Wording

- For large projects, where significant capital is required for field development or infrastructure construction, significant capital expenditures should commence within three years for assignment of Proved Undeveloped Reserves. For the assignment of Probable Undeveloped Reserves, significant capital spending should commence within five years. If significant capital expenditures do not occur within these times, the associated oil and gas quantities should be classified as Contingent Resources.
- For new or expansions to existing facilities to be built by the producer, detailed capital cost estimates and further compelling documentation from the Company is required for the facility to be included in the reserve categories. For facilities to be built by third parties, an executed contract with the third party is required for the facility committed capacity to be included in the reserve categories.
- **Highlights – when booking a company operated facility expansion, detailed capital cost estimates and firm intent from the board required to include it. If the facility is being built by a third party, a signed agreement is required.**

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Undeveloped Reserves. For the assignment of Probable Undeveloped Reserves, significant capital spending should commence within five years. If significant capital expenditures do not occur within these times, the associated oil and gas quantities should be classified as Contingent Resources.

For new or expansions to existing facilities to be built by the producer, detailed capital cost estimates and further compelling documentation from the Company is required for the facility to be included in the reserve categories. For facilities to be built by third parties, an executed contract with the third party is required for the facility committed capacity to be included in the reserve categories.

Each large project will be unique in terms of the time required to develop the associated proved or Probable Undeveloped Reserves. Large processing facilities generally have a design life of 20 to 30 years, although these can typically be extended with maintenance capital, replacement of major components, and facility upgrading.

The following is a discussion of the guidance related to Reserves evaluations for certain common situations:

- **Ongoing Resource Play Development:** For Resource plays where drilling programs have been underway for a few years and are expected to continue for some time due to a large inventory of locations that qualify for assignment as Reserves, it is reasonable to have Proved Undeveloped Reserves assigned for five years of development drilling and Probable Undeveloped Reserves extending out for ten years of development drilling.
- **Gas Processing Facilities:** When construction is underway of a large gas processing facility in which the Reserve owner has committed capacity and is forecasted to be completed within two years to develop a large Resource, it is reasonable to schedule drilling wells for up to five years from the start-up of the facilities in the Proved Undeveloped Reserves category. In the Proved plus Probable Undeveloped Reserves category drilling is limited to ten years from the effective date of the report.
- **In-Situ Projects:** Projects involving In-Situ recovery processes typically require a large upfront capital expenditure for the steam generators, related infrastructure and the first phase of well-pairs. Within the project area defined in the field development plan, there may be areas where Reserves are categorized as proved or probable undeveloped or classified as Contingent Resources depending on the well density used to define the accumulation or the geological characteristics of the accumulation. It is acceptable to schedule drilling well-pairs for the time frame required to recover the assigned Reserves. Drilling should not extend beyond the design life of the facility unless adequate maintenance capital is scheduled in the evaluation, to a maximum of 50 years.
- **Bitumen Mining Projects:** Projects involving bitumen mining typically require a large upfront capital expenditure for infrastructure and processing facilities. Within the project area defined in the field development plan, there may be areas where Reserves are categorized as proved or probable undeveloped or classified as Contingent Resources depending on the well density used to define the accumulation or the geological characteristics of the accumulation. It is acceptable to schedule mining for the time frame required to recover the assigned Reserves. Mining should not extend beyond the design life of the facility unless adequate maintenance capital is scheduled in the evaluation, to a maximum of 50 years.

Undeveloped Reserves (2/2)

Guidance

- For resource plays only (Montney, Duvernay, etc.), 5 years of undeveloped locations can be booked in the 1P and 10 years in the 2P case
  - When a facility is under construction, can book 5 years from the onstream date to a maximum timeframe of 7 years from the effective date
  - The facility on stream date does not effect 2P bookings – the timeframe is a maximum of 10 years from the effective date
- Note that only the expanded facility capacity can be booked from the on stream date
  - Ex. A company has a 200 MMCF/D facility that they are expanding to 300 MMCF/D that is under construction and will be on stream one year after the effective date. Proved undeveloped reserves that fill the original 200 MMCF/D facility can only be booked for 5 years. In addition, the 100 MMCF/D can be booked from year 2 through 6 after the effective date. As a result, in year six, undeveloped reserves can be booked to fill 100 MMCF/D of capacity.

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The following is a discussion of the guidance related to Reserves evaluations for certain common situations:

- **Ongoing Resource Play Development:** For Resource plays where drilling programs have been underway for a few years and are expected to continue for some time due to a large inventory of locations that qualify for assignment as Reserves, it is reasonable to have Proved Undeveloped Reserves assigned for five years of development drilling and Probable Undeveloped Reserves extending out for ten years of development drilling.
- **Gas Processing Facilities:** When construction is underway of a large gas processing facility in which the Reserve owner has committed capacity and is forecasted to be completed within two years to develop a large Resource, it is reasonable to schedule drilling wells for up to five years from the start-up of the facilities in the Proved Undeveloped Reserves category. In the Proved plus Probable Undeveloped Reserves category drilling is limited to ten years from the effective date of the report.

Abandonment and Reclamation

Key Wording

Each report must clearly describe the ADR costs:

- included in the evaluation; and those excluded from the evaluation.

Statements regarding ADR costs should address both active and inactive development including but not limited to:

- producing wells; suspended wells; service wells; gathering systems; facilities; and surface land development.

Best practice would include all costs required to restore existing development from the well's bottom hole to custody transfer point, to a standard imposed by applicable government or regulatory authorities and include the ADR costs for both active and inactive development included in the assets evaluated. These ADR costs may be reported at an appropriate level fit for purpose, such as a corporate level.

Source of ADR costs must be identified.

Highlights – Best practice to include full ADR costs. If the company requests partial ADR it is still allowed (as long as excluded costs clearly noted). Historically, it has been common for companies to include an allowance for future well abandonment and well site reclamation costs for all of the Company's working interest wells assigned reserves and material dedicated facilities.

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3.6.4 ABANDONMENT, DECOMMISSIONING AND RECLAMATION COSTS

ADR costs represent the end of life costs associated with restoring to a standard imposed by applicable government or regulatory authorities, an asset where petroleum exploration, development, production and processing operations have been conducted. These ADR costs should always be considered in the evaluation process and notably can vary greatly for a multitude of reasons including, but not limited to:

- the vintages of entities within an evaluated property;
- the history of operations;
- environmental stewardship of multiple operators over long periods of time; and
- initial well and facility designs.

Further, ADR liabilities, though not quantifiable, may continue to exist long after a company has actually conducted their ADR activities.

Environmental damage associated with oil and gas development has emerged as a material societal concern and ADR costs are subject to increased scrutiny. Each report must clearly describe the ADR costs:

- included in the evaluation; and
- those excluded from the evaluation.

Statements regarding ADR costs should address both active and inactive development including but not limited to:

- producing wells;
- suspended wells;
- service wells;
- gathering systems;
- facilities; and
- surface land development.

Operating Costs

Key Wording

- Inactive assets and their related costs should be included in the evaluation to properly represent the asset(s) being evaluated. It is recommended that inactive costs be forecast separately from active asset costs at the property or corporate level, so economic production entities are not unduly burdened. When included in this fashion an appropriate method can be employed to retire these costs over time.
- **Highlights – include a one line entity for non active area operating costs. Recommended that inactive costs forecast separately to not unduly burden active entities.**
- **To clearly state which properties are included vs excluded.**

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3.6.2 COSTS ASSOCIATED WITH ACTIVE AND INACTIVE ASSETS

The evaluator, when analyzing historical operating expense data to establish operating costs for an evaluation, should carefully consider those costs associated with active and inactive entities within a property.

Active entity and area costs represent those costs that directly burden producing wells, including the associated gathering and processing facilities and related disposal and injection facilities.

Inactive entity and area costs represent those costs associated with non-Resource bearing lands or inactive wells in an area. In general, in-active entity costs include:

- mineral lease rentals;
- shut-in, suspended and capped well operating costs;
- shut-in operating and gathering systems and related processing facilities; and
- future ADR liabilities.

They are often components included with active assets in an area or appear as inactive areas within a company's portfolio.

Inactive assets and their related costs should be included in the evaluation to properly represent the asset(s) being evaluated. It is recommended that inactive costs be forecast separately from active asset costs at the property or corporate level, so economic production entities are not unduly burdened. When included in this fashion an appropriate method can be employed to retire these costs over time.

Maintenance Costs

Key Wording

- Operating cost statements may not include the ongoing maintenance costs required to maintain area facilities and gathering systems. These costs may occur periodically, once every few years, and therefore will not always appear in typical lease operating statements provided to determine certain economic parameters. Alternatively, these costs may be capitalized. Including maintenance costs in an asset evaluation is critical, as without required maintenance, most properties will not be able to maintain operations for the extended periods, which production is forecast to occur.
- Forecasts of required maintenance costs, expensed or capitalized, must be obtained from the company and included in an evaluation. These maintenance costs are mostly fixed and will continue throughout the life of facilities until production from the region they service approaches its twilight years. In later years, maintenance costs would be managed to maintain production at economic levels until the field is no longer economic to produce.
- In some instances, facilities may be completely shut-in and area production diverted to alternative facilities. This action; however, requires additional capital investment.
- **Highlights – discuss with companies that the new version of COGEH has strict wording that maintenance capital is to be included in the evaluation. Request maintenance capital for the past two years and a future forecast from the company**

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3.6.1.3 MAINTENANCE COSTS

Operating cost statements may not include the ongoing maintenance costs required to maintain area facilities and gathering systems. These costs may occur periodically, once every few years, and therefore will not always appear in typical lease operating statements provided to determine certain economic parameters. Alternatively, these costs may be capitalized. Including maintenance costs in an asset evaluation is critical, as without required maintenance, most properties will not be able to maintain operations for the extended periods, which production is forecast to occur.

Forecasts of required maintenance costs, expensed or capitalized, must be obtained from the company and included in an evaluation. These maintenance costs are mostly fixed and will continue throughout the life of facilities until production from the region they service approaches its twilight years. In later years, maintenance costs would be managed to maintain production at economic levels until the field is no longer economic to produce.

In some instances, facilities may be completely shut-in and area production diverted to alternative facilities. This action; however, requires additional capital investment.

Product Types

Key Wording

- Recommended product types simpler than previous list
- However, NI 51-101 product types unchanged year over year and as a result expect similar disclosure

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1.2.1 PRODUCT TYPES

Reporting of evaluation results is generally in terms of product type rather than Resource Type, which may vary, depending on the requirements of the organization for which a report is prepared. COGEH does not prescribe product types for reporting because regulatory and other agencies may define the product types they require for reporting and different agencies may define different product types. Reference should be made to the specifications of those agencies when preparing a report. See, for instance:

- CSA National Instrument 51-101 Part 1.1 Definitions, Product Type, for a list of the Product Types required in reports prepared for NI 51-101. NI 51-101 Effective July 1, 2015
- SEC S-K § 229.1202 (Item 1202). Disclosure of Reserves.
- Financial Accounting Standards Board (FASB) Accounting Standards Update 2010-03. Extractive Industries – Oil and Gas (Topic 932).

Evaluators should ensure they use the product types required for an evaluation, and users of evaluation reports should ensure they understand what these represent. However, when the product types required for a report are not specified, it is recommended evaluators use the following (the definitions of which can be found in the Glossary):

Oil:	Light, Medium
	Heavy
	Bitumen
	Synthetic Crude Oil
Natural Gas:	Associated
	Non-Associated
	Coalbed Methane
By-Products:	Ethane
	Propane
	Butanes
	Pentanes Plus (Condensate)
Non-Hydrocarbons:	Sulphur
	Helium

Reconciliations

Key Wording

- Additional guidance on how to treat acquisitions and divestures
- The volumes are recorded as the sum of the remaining Reserves assessed as of the evaluation effective date plus production occurring between the closing date of the acquisition and the evaluation effective date.
- Additional guidance states that:
  - Entities included within an acquisition can only include those entities which were attributed Reserves as of the closing date of the purchase and sale agreement. As such, entities assigned Reserves, which are the result of activity and data occurring and obtained after the purchase and sale closing date and before the effective date of the evaluation, who's interests are part of the purchase and sale agreement, must be booked as either discovery, extension, infill, or improved recovery reserve additions.

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4.6.2.3 ACQUISITIONS AND DISPOSITIONS

It is important to understand the meanings attributed to dates when dealing with acquisitions and dispositions. Acquisitions and dispositions can only be recorded when a deal has closed. Until closing has occurred, an acquiring company does not own any interest in a property and a selling company has not disposed of their interest. The closing date is the date when all the conditions of a purchase and sale agreement have been met and funds and interests are transferred.

The closing date is not to be confused with the *effective date of a purchase and sale agreement*. The *effective date of a purchase and sale agreement* simply represents the date at which adjustments are determined. Operational revenues and expenses between the effective date of a purchase and sale agreement and the closing date are applied against the offering as a cash adjustment and typically only adjusts the final transfer of funds or equities between the parties to close the deal.

Acquisition change records are recorded as the sum of the remaining Reserves assessed as of the *evaluation effective date* plus production occurring between the closing date of the acquisition and the *evaluation effective date*.

Type Curves

Key Wording

- Additional detail on best practices for type curve generation. Most recommendations not prescriptive
- In general agreement with material within SPEE Monograph 3 and 4
- Detailed examples on data normalization
- Recommended minimum terminal decline rate: “Enforcing a terminal decline rate in late time is mandatory for wells with high hyperbolic rates”
- “The terminal decline rate is controlled by formation parameters, well completion (fracture spacing and half-length), and development density, but is often in the range of 5 to 15 percent per year. The value should be determined based on experience and/or analogs.”
- “Theory states that early time transient linear flow hyperbolic behaviour should be b = 2.0. Based on actual production results observed in HMSF wells within Western Canada, hyperbolic behaviour of 2.0 or greater is rare and generally only for short periods of time. The Canadian Oil and Gas Evaluation Handbook (COGEH) recommends that segment 1 hyperbolic factors of b > 1.5 should only be used for limited periods of time (months) and there are very few examples where a b of greater than 2 is required. Transition to the second segment is typically estimated based on flow time, reservoir characteristics, and current decline rate. Based on observing actual wells, the stabilized b, typically seen in segment 2, is typically between 0.8 and 1.3, depending on reservoir and completion conditions.”

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Social and Environmental Considerations

Key Wording

- Consideration of social and environment contingencies should already have been considered (reserves are assumed to have a chance of commerciality of 100%). However, additional guidance provided.

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Reserves have been determined according to the standards of the COGEH, including the condition for commerciality noted above.

There is no standard process for assessing social and environmental contingencies, but the following steps are recommended:

(a) Identify any relevant social and environmental contingencies.
(b) Estimate the probability that relevant socio-environmental issues will be resolved and maintained over the life cycle of the project. This resolution will depend on the specifics of an asset or project and the legal, regulatory and social environment in which it is proposed to be carried out. Although qualitative and subjective, the assumed resolution should be based as much as possible on a documented analysis. In many cases, there will be a history of similar project developments that can be used as analogues.
(c) Consider the status of the efforts being made to resolve socio-environmental issues. The level of effort and engagement required will depend on the project.
(d) Provide appropriate explanation in a report.

1.4.7.2.1.6 POLITICAL CONTINGENCY

Contingent Resources refers to political contingences, and, although this may not be a consideration, they can have a significant influence on the ability to proceed with a project. It is not often clear where the boundary between social and political issues lies. From the point of view of classification, the issues can be an action by a controlling organization that may influence, impede, or facilitate the ability to proceed with a project. The controlling organization can range from a government to a guerrilla activity, and an action may also include legislation, expropriation, or armed conflict, etc.

Political factors may sometimes be considered as force majeure situations. An example of this was a reclassification of Reserves to Contingent Resources as the result of an armed conflict in Libya in 2011.

Infrastructure and Markets

Key Wording

- Guidance reasonably unchanged
- However, given the recent oil and gas transportation bottlenecks observed within the WCSB, a clear plan is required for reserves to be assigned. It cannot be assumed that there will be a market especially when large expansions are expected.
- "An evaluator may assign Reserves if a market exists or is likely to develop for the sale of production from a property. In circumstances where a market is identified but is not currently available, the evaluator must assess the level of confidence in the likelihood that a market will be secured when classifying oil and gas Reserves."

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1.4.7.2.1.7 INFRASTRUCTURE AND MARKETS

There must be identifiable transportation infrastructure and a market to move and sell the production from an oil and gas property for an evaluator to assign Reserves. For Proved Reserves, access to infrastructure and markets must be secured or highly likely to be secured within a short time. For Probable Reserves, access to infrastructure and markets must also be highly likely but within a slightly longer time. Considerations related to the timing of production and development is presented in the following section.

Market options can span from the highly transparent spot or short-term markets for natural gas and crude oil sales now common in North America and the United Kingdom (and governed by industry-standard precedents) to long-term, single purchaser markets with very specific and unique terms and documentation.

An evaluator may assign Reserves if a market exists or is likely to develop for the sale of production from a property. In circumstances where a market is identified but is not currently available, the evaluator must assess the level of confidence in the likelihood that a market will be secured when classifying oil and gas Reserves.

If a property owner does not have an ownership interest in existing infrastructure, an evaluator may assign Reserves to that property if the required gathering and/or processing agreements with the infrastructure owners either exist or are likely to be put in place. When classifying oil and gas Reserves, an evaluator should consider:

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- the level of confidence that applies to various factors, including the likelihood of the required agreements being finalized;
- the capacity availability (existing and/or future);
- the priority of service; and
- agreement terms.

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Acknowledgements and Questions

- Doug Wright was Chair of the update
- The oversight committee for their dedication to this project. They are as follows:
  - Jodi Anhorn, P. Eng,David Elliott. P. GeolFloyd Williams, P. Eng,Nora Stewart, P. Eng, Keith Braaten, P. Eng, Robert Warholm, P. Eng, Claudio Virues, P. Eng, Peter Joziasse, P. Eng, Mike Verney, P. Eng, Sandeep Solanki, P. Eng
- The following individuals who contributed their time and energy to the subcommittees:
  - Phil Welch, P. Eng, Dave Perrott, P. Eng, Kevin Hanson, P. Eng, Richard Leslie, P. Eng, Brian Hamm, P. Eng, Jim Gouveia, P. Eng, Lester Berezowski, P. Eng, Jamil Badran, P. Eng, Khani Ghaffari, P. Eng, Andi Polanski, P. Eng, Jim Jenkins, P. Eng, Jason Pacholko, P. Eng, Shannon Scott, P. Eng, Dave Haugen, P. Eng, Blair Best, P. Eng, Wes Feick, P. Eng, Jared Wynveen, P. Eng, Tim Smith, P. Eng, Chad Lemke, P. Eng, Tyler Schloser, P. Eng
- The following individuals for their time and energy to review all or parts of the compiled document as submitted by the subcommittees.
  - Dave Perrot, P. Eng, Harry Helwerda, P. Eng, Rod Sidle, PENg, Gary Gozenbach, PE, Craig Burns, P. Geol, Randy Freeborn, P. Eng, Keith Macleod, P. Eng

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