CANADIAN

OIL AND GAS

EVALUATION HANDBOOK

Consolidated Third Edition – (Online)

October 2025

Reserves Definitions

and

Evaluation Practices and Procedures

Prepared by

Society of Petroleum Evaluation Engineers
(Calgary Chapter)

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1. Petroleum Reserves—Valuation—Standards—Canada. 2. Natural gas Reserves—Valuation—Standards—Canada. 3. Petroleum Reserves—Valuation—Canada—Handbooks, manuals, etc. 4. Natural gas Reserves—Valuation—Canada—Handbooks, manuals, etc.
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Furthermore, COGEH provides a standard other groups such as governments, transmission companies, energy purchasers and financial users, just to name a few, can use in their business models.

Regulatory or legislative rules or guidelines, including specific requirements for reporting in jurisdictions outside of Canada, may permit or require deviation from the evaluation guidelines set out in the Handbook. In all other instances, SPEE Calgary Chapter expects that oil and gas Reserve and Resources evaluations for public disclosure in Canada will adhere to standards and guidelines in COGEH. Further, it is emphasized the Handbook should be used and considered by evaluators in its entirety and it is neither appropriate nor acceptable for evaluators to use or exclude portions of the guidelines on a selective basis unless they can provide valid, technically compelling reasons for doing so.

If evaluators deviate from the Handbook in preparing a Reserves and Resources evaluation intended for public disclosure in Canada, it is further expected they will disclose this fact in writing within their evaluation report, together with an explanation for the deviation.

I trust the COGEH will continue to be a useful standard for practicing evaluators and other parties. It is my hope that it will continue to improve consistency to the evaluation of oil and gas Reserves and Resources across the industry.

Douglas M Wright, P.Eng., MBA

Chairman 2018 COGEH Update Committee, SPEE (Calgary Chapter)

Note that there have been modifications to the original 2018 version. Changes were released in December 2018, October 2019, October 2020, January 2022 and October 2025. Discussion of the major changes have been posted to the SPEE Canada website and have been incorporated into this document.

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 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.

Effective use of the MHD method relies heavily on evaluator experience with a given play type and typical hyperbolic behavior that should be expected based on analogous wells. **Figure 2-13** illustrates expected relationships between key geological and well design parameters that influence observed hyperbolic behavior.

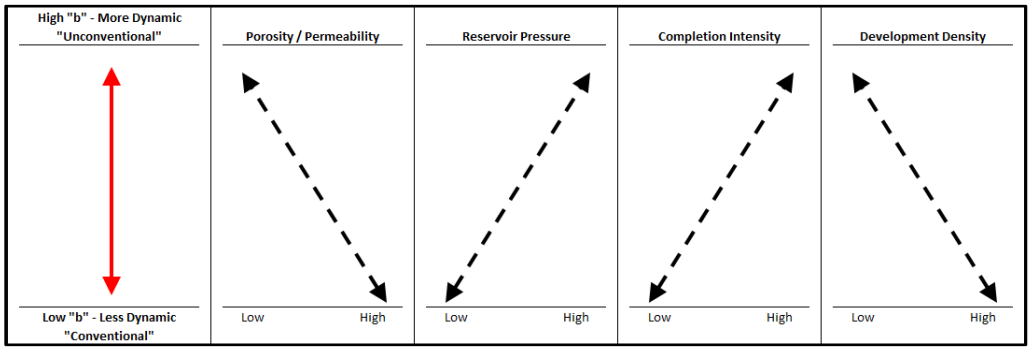

Figure 2-13 Relationships between Key Geological and Well Design Parameters and Hyperbolic Behaviour

Transitioning from one segment to the next should ensure the final decline rate of the preceding segment matches the initial decline rate of the following segment.

2.6.1.2.1.1 MHD EXAMPLE #1 – HMSF CARDIUM OIL WELL

Figure 2-14 shows the well performance of a horizontal multiple-stage fractured well in the Cardium play in West Pembina, Alberta. This area requires HMSF development to achieve economic production rates; however, the reservoir is relatively shallow and permeable, and the completions are of relatively low intensity as compared to a shale or very tight sandstone play, such as in Montney or Duvernay.

In the plot below an Arps forecast (pink) has been fit over the historical data and forecast forward using an estimated b = 1.0.

3.1 INTRODUCTION

In any industry, accurate analysis of cash flow is an essential part of investment decision-making and optimum capital budgeting. Like all Resource-based industries, the oil and gas industry depends upon such analysis to quantify its Resource base. An oil and gas company's upstream assets consist primarily of Reserves that will generate future revenue and Resource that will be developed to replenish depleted Reserves. The procedure used to evaluate Reserves and Resource is the discounted cash flow method. The steps in preparing a cash flow for evaluating Reserves are as follows:

1. Estimate Reserves;
2. Forecast annual production;
3. Predict product prices and calculate annual gross revenues;
4. Apply appropriate ownership interest, such as:
    - working interests;
    - lessor royalties;
    - overriding royalties.
5. Determine future capital and operating costs;
6. Determine future abandonment, decommissioning and reclamation (ADR) costs;
7. Calculate federal and provincial income taxes;
8. Calculate net cash flows by deducting all costs from revenues for:
    - before-tax cash flows;
    - after-tax cash flows.

By definition, Reserves are discovered and economic, so there is no remaining "risk"; however, there is uncertainty in the Reserves estimates, both technical and commercial. The methods discussed in this section address the uncertainty inherent in estimating Reserves.

The classification of Reserves into Proved, Proved + Probable, and Proved + Probable + Possible is an attempt to classify Reserves into three different levels of certainty and uncertainty.

When evaluating Resources, an associated risk is whether the volumes will eventually be classified as Reserves. If and when they are booked as Reserves, there will still be an associated range of uncertainty in the Reserves estimates.

Further details on how both risk and uncertainty is dealt with in decision-making are discussed in Chapter 1 – *Introduction and Definitions*.

3.2 OWNERSHIP AND THE REPORTING OF RESERVES AND RESOURCES

While preparing these guidelines, it became clear additional guidance was required on the issue of Resource ownership. All reports should:

- contain a statement on the status of ownership, without which the information in the report may be misleading;
- indicate why they were prepared; and
- state the standard that was followed, if a standard was required for regulatory disclosure.

The COGEH can be used to evaluate and classify all Resource classes without considering ownership, but a distinction must be made between "reporting" and regulatory "disclosure". In the context of this

operating statement for that property attributed to the compressor. After implementation of IFRS 16, a company would recognize a right-of-use asset of $67,100 and a lease liability of $67,100 (assuming an incremental borrowing rate of 8%). Each year, the right-of-use asset will be depreciated; assuming straight-line depreciation, at $6,710 per year. Interest expense will be recognized on the lease liability at 8%. COGEH recommends that the depreciation and finance expense continue to be included as operating costs within reserve reports.

With various jurisdictions implementing carbon tax regimes to promote a reduction in greenhouse gas (GHG) emissions, companies may often generate carbon emission credits which may be used to offset future carbon emission payment or which they may potentially sell to other parties. These tax regimes, and the credits generated by them, are in a state of evolution.

In general, these credits may either be generated by emitting less GHGs than their prescribed target levels, by reducing GHG emissions from GHG sources not directly regulated by a regime or may be purchased from others and are not always specifically related to oil and gas exploitation activities. In effect, carbon credits may be viewed as a commodity themselves after they are generated. It is also noted that it may not be possible for a company to use or monetize the carbon emission credits which they have generated and that in some instances, these carbon credits have an expiry date associated with them.

When the carbon credits are not property-specific and are considered a corporate item, they may not be usable to offset carbon costs within the reserve report. In certain instances, when carbon taxes are generated and applied to the same property, it may be appropriate to include the effect of the credits in the reserve report, provided its inclusion and the assumptions around it are clearly stated in the report.

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.

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.

economic. Careful assessment of acceleration projects is required when no Reserves are added. Incremental discounted cash flow analysis of such projects (e.g., the difference between the accelerated and original cash flow streams) can indicate more than one internal rate of return.

Incremental discounted cash flow analysis generally does not include:

- G&A
    - If a future project or expenditure is anticipated to result in a material increase or decrease in G&A charges, then this fact should be disclosed or accounted for within the evaluation report.
- Charges for DD&A

Note: Even though future capital costs are usually included in a cash flow forecast, DD&A charges could have some relevance in determining the economic limit of a producing property, especially when prices are low, earnings contributions are minimal, and a shut-in decision must be made.

4.6 VALIDATION AND RECONCILIATION OF RESERVES AND VALUE ESTIMATES

Given the uncertainty in estimating oil and gas Reserves and Resources, the actual petroleum volumes recovered from a reservoir will not be known until production reaches the economic limit and the reservoir production is suspended. Even then, future improvements in technology and economics could allow a reservoir to be redeveloped and additional volumes produced.

When evaluating Reserves or Resources, the evaluator must prepare estimates (usually annually) of the remaining oil and gas Reserves or Resources volumes, according to the definitions and guidelines specified in the COGEH or as specified by regulatory agencies. Those estimates will vary for individual reservoirs in the future because of production, capital investments, changing economic conditions, further technical data and technology. On a corporate level, acquisitions, dispositions, extensions, infill drilling, new discoveries, and improved recovery will also affect the overall Reserves and Resources of a company from one evaluation to the next.

Estimating Reserves and Resources involves technical processes and evaluator judgments that the company should review regularly. The best way to assess the quality of the technical processes employed and the evaluator judgments over time is to validate and reconcile past Reserves and Resource estimates to current expectations.

The technical requirements for assigning and reporting of Contingent Resources are the same as for assigning Reserves. If the non-technical contingencies were removed, the 1C, 2C, and 3C Resource volumes with sub-class “Development Pending” would be booked as 1P, 2P, and 3P Reserves, respectively.

For Prospective Resources a successful discovery will usually provide new technical information that may narrow the range of uncertainty as a prospect is reclassified as Contingent Resources or Reserves.

Reconciliation is a process of identifying and categorizing changes made in Reserves and Resource estimates from one evaluation to the next. The primary reasons for conducting Reserves or Resource reconciliations are to track changes and to understand the reasons for those changes. A secondary reason is to verify that past estimates met the definitions and guidelines specified in the COGEH.

This section discusses Reserves and Resource reconciliation and the validation of previous. Reconciliations of NPV of oil and gas Reserves are also presented. Submissions of these reconciliations to securities

5.1 INTRODUCTION

The fundamental purpose of an of oil and gas Resources evaluation is to provide information to assist in making decisions. The COGEH provides guidance that is generally applicable to all oil and gas Resources evaluations. Given the wide variety of evaluation objectives, an evaluator should ensure an evaluation will meet the purpose for which it is being carried out, that it is fit for purpose.

The COGEH provides general guidance on the content of a report, but the content depends on the purpose. Even if the general purpose is the same, there may be differences in content. For example, an evaluation carried out for regulatory reporting in one jurisdiction may not meet the requirements for a different jurisdiction.

5.2 USES OF EVALUATIONS

Reports summarizing the estimation and classification of Reserves and Resources are used to communicate recoverable volumes of oil and gas, Resources, uncertainty of estimates, production timing and commercial viability. This information enables users to make technical, economic, financial, and management decisions. Reports are normally tailored to meet the needs of the client or other identified users. While some overlap of objectives may exist among users, there can also be differences in terms of objectives, time frames, levels of aggregation, risk and uncertainty profiles.

Users can be broadly classified into the three groups described below. Although evaluations have much information in common, there will be variation in the type and detail of the information that is required by users within each of these groups. There may also be other users than those described here.

5.2.1 OPERATING ENTITIES

Operating entities carry out exploration and development, transport and delivery of oil and gas to the ultimate consumers. Broad types of operating entities include:

- **Upstream**: Operating entities who explore for, produce, and deliver oil and gas. Estimates of Recoverable Resources, especially Reserves, constitute the basic value of most oil and gas companies and realistic evaluations are vital to their success. They require Resources evaluations to prepare and validate exploration and development plans, for forecasts of production to size the equipment needed to produce and deliver the Reserves and/or Resources to market, estimate potential revenue, and to assist in deciding on the allocation of capital for major investment decisions. Investment decisions based on Reserves and/or Resources evaluations vary greatly in purpose and in scope and include:
    - geological and geophysical projects;
    - assessment of land acquisitions and planning;
    - exploration and appraisal drilling;
    - development drilling and production facilities;
    - buying or selling oil and gas assets;
    - mergers and acquisitions; and/or
    - borrowing money using future production as security.
- **Midstream:** Operating entities whose activity includes local gathering and transport (by pipeline, rail, truck, barge, or tanker) to market, and processing. These operating entities require estimates of Reserves, Contingent Resources and Prospective Resources, together with production forecasts,

5.3.1.1 USE OF THE TERMS - QUALIFIED RESERVE EVALUATOR AND QUALIFIED RESERVES AUDITOR

QRE and QRA were terms developed when evaluation practice was focused almost exclusively on Reserves. Since then, the importance of other Resource Classes has been recognized, and more appropriate terminology would now be Qualified Resource Evaluator and Qualified Resource Auditor. However, the terms QRE and QRA have become widely accepted and no change is proposed, but in this edition of the COGEH, the terms QRE and QRA are intended to include all Resource Classes that may be evaluated, audited, or reviewed.

5.3.2 EVALUATION

Several fundamental evaluation practices and procedures are required to prepare Resource information. The following are important considerations relating to conducting Resource evaluations and using the resulting information:

- reporting practices and consistency of information disclosure;
- terms under which evaluators are retained, and public disclosure of those terms;
- availability and reliability of evaluation data;
- verification of data and use of results;
- role of Reserves audit and review committees in public companies; and
- standards of independence, objectivity, and confidentiality.

The evaluation process requirements outlined in the following sections expand on these considerations. The objective is to ensure consistent reporting of Resource information and enhance all those business arrangements and related considerations that potentially affect the conduct of Resource evaluations and results reporting. The goals are:

- to improve the understanding and application of approved practices and procedures to consistently achieve higher-quality work; and
- to ensure the responsible use of Resource information.

Although the requirements and guidelines that follow primarily apply to producers needing independent evaluators, they also apply to companies that prepare in-house evaluations and use independent evaluators to conduct audits.

5.3.2.1 INDEPENDENT EVALUATIONS

Evaluations of oil and gas assets are to be prepared by QREs who are either independent consultants or employees of an oil and gas producer. Regardless of who conducts the evaluations, with publicly traded oil and gas producers, the results will be reported publicly, or with privately owned producers, will become known to the investment community through sharing of information in support of financial transactions. Therefore, evaluations must be prepared by QREs who meet reporting and disclosure standards and minimum requirements using accepted engineering, geoscientific, and economic evaluation procedures.

The Society of Petroleum Evaluation Engineers (SPEE) (Calgary Chapter) strongly supports using independent Resource evaluators for all publicly traded oil and gas company evaluations.

QREs and QRAs, whether companies or individuals, are considered *independent* when they do not have, nor expect to receive, any direct or indirect interest in either the properties being evaluated or in the

5.4.3 QUALIFICATIONS OF EVALUATORS AND AUDITORS, ENFORCEMENT AND DISCIPLINE

This section deals with the qualifications of evaluators and auditors and with practice reviews, enforcement, discipline, and continuing education.

Professional engineers, geologists, or geophysicists must prepare Resources evaluations and audits or the preparation must be supervised and approved by one or more of these professionals.

In Canada, each province has a professional organization that governs standards of engineering and geological practice. In Alberta, this is the APEGA and counterparts to APEGA are usually responsible for some or all these professions in other jurisdictions.

Information published by organizations such as the Society of Petroleum Engineers (SPE), the Society of Petroleum Evaluation Engineers (SPEE), the Canadian Institute of Chartered Accountants (CICA), and APEGA was reviewed on matters relating to qualification and enforcement. Representatives of the Institute of Chartered Accountants of Alberta (ICAA) and APEGA were also consulted.

5.4.3.1 QUALIFICATIONS

Professional engineers and geoscientists are to practice their profession in the public interest and must abide by the respective national or provincial engineering and geosciences professions legislation where this exists. Professional organizations generally establish a code of ethics or rules of conduct that are intended to guide the members about their individual professional roles and activities. The code of ethics addresses four major areas:

- duty to society at large and the public interest;
- duty to the client or employer and its employees;
- duty as a registered professional; and
- duty to the member's professional association.

In Alberta, APEGA is responsible for regulating the practice of engineering, geology, and geophysics. Its authority comes from a statute of the province of Alberta — The Engineering and Geosciences Professions (EGP) Act. Under the EGP Act, registration with APEGA is required to practice engineering, geology, and geophysics in Alberta and similar provisions exist in many other jurisdictions.

In jurisdictions where there is no relevant legislation or professional organization, evaluators using COGEH must conform to equivalent standards. To prepare Resource information for public reporting, this may not suffice. When this situation arises for public reporting in Canada, Resource evaluators should consult with the securities regulator to assure that their professional organization is acceptable and that they have the appropriate expertise and experience.

In addition to being a guide to each member, the code of ethics is an important document the disciplinary committee of a professional organization, such as APEGA, uses.

Examples of such codes are:

- APEGA - Guideline for Ethical Practice V3.0
- SPEE Discussion and Guidance on Ethics

5.4.3.1.1 QUALIFIED RESERVES EVALUATOR

Resources evaluators are considered qualified if they have sufficient educational background, training, and experience to exercise prudent judgement and to be responsibly charged with Resource estimation and preparation and analysis of cash flows. Whether a QRE is qualified is judged individually. An evaluator should only undertake work that he or she is competent to perform based on his or her training and experience. QRE's are specialized within the field of resource evaluations.

SPEE (Calgary Chapter) has the following requirements for QREs:

- They are a registered professional engineer, geologist, or geophysicist in good standing and licensed to practice engineering, geology, geophysics, or other disciplines of physical science. The scope of the license must include resource evaluations and audits and apply to the jurisdiction in which they are practicing.
- They have a minimum of five years practical experience in petroleum engineering, geology, or geophysics, which include at least three recent years experience where the majority of time was spent evaluating Resources.
- The evaluator must have appropriate professional experience and qualifications for Resource evaluation, including competency in current industry practice and an understanding of the applicable jurisdictional codes and guidelines.

5.4.3.1.2 QUALIFIED RESERVES AUDITOR

Resources auditors are considered qualified if they have sufficient educational background, training, and experience to exercise prudent judgement, and to be responsibly charged with an audit of Resource evaluations estimated by others. Whether a Qualified Reserves Auditor (QRA) is qualified is judged individually. SPEE (Calgary Chapter) supports the following requirements for QRAs:

- They are a registered professional engineer, geologist, or geophysicist in good standing and licensed to practice engineering, geology, geophysics, or other disciplines of physical science. The scope of the license must include resource evaluations and audits and apply to the jurisdiction in which they are practicing.
- They have a minimum of ten years practical experience in petroleum engineering, geology, or geophysics, which include at least five recent years experience where the majority of time was spent evaluating Resources.
- The auditor must have appropriate professional experience and qualifications for Resources evaluation, including competency in current industry practice and an understanding of the applicable jurisdictional codes and guidelines.

A QRA is retained to conduct procedures designed to allow the auditor to provide reasonable assurance, in the form of an opinion, that a company's Resource information have, in all material respects, been determined and presented according to the COGEH's Resource definitions and principles (see Chapter 1) and are, therefore, free of material misstatements.

5.4.3.2 PRACTICE REVIEWS, AUDITS, ENFORCEMENT, AND DISCIPLINE

In the province of Alberta, APEGA enforces legislation that requires anyone practicing the professions to be registered with the Association. Furthermore, APEGA establishes standards for professional practice,

6.1 INTRODUCTION

This section of the COGEH addresses the unique characteristics and considerations required in evaluating and classifying of coalbed methane (CBM). References to general sections of the COGEH are specifically noted herein, to avoid redundancy and confusion, where those existing guidelines apply wholly and directly to CBM. Modifications and additions have then been made to address the specific and unique technical aspects of CBM.

The CBM section of the COGEH addresses only the estimating the gas volumes existing in, and recoverable from, coal. CBM reservoirs are quite distinct from most other natural gas reservoirs, which also predominantly contain methane. In addition to CBM being found in fractures, or cleats, and porosity within coal deposits, it is also absorbed onto the surface of coal. Production strategies revolve around the mechanism of CBM desorbing from the coal. In many CBM deposits, the presence of water also impacts production strategies.

For situations in which a coal deposit might be evaluated both for CBM and mining, cross-over with the mining industry may occur in the estimation of in-situ coal tonnage. Indeed, the two industries may rightly derive different estimates as each industry uses different parameter cut-offs. The estimation of the amount of coal recoverable by mining is beyond the scope of this handbook.

6.2 RESOURCE CLASS CLASSIFICATIONS AND DEFINITIONS FOR CBM

Guidance for classifying of CBM Resource Other Than Reserves (ROTR) are discussed in this section. General definitions and discussion of these classifications are found in Chapter 1 with additional CBM specific information below.

6.2.1 CBM RESOURCE CLASSIFICATION

The definitions of Resources presented within Chapter 1 should be applied to CBM in the same manner and with the same criteria as conventional petroleum accumulations. This applies to petroleum initially-in-place, and all the associated sub-categories of undiscovered Resources, Prospective Resources, discovered Resources, Contingent Resources, Reserves, as well as the various probability categories.

The primary risk associated with CBM production is economic – will gas rates and gas contents be sufficient to justify capital costs? To effectively evaluate a CBM asset the evaluator must address the following questions:

- Is the reservoir at equilibrium, saturated, or undersaturated?
- If dewatering is required, how long will dewatering take?
- What volumes of water will need to be handled?
- What disposal method will be required for the water?
- What is the composition of the gas?
- What peak production rate can be expected for a typical well?
- What well density will be optimal?

6.3 GENERAL REQUIREMENTS FOR CLASSIFICATION OF CBM RESERVES

6.3.1 INTRODUCTION

Chapter 1 outlines the general requirements for classifying conventional Reserves. The following describes some of the unique requirements for classification of CBM Reserves.

7.1 INTRODUCTION

This section of the COGEH addresses the unique characteristics and considerations in the evaluation and classification of the volumes of heavy oil or bitumen existing in, and recoverable from, formations that are suitable for exploitation using in-situ or mining recovery methods. For this section of the Handbook, in-situ methods include all those processes that mobilize bitumen or heavy oil, by thermal, chemical, or other means, so it may be recovered from a wellbore. Mining recovery methods include all those that recover bitumen-bearing ore that is processed to yield marketable bitumen-related products, and which do not involve recovery via a wellbore.

Some projects achieve a minor amount of primary/non-thermal or waterflood supported production of bitumen. These projects should be evaluated using the guidelines provided in Chapter 2 – *Estimation of Reserves and Resources*. If cold production is a precursor to recovery using an in-situ process, separate evaluations of cold and thermal recovery may be combined to provide a single, complete evaluation of a recovery project.

"Bitumen" means a naturally occurring solid or semi-solid hydrocarbon;

- consisting mainly of heavier hydrocarbons, with a viscosity greater than 10,000 centipoise (cP) measured at the hydrocarbon's original temperature in the reservoir and at atmospheric pressure on a gas-free basis; and
- that is not primarily recoverable at economic rates through a well without implementing enhanced recovery methods.

Other definitions can be found at AER - Oil Sands Glossary.

Canada has an abundance of heavy oil and bitumen. Although heavy oil occurs in virtually all Western Canada's productive sedimentary basins, bitumen (including heavy oil where steam-assisted gravity drainage (SAGD) or cyclic steam stimulation (CSS) is used), with in-place viscosity values ranging up to several million centipoise (cP), is concentrated in north-eastern Alberta with a limited extension into north-western Saskatchewan. More detail is contained in Section 7.6 - *Bitumen Appendix – Western Canada and Other Country Bitumen Deposits* with respect to the formations under development, generally sandstones and those with limited commercial production, the carbonates.

Approximately 20 percent of the oil sands are accessible to surface mining while the remaining 80 percent of the oil sands bitumen, and all the carbonate bitumen, are not accessible by mining and will require in-situ extraction methods. According to the 2016 AER ST98 report (AER - Statistical reports - ST98), 54 percent (1335 Mbbls/d) of the annual bitumen production was from in-situ projects while 46 percent (1117 Mbbls/d) was from mines, for a total of 2452 Mbbls/d.

Although COGEH guidelines are intended to be generally applicable, these bitumen guidelines focus on Canadian oil sands operations, the largest and most developed of their type in the world. They could be used as a template that can be applied to operations in other areas, should these develop.

7.2 BITUMEN RECOVERY METHODS

7.2.1 MINING

Bitumen is mined when a sufficiently large bitumen bearing ore deposit is close enough to the surface to allow current mining techniques to remove and relocate the overburden, recover the ore, and separate the