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PRMS

# Petroleum Resources Management System

Revised June 2018

The cover of the PRMS report features a central image of a globe with a grid overlay, set against a dark blue background with a glowing oil rig on the left. The globe is highlighted with red and white, indicating resource distribution.

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## PRMS 2018 – Highlights of Changes

14<sup>th</sup> Annual RSC Reserves Conference

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## PUBLIC COMMENTS

- SPE posted a draft of the new PRMS for public comment during 2017.
- There were over 50 comments submitted:
  - Comments came in from around the world. Comments from outside of the US outnumbered US comments by a 3 to 1 margin.
  - Comments ranged from one page thoughts on a single issue to submissions where there were edits or discussion and commentary to virtually every section of the draft.
  - The OGRC sub-committee considered every single comment, and the resulting post-public comment drafts were much improved.

## THE FINAL STRETCH

- The final draft was submitted to the entire SPE OGRC on May 15, 2018.
- OGRC members were asked to review prior to forwarding to the SPE Board of Directors for final approval.
- Concurrently, draft was circulated among sister societies for approval
- The document was unanimously approved by both sister societies and the SPE Board of Directors in June 2018
- Publically released on July 10, 2018 at <http://www.spe.org/industry/reserves.php>

## WHAT HAS CHANGED?

- No major changes. Goal was to limit changes to areas requiring clarification and focus on key principles.
- Look and feel:
  - Introduction of Paragraph numbers (except for Preamble) to make it easy to cite a specific portion - PRMS 2007 just had section numbers
  - The first use of a term is hyperlinked to the glossary
  - 2007 PRMS glossary included 50 of 182 terms not used in the body of the PRMS
    - For 2018, glossary includes only terms used in the body of the PRMS
    - 50 unused terms have been dropped
    - 63 new terms added

## WHAT'S NEXT?

- The SPE audit standards are being updated
- Examples are under construction
- An update to the PRMS Application Guidelines is being planned.
- A listing of Errata should be published soon, and will be published as necessary going forward, but no more frequently than quarterly.
- Current Errata includes correction of some graphic titles, section numbers, removal of redundancies, missing words, etc.
- The registration you did for the download will also be used to notify you when updates are available. Updates are to be clearly marked with version numbers in the footer.

## PRESENTATION STANDARDS

- Sections from PRMS are preceded with the paragraph number or indicated as from the glossary or from the preamble.
- Commentary is prefixed with a bullet point.
- New concepts are denoted with .
- There has been extensive re-wording in many sections of PRMS. In many instances, there is no material change from 2007 despite the rewording. In some situations, there have been minor or subtle revisions. These types of changes have not been indicated as .
- In some cases, equivalent PRMS 2018 sections and PRMS 2007 sections are shown together to help illustrate the changes. Sections of each that are identical are underlined.
- Any hyperlinks have been removed from this presentation, instead terms are *italicized*.

## 1.0.0.2 QUANTITIES VERSUS VOLUMES

1.0.0.2 The technical estimation of petroleum resources quantities involves the assessment of quantities and values that have an inherent degree of uncertainty. Quantities of petroleum and associated products can be reported...

- 2007 PRMS used “volumes” and “quantities” somewhat interchangeably.
- Use of “quantities” acknowledges the mass component element in hydrocarbon production, particularly where liquid production is recorded in tons or (metric) tonnes or gas production in terms of energy content (Btu or Joule).
- Section 1.0.0.2 notes that quantities of petroleum can be reported in volume, mass, or energy.



# FIGURE 1.1 – 2007 VERSION & 2018 VERSION

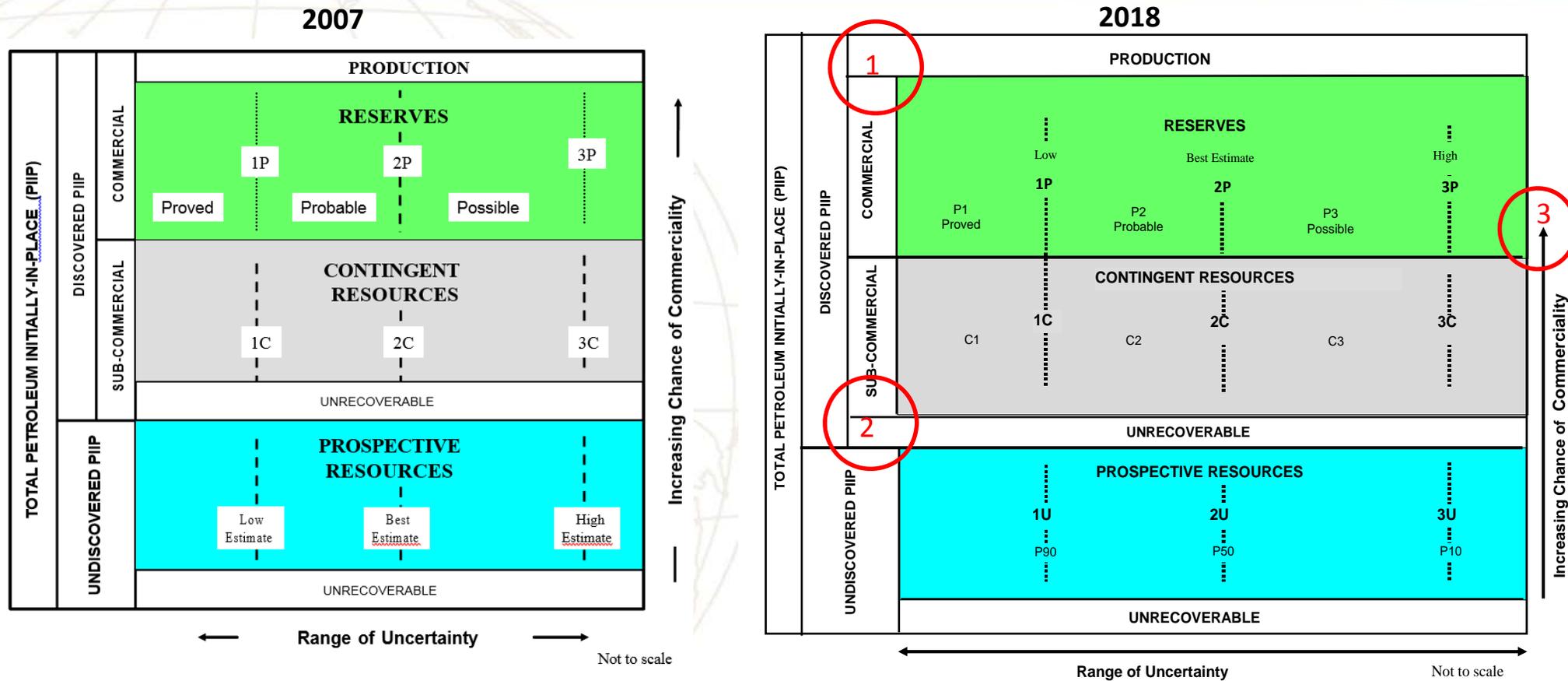
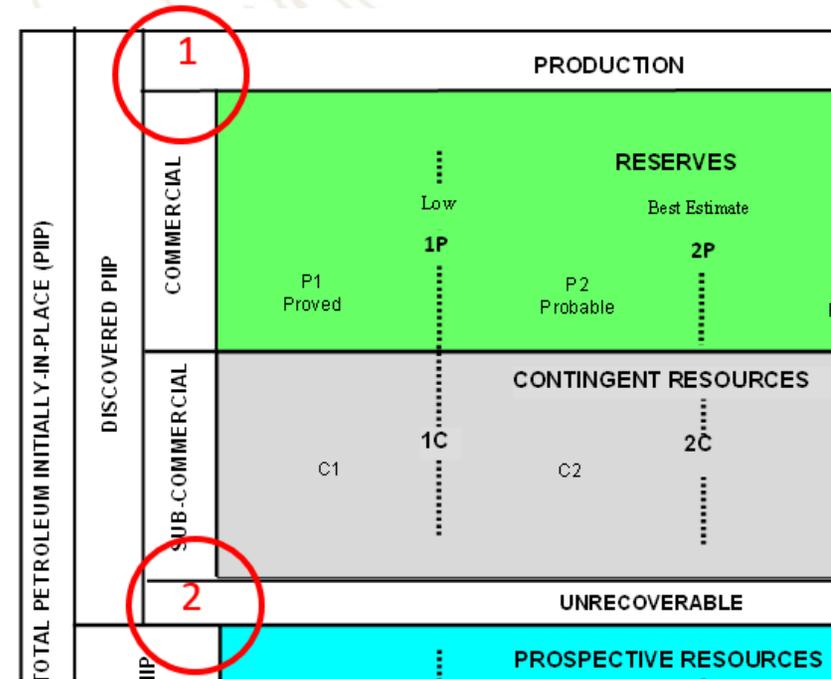


Figure 1-1: Resources Classification Framework.

## CHANGES TO FIGURE 1.1 – MASS BALANCE ISSUES

- **1** – Production box is not part of Commercial Reserves anymore but still a part of Discovered PIIP.
- **2** – Unrecoverable is not part of sub-Commercial Contingent resources anymore but still a part of Discovered PIIP.



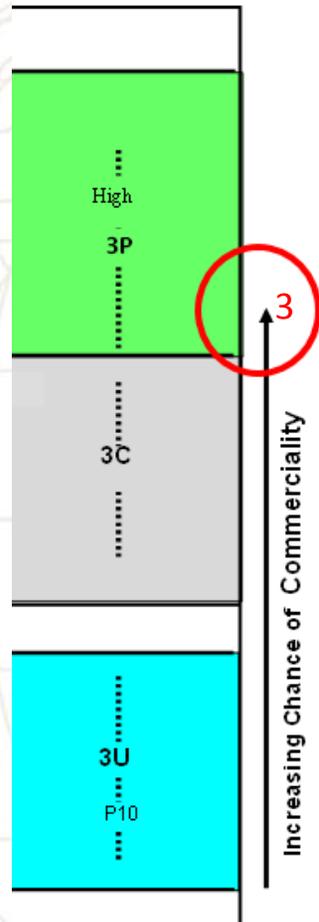
- Total PIIP = **Discovered PIIP** + **Undiscovered PIIP**

OR

**(Production + Reserves + Contingent Resources + Discovered but Unrecoverable)** + **(Prospective Resources + Undiscovered but Unrecoverable)**

- 2007 PRMS did not clearly show Unrecoverable as a subset of PIIP.
- Matrix modified to better convey the mass balance.

# CHANGES TO FIGURE 1.1 - COMMERCIALITY



- 3 – the arrow for Increasing Chance of Commerciality does not continue to the top of the Commercial Reserves box, to avoid implying that there are additional levels of commerciality after achieving Approved for Development (AfD).
- It is implied that it stops after achieving Approved for Development (Figure 2.1), rather than stopping at Justified for Development, where there is a firm intent to proceed with the project but Final Investment Decision has not occurred.

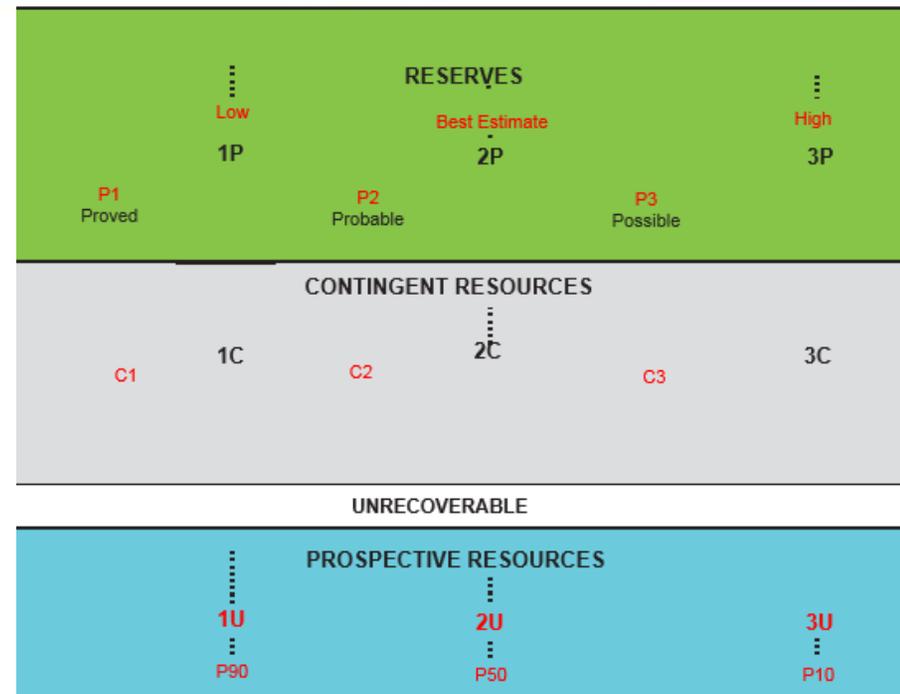
PRODUCTION	Project Maturity Sub-classes
RESERVES	On Production
	Approved for Development
	Justified for Development
CONTINGENT RESOURCES	Development Pending
	Development On Hold
	Development Unclassified
	Development Not Viable
UNRECOVERABLE	
	Prospect

Increasing Chance of Commerciality



## CHANGES TO FIGURE 1.1 - NOMENCLATURE

- Note many changes to the labels:
  - Low, Best, and High moved to the top, as these concepts apply to Reserves, Contingent Resources, and Prospective Resources.
  - Incremental volumes of **P1, P2, P3, C1, C2, C3** included.
  - Prospective labeled as **1U, 2U, & 3U**, and **P90, P50, P10** instead of Low, Best, and High Estimates.
  - Some of these are new terms to PRMS**, we will discuss further in 2.2.0.2 and 2.2.2.2.
- Although Low/Best Estimate/High moved to Reserves and P90/P50/P10 moved to Prospective Resources, they can be used in any of the classes.



# NOMENCLATURE MATRIX (RSC)

Deterministic Estimate	Low	Best	High	Can apply to any class, usually associated with Prospective Resources
Probabilistic Estimate	P90	P50	P10	Can apply to any class, used with Probabilistic approach
<b>Reserves Category</b>	<b>Proved</b>	<b>Probable</b>	<b>Possible</b>	Discrete / Incremental
Abbreviation	P1	P2	P3	Discrete / Incremental
Low Estimate of Reserves	1P			Continuous / Cumulative
Best Estimate of Reserves	2P			Continuous / Cumulative
High Estimate of Reserves	3P			Continuous / Cumulative
<b>Contingent Resources Category</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	Discrete / Incremental
Low Estimate of Contingent Resources	1C			Continuous / Cumulative
Best Estimate of Contingent Resources	2C			Continuous / Cumulative
High Estimate of Contingent Resources	3C			Continuous / Cumulative
<b>Prospective Resources Category</b>	U1	U2	U3	Discrete / Incremental terms <b>UNDEFINED*</b>
Low Estimate of Prospective Resources	1U			Continuous / Cumulative
Best Estimate of Prospective Resources	2U			Continuous / Cumulative
High Estimate of Prospective Resources	3U			Continuous / Cumulative
*2.2.2.4: ...No specific terms are defined for incremental quantities within Prospective Resources.				

## MAJOR SUBDIVISIONS

**1.1.0.6 A 1. Reserves** are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must satisfy four criteria: discovered, recoverable, commercial, and remaining (as of the evaluation's effective date) based on the development project(s) applied.

**1.1.0.6 A 2.** Reserves are recommended as sales quantities as metered at the reference point. Where the entity also recognizes quantities consumed in operations (CiO) (see Section 3.2.2), as Reserves these quantities must be recorded separately. Non-hydrocarbon quantities are recognized as Reserves only when sold together with hydrocarbons or CiO associated with petroleum production. If the non-hydrocarbon is separated before sales, it is excluded from Reserves.



**1.1.0.6 A 3.** Reserves are further categorized in accordance with the range of uncertainty and should be sub-classified based on project maturity and/or characterized by development and production status.

- 1.1.0.6 A 2 clarifies that while reserves are recommended to be sales quantities, it is acceptable to include CiO volumes as reserves, although they should be shown in a manner that clearly identifies the CiO volumes
- Non-hydrocarbons sold or consumed as a part of the production (“as-sold” basis) can be considered reserves, but if the non-hydrocarbons must be separated prior to sales, i.e. to meet sales spec, then not part of reserves.

## RESERVES - 2018 VERSUS 2007

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**1.1.0.6 A 2.** Reserves are recommended as sales quantities as metered at the *reference point*. Where the *entity* also recognizes quantities *consumed in operations* (CiO) (see Section 3.2.2), as Reserves these quantities must be recorded separately. Non-hydrocarbon quantities are recognized as Reserves only when sold together with hydrocarbons or CiO associated with petroleum production. If the non-hydrocarbon is separated before sales, it is excluded from Reserves.

**1.1.0.6 A 3.** Reserves are further categorized in accordance with the range of uncertainty and should be sub-classified based on project maturity and/or characterized by development and production status.

**PRMS 2007 (§1.1, ¶9) : RESERVES** are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must further satisfy four criteria: they must be discovered, recoverable, commercial, and remaining (as of the evaluation date) based on the development project(s) applied. Reserves are further categorized in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterized by development and production status.



## 1.1.0.8 OTHER TERMS

**1.1.0.8 A Estimated Ultimate Recovery (EUR)** is not a resources category or class, but a term that can be applied to an accumulation or group of accumulations (discovered or undiscovered) to define those quantities of petroleum estimated, as of a given date, to be potentially recoverable plus those quantities already produced from the accumulation or group of accumulations. For clarity, EUR must reference the associated technical and commercial conditions for the resources; for example, proved EUR is *Proved Reserves* plus prior production.

- Clarified that EUR needs a descriptor associated with its use, such as “proved EUR, “3P EUR”, etc. 

## 1.1.0.8 OTHER TERMS

**1.1.0.8 B *Technically Recoverable Resources*** (TRR) are those quantities of petroleum producible using currently available technology and industry practices, regardless of commercial considerations. TRR may be used for specific Projects or for groups of Projects, or, can be an undifferentiated estimate within an area (often basin-wide) of recovery potential.

- Defined as technically producible quantities regardless of commercial considerations
- Intent: Discovered quantities pending development or evaluations of producing projects, where economic evaluation or commercial assessment has not been completed.
- Provides an acceptable nomenclature to the often-heard but always-incorrect “technical reserves”.



**Glossary: Technical Forecast:** The forecast of produced resources quantities that is defined by applying only technical limitations (i.e., well-flow-loading conditions, well life, production facility life, flow-limit constraints, facility uptime, and the facility's operating design parameters). Technical limitations do not take into account the application of either an economic or license cutoff. (See also Technically Recoverable Resources).

- Technical Forecast is a defined term that is new from PRMS 2007
- It is intended to describe the forecast associated with Technically Recoverable Resources.

## FIVE YEAR RULE 2.1.2.3 & 2.1.3.6.4

2.1.2.3 To be included in the Reserves class, a project must be sufficiently defined to establish both its technical and commercial viability as noted in Section 2.1.2.1. There must be a reasonable expectation that all required internal and external approvals will be forthcoming and evidence of firm intention to proceed with development within a reasonable time-frame. A reasonable time-frame for the initiation of development depends on the specific circumstances and varies according to the scope of the project. While five years is recommended as a benchmark, a longer time-frame could be applied where justifiable; for example, development of economic projects that take longer than five years to be developed or are deferred to meet contractual or strategic objectives. In all cases, the justification for classification as Reserves should be clearly documented. **ESSENTIALLY UNCHANGED FROM 2007**

2.1.3.6.4 Where Reserves remain Undeveloped beyond a reasonable time-frame or have remained Undeveloped owing to postponements, evaluations should be critically reviewed to document reasons for the delay in initiating development and to justify retaining these quantities within the Reserves class. While there are specific circumstances where a longer delay (see Section 2.1.2, Determination of Commerciality) is justified, a reasonable time-frame to commence the project is generally considered to be less than five years **from the initial classification date**. **ESSENTIALLY UNCHANGED FROM 2007**

- Clarified that the “5 year reasonable time-frame” starts with the ***initial classification date***. 
- Does not provide for treating proved reserves different from Probable or Possible Reserves – this is unchanged from 2007.
- Discussions of 5 year rule only address Reserves. By inference (and intention), the rule does not apply to Contingent Resource projects.

## FINAL INVESTMENT DECISION

2.1.2.4 While PRMS guidelines require financial appropriations evidence, they do not require that project financing be confirmed before classifying projects as Reserves. However, this may be another external reporting requirement. In many cases, financing is conditional upon the same criteria as above. In general, if there is not a reasonable expectation that financing or other forms of commitment (e.g., farm-outs) can be arranged so that the development will be initiated within a reasonable time-frame, then the project should be classified as Contingent Resources. If financing is reasonably expected to be in place at the time of the final investment decision (FID), the project's resources may be classified as Reserves.

Glossary **Final Investment Decision (FID)**: Project approval stage when the participating companies have firmly agreed to the project and the required capital funding.



- “Final Investment Decision” was not used in 2007 PRMS. Not used by the SEC in their 2009 update, but used in their CD&I of October, 2009.
- 2007 PRMS (§2.1.2, ¶2): ...There must be a reasonable expectation that all required internal and external approvals will be forthcoming, and there is evidence of firm intention to proceed with development within a reasonable time frame.

## CHANCE OF COMMERCIALITY

2.1.3.2 ...For Contingent and Prospective Resources, this is further expressed as a chance of commerciality,  $P_c$ , which incorporates the following underlying chance component(s):

2.1.3.2 A The chance that the potential accumulation will result in the discovery of a significant quantity of petroleum, which is called the “*chance of geologic discovery*,”  $P_g$ . 

2.1.3.2 B Once discovered, the chance that the known accumulation will be commercially developed is called the “*chance of development*,”  $P_d$ .

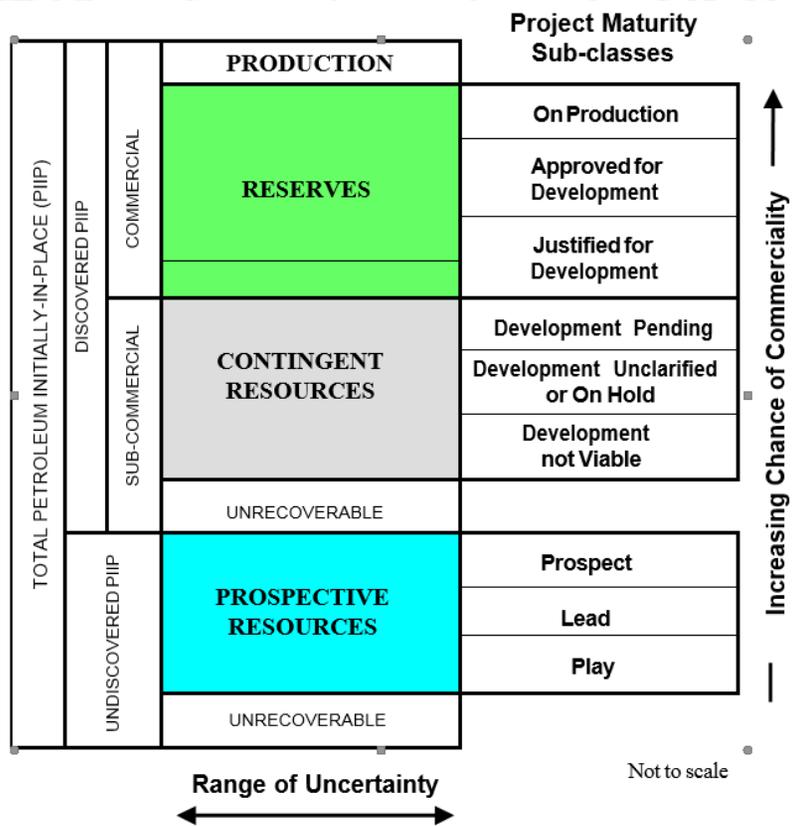
2.1.3.3 There must be a high degree of certainty in the chance of commerciality,  $P_c$ , for Reserves to be assigned; for Contingent Resources,  $P_c = P_d$ ; and for Prospective Resources,  $P_c$  is the product of  $P_g$  and  $P_d$ . 

2.1.3.4 Contingent and Prospective Resources can have different project scopes (e.g., well count, development spacing, and facility size) as development uncertainties and project definition mature.

# PROJECT MATURITY SUB-CLASSES 2007 VS 2018



## 2007 Version



## 2018 Version

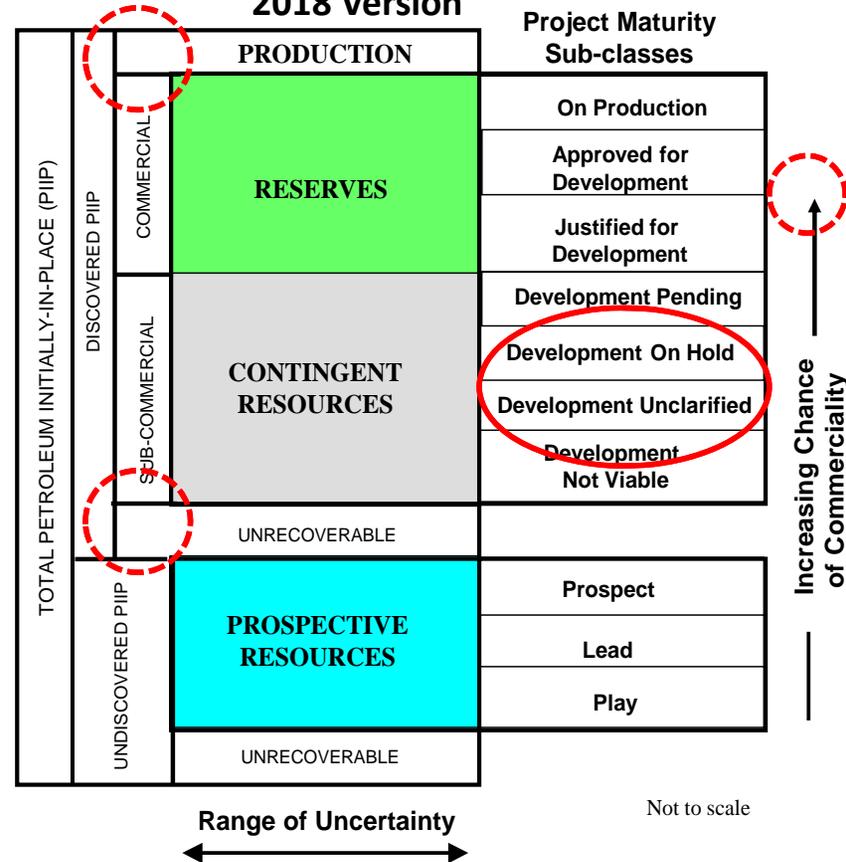


Figure 2-1: Sub-classes based on Project Maturity.

## DEVELOPMENT ON HOLD AND UNCLARIFIED

- 2007 PRMS had the single category Development Unclassified or On Hold

Development Unclassified  
or On Hold



Development On Hold

Development Unclassified

- Now split into two separate categories for more clarity.



## IS IT STILL RESERVES?

2.1.3.5.7 Where commercial factors change and there is a significant risk that a project with Reserves will no longer proceed, the project shall be reclassified as Contingent Resources.

- This is certainly not a new concept in PRMS, but is a good example of more explicit guidance. All projects need to be tested at each evaluation to ensure that reserves don't need to be downgraded.



2.1.3.6.1 Once projects satisfy commercial maturity (criteria given in Table 1), the associated quantities are classified as Reserves. These quantities may be allocated to the following subdivisions based on the funding and operational status of wells and associated facilities within the *reservoir* development plan (Table 2 provides detailed definitions and guidelines):

**2.1.3.6.1 A Developed Reserves** are quantities expected to be recovered from existing wells and facilities.

**2.1.3.6.1 A 1 Developed Producing Reserves** are expected to be recovered from *completion intervals* that are open and producing at the time of the estimate.

**2.1.3.6.1 A 2 Developed Non-Producing Reserves** include shut-in and *behind-pipe Reserves* with **minor costs to access** 

**2.1.3.6.1 B Undeveloped Reserves** are quantities expected to be recovered through future significant investments.

Minor word changes, but essentially unchanged from 2007. The new addition of “minor costs to access” is in keeping with the Developed status. Again, a point of clarity from 2007.

## MINOR / SIGNIFICANT COST RULE 2.1.3.6

2.1.3.6.2 The distinction between the “minor costs to access” Developed Non-Producing Reserves and the “significant investment” needed to develop Undeveloped Reserves requires the judgment of the evaluator taking into account the cost environment. A significant investment would be a relatively large expenditure when compared to the cost of drilling and completing a new well. A minor cost would be a lower expenditure when compared to the cost of drilling and completing a new well.

- The PRMS does not make a recommendation as to what the threshold between minor and significant should be. That is left to the entity to determine.
- Entities should have a clear policy on this issue.



## 2.1.3.7 ECONOMIC STATUS

2.1.3.7.1 Projects may be further characterized by economic status. All projects classified as Reserves must be commercial under *defined conditions* (see Section 3.1, Assessment of Commerciality Assessment). Based on assumptions regarding future conditions and the impact on ultimate economic viability, projects currently classified as Contingent Resources may be broadly divided into two groups:

- ***Economically Viable Contingent Resources*** are those quantities associated with technically feasible projects where cash flows are positive under reasonably forecasted conditions but are not Reserves because it does not meet the commercial criteria defined in Section 2.1.2.
- ***Economically Not Viable Contingent Resources*** are those quantities for which development projects are not expected to yield positive cash flows under reasonable forecast conditions.



## 2.1.3.7 ECONOMIC STATUS

- PRMS 2007 (§2.1.3.3, ¶1) presented the same concept, but used different terms:
  - Marginal Contingent Resources → Economically Viable Contingent Resources
  - Sub-Marginal Contingent Resources → Economically Not Viable Contingent Resources
- Although new terms are presented, overall intent is unchanged.

**2.1.3.7.4 The project's low-case scenario is tested to ensure it is economic, which is required for *Proved Reserves* to exist** (see Section 2.2.2, Category Definitions and Guidelines). It is recommended to evaluate the low case and the high case (which will quantify the 3P Reserves) to convey the project downside risk and upside potential. The project development scenarios may vary in the number and type of wells, facilities, and infrastructure in Contingent Resources, but to recognize Reserves, there must exist the reasonable expectation to develop the project for the best-estimate case.

- Emphasis added above.
- Although this was the intent of PRMS 2007, it was not clearly understood.



2.1.3.7.4 The project's low-case scenario is tested to ensure it is economic, which is required for *Proved Reserves* to exist (see Section 2.2.2, Category Definitions and Guidelines). It is recommended to evaluate the low case and the high case (which will quantify the 3P Reserves) to convey the project downside risk and upside potential. **The project development scenarios may vary in the number and type of wells, facilities, and infrastructure in Contingent Resources, but to recognize Reserves, there must exist the reasonable expectation to develop the project for the best-estimate case.**

- Emphasis added above
- 2.1.3.7.4 clarifies that the development plan assumed for the 2P scenario may vary for the low and high cases.
- This was not clearly stated in PRMS 2007.



## STAND ALONE POSSIBLE?

- Generally speaking, the 2P case must be commercial in order to recognize reserves.
- One exception is the situation of “stand alone possible.”
- Sometimes, particularly in unconventional plays, it can be demonstrated that certain undeveloped locations may be considered to be proved, probable, or possible undeveloped based on data from wells located in the nearby vicinity but not located on the same lease as the prospective undeveloped location.
- In this situation, it is permissible to have a possible undeveloped location (assuming it meets commercial conditions) although there is no accompanying “best estimate” case as a part of that specific project.

2.2.2.8 C ...Stand-alone Possible Reserves must reference a commercial 2P project (e.g., a lease adjacent to the commercial project that may be owned by a separate entity), otherwise stand-alone Possible is not permitted.



## SPLIT CONDITIONS 2.2.0.3 & 2.2.2.7

2.2.0.3 There must be a single set of defined conditions applied for resource categorization. Use of different commercial assumptions for categorizing quantities is referred to as “*split conditions*” and are not allowed. Frequently, an entity will conduct project evaluation sensitivities to understand potential implications when making project selection decisions. Such sensitivities may be fully aligned to resource categories or may use single parameters, groups of parameters, or variances in the defined conditions.

2.2.2.7 All evaluations require application of a consistent set of forecast conditions, including assumed future costs and prices, for both classification of projects and categorization of estimated quantities recovered by each project (see Section 3.1, Assessment of Commerciality).

- What are we trying to say here?
- The economic and commercial assumptions used to evaluate a certain scenario should be the same for all categories.
- Example:
  - Use same price scenario for the low, best and high / 1P, 2P, 3P cases for a single project.
  - Use the same discount rate / hurdle rate criteria to test commerciality.



## SPLIT CLASSIFICATION 2.2.0.4

2.2.0.4 Moreover, a single project is uniquely assigned to a sub-class along with its uncertainty range. For example, a project cannot have quantities classified in both Contingent Resources and Reserves, for instance as 1C, 2P, and 3P. This is referred to as “*split classification*.”

- A single project is uniquely assigned to a sub-class along with its uncertainty range.
- An accumulation or field may have several separate projects in its development plan.



Project Maturity Sub-classes	
On Production	
Approved for Development	
Justified for Development	
Development Pending	
Development On Hold	
Development Unclassified	
Development Not Viable	
Prospect	
Lead	
Play	

2.2.2.1 Evaluators may assess recoverable quantities and categorize results by uncertainty using the deterministic incremental method, the deterministic scenario (cumulative) method, *geostatistical methods*, or *probabilistic methods* (see Section 4.2, Resources Assessment Methods). Also, combinations of these methods may be used.

- In 2007, it said: ...using the deterministic incremental (risk-based) approach, the deterministic scenario (cumulative) approach, or probabilistic methods.
- Geostatistical Methods were mentioned in 2007 as a method to preserve spatial distribution information for reservoir simulation applications. It has been given more recognition now due to its evolving importance as a mainstream evaluation method.

Glossary **Geostatistical** Methods: A variety of mathematical techniques and processes dealing with the collection, methods, analysis, interpretation, and presentation of large quantities of geoscience and engineering data to (mathematically) describe the variability and uncertainties within any reservoir unit or pool, specifically related here to resources estimates.



## RESERVE DEFINITIONS LARGELY UNCHANGED



**2.2.2.8 A: Proved Reserves** are those quantities of Petroleum that, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be commercially recoverable from known reservoirs and under defined technical and commercial conditions. If deterministic methods are used, the term “reasonable certainty” is intended to express a high degree of confidence that the quantities will be recovered. If probabilistic methods are used, there should be at least a 90% probability that the quantities actually recovered will equal or exceed the estimate.

PRMS 2007: Proved Reserves are those quantities of petroleum, which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under defined economic conditions, operating methods, and government regulations. If deterministic methods are used, the term reasonable certainty is intended to express a high degree of confidence that the quantities will be recovered. If probabilistic methods are used, there should be at least a 90% probability that the quantities actually recovered will equal or exceed the estimate.

## RESERVE DEFINITIONS LARGELY UNCHANGED



**2.2.2.8 B: Probable Reserves** are those additional Reserves which analysis of geoscience and engineering data indicate are less likely to be recovered than Proved Reserves but more certain to be recovered than *Possible Reserves*. It is equally likely that actual remaining quantities recovered will be greater than or less than the sum of the estimated Proved plus Probable Reserves (2P). In this context, when probabilistic methods are used, there should be at least a 50% probability that the actual quantities recovered will equal or exceed the 2P estimate.

PRMS 2007: Probable Reserves are those additional Reserves which analysis of geoscience and engineering data indicate are less likely to be recovered than Proved Reserves but more certain to be recovered than Possible Reserves. It is equally likely that actual remaining quantities recovered will be greater than or less than the sum of the estimated Proved plus Probable Reserves (2P). In this context, when probabilistic methods are used, there should be at least a 50% probability that the actual quantities recovered will equal or exceed the 2P estimate.

- **No change from the 2007 definition**

## RESERVE DEFINITIONS LARGELY UNCHANGED



**2.2.2.8 C: Possible Reserves** are those additional Reserves that analysis of geoscience and engineering data suggest are less likely to be recoverable than Probable Reserves. The total quantities ultimately recovered from the project have a low probability to exceed the sum of Proved plus Probable plus Possible (3P) Reserves, which is equivalent to the high-estimate scenario. When probabilistic methods are used, there should be at least a 10% probability that the actual quantities recovered will equal or exceed the 3P estimate. Possible Reserves that are located outside of the 2P area (not upside quantities to the 2P scenario) may exist only when the commercial and technical maturity criteria have been met (that incorporate the Possible development scope). Stand-alone Possible Reserves must reference a commercial 2P project (e.g., a lease adjacent to the commercial project that may be owned by a separate entity), otherwise stand-alone Possible is not permitted.

PRMS 2007: Possible Reserves are those additional reserves which analysis of geoscience and engineering data suggest are less likely to be recoverable than Probable Reserves. The total quantities ultimately recovered from the project have a low probability to exceed the sum of Proved plus Probable plus Possible (3P) Reserves, which is equivalent to the high estimate scenario. In this context, when probabilistic methods are used, there should be at least a 10% probability that the actual quantities recovered will equal or exceed the 3P estimate.

2.3.1.2 Facilities that are either beyond their operational life, placed out of service, or removed from service cannot be associated with Reserves recognition. When required facilities become unavailable or out of service for longer than a year, it may be necessary to reclassify the Developed Reserves to either Undeveloped Reserves or Contingent Resources. A project that includes facility replacement or restoration of operational usefulness must be identified, commensurate with the resources classification.



## LEARNING CURVE FOR UNCONVENTIONALS



2.4.0.5 A fundamental characteristic of engagement in a repetitive task is that it may improve performance over time. Attempts to quantify this improvement gave rise to the concept of the manufacturing progress function commonly called the “*learning curve*.” The learning curve is characterized by a decrease in time and/or costs, usually in the early stages of a project when processes are being optimized. At that time, each new improvement may be significant. As the project matures, further improvements in time or cost savings are typically less substantial. In oil and gas developments with high well counts and a continuous program of activity (multi-year), the use of a learning curve within a resources evaluation may be justified to predict improvements in either the time taken to carry out the activity, the cost to do so, or both. While each development project is unique, review of analogs can provide guidance on such predictions and the range of associated uncertainty in the resulting recoverable resources estimates (see also Section 3.1.2 Economic Criteria).



## ASSESSMENT OF COMMERCIALITY 3.1

3.1.0.1 Commercial assessments are conducted on a project basis and are based on the entity's view of future conditions. The forecast commercial conditions, technical feasibility, and the entity's decision to commit to the project are several of the key elements that underpin the project's resources classification. Commercial conditions include, but are not limited to, assumptions of an entity's investment hurdle criteria; financial conditions (e.g., costs, prices, fiscal terms, taxes); partners' investment decision(s); organization capabilities; and marketing, legal, environmental, social, and governmental factors. Project value may be assessed in several ways (e.g., cash flow analysis, historical costs, comparative market values, key economic parameters) (see Section 2.1.2, Determination of Commerciality). The guidelines herein apply only to assessments based on cash-flow analysis. Moreover, modifying factors that may additionally influence investment decisions, such as contractual or political risks,\* should be recognized so the entity may address these factors if they are not included in the project analysis.



PRMS 2007 (§3.1 ¶1) Investment decisions are based on the entity's view of future commercial conditions that may impact the development feasibility (commitment to develop) and production/cash flow schedule of oil and gas projects. Commercial conditions include, but are not limited to, assumptions of financial conditions (costs, prices, fiscal terms, taxes), marketing, legal, environmental, social, and governmental factors. Project value may be assessed in several ways (e.g., historical costs, comparative market values); the guidelines herein apply only to evaluations based on cash flow analysis. Moreover, modifying factors such contractual or political risks that may additionally influence investment decisions are not addressed. (Additional detail on commercial issues can be found in the "2001 Supplemental Guidelines," Chapter 4.)

\* Order of sentence reversed

The OGRC sub-committee noted that there is significant confusion around the concepts of economic and commercial.

**Glossary Economic:** A project is economic when it **has a positive undiscounted cumulative cash flow** from the effective date of the evaluation, the net revenue exceeds the net cost of operation (i.e., positive cumulative net cash flow at discount rate greater than or equal to zero percent).

**Glossary Commercial:** A project is commercial when there is **evidence of a firm intention to proceed with development within a reasonable time-frame**. Typically, this requires that the **best estimate case meet or exceed the minimum evaluation decision criteria** (e.g., rate of return, investment payout time). There must be a reasonable expectation that all required internal and external approvals will be forthcoming. Also, there must be evidence of a technically mature, feasible development plan and the essential social, environmental, economic, political, legal, regulatory, decision criteria, and contractual conditions are met.

## ECONOMIC EVALUATION / COMMERCIAL ASSESSMENT



- To aid in the distinction, we discuss the concepts in terms of first doing the **economic evaluation** to determine whether the project has positive cash flow. If it does have positive cash flow, the project is “economic”.
- Then we do the **commercial assessment**. There are two aspects of the commercial assessment:
  - 1) The financial aspects, where you consider all of the costs and revenues of the project, and determine whether the project generates sufficient cash flow to satisfy the entity’s financial requirements / meet the entity’s hurdle rate. In other words, does it provide a sufficient rate of return to justify the project?
  - 2) Commercial conditions other than financial: There must be a reasonable expectation that the other (non-financial) issues have been addressed:
    - Is there a firm intent to proceed in a reasonable time frame?
    - Are all required approvals in place or expected to be forthcoming?
    - Is there a reasonable expectation that the essential social, environmental, political, legal, regulatory, contractual, marketing conditions, etc. have been or will be met?

## COMMERCIALITY BASED ON 2P

- The commercial assessment may be applied to the 2P or Best Estimate forecast case. (2.1.3.7.2)
- Any 1P reserves associated with the project must be economic to be considered as reserves.
- If the 1P volumes are not economic, then the project only has 2P reserves. Recognition of 2P reserves does not elevate uneconomic 1P volumes to proved reserves status.

- Once a project has been implemented, the investment costs become sunk costs and are no longer relevant to recognizing reserves in the current (or future) time periods.
- At this point, the reserves must be Economically Producing. The concept of commerciality does not apply to Economically Producing.
- In other words, you have spent the capital, and now your revenue must be greater than the operating expenses. Hopefully, there will be enough revenue to not only cover the operating costs, but to pay back the capital investment costs also. But a payback of capital invested is not a part of Economically Producing. You do not have to achieve a return on capital / hurdle rate once production starts, just cover your operating costs.

- Attempts to calculate a rate of return from the effective date (as opposed to the beginning date of the project) forward will result in erroneous and, in most cases, highly inflated values, since the sunk costs are not being considered.
- Economic Limit is the point where revenues equal operating costs, and production beyond that will incur a loss. This is the end point for reserves.
- Commerciality is now limited to a project look back analysis, where all cash flow activity prior to the effective date is added to cash flows after the effective date to determine if the overall project has or is expected to achieve the original commercial goals.

## COMMERCIAL OR ECONOMIC?

- A new project must be commercial to have reserves
- A project that is:
  - economic may not be commercial
  - commercial is also economic
  - economic but not commercial may have contingent resources
  - economic but not commercial may become commercial in the future when enough capital investment has been expended (i.e. sunk costs)

## ADR – NEW ISSUE?

- PRMS has adopted the term ADR – Abandonment, Decommissioning, and Reclamation as a more comprehensive term to replace abandonment. 
- PRMS 2007 (§3.1.1, second bullet point) discusses that cash-flow-based resource evaluations shall reflect....estimated costs associated with the project...including environmental, abandonment, and reclamation costs.
- So really just a clarification of prior guidance; a new term but no new requirements are being imposed.

## ABANDONMENT, DECOMMISSIONING AND RECLAMATION

3.1.2.4 All costs, including future ADR liabilities, are included in the project economic analysis unless specifically excluded by contractual terms. ADR is not included in determining the economic producibility or for determining the point the project reaches the economic limit (see Section 3.1.3, Economic Limit). ADR costs are included for project economics but are not included in judging economic producibility or determining the economic limit (see Section 3.1.3, Economic Limit). ADR costs may also be reported for other purposes, such as for a property sale/acquisition evaluation, future *field* planning, accounting report of future obligations, or as appropriate to the circumstances for which the resource evaluation is conducted. The entity is responsible for providing the evaluator with documentation to ensure that funds are available to cover forecast costs and ADR liabilities in line with the contractual obligations.

- ADR costs are included in the project economic analysis unless specifically excluded by contractual terms.
- ADR not considered in determining economic producibility or economic limit.

### 3.1.2.8 SUNK COSTS

3.1.2.8 There may be circumstances in which the project meets criteria to be classified as Reserves using the *best estimate* (2P) forecast but the low case is not economic and fails to qualify for Proved Reserves. In this circumstance, the entity may record 2P and 3P estimates and no Proved Reserves. As costs are incurred in future years (i.e. become *sunk costs*) and development proceeds, the *low estimate* may eventually become economic and be reported as Proved Reserves. Some entities, according to internal policy or to satisfy regulatory reporting requirements, will defer reclassifying projects from *Contingent Resources* to Reserves until the low estimate case is economic.

- Paragraph is substantially the same as 2007's (§3.1.2 ¶15), but sunk costs introduced.

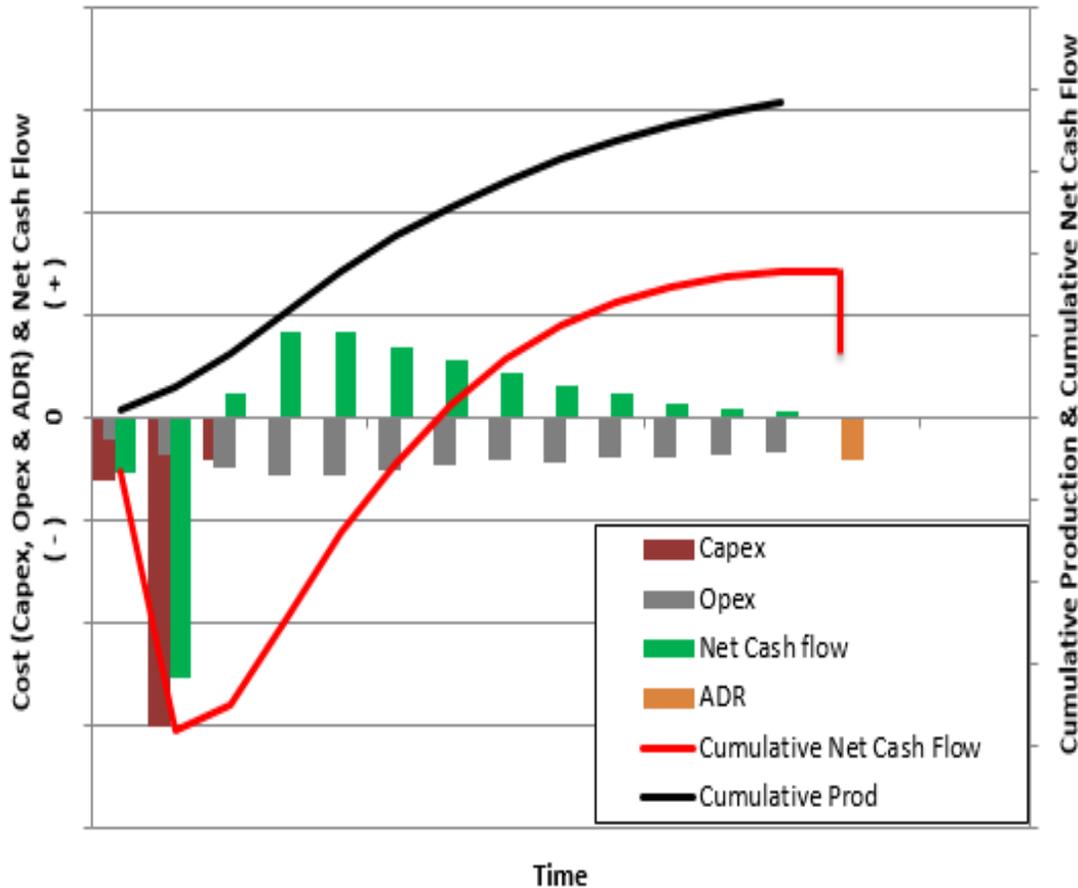
## SUNK COSTS NOW DEFINED

**GLOSSARY Sunk Cost:** Money spent before the effective date and that cannot be recovered by any future action. Sunk costs are not relevant to future business decisions because the cost will be the same regardless of the outcome of the decision. Sunk costs differ from committed (obligated) costs, where there is a firm and binding agreement to spend specified amounts of money at specific times in the future (i.e., after the effective date).

- Evaluations are point forward. Prior capital costs are sunk costs and not included in the cash flow analysis.
- Sunk costs are money spent before the Effective Date and not recoverable by any future action.
- Committed costs are those where there is a firm obligation to spend the money, but the money will be spent after the Effective Date. Therefore committed costs are not sunk costs until they are actually spent.



# NET CASH FLOW DIAGRAM



Included at 3.1.2.5 to help illustrate the concepts of cash flow over time.



### 3.1.3 ECONOMIC LIMIT

3.1.3.1 The economic limit is defined as the production rate at the time when the maximum cumulative net cash flow occurs for a project. The entity's *entitlement* production share, and thus *net entitlement* resources, includes those produced quantities up to the earliest truncation occurrence of either technical, license, or economic limit.

PRMS 2007 (§3.1.3, ¶1): Economic limit is defined as the production rate beyond which the net operating cash flows from a project, which may be an individual well, lease, or entire field, are negative, a point in time that defines the project's economic life.

- Defining EL as the maximum cumulative net cash flow clarifies the situation where cash flows may temporarily go negative but is expected to return to positive, and the positive more than compensates for the negative. The SEC view is that EL is reached at the first point where cash flows go negative.



## UNECONOMIC PRODUCTION 3.1.3.5

3.1.3.5 In some situations, entities may choose to initiate production below or continue production past the economic limit. Production must be economic to be considered as Reserves, and the intent to or act of producing sub-economic resources does not confer Reserves status to those quantities. In these instances, the production represents a movement from Contingent Resources to Production. However, once produced such quantities can be shown in the reconciliation process for production and revenue accounting as a positive technical revision to Reserves. No future sub-economic production can be Reserves.



## 3.2.2 CONSUMED IN OPERATIONS (CiO)

- Replaces 2007's term "Lease Fuel". Despite re-wording of the section, it is essentially unchanged from 2007. 
- Reserves are recommended to be sales quantities, but CiO may be included as reserves or resources.
- When included as reserves or resources, CiO **must** be stated and recorded separately from the sales portion (1.1.0.6 A 2). PRMS 2007 (§3.2.2, ¶12) said "**should** be reported separately". 
- Notes that CiO quantities must not be included in the project economics because there is neither a cost incurred for purchase nor a revenue stream, but since CiO may replace the expense of purchasing a fuel source, the net effect of CiO is implicitly included in the cash flow.
- CiO remains as one of the most polarizing issues in PRMS, with many commenters adamantly against the concept.

## 3.3 RESOURCES ENTITLEMENT AND RECOGNITION

- Expansion of the discussion in 2007 PRMS.
- 3.3.0.3 includes the basic components necessary for recognition:

3.3.0.3 The ability for an entity to recognize Reserves and Resources is subject to satisfying certain key elements. These include (a) having an economic interest through the mineral lease or *concession* agreement (i.e., right to proceeds from sales); (b) exposure to market and technical *risk*; and (c) the opportunity for reward through participation in *exploration*, *appraisal*, and development activities. Given the complexities of some agreements, there may be additional elements that must be considered in determining entitlement and the recognition of Reserves and Resources.



## SECTION 4 – ESTIMATING RECOVERABLE QUANTITIES



- No significant changes in Section 4.
- Analog section 4.1.1 reworded and reformatted but essentially unchanged.
- Volumetric Analysis section 4.1.2 reworded and reformatted but essentially unchanged.
- Recognition of Geostatistical and Integrated Methods.

- The 2007 PRMS did not discuss the requirements for a **Qualified Reserve Auditor** or a **Qualified Reserve Evaluator**. These terms were defined in the “*Standards Pertaining to the Estimating and Auditing of Oil and Gas Reserves Information*” (last revised 2007).
- Glossary now includes definitions for Qualified Reserve Auditor and Qualified Reserve Evaluator.
- A Qualified Reserve Auditor is now defined as having a minimum of ten years experience instead of five years.
- A Qualified Reserves Evaluator now has a minimum of five years of practical experience instead of three years.
- A new “*Standards Pertaining to the Estimating and Auditing of Oil and Gas Reserves Information*” is expected to be released shortly to conform to these changes.



## THAT'S NOT ALL!



- This short presentation did not cover all of the changes in the new PRMS, but the ones that I thought we could cover in the short time allowed, and those that would be of the most interest to this audience.
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