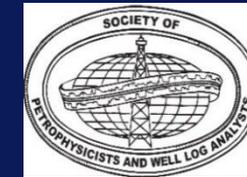
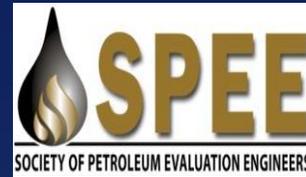


Petroleum Resources Management System (PRMS): Maintaining the Global Standard and Addressing Key Issues



Daniel DiLuzio, P.E.



Society of Petroleum Engineers
Distinguished Lecturer Program
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Disclaimer



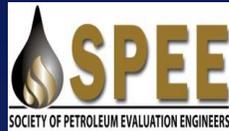
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PRMS 2018 Sponsors



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Society of Petroleum Evaluation Engineers (**SPEE**)

Society of Exploration Geophysicists (**SEG**)

Society of Petrophysicists and Well Log Analysts (**SPWLA**)

European Association of Geoscientists and Engineers (**EAGE**)

PRMS provides the hydrocarbon specifications for the United Nations Framework Classification for Resources (UNFC)

Outline



- Why do we need resources definitions?
- Scope of PRMS
- PRMS historical evolution
- PRMS overview and key principles
- Application examples and addressing key issues
 - Classification, commercial, usage of economic terms, transparency in Resources
- Conclusion

Drivers for Hydrocarbon Resources Definitions and a Management System

- Common, global language for industry
- Recognition of future value
- Account for risk of commerciality
- Account for uncertainty in forecast quantities
- Require recognition of evaluation conditions
 - Regulatory, economic, and operating
- Maintaining standard current as industry evolves



Scope of the PRMS



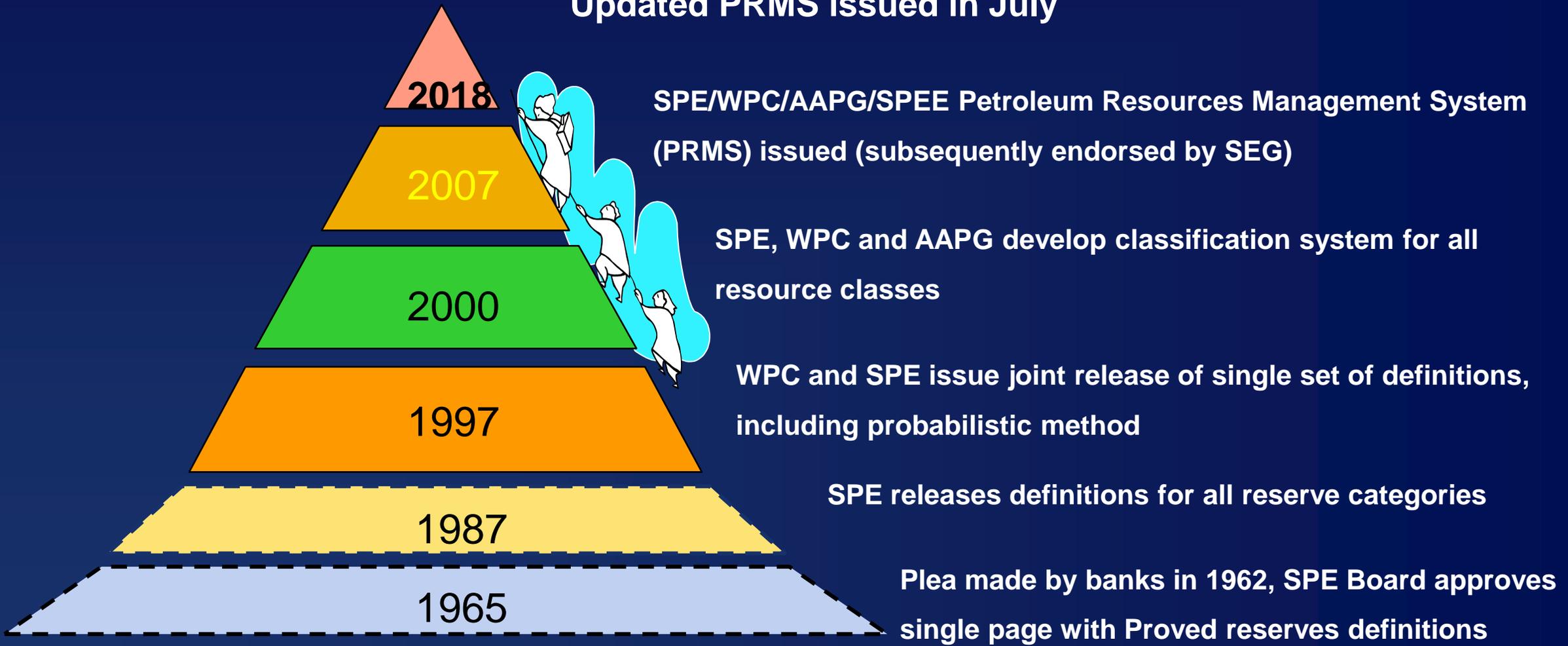
- Consistent petroleum resources evaluations
 - Technically sound industry practices
 - Not designed specifically for reporting
- Modeled to technical and business requirements
 - Needs of governments, financial institutions and industry
 - Referencing the PRMS, agencies develop reporting and disclosure rules and retain industry consistency



PRMS Historical Development



Updated PRMS issued in July

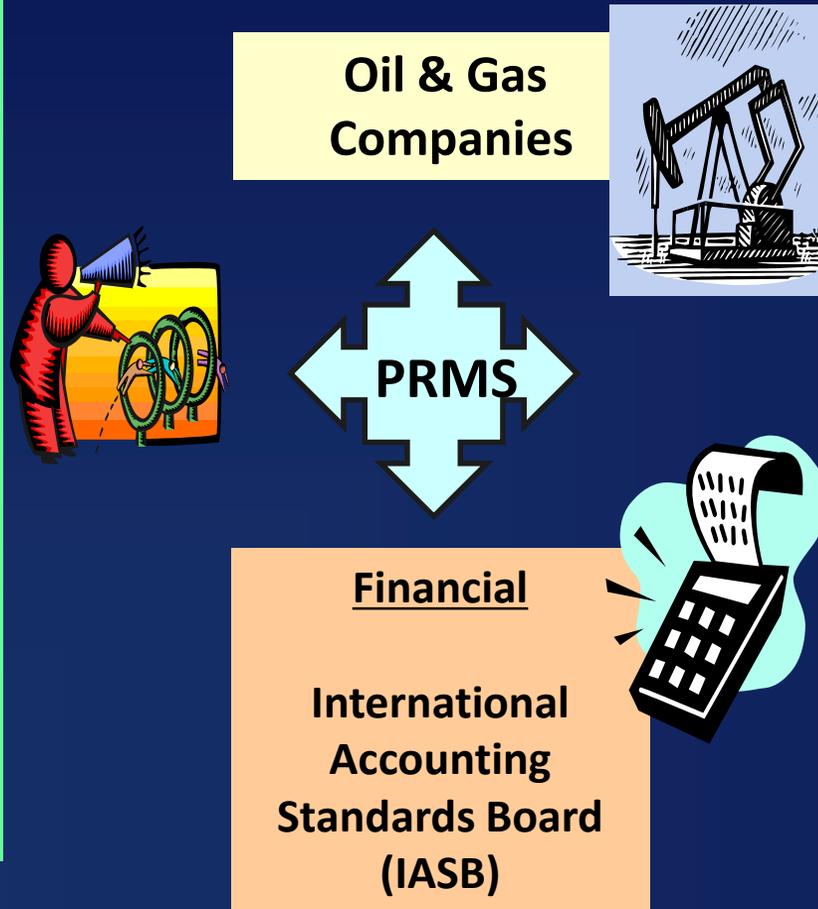


PRMS Adoption Status as of 2018

Securities Regulators

USA (SEC)
Canada (CSA)
Hong Kong
(HKEX)
Australia (ASX)
UK (LSE-AIM)
Singapore
Argentina
Netherlands
Brazil
Italy
France
South Africa
(ESMA)

PRMS is implicitly or explicitly referenced by:



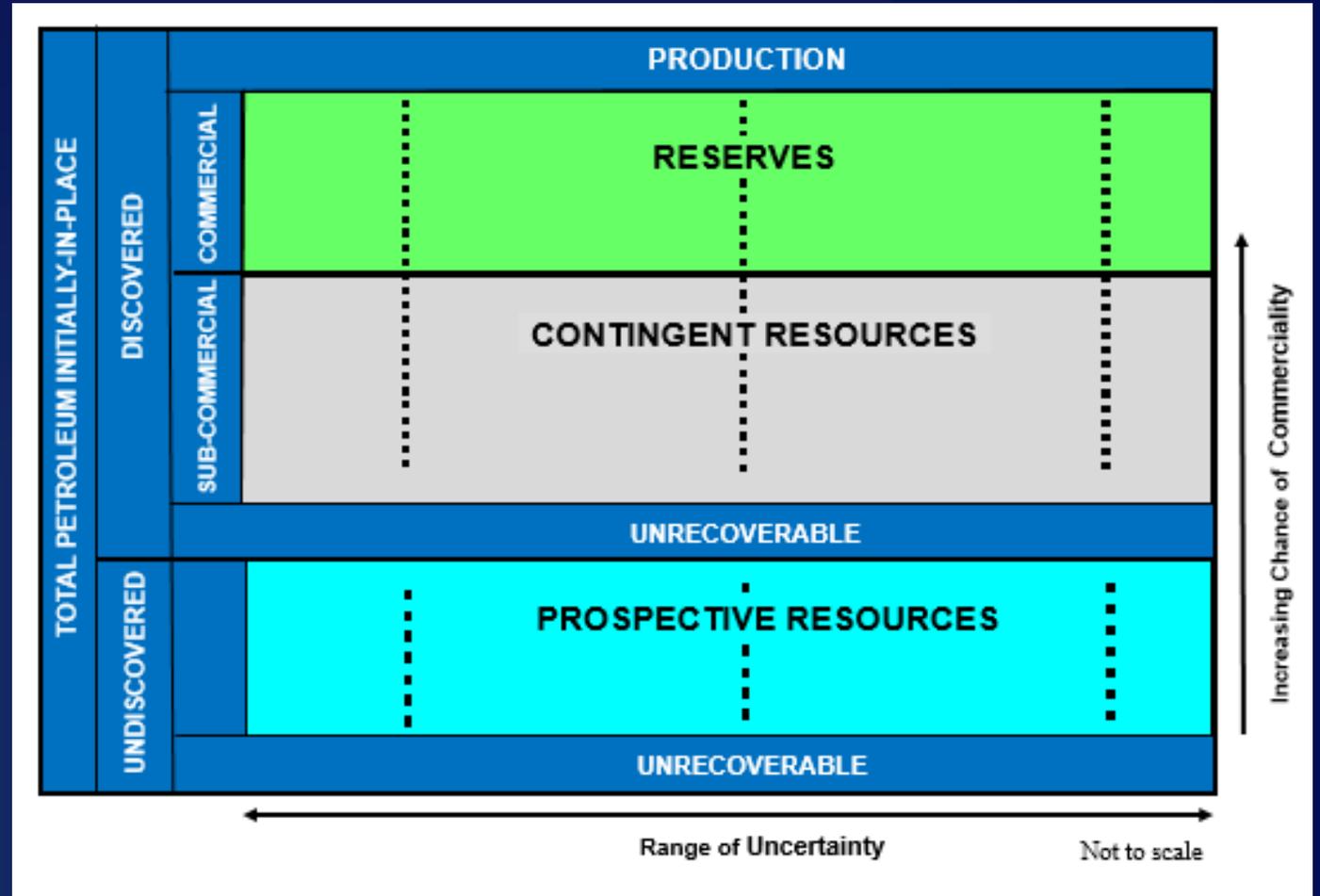
Government Reporting

OPEC
NPD - Norway
BOEM - USA Offshore
ANP - Brazil
CNH – Mexico
ANH - Colombia
UNFC – United
Nations
& several others



Principles of PRMS

- “Project–based” system
 - Classification based on project’s chance of commerciality
 - Categorization is the project’s recovery uncertainty range
- Provides granularity for project management



PRMS – Clarification of the ‘Project’



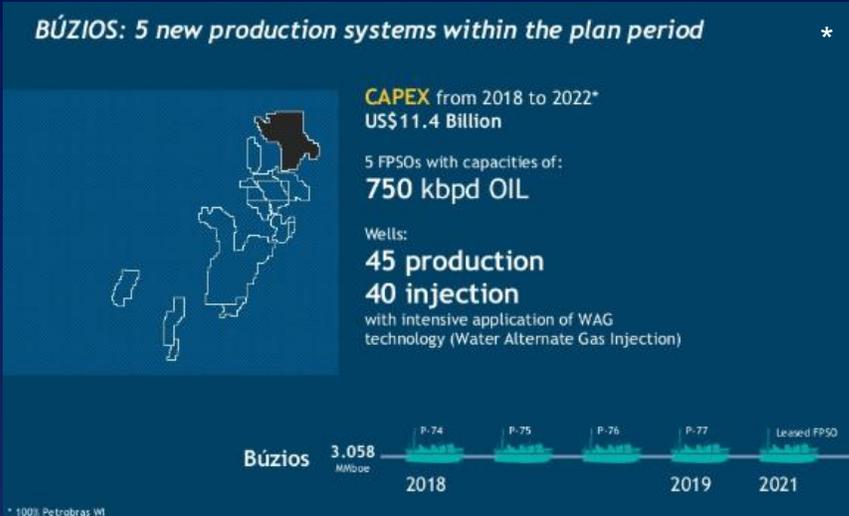
- Project can be a single well, single reservoir, a field, an incremental project in an existing field, or the producing wells and related facilities of an existing field (e.g. developed case)
- Maturity level (sub-class) at which a decision is made on whether to:
 - Proceed (i.e. spend money),
 - Suspend / recycle, or
 - Stop / remove
- Basis for the commercial maturity test
- Project scope has Low, Best and High range



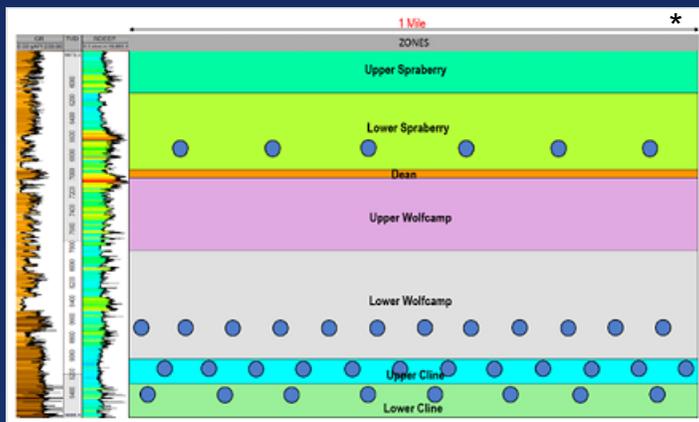
PRMS Applies to All Types of Projects



Deepwater, complex island and oil sand surface mining projects, to...



Unconventional project(s) and others ...



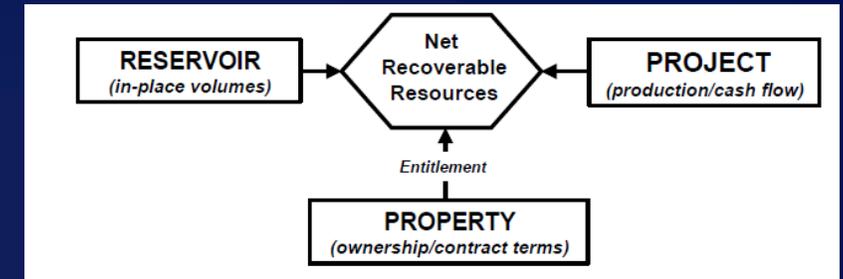
* Illustrative annual FFO² profiles³

	Initial capital	Decline rate	Sustaining costs	Operating cost	Reservoir risk	Recovery factor
Mining	High	Very low	Very low	Medium	Very low	Very high
In situ	Medium	Low	Low	Low	Low	High
Offshore	High	High	Medium	Very low	Medium	Medium
Tight oil	Low	Very high	High	Medium	High	Low

* see reference source citation slide 40

Principles of PRMS

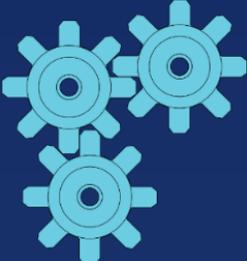
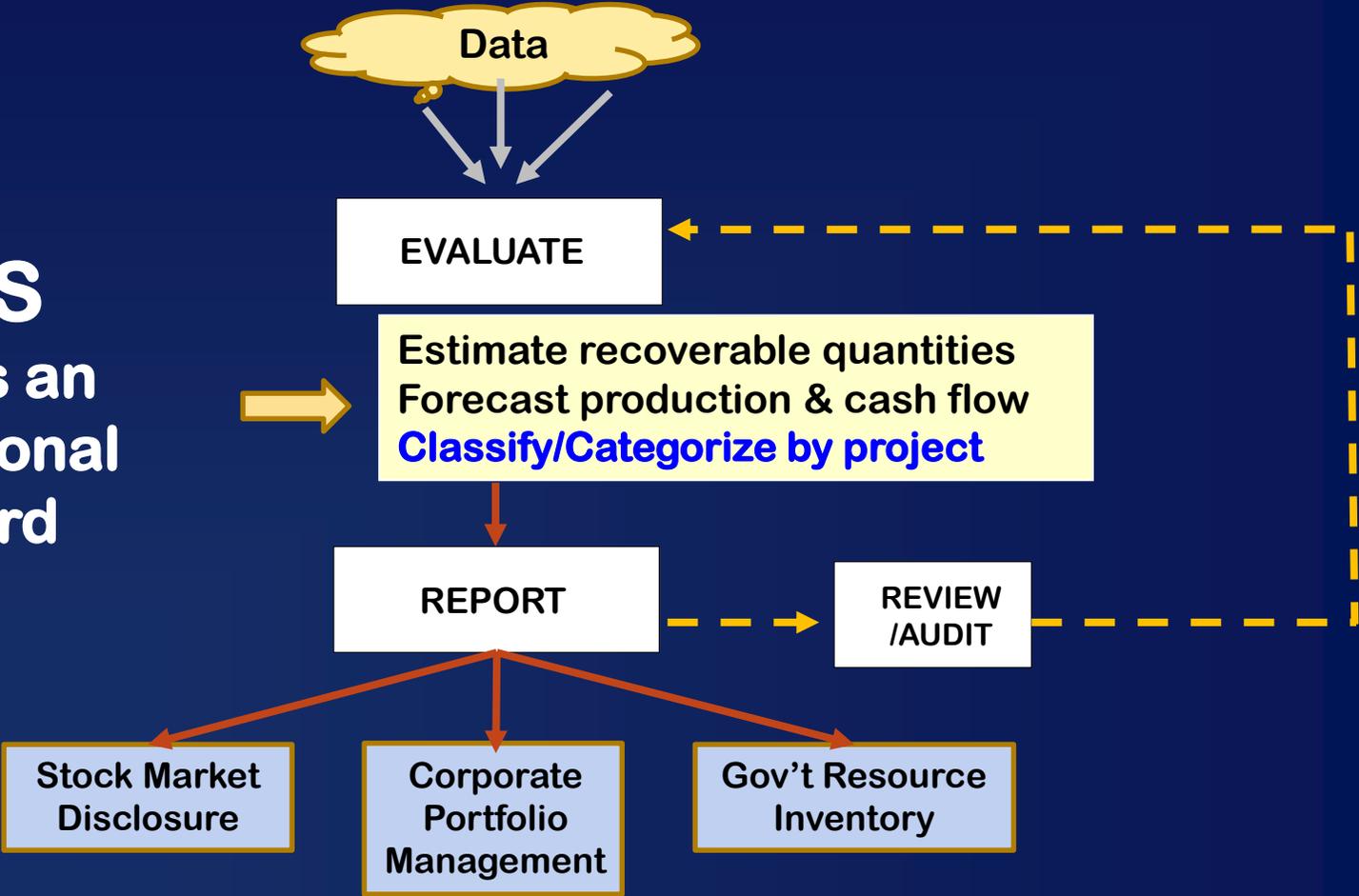
- Net resources (ownership/entitlement)
 - Government / Regulator may require alternative basis
 - License duration terms
 - Technical limit
 - Evaluation at different ownership
- Forecast conditions used
- Deterministic and/or probabilistic methods
- Reserves are estimated as sales quantities
 - Fuel reserves allowed, must be separate



Petroleum Projects Evaluation Process



PRMS
provides an
international
standard



Reserves

Reserves require four criteria that must be present:

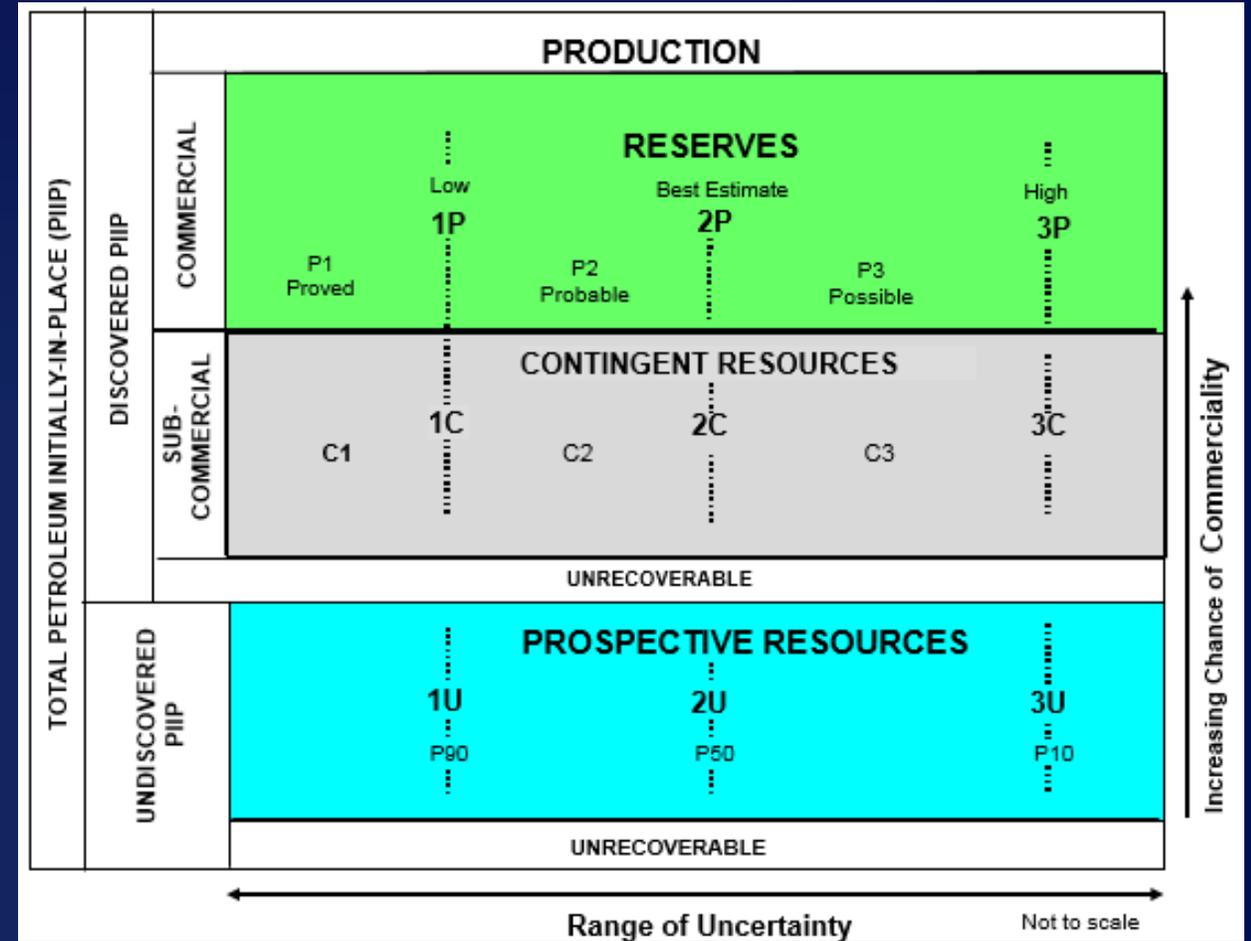
- Discovered
- Recoverable
- Commercial and
- Remaining, based on the development project(s) applied



PRMS – Resource Classification Framework



- Common language for communicating
 - Confidence of project's maturation
 - Resource range
- Addresses the total resources
 - In-place
 - Discovered and undiscovered
 - Production, reserves, contingent resources, prospective resources and unrecoverable
- Chance of a project's commerciality (y – axis)
- Project's range of resource uncertainty (x-axis)



Chance and Uncertainty



In the context of PRMS, **chance** (1-risk) represents the **chance of commerciality** and **uncertainty** represents the **range of possible outcomes**

Chance (y-axis) and uncertainty (x-axis) are distinct



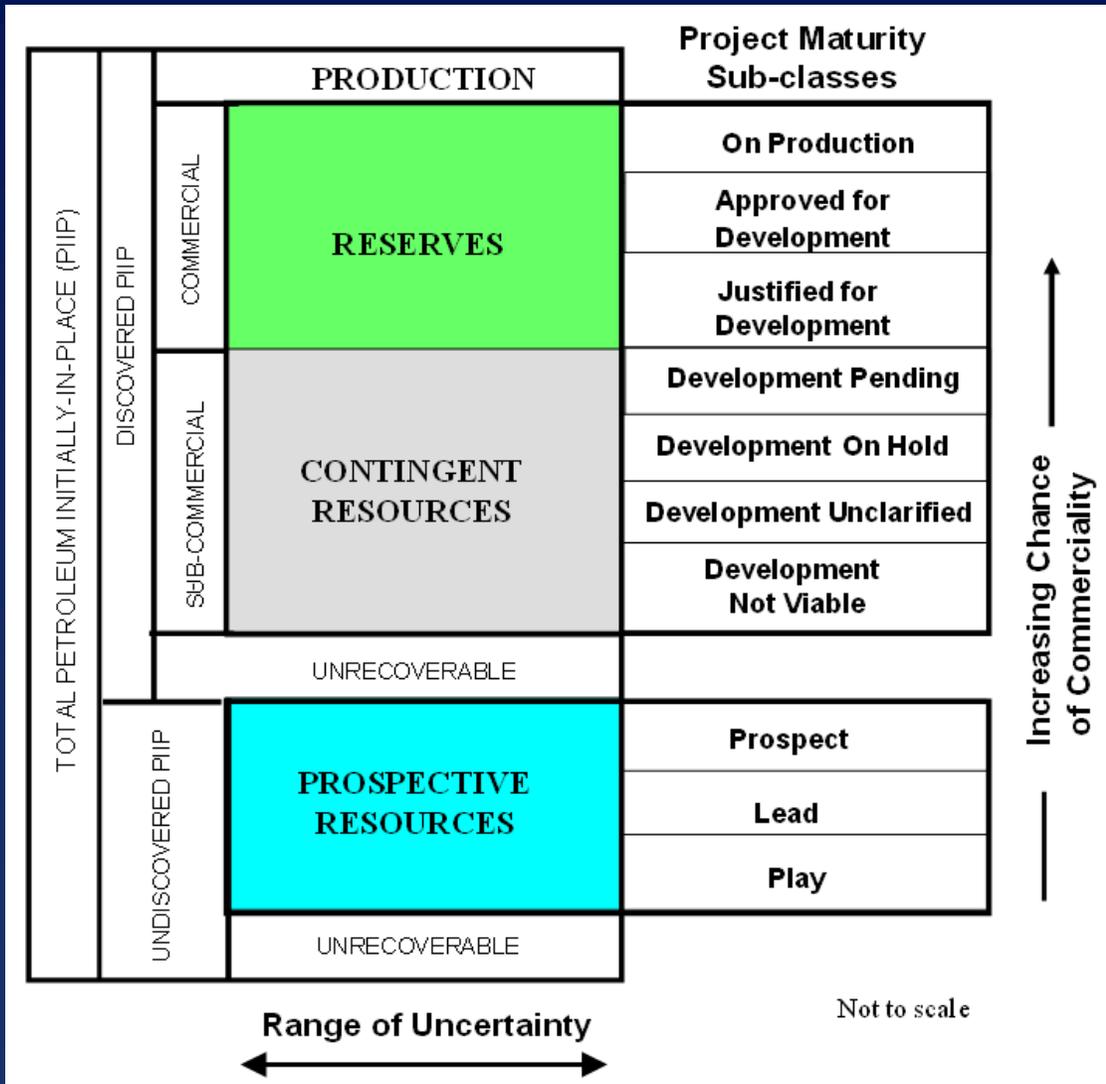
- Project maturity status and defined commercial conditions are associated with projects' commercial chance of occurrence (Y axis)
- Uncertainty in recoverable quantities is technical (X axis).

Resources chance of success can be described as:

- Contingent Resources carry a Chance of Commerciality (P_c) which is equal to the Chance of Development (P_d)
- Prospective Resources carry a Chance of Commerciality (P_c) which includes both the Chance of Development (P_d) and the Chance of Discovery (P_g)



PRMS Project Maturity Sub-classes



Prior to Final Investment Decision

To manage projects and their maturity, evaluators may use the Project Maturity sub-classes

Option to include quantitative chance of commerciality (Pc), state what is applied

Application Examples and Addressing Key Issues

- Classification
- Economic vs. Commercial
- Usage of economic terms
- Transparency in resources reporting

PRMS – Classification vs. Categorization

- Commercial conditions are associated with resource classes and not with categories
 - ‘Split conditions’ are **not allowed**
 - Cannot use different defined commercial conditions, such as prices, inflation, and escalation
 - ‘Split classification’ is having a project’s resources assigned to more than one class is also **not permitted**
 - Project cannot have both contingent resources and reserves
 - Cannot have 1C, 2P and 3P when the 1P is zero



Clarification: Economic and Commercial



Project is **Economic** when the Entity's net revenue has a positive undiscounted cumulative cash flow from the effective date of the evaluation.

- Determined for “the Project” and NOT for the individual Reserves categories of the Project

Use Best Estimate net recoverable quantities of a project (or Low case for more conservative evaluations) meeting the minimum evaluation criteria (e.g., $NPV \geq 0$) up to the Economic Limit cut off (maximum cumulative net cash flow).

A project is **Commercial** when the Entity has demonstrated a firm intention to proceed with development based on satisfying the internal decision criteria, typically rate of return at or above the internal hurdle rate, and other technical and commercial criteria contingencies.

- Economic is a criterion of Commerciality determination

Who is Tested to Pass Commercial Maturity?



Decisions that management may make on a project are:

- Proceed,
 - Recycle, or
 - Stop
-
- Commerciality determination is based on the best estimate / P50 forecast (or more conservative case)



Not all
categories
are tested!

Project Commerciality Determination

Commerciality Elements	Low Estimate /P90 to Proved	Best Estimate /P50 to 2P	High Estimate /P10 to 3P
Development Plan		Yes	
Financial appropriations		Yes	Yes
Internal decision criteria (ROR \geq cost of capital or hurdle rate) [stricter cases (e.g. P90) may be used]	No	Yes	No
Reasonable time-frame		Yes	
Positive economics based on entitlement forecast	Yes	Yes	Yes
Market for forecast sales quantities		Yes	
All other streams have known dispositions		Yes	
Production and transport facilities will be available		Yes	
Legal, contractual, environmental, regulatory and government approvals in place or forthcoming		Yes	
Social and other economic concerns addresses		Yes	



Clarification: P90 / Low Case Uneconomic



Project meets criteria to be classified as Reserves using the best estimate (2P) forecast case but the low estimate standalone is not economic

So potential “Proved Reserves” are not economic!

Reserves existing are 2P and 3P, but not Proved

- 2P Reserves can exist without 1P
- Non-economic low case provides Entity a view of the downside exposure to the Project

As development proceeds, the low estimate may eventually satisfy economic criteria and be reported as Proved Reserves.

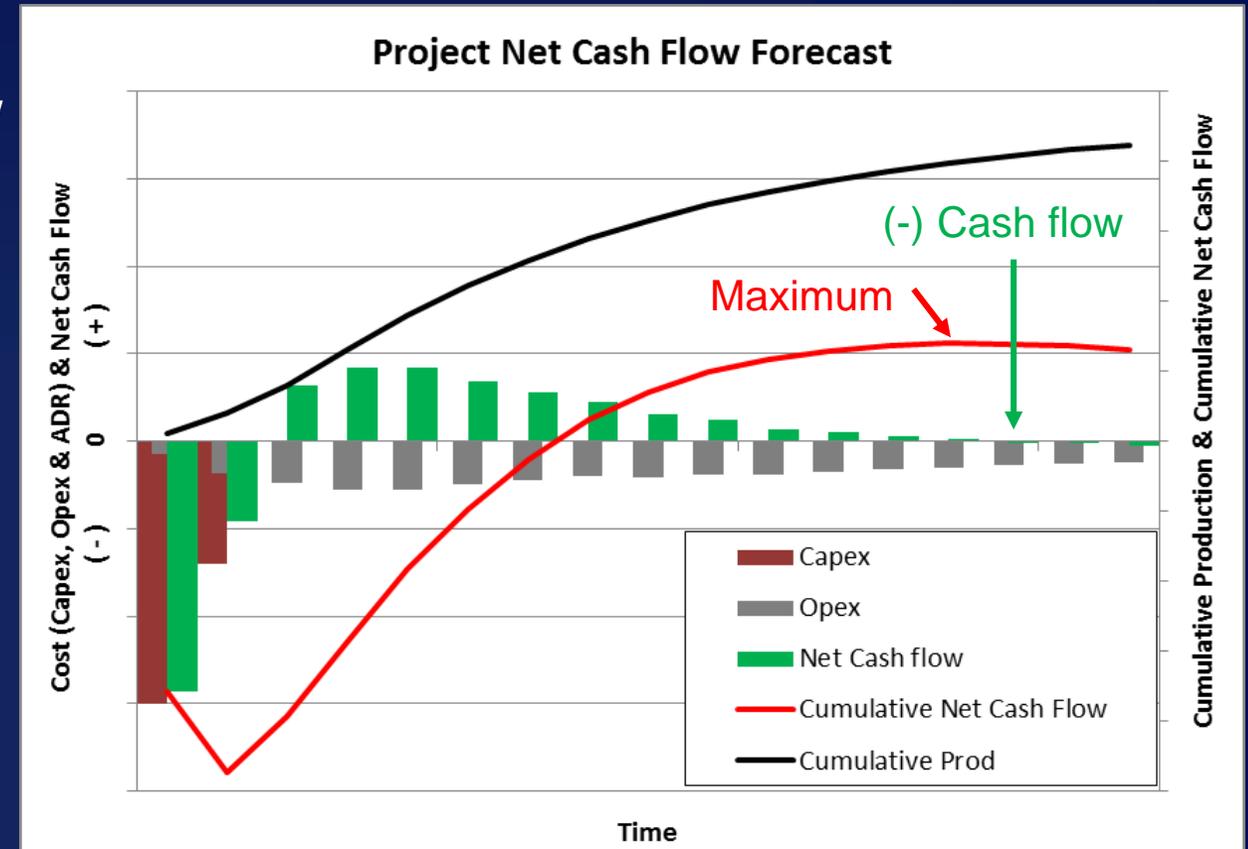
Project Net Cash-Flow Evaluation Elements



- Limited by period of economic interest or reasonable certainty of renewal
- Utilizes forecast production, costs and schedule
- Applies set of defined conditions
 - May be either constant case (current economic conditions) or forecast case
- Entity's net resources are defined by the earliest truncation of technical, license, or economic limit
- Example: undeveloped project (next slide)

Clarity in Use of “Economic”

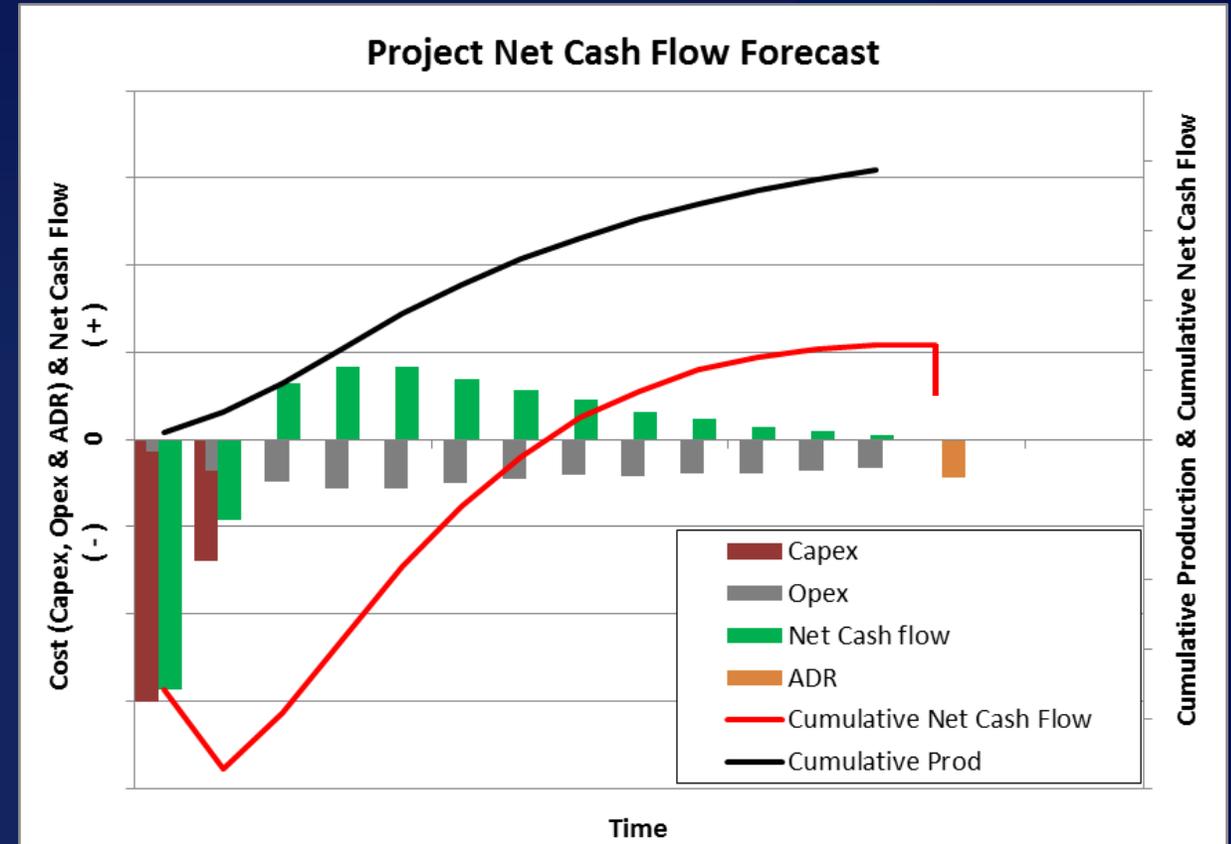
- Is the project **economic**?
 - Project has a positive undiscounted cumulative cash flow from the date of the evaluation
- Is it **economical producible**?
 - Net cash flow exceeds net costs (ADR* not included)
- When is the **economic limit**?
 - Time when maximum cumulative net cash flow occurs (ADR* not included)



* ADR – Abandonment, Decommissioning and Restoration

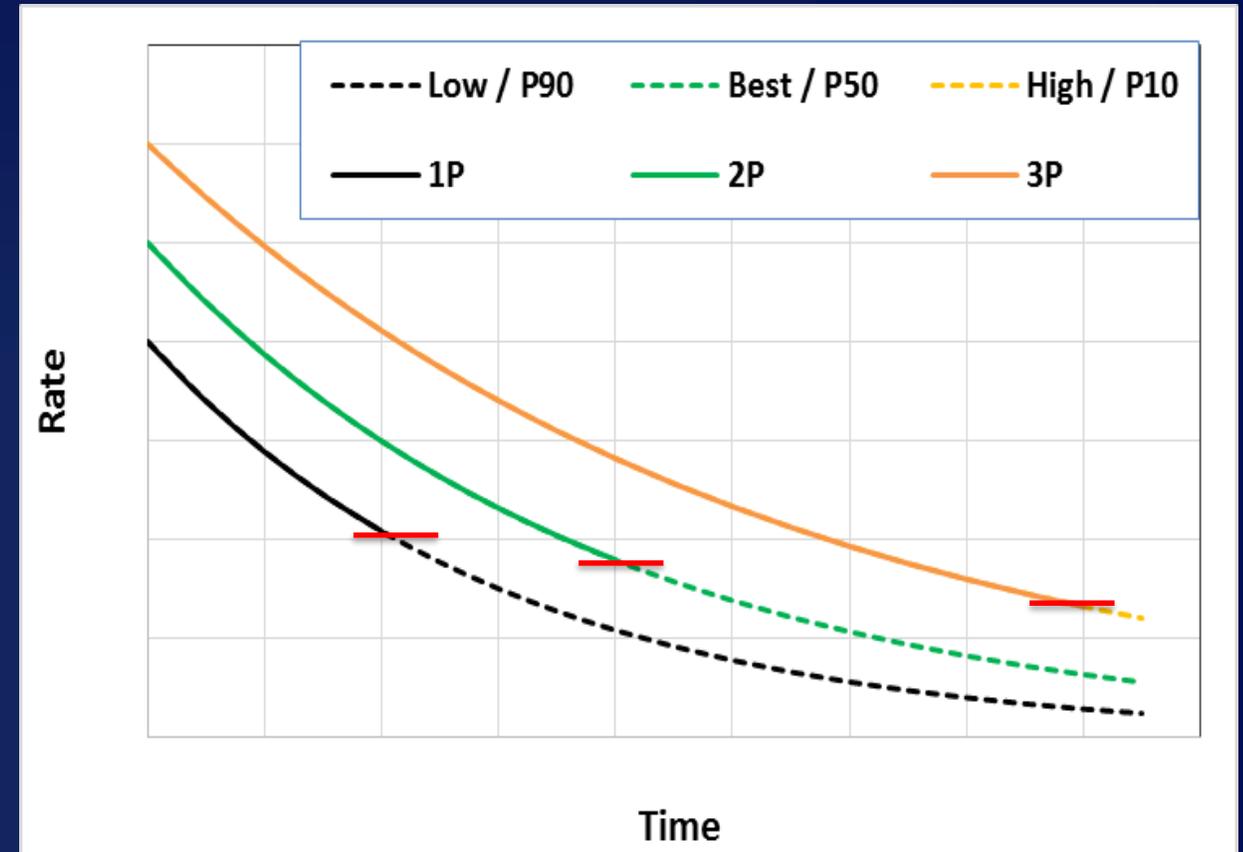
Clarity in Use of “Economic”

- Economic – Yes
 - Cumulative net cash is positive
- Economical Producible – Yes
- Economic Limit
 - Date where truncation occurs defines limit of Reserves
 - Volumes after truncation are not Reserves



Clarity in Economic Limit Determination

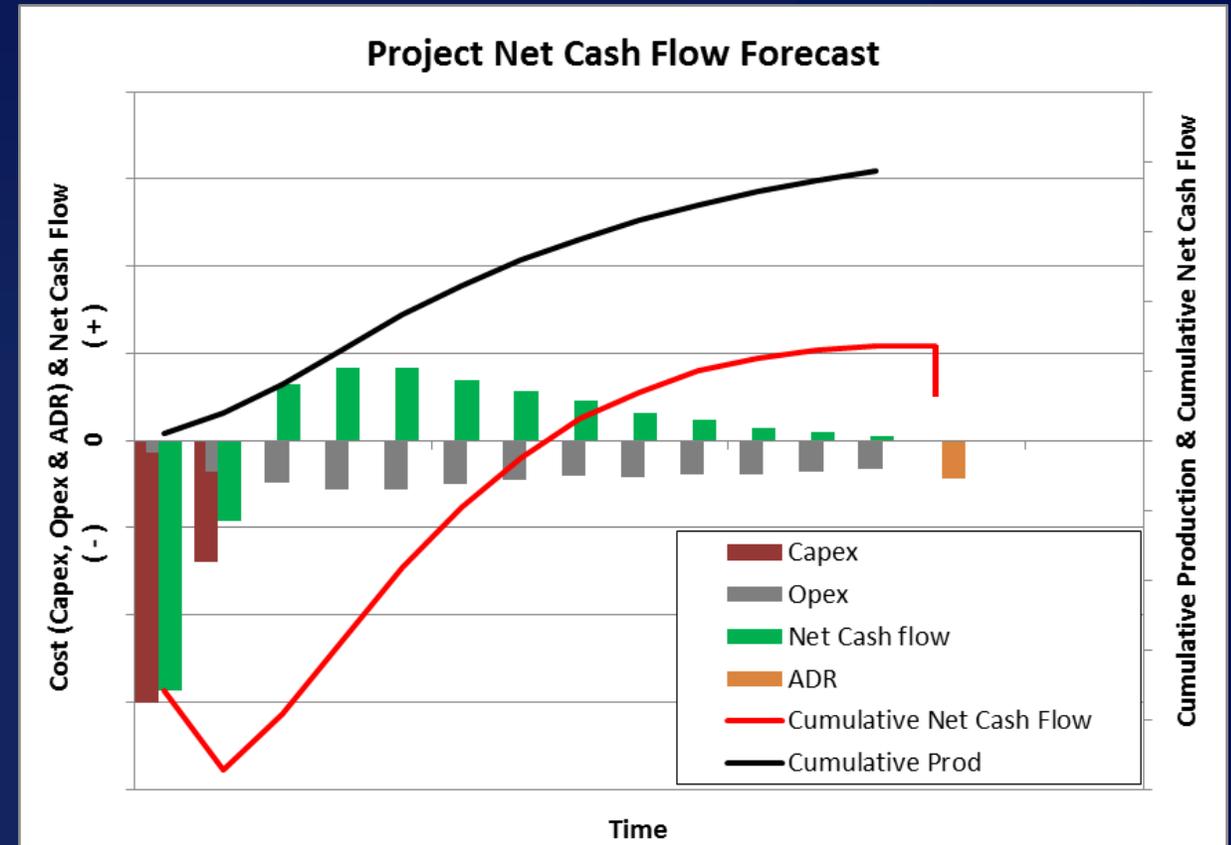
- Economic Limit is the date when the net operating cash flows is negative
 - Is conducted for each category
 - Low Estimate (P90),
 - Best Estimate (P50), and
 - High Estimate (P10)



Economic Determination: 2P Case

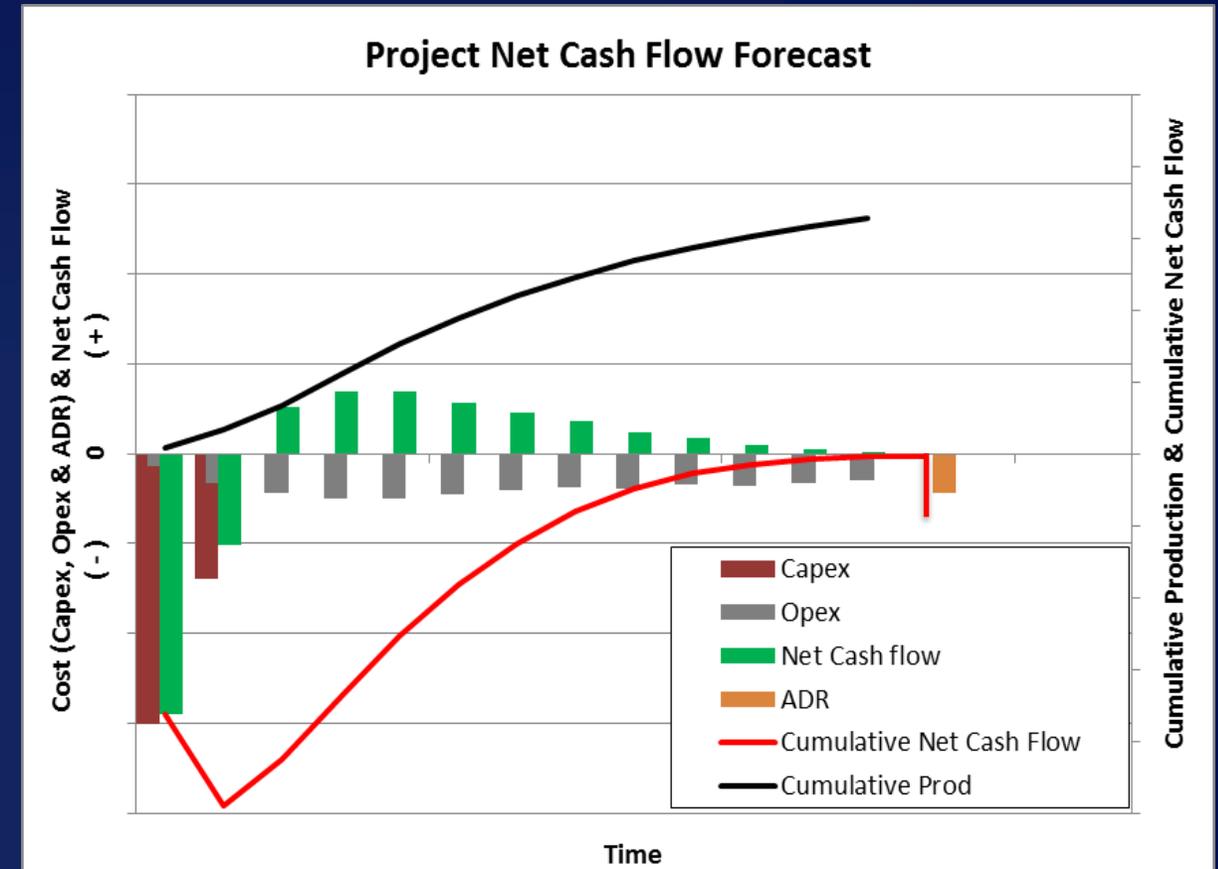
- Undeveloped project
- Cumulative net cash-flow must exceed ADR liabilities
- 2P economics > 0
- With all other Reserves requirements met...

➤ 2P Reserves exist



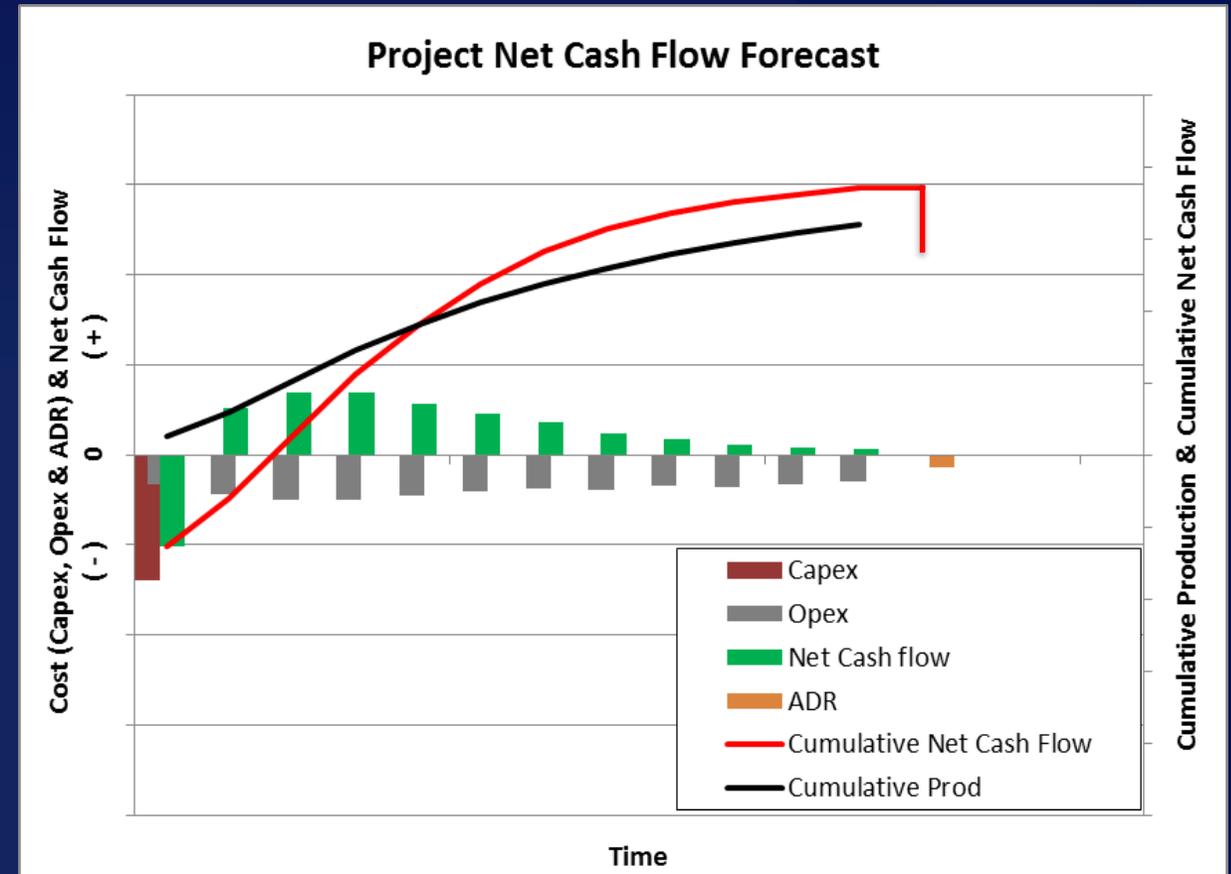
Checking for the Existence of Proved

- Evaluation “as of” date is prior to project spend
- Proved case is not economic
 - $1P = 0$ MMboe
- Capital investment decision made on 2P projection



Do We Have Proved? 1 Year Later

- Project's low case life-cycle economics have not changed
- Proved case is economic and 1P exist
 - Reserves use future cash flow
 - Timing (as well as other parameters) are important



Abandonment, Decommissioning & Reclamation



ADR costs are included in the economics when evaluating **undeveloped**

ADR is not required for Reserves determination of the economics of a **developed** well currently on production

ADR costs may also be reported for other purposes (e.g., property sale/acquisition evaluation, future field planning, accounting report of future obligations)

The entity is responsible for providing documentation to ensure that funds are available to cover ADR liabilities in line with the contractual obligations.

PRMS Treatment of Lease Fuel

CiO is that portion of produced petroleum **Consumed in Operations** as fuel before the reference point.

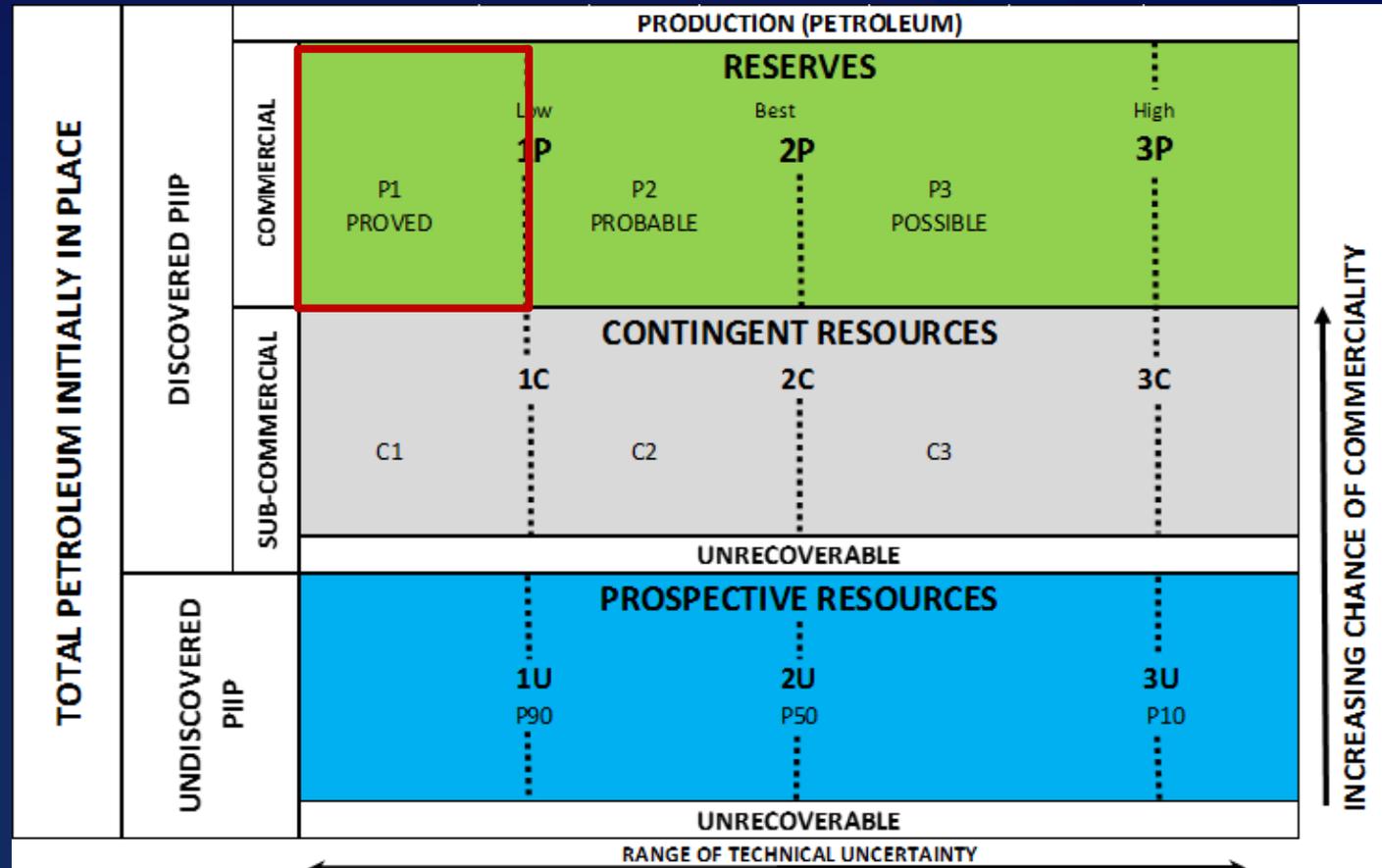
- + **CiO** reduces operating costs – replaces energy that would otherwise be purchased. Thus, may be considered a “marketable resource” (if there is a market).
- + **Reserves are recommended to be Sales quantities**, however CiO may be included
* but ...
- + when included, CiO **must** be stated and recorded separately from the Sales portion
- + Resources that are lost, flared, vented or are purchased for fuel use are excluded from Reserves and Resources classes



(* some jurisdictions prohibit inclusion of CiO in reported reserves)

Companies that Report under SEC...

- SEC allows for reporting Proved, Probable and Possible
- SEC provides a comparative valuation method amongst companies
- Most companies report only Proved
- Challenge reporting projects companies plan to execute...
- Limited PUDs disclosed results and is the valuation still comparative?

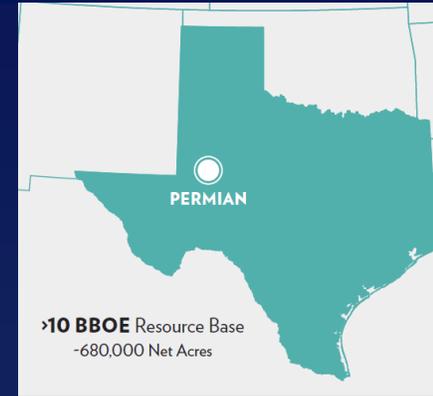


Companies that Report under SEC...



About Pioneer*

- Top-tier, independent exploration and production company
- Proven track record of adding value for its shareholders
- All proved reserves, production and resource potential in low-risk, predictable basins in the United States
- Multi-year drilling inventory in its core operating areas



	Total (MMBOE)
Proved Developed Reserves:	
December 31, 2019	1,077,997
December 31, 2018	963,118
December 31, 2017	903,373
Proved Undeveloped Reserves:	
December 31, 2019	57,655
December 31, 2018	85,902
December 31, 2017	81,993

- Permian focus
- Proved undeveloped <1 year of drilling

➤ How to best convey?

- Undeveloped reserves value, and
- Resource potential (risked and/or unrisked)

'19 Activity and Year-end '19 Reserves

- 2019 spud 15 development wells and 352 exploration/appraisal wells
- '19 Prod. 128 MMBOE
- '19 year-end P1 / PUD: 1136 / 58 MMBOE
- 95% PDev / 5% PUD of Proved
- Proved / Prod. ~ 8.9 years
- PUD / Prod. ~ 0.5 years

* see reference source citation slide 40

Conclusion



- PRMS is the global resource classification system
 - Addresses needs for managing resources
 - Resource definitions
 - Recognized by governments, regulators, and financials
- PRMS allows portfolio transparency of its projects: viability, uncertainty, and risk
- SPE OGRC, together with the PRMS Sponsors, will continue to educate, discuss issues, and maintain the PRMS evergreen



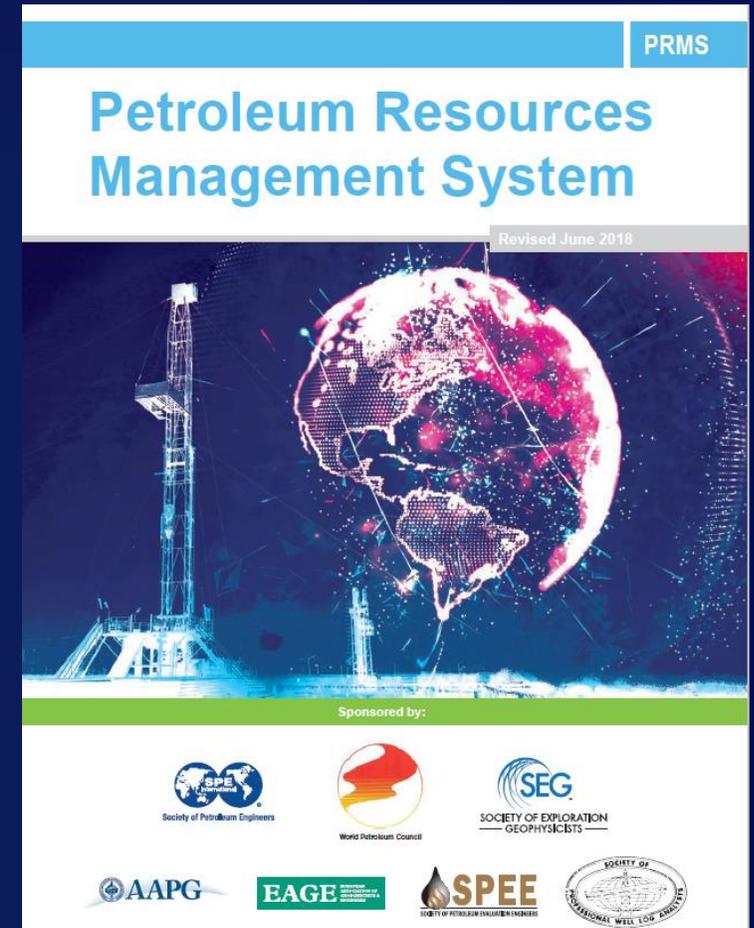
Acknowledgments

- SPE Oil and Gas Reserves Committee (OGRC)
- OGRC PRMS Update Sub-Committee: Bernard Seiller, John Etherington, Steve McCants, Dan Olds, Rawdon Seager and Melissa Schulte (Secretary)
- WPC, AAPG, SPEE, SEG, EAGE and SPWLA, collectively the PRMS Sponsor Societies

Reference

Petroleum Resources Management System

<https://www.spe.org/en/industry/petroleum-resources-management-system-2018/>



What's Next?

- SPE Audit Standards - **issued 2019**
- FAQ's to be posted on SPE website
- Education Programs (ATW's, training courses)
- "Examples" to be available on SPE website
- Update to the PRMS 2011 Guidelines
- Continue collaboration with other standards (government, national and international)



Questions?

If questions arise later, you can contact me at:
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Slide References



- Slide 11: Petrobras “2018-2022 Business and Management Plan offshore” ...slide #30
 - <http://www.investidorpetrobras.com.br/en/presentations/business-management-plan>
- Slide 11: Aramco’s Manifa field development
 - (<http://www.saudiaramco.com/en/home/inaugurations/manifa-project.html>)
- Slide 11: CBC Feb 22, 2016 article with oil sand photo
 - <https://www.cbc.ca/news/canada/edmonton/alberta-oilsands-monitoring-needs-to-be-clearer-to-public-review-1.3458235>
- Slide 11: Suncor slide #31 “Q1-2018-Investor-Presentation-English” published May 31st, 2018 displaying types of projects for various plays and investment profile
 - <https://www.suncor.com/investor-centre/presentations-and-key-dates#>
- Slide 34: Pioneer Investor page cites all Proved as low risk but later stating only ~10% is PUD... While also providing insight in the long term with its drilling inventory
 - <http://investors.pxd.com/investor-overview>
- Slide 34: Pioneer “JP Morgan Energy Conference June 19th, 2018” slide #24
 - <http://investors.pxd.com/news-releases/news-release-details/pioneer-natural-resources-present-jp-morgan-energy-conference>
- Slide 34: Pioneer “2019 10-K and Annual Report”
 - https://materials.proxyvote.com/Approved/723787/20200327/AR_425104.PDF

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Daniel DiLuzio is a Reserves Consultant in Chevron's Global Reserves group. Dan has 34 years of global industry experience with Shell International, Total E&P, Newfield, and Encana in various engineering and management roles in: development, operations, country management, business development, reserves, and reservoir engineering.

Dan is a member, and prior chair, of the SPE Oil and Gas Reserves Committee (OGRC) since 2011 and was chair of the PRMS Update Sub-Committee delivering the PRMS 2018. He has served as SPE's representative to the United Nations on classification of resources (UNFC), and various SPE committees for resource evaluation ATWs. He is also an SPEE member and a registered professional engineer in the state of Texas.

Dan holds BS and MS degrees in Petroleum Engineering from Louisiana State University.

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Numbers to Count On. Experts to Trust.