

Understanding Reserves and Resources Estimation According to SPE-PRMS



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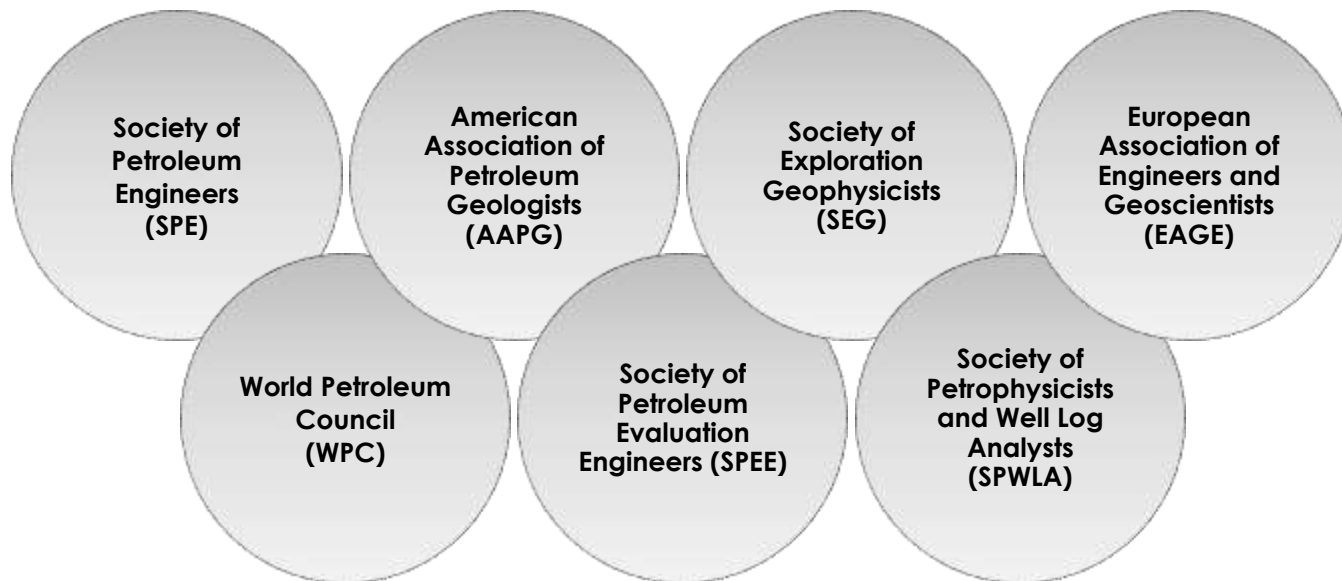


The Society of Petroleum Engineers – Petroleum Resources Management System (SPE-PRMS) is a widely used industry standard for estimating oil and gas reserves and resources approved by the SPE and other co-sponsoring organizations.

These definitions and the related classification system provide a measure of comparability, reduce the subjective nature of resources estimation, and improve clarity in global communications regarding petroleum resources.

There are two key documents:

- Petroleum Resources Management System, Revised June 2018
- Guidelines for Application of the Petroleum Resources Management System, November 2011



PRMS: A Project Based Classification System

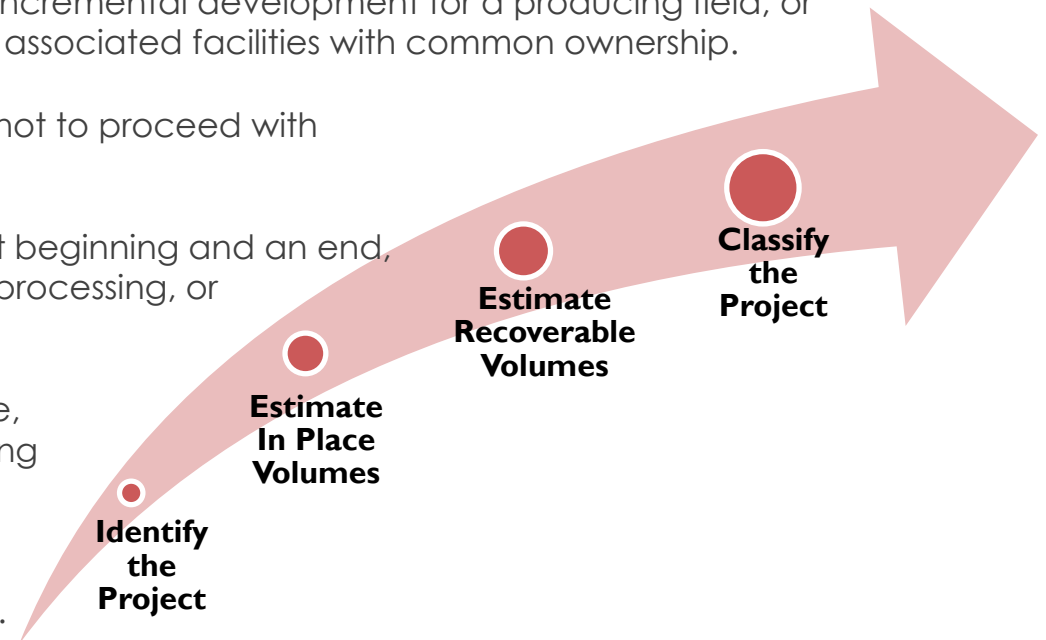


PRMS is a **project based classification system**. The resources evaluation process consists of:

- Identifying a recovery project, or projects, associated with a petroleum accumulation(s)
- Estimating the quantities of petroleum initially in place
- Estimating the portion of those in-place quantities that can be recovered by each project
- Classifying the project(s) based on its maturity status or chance of commerciality

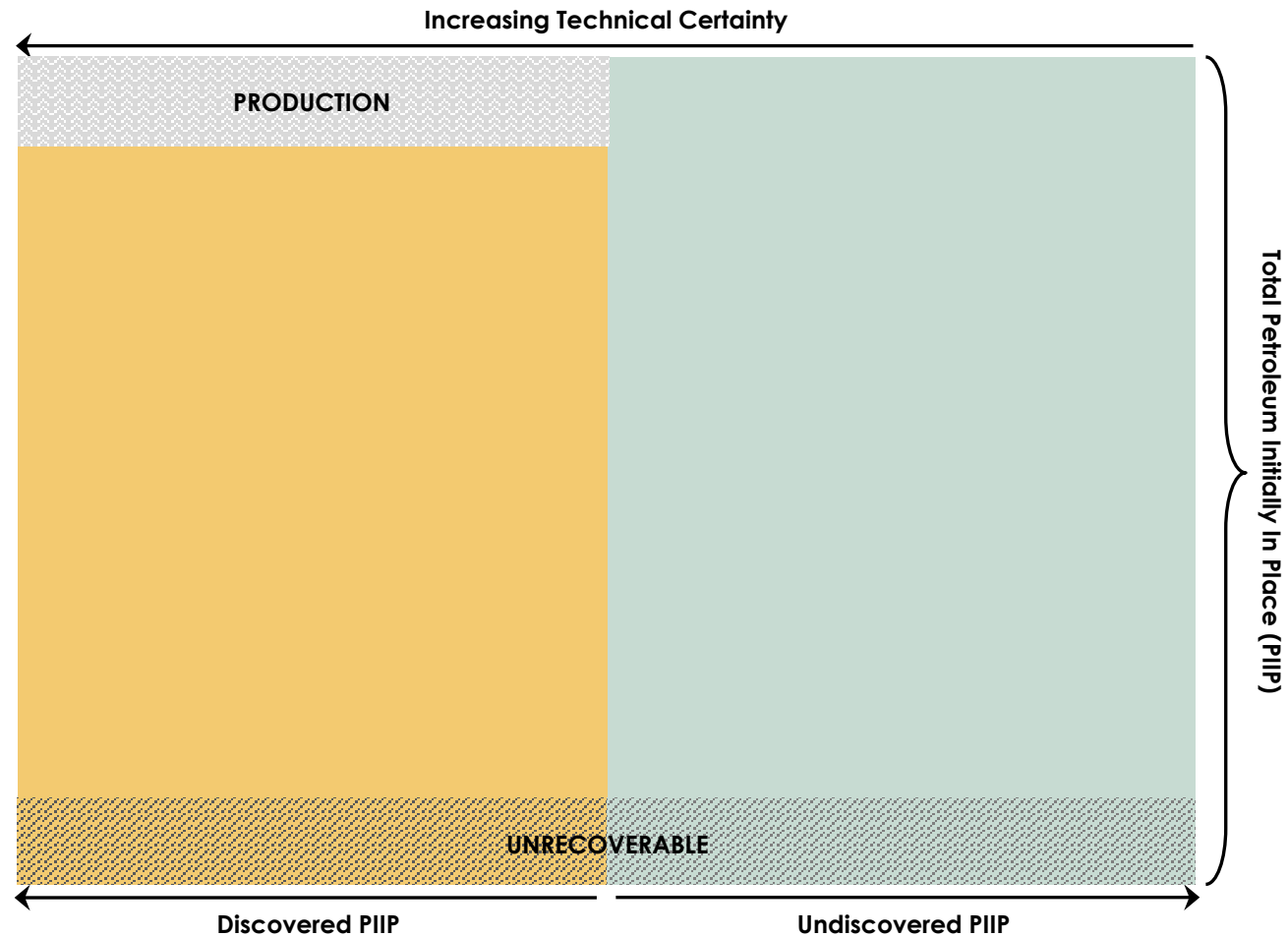
What is a project?

- The link between the petroleum accumulation and the decision-making process.
- The primary element considered in resources classification.
 - Net recoverable resources are the incremental quantities derived from each project.
- The development of a single reservoir or field, an incremental development for a producing field, or the integrated development of several fields and associated facilities with common ownership.
- The level at which a decision is made whether or not to proceed with development.
- Typically a single engineering activity with a distinct beginning and an end, which, when completed, results in the production, processing, or transportation of crude oil or natural gas.
- Typically has a definite cost estimate, time schedule, and investment decision, and is approved for funding by management.
- May be defined at various levels and stages of maturity and may include all categories of reserves.



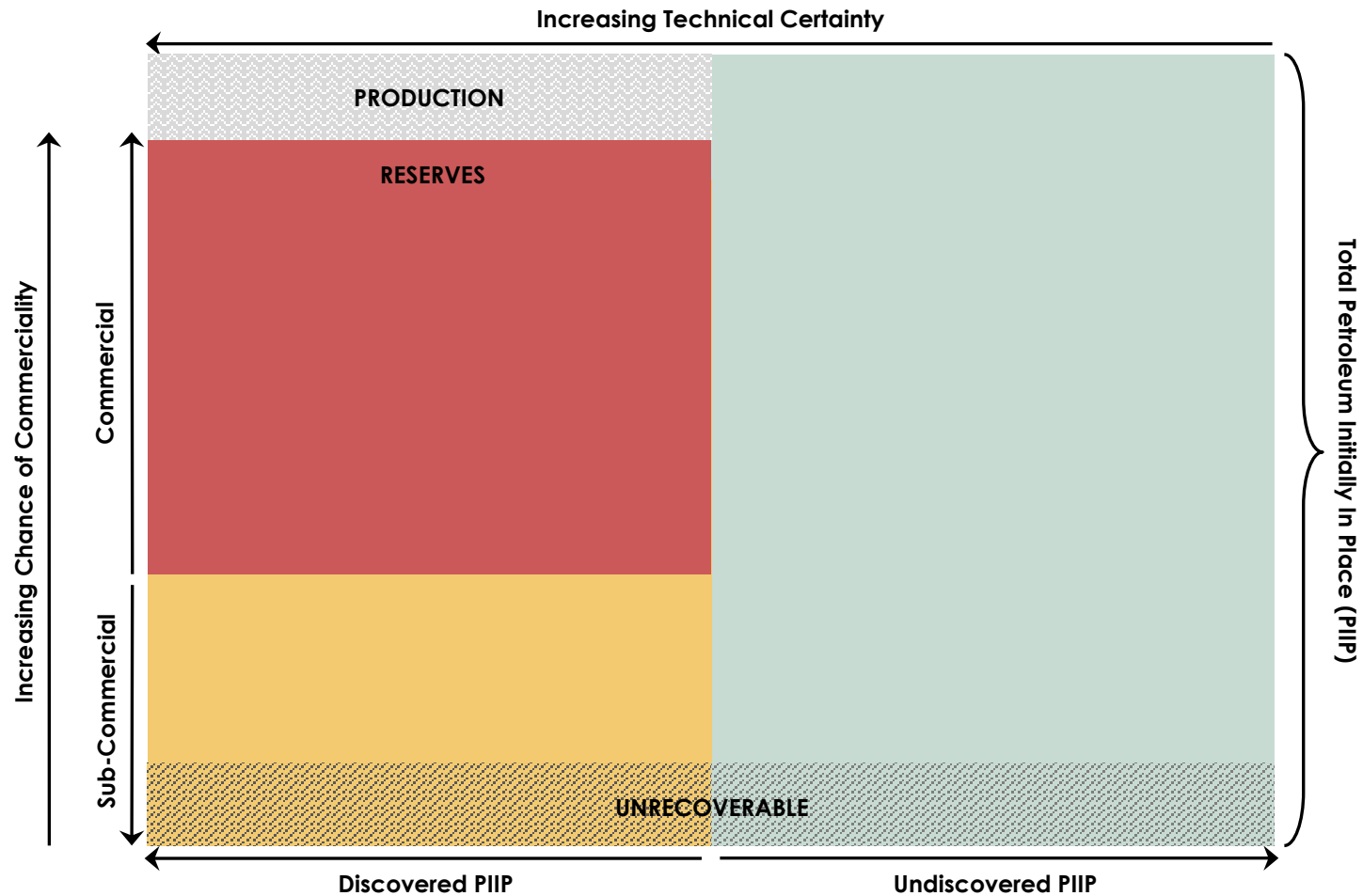


Resources are all quantities of petroleum, recoverable and unrecoverable, that are estimated to exist originally in naturally occurring accumulations, discovered and undiscovered, plus those quantities already produced.





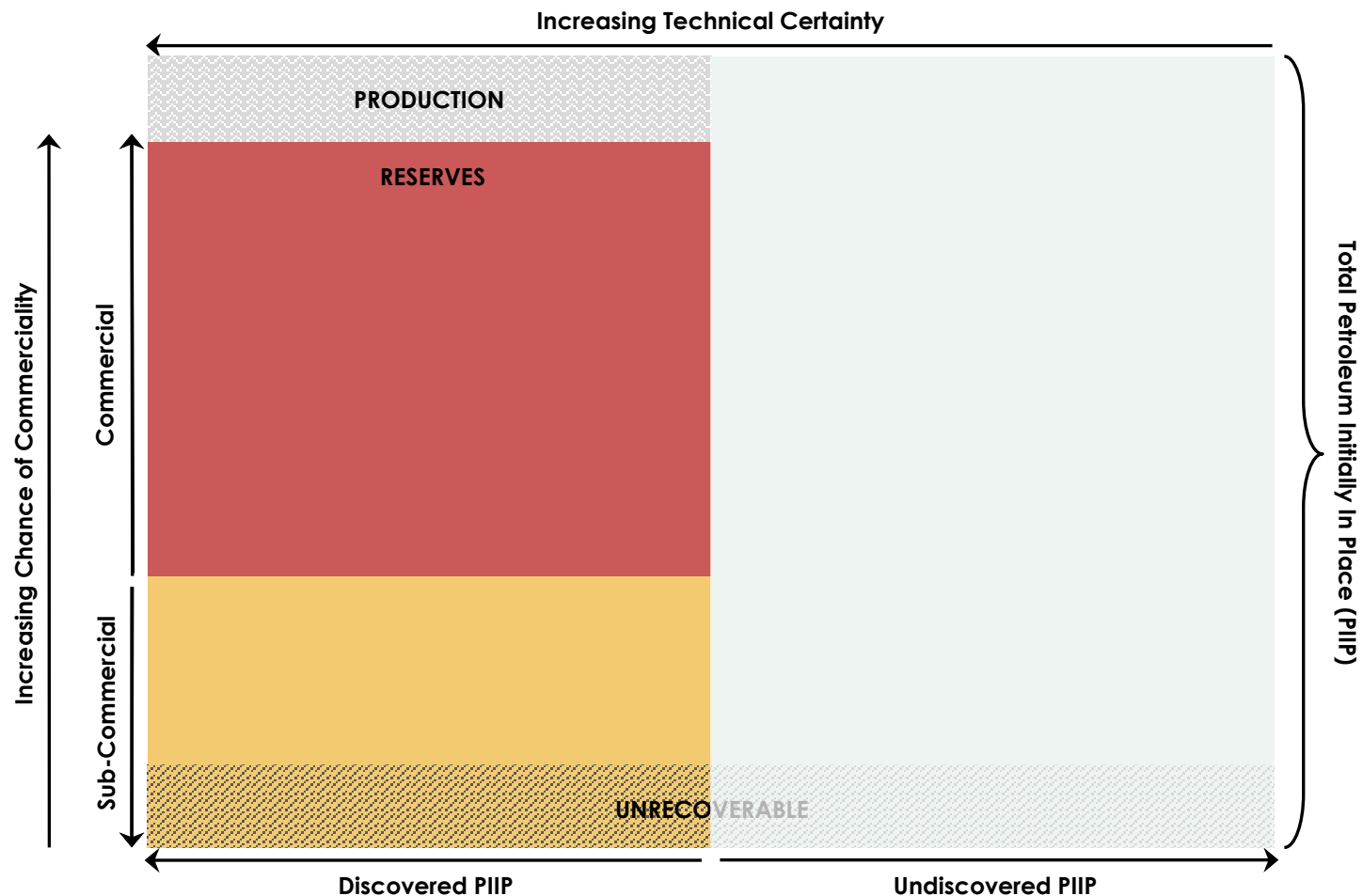
Reserves are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions.





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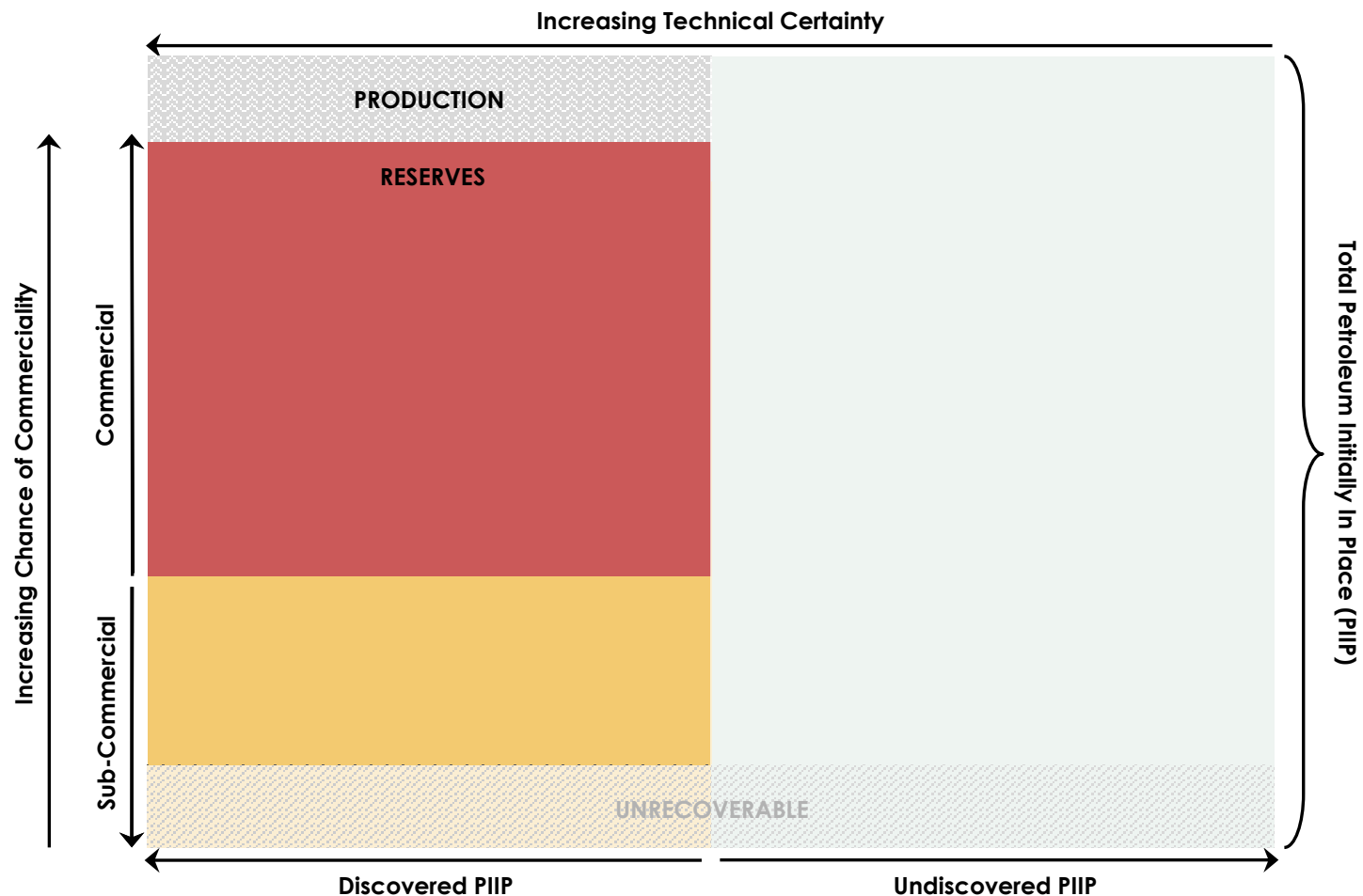
Reserves must be: (1) **Discovered**





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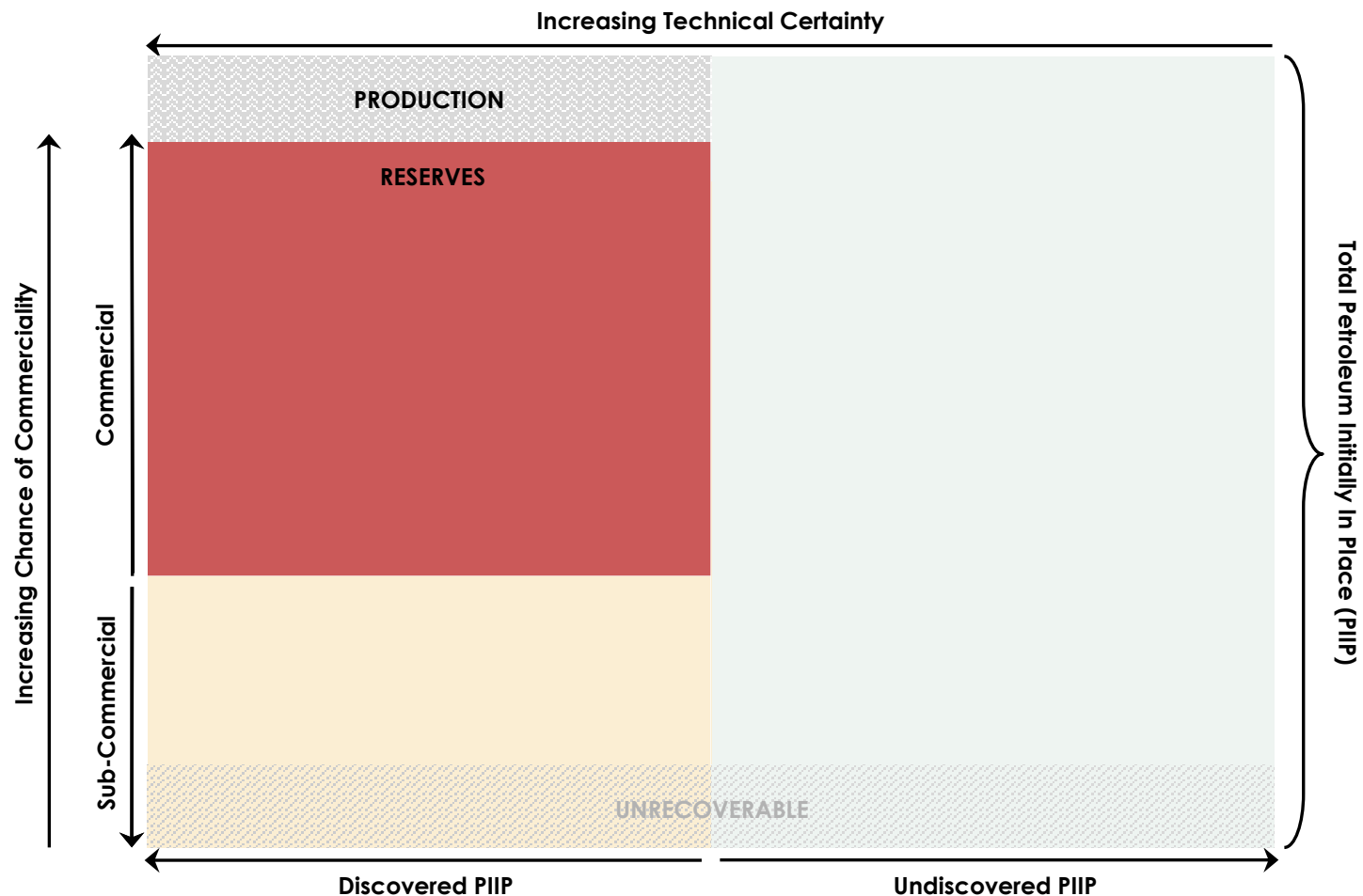
Reserves must be: (1) Discovered, (2) **Recoverable**





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.

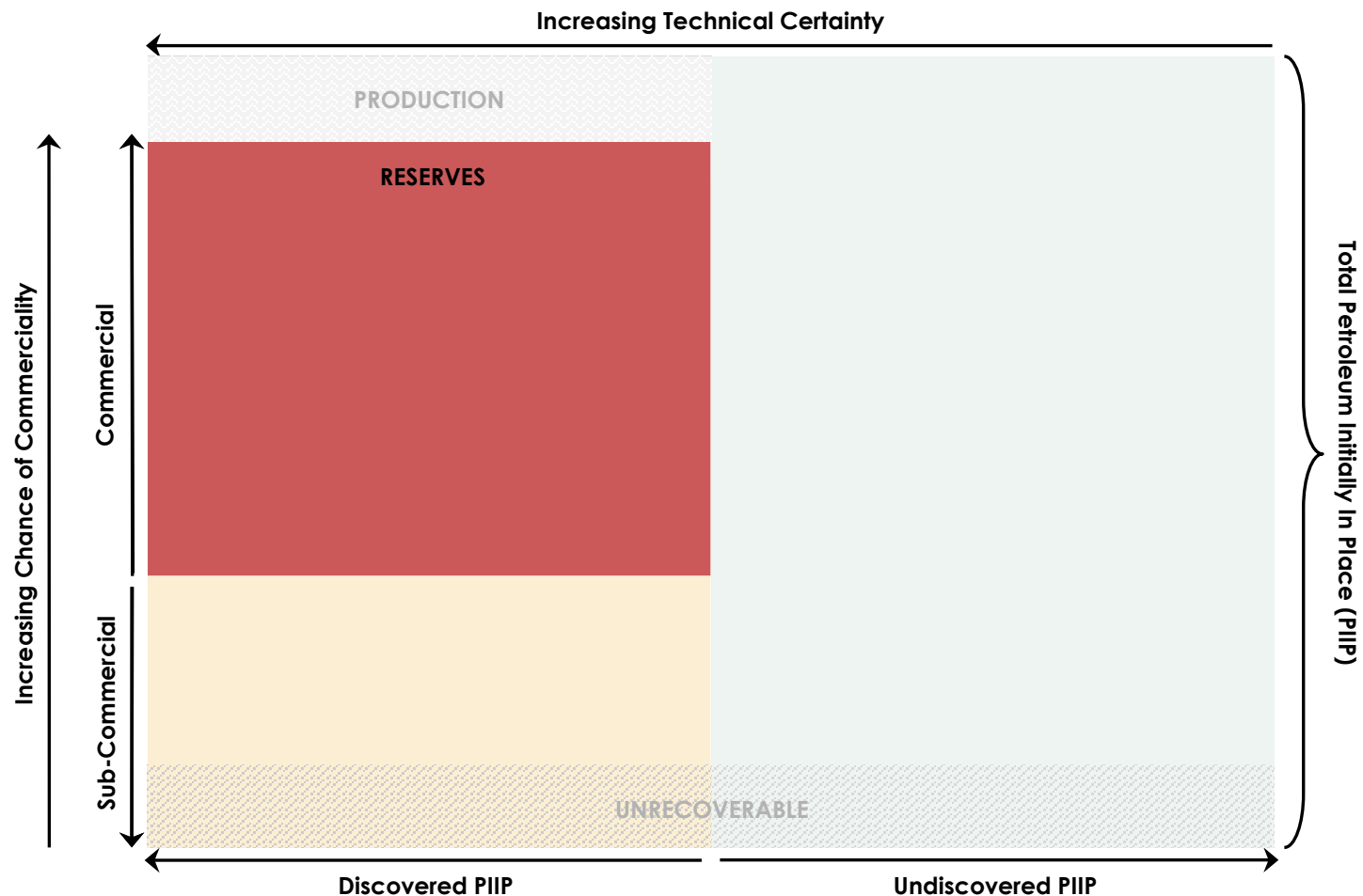
Reserves must be: (1) Discovered, (2) Recoverable, (3) **Commercial**





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 be: (1) Discovered, (2) Recoverable, (3) Commercial, and (4) **Remaining**.



Reserves Must Be Discovered

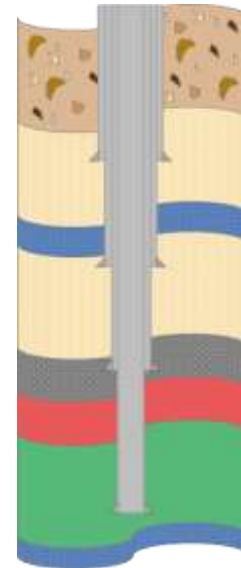
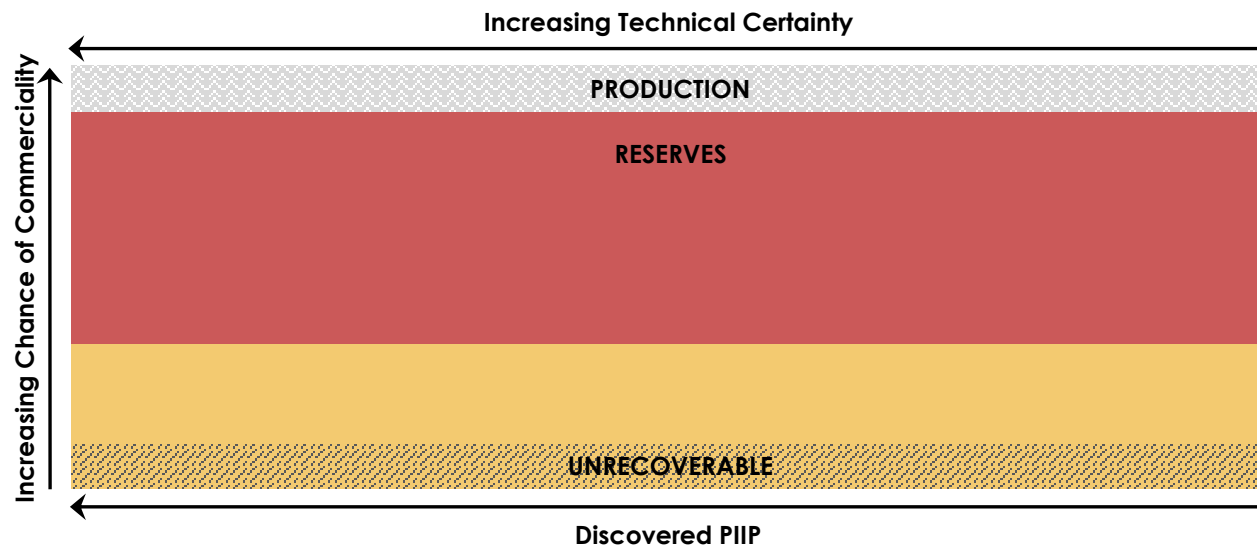


A **discovered** petroleum accumulation is determined to exist when one or more exploratory wells have established through testing, sampling, and/or logging the existence of a **significant** quantity of potentially recoverable hydrocarbons and thus have established a **known accumulation**.

- **Known reservoir** or **known accumulation** is used in the PRMS definitions to mean discovered resources.
- **Significant** implies that there is evidence of a sufficient quantity of petroleum to justify estimating the in-place quantity and evaluating the potential for commercial recovery.

Reserves should not be assigned to adjacent reservoirs isolated by major, potentially sealing, faults until those reservoirs are penetrated and evaluated as commercially recoverable.

Reserves should not be assigned to areas that are clearly separated from a known accumulation by a non-productive reservoir (i.e. absence of a reservoir, structurally low reservoir, or negative test results).



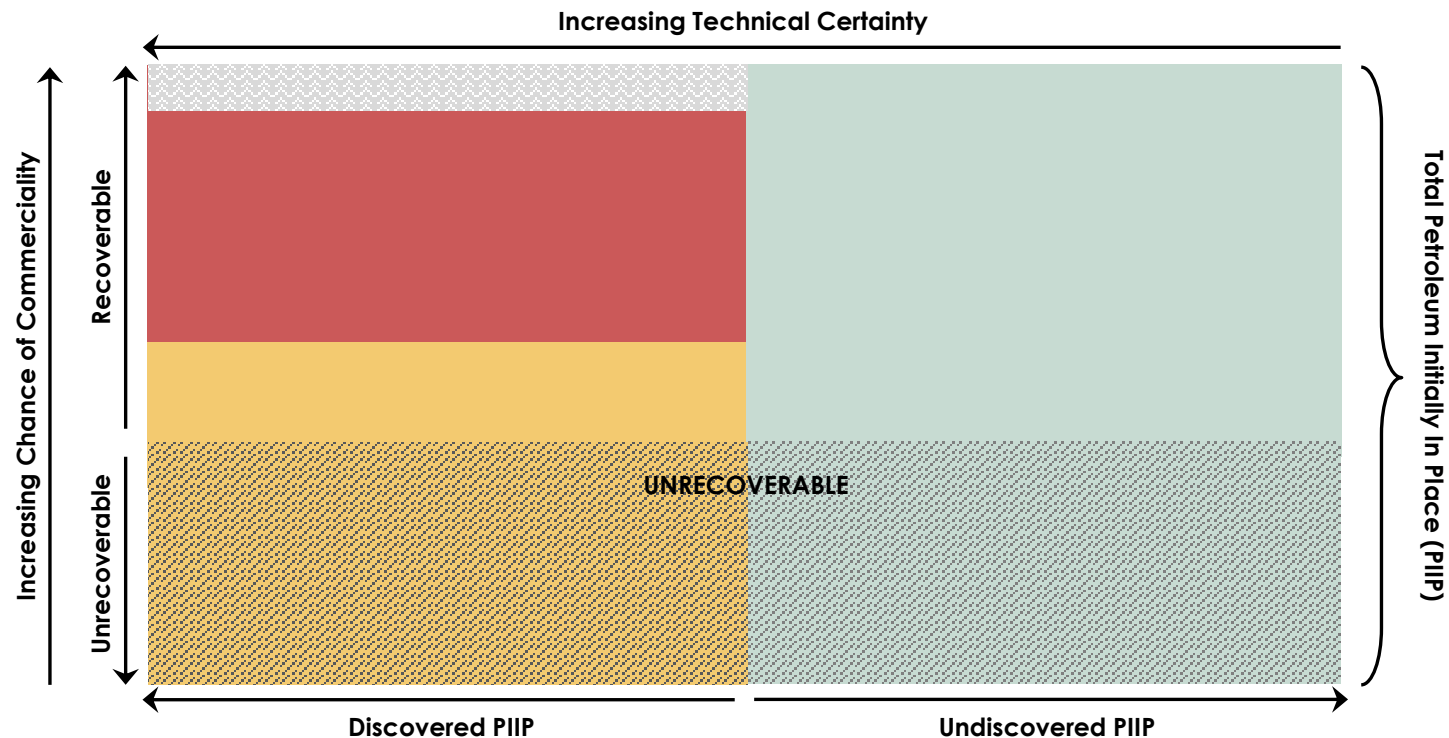
Reserves Must Be Recoverable



Recoverable resources are those quantities of hydrocarbons that are estimated to be producible by the project from either discovered or undiscovered accumulations.

Unrecoverable resources are that portion of either discovered or undiscovered PIIP evaluated, as of a given date, to be unrecoverable by the currently defined project(s).

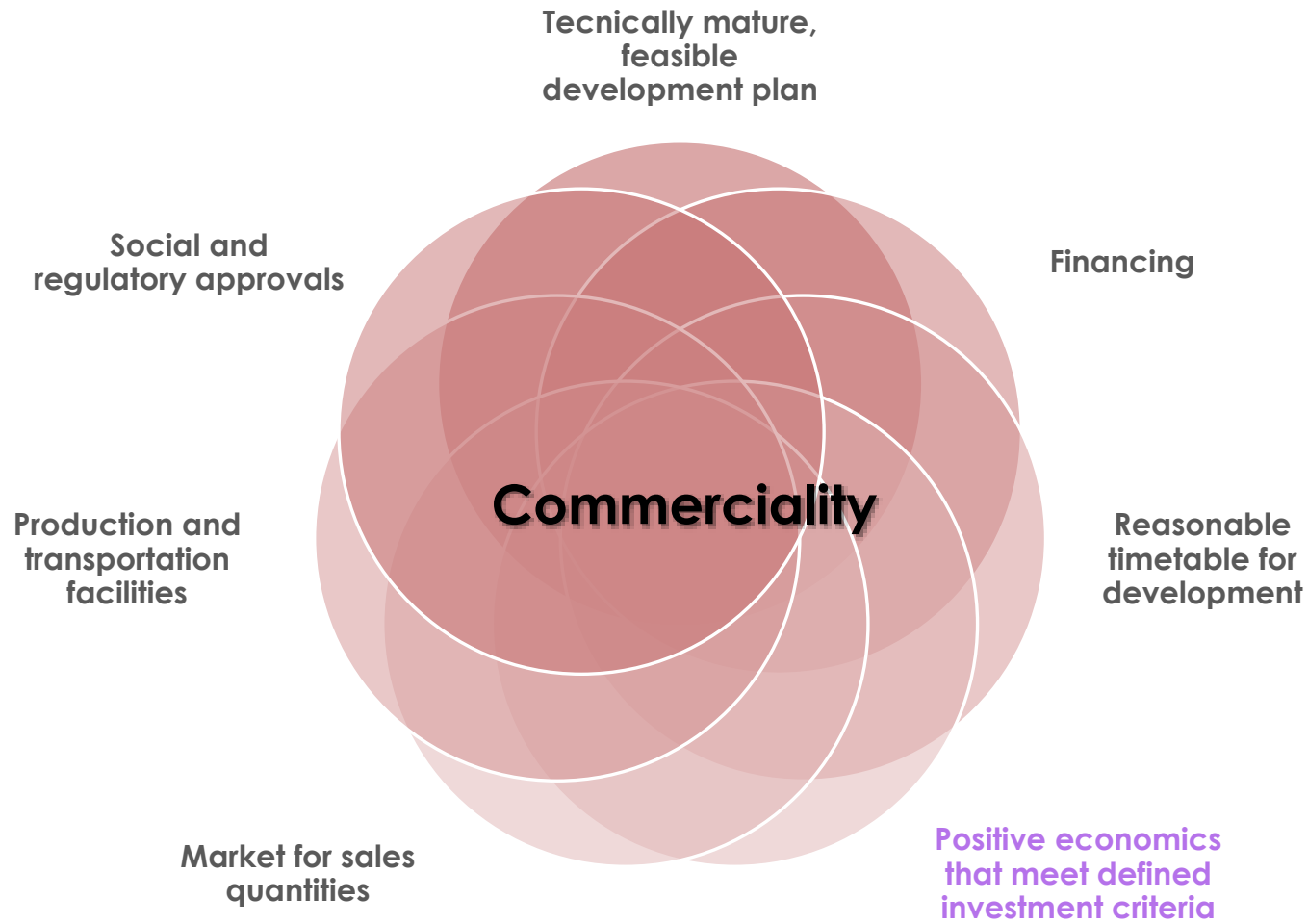
- A portion of these quantities may become recoverable in the future as commercial circumstances change, technology is developed, or additional data are acquired.
- The remaining portion may never be recovered because of physical/chemical constraints represented by subsurface interaction of fluids and reservoir rocks.



Reserves Must Be Commercial



Discovered resources may be considered **commercially recoverable** if the entity claiming commerciality has a firm intention to proceed with development and evidence to support a reasonable expectation for each of the following:

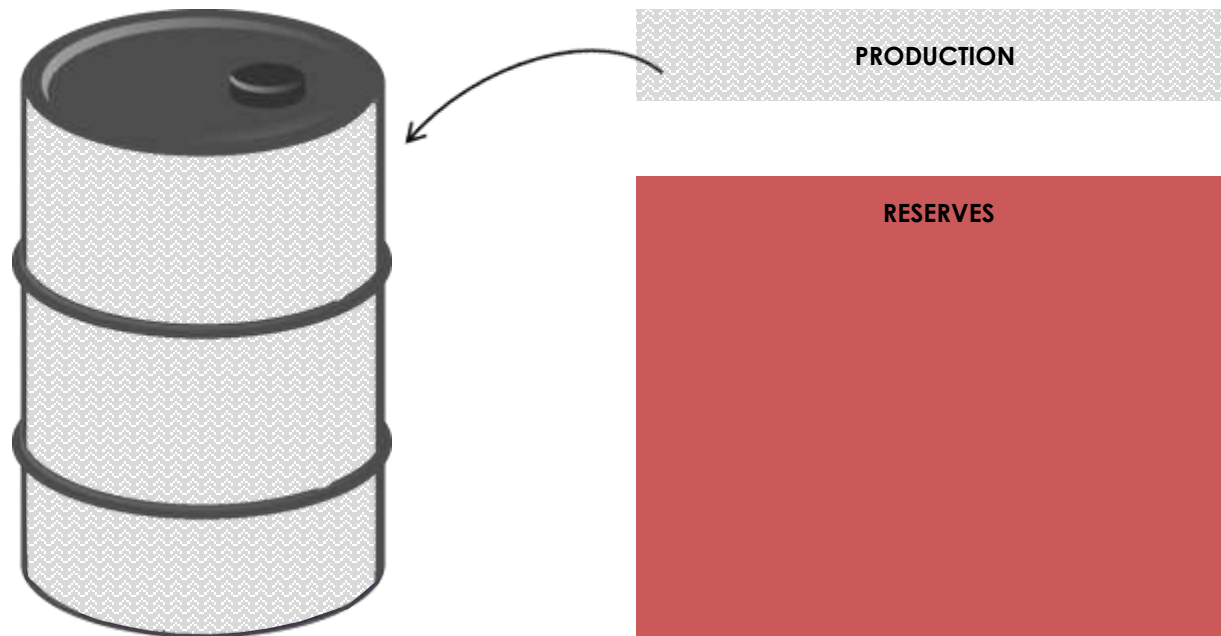


Reserves Must Be Remaining



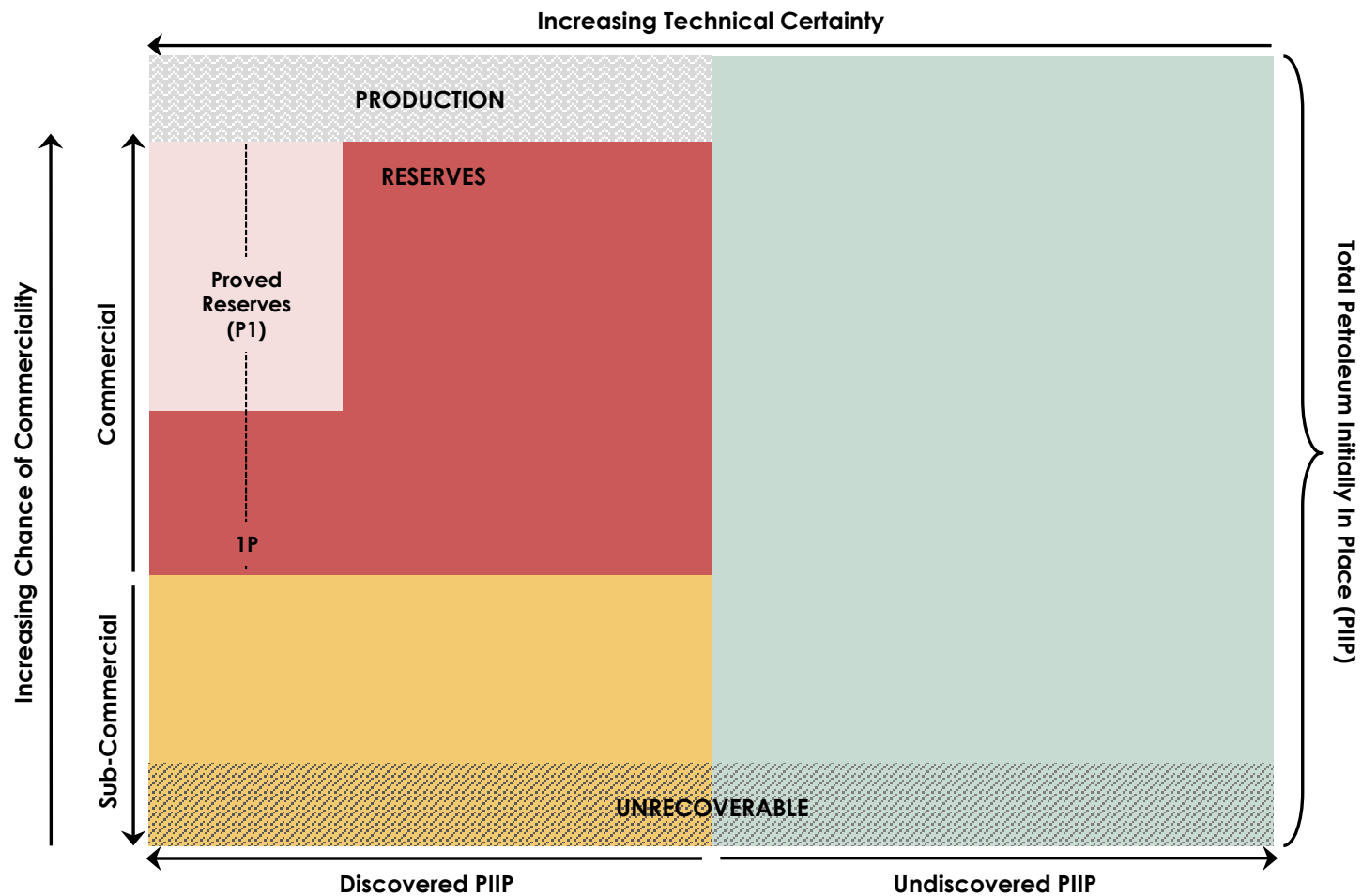
Reserves are by definition those quantities **remaining** to be produced and exclude both sales and non-sales production volumes.

Estimated reserves and sales are measured and reported at a **reference point**, which is typically the point of sale to third parties or where custody is transferred to the entity's midstream or downstream operations.



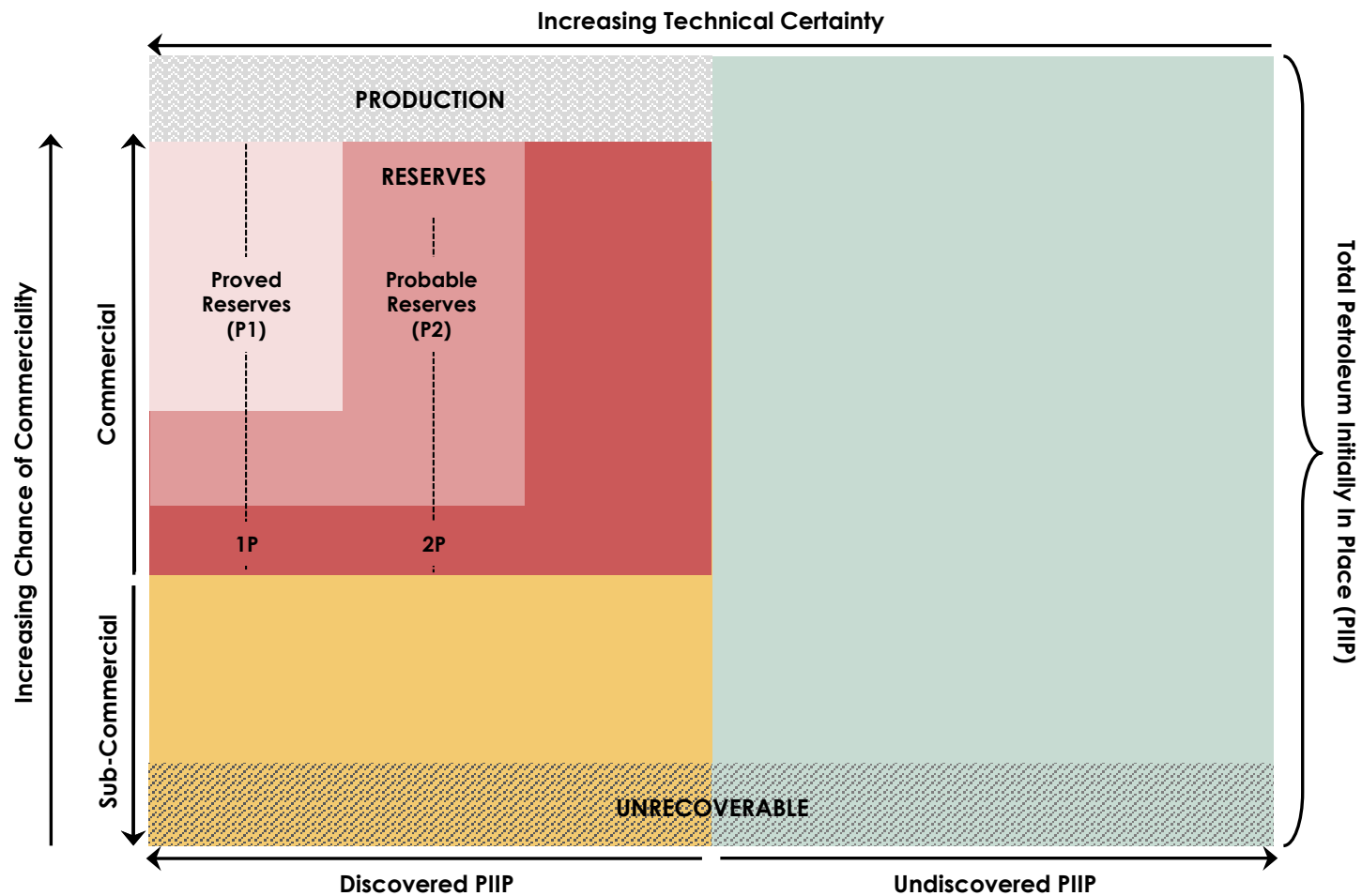


There are three categories of reserves: (1) **Proved Reserves**



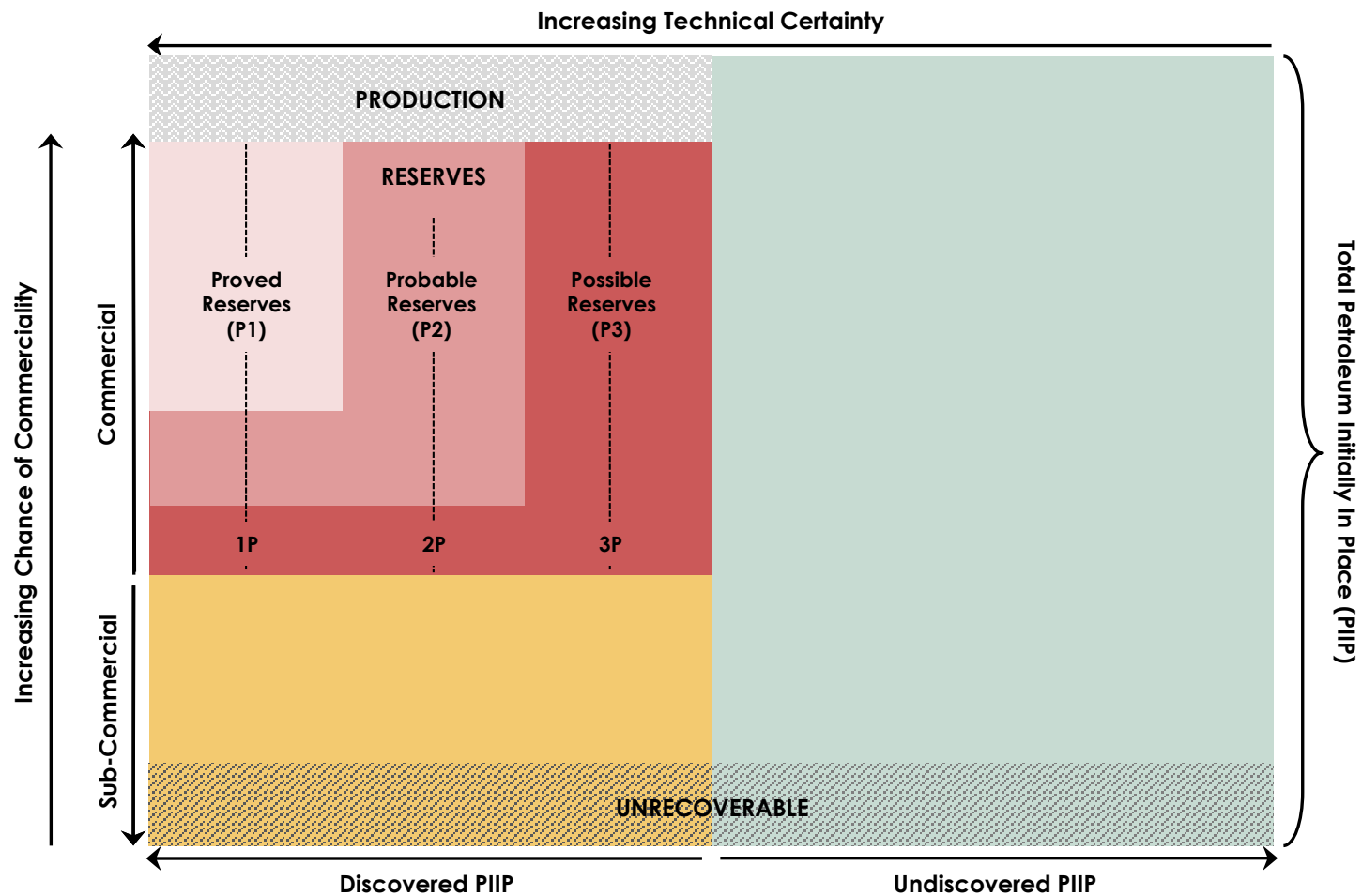


There are three categories of reserves: (1) Proved Reserves, (2) **Probable Reserves**





There are three categories of reserves: (1) Proved Reserves, (2) Probable Reserves, and (3) **Possible Reserves**.

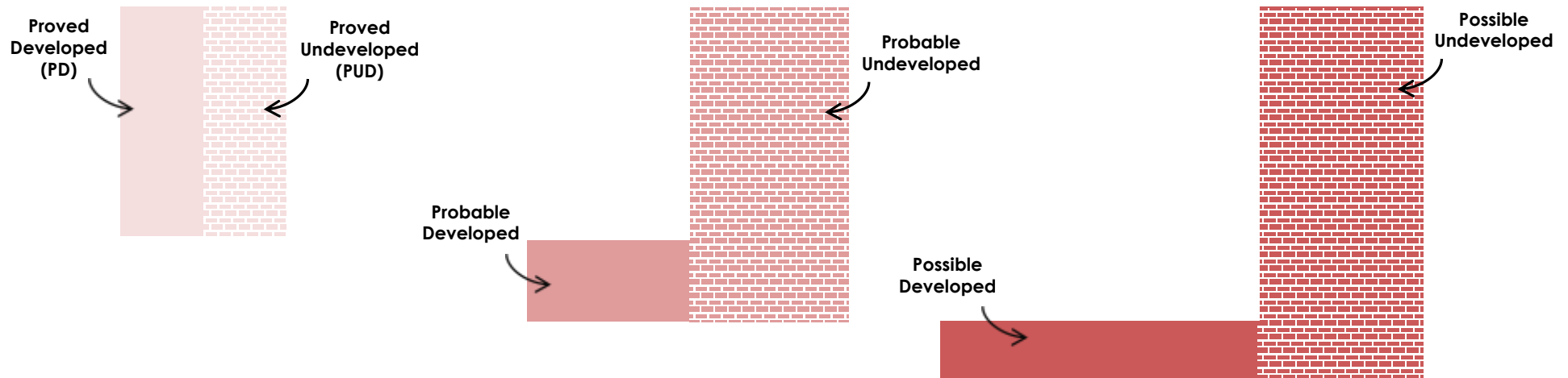


Developed and Undeveloped Reserves



Each reserve category can be further broken down into:

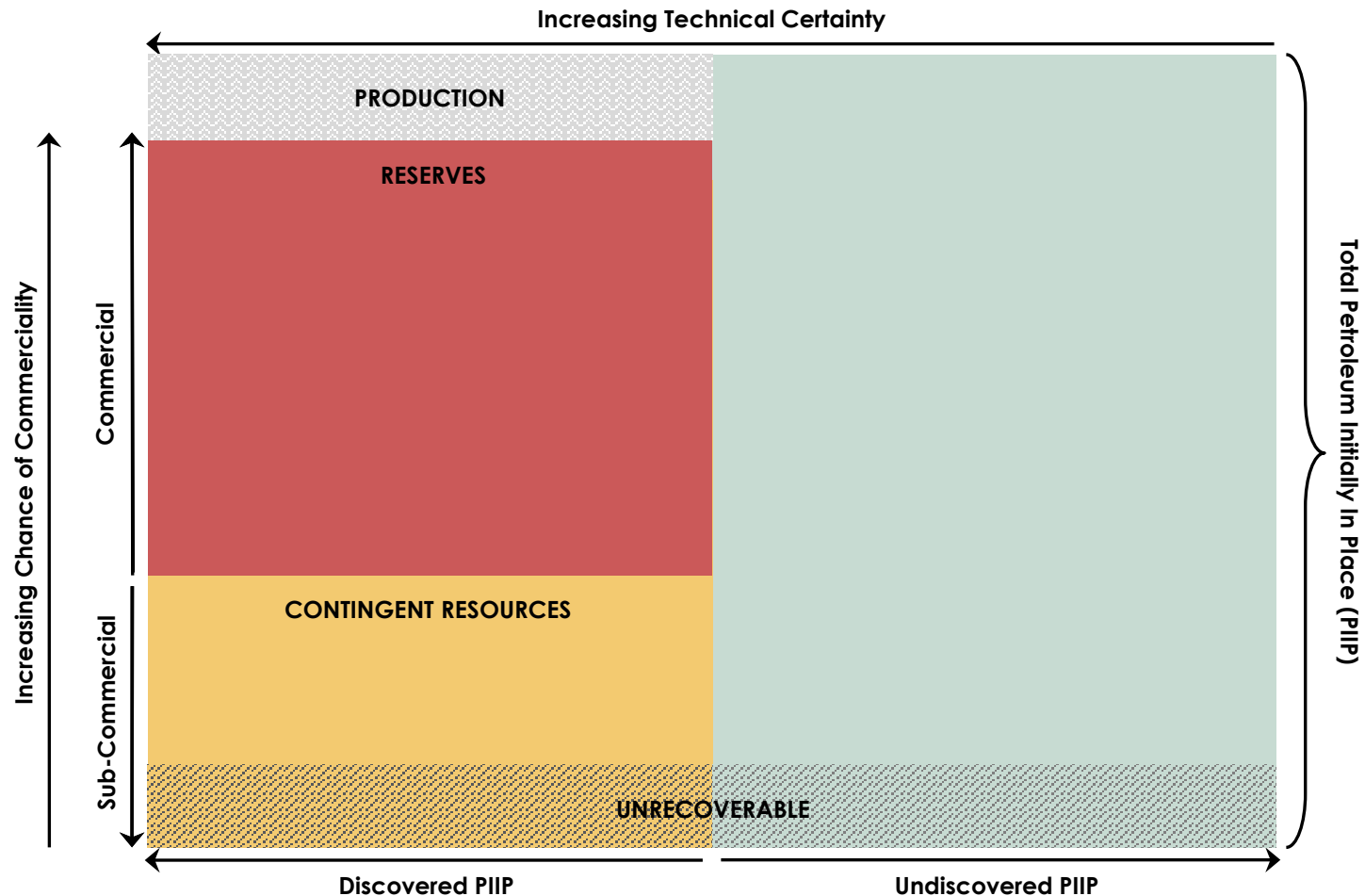
- **Developed Reserves:** Developed oil and gas reserves are reserves of any category that are expected to be recovered from existing wells and facilities, either from completion intervals that are open and producing at the time of the estimate or from shut-in and behind-pipe reserves with minor costs to access.
- **Undeveloped Reserves:** Undeveloped oil and gas reserves are reserves of any category that are expected to be recovered through future significant investments.



Contingent Resources



Contingent Resources are quantities of petroleum estimated to be recoverable from discovered accumulations by development projects not currently classified as reserves. Contingent resources may include projects for which there are currently no viable markets, projects where commercial recovery is dependent on technology under development, projects where commerciality cannot be assessed, or uneconomic volumes.

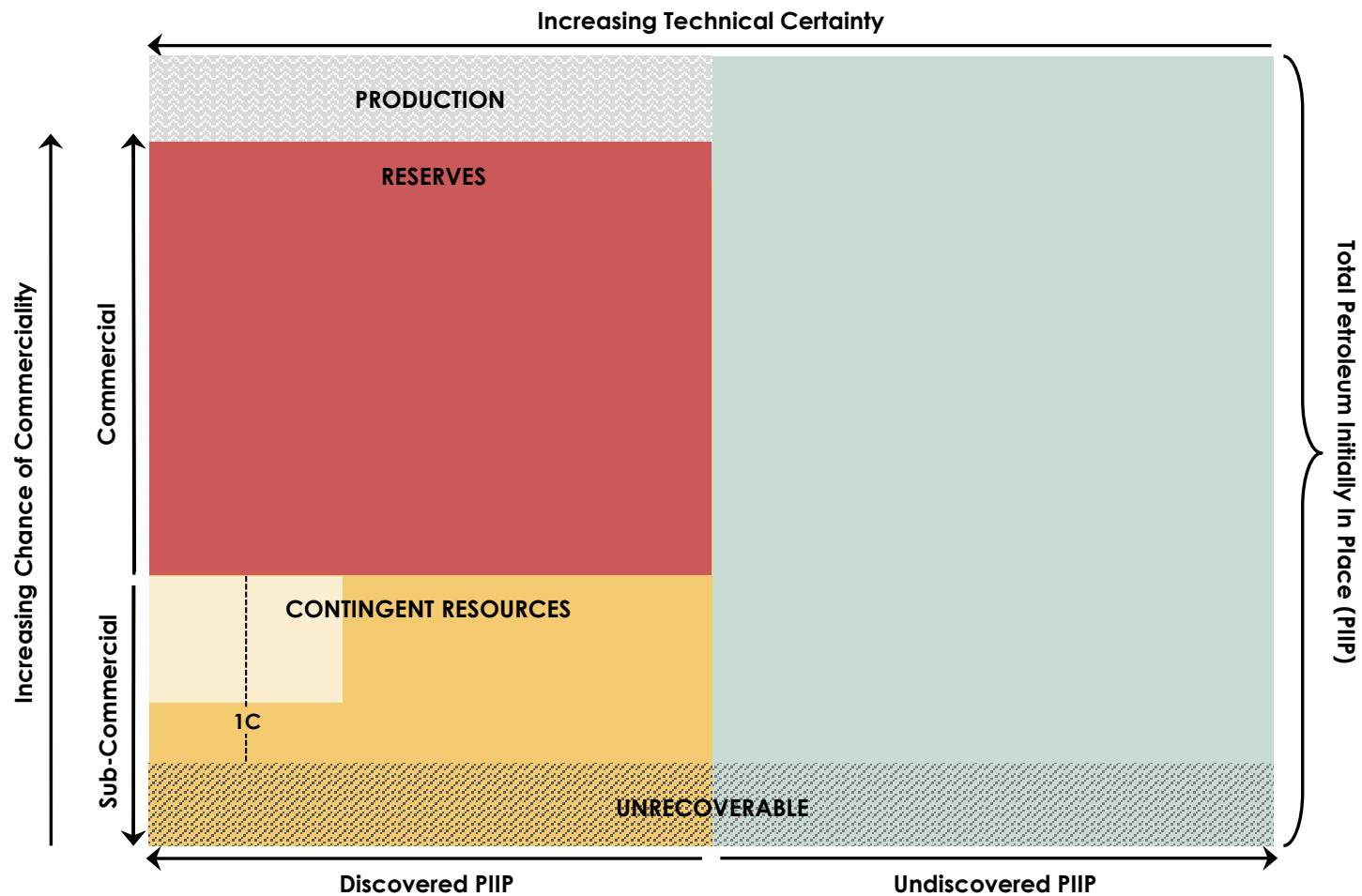


Contingent Resources



Similar to reserves, contingent resources are broken into three sub-categories:

- 1C = “low side estimate” or 90% probability of occurrence

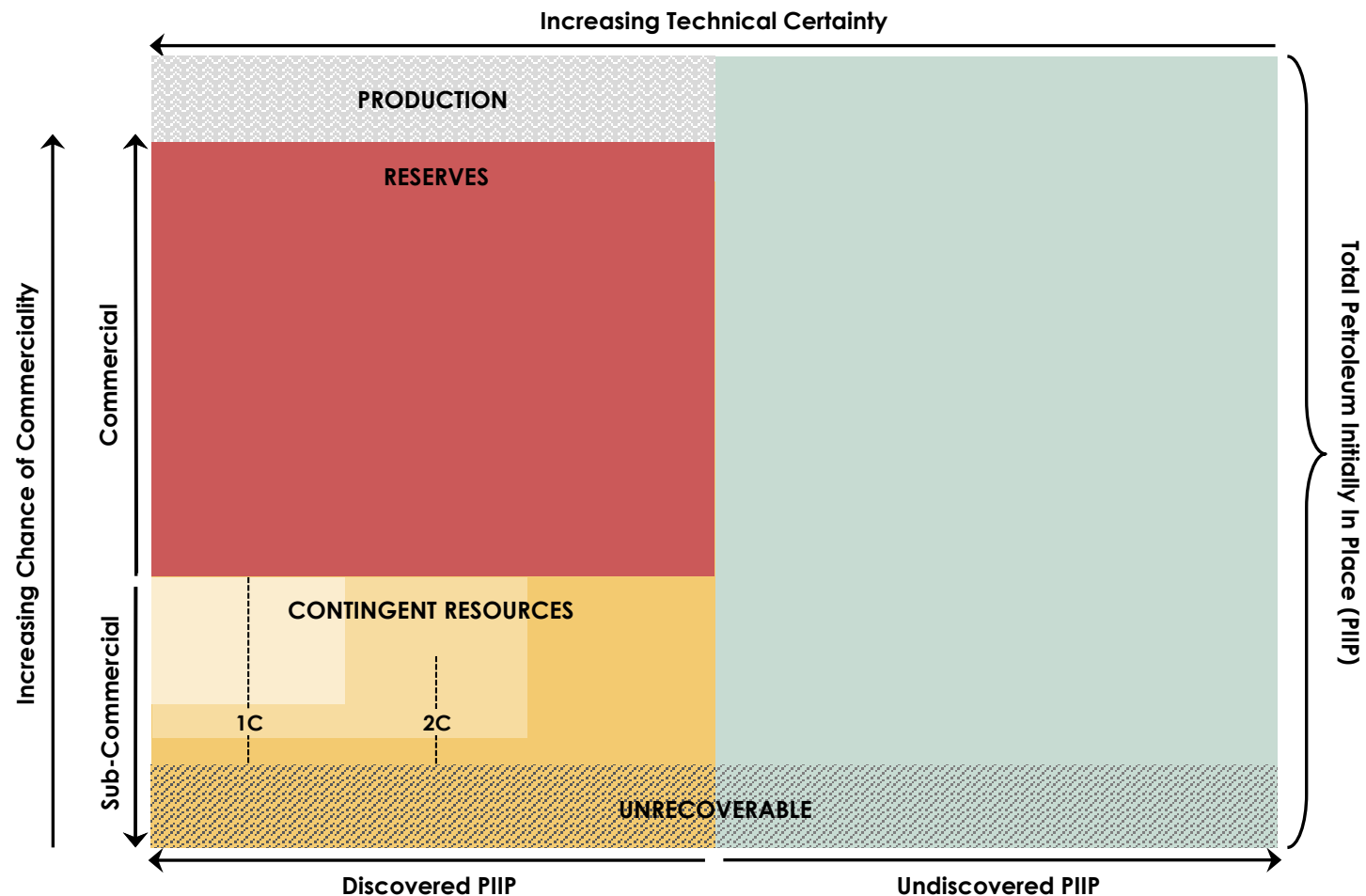


Contingent Resources



Similar to reserves, contingent resources are broken into three sub-categories:

- 1C = “low side estimate” or 90% probability of occurrence
- 2C = “most likely estimate” or 50% probability of occurrence

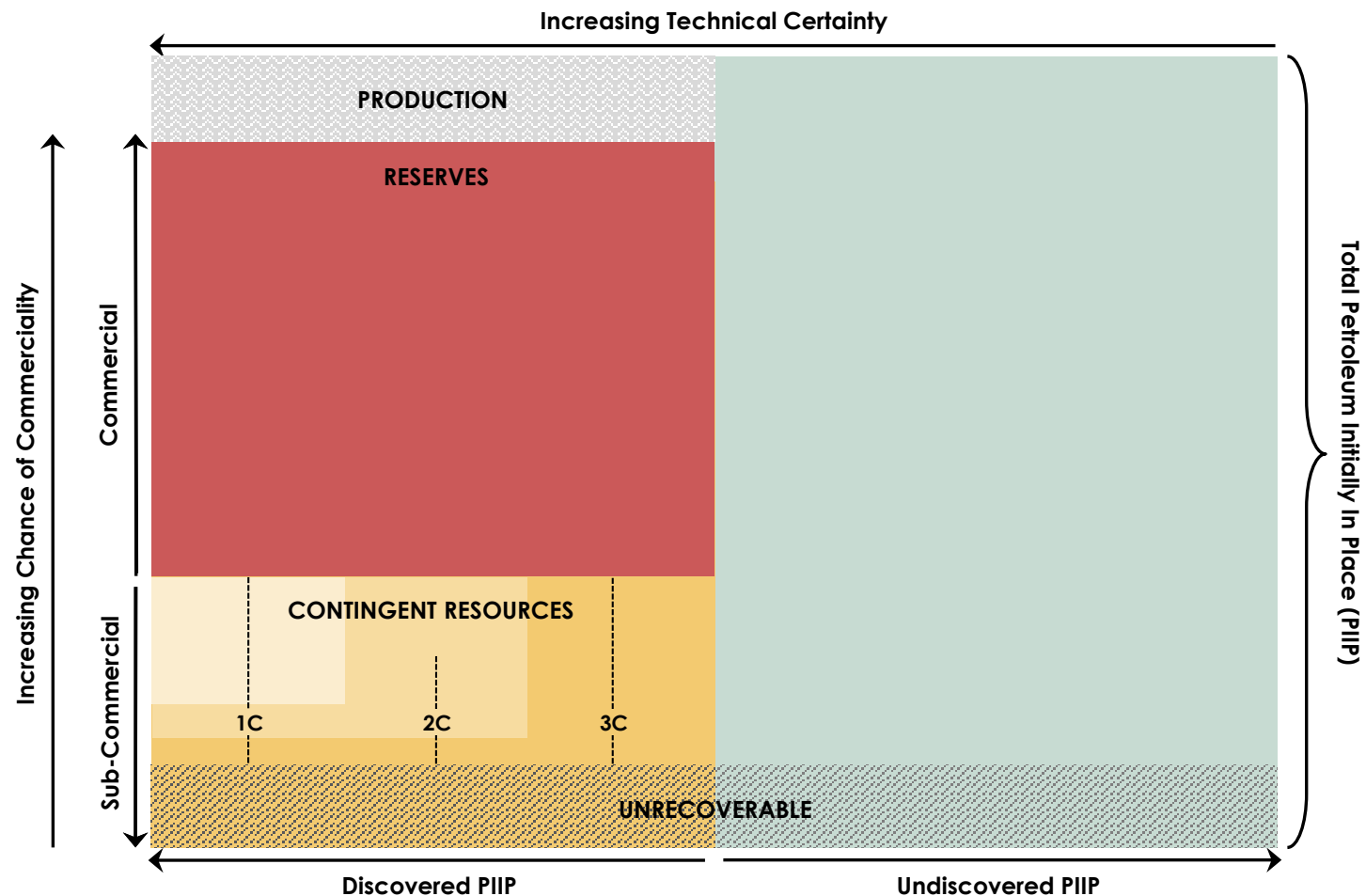


Contingent Resources



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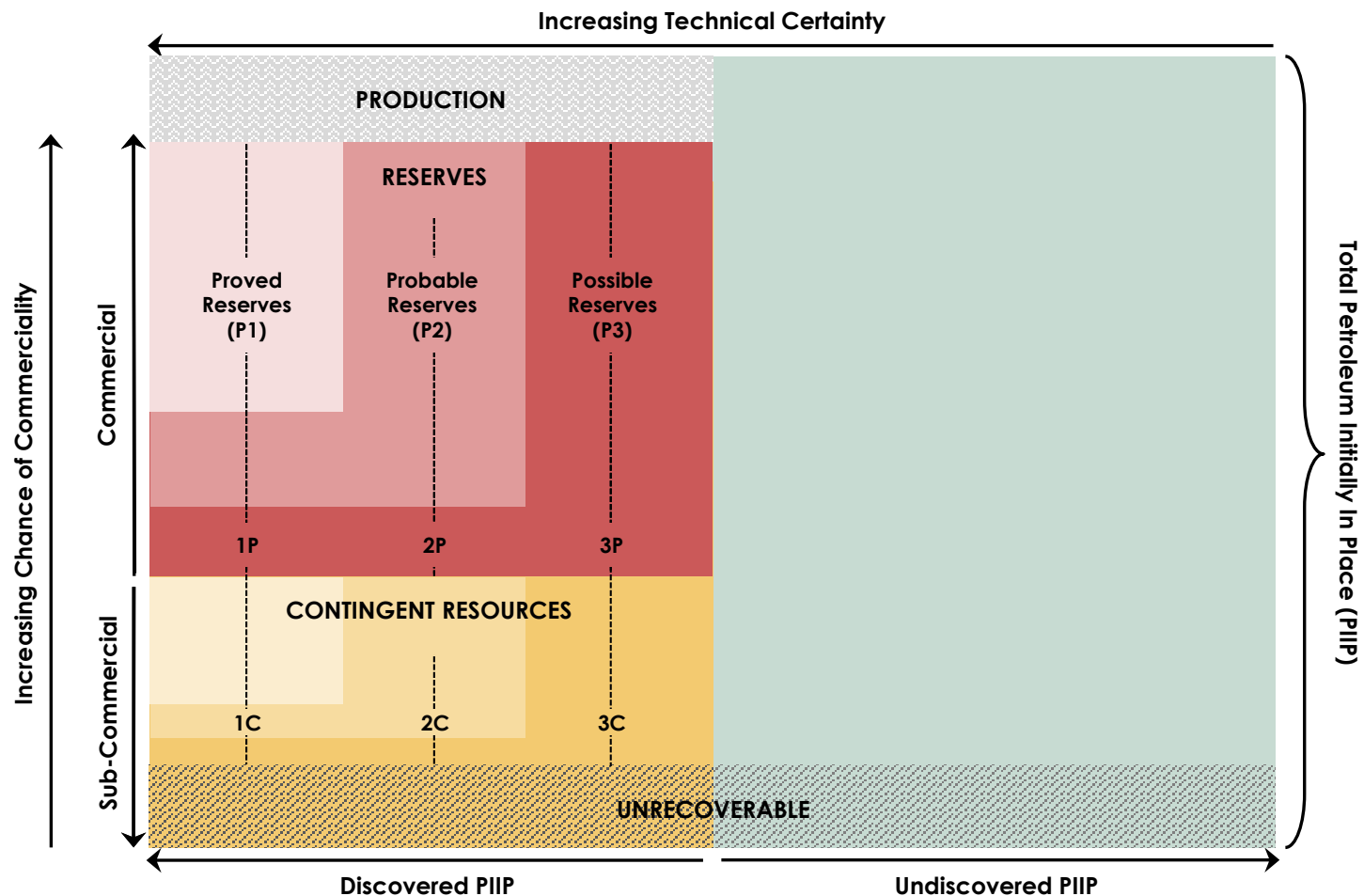
- 1C = “low side estimate” or 90% probability of occurrence
- 2C = “most likely estimate” or 50% probability of occurrence
- 3C = “high side estimate” or 10% probability of occurrence



Contingent Resources



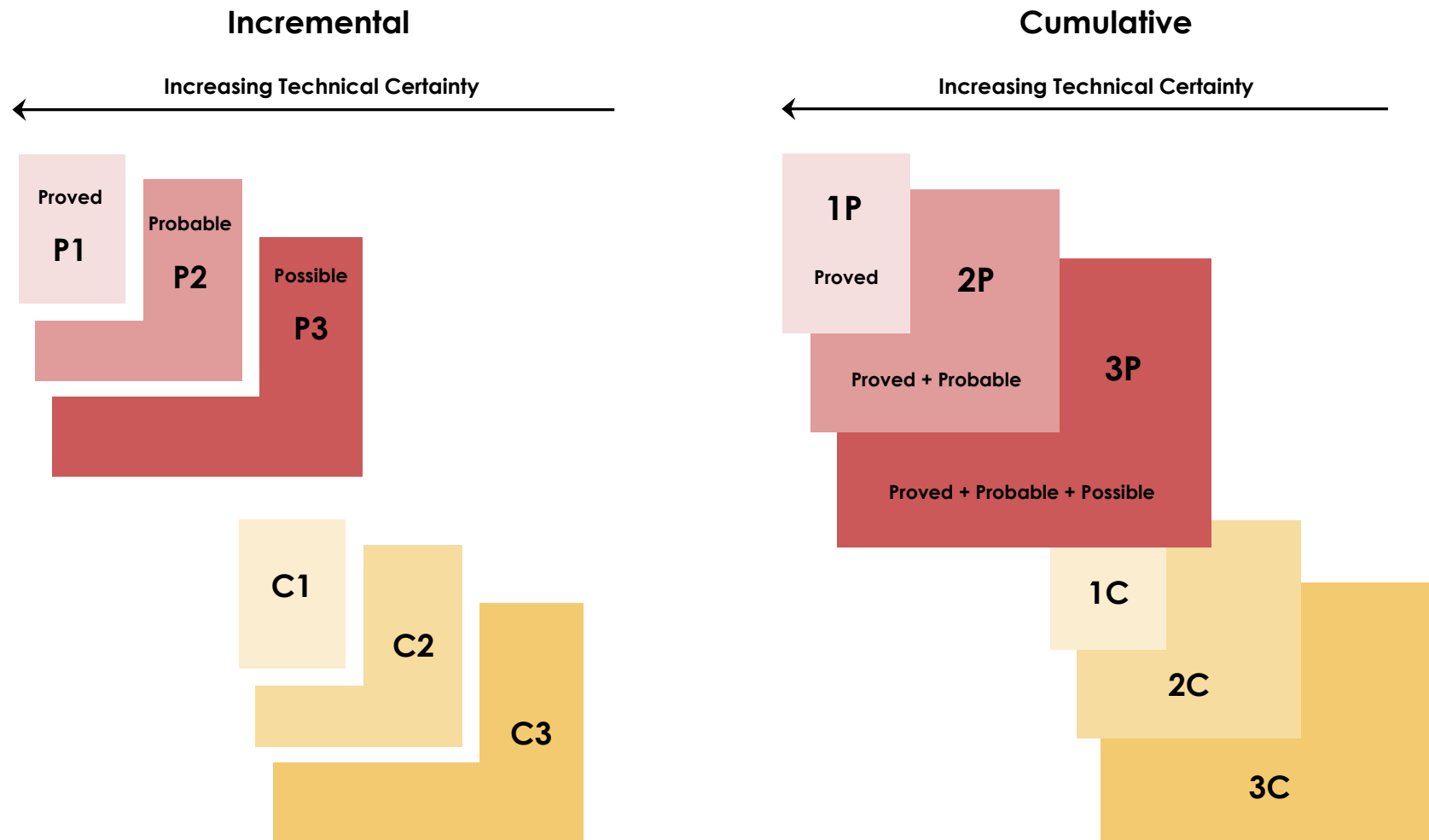
If the contingency is removed, these categories are directly transferrable to reserves (1C = 1P, 2C = 2P, 3C = 3P).



Reserves and Contingent Resources



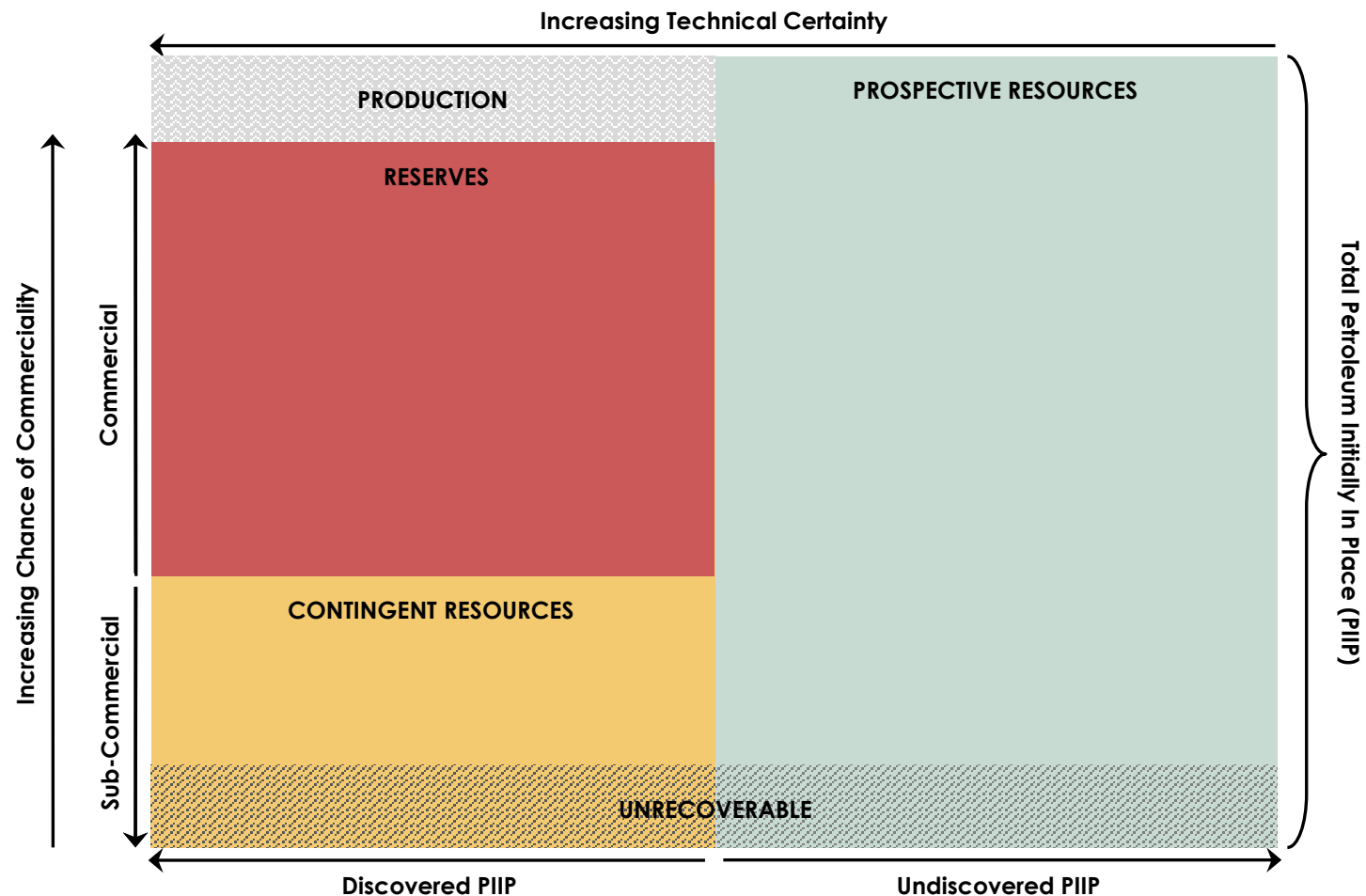
Reserves and contingent resources can be defined as **incremental** quantities or as **cumulative** quantities.



Prospective Resources



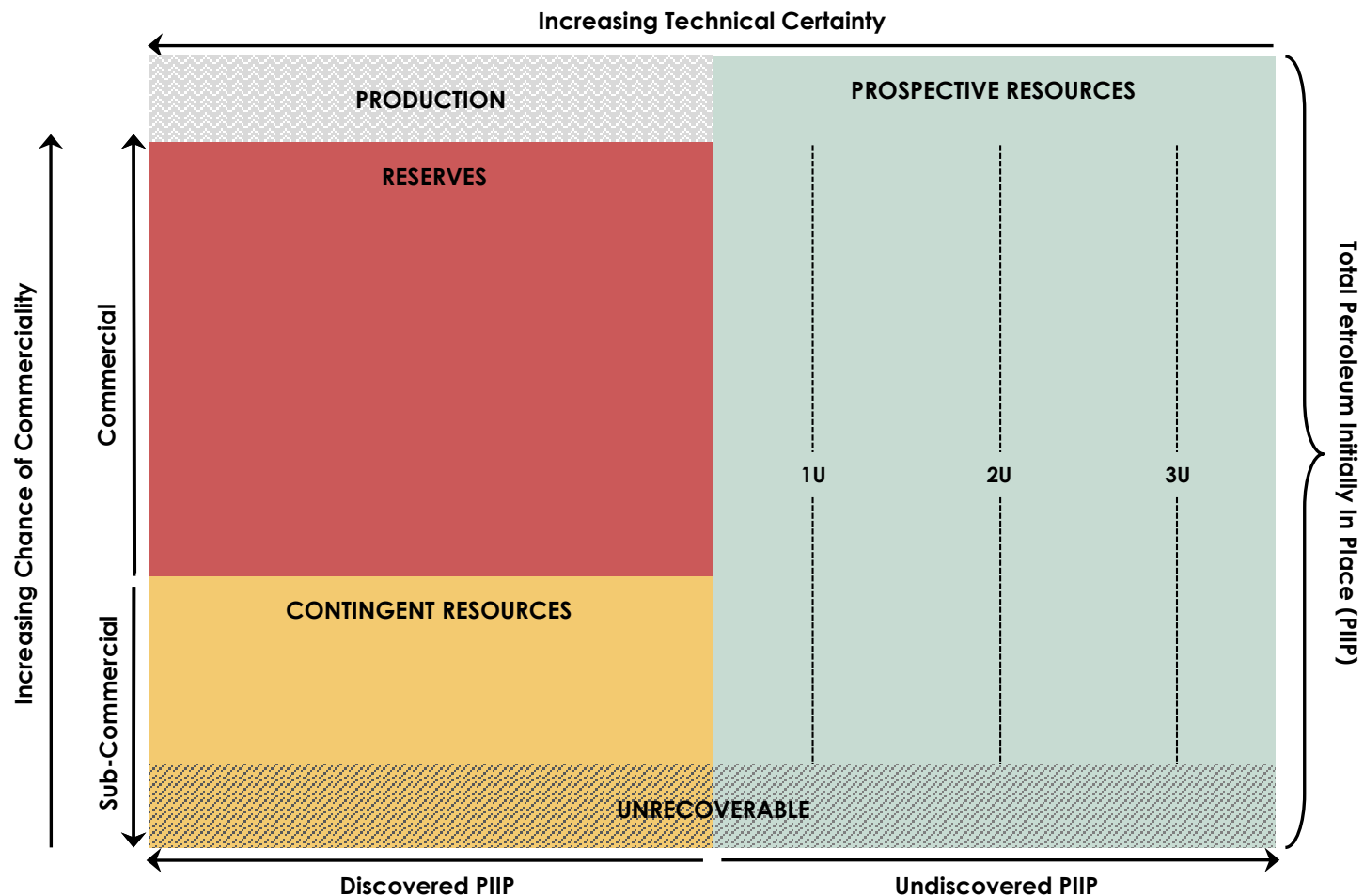
Prospective Resources are quantities of petroleum estimated to be recoverable from undiscovered accumulations by application of future development projects. Prospective resources have an associated **Chance of Discovery** and a **Chance of Development** that determine the **Chance of Commerciality**.



Prospective Resources



Prospective Resources can also be broken into three sub-categories representing a low side estimate (1U), most likely estimate (2U), and a high side estimate (3U).



Comments or Questions?

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