geoconvention
Virtual Event
September 13 - 15
2021

The Fundamental Role of Electrostatic Forces Within Pore Systems and Their Effects on Resource Evaluation and Reservoir Performance

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Part 1: Global resource distribution: a case for adding the classification of semi-conventional resources to the resource pyramid.

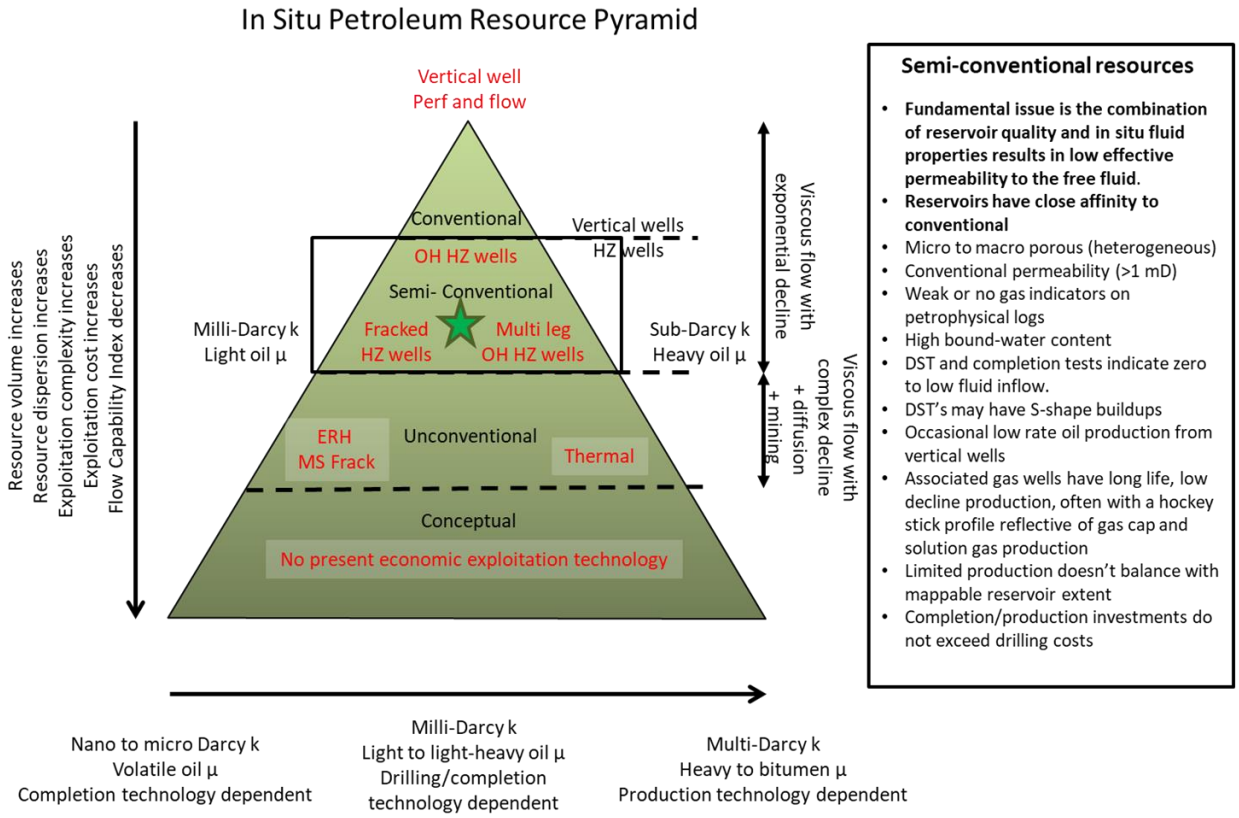
Since the late 1990's, energy companies have increasingly focused on opportunities within mature basins that fall below conventional targets on the hydrocarbon resource pyramid (triangle). The resource pyramid is a graphical representation of theoretical global resource volume and quality [1–4]. The initial concept of the pyramid is credited to an unpublished Canadian Gas Association conference presentation in 1977 by Jim Gray [1,3]. Several factors provide a degree of relative scaling. These factors are: In-situ resource volume, dispersion, and exploitation technical complexity and cost all increase downward. This study proposes a new semi-quantitative metric based in fundamental reservoir and fluid properties for scaling the pyramid. This is the Flow Capability Index.

A strong case has been made for the pyramid being viewed as a conceptual framework for understanding fundamental characteristics of total resource endowment and how it is converted to supply [3]. These concepts are:

- The total resource endowment is immense.
- Only a fraction of the endowment is economically exploitable at any time.
- Advances in knowledge and technology over time allow larger portions of the endowment to be exploitable.
- Geoscientists should be aware of how existing knowledge and technology limits their understanding of the total endowment.

This study proposes the spectrum of global resources are better illustrated by applying four vertical divisions to the pyramid based on generally accepted factors plus fundamental reservoir and fluid properties. The proposed classes are conventional, semi-conventional, unconventional, and conceptual. The first three classes formalize the commonly indicated quality divisions of several previous workers [1,2,4,5]. The fourth reflects resources that are not economically or technically developable in the foreseeable future [6,7]. The reasons for this structure for the pyramid follow. Fundamentally, much more is known about a wider range of resource situations and their technology and cost challenges so more meaningful groupings are possible. Lumping resource situations together that have extremely different characteristics and exploitation technology/cost requirements does not reflect the knowledge and technology evolution, and masks the spectrum of resource deposit situations that are present. The

technological and cost challenges of a resource deposit that can be exploited with simple openhole horizontal wells have nothing in common with those of exploiting a gas hydrate accumulation and little in common with exploiting a bitumen or shale deposit. This study is primarily interested in semi-conventional resources.



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