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Alberta's Oil Sands Probabilistic Reserves and Resources Evaluation

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Summary

The Alberta Energy Regulator (AER) is currently reviewing its independent estimates of in situ bitumen reserves and resources in Alberta. As part of this review, the AER will introduce a new reserves and resources classification framework that will account for and quantify the uncertainty associated with its reserves and resources estimates. This new probabilistic evaluation method will replace the regulator's previous deterministic approach of estimating reserves and resources.

Introduction

The AER ensures the safe, efficient, orderly, and environmentally responsible development of hydrocarbon resources in Alberta over their entire life cycle. Under the *Oil Sands Conservation Act*, the AER is required to provide an appraisal of Alberta's oil sands resources.The regulator has been working on a method to estimate reserves and resources that is unbiased, transparent, repeatable, and easy to communicate to stakeholders. This new evaluation framework, which will replace the historical IPACE (Inter-Provincial Advisory Committee on Energy) framework, categorizes reserves and resources into clearly defined categories that are familiar to industry stakeholders and better suited to help guide energy policy and regulation.

The unbiased AER estimates will serve a different purpose than industry estimates, which are made for investment, securities, financing, and insurance purposes and must adhere to strict rules to protect consumers and maintain confidence in markets. The AER estimates are needed to manage the full life cycle of energy development and related cumulative effects, inform future development scenarios for the province, and help evaluate the risks and opportunities of energy developments to ensure that the AER fulfills its mandate to regulate energy development in a safe, efficient, orderly, and environmentally responsible manner.

Theory and/or Method

The AER is re-assessing the volumes and the reserves and resources calculations for the SAGD interval on the active development areas in Athabasca with the goal to obtain reserves and resources estimates that are representative of the Athabasca Oil Sands and account for its associated uncertainty.
In the past the volumes and reserves calculations were deterministically done based on average properties of porosity and water saturation, also by applying a single bitumen mass fraction cutoff of >= %6 to define net pay. However this approach has issues as spatial and vertical uncertainty of the well data is not captured, obtaining over or under estimated reserves as a result.

Currently the AER is estimating original bitumen in place (OBIP), as well as the reserves and resources stochastically by ranges of low, medium and high estimates, moving away from single deterministic value. The net pay probability log is used to generate different probable cases of stochastics OBIP to find the best estimates of the volumes, and after a probability cutoff will be applied to the selected net pay probability log case to calculate low, medium and high estimates of net pay, porosity and water saturation which are then modelled to calculate oil column variability at the well and the spatial uncertainty associated with the data. As a result 100 equally probable OBIP realizations are obtained and provided for reserves and resources evaluations.

The stochastic recovery factor workflow uses the estimates of the ultimate recovery factors submitted by all operators under Directive 54: Performance Presentations, Auditing, and Surveillance of In Situ Oil Sands Schemes, to determine a wide range of recovery that is applicable (but not limited) to all active projects within the Athabasca oil sands. These recovery factors are fitted to a probability distribution that is coupled with the stochastic OBIP volumes in a Monte Carlo simulation to determine stochastic reserves and resources volume estimates. These volumes are then categorized into the new AER classification framework. This methodology is repeatable and can be applied consistently across the Athabasca oil sands for any oil sands deposit and for any size of area, such as stratigraphic extent, geological play, or active development area.

Conclusions

Using probabilistic methods to estimate bitumen reserves and resources will allow the AER to account for uncertainties associated with reservoir geology and the recovery technology (SAGD), will help guide energy development in Alberta's oil sands, and will allow for risk-based decision making to guide energy policy and regulation.

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