From Potential to Proved

RESOURCE PLAY BOOKINGS

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Reserves/Resource Classification System

- **Production**
  - **Reserves**
    - 1P: Proved
    - 2P: Probable
    - 3P: Possible
  - **Contingent Resources**
    - 1C
    - 2C
    - 3C
  - **Unrecoverable**
- **Total Petroleum Initially-In-Place (PIIP)**
  - **Discovered PIIP**
  - **Sub-Commercial**
  - **Undiscovered PIIP**
  - **Prospective Resources**
    - Low Estimate
    - Best Estimate
    - High Estimate
  - **Unrecoverable**
Drill to De-risk

- Initial pilot wells (hopefully) discover the presence of hydrocarbons
- Initial tests/completions establish productivity
- Delineation wells establish reservoir size and place bounds on recovery
- Repeated success and commerciality converts resources into reserves
- Required distance between the wells depends on the geology
- As with conventional reservoirs, you would hope that the reservoir size isn’t delineated by a single well.
Potential Resources

• Are there hydrocarbons?
• The geology of the WCSB is well known, we know it contains hydrocarbons and traps and, best of all, it is large
• Numerous studies, both public and private, have identified formations with interesting hydrocarbon shows and thermal histories
• The public record is uniquely extensive and complete, nearly everything from core samples to production data is available for data mining
• Lots of potential!
Extent of Triassic Sediments in the WCSB

Panek 2000
Burial History at 10-35-71-13W6

Ness 2001
Contingent Resources

- Are the results commercially interesting? This means productivity is important.
- Economics should be solid to add major bookings. Regulators are asking for clarity as to whether or not resource is economic and one would expect little value from an uneconomic resource.
- Use a radius away from tested wells for lands within a fairway.
- Resource assignments based on average performance of wells in region. Select best estimate contingent using expected behavior (may need to estimate minimum and maximum bounds).
- Check resulting volumetric recovery for the assumed well and frac spacing.
Extent of Triassic Sediments in the WCSB

Panek 2000
Montney Fairway – IP per Frac
Montney Fairway – IP per Frac
Montney Contingent Resource
These plots represent area weighted averages. They are made by overlying a series of grids, each with a different spacing, on a region of interest. Calculate the average within each grid box, then average all boxes that contain data. Each box will have the same weight, but each well will have a different weight.
Many Models will Match Early Data
Reserves

- Plays must demonstrate commerciality and repeatability
- Significant reserves booking between control points, if all data is good
- Establish minimum and maximum bounds, establish best estimate reserves (2P)
- Select 1P reserves between the minimum and the best estimate
- 3P between best and maximum estimate
- Applied type curves developed from older wells to new/proposed wells
Looking at one of Canada’s original resource plays, we can see that 25 years of technology have incrementally added URR, but have not fundamentally changed the picture.
Shallow Gas Geostatistics
Shallow Gas – URR as a function of Drilling Density

URR per section  URR Per Well
Reserves

- Rate of return must exceed 10% (reasonable expectation of economic development for small decreases in prices)
- A halo of proved and a further halo of probable. The offset distance of this halo will depend on the reservoir.
- Assignments based on local offset control (not regional).
- Do a volumetric check of recovery
- Allowance must be made for interference, using simulation if boundaries have not yet been seen.
- Reservoirs will be drilled up past the point that wells interfere with each other.
Montney Proved Reserves (Green)
Montney Probable Reserves (Purple)
References