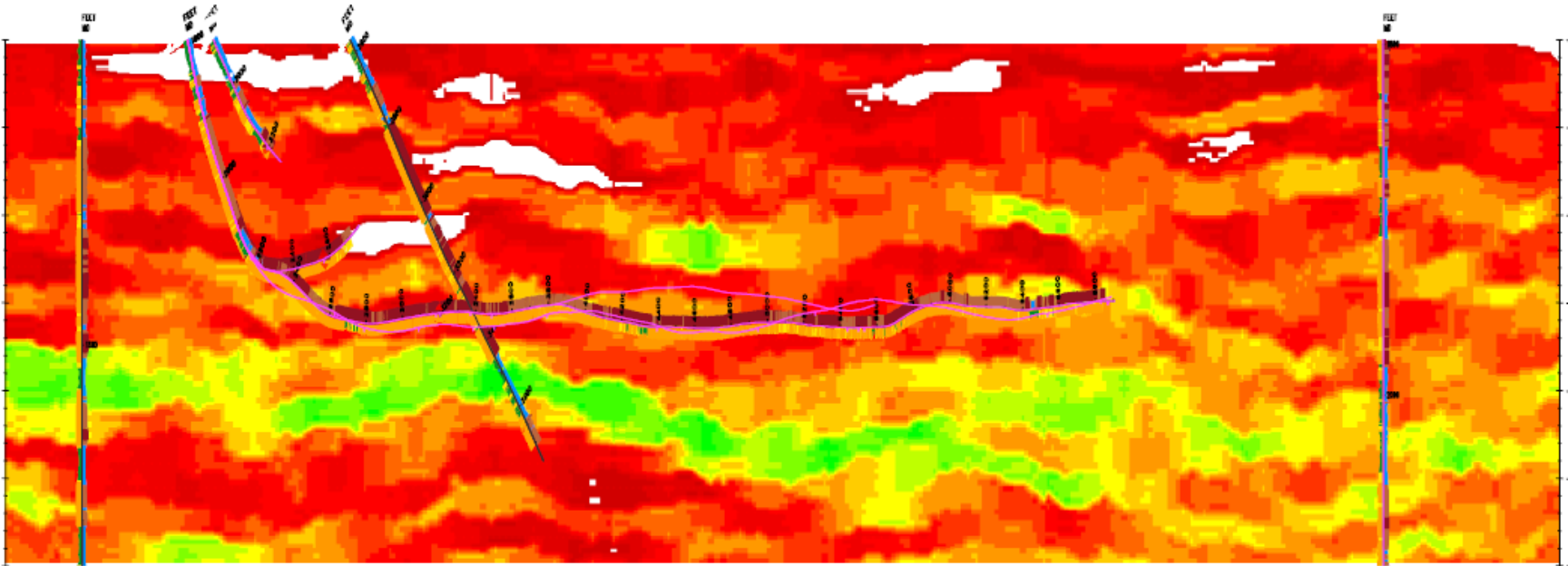


# Promising New Technologies for SAGD



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# Promising Technologies for SAGD

- Introduction – Economics
- Solvent-aided SAGD
  - Projects –Cenovus, Laricina
  - Solvents effect on recovery
  - Viscosity changes
  - Vapor pressures
  - Solvent comparison
- Membrane filters
  - Ceramic/Steel filter
  - motivators
  - Boiler Water Requirements
  - Conventional process
  - Ceramic filters performance
  - Back flushing
  - Cleaners
- Screens
  - Motivator
  - Selecting a screen size

# Location Impact on Illustrative In-Situ Oil Sands Economics

## In-Situ Oil Sands Economic Comparison

|                                 | Commodity Scenarios |         |         |
|---------------------------------|---------------------|---------|---------|
|                                 | No Escalation       |         |         |
| WTI (US\$/bbl)                  | \$50.00             | \$70.00 | \$90.00 |
| NYMEX (US\$/MMBTU) - 10.0 to 1  | \$5.00              | \$7.00  | \$9.00  |
| WTI-WCS Differential (US\$/bbl) | \$13.50             | \$17.50 | \$20.70 |
| Foreign Exchange (US\$/C\$)     | \$0.825             | \$0.875 | \$0.925 |
| C5+ Premium to WTI (\$US/bbl)   | \$1.50              | \$2.10  | \$2.70  |
| Operating Cost Adjustment       | -20%                | -10%    | 0%      |
| Capital Cost Adjustment         | -40%                | -20%    | 0%      |
| <b>Athabasca North</b>          |                     |         |         |
| NPV (8%, A-T, \$mm)             | \$127               | \$485   | \$794   |
| IRR (Unlevered, After-Tax)      | 9.9%                | 13.5%   | 15.3%   |
| <b>Athabasca South</b>          |                     |         |         |
| NPV (8%, A-T, \$mm)             | \$283               | \$631   | \$927   |
| IRR (Unlevered, After-Tax)      | 12.0%               | 14.9%   | 16.4%   |
| <b>Cold Lake</b>                |                     |         |         |
| NPV (8%, A-T, \$mm)             | \$388               | \$735   | \$1,022 |
| IRR (Unlevered, After-Tax)      | 13.3%               | 15.9%   | 17.1%   |

## Key Project Assumptions

|   | Athabasca | Athabasca | Cold Lake |
|---|-----------|-----------|-----------|
|   | North     | South     |           |
| Steam-Oil-Ratio                               | 3.00      | 3.00      | 3.00      |
| Steam Gen. Efficiency (scf/bbl)               | 400       | 400       | 400       |
| Non-Energy Op. Costs<br>@ US\$90/bbl (\$/bbl) | \$7.00    | \$7.00    | \$7.00    |
| Sustaining Capital Costs                      | \$4.50    | \$4.50    | \$4.50    |
| Quality Differential (US\$)                   | \$2.00    | \$1.50    | \$1.00    |
| Bitumen Blend Transport. (\$/bbl)             | \$1.50    | \$1.00    | \$0.85    |
| Blending Ratio (% Condensate)                 | 32.0%     | 30.0%     | 28.0%     |
| Condensate Transport. (\$/bbl)                | \$1.25    | \$0.75    | \$0.60    |
| Initial Capital Cost @ US\$90 (\$/bbl/d)      | \$40,000  | \$40,000  | \$40,000  |
| Peak Production Volume (bbl/d)                | 30,000    | 30,000    | 30,000    |
| Recoverable Bitumen (mmbbl)                   | 330       | 330       | 330       |

- Factors influenced by a project's location, including bitumen viscosity and quality and pipeline transportation costs, have a material impact on non-integrated oil sands project economics
- The tables above compare theoretical 30,000 bbl/d projects in the Athabasca North, Athabasca South and Cold Lake regions assuming the same project sizes, development and operating cost structures

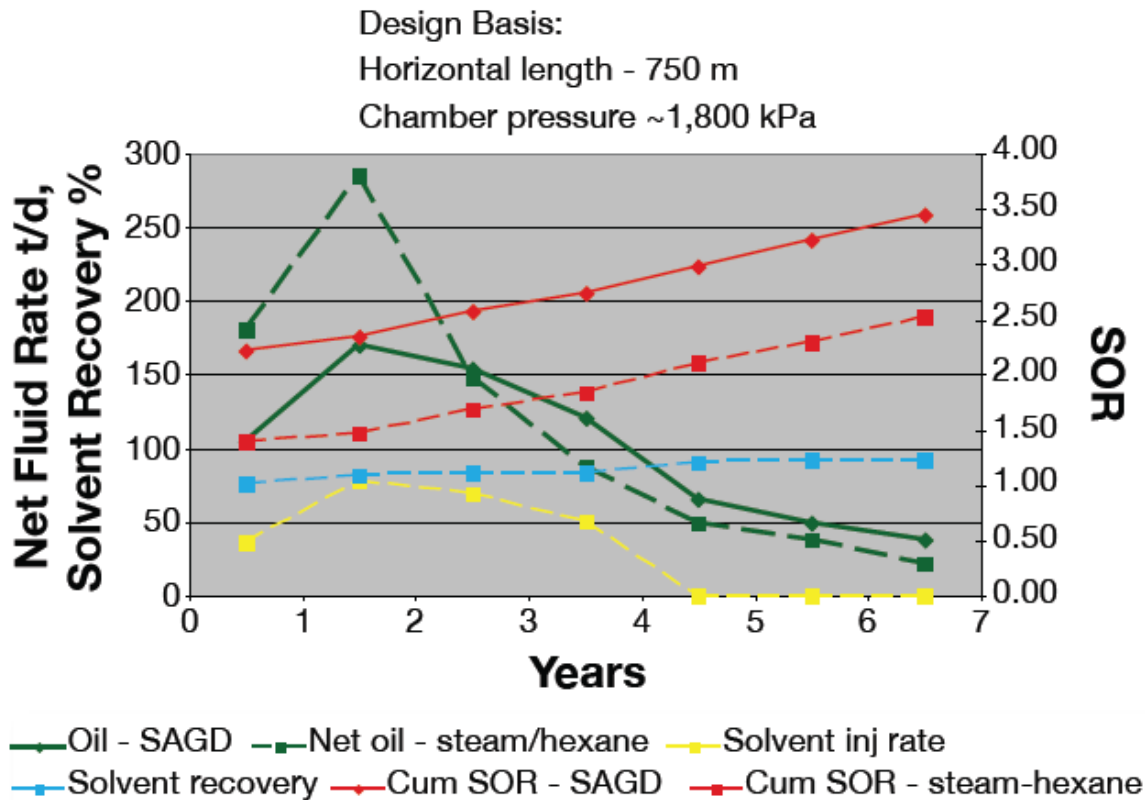
Note: Capital costs and operating costs varied with oil price assumptions in the analysis above

# Solvent-aided SAGD

- Use of solvent in SAGD
  - Decreases viscosity
  - Increases production
  - Decreases steam consumption

# Solvent Effects on Recovery

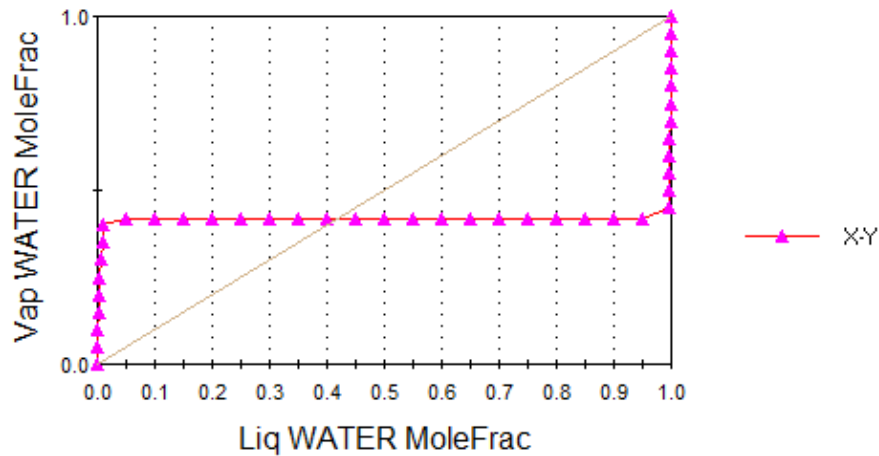
0.2 hexane



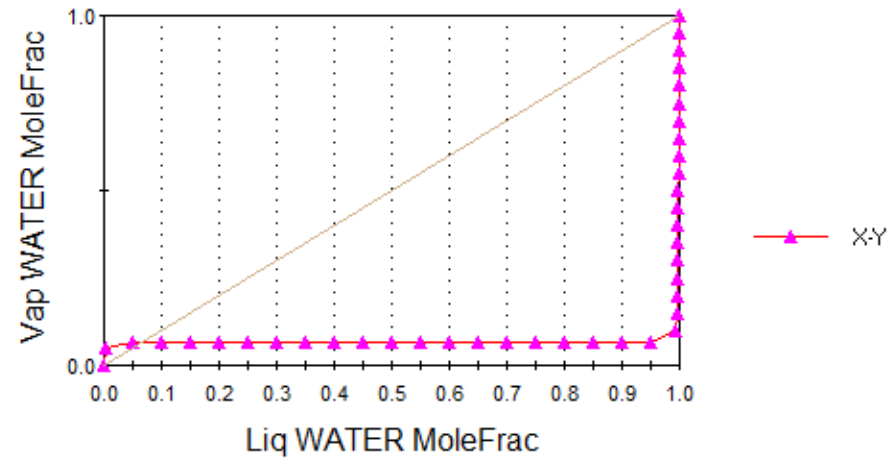
Potential steam-hexane SAGD performance.

# XY Plots of Solvents

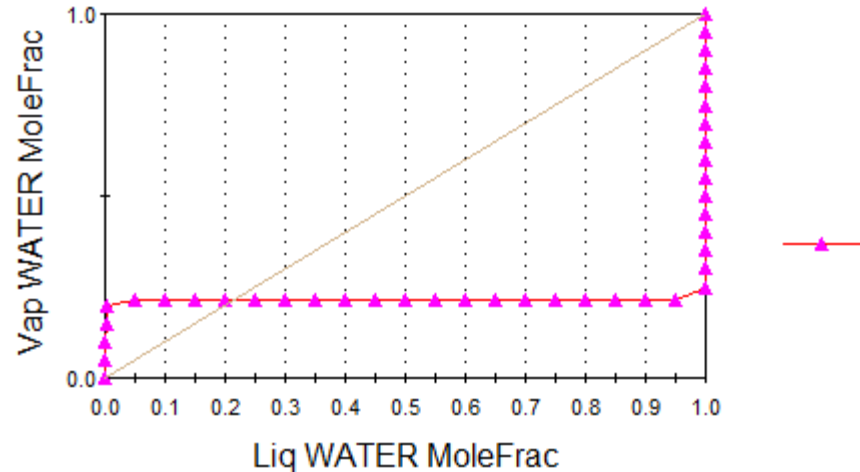
N-Hexane – Water, 2000 Kpa



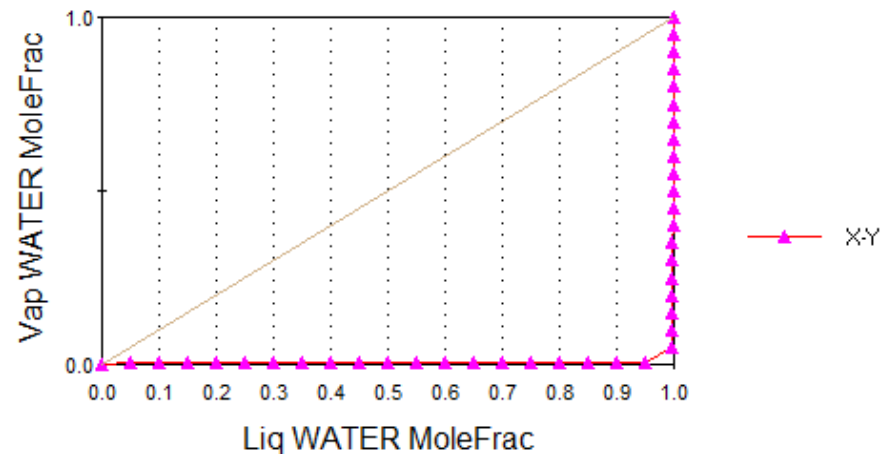
N-Butane – Water, 2000 kPa



N-Hexane – Water 103 kPa



Propane-Water, 2000 kPa



# Screen-based Liners



Regent Control



Absolute Energy Solutions

20% open area vs. 2%



G. Wozney

# Thanks!

This presentation contains just a few slides, please contact me

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