ENHANCED SOLVENT EXTRACTION INCORPORATING ELECTROMAGNETIC HEATING

How the Harris HeatWave® Enabled ESEIEH® Process Works:

1. Electrical energy is converted into radio frequency (RF) energy
2. The HeatWave® RF antenna heats the reservoir
3. Solvent is injected to assist the flow of the warmed bitumen
4. The bitumen and solvent drain via gravity to the well and are pumped to the surface
5. The bitumen and solvent are separated
6. Bitumen is transported to market and solvent is recycled

MARKET SNAPSHOT

- 95 MILLION BARRELS
  - The current, global oil production for ONE DAY
- 134.3 BILLION BARRELS IN SITU RESERVES IN CANADIAN OIL SANDS

SAGD** LIMITATIONS

- High capital investment
- Energy intensive
- Greenhouse gas intensive
- Large surface facilities needed to generate steam and treat water
- Cannot access many resource-rich pay zones

Typical operating temperature for ESEIEH®:

By comparison, SAGD typically operates at 240°C.

* Enhanced Solvent Extraction Incorporating Electromagnetic Heating
** Steam Assisted Gravity Drainage: A technology for recovering heavy crude oil and bitumen
*** Source: http://www.eia.gov/forecasts/steo/report/global_oil.cfm
†† 75% reduction based on a comparison with natural gas as the power source.
††† Source: Goldman Sachs, Cenovus. Goldman Sachs defines breakeven as the US dollar equivalent WTI oil price required to achieve a 10% return.

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KEY:

- RF ENERGY
- SOLVENT
- RECOVERY

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