ISR Uranium Processing
Cameco Resources
Smith Ranch – Highland Operation
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Safe, clean, reliable.
Doubling uranium production by 2018.
Forward-looking Statement

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Smith Ranch-Highland
Glenrock, Wyoming

- Largest US uranium mine
- 147 employees
- 50 contractors
- 2 million lbs. of uranium/year
• The ore occurs at depths of several hundred feet, the extent is determined by surface drilling.
• Ore is typically confined by impervious shale.
• After deposit delineated, an extraction plan is prepared and grids of injection and production wells are installed.
Wellfield Development

Deposited Uranium

Mineralization averages about 10 meters in width.
Wellfield Development

No waste rock or tailings

- Application of the ISR mining technique avoids the use of conventional mining methods such as excavation, blasting, crushing, and grinding the ore.
- Removes the uranium mineral from the deposit by the recirculation of native water through the ore zone.
- Controlled-loop system
Wellfield Development

Injection/Extraction wells

- Installed to depth of the ore deposit
- Permitted as EPA Class III wells
- Mechanical Integrity must be proven
- Interconnected moisture detection system
- Delivers/Extracts native groundwater along with small amounts of gaseous oxygen, carbon dioxide and/or baking soda to the mining zone
Headerhouse Internals
Reversing Mother Nature

Oxygen

Carbon Dioxide
and/or

Baking Soda
Uranium Extraction and Controlling Ground Water Movement

From IX Plant w/ Oxygen & Carbon Dioxide

To IX Plant

Recovery Fluid

Ore Body

Shale

Overlying Aquifer

Shale

Ore Bearing Aquifer

Shale

Underlying Aquifer

Cameco
A small portion of outside groundwater is constantly being drawn into the mining unit to aid in control of the mining fluids in the aquifer.
Satellite Operations

The uranium-bearing solution is then pumped from the formation via extraction wells to a satellite facility.

- The solution is passed through large water-softening vessels.
- Uranium ions, from the solution, are transferred onto water softening resin beads.
- Uranium-loaded resin is then trucked to central processing plant.
Yellowcake

- Dry powder shipped to other facilities in the US and Canada for conversion and enrichment.

- Ultimately used to produce pellets that are placed in fuel rods for nuclear power plants.
Annual Radiation Exposure

Millirems per year

- NRC limit: 5,000
- International limit: 2,000
- CB, SR-H
- Avg. US resident
Protecting Wildlife and the Land

• During and after wellfield installation:
  • Development and operational activities are planned to protect topsoil and vegetation
  • Soils must be stabilized
  • Vegetation re-established

• After final reclamation is completed, the land is returned to its original use
Protecting / Restoring Groundwater

Tap only non-drinking water aquifers

- Water continually recycled in process
- Monitor wells around, above and below
- Restoration to baseline or quality as was before mining
Protecting / Restoring Groundwater

Monitor well samples are continually tested in our lab with results reported to WDEQ.

- About 800 wells at Smith Ranch-Highland
- Each well tested at least every 2 weeks
Groundwater Sweep

2. Water Production Continues. Fluid volume and ion concentrations are reduced.
Reverse Osmosis

2. Retraped water is filtered to reinject into wellfield, further reducing volumes and ion concentrations.

Diagram showing a cross-section of geological layers with labeled aquifers and shale layers.
Reductant Addition

2. Sodium Sulfide, a chemical reductant, is added to the mine unit to stabilize the water.
Advantages of ISR

• Minimal environmental impact
• Protection of water, land and wildlife
• Exceptional worker health and safety
• Economical recovery from very low grade ores: 1/10 of 1%
ISR Uranium Production

Questions?

Double

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