NEXT SHALE 2017

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Navigating the Future of Unconventional Resources

Water Management and Regulatory Challenges in Unconventional Play

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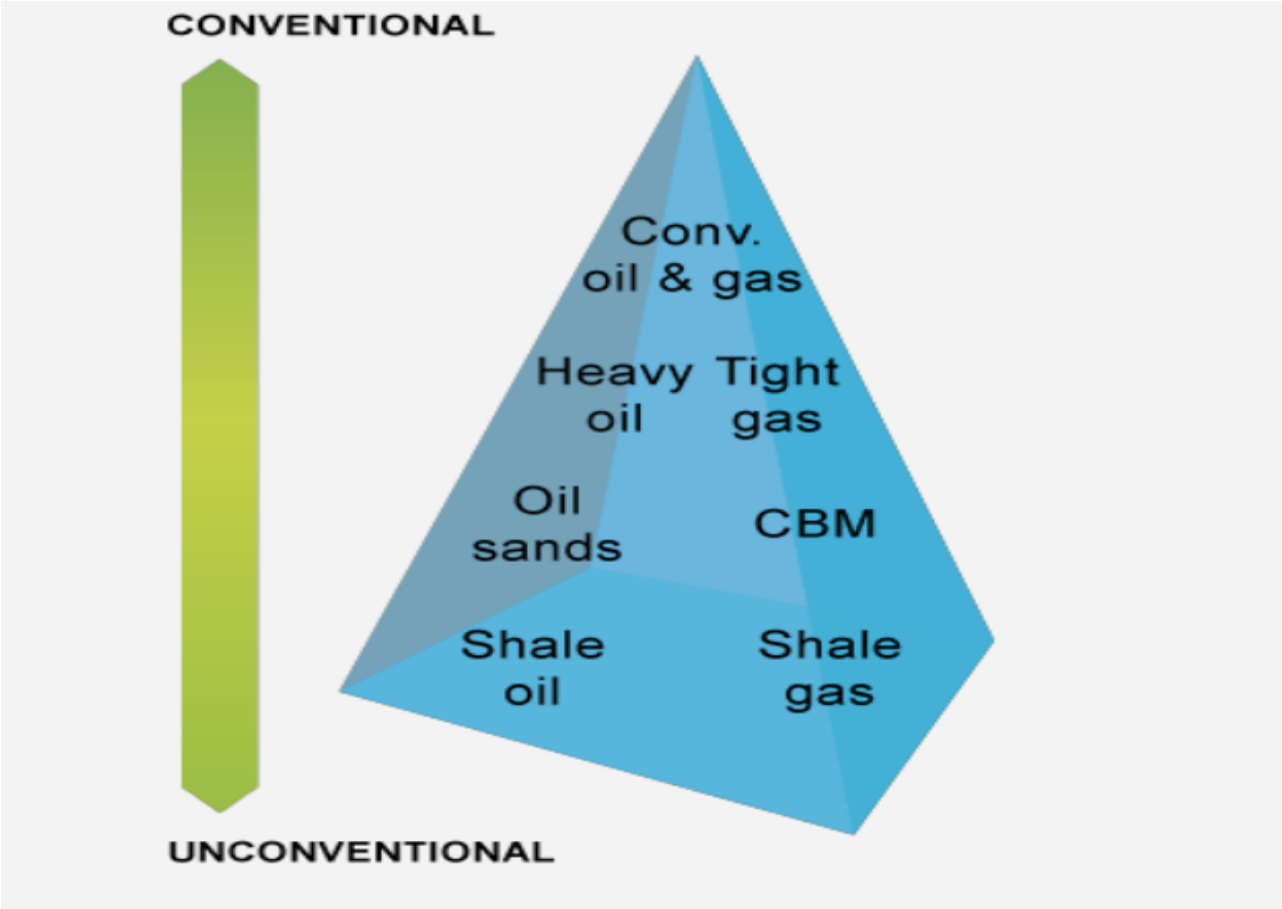
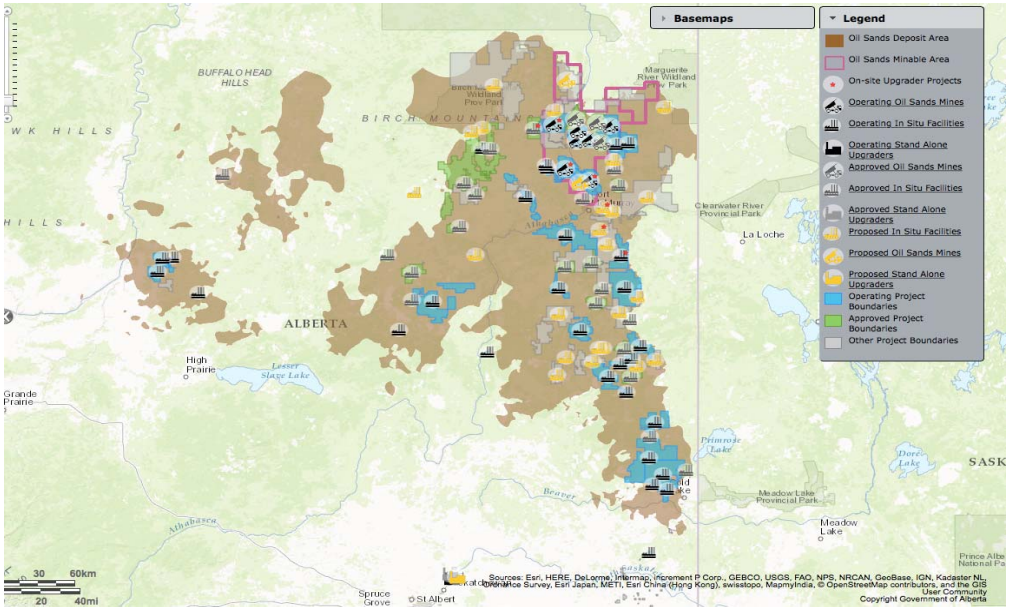
Unconventional Resources

- Coalbed methane (CBM)
- Tight gas
- Tight oil
- Shale gas
- Oil Sands
  - Made up of bitumen, water, sand and clay
  - Unable to flow on its own

Unconventional Play



NORTHWEST TERRITORIES
Wood Buffalo National Park
Lake Athabasca
Clearwater River Provincial Park
Fort McMurray
Athabasca Oil Sands
Peace River Oil Sands
SASKATCHEWAN
Grande Prairie
ALBERTA
Cold Lake Oil Sands
Meadow Lake Provincial Park
Edmonton
Lloydminster
BRITISH COLUMBIA
Jasper National Park
Red Deer
Banff National Park
Calgary
Medicine Hat
Lethbridge
Canada
United States
MONTANA
NORTH
0 50 100 200
Kilometres


Basemaps
Legend
Oil Sands Deposit Area
Oil Sands Minable Area
On-site Upgrader Projects
Operating Oil Sands Mines
Operating In Situ Facilities
Operating Stand Alone Upgraders
Approved Oil Sands Mines
Approved In Situ Facilities
Approved Stand Alone Upgraders
Proposed In Situ Facilities
Proposed Oil Sands Mines
Proposed Stand Alone Upgraders
Operating Project Boundaries
Approved Project Boundaries
Other Project Boundaries
BUFFALO HEAD HILLS
BIRCH MOUNTAINS
ALBERTA
Clearwater River Provincial Park
La Loche
High Prairie
Grande Prairie
Meadow Lake Provincial Park
Meadow Lake
Spruce Grove
St Albert
30 60km
20 40mi
Copyright Government of Alberta

NORTHWEST TERRITORIES
Canada
United States
Wood Buffalo National Park
Lake Athabasca
Clearwater River Provincial Park
Fort McMurray
Athabasca Oil Sands
Long Lake Oil Sands Project
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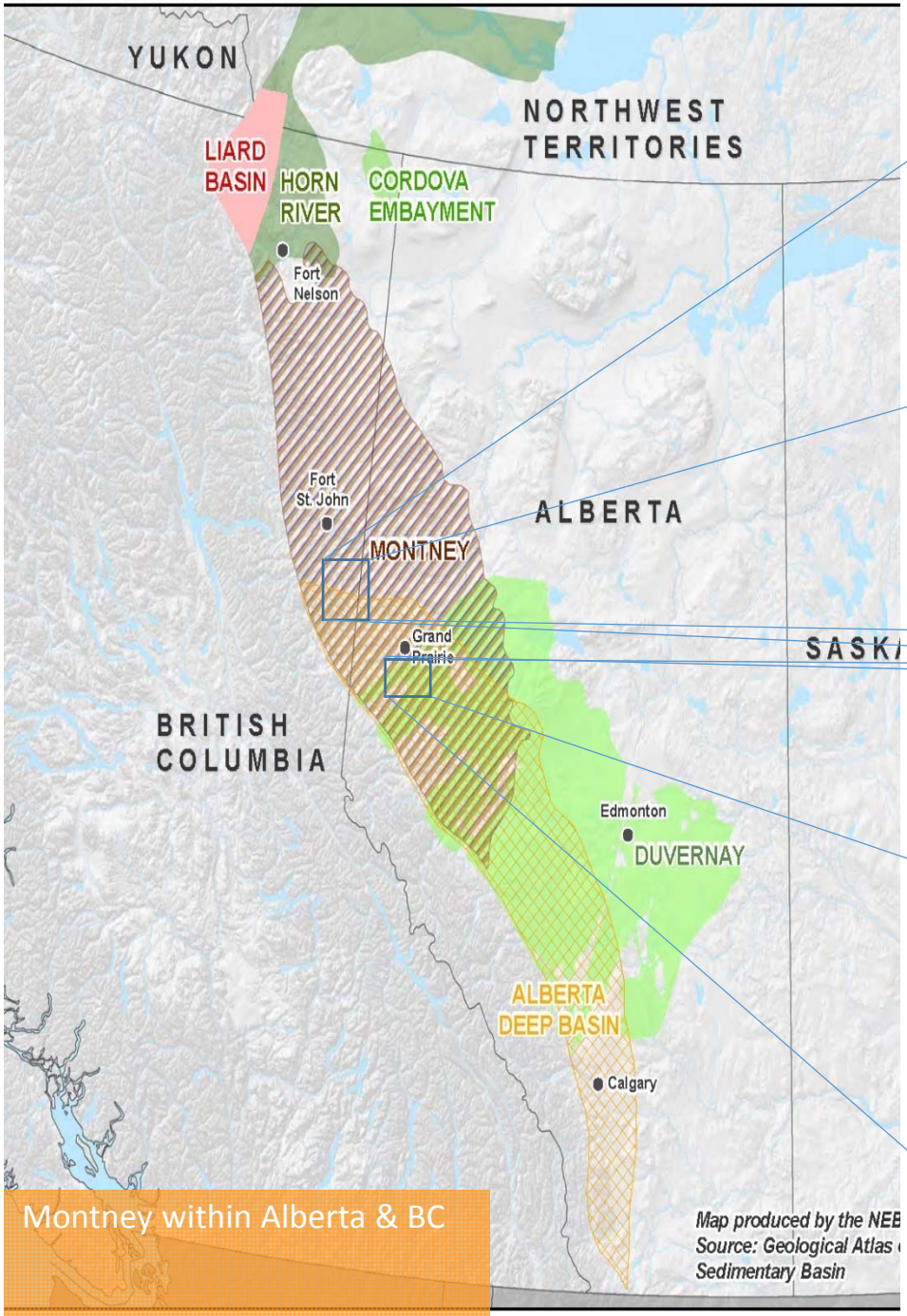
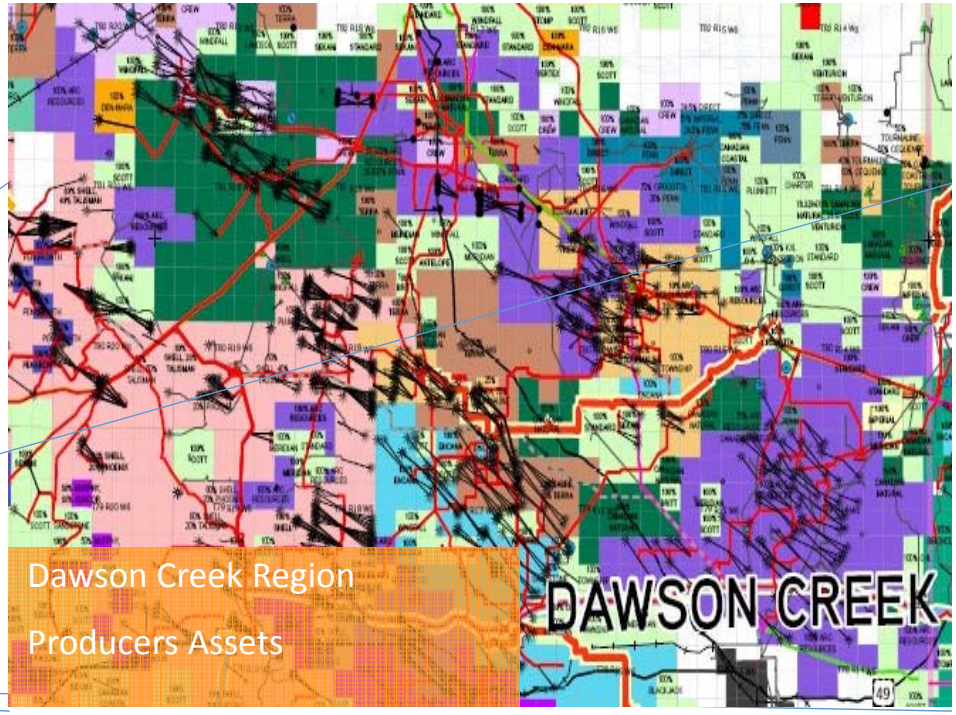
Kilometres
Edmonton
Lloydminster
BRITISH COLUMBIA

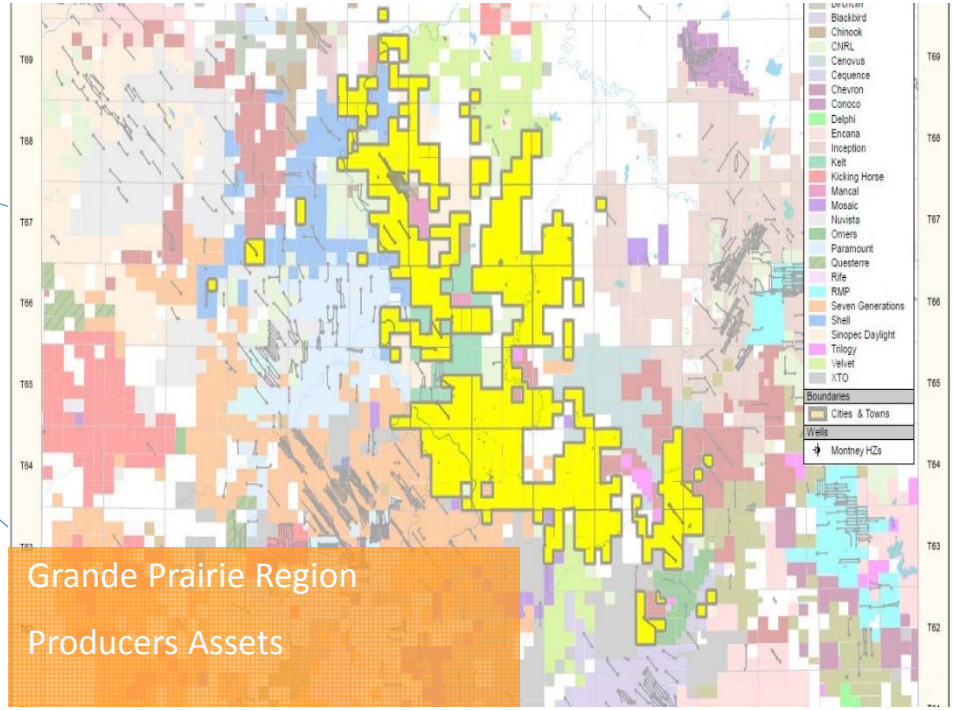


Montney within Alberta & BC



Dawson Creek Region

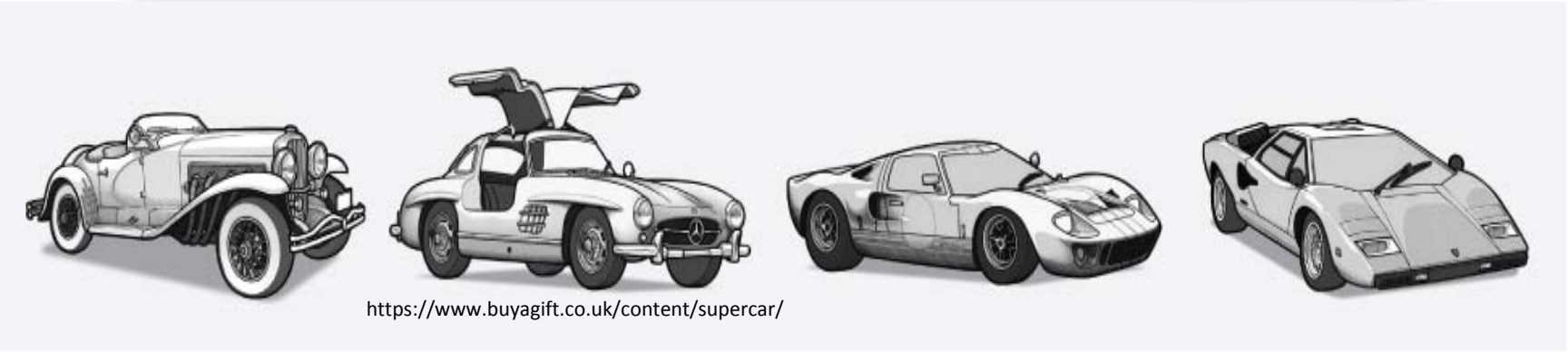
Producers Assets

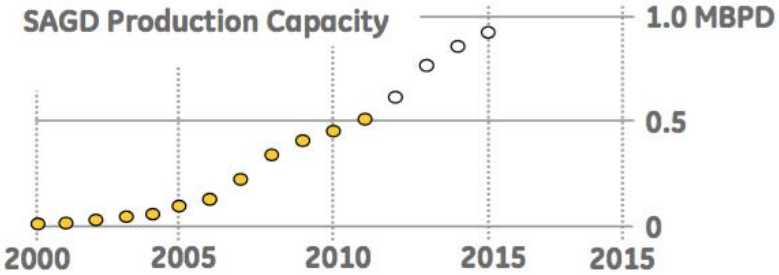


Grande Prairie Region

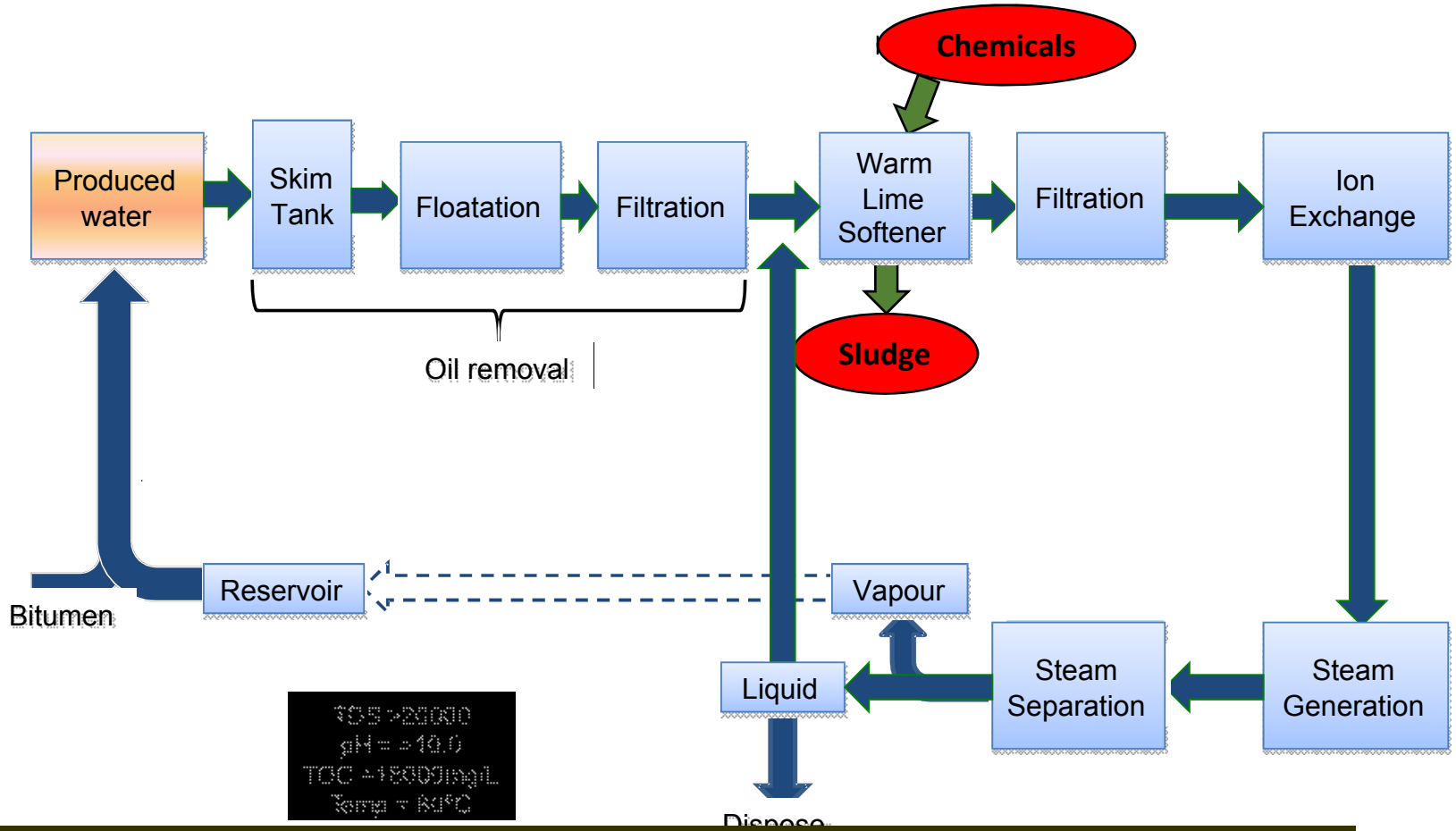
Producers Assets

It has only been 24 years since SAGD came off the paper and 12 years at commercial scale in the field





Steam-Assisted Gravity Drainage Process



Regulation and Key Directives for In Situ

- Water for Life, Environmental Protection and Enhancement Act (EPEA), and Water Act, Responsible Energy Development Act (REDA)
- Directive 081: Water Disposal Limits and Reporting Requirements for Thermal In Situ Oil Sands Schemes
- Directive 054: Performance Presentations, Auditing, and Surveillance of In Situ Oil Sands Schemes

Directive 54

- Focus on Water Management Plan, Reliability and Operability through process optimization
- Accelerate the pace of resource recovery improvement and maximize resources
- Reporting includes: treatment technology, problems and successes, wastewater and waste disposal option

Key Findings

- Extraction process is energy intensive and results on large volumes of contaminated water
- The produced water has high silica, hardness, heavy metals, salts that must be removed for reuse or release to the environment
- Organic can cause severe fouling of expensive polymeric membranes
- Premature membrane degradation can reduce process performance
- Opportunities for improvement in treatment process

Key Findings

- Opportunities for improvement in treatment process optimization:
  - Once Through Steam Generators (OTSG) Steam Quality
  - Optimization of steam generation capacity
  - Improved pigging frequency
  - Improved reliability of the OTSG due to erosion/corrosion issues

Potential Solution

- Develop a robust and flexible system approach that can eliminate processes
- Online monitoring is part of the system approach
- Understand the behavior of contaminants of interest i.e. silica, hardness, total organic carbon.
- Explore ULQ management options
  - By operating the OTSG at 25-40% quality
- Increased recycle rate.
- Look for innovative ways to reduce contaminants:
  - Hardness <0.2 mg/L
  - Silica <50-75 mg/L

Potential solution contd.
Holistic Water Management Plan

- Use produced water as a resource to maintain your assets profitable and sustainable.
- Creating an essential tool to better understand water resources and its use.
- Consider developing water management plan in the initial phase of planning.

Water Management Plan

Conclusion

- The financial and environmental sustainability of produced water could be greatly improved through the development of new treatment approach.
- Reliability should be judged through operational safety, ease of operational control and consequent economic and operational values
- Innovative solution and continuous improvement can improve environmental performance and reliability and efficiency
- Create an environment that enables innovation.

Questions?

Thank you!