Over 80% of Canada’s oil production in 2017
- ~1.2 billion barrels

Nearly 70% of natural gas production in 2017
- ~4 trillion cubic feet

Much is exported to U.S.

Regulated by the Alberta Energy Regulator

Source: AER ST-98
Hydraulic Fracturing in Alberta

- >15,000 horizontal wells fractured since 2008
  - 15 different formations
    - e.g., Duvernay, Montney, Cardium
  - 65% oil, 35% gas
  - Variable water needs
    - <200,000 to >13 mil gal
- Detailed additive and water data collected since 2013
Water for Hydraulic Fracturing

» Regulatory requirement for submission
  • Water used (technological aspect)
    – Carrier fluid, reported by stage
      » Reported on FracFocus.ca!
    – Nonsaline water use performance
  • Water sourced (environmental aspect)
    – Where, when, how much…
      » Nonsaline - surface water, groundwater, municipal
      » Alternatives - saline groundwater, produced, recycled/reused flowback, waste/effluent
Environmental Aspects – Impact?

Nonsaline water for Fracturing - 2016

Availability: 343 trillion gallons (est.)

Allocation:
- Commercial & Cooling 28%
- Agricultural & Irrigation 44%
- Municipal 11%
- Other 7%

Use:
- HF 0.7%
- Other Energy 21%
- Unused 78%

Energy Sector 10%
- Enhanced Oil Recovery 10.4%
- Hydraulic Fracturing 6.6%
- Oil Sands Mining 70.5%
- In Situ 7.7%

Source: AER data; Alberta Energy Industry Water Report, AER.ca
Environmental Aspects – Sources

Various water types used, mostly nonsaline...

(Preliminary 2017 data shows increases.)

Source: Alberta Energy Industry Water Report, AER.ca
Technical Aspects - Performance

Nonsaline Water Use Intensity - HF

(Preliminary 2017 data shows increases.)

Other sectors

Source: Alberta Energy Industry Water Report, AER.ca
Technical Aspects – Benchmarking

Peer to peer performance comparison

- Cohorts by company ‘size’
- Differing strategies

Source: AER data
Technical Aspects – Benchmarking

Geologic Variability

- Formation differences.... Operator can influence

Intensity by Formation

Formation Intensity by Company

Source: AER data
Improving Water Performance

Drivers:
• water conservation
• environmental protection
• social license
• cost

Challenges:
Regulatory aspects
• Limiting water classifications
  – Waste vs produced
• Unclear, sometimes restrictive or absent
  – Conveyance…
  – Storage…
Possible Solutions

▷ Conveyance
  • Temporary, surface infrastructure
  • Poor quality nonsaline (e.g., treated effluent)

▷ Storage
  • Large volumes, centralized
    – ECPs, AWSSs (aka C-ring)
  • Flowback, produced water

▷ Consider fluid risk, siting, monitoring, liability…
Benefits of Regulatory Change

» Regulator
  • Clarity, consistency, efficiency, monitoring/reporting, help to meet goals

» Industry
  • Cost savings, time savings, regulatory certainty, facilitate water sharing → competitiveness

» Environment
  • less nonsaline water use, reduced disturbance, less trucking → lower risk
Pilot Project - ECP

Tourmaline Oil proposed engineered containment pond (ECP) for produced water/flowback to support HF operations

- Goal – reuse water, use less nonsaline water
  - reduced trucking/disposal → decrease cost & risk

Restrictive rules for long-term, large volume storage

- Worked with operator
  - develop requirements, processes for application and approval
Success – Tourmaline Banshee ECP

 réussissant pilote projet!

• Regulator:
  – Knowledge gathering – process, info requirements, gaps, site visits
    ▶️ 3 more ECPs approved since, up to 40 mil gal.
  – Informing current development of regulatory tool

• Operator:
  – Reuse facilitated, reduced disposal/ trucking/ NS water use/ cost
  – Regulatory certainty
Summary

- Detailed HF water data = invaluable intelligence
- HF activity and water use is increasing, while barrels of nonsaline water per BOE is not...
- Regulatory solutions to facilitate increased use of alternatives are under development
Thank you