The Oil Sands Lifecycle
A look at Mining and SAGD Operations
Agenda

1. Who is OSCA?
2. Energy Outlook
3. Understanding Oil Sands Mining and Steam Assisted Gravity Drainage (SAGD) 101
4. Project Lifecycles
Who is Oil Sands Community Alliance (OSCA)?

- ~15 oil sands companies.
- OSCA’s members have assets or interests in the Athabasca Oil Sands Area.
History of OSCA

The evolution from AOSDFC to OSCA

**AOSDFC**
10 oil sands companies, the RMWB and GEA came together to form the Athabasca Oil Sands Development Facilitation Committee (AOSDFC) to jointly address common development issues in RMWB.

**ARIWGA**
The organization was incorporated as a non-profit named the Athabasca Regional Issues Working Group Association (ARIWGA) but was still referred to as RIWG.

**OSCA**
The organization was transitioned to the Oil Sands Community Alliance (OSCA), an unincorporated business division of the Canadian Association of Petroleum Producers. The mandate was changed to socio-economic issues with a focus on Aboriginal, Community Well-Being, Infrastructure and Workforce issues in the Athabasca Oil Sands Area.

**RIWG**
The organization's name was changed to the Regional Issues Working Group (RIWG) to reflect involvement in social, economic, infrastructure and environmental issues made up of 19 members.

**OSDG**
The organization's name changed to The Oil Sands Developers Group (OSDG). The name change was sparked by the broadening awareness and interest in Canada's oil sands – both as a source of energy and a source of potential concerns. The OSDG took a more proactive role in discussing regional issues with a more geographically-diverse audience.

1997

2002

2004

2008

2013
What are our Priority Areas?

- Community Well-Being
- Workforce
- Regional Stakeholder Engagement
- Infrastructure
- Aboriginal Community Relations
- OSCA
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Oil and Gas is a driving force in the Canadian Economy

Economic Impacts of the Oil and Natural Gas Industry in Canada

- The oil and natural gas industry is the largest single private investor in Canada.
- Capital expenditure: $81 BILLION in 2014
  $41 BILLION forecast in 2018
- Direct and indirect employment: 528,000 CANADIAN JOBS
- Contribution to government revenues $7 BILLION/YEAR
- Energy sector to GDP: 6.25 PER CENT in 2017
- Supply chain: More than 3,400 in Canada (outside of Alberta) providing goods and services to the oil sands.

Source: Statistics Canada, Prism Economics and CAPP, 2018
Growth in the Global Energy Mix from 2017-2040

The World Wants Canadian Energy

THE WORLD IS OPEN TO CANADIAN ENERGY.

Canada is the preferred choice for oil and natural gas imports out of 11 producing countries.

globalenergypulse.com
Canadian Oil Production

million barrels per day

Actual  Forecast

Eastern Canada

Oil Sands

Pentanes and Condensate

Conventional Heavy

Conventional Light


June 2017 Forecast
Oil Sands Employment Outlook to 2020

49,750 workers needed by 2020 – 3,345 fewer jobs than previously projected

<table>
<thead>
<tr>
<th>Occupation</th>
<th>2016e</th>
<th>2020f</th>
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<tbody>
<tr>
<td>Operations Operations</td>
<td>28,925</td>
<td>32,540</td>
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<tr>
<td>Operations Ongoing maintenance</td>
<td>11,520</td>
<td>15,045</td>
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<tr>
<td>Operations On-site construction</td>
<td>7,700</td>
<td>2,165</td>
</tr>
<tr>
<td>Operations Total</td>
<td>48,145</td>
<td>49,750</td>
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</tbody>
</table>

Source: PetroLMI
Existing headwinds

1. Market access
   - Current 4 Mb/d oil pipeline network operating near maximum capacity.
   - Limited takeaway capacity results in heavy discounts on Canadian crudes and challenges investment in new and existing projects

2. Uncompetitive with United State’s
   - The US tax system has become much more competitive and as a result, the US economy is going to be much more attractive for investment

3. Regulatory environment: complexity, climate policy, uncertainty
   - Canada is losing market share to U.S. producers who are growing supply while faced with less stringent environmental regulations

4. Cost Structure
“2018 oilsands spending to be lowest in 15 years; slower growth to continue”

“Canada's dashed 'energy superpower' dream”

“No new Canadian investments without new pipelines”
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Heavy Oil Production from Oil Sands

Oil Sands Reserves
- In Situ: 80%
- Mining: 20%

Oil Sands Land Use
- In Situ: 97.5%
- Mining: 2.5%
Understanding OS Mining

OS Mining

A surface mining technique of extracting resources from the earth by their removal from an open pit or borrow using a process that begins with large trucks and shovels.

Stage 1
Mining shovels dig into sand and load it into trucks.

Stage 2
Trucks take oil sands to crushers, where it is prepared for extraction.

Stage 3
Hot water is added to the oil sands and then transported via hydrotransport to the extraction plant.

Stage 4
Bitumen is extracted from the oil sands in the separation vessels.
Understanding SAGD

STEAM ASSISTED GRAVITY DRAINAGE DRILLING (IN SITU) METHOD

Stage 1
Surface wellhead: Horizontal wells are drilled based on the location of bitumen deposits

Stage 2
Steam is injected underground to liquefy the bitumen

Stage 3
Bitumen is pumped to the surface through a recovery well
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OS – Lifecycle Diagram

Oil Sands Open Pit
Mine Life Cycle & Key Activities

Phase 1: Exploration and Production
- Drilling and Completion
- Subsurface Investigations (e.g., drilling, exploration wells)
- Geophysical and Drilling Exploration
- Locating Deposits
- Engineering and Construction Services
- Land planning and review of existing geological information
- Mine construction

Phase 2: Construction
- Mining
- Site preparation, clearing, grading, stripping, and blasting
- Overburden removal
- Engineering and Construction Services
- Construction of mine infrastructure (e.g., power, roads, water)
- Civil construction works

Phase 3: Operations
- Maintenance and Support Services
- Site wide services and plant maintenance
- Waste management
- Tank services
- Mining
- Mining and explosive services
- Mining equipment repairs and leasing
- Earthworks
- Transportation and Logistics
- Freight handling and haulage services
- Lodging services and facility maintenance

Phase 4: Consultation, Planning and Feasibility
- Professional Services, ISA and EH&S
- Completion of the environmental, feasibility, and social impact assessment
- Environmental, social planning and reclamation planning
- Engineering and Construction Services
- Design of mine layout and facilities
- Characterization of baseline site conditions

Phase 5: Closure
- Professional Services, ISA and EH&S
- Reclamation, revegetation and rehabilitation
- Environmental Monitoring
- Site clean up
- Backfilling
Mining - Phase One

Oil Sands Mining Life Cycle and Key Activities

**Phase 1: Exploration and Production**

**Drilling and Completions**
- Subsurface investigations (i.e., drilling, exploration wells)
- Detailed surface reconnaissance (e.g., geologic mapping, geochemical sampling, geophysics)
- Geophysics and drilling exploration
- Locate deposits

**Engineering and Construction Services**
- Land surveying and review of existing geologic information
- Civil construction

[Diagram showing the phases with numbers and icons]
Mining - Phase Two

Oil Sands Mining and Key Activities

Phase 2 Consultation, Planning and Feasibility

Professional Services, IS and EH&S
- Mine planning and waste management plan
- Completion of the environmental, feasibility and social impact assessment
- Environmental/social planning and reclamation planning

Engineering and Construction Services
- Design of mine layout and facilities
- Characterization of baseline site conditions
Mining - Phase Three

Oil Sands Mining Life Cycle and Key Activities

**Phase 3 Construction**

**Mining**
- Site preparation: clearing, grubbing, stripping and blasting
- Overburden removal

**Engineering and Construction Services**
- Construction of mine infrastructure (e.g., power, roads, water)
- Construction of waste containment and water treatment facilities
- Civil construction works
Mining - Phase Four

Oil Sands Mining Life Cycle and Key Activities

Phase 4 Operations

Maintenance and Support Services
- Site wide services and plant maintenance
- Wastewater management
- Tank services

Mining
- Mining and explosive services
- Mining equipment repairs and leasing
- Earthworks

Transportation and Logistics
- Freight hauling and hotshot services
- Lodging services and facility maintenance

Engineered Equipment, Electrical and MRO
- Tailings management
- Bitumen extraction
- Equipment design, installation and repairs

Professional Services, IS and EH&S
- Progressive reclamation
- IS services and corporate consulting
- Waste management services
Mining - Phase Five

Oil Sands Mining Life Cycle and Key Activities

Phase 5 Closure

Professional Services, IS and EH&S
- Reclamation, revegetation and rehabilitation
- Environmental Monitoring
- Site clean up
- Backfilling
SAGD – Lifecycle Diagram

Oil Sands SAGD Life Cycle & Key Activities

Phase 1: Exploration
- Geophysical and seismic
- Drilling exploration
- Engineering
- Cleaning
- Land surveying
- Environmental services

Phase 2: Early Earthworks Construction
- Clearing and grubbing
- Log hauling

Phase 3: Construction and Development
- Lease construction (plant and pad development)
- Access road development

Phase 4: Operations
- Operational
  - Maintenance and repairs
  - Waste fluid and hauling
  - Security
  - Travel
  - Insulation
  - Crane
  - Road maintenance
  - Tank inspection / cleaning
  - Bussing
  - Rental equipment
  - Environmental services
  - Truck load transportation
- Capital
  - Drilling and Earthworks
  - Offsites (pad / pipeline) completions
  - Camps
  - Surveying

Phase 5: Reclamation
- Reclamation, restoration and remediation
- Control erosion
- Reclaim land and control vegetation

Oil Sands Community Alliance
SAGD - Phase One

Oil Sands SAGD Life Cycle and Key Activities

Phase 1 Exploration

- Geophysical and seismic
- Drilling exploration
- Engineering
- Clearing
- Land surveying
- Environmental services
SAGD - Phase Two

Oil Sands SAGD Life Cycle and Key Activities

Phase 2 Early Earthworks Construction

- Clearing and grubbing
- Log hauling
SAGD - Phase Three

Oil Sands SAGD Life Cycle and Key Activities

Phase 3 Construction and Development

- Lease construction (plant and pad development)
- Access road development
SAGD - Phase Four

Oil Sands SAGD Life Cycle and Key Activities

Phase 4 Operations

Capital
- Drilling and Earthworks
- Offsites (pad / pipeline) completions
- Camps
- Surveying

Operational
- Maintenance and repairs
- Waste fluid and hauling
- Security
- Travel

- Insulation
- Crane
- Road maintenance
- Tank inspection / cleaning

- Bussing
- Rental equipment
- Environmental services
- Truck load transportation
- HR Services
- Electrical
- Chemicals and chemical supply
- Workforce
- Health and safety
- Scaffolding
- Piling
- Hot shot

OIL SANDS COMMUNITY ALLIANCE
SAGD - Phase Five

Oil Sands SAGD Life Cycle and Key Activities

Phase 5 Reclamation

- Reclamation, restoration and remediation
- Control erosion
- Reclaim land and control vegetation
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Oil Sands Mining – Projects as of October 2017

MINING PROJECTS STATUS
October 2017

AP | Announced, Regulatory Application Pending
AF | Regulatory Application Filed
A | Regulatory Approval in Place
UC | Under Construction
OP | Operating
H | In Hold; Timing Uncertain
S | Operations Suspended
C | Project Cancelled

- Regulatory Status
- Current Status
- Stage of Lifecycle
SAGD – Projects North Athabasca as of October 2017

IN-SITU PROJECTS NORTH
STATUS October 2017
AP Announced, Regulatory Application Pending
AF Regulatory Application Filed
A Regulatory Approval in Place
UC Under Construction
OP Operating
H In Hold; Timing Uncertain
S Operations Suspended
C Project Cancelled

Regulatory Status
Current Status

OIL SANDS COMMUNITY ALLIANCE
2019 Project Updates

• Fort Hills is now operational

• Syncrude Aurora North is now operational

• $400 million expansion planned for Nexen Long Lake

• Imperial’s $2.6-billion Aspen oilsand project has been approved

• Devon Energy announced separation from its Canadian assets
Value of Contracts Awarded to Aboriginal businesses

OSCA member companies have awarded over $9 billion worth of contracts to Aboriginal businesses in RMWB and LLB in a decade (2005-2014)

Source: OSCA and OSDG surveys
In 2015 and 2016, 399 Indigenous companies from across Alberta had direct business valued at $3.33B with oil sands operators.

Source: CAPP
Procurement Spend in the RMWB

In 2015 and 2016, Indigenous companies in RMWB had direct business valued at $1.6B with oil sands operators

• Most popular categories
  - Camp and Catering – 21%
  - Construction – 19%
  - Electrical Equipment/Services – 18%
  - MRO* – 6%
  - Health and Safety – 4%
  - Water/waste water treatment – 4%

*Maintenance, Repair and Operations

Source: CAPP
Questions?
Appendix
1. Market Access: Pipeline Proposal Projects

**Trans Mountain Expansion Project**
- **Additional Capacity:** 590,000 b/d
- **Potential Markets:** Asia and California
- **Status:** Approved November 29, 2016 with 157 conditions by the federal government.

**Enbridge Line 3 Replacement**
- **Additional Capacity:** 370,000 b/d
- **Potential Markets:** Central and Eastern Canada, U.S. Midwest and Gulf Coast
- **Status:** Approved November 29, 2016 with 89 conditions by the federal government.

**TransCanada Keystone XL**
- **Additional Capacity:** 830,000 b/d
- **Potential Markets:** Heavy oil refineries along Gulf Coast
- **Status:** U.S. Presidential permit received on March 24, 2017.