Leismer SAGD 2014 (January 1 – December 31, 2013)
Annual D054 Performance Presentation
Alberta Energy Regulator
March 5, 2014
LEISMER PROJECT
Introduction and Overview

- Introduction
Subsurface Issues Related to Resource Evaluation and Recovery
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BRIEF BACKGROUND

Subsurface Section 1

Leismer 2014 Annual Performance Presentation
<table>
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<tr>
<th>Project</th>
<th>Application Number</th>
<th>Date Submitted</th>
<th>Approval Date</th>
<th>New Approval No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clerical Error Correction</td>
<td>1751374</td>
<td>16-Jan-13</td>
<td>16-Jan-13</td>
<td>10935I</td>
<td>Application submitted by the AER to correct an AER clerical error.</td>
</tr>
<tr>
<td>Well Pad Separators</td>
<td>1747774</td>
<td>7-Dec-12</td>
<td>17-Jan-13</td>
<td>10935J</td>
<td>Installing three well pad separators on Pads L1, L2 and L4.</td>
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<tr>
<td>Ceramic Membrane (Ceramem)</td>
<td>1772007</td>
<td>23-Aug-13</td>
<td>3-Oct-13</td>
<td>10935K</td>
<td>Piloting a commercial scale ceramic membrane water system</td>
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<tr>
<td>Pad L6 Well Pad Standardization</td>
<td>1779244</td>
<td>13-Nov-13</td>
<td>9-Dec-13</td>
<td>10935K</td>
<td>Implementing the well pad standardization (WPS) design for Pad L6 and adding flow control devices to all the wells.</td>
</tr>
<tr>
<td>Produced Water Recycle Rate Clause</td>
<td>1779086</td>
<td>13-Nov-13</td>
<td>23-Jan-14</td>
<td>10935L</td>
<td>Request to rescind Clause 5 of the approval relating to a produced water recycle rate of 90%.</td>
</tr>
<tr>
<td>Infill Wells Pilot on Pad L2</td>
<td>1771039</td>
<td>22-Aug-13</td>
<td>23-Jan-14</td>
<td>10935L</td>
<td>Drilling up to two infill wells on Pad L2.</td>
</tr>
<tr>
<td>Vacuum Insulated Tubing on Pad L5</td>
<td>1787033</td>
<td>29-Jan-14</td>
<td>24-Feb-14</td>
<td>10935L</td>
<td>Installing vacuum insulated tubing for wells on Pad L5</td>
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<tr>
<td>Leismer Amendment Phase 2 (LAP2) Project</td>
<td>1749087</td>
<td>27-Dec-12</td>
<td>Under review</td>
<td>-</td>
<td>Changing the layout of the project footprint, expanding the approved development area to the northwest and southwest, adding 63 well pairs on 10 surface well pads, and optimizing the CPF into a single facility.</td>
</tr>
</tbody>
</table>
GEOSCIENCE OVERVIEW

Leismer Development Area (LDA) Well Count

LEGEND

OSE - Oil Sands Evaluation Wells (105)
OBS - Observation Wells pre-2013 (35)
OBS - Observation Wells in 2013 (1)
WDW – Granite Wash Disposal (1)
WDW – McMurray Water Disposal Wells (2)
SAGD – 23 well pairs in Pads L1-L4 pre-2013
SAGD – 7 well pairs in Pad L5 in 2013
Existing Pads
Future Pads
Leismer Development Area (LDA)
McMurray O and V Channels (A1 and B1 Equivalent)
Potential Associated Gas Zones
## GEOSCIENCE OVERVIEW

### Leismer Reservoir Properties

<table>
<thead>
<tr>
<th>Reservoir Property</th>
<th>LDA Average</th>
<th>Pads L1-L4 Average</th>
<th>Pad L5 Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (m TVD)</td>
<td>424</td>
<td>429</td>
<td>444</td>
</tr>
<tr>
<td>Depth (m subsea)</td>
<td>-216</td>
<td>-221</td>
<td>-222</td>
</tr>
<tr>
<td>Pay Thickness (m)</td>
<td>17</td>
<td>22.5</td>
<td>19.1</td>
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<tr>
<td>Effective Porosity (%)</td>
<td>33</td>
<td>34</td>
<td>32.6</td>
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<tr>
<td>Horizontal Permeability (D)</td>
<td>6</td>
<td>6.5</td>
<td>6</td>
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<tr>
<td>Oil Saturation (%)</td>
<td>87</td>
<td>87.5</td>
<td>83.7</td>
</tr>
<tr>
<td>Original Reservoir Pressure (kPa)</td>
<td>-</td>
<td>2,400 - 2,600</td>
<td>2,400 - 2,600</td>
</tr>
<tr>
<td>Original Reservoir Temperature (°C)</td>
<td>-</td>
<td>14</td>
<td>14</td>
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</tbody>
</table>
# GEOSCIENCE OVERVIEW

## Original Bitumen In Place

<table>
<thead>
<tr>
<th>Well Pad (50 m Drainage Boundary)</th>
<th>Drainage Area ($10^3$ m$^2$)</th>
<th>Gross Rock Volume ($10^3$ m$^3$)</th>
<th>McMurray Fm. Total OBIP ($10^3$ m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>523</td>
<td>12,360</td>
<td>3,636</td>
</tr>
<tr>
<td>L2</td>
<td>510</td>
<td>12,142</td>
<td>3,437</td>
</tr>
<tr>
<td>L3</td>
<td>407</td>
<td>10,609</td>
<td>3,166</td>
</tr>
<tr>
<td>L4</td>
<td>378</td>
<td>8,230</td>
<td>2,334</td>
</tr>
<tr>
<td>L5</td>
<td>688</td>
<td>13,240</td>
<td>3,613</td>
</tr>
<tr>
<td>L6 (proposed)</td>
<td>575</td>
<td>14,625</td>
<td>4,154</td>
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<tr>
<td>Total</td>
<td>3,081</td>
<td>71,206</td>
<td>20,340</td>
</tr>
<tr>
<td>LDA Total</td>
<td>10,360</td>
<td>176,612</td>
<td>48,603</td>
</tr>
</tbody>
</table>

Total OBIP = Gross Volume X Gross Porosity X Gross Oil Saturation
GEOSCIENCE OVERVIEW

Net Bitumen Isopach Map

LEGEND

Existing Pads
Future Pads
Leismer Development Area (LDA)
McMurray O and V Channels (A1 and B1 Equivalent) Potential Associated Gas Zones

Contour Interval: 5m
GEOSCIENCE OVERVIEW

Top Bitumen Pay Structure Map

LEGEND

Existing Pads

Future Pads

Leismer Development Area (LDA)

McMurray O and V Channels (A1 and B1 Equivalent) Potential Associated Gas Zones

Contour Interval: 5m
GEOSCIENCE OVERVIEW

Base Bitumen Pay Structure Map

Contour Interval: 5m

LEGEND

Existing Pads

Future Pads

Leismer Development Area (LDA)

McMurray O and V Channels (A1 and B1 Equivalent) Potential Associated Gas Zones
GEOSCIENCE OVERVIEW

LDA Pad L5 Example Well – 1AA/08-04-079-10W4/0

T79

T78

R10W4

Blue = Water
Green = Oil
Yellow = Sand
Grey = Mud

(Volumetrics)

Top Wabiskaw Member
Top McMurray Formation
McMurray B1 Base
Top Bitumen
Exploited Zone (Pad L5)
Base Bitumen
Devonian

Top McMurray Formation

Exploited Zone (Pad L5)

Classification: Open
2014-03-05
Subsurface Section 2
LEGEND

- Full Log Suite (includes Image Logs) and Core (84)
- Standard Log Suite (no Image Logs) and Core (15)
- Full Log Suite (includes Image Logs) and No Core (41)
- Standard Log Suite Only (9)
- Existing Pads
- Future Pads
- Leismer Development Area
- McMurray O and V Channels (A1 and B1 Equivalent) Potential Associated Gas Zones
No new cores were obtained or analyzed in 2013 within the LDA.
GEOSCIENCE OVERVIEW

LDA Petrographic Analysis

- No petrographic analyses were conducted in 2013
GEOSCIENCE OVERVIEW

LDA West to East Petrophysical Log Cross-Section

Wabiskaw Member
McMurray Formation
McMurray A2 Mudstone Base
McMurray B1 Base
Top Bitumen
Base Bitumen
Devonian
GEOSCIENCE OVERVIEW

LDA West to East Seismic Cross-Section
GEOLOGICAL OVERVIEW

LDA North to South Petrophysical Log Cross-Section

- McMurray Formation
- McMurray A2
- Mudstone Base
- McMurray B1 Base
- Wabiskaw Member
- Top Bitumen
- Base Bitumen
- Devonian
GEOSCIENCE OVERVIEW

LDA North to South Seismic Cross-Section
GEOSCIENCE OVERVIEW
Pad L5 North to South Petrophysical Log Cross-Section
GEOSCIENCE OVERVIEW

Pad L5 North to South Seismic Cross-Section
GEOSCIENCE OVERVIEW

LDA Geomechanical Analysis

- No geomechanical analyses were conducted in 2013
GEOSCIENCE OVERVIEW
Reservoir Fracture Pressure and Caprock Integrity

- No reservoir fracture pressure and caprock integrity tests were conducted in 2013
GEOSCIENCE OVERVIEW

Surface Heave Deformation Monitoring

• Interferometric Synthetic Aperture Radar (INSAR) - satellite based radar technique used for mapping surface changes

• INSAR deformation monitoring commenced April 2011
  – Original 4 well pads and primary steam pipeline - 89 surface deformation corner reflectors operational plus numerous natural reflectors available
  – 5 corner reflectors planned for Pad L5, combined with multiple natural points

• Results to end of 2013 show minimal surface heave

• Rough correlation between high quality reservoir (best steam chamber development) and maximum surface heave
GEOSCIENCE OVERVIEW

Pads L1-L4 INSAR Surface Heave Deformation Maps

Cumulative deformation maps
INSAR Monitoring since April 2011
Maximum deformation ~40 mm
GEOSCIENCE OVERVIEW
Pad L5 Surface Heave Deformation Monitoring
DRILLING AND COMPLETIONS

Well Location Map – Wellbore Design (Pads L1 to L4)

**INJECTORS**
8-5/8” slotted liners (23)

**PRODUCERS**
7” slotted liners (11)
8-5/8” slotted liners (4)
7” wire wrapped screens (8)
Leismer SAGD Project

Typical Well Pair

Operation Phase

-20" Surface Hole
-17 1/2" Surface Hole
-Thermal Cement
-Surface Casing - 16", 65lb/ft, K-55, BT&C
-Surface Casing - 13 3/8", 54.5lb/ft, K-55, BT&C
-185mKB
-14 3/4" Intermediate Hole
-Intermediate Casing - 11 3/4", 54lb/ft, L-80, TB

Heal String - 4 1/2", 12.7lb/ft, L-80, Hydrid 503
x 3 1/2", 9.3lb/ft, L-80, Hydrid 511

660.0mKB - Liner Hanger
700.0mKB/420.0mTVD
10 5/8" Liner Hole

Injection Liner (straight Gang Slots) - 8 5/8", 32lb/ft, L-80, TB-5
Instrumentation (TC'S & BT'S) - Inside 1 3/4" CT

Production Liner (Seamed Keystone Slots or WW3) - 7", 26lb/ft, L-80, TB-5

8 3/4" Liner Hole
700.0mKB/425.0mTVD
660.0mKB - Liner Hanger

TD 1,410.0mKB
1,400.0mKB/420.0mTVD
1,390.0mKB

Power Cable for ESP

TB - Tenaris Blue
TB - Tenaris Blue SAGD SC/SB

Production String - 3 1/2", 9.3lb/ft, L-80, Hydrid 503

ESP w/Downhole T/P Sensors

Not to Scale
Pad L5 Modifications

- 7 well pairs in total
- Drilling operations from March to June 2013
- Planned horizontal length = 950 m
- L5P2, L5P3, and L5P4 were shortened to mitigate proximity to bottom water at the toe
INJECTORS
- Slotted liner (5)
- Wire wrapped screens with flow control devices (2)

PRODUCERS
- Wire wrapped screens (3)
- Wire wrapped screens with flow control devices (4)

7 new well pairs drilled in 2013
DRILLING & COMPLETIONS
Pressures in SAGD Start-up and Circulation

• Maximum Operating Pressure (MOP):
  – MOP of 5,500 kPa per AER Approval

• Bottomhole Operating Pressure:
  – Bottomhole operating pressure during circulation and SAGD is generally targeted between 2,600 and 3,500 kPa
    • Blanket gas is used to measure pressure
      – Good historical track record and primary method for all phases of operation
      – Corrected bottomhole pressure is based on calculated compressibility factor (Z) and measured pressure
      – No purge is required for reliable measurement
• ESP pulled in December 2012
• Well remained inactive during 2013
- Developed plan in consultation with AER to drill observation (OBS) well in close proximity to L2P2 to monitor aquifers
- Directive 051 approval granted December 2011; Statoil must execute the agreed upon mitigation plan
- No major changes in 2013
ARTIFICIAL LIFT

Pads L1 to L4

Current LDA Artificial Lift Installs

- ESP 250 °C motors (21)
- Start-up pending → L2P2
- Suspended → L2P1

Design lift capacity: 200 - 550 m³/cd
Operating temperature: 210 - 235°C
Operating pressure: 2,800 – 3,000 kPa

ESP's installed after circulation on all wells:
- Pad L1: January/February 2011
- Pad L2: January/February 2011
- Pad L3: May/June 2011
- Pad L4: March/April 2011
INSTRUMENTATION

Leismer Downhole Producer Instrumentation (Pads L1 to L4)

- FBG - 40 discrete temperature points
- DTS - multimode fiber (spatial resolution 1m)
  
  **Note:** DTS on L1P3, L1P4 and L1P5 have failed

- Bubble Tube and Thermocouple
- Thermocouple
- Thermocouple, Bubble Tube, and Fiber Optic Gauge

**Notes:**
- L2P1 configuration modified to revised TD
- L2P2 not instrumented currently
INSTRUMENTATION

Summary of Lessons Learned

• Pressure measurement:
  – Piezometers on injector wells have been susceptible to data integrity issues

• Temperature measurement:
  – Thermocouples in producers are the most reliable and used for subcool calculation along the horizontal wellbore; wellbore subcools are monitored on a daily basis
  – DTS (Distributed Temperature Sensing) has been less reliable
  – FBG (Fiber Bragg Grating) resolution is better than thermocouples with higher reliability than DTS. However, subcool calculation based on the thermocouples is the standard design

• 40 FBG points placed from surface to toe vs. 5 thermocouples along the horizontal. Advantageous for temperature fall-off analysis
INSTRUMENTATION

Leismer Typical SAGD Wellbore Schematic (Pads L1 to L4)

Producer – Instrumentation
- 1.75" x 0.156" Coil Tubing
- 0.75" Bubble Tube @ Pump
- 3/8" Bubble Tube @ Heel
- 3/8" Bubble Tube @ Toe
- 5 x 1/8" Duplex Thermocouples
INSTRUMENTATION

Leismer Downhole Injector Instrumentation (Pads L1 to L4)

- Bubble Tube and Thermocouple
- Thermocouple
- Piezometer and Thermocouple
  *Note: significant piezometer issues*
- Bubble Tube, Piezometer and Thermocouple
  *Note: significant piezometer issues*

Notes:
- L211 sheared during injector re-completion
INSTRUMENTATION

Pad L5: Injection Well Schematic

• Three thermocouples outside 13-3/8” surface casing wells L5I5 and L5I7, at 40 m, 82 m and 175 m:
  • Monitoring cement temperatures during start-up, SAGD, and interventions operations. The data will be used in an on-going cement integrity study and to support the assessment of VIT performance by providing data for history matching wellbore heat loss models
• Fiber optic installed outside at 7” short string to heel
INSTRUMENTATION

Leismer Observation (OBS) Wells

LEGEND

OSE - Oil Sands Evaluation Wells (105)  
OBS - Observation Wells pre-2013 (35)  
OBS - Observation Wells in 2013 (1)  
WDW – McMurray Water Disposal Wells (2)  
SAGD – 23 well pairs in Pads L1-L4 pre-2013  
SAGD – 7 well pairs in Pad L5 in 2013  
Existing Pads  
Future Pads  
Leismer Development Area (LDA)  
McMurray O and V Channels (A1 and B1 Equivalent) Potential Associated Gas Zones
Leismer SAGD OBS Wells Contain:

- 30 thermocouples, spaced at 1 m, above, below, and within SAGD pay
- Some wells are equipped with fiber optics (DTS) instead of thermocouples
- 3 to 4 piezometers in bitumen, bottom water, and top lean/gas zone
INSTRUMENTATION

OBS Well Saturation Logging

• 2013 saturation logging program consisted of logging 13 OBS wells for time lapse saturation
• Repeat logs conducted to obtain carbon/oxygen (C/O) readings over SAGD pay zone
• Time lapse saturation logs consistent with the temperature profile seen from thermocouples
Time lapse saturation log for well 104/13-27-078-10W4
4D SEISMIC
Acquisition History

- 4.92 km² 4D baseline survey acquired Q1 2009 (pre-steam) – Pads L1-L4
- 8.6 km² 3D acquired January, 2012
  - first repeat survey 2012 (4 active SAGD pads, 4.92 km² 4D 1st monitor)
  - new baseline 4D (Pads L5 / L6 ) 3.68 km² survey acquired January, 2012
- 4.5 km² 3D acquired February 2013
  - Second repeat survey (4 active SAGD pads, 2nd monitor)

Legend
- Leismer LDPA
- Baseline 2009 survey
- 1st Monitor 2012
- 2nd Monitor 2013
- Future Development Pads
- 4D seismic anomalies indicate a high degree of conformance along SAGD well pairs
- Irregularities are mainly attributable to reservoir heterogeneity and, in some cases, to heat transfer below the producer elevation into the Basal McMurray Fm. (i.e., bottom water)
• 4.5 km² of 4D seismic acquired in February 2013
  − Second repeated 4D seismic survey over Leismer Pads L1-L4
• 2013 4D seismic helped to monitor steam chamber conformance, optimize production and manage bottom water
  − Observed volume increase in areas as expected based on steam injection strategy (reference difference map from previous slide)
SCHEME PERFORMANCE

Project Historical Trends

Turnaround

![Graph showing historical trends in oil rate, water rate, steam injection rate, and other parameters with marked turnaround event.]
SCHEME PERFORMANCE
Leismer Project Highlights

- 2013 average bitumen production rate of 2,361 m³/d (14,850 bbl/d)
- Operated 21 of 23 wells on SAGD
  - L2Pair1 and L2Pair2 inactive
- Scheduled turnaround took place June 2013 (~2 weeks)
- Continuous field optimization required based on dynamic operating conditions
### SCHEME PERFORMANCE

**Pad Recoveries**

<table>
<thead>
<tr>
<th>Well Pad (50 m Drainage Boundary)</th>
<th>McMurray Formation SAGD-able OBIP ($10^3$ m$^3$)</th>
<th>Predicted SAGD-able Recovery Factor after 15 years (%)</th>
<th>Cumulative Production ($10^3$ m$^3$)</th>
<th>SAGD-able Recovery To Date (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>2,772</td>
<td>63</td>
<td>727</td>
<td>26.2</td>
</tr>
<tr>
<td>L2</td>
<td>2,911</td>
<td>54*</td>
<td>558</td>
<td>19.2</td>
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<tr>
<td>L3</td>
<td>2,429</td>
<td>67</td>
<td>717</td>
<td>29.5</td>
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<tr>
<td>L4</td>
<td>1,730†</td>
<td>68</td>
<td>415</td>
<td>24.0</td>
</tr>
<tr>
<td>L5</td>
<td>2,938</td>
<td>61</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Due to poor contribution from L2Pair1 and L2Pair2
† Relatively lower OBIP attributable to overall reservoir characteristics, especially thinning from a younger McMurray Fm. A1-Equivalent Channel (“O Channel”)

- SAGD-able OBIP, Cumulative Production, and Recovery Factor (RF) valid as of December 31, 2013
- Predicted (SAGD-able) RF based on 2D mapping and simulations using SAGD-able OBIP (OBIP above producer well)
- Reference “Supplemental Information Request Application Nos. 1693442 and 1694622, Amendment to Approval No. 10935E, Leismer Project”
SCHEME PERFORMANCE

Pad L1 Performance

Turnaround
SCHEME PERFORMANCE

Pad L1 OBS Well Temperature Profile – 102/04-27-078-10W4/0
SCHEME PERFORMANCE

Pad L1 OBS Well Pressure Profile – 102/04-27-078-10W4/0

Data communication issues

Normalized pressure (202 mSS)
SCHEME PERFORMANCE

Pad L1 Highlights

- First steam September 2010
- 6 well pairs in SAGD mode
- Average 2013 iSOR of 3.90
- Pad cSOR of 2.70 up to December 31, 2013
SCHEME PERFORMANCE

Pad L2 Performance

![Chart showing performance metrics with a highlighted Turnaround period]
Observed step change of temperature feature from March to May 2012. Shale baffle penetrated with heat.
SCHEME PERFORMANCE

Pad L2 OBS Well Pressure Profile – 103/03-27-078-10W4/0

Data communication issues

Normalized pressure (229.5 mSS)
SCHEME PERFORMANCE
Pad L2 Highlights

• First steam October 2010
• 4 well pairs in SAGD mode
  • L2Pair1 and L2Pair2 inactive
• Average 2013 iSOR of 3.00
• Pad cSOR of 2.84 up to December 31, 2013
SCHEME PERFORMANCE

Pad L3 Performance

Turnaround
SCHEME PERFORMANCE
Pad L3 OBS Well Temperature Profile – 104/13-27-078-10W4/0

PAD 3 L3P4 T DD Observation well (3.15m from L3I4 )

Dataset information:
- Temperature (degC)
- Depth (mSS)
- Gamma Ray
- Porosity
- Resistivity

Legend:
- 01-Sep-10
- 01-Jan-12
- 01-Sep-12
- 01-Mar-13
- 01-Jul-13
- 01-Aug-13
- 01-Nov-13
- 01-Dec-13
- 01-Jan-14
- Top Pay
- Base Pay
- WLT
- Devonian Top
- Producer
- Injector
SCHEME PERFORMANCE
Pad L3 Highlights

• First steam February 2011
• 6 well pairs in SAGD mode
• Test separator operational Q3 2013
• First solvent in Q4 2013
  – Experimental Scheme No. 11834A, confidentiality effective June 1, 2013
• Multi-phase flow meter (MPFM) field trial commenced in Q4 2013
SCHEME PERFORMANCE

Pad L4 Performance

![Graph showing oil rate, water rate, steam injection rate, cSOR, iSOR, well count, and CWSR over time from September 2010 to December 2013. The graph highlights a turnaround period.]

Classification: Open

Subsurface Section 7
SCHEME PERFORMANCE
Pad L4 OBS Well Temperature Profile – 100/09-28-078-10W4/0
SCHEME PERFORMANCE
Pad L4 OBS Well Pressure Profile – 102/16-28-078-10W4/0

Normalised Pressure (239.3 mSS)

- Bottom Water Pressure (440.0mKB/197.3mSS)
- Top Bitumen Pressure (416.0mKB/221.3mSS)
- Top Lean Pressure (398.0mKB/239.3mSS)

Data communication issues
SCHEME PERFORMANCE
Pad L4 Highlights

• First steam November 2010
• 5 well pairs in SAGD mode
• Average 2013 iSOR of 3.81
• Pad cSOR of 2.99 up to December 31, 2013
SCHEME PERFORMANCE

Water Source (WSW) and Disposal Wells (WDW)

- Addition of Pad L5 OBS well

LEGEND

WDW – Basal McMurray Aquifer (BMA) (2)
OBS – BMA - WDW (5)
EXPL – Granite Wash, WDW exploration (4)
WSW – Grand Rapids (6)
WSW – Clearwater Horizontal Wells (2)
Existing Pads
Future Pads
Leismer Development Area (LDA)
McMurray O and V Channels (A1 and B1 Equivalent) Potential Associated Gas Zones
JV Lands
• Bottom water pressure has increased since SAGD start-up but is being actively managed
• Reasons for pressure increase:
  − Steam injection from normal operations has greater effect than disposal on bottom water pressure
  − Confined Basal McMurray Aquifer (BMA)
  − Disposal in BMA at 100/12-33 and 100/13-33-78-10W4
• New monitoring well drilled in 2013 near Pad L5 at 100/02-04-079-10W4/0 per AER Approval No. 11479
  − Instrumented with 2 piezometers and thermocouple string
• Continued study of BMA for disposal to evaluate effects on resource recovery
SCHEME PERFORMANCE
Bottom Water Monitoring and Mitigation Plan (2012-2014)

• More wells (almost 80%) showed signs of communication with bottom water after June 2013 turnaround

• Through Q3 2013, steam injection increased to foster upward steam chamber growth and maintain a positive pressure differential

• In September-October 2013, decline in oil rate led to the decision to decrease steam injection to balance the pressure gradient, which improved short-term production
SCHEME PERFORMANCE

Bottom Water Monitoring and Mitigation Plan

- Mitigation involves reservoir pressure management to optimize balance
- Data analysis includes chloride concentration and water cuts for all SAGD wells
  - BMA pressure within LDA
  - Reservoir balance
  - Responses to bottom water

Different wells were chosen vs. 2013 D054 due to availability of the data.
SCHEME PERFORMANCE

Wellhead Steam Quality

• Steam quality lost during transportation to well pads due to heat losses
  - Wellhead steam quality estimated at 95%

• Steam is delivered to pads at about 7,000 – 9,000 kPa and is currently dropped to 5,000 kPa at the pad prior to injection at a specific injection wellhead
High plant reliability helped achieve successful SAGD ramp-up

Integrated reservoir surveillance is a key factor in optimization of well pair performance

Gaining understanding of LDA performance over long term (i.e. effects of lean and bottom water zones with respect to subcools)

Bottom water requires a field-wide holistic management strategy
  - Optimum differential pressure between the steam chamber pressure and bottom water pressure

Temperature response and upward steam chamber development suggests shale baffles can be overcome
SCHEME PERFORMANCE

Leismer Pad Abandonments

• No pad abandonments anticipated at Leismer within next five years
SCHEME PERFORMANCE

Suspended Gas Wells: Abandonments

• 100/06-21-078-10W4/0 abandoned (subsurface abandonment completed in 2013, surface portion scheduled for Q1 2014)

• Gas well abandonments planned per Directive 020, as outlined in Applications 1693442 and 1694622

  1. 00/12-03-079-10W4/0 (subsurface abandonment completed in 2013, surface portion scheduled for Q1 2014)
  2. 00/05-33-078-10W4/0 (subsurface abandonment completed in 2013, surface portion scheduled for Q1 2014)
  3. 00/11-04-079-10W4/0 (subsurface abandonment completed in 2013, surface portion scheduled for Q1 2014)
  4. 00/09-05-079-10W4/0 (subsurface abandonment completed in 2013, non-routine surface casing remediation scheduled for Q1 2014)
  5. 00/06-34-078-10W4/0 (subsurface abandonment ongoing)
SUBSURFACE – FUTURE PLANS

Leismer Future Development Plans

- No plans in 2014 for substantive changes to recovery strategy (i.e. operating pressure, fluid composition) for Leismer Project
- Pad L2 infill wells approved by AER; plan to drill one well in Q2/Q3 2014
- Drilling of monitoring OBS well for L2Pair2 in Q2/Q3 2014
- Pad L5 – first steam Q2 2014
- Pad L6 – drilling Q3 2014; first steam Q2 2016
SUBSURFACE – FUTURE PLANS
Leismer Steam Requirements

Short Term Steam Forecast

Steam rates (m³/cd)

L5 start-up

SUBSURFACE – FUTURE PLANS

Leismer Steaming Strategy

• Fourth steam generator online Q4 2013
• Total steam capacity to the field of 69,000 bbl/cd
• L2P2 start-up will occur after the OBS well is drilled in Q2/Q3 2014
• Technology implementation – vacuum insulated tubing, solvent-facilitated start-up, autonomous inflow control devices
SUBSURFACE – FUTURE PLANS

L2Pair1 Update

- Suspend well by March 31, 2014 (deadline for inactive wells per Directive 013)
- Intention to re-enter well, clean out, and investigate liner integrity
SUBSURFACE – FUTURE PLANS

L2Pair2 Update

• Lease expansion has commenced (Q1 2014)
• Drill observation well (scheduled for Q2/Q3 2014)
• Installation of appropriate instrumentation on observation and producer wells (Q2/Q3 2014)
• Developed plan in consultation with AER to drill infill well pilot (L2P3-4) in between L2Pair3 and L2Pair4
• AER scheme amendment was approved on January 23, 2014
• 2014 Plans
  − Drill infill well pilot which is only producer (scheduled for Q2/Q3 2014)
  − Lease expansion commenced in Q1 2014
  − Engineering surface facility design has commenced
  − Target circulation and production in Q1/Q2 2015
1. Facilities
2. Facility Performance
3. Measurement and Reporting
4. Water Production, Injection and Uses
5. Sulphur Production
6. Summary of Environmental Issues (will NOT be presented today as per AER request)
7. Compliance Statement
8. Non-compliance Events
9. Future Plans
FACILITIES

Leismer Central Processing Facility (CPF)
FACILITIES

Simplified Leismer Plant Schematic

Revision B
By MJS
FACILITIES

June 2013 Turnaround

• Summary
  − 14 day outage
    • 2 days ramp down
    • 10 days shutdown
    • 2 days ramp-up
  − Strong HSE results
  − No major injuries
  − 1 reportable spill
  − No major issues identified

• Operations Scope
  − Vessel inspections
  − PSV servicing
  − No significant issues identified

• Maintenance Capital Scope
  − Control system change-out to increase safety and reliability
  − 30 minor modifications
    • Flare meters
    • Lime silo modifications
    • MARP meter installations
  − Installation of dual HP steam separator level control valves

• Major Projects
  − Fourth steam generator tie-ins
  − Well Pad L5 tie-ins
  − Reduced liquid discharge (RLD) tie-ins
  − Cheecham pump capacity increase tie-ins

• Drilling & Well
  • ESP replacements
  • 1 injector tubing modification
  • Tubing flushes
FACILITIES PERFORMANCE

Bitumen Treatment

• Treater and Free Water Knock Out (FWKO) operations
  - Production train consists of one FWKO and two treaters
  - Achieved high unit reliability throughout year
  - No major issues to report
• Chemical treatment
  - Chemical treatment optimized throughout the year
FACILITIES PERFORMANCE

Bitumen Treatment

• Produced Water (PW) coolers
  – Fouling of coolers continues to be a challenge – bi-weekly cleanings
  – Additional coolers installed during turnaround and in-service
  – On-going testing of chemical injection prior to coolers
  – On-going design reviews for future installations (i.e., utilizing boiler blowdown for cleanings)

• Slop volumes
  – Small volumes of slop being generated
**FACILITIES PERFORMANCE**

Water Treatment

- **De-Oiling**
  - No major issues to report; system operating as per design

- **Warm Lime Softener (WLS) operations**
  - Minor operational challenges throughout the year
  - Continue to optimize to meet recycle requirements
  - Blowdown recycle into WLS with no adverse affects; adjust recycle to meet water specifications
  - Meeting Boiler Feed Water (BFW) specifications >95% of the time
  - Process sludge pond primary liner leak – operating at lower volumes as dual liner design and additional clay layer ensures containment. Repair options still under review
  - Pond successfully dredged in 2013
FACILITIES PERFORMANCE

Water Treatment

• Weak Acid Cation (WAC) Operation
  − No major issues to report, system operating as per design
  − 1 additional primary WAC installed and in service
  − Construction continued on RLD unit
  − WAC throughputs extended to reduce chemical usage

• Brackish Water Source
  − Preparing facilities for brackish water use in 2014
    • Pipeline completed, liner installed
    • ESP installed in source well
LEISMER FACILITY PERFORMANCE

Once Through Steam Generators
FACILITIES PERFORMANCE

Steam Generation

• System now consists of four Once Through Steam Generators (OTSGs)
  − One additional OTSG installed and put into service
• Operating system at average 80% steam quality
• Steam generators operating as per design
• Issues
  − Experienced a number of leaks on the pigging spool flanges which resulted in short outages for the affected OTSG
FACILITIES PERFORMANCE

Well Pads

• Heat medium oil system; optimization efforts to increase efficiency of heat tracing
• Multi-phase pump (MPP) operations
  − Pad L1 MPP modifications for seal flush in-service
  − MPP on all pads experienced numerous maintenance issues that affected reliability
• Pad L3
  − First solvent commenced in Q4 2013
  − Test separator installed and in-service
• Issues
  − Heat medium heater design continues to present challenges
Currently no independent power generated at Leismer CPF

Electricity Consumption

Yearly Total: 62,833 MWh
Facility Gas Usage – Purchased Gas

Yearly Total for Purchased Gas: 187,797 e3m3
Facility Gas Usage – SAGD Gas

Yearly Total for SAGD Gas: 5,269.5 e3m3

- SAGD Gas (e3m3)

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<td>Nov-13</td>
<td>1000</td>
</tr>
<tr>
<td>Dec-13</td>
<td>1000</td>
</tr>
</tbody>
</table>
Facility Gas Usage – Continuous Venting

Vented Gas from Raw Water Tank

Venting Rate based on the test value of the gas water ratio at raw water tank. Gas ratio decreased from 0.20 to 0.17 Sm3 (gas) /m3 (water) as of July 2013.

Yearly total: 21.7 Se3m3
FACILITIES PERFORMANCE

Gas Flaring

- Solution gas recovery percentage was 96%

![Flared Gas Graph]

- ControlNet card failure on I/O rack in water treatment MCC BU-2400 leading to steam generator trip
- Total plant trip due to wildlife interference shorting out third-party substation
CO₂ (t) Direct

Total 2013 Direct CO₂ emissions = 377,612 tonnes
LEISMER FACILITY PERFORMANCE

Plant Performance and Expectations

- Surface facilities have operated close to design
- Reliability continues to be significantly higher than anticipated
- Overall plant performance has met expectations
MEASUREMENT AND REPORTING

Surface Section 3

Leismer 2014 Annual Performance Presentation
Low Proration Factors:
- Operational upsets required ramping down/up of the field
- Infrequent well tests to capture the well changes, resolved after June turnaround
- Drift in analyzers, recalibrated in December
MEASUREMENT AND REPORTING

SAGD Well Testing

• Well tests used to calculate daily bitumen and water production

• Well test frequency increased (11 hours well tests with 1 hour purge) to improve production calculation
  - Typical frequency is 6 – 7 per month per well

• Pads L2, L3, and L4 are equipped with a water cut analyzer (L3 test header decommissioned in January 2014)
  - L2/L4 rates = water cut x FQI at individual wellhead

• Pad L1 is equipped with a multi-phase flow meter (only water cut portion used for reporting)

• Pad L1 also equipped with a test separator, operational Q1 2014

• Pad L3 equipped with a test separator
MEASUREMENT AND REPORTING
SAGD Well Testing Bottlenecks and Optimization

• Bottlenecks
  − Partial flow through 2” test header
  − Single phase flow devices for multi-phase flow
  − Relying on two phase water cut analyzer for three phase flow

• Optimization
  − Installation of well test separator in Pads L1 and L3
  − Orifice plate sizing optimization
  − Calibration of water cut analyzers on a regular basis
  − Implemented common well testing validation strategy
  − Continuous analysis of well testing data
  − Comparing and evaluating various technologies
Multi-Phase Flow Meter Field Trial

- Obtained approval to conduct field trial in AER Application No. 1767995
- Engineering and construction completed in 2013
- Commenced field trial in Q4 2013
- Trial is ongoing, target completion Q2 2014
WATER PRODUCTION, INJECTION, AND USES

Unique Well Identifiers

![Map showing unique well identifiers]
CPF Water Use

• Leismer’s source water network includes 5 wells completed in Lower Grand Rapids Formation (LGR)
  − 16-04-079-10W4/0 was offline all year
• Brackish water will not be brought to site prior to the reported Q2 2014 timeframe
  − Brackish water will be used when the facility is projected to be water short for an extended period of time
Water Diversion Licence (WDL) 00239880 for 317,915 m³/yr (871 m³/cd)
- Total non-saline water pumped from source wells at Leismer in 2013 was 282,938 m³ (775 m³/d), 89% of allowable WDL amount
- Of the total amount drawn from the source wells:
  - 90% went to Leismer CPF for process use
  - 7% was used for drilling
  - 2% was used for dust control
  - 1% for domestic use
Temporary Diversion Licence (TDL) 00328877 for 255,500 m³/yr (700 m³/cd)
- No water was used as part of this TDL in 2013
WATER PRODUCTION, INJECTION, AND USES

Lower Grand Rapids Water Volumes

Total Flow from Source Water Wells

Note: Graph shows total amount of water pumped from source wells, not only for steam injection. In February, ~9,000 m³ used for drilling purposes. From facility perspective, CPF was water short, therefore source water required.
## Typical Water Quality

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Brackish (future use)</th>
<th>Source Water</th>
<th>Produced Water</th>
<th>Disposal Water</th>
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<td>Hardness</td>
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<td>Total Alkalinity</td>
<td>mg/L as CaCO3</td>
<td>880</td>
<td>810</td>
<td>230</td>
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<td>Na</td>
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</table>
Produced Water Volumes*

* AER Project Approval No. 10935L only
WATER PRODUCTION, INJECTION, AND USES

Steam Volumes*

* AER Project Approval No. 10935L only
WATER PRODUCTION, INJECTION, AND USES

Disposal Limit (Directive 081)

- **Allowable Disposal Limit**
- **Actual Disposal**

![Graph showing water disposal percentages by month and total.]
Blowdown Recycle Percentage

- Operations focus on maximizing blowdown recycle contributed to achieving 90% Produced Water Recycle and low disposal rates.
Leismer has two disposal wells on site (one operating, one standby)
Disposal Pressure and Temperature

- Wellhead Pressure (kPa)
- Temperature (°C)

- 13-33-078-10W4
- 12-33-078-10W4
- Temperature
WATER PRODUCTION, INJECTION, AND USES

Off-site Waste Disposal

• Slop Handling – 7,020 m³ of water was trucked off site with slop oil to the Lindbergh cavern facility

• Solids Disposal
  – Water treatment related solids (lime softening sludge) is allowed to settle in the sludge pond at site
  – The pond was successfully dredged for the first time in 2013
  – 6,085 tonnes of dewatered sludge was trucked off site to the Janvier landfill as part of the dredging campaign, with 48.6% water content
SULPHUR PRODUCTION
Surface Section 5
Leismer 2014 Annual Performance Presentation
SULPHUR PRODUCTION
Sulphur and Sulphur Dioxide

• Leismer average daily sulphur dioxide (SO₂) emissions 0.34 tonnes/day (17.1% of approval limit)¹

• Total annual emissions for 2013 – 124.69 tonnes

• Leismer peak daily SO₂ emission – 0.83 tonnes

• Leismer does not currently have sulphur recovery facilities

• Statoil shall ensure that sulphur recovery will be operational before total sulphur emissions reach one tonne/day on a calendar quarter-year average basis

¹EPEA Kai Kos Dehseh approval limit is 2.0 tonnes/calendar day of SO₂ emissions
Daily Sulphur Emission as Sulphur Dioxide (from OTSG's and Flaring)

Note: Large change in $\text{SO}_2$ emission from OTSG and flare when the $\text{H}_2\text{S}$ concentration went from the normal 100-300 ppm to 590 ppm

Q1Avg. = 0.43  Q2Avg. = 0.43  Q3Avg. = 0.19  Q4Avg. = 0.31

Fuel Gas H2S (ppm) To SG

Daily emissions  Limit (2.0 t/day)  Quaterly average  Fuel Gas H2S (ppm) To SG
## Sulphur Production

### Leismer Sulphur Balance

#### Sulphur Balance (tonnes S)

<table>
<thead>
<tr>
<th>Month</th>
<th>Sulphur from Reservoir</th>
<th>Sulphur from Diluent Receipts</th>
<th>Emissions from OTSGs</th>
<th>Emissions from Flare Gas</th>
<th>Sulphur in Diluted Bitumen</th>
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<td>Jan 2013</td>
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SULPHUR PRODUCTION
Leismer Sulphur Balance – Explanation of Data Derivation

Sulphur from Reservoir (A): Calculated from total bitumen production and sulphur content in bitumen from lab analysis

Sulphur from Diluent Receipt (B): Sulphur content based on historical product specifications

Emission from OTSGs (C): Calculated from measured fuel gas flow to steam generators and lab analysis of $\text{H}_2\text{S}$ in fuel gas

Emission from Flare Gas (D): Sum of sulphur emission from
(1) The estimated low-pressure flare gas flow and $\text{H}_2\text{S}$ in VRU gas and
(2) Estimated high-pressure flare gas flow and $\text{H}_2\text{S}$ in mixed fuel gas and produced gas

Sulphur in Diluted Bitumen: (A) + (B) – (C) – (D)
Alberta Environment and Sustainable Resource Development (ESRD) approval limits based on Alberta ambient air quality objectives:

SO$_2$ (1 hour average) 172 ppbv

H$_2$S (1 hour average) 10 ppbv

### Passive Ambient Air Monitoring 2013

<table>
<thead>
<tr>
<th>Month</th>
<th>SO$_2$ Peak Reading (ppb)</th>
<th>H$_2$S Peak Reading (ppb)</th>
<th>ESRD Approval Limit SO$_2$ - 1 Hour Average (ppbv)</th>
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### Continuous Ambient Air Monitoring 2013

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<tr>
<th>Month</th>
<th>SO$_2$ Peak Reading - One Hour Average (ppb)</th>
<th>H$_2$S Peak Reading - 1 Hour Average (ppb)</th>
<th>Operational Time %</th>
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<tr>
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ENVIRONMENTAL ISSUES

Environment and Sustainable Resource Development (ESRD) Approval Compliance Issues

• *Environmental Protection and Enhancement Act (EPEA) Approval 241311-00-02* - 4 spills reportable to ESRD at Leismer CPF or access roads
  
  − Reportable Spill 05/21/2013: An estimated 100-600 L of diesel was spilled in the Leismer Lodge parking lot from a bus used to transport workers to site. Spill occurred over the winter and was discovered after snow melt and reported. Reference #270345
  
  − Reportable Spill 05/31/2013: Hydraulic oil leak of 70 L occurred on an access road near the CPF. Reference #270697
  
  − Reportable Spill 06/15/2013: 70 L of diesel fuel was spilled from the fuel line of a paramedic ambulance unit on the construction site of Well Pad L5, spreading to the access roads. All contaminated material was disposed of. Reference #271286
  
  − Reportable Spill 10/09/2013: 1,000 L of hydrochloric acid cleaning solution leaked into an excavation area under the exchangers during the neutralization portion of the exchanger cleaning procedure. The spill was caused by a failed valve. All contaminated material was disposed of. Reference #276214
ENVIRONMENTAL ISSUES

ESRD Approval Compliance Issues

- EPEA Approval 241311-00-02, continued - Potential non-compliance related to water discharge from storm water pond

  - Potential Non-compliance 06/09/2013: A significant amount of rain the weekend of 06/08/2013 resulted in the overflow of water from the storm water pond into the approved discharge area. The overflow of water occurred before Statoil was able to take a sample and submit for laboratory analysis. Samples were collected the morning of 06/09/2013 and met EPEA approval parameters. Normal discharge procedures commenced. Reference #271077
ENVIRONMENTAL ISSUES

ESRD Approval Compliance Issues

- **EPEA Approval 241311-00-02, continued** - 5 Continuous Emission Monitoring (CEMS) Code contraventions of not meeting the >90% availability requirement
  - CEMS Code Non-compliance 01/2013: Did not achieve the required >90% availability for the month of January due to a communication failure in the FlowSic. Reference #267086
  - CEMS Code Non-compliance 04/2013: Did not achieve the required >90% availability for the month of April due to failure of the lamp in the GM31 Analyzer. Reference #269433
  - CEMS Code Non-compliance 05/2013: Did not achieve the required >90% availability for the month of May due to not receiving the new bulb ordered because of the April non-compliance. Reference #270053
  - CEMS Code Non-compliance 07/2013: Unable to capture emissions from July 2 – July 12, 2013 due to a malfunction in the DAS after the DCS changeover during Turnaround. The CEMS falsely recorded an availability of >90%. Reference #272396
  - CEMS Code Non-compliance 09/2013: Did not achieve the required >90% availability due to errors in the stack temperature data. Flow and mass emission calculations are dependent on the stack temperature
ENVIRONMENTAL ISSUES
ESRD Approval Compliance Issues

- **Stressed Vegetation**
  - 3 incidents of stressed vegetation occurred at Leismer, Thornbury and Hangingstone in July 2012, August 2013, and September 2013, seemingly the result of clear fluid pump-off events during winter exploration programs. Reference #261394, #274002, #275725, respectively. Follow-up with ESRD and AER is ongoing.

- **Alberta Energy Regulator**
  - Non-compliance events reportable to AER are provided in Surface Section 8
ENVIRONMENTAL ISSUES
Leismer Approvals and Amendments

• EPEA Approval
  - Leismer Amendment Phase 2 (LAP2) – submitted in April 2013 and currently under review

• Water Diversion Licences:
  - Groundwater WDL 00239880-01-00 (June 2012 – June 2017)
  - TDL 00328877 (May 2013 – May 2014)
    • Replaces groundwater TDL 0311041-00-00 (May 2012 – May 2013)
  - TDL 00329405 (May 2013 – May 2014): use includes OSE, dust control and construction
  - WDL 00322141 (Aug 2013 – Aug 2023): Waddell Camp – use includes industrial (Waddell camp supply), commercial (drilling), and earthworks (construction, dust suppression and ice roads)
ENVIRONMENTAL ISSUES

Leismer Monitoring Programs

• EPEA Approval reports and proposals submitted:
  - Monthly Air Reports
  - Annual Groundwater Monitoring Report (March 2013)
  - Annual Conservation and Reclamation Report (March 2013)
  - Annual Air Emissions Summary and Evaluation Report (March 2013)
  - Annual Industrial Wastewater Report (March 2013)
  - Annual Industrial Runoff Report (March 2013)
  - Annual Wetland Monitoring Report (March 2013)
  - Wetland Reclamation Trial Program (Proposal submitted March 2013)
  - Wetland Monitoring Program Supplemental Information Request (Submitted July 2013; currently awaiting approval)
ENIRONMENTAL ISSUES
Leismer Monitoring Programs, Continued

• EPEA Program Proposals approved:
  - Air Monitoring Site Selection Proposal – Location A re-approved February 2013

• Water Act reports:
  - WDL – monthly and annual water use reporting
  - TDL – no formal report unless requested
ENVIRONMENTAL ISSUES
Other Environmental Initiatives

- Founding member of Canada’s Oil Sands Innovation Alliance (COSIA)
- Member of the Integrated CO\(_2\) Network (ICO\(_2\)N)
- Canadian Association of Petroleum Producers (CAPP)
  - Actively participating in various environmental working groups
  - Submitted Responsible Canadian Energy (RCE) 2012 Progress Report
- Statoil participates in regional initiatives:
  - Alberta Biodiversity Monitoring Institute (ABMI) including Ecological Monitoring Committee for Lower Athabasca (EMCLA)
  - Regional Aquatics Monitoring Program (RAMP)
  - Wood Buffalo Environmental Association (WBEA)
  - Cumulative Effects Management Association (CEMA)
  - Industrial Footprint Reduction Options Group (iFROG): Multi-stakeholder reclamation research collaboration focused on road and pad reclamation within treed poor fens
ENVIRONMENTAL ISSUES

Other Environmental Initiatives

- Woody Debris Rollback Program has proven effective throughout 2013, maintaining the same number of wildlife cameras (60)

- Continuation of Statoil’s Surface Water Monitoring Program (SWMP), with seasonal sampling in the Leismer and Corner lease areas

- Continuation of Lichen Propagation Pilot

- Piloted Road Dust Suppression Trial using canola oil (Summer 2013)
In the 2013 Faster Forests Program [previously with Oil Sands Leadership Initiative (OSLI), now a COSIA program], Statoil planted 69,179 stems on 69 OSE sites, consisting of 5 tree species and 3 shrub species

- 2012 saw 267,000 stems: 5 tree species and 6 shrub species
- 2011 saw 182,000 stems: white spruce
- 2010 saw 62,853 stems

A Planning Optimization Tool was developed in a joint project with Devon Energy Corporation to minimize footprint and avoid sensitive areas

Continuation of OSE Reclamation Tours for industry members, regulators, researchers and academics to share knowledge amongst operators and promote best practices for construction and reclamation of Statoil’s OSE sites

No SAGD pad abandonments planned within next five years
COMPLIANCE STATEMENT

Approval and Regulatory Requirements Compliance Statement

• Statoil believes that it is in compliance with the AER Scheme Approval and regulatory requirements
NON-COMPLIANCE EVENTS
AER Non-Compliance Events

1. January 2013
   - None

2. February 2013
   - Produced Water Recycle Rate 02/14/2013: AER issued a High Risk Enforcement Action regarding failing to meet a minimum produced water recycle rate of 90% in 2012 as per clause 5d of the approval. Statoil submitted a detailed action plan in accordance with Directive 019 on March 1, 2013.
   - Self disclosure 02/27/2013: Identification sign requirements not met for 35 gas wells and 9 gas pipeline locations. Signs placed and issue resolved per OGCF 6.020 and Section 68 of the Pipeline Regulations.

3. March 2013
   - Self disclosure 03/05/2013: Lack of leak detection monitoring in three sumps due to inability to hold a vacuum. This is resolved and monitoring of interstitial spaces is now done using conductivity.
   - Unplanned Flaring 03/15/2013: 5 hours of unplanned flaring due to plant trip. DDS #697985
NON-COMPLIANCE EVENTS

AER Non-Compliance Events

4. March 2013 continued
   - Reportable Spill 03/26/2013: 4,000 L of emulsion leaked from a failed gasket in a produced emulsion line. Investigation, clean up and disposal of contaminated material completed. Reference #20130658

5. April 2013
   - Unplanned Flaring 04/03/2013: Unplanned flaring event of ~12 hours during an emergency shut down as a result of a steam leak. DDS# 700408
   - Unplanned Flaring 04/23/2013: Unplanned flaring event of 4 hours due to a plant upset condition caused by a control system equipment failure. DDS# 701494

5. May 2013
   - None

6. June 2013
   - Reportable Spill 06/10/2013: Approximately 1,000 L of diluted bitumen was spilled on Waddell Road by a truck transporting diluted bitumen off-site. A hose on the truck fell off due to rough road conditions and was run over by the truck and the remaining liquid in the hose was spilled. All contaminated material was disposed of. Reference #20131154
NON-COMPLIANCE EVENTS

AER Non-Compliance Events

6. June 2013 continued
   - Planned Flaring 06/19/2013: Notification to AER of the flaring to occur during the shut down of the facility in preparation for turnaround. DDS #705948
   - Reportable Spill 06/28/2013: 15,000 L of glycol was released to grade during the reintroduction of glycol into the system during turnaround. The glycol was contained on-lease and all contaminated material was disposed of. Reference #20131274

7. July 2013
   - Planned Flaring 07/01/2013: Notification to AER with the volumes flared during the startup of the facility for the 2013 turnaround. DDS #710489
   - Stressed Vegetation 07/2013: Notification to ESRD and AER of stressed vegetation observed off of Waddell Road.

8. August 2013
   - Unplanned Flaring 08/25/2013: Flaring event of approximately 20 hours occurred due to a raven landing on the ATCO substation and shutting down the power completely to the plant. Flaring was of sweet natural gas and tank vapors as process was completely down. DDS #715290
NON-COMPLIANCE EVENTS

AER Non-Compliance Events

9. September 2013
   - Pipeline Strike 09/05/2013: The brackish water pipeline (License 51231-14) was struck with a miniature excavator. Slight damage occurred to the protective insulation cladding and negligible damage to the pipeline itself. No release occurred as the pipeline was out of service. ABSA was notified and a pipeline inspection was completed to confirm integrity of the line. Reference #20131749
   - CEMS Code Non-compliance: Did not achieve the required >90% availability due to errors in the stack temperature data. Flow and mass emission calculations are dependent on the stack temperature.

10. October 2013
    - None

11. November 2013
    - None

12. December 2013
    - None
SURFACE REVIEW – FUTURE PLANS

Future Plans

• RLD installation complete, start-up intended Q3 2014. Delay due to excess produced water returned, negating benefits of RLD for disposal reduction
• Pad L5 SAGD facilities, first steam Q2 2014
• Pad L2 infill well and L2Pair2 start-up Q2/Q3 2014
• Ceramic membrane pilot, start-up Q3 2014
• Continue MPFM tests
• Pad L6 SAGD facilities construction, first steam Q2 2016
• LAP2 awaiting AER approval and undergoing internal decision gate process
There’s never been a better time for good ideas.

Presentation: Leismer 2014 Annual Performance Presentation (D054) to Alberta Energy Regulator

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