Alberta Bitumen Assay Program
Overview & Technical Challenges
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Introduction

- Overview
  - Alberta Energy
  - Program importance and objectives
  - Overview of program design
  - Technical challenges
    - Sampling
    - Sample preparation
    - Assays
  - Implementation
  - Questions
Alberta Energy

- Steward of Alberta’s energy system for Albertans.
- Develop policy for and manage development of Alberta’s non-renewable resources and renewable energy.
- Grant industry the right to explore for and develop Alberta’s energy and mineral resources.
- Establish, administer and monitor the effectiveness of Alberta’s fiscal and royalty systems.
- Collect revenues from the development of Alberta’s energy and mineral resources on behalf of Albertans.
- Promote energy efficiency and conservation by Albertans and industry.
- Encourage investment in Alberta’s energy industry to create jobs and economic prosperity for Albertans.
Importance

- Majority of Oil Sands owned by Alberta
- Oil Sands Royalty (OSR): royalty is based on project revenue and costs (either 1-9% gross revenue or 25-40% net revenue).
- Royalty rates are based on WTI price.
- Royalty collected on bitumen.
- ~$5.6 billion in bitumen royalties for 2012-13 (over 50% of ALL royalty revenue – AE 2012 budget forecast).
Importance

- Over 50% of Alberta bitumen is not sold to third parties and considered non-arms length (NAL) transactions
- NAL bitumen is valued with a bitumen valuation methodology (BVM)
- BVM variable is bitumen density
Objectives

- Data may be used in a variety of ways:
  - Review of BVM
  - Enhances knowledge of oil sands resource
  - Advocacy – studies to show:
    - Carbon pathway
    - Other (i.e. CCQTA studies on corrosivity, processability, bitumen compatibility)
  - Assess value added and other strategies
  - Other general work

- Authority:
  - Section 52 of Mines and Minerals Act
Program Design

- **Program Overview:**
  - ADOE pays for sampling, preparation, and analyses
  - Approximately twenty OSR Projects representing over 90% of bitumen production
  - Mining and in-situ (thermal & cold) Projects included from all three oil sand areas
  - Two phases (phase 1 is 14 Projects)

- **Program Design:**
  - ADOE will retain an independent laboratory to collect and prepare samples, and perform laboratory tests
  - Assays conducted over two years (2012 to 2013)
  - Assay results will be shared with project operator
### Assay Requirements

#### Table 1 - Bitumen Assay Program Test Matrix

<table>
<thead>
<tr>
<th>Property</th>
<th>Possible Test Method</th>
<th>Whole Crude</th>
<th>Naphtha (IBP-266°C)</th>
<th>Distillate (266-343°C)</th>
<th>LGO (343-399°C)</th>
<th>Atm. Resid (399°C+)</th>
<th>HGO (399-454°C)</th>
<th>VGO (454-527°C)</th>
<th>Residue (527+C)</th>
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<tbody>
<tr>
<td>Volume and Mass % Yields</td>
<td>D2892, D5236</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Density (kg/m3)</td>
<td>D4052, D5002, D70</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Sulphur, total (mass %)</td>
<td>D4294</td>
<td>X</td>
<td>X</td>
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<td>X</td>
<td>X</td>
<td>X</td>
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<td>Total Acid Number (TAN)</td>
<td>D664, D664M</td>
<td>X</td>
<td>X</td>
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<td>MicroCarbon Residue (mass %)</td>
<td>D4530</td>
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<td>X</td>
<td>X</td>
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<td>Nitrogen, total (mass%)</td>
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<td>Nitrogen, basic (mass%)</td>
<td>UOP 269</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Chlorides, Total Organics</td>
<td>D4929</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Viscosity at 3 temps (cSt)</td>
<td>D7042, D445, D4402, D341</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Simulated Distillation</td>
<td>D7169, D2887, D6352</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Metals (Iron, Vanadium, Nickel)</td>
<td>D5708B</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<td>Asphaltenes, C5 &amp; C7 Insoluble</td>
<td>D4055, D6560</td>
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<td>X</td>
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<td>Pour Point (°C)</td>
<td>D5835A, D97</td>
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<td>X</td>
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<td>Cloud Point (°C)</td>
<td>D2500</td>
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<td>X</td>
<td>X</td>
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<td>Softening Point (°C)</td>
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<td>PONA (mass %)</td>
<td>D2425, D2549, D1319</td>
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<td>X</td>
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<td>X</td>
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<td>Smoke Point (°C)</td>
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<td>X</td>
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<td>Aniline Point (°C)</td>
<td>D611</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Cetane Index</td>
<td>D976</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>K Factor, UOP</td>
<td>UOP 375</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Ash (mass %)</td>
<td>D482</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>CHNS (mass %)</td>
<td>D5291</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Water Content (mass%)</td>
<td>D6304, D4007</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Salt (mass%)</td>
<td>D3230</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Note:** Final list of tests are subject to adjustment.
Sampling Requirements

- Samples to be collected prior to diluent addition (PFT exception)

Sampling Issues:
- Sample points exist?
- Multiple samples (representative of project)
- Limit/eliminate loss of light ends
- Size of samples (high water content & Naphtha cut)
- Safety
Sample Preparation

- Samples prepared according to industry standard (same method – data integrity)

Preparation Issues

- Mining vs. In-situ
  - Dewatering: Toluene vs. Distillation (decanting?)
  - Loss of light ends (preparation)
  - Solids removal
  - Solvent removal

- Volume – size of sample for assay (naphtha cut)
Assay

- Tests conform to ASTM and other recognized standards

Assay Issues

- Standards applicable for bitumen
- Distillation (first cut volume)
  - Still availability
  - Consistent test methods between cuts
- Analysis of data – representative?
Implementation Requirements

- **Sampling Process**
  - Will respect operator environmental, health and safety requirements.
  - Laboratory will oversee sampling, conduct the testing and analysis work (data integrity).
  - ADOE staff will accompany during sample collection.
  - Schedule is adaptable (turnarounds, lab availability, other program impacts).

- **Future Sampling**
  - New projects.
  - Updates to ensure data is current.
  - Tests may be adjusted to ensure data is useful.
Implementation

- **Program Timeline**
  - ADOE is currently finalizing RFP contract.
  - Vendor for phase 1 was selected through competitive RFP process in Q2 of 2012.
  - Sample collection, preparation, and laboratory testing scheduled to commence in Q2/Q3 of 2012.

- **Oil Sands Operator Engagement**
  - Past - Original presentation in December 2011.
  - Ongoing - Individual technical sessions.
  - Future - access to project site for sample collection.
  - Future - comments and feedback on assay results.
Thank You