Remtech 2006

October 11 – 13, 2006
Alberta Economic Development
Alberta’s Oil & Gas Well Remediation Industry

Remediation Technologies Symposium
October 11 - 13, 2006
The Fairmont Banff Springs Hotel
Presentation Overview

- Alberta’s Remediation Industry
  - Industry Overview
  - Industry terms
  - Industry Snap Shot

- Alberta’s Remediation Market Drivers
  - Drilling Activity
  - Regulatory Trends
  - Public Expectation

- Alberta’s Remediation Products & Services
  - Future Trends

- Alberta Economic Development’s Strategic Direction
Industry Overview

• Alberta’s remediation industry has grown in response to the needs of the province’s large oil & gas industry

• Over 400 Alberta companies have work related to soil remediation
  – Most of these companies are quite small
  – New larger firms are entering Alberta from eastern Canada and the U.S.

• Remediation projects are both knowledge and labour intensive work and require the use of heavy equipment
  – Labour shortages in key technical fields may constrain future growth

• Large open spaces allow for oil & gas operations spread across the landscape
  – Increasing surface fragmentation
  – Increasing urban interaction with oil & gas industry
Industry Overview

Markets
- Trends having greatest impact on markets: remediation & risk assessment technologies, environmental insurance, risk transfer mechanisms, labour shortages, long-term stewardship for sites and corporate accounting requirements.

Growth Prospects
- Remediation at oil and gas sites, the impact of land-use intense operations, growth opportunities for many years to come.

Challenges
- Key challenge to industry is technology development, commercialization, and adoption
- Old well bores are being recompleted for new uses such as Coalbed Methane and CO2 injection.
Industry Terms

- **Active Wells**: All wells that reported production or injection post 2004 Dec 31st or spud 2004 Dec 31st. (Includes all drilled & cased well bores)

- **Reclaimed Wells**: All wells issued reclamation certificates, exempt or pre 1963 exempt

- **Abandoned Wells**: Abandoned according to EUB guidelines

- **Inactive Wells**: All wells not abandoned that have not reported production or injection post 2004 Dec 31st. (excludes drilled & cased well bores)
## Alberta Industry Snap Shot

<table>
<thead>
<tr>
<th>Term</th>
<th>Well Bore Count</th>
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<tbody>
<tr>
<td>Active Wells</td>
<td>173,695</td>
</tr>
<tr>
<td>Inactive Wells</td>
<td>48,257</td>
</tr>
<tr>
<td>Abandoned Wells</td>
<td>34,879</td>
</tr>
<tr>
<td>Reclaimed Wells</td>
<td>85,879</td>
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</tbody>
</table>

Source: AEUB, August 2006
Market Drivers

- Drilling Activity
- Regulatory Trends
- Public Expectations
Drilling Activity - Gas

Gas Pricing Canadian $ per GJ

Wells Drilled in Alberta

- Drilling Activity - Gas
Cumulative Drilling, Abandonment & Reclamation Statistics

Abandoned Licences | Reclaimed Well Licences | Drilled Well Licences
--- | --- | ---
Nov 05 | 33451 | 85129 | 307117
Dec 05 | 33474 | 85245 | 308839
Jan 06 | 33567 | 85376 | 311157
Feb 06 | 33656 | 85469 | 313645
Mar 06 | 33940* | 85572* | 315967
Apr 06 | 34224 | 85675 | 316256
May 06 | 34591 | 85796 | 316959
June 06 | 34831 | 85879 | N/A
July 06 | 35064 | 85950 | N/A
Aug 06 | 35169 | 86024 | N/A

*March 2006 data was not available. The figure presented represents the average of February and April’s data.
Total Inactive and Active Well Licence Statistics

<table>
<thead>
<tr>
<th></th>
<th>Inactive Well Licences</th>
<th>Active Well Licences</th>
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<tbody>
<tr>
<td>Nov 05</td>
<td>45,143</td>
<td>165,100</td>
</tr>
<tr>
<td>Dec 05</td>
<td>45,701</td>
<td>166,574</td>
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<tr>
<td>Jan 06</td>
<td>43,759</td>
<td>169,060</td>
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<td>Feb 06</td>
<td>47,786</td>
<td>168,158</td>
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<tr>
<td>Mar 06</td>
<td>47,826</td>
<td>169,732</td>
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<tr>
<td>Apr 06</td>
<td>47,866</td>
<td>170,414</td>
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<td>May 06</td>
<td>48,094</td>
<td>170,970</td>
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<tr>
<td>June 06</td>
<td>48,274</td>
<td>171,422</td>
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<tr>
<td>July 06</td>
<td>46,899</td>
<td>172,394</td>
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<tr>
<td>Aug 06</td>
<td>46,623</td>
<td>172,733</td>
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</table>
How big is this Market opportunity?

- 35,000 wells currently abandoned/unreclaimed to be remediated at an average cost of $25,000 results in an inventory of $850 million of work to be done
- Each year wells continue to move from active to inactive to abandoned. Each year new wells are drilled
- All 173,000 active wells will eventually be remediated
Regulatory Trends

- Environmental Self Management/New Management Approaches
- limits of command and control regulation recognized
- regulatory reform in government
- industry self-regulation
- voluntary programs
- market mechanisms
- taxes and fiscal incentives
Well Life Cycle:

1. Greenfield
2. Active
3. Inactive
4. Abandonment
5. Phase 1: Assessment
6. Phase 2: Physical Work
7. Phase 3: Monitoring
8. Phase 4: Regulatory Application
9. Reclamation Certificate
10. Active Reclamation Complete
11. Well Life Cycle
Regulatory Trends

Regulatory Drivers focus on health, safety, and environmental concerns
Public Expectations

• Public becoming increasingly involved in oil and gas development in Alberta
  – Partly driven by the closer proximity of Albertans to oil and activity, increased environmental awareness in general, and the significant amount of recent drilling and associated energy activities

• More activist population in regards to oil and gas development
  – Increased interventions at EUB hearings by both concerned individuals and recently municipalities
  – The formation of more coordinated and sophisticated stakeholder associations like Synergy Alberta and Surface Rights Groups
Alberta Industry Technologies

- Site clean-up and remediation
- Air sparing
- Bioremediation
- Containment – Barrier Walls
- Containment – Caps
- Flushing
- In Situ Chemical Oxidation
- Incineration
- In-Well air sparing

- Monitored natural attenuation
- Multi-phase extraction
- Permeable reactive barriers
- Phytoremediation
- Soil vapour extraction
- Soil washing
- Solidification stabilization
- Thermal desorption
Current Trend affecting the pace of remediation

- Remediation and risk assessment technologies
- Long term stewardship for sites with institutional and engineering controls
- Corporate accounting requirements- eg. Petro-Canada has taken a proactive position in applying risk based management to inactive wells in Alberta
Future Trends

- Need to move from labour intensive & large equipment to technology driven industry
- Competing demands for surface use leading to more land usage consultation
- Large number of industrial and commercial sites will need to be remediated or better environmentally managed
- New nanotechnology in the product development pipeline – nanoparticles for pollutant absorption
AED’s Strategic Direction

Key Initiatives

• Promote technology verification, demonstration and commercialization in key sub-sectors of remediation, water treatment, and climate change.

• Support partnerships with industry which promote capacity building and growth in domestic and export markets.

• Analyze existing environmental technology roadmaps and address gaps

• Work with industry and government to address skilled labour shortages.
How should we address this opportunity?

- Alberta firms- Can continue to develop services and technologies that create cost effective solutions and reduce risk
- Oil and Gas firms- Have realistic plans to remediate sites in a sustainable manner
- Regulators-Continue to work with stakeholders to streamline approval processes and remove regulatory uncertainty
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