Energy Audits
Methane to Markets-Oil and Natural Gas Technology Transfer Workshop
Jamie Swallow, P.Eng.

• Eco Efficiency
• Energy Efficiency + Environmental Efficiency
Eco-Efficiency
as applied to
The Canadian Upstream Oil and
Gas Sector

Integrated Plant Audit

Energy

Feedstock
HC, H₂S, CO₂

By-products
Residual

Emissions
Liquids
Solid Waste
Heat Losses
CO₂, H₂O

Product Streams
Sales Gas
Condensate Sx
Integrated Plant Audit = Process Diagnostics

“A concurrent examination by a multidisciplinary team of leading industry experts to seek out economic and environmental improvements.”

2 + 2 > 4

Potential Fuel Gas (Methane) and Electrical Savings

- 16 Plant Summary Normalized to CAD 5.25/GJ and CAD 60/MW

<table>
<thead>
<tr>
<th></th>
<th>Current Consumption (CAD)</th>
<th>Potential Savings (CAD)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Gas</td>
<td>90 000 000</td>
<td>11 700 000</td>
<td>13</td>
</tr>
<tr>
<td>Electricity</td>
<td>33 000 000</td>
<td>3 000 000</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>123 000 000</td>
<td>14 700 000</td>
<td>12</td>
</tr>
</tbody>
</table>
### Annual Gas Processing 2005 - Canada vs. Mexico

<table>
<thead>
<tr>
<th></th>
<th>Raw Gas Production (10^3 m^3)</th>
<th>Potential Savings (10^3 m^3)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>180 000 000</td>
<td>23 400 000</td>
<td>13</td>
</tr>
<tr>
<td>Mexico</td>
<td>60 000 000</td>
<td>8 000 000</td>
<td>13+</td>
</tr>
</tbody>
</table>

### Canada Greenhouse Gas Reductions -GHG (CO₂E)

(16 Plant Summary)

...as a by-product of energy conservation

<table>
<thead>
<tr>
<th>Current Emissions</th>
<th>Potential Reductions</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>tonnes/year</td>
<td>tonnes/year</td>
<td></td>
</tr>
<tr>
<td>1 300 000</td>
<td>240 000</td>
<td>~19</td>
</tr>
</tbody>
</table>

Reductions ranged from 10% to 35% at the 16 Plants, including fugitive emissions
Eco-Efficient Technology Implementation

- market ready
- proven reduction in energy consumption or emissions
- technologies appropriate to identified opportunities

Eco-Efficient Technology Demonstration in Industry

- sulphur plant thermal incinerator optimisation
- process optimisation tools
  - amine treating
  - sulphur recovery
  - dehydration
- pneumatic equipment emissions reduction
- natural gas engine controls
- zero emission compressor/pump

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Sulphur Plant Incinerator Optimisation

Stack top temperature reduction

Process Optimisation Tools

Tools for optimal operation
Pneumatic Equipment Emissions Reduction

Reduce emissions from constant bleed instrumentation

Natural Gas Engine Controls

Rich to lean conversion
All gas returns back to the pipeline to be sold

Thank You

Questions?