Medicine Bow Fuel & Power Project

4th Annual Wyoming CO₂ Conference

30 June 2010
Project Overview

DKRW Advanced Fuels ("AF") is sponsoring a coal to gasoline project in SE Wyoming.

The project will use proven commercial technologies.

The main product will be regular gasoline delivered into the Denver market by pipeline.

The project can capture and compress over 80% of the process CO2 and deliver it by pipeline to the EOR market.

The project will be mine-mouth and Arch Coal will operate the mine. The mine will have 180 mm tons of coal reserves.

Planning to begin construction in 2011 and commercial operation in 2014.
Significant incremental market for unconventional fuels: AF has a leading position in the race to fill this gap with unconventional liquids.
DKRW AF Strategy: Capturing the Coal-Oil Price Spread

AF creates an oil equivalent product from its low cost coal --- Medicine Bow is a low cost 30 year option on oil.
Value Comparison – Medicine Bow vs. Refinery Economics

- Low feedstock cost and other fixed costs provide larger relative profit
- At $85 WTI price – Medicine Bow provides 10x higher profits than typical refinery

With its coal feedstock costs for Phase I at less than $4/mmbtu and product sales in excess of $17/mmbtu, AF creates tremendous value with its facility using commercially proven technologies.

* Estimated Denver Rack Price for Gasoline at $85 WTI cost and assumes average $5 crack spread for refinery.
Value Comparison – Medicine Bow vs. Refinery Economics

- Differing economics are magnified as WTI increases
- At $120 WTI price – Medicine Bow provides 20x higher profits than typical refinery

Medicine Bow @ $3.66 Gasoline*

Average Refinery @ $3.66 Gasoline*

* Estimated Denver Rack Price for Gasoline at $120 WTI cost and assumes average $5 crack spread for refinery.

AF margins increase with oil unlike traditional refining. At $120/bbl oil price case its coal feedstock costs are less than $4/mmbtu and product sales are in excess of $24/mmbtu.
### US Synthetic Oil Potential Using CTL

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<tr>
<td>US Coal Reserves 2009</td>
<td>262 Billion Short Tons</td>
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<td>Average Heat Content</td>
<td>19.8 mmbtus/ton</td>
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<tr>
<td>Conversion Ratio to Gasoline</td>
<td>1.67 barrels per ton</td>
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<tr>
<td>US Synthetic Oil Potential</td>
<td>437 Billion Barrels</td>
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<td>Saudi Oil Reserves 2009</td>
<td>265 Billion Barrels</td>
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<td>Ratio US Synthetic/Saudi</td>
<td>1.65</td>
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*Source: U.S. DOE Energy Information Administration AEO 2009

Converting Our Coal to Liquids would give us 165% of Saudi Arabia’s Oil Reserves
**Medicine Bow Fuel & Power: Gasoline from Coal**

**Coal Asset/Feedstock Liquid Reserves**
- 180 mm ton reserve/fully permitted coal mine – Arch operator
- Converts to 2 barrels of regular gasoline per ton of coal
- Synthetic oil reserves of 360mm barrels of oil equivalent (BOE)

**Conversion Technology & Returns**
- Every technology used is commercially proven at similar scale
- Breakeven oil price of $45/bbl to cover cash costs plus 1 x DSCR
- High returns using NYMEX forward curve for WTI + margin

**Product Streams: Gasoline Methanol CO2 /EOR**
- Gasoline sold in high growth Denver market transported via pipeline
- Methanol as an intermediate product
- CO₂ for enhanced oil recovery (EOR) market
- LPGs sold to nearby pipeline company

*A world class conversion facility with gasoline and methanol arbitrage flexibility.*
**Medicine Bow --- Saddleback Hills Coal Mine**

- **Location**: Medicine Bow, Carbon County, Wyoming
- **Project will own the Coal**
- **Mine is permitted to start construction**
- **Arch will operate the mine**
- **Coal reserves: over 180mm ST, bituminous**
- **Project will control coal reserves**

*Project controls coal reserve with 60 years of feedstock supply -- key project collateral.*
**Medicine Bow --- Proven IGL Technology**

All technologies used in the process have been built and run at similar commercial scale. Each section is built at appropriate competitive scale and fully integrated.
**Medicine Bow --- Carbon Capture & Sequestration**

- Over 80% of CO₂ produced by project can be captured and used for enhanced oil recovery (EOR)
  - EOR has been used by oil industry for many years and is very effective sequestration of CO₂
  - Significant revenue generation potential

- EOR is sequestration
  - Intergovernmental Panel on Climate Change (IPCC)
  - National Resource Defense Council (NRDC)

- Depleted oil reserves in Wyoming create an opportunity for EOR

MBFP will be the first industrial gasification project in the US to be financed with integrated carbon capture and sequestration.
MBFP “Well-to-Wheels” CO2 emissions are significantly better on a lifecycle basis than the average gasoline produced by US refineries ---significantly better with hydrogen & biomass.
The gasoline produced by Medicine Bow will enter the market and displace the highest cost marginal alternative. As conventional crude oil globally begins to decline, liquid transport fuels will increasingly come from heavier crudes. In the US market that will be Oil Sands and Venezuelan Syncrudes.
### Medicine Bow --- Status of Permitting

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<tr>
<th>Key Permits</th>
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<tr>
<td>Conditional Use Permit (zoning approval)</td>
<td>Yes</td>
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<td>Wyoming Industrial Siting Council Permit</td>
<td>Yes</td>
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<td>Federal Air Permit Received</td>
<td>Yes</td>
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<td>Environmental Impact Statement (EIS)</td>
<td>Yes</td>
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<td>State of Wyoming Department of Environmental Quality – Land Quality Division mining and reclamation major permit revision</td>
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Permits now in hand allow for start of construction of the mine and IGL facility.
Key Project Milestones

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<td>Coal Mine Operational</td>
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<td>Start Up/Commercial Operations</td>
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<td>IGL Facility Ramp Up Completed</td>
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Completed: Green
In progress: Orange
Planned: Blue

Project NTP in Q1 2011 with start-up in mid 2014 with full production in 2015.
Medicine Bow Fuel & Power---- Advantages

• Technology can provide the scale to close the gap between the supply and demand for liquid fuels

• Significant Coal Reserves --- 180 mm tons
  – Creates 360 mm bbls of synthetic oil reserve
  – Provides key collateral for the project

• Project investment is a low cost 30 yr option on oil

• CTL gasoline will displace higher cost technology alternatives and be very competitive in the liquid transportation fuels market
Thank You!