

# DKRW Advanced Fuels

## **Coal to Liquids: Transport Fuel For a Supply Constrained World Oil Market**

*Gasification Technologies Conference 2008*

*October 7, 2008*

## Agenda

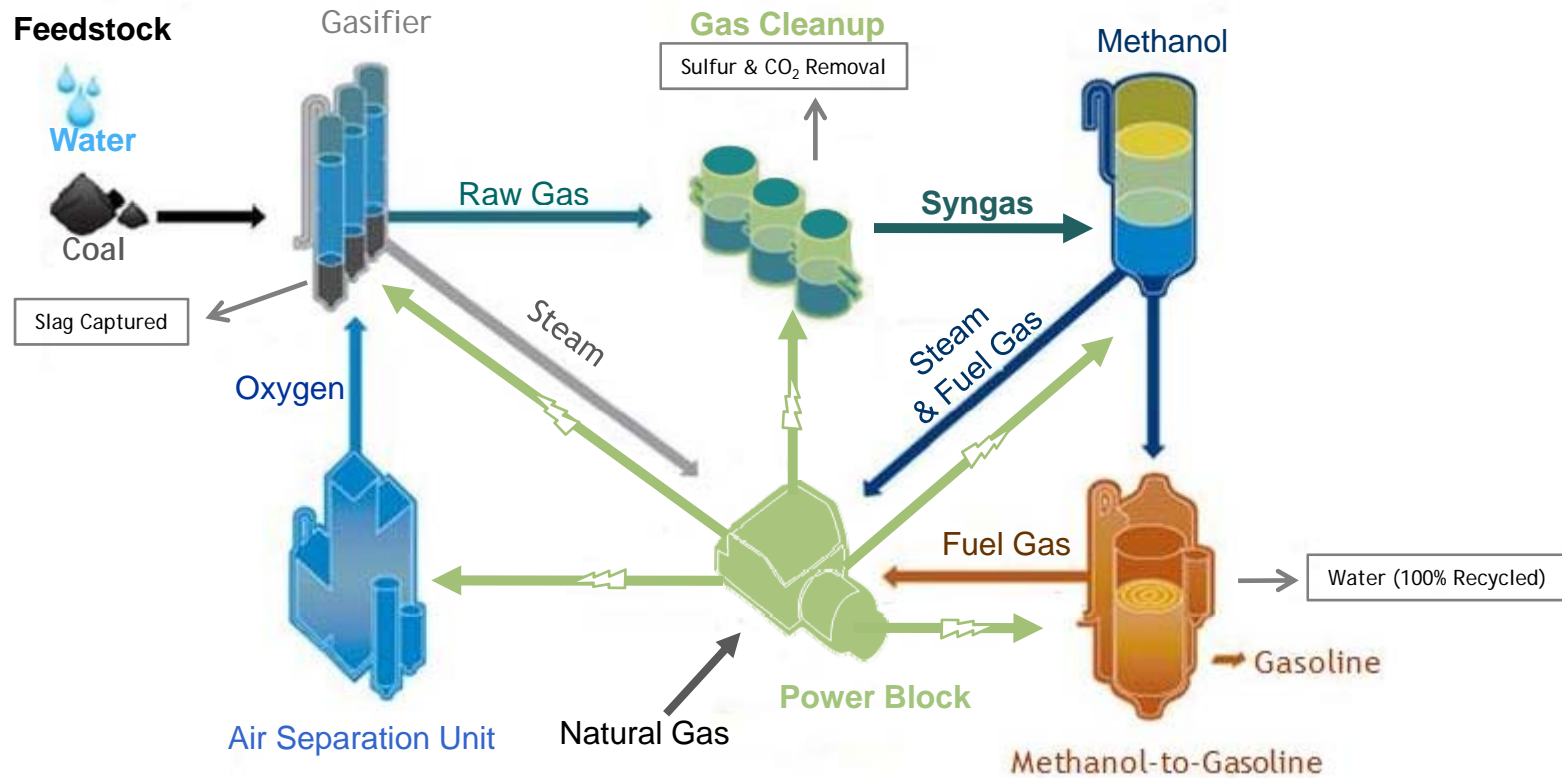
- Company and Project Overview
- CTL Market Drivers
- CTL's Role
- Conclusions

## Company & Medicine Bow Project Overview

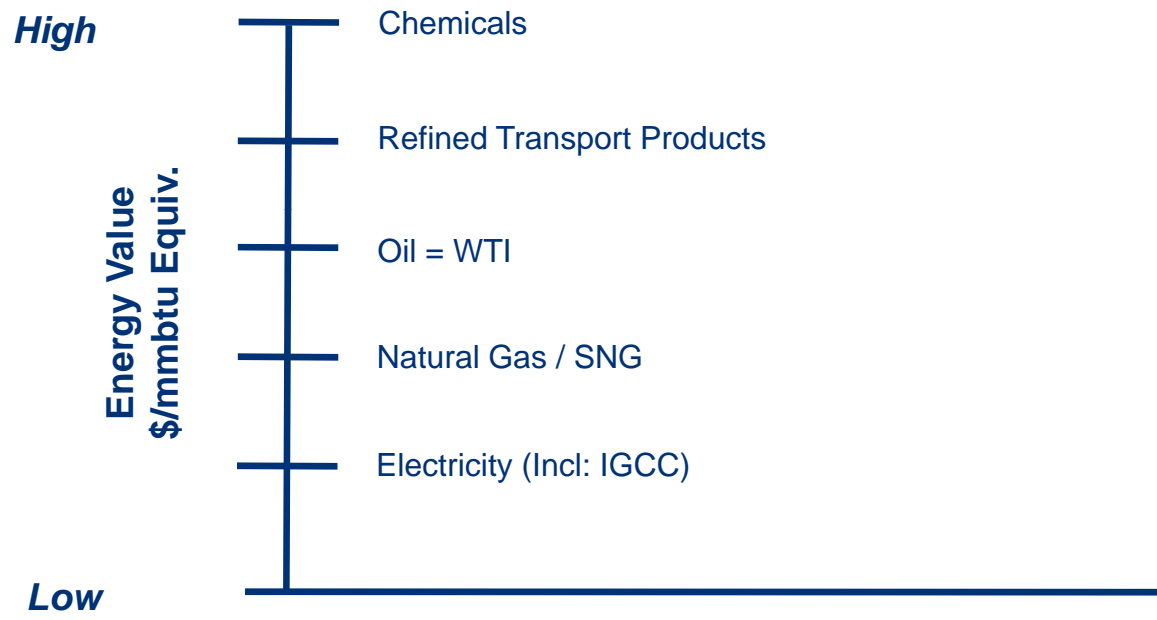
## DKRW Advanced Fuels LLC - Company Overview

- DKRW Advanced Fuels LLC (“AF”) is focused on using clean coal conversion technology to produce synthetic hydrocarbon products
- Our flagship project at Medicine Bow, WY is currently planned to go into production in 2013 producing 18,000-20,000 bpd of regular gasoline
- In addition to revenues from liquid hydrocarbons significant amounts of purified CO2 will be captured and sold for EOR purposes --- effectively sequestering the CO2 in underground oil reservoirs
- Our long term plan is to both expand Medicine Bow and build additional facilities similar to Medicine Bow in the US and abroad
- We have key relationships with world class companies in coal, technology and finance: Arch Coal, General Electric, UOP, Davy and Exxon Mobil

# Medicine Bow - Conversion Process



# Target Market

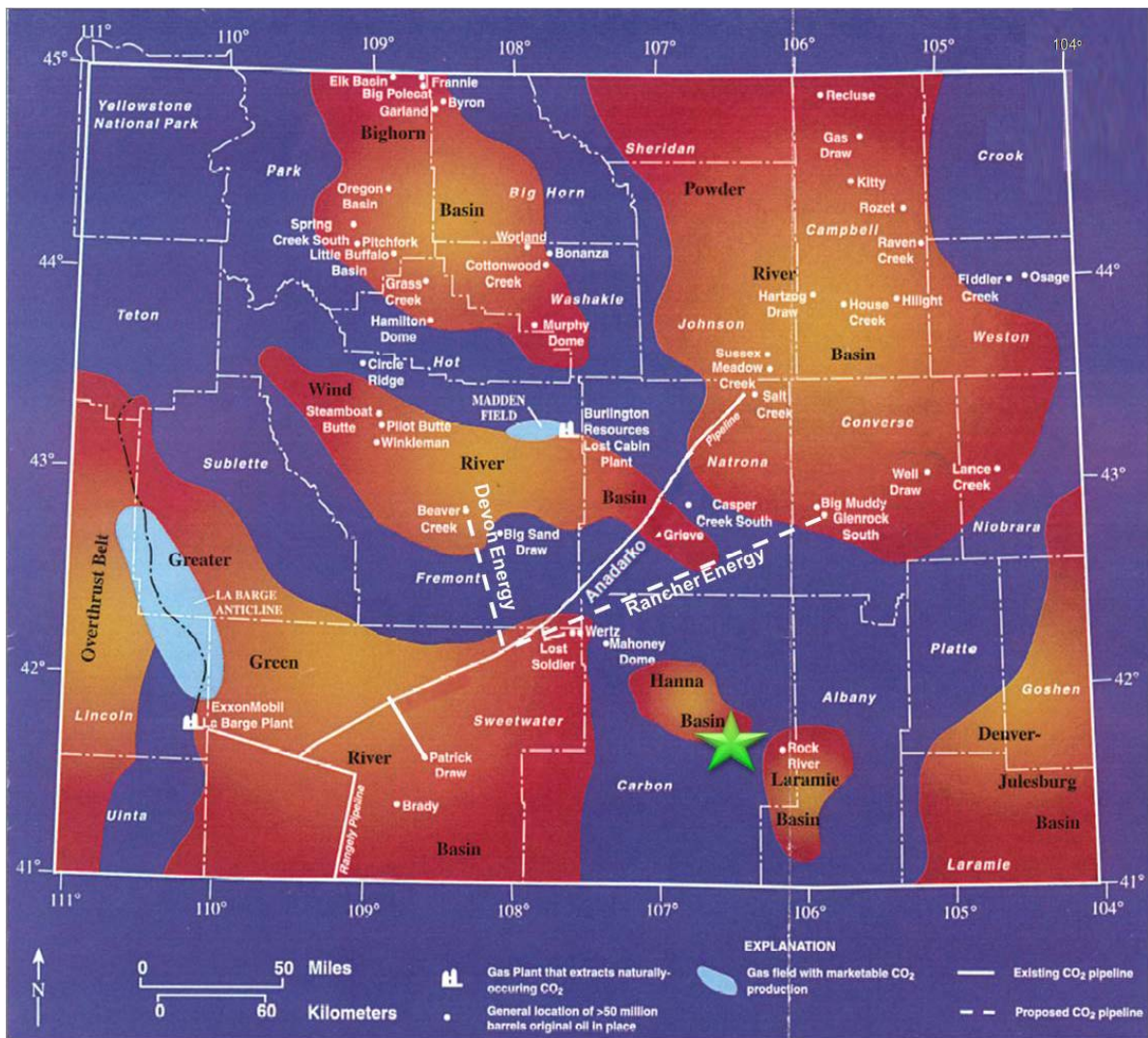


Gasoline sold into the Denver market under long term contract

## Medicine Bow - CO2 EOR Opportunity

- Significant reserves in Wyoming amenable to EOR
- Contract Structure: Base price with oil bonus
- Sale of 100% of CO2 to EOR counter-parties
- EOR endorsed as excellent method of CO2 sequestration
  - “Hydrocarbon reservoirs, which generally have been well researched, are considered to be safe sinks for CO2 sequestration, since these media have held oil/gas for millions of years without large spontaneous releases.” IPCC Working Paper (Damen et. al. 2003)
  - “Recently, soil gas measurements ... have been taken at the Rangely Webber oil field, where CO2 is injected to enhance oil recovery. These measurements indicate annual fluxes of circa 3800 tons of CO2 originating from deep sources over 78 km<sup>2</sup> ... corresponding to approximately 0.01% of the annual injection CO2 rate.” IPCC Working Paper (Damen et. al. 2003)

# Medicine Bow - EOR Opportunities in Wyoming



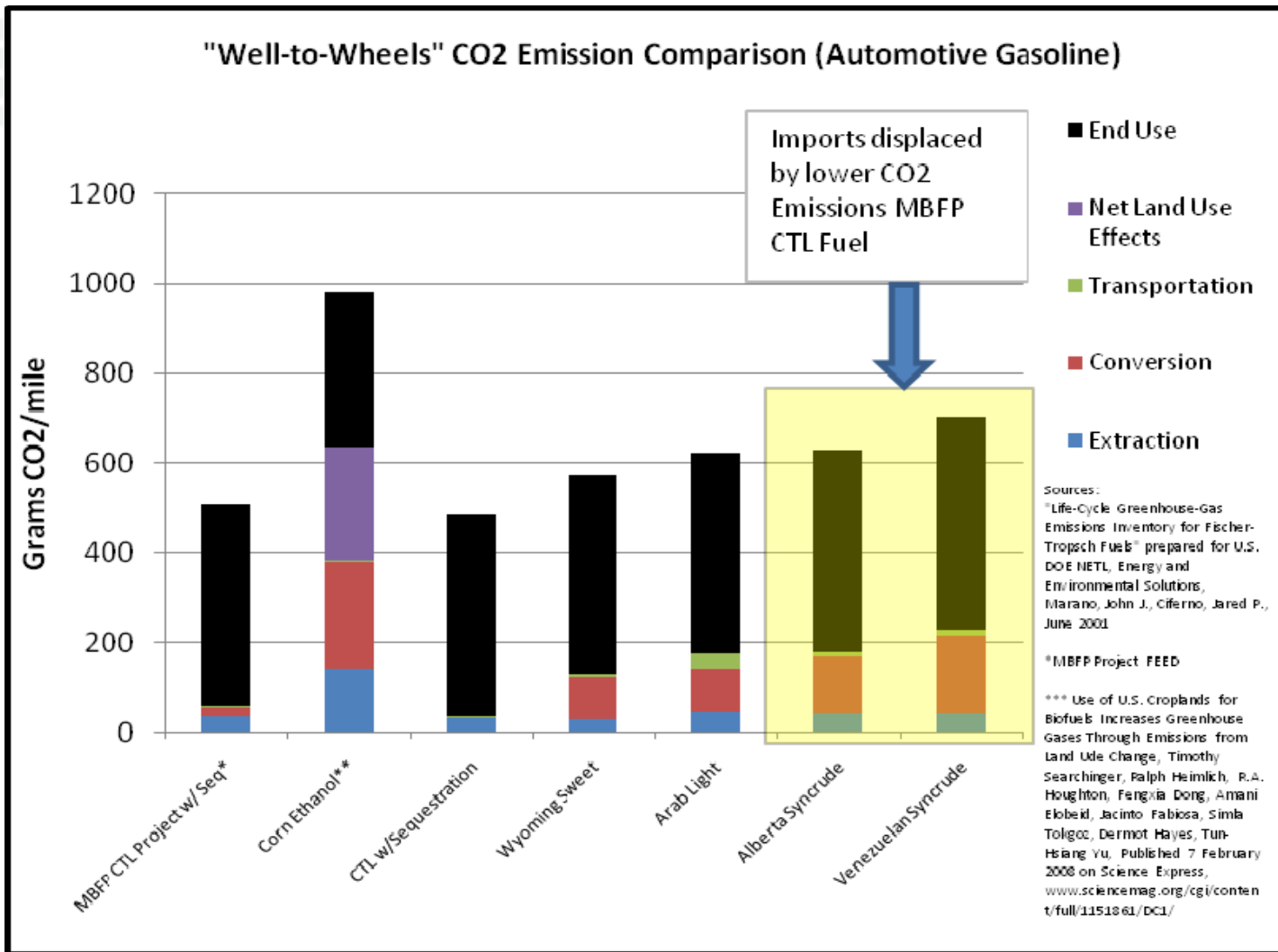
	CO2-EOR Recoverable Oil	CO2 Needed to Recover
	Bill BBLs	TCF
Wyoming*	.8 – 1.2	4.8 – 7.2
USA**	88	528

Sources  
 \* [www.eori.uwyo.edu](http://www.eori.uwyo.edu)  
 \*\* [www.fossil.energy.gov/programs/oilgas/publications/eor](http://www.fossil.energy.gov/programs/oilgas/publications/eor)

★ Medicine Bow Site

\* RAND 2007





MBFP's "Well-to-Wheels" CO2 emissions compare favorably to those of traditional refining

# DKRW AF Strategic Plan

## DKRW AF Strategy

- 160,000 bpd by 2018
- CTL technology: MTG
- MB cost reductions

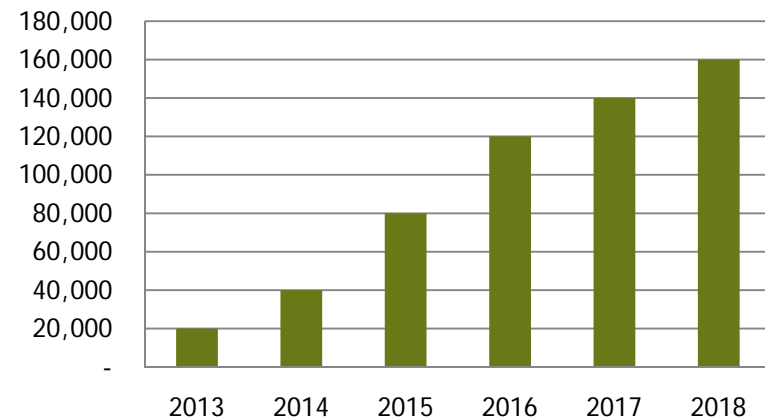
## DKRW AF Projects

- Medicine Bow
- US West
- US East
- Australia

## Coal/Liquid Reserves

	Actual/Target Coal Reserves (mm ST)	Convert Ratio (bbls/ton)	Liquid Reserves (mm bbls)
Medicine Bow Phase I**	90	2.04	183
Medicine Bow Phase II**	90	2.04	183
Western US Phase I	189	1.46	275
Western US Phase II	189	1.46	275
Eastern US Phase I	135	2.04	275
Eastern US Phase II	135	2.04	275
Australia Phase I	158	1.74	275
<u>Australia Phase II</u>	<u>158</u>	1.74	<u>275</u>
Total Reserves	1145		2019

## MTG Capacity Plan (bpd)



\*Future projects based on a 40 yr project life and Medicine Bow assumptions

\*\*Actual Coal Reserves

## CTL Market Drivers

## Market Drivers for CTL Technology

- Competitively Priced Gasoline
  - Meeting the demand for energy in America
  - Low cost producer of US gasoline
- Environmental Advantages
  - Captures sulfur, mercury, and CO<sub>2</sub>
  - Meets/exceeds new regulations for sulfur and benzene
- Reducing America's Oil Import Problem
  - 13.4mm barrels/day of imports in 2007 (~ 65% \* of daily U.S. use)
  - \$490 billion per year @ \$100/BBL --sent overseas
- Enhancing National security
  - Domestic production of transport fuels
  - Reducing dependence on unstable suppliers
- Security of Energy Supply
  - High value product (gasoline) from US coal supplies
  - Relatively stable coal pricing compared to oil

## CTL's Role

# US Oil Import Example

- US imports 2/3 of its current oil
- Transportation sector is 2/3rds of US demand
- 50% of US imports are from volatile sources
- 10% of US imports are Venezuelan Syncrude

\* All data sourced from DOE EIA 2007

US Oil Market Fundamentals ('000 of BPD)		
	2007	Cummulative
US Oil Demand	20,698	100%
US Oil Supply	6,879	33%
Net Oil Imports	13,819	67%

US Oil Demand by Sector ('000 of BPD)		
	2007	Cummulative
Transpotation	13,868	67%
Stationary Uses	6,830	33%
	20,698	100%

US Oil Imports by Country ('000 of BPD)		
	2007	% of Total Imports
Saudi Arabia	1,485	11%
Mexico	1,532	11%
Venezuela	1,361	10%
Nigeria	1,134	8%
Iraq	484	4%
Algeria	670	5%
Angola	508	4%
Russia	414	3%
ROW	6,231	45%
<b>Total</b>	<b>13,819</b>	<b>100%</b>

A US CTL program of 1 mm bpd by 2030 is achievable

# Global Price Benefits of a CTL Supply Scenario

Increased Production (mm bpd)	Production Increase (%)	Price Reduction (%)	Global Oil Production 2007 (mm bpd)	Global Benefit Oil at \$100/bbl (\$billions)	US Benefit** Oil at \$100/bbl (\$/billions)
1	1.2%	1.2%	81.5	\$36.5	\$8.9
2	2.5%	2.5%	81.5	\$73.0	\$17.7
3	3.7%	3.7%	81.5	\$109.5	\$26.6
6	7.4%	7.4%	81.5	\$219.0	\$53.2

\* Based on: James T. Bartis, The RAND Corporation, "Policy Issues for Coal-to-Liquids Development", May 24, 2007 Senate Testimony

\*\* US at 24% of World Consumption

The CTL industry can put downward pressure on oil prices and provide significant benefits to the World/US Economy

## Carbon Capture and EOR Benefit

- Gasification and clean up methods used enable cost competitive CO<sub>2</sub> Capture
- Rand estimates 2-3 barrels of oil production from existing oil fields per ton of captured CO<sub>2</sub>, depends on given field
- Rand's estimates indicate the favorable collateral consequence of producing 1 mm bpd of CTL fuels is to promote 2 mm bpd of domestic oil production
- Some sources indicate the US has over 88 bn bbls of CO<sub>2</sub>-EOR recoverable oil that will require 528 TCF of CO<sub>2</sub>
- This additional production does not require new drilling in environmentally sensitive areas



## Conclusions

## Conclusion

- Gasification technology has a central role to play in supporting a stable energy market
  - Key to near term electricity and transport fuels market solutions
- Benign environmental footprint
  - CTL CO2 footprint competitive with traditional refineries
  - Superior local pollutant solution
- Gasification technology directly addresses important national security, economic security, and environmental concerns that are at the center of the current global energy debate

