

Fischer-Tropsch Diesel – Meeting the California Supply Challenge



**Alternative Diesel Fuels Symposium
Presented by CEC/CARB
Sacramento, California**

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Agenda

- Quick Overview of Rentech Fischer-Tropsch Diesel (FTD)
- Viable FTD supply options
- Supplying California with Competitively Priced FTD
- Where Do We Go From Here?

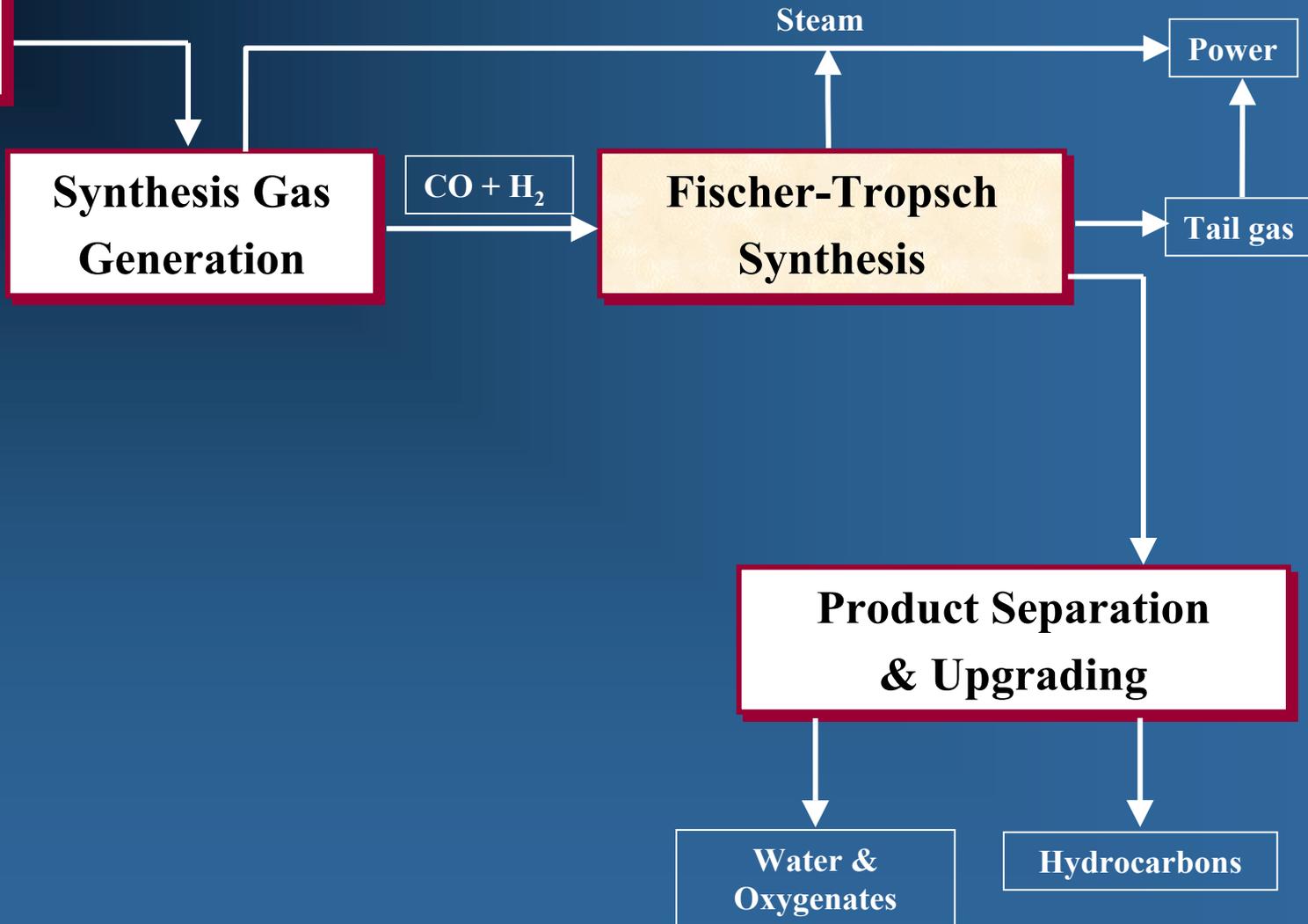
Rentech Background

- Rentech was formed in 1981 specifically to develop Fischer-Tropsch technology
 - Patented/proprietary technology
 - Iron catalyst development
 - Slurry bubble column
 - Synhytech commercial demonstration
- Became a public company in 1991
 - Traded as RTK on the AMEX

“Hydrocarbons” to Liquids

Carbon-Bearing Feedstocks

• Natural gas

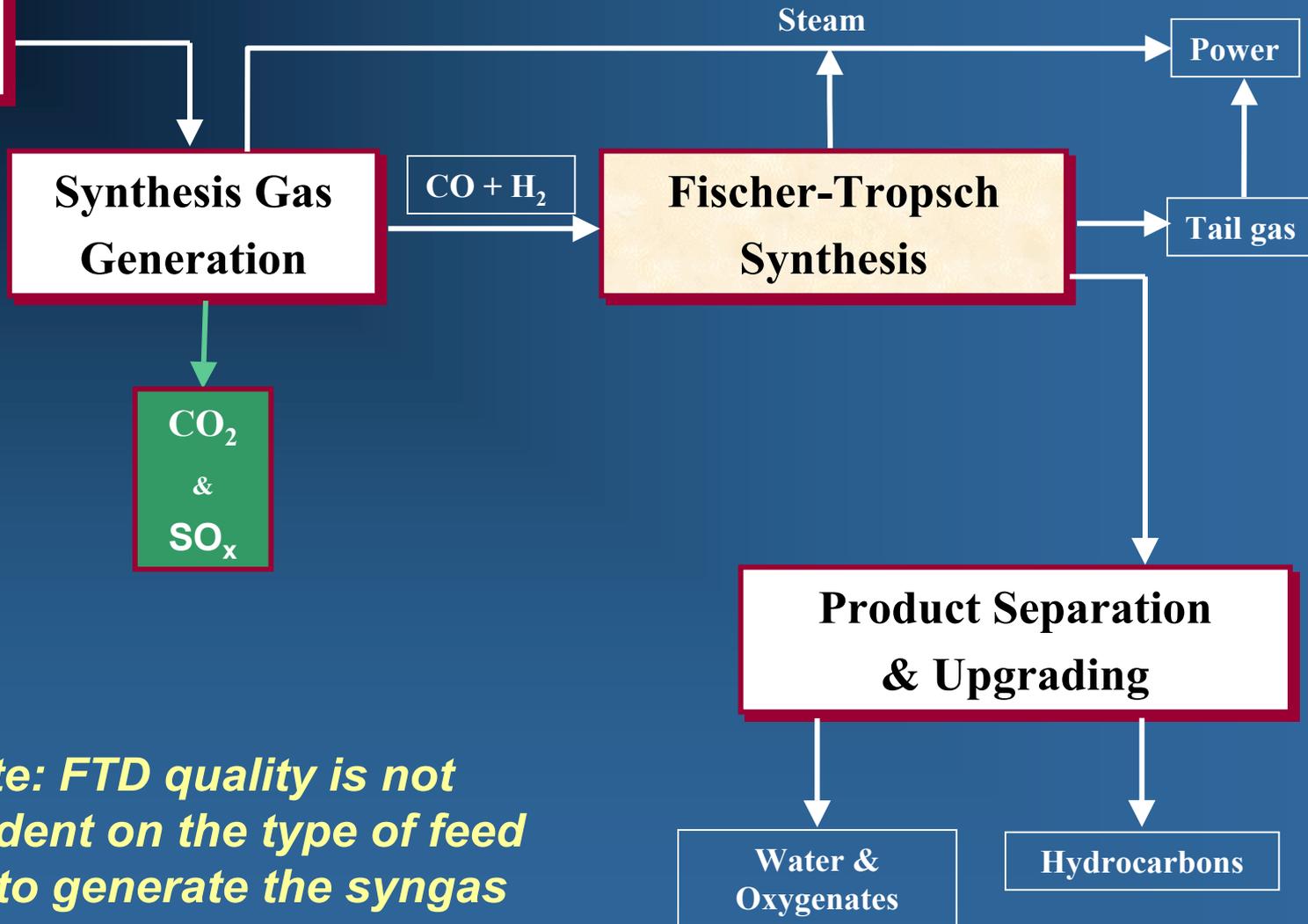


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“Hydrocarbons” to Liquids

Carbon-Bearing Feedstocks

- Natural gas
- *Coal*
- *Refinery bottoms*
- *Orimulsion™*
- *Heavy oil*
- *Biomass/RDF*



Note: FTD quality is not dependent on the type of feed used to generate the syngas

Today's Sources of FTD are not Domestic

SASOL (S. Africa)

- 44 years commercial
 - 160,000 b/d+
 - Feedstock Coal

SASOL'S SOUTH AFRICAN FACILITY



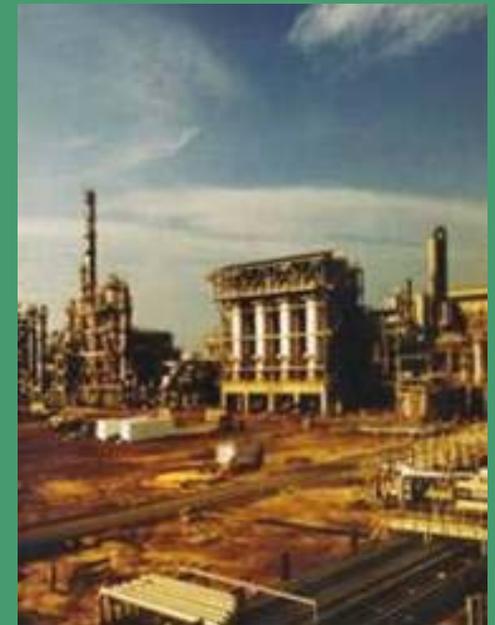
MossGas (S. Africa)

- 10 years commercial
 - 22,500 b/d+
 - Feedstock Natural Gas



Shell (Malaysia)

- 7 years commercial
 - 15,000 b/d+
 - Feedstock Natural Gas



Examples of Viable Rentech GTL Projects

Bolivia Stranded Gas



10,000 B/D

Indonesian Methane Complex



16,500 B/D

Flared Gas FPSO



5,000-10,000 B/D

IGCC / EECF Power Generation



1,000 – 10,000 B/D



**Supplying California
With Competitively Priced FTD**

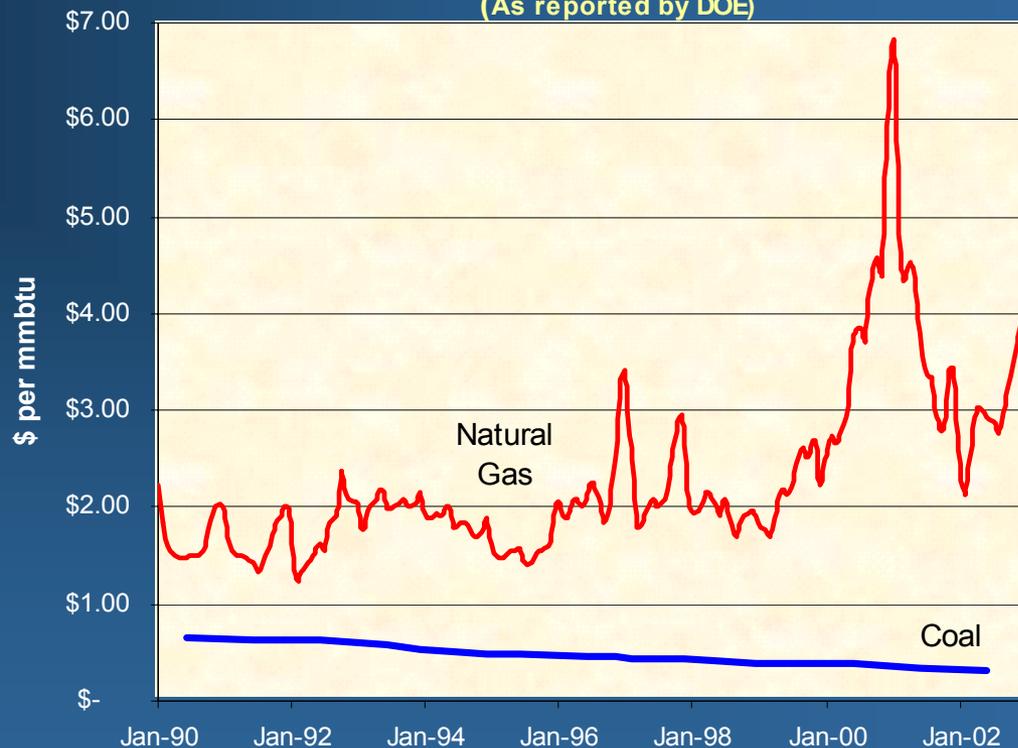
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Domestic FTD Feedstock Alternatives

- Natural Gas
($> \$3.50/\text{mmbtu}$)
- Coal
($< \$1.00/\text{mmbtu}$)
- Refinery Bottoms
($< \$1.00/\text{mmbtu}$)
- Refuse Derived Fuel & Biomass
($?\text{/mmbtu}$)

Wellhead Natural Gas Prices vs WY Coal Prices

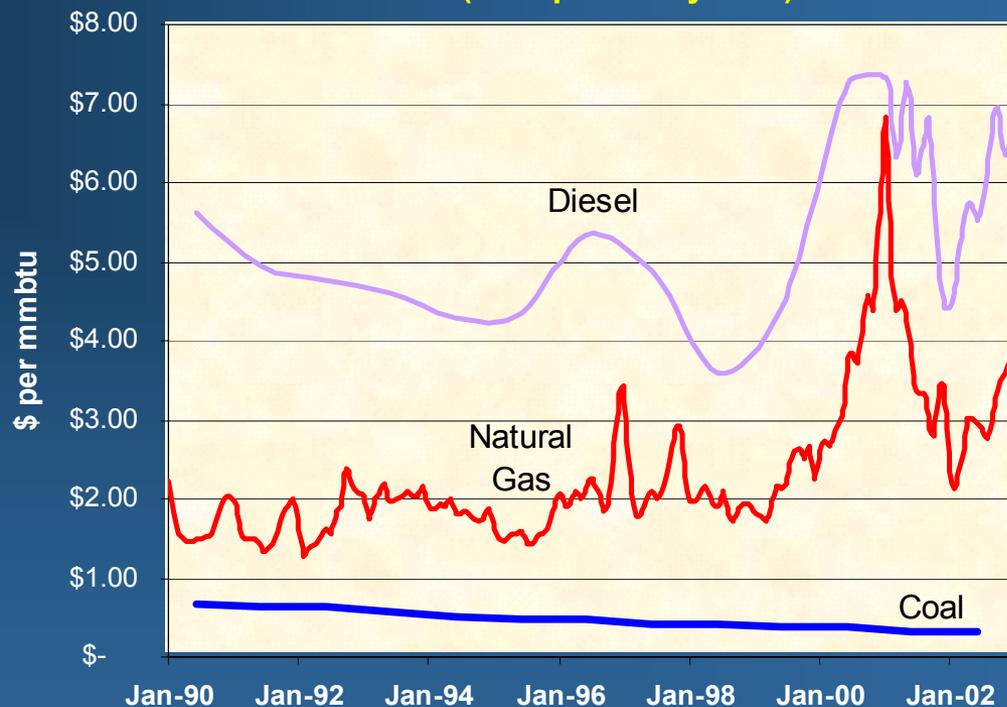
(As reported by DOE)



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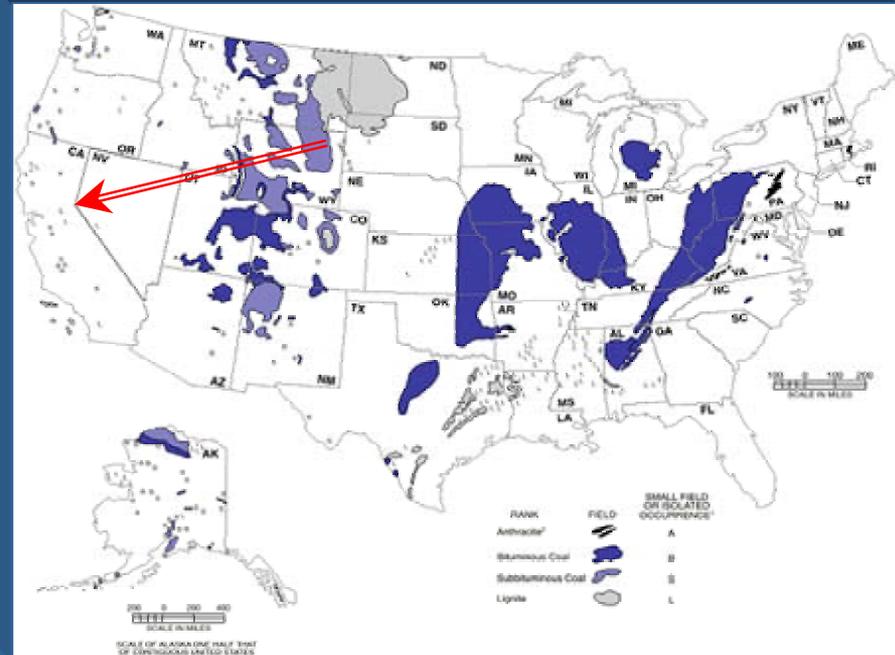
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Why Not FTD from Coal?

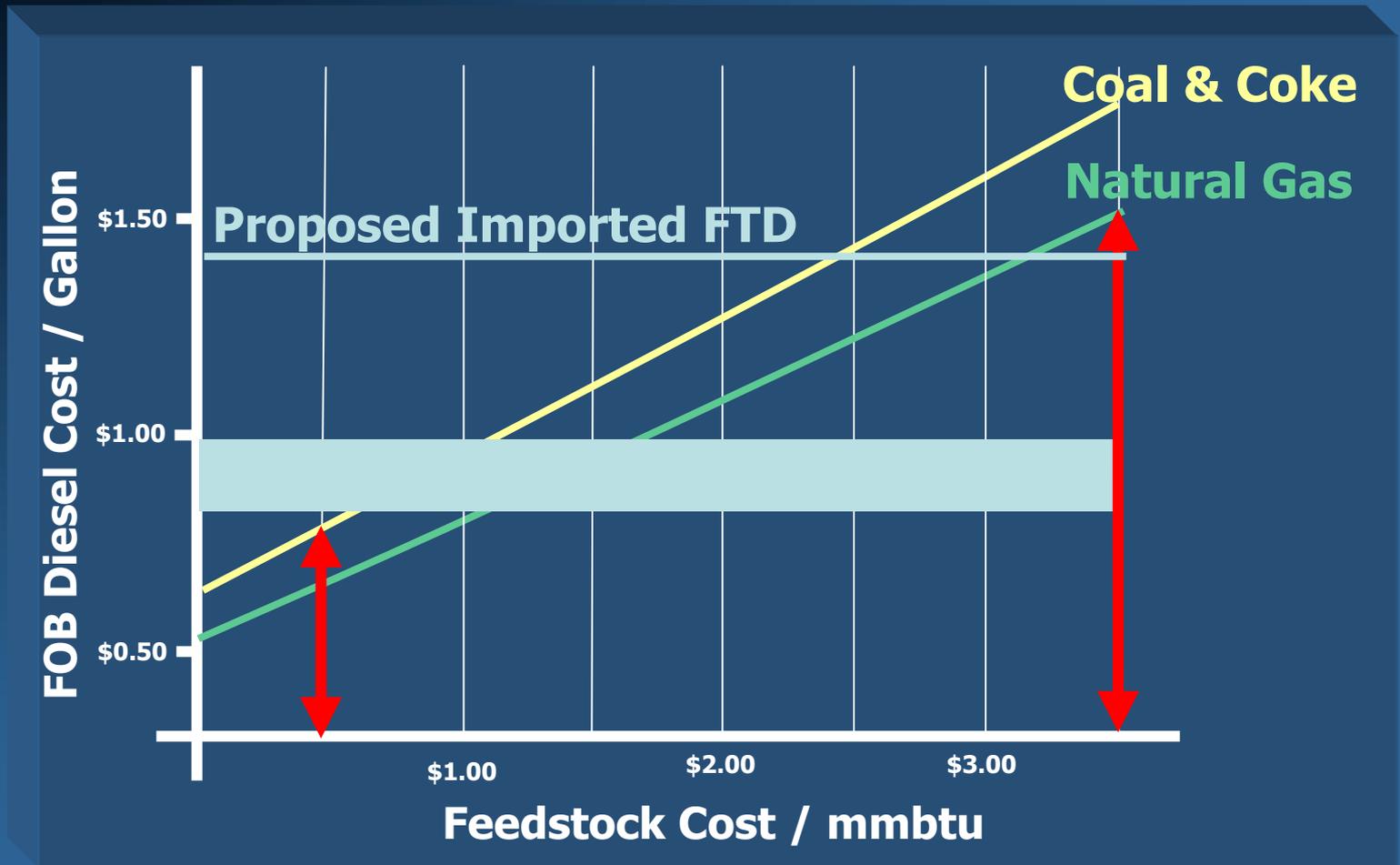
- U.S. has over 275 billion tons of coal reserves
 - The world's largest coal resource
 - Equivalent to over 20 trillion gallons of FTD
- U.S. coal is inexpensive, price stable and available for long-term contract supply
- New coal-fired power plants will be required to meet growing needs
- H₂ can be co-produced
- Carbon dioxide is extracted and can be sequestered



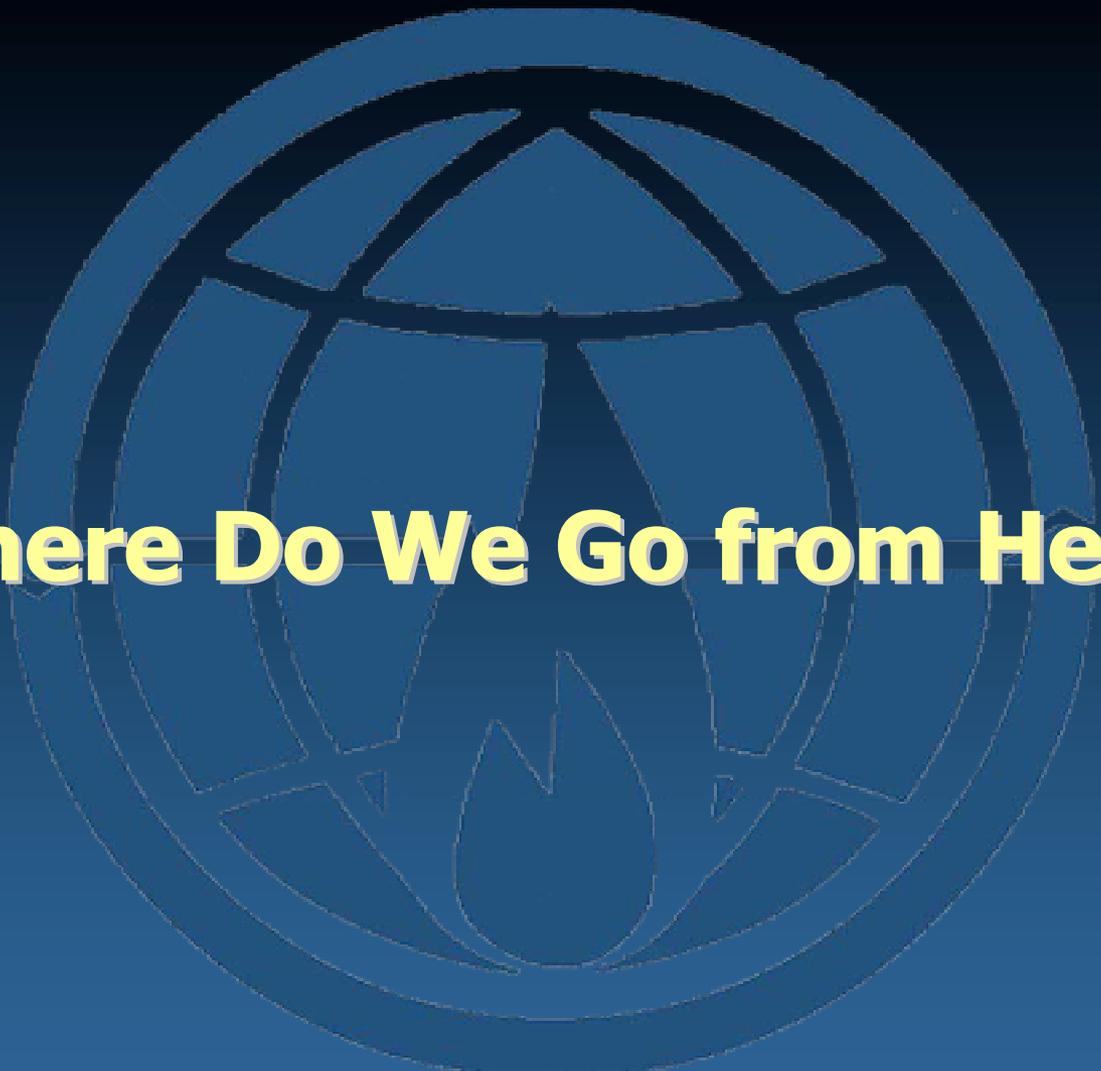
Plant Emissions with Sequestration

	Natural Gas Combined Cycle	Natural Gas FT	Conventional Pulverized Coal	IGCC w/o Sequestration	IGCC w/ Sequestration	FT w/o Sequestration	FT w/ Sequestration
Type of Feed	Gas		Coal	Coal	Coal	Coal	
CO ₂ – pounds per Kwh (equivalent basis)	0.95		2.10	1.88	1.24	0.97	
NOx – parts per million	3		150	<9	<9	<9	
Sulfur Recovery - %	-		95	98	98	>99.9	

Cost Estimates for FTD



- Transportation to California market may range from \$.08 to \$.20/gal
- The price of FTD from the CEC report is \$0.10 per gallon above CARB Diesel



Where Do We Go from Here?

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California Needs & Challenges

- Reduced air emissions
- Non-petroleum sources of transportation fuels
- Stable, competitive prices
- Reliable supplier
- Flexibility in supply

FTD Provider Needs & Challenges

- Reliable source of low-cost feedstock
 - Price, quality and quantity
- Long-term product sales contract (>5 years)
- Stable production off-takes
 - Steady growth from 350,000 gallons/day
 - Minimum disruption to existing markets

Proposed Wyoming Coal Project

Build a next generation FTD plant sourced on low-cost Wyoming coal

- Phase 1 facility at 350,000 gallons per day (gpd)
 - This represents less than 4% of CA's diesel demand
 - Ultimate capacity could be over 1 million gpd
- Secure long-term coal supply \leq \$0.50 per mmbtu
- Optimize co-produced electrical generation, steam and other ancillary products including sequestered CO₂
- Expedite construction to meet near-term California needs at current CARB diesel prices

Proposed Approach

- Public-private partnership between FTD provider and appropriate CA entity to expedite project development
 - Government support mechanism to enhance project attractiveness
 - Tax parity with other alternative fuels
 - State and local government support through promotion of FTD use by their own agencies

Proposed Approach

- Public-private partnership between FTD provider and appropriate CA entity to expedite project development
- Consortium of financially strong stakeholders capable of moving forward in a timely manner
 - Secure long-term agreements for feedstock supply and product off-takes
 - Develop an acceptable mechanism to allow for logical market introduction leading to steady sales growth and stable pricing
 - Obtain sufficient financial support to complete planning and construction steps quickly

Proposed Approach

- Potential stakeholders
 - Investors familiar with energy development projects
 - Fuel distributors and users willing to sign long-term agreements
 - Coal mine operators
 - Electric utilities
 - Railroads
 - Local and State Governments
 - Federal Government
 - FT technology partners

Summary

- **FTD is Good!**

- FTD – either straight run or blended - is superior to CARB diesel

- **FTD from coal is a viable low-cost alternative**

- The technology is proven
- Domestic coal available at or below \$0.50 per mmbtu
- FTD from coal can be competitively priced with CARB diesel

- **Public/private support needed to move any project forward**

- Long-term contracts needed for financing,
- Financial commitment by interested parties critical for rapid implementation

- **Rentech is ready to start a FTD project NOW!**



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