

The Outlook for Unconventional Liquids in *AEO2006*

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How's Business?

Over 100 billion burgers sold since 1948.

- *McDonalds*

Over 63 billion CTL gallons produced since 1955.

- *Sasol*

Over 1.5 billion syncrude barrels produced since 1978.

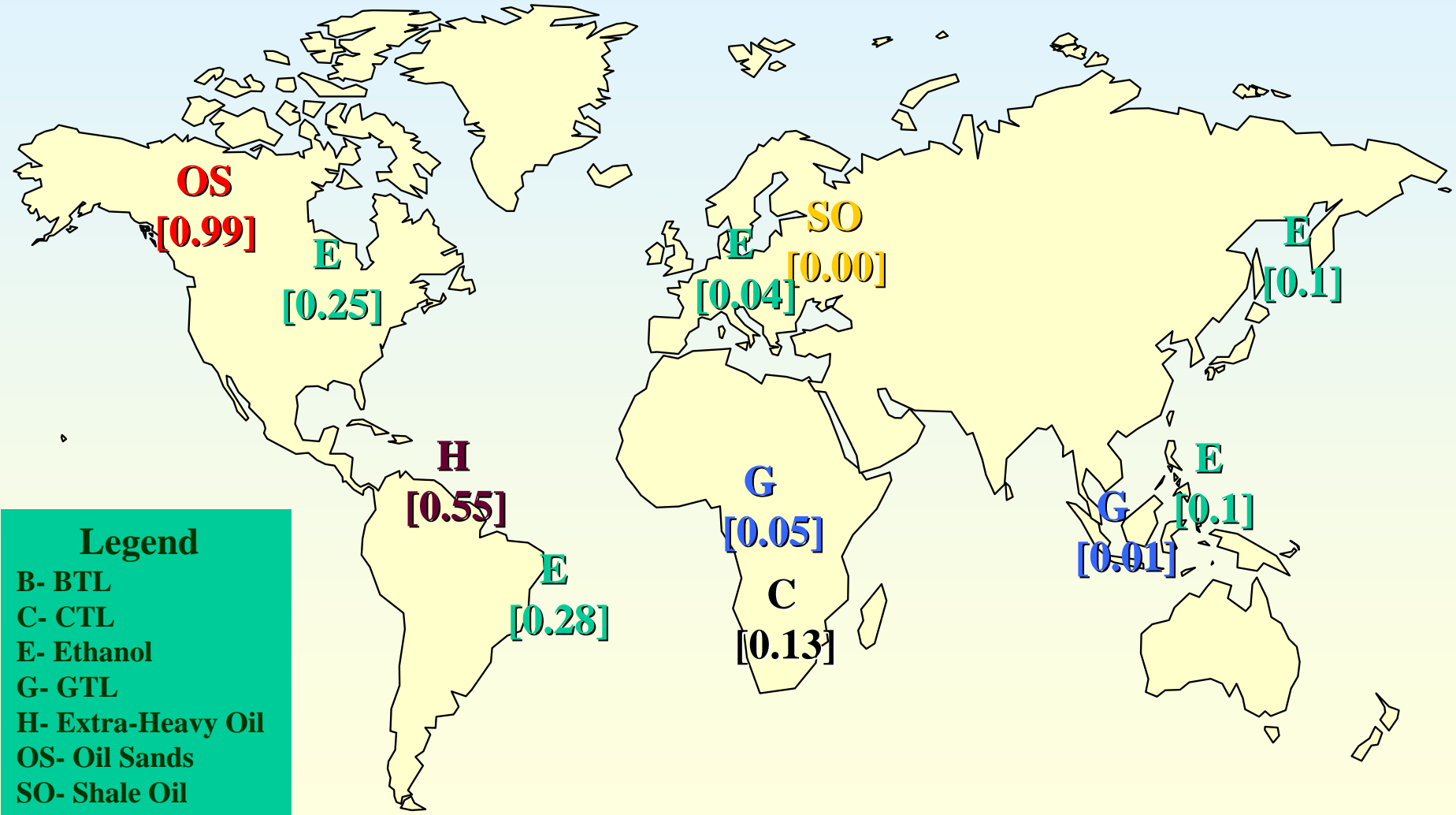
- *Syncrude Canada*

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Unconventional Often Evolves Into Conventional Production

- Technology allows yesterday's "exotic" production to become today's "ordinary" production. Recent examples include:
 - *Coalbed Methane*
 - *Enhanced Oil Recovery (EOR)*
 - *Deepwater Gulf of Mexico*
- Today, unconventional frequently includes:
 - *Shale Oil*
 - *Heavy Oil*
 - *Oil Sands*
 - *Gas-to-liquids (GTL)*
 - *Coal-to-liquids (CTL)*
 - *Energy Crops*
 - *Biomass-to-liquids (BTL)*
 - *Ethanol*
 - *Biodiesel*

Representative Unconventional Production in 2005

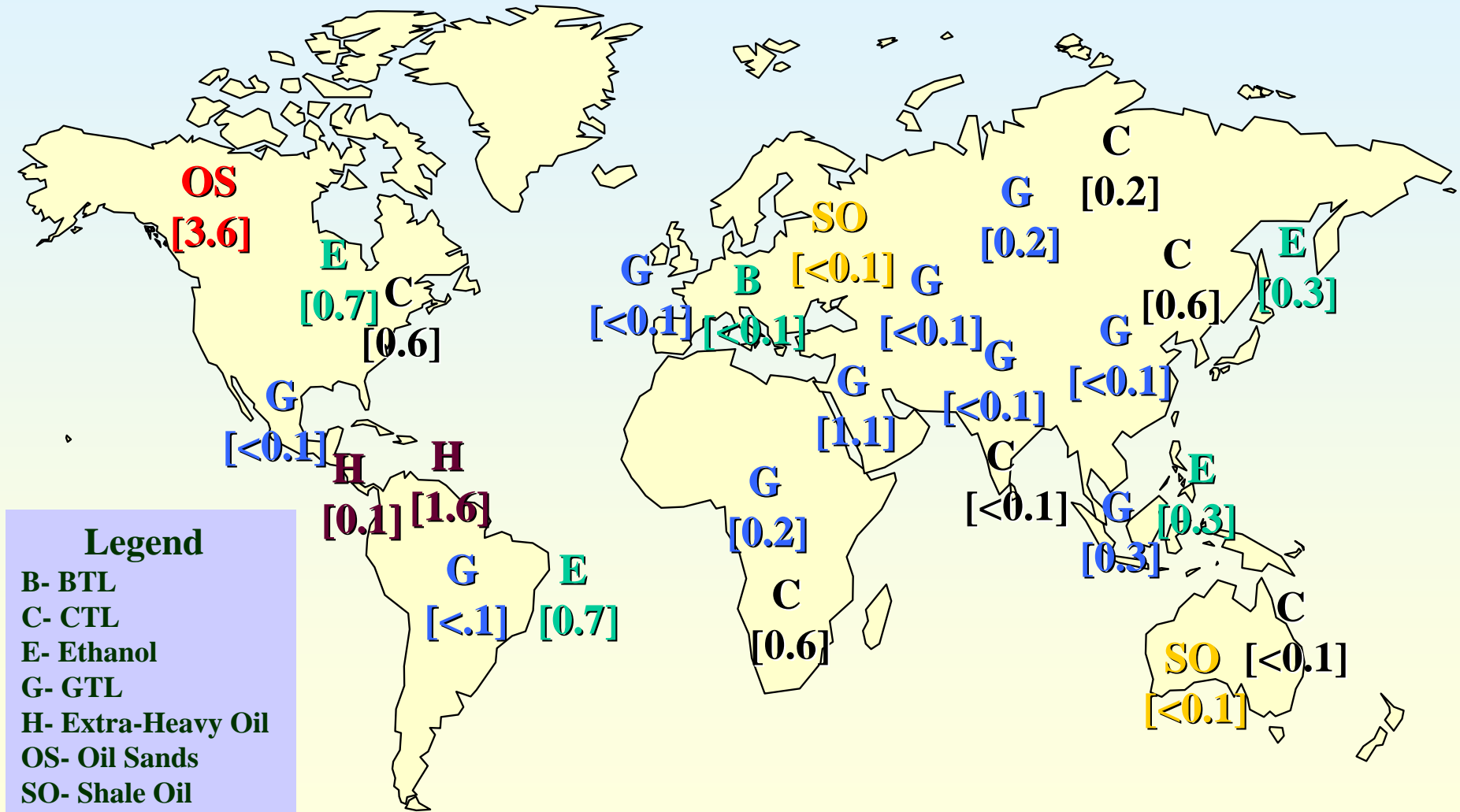


Legend

- B- BTL
- C- CTL
- E- Ethanol
- G- GTL
- H- Extra-Heavy Oil
- OS- Oil Sands
- SO- Shale Oil

[0.00] - Million BPD

Unconventional Production in Reference Case, 2030

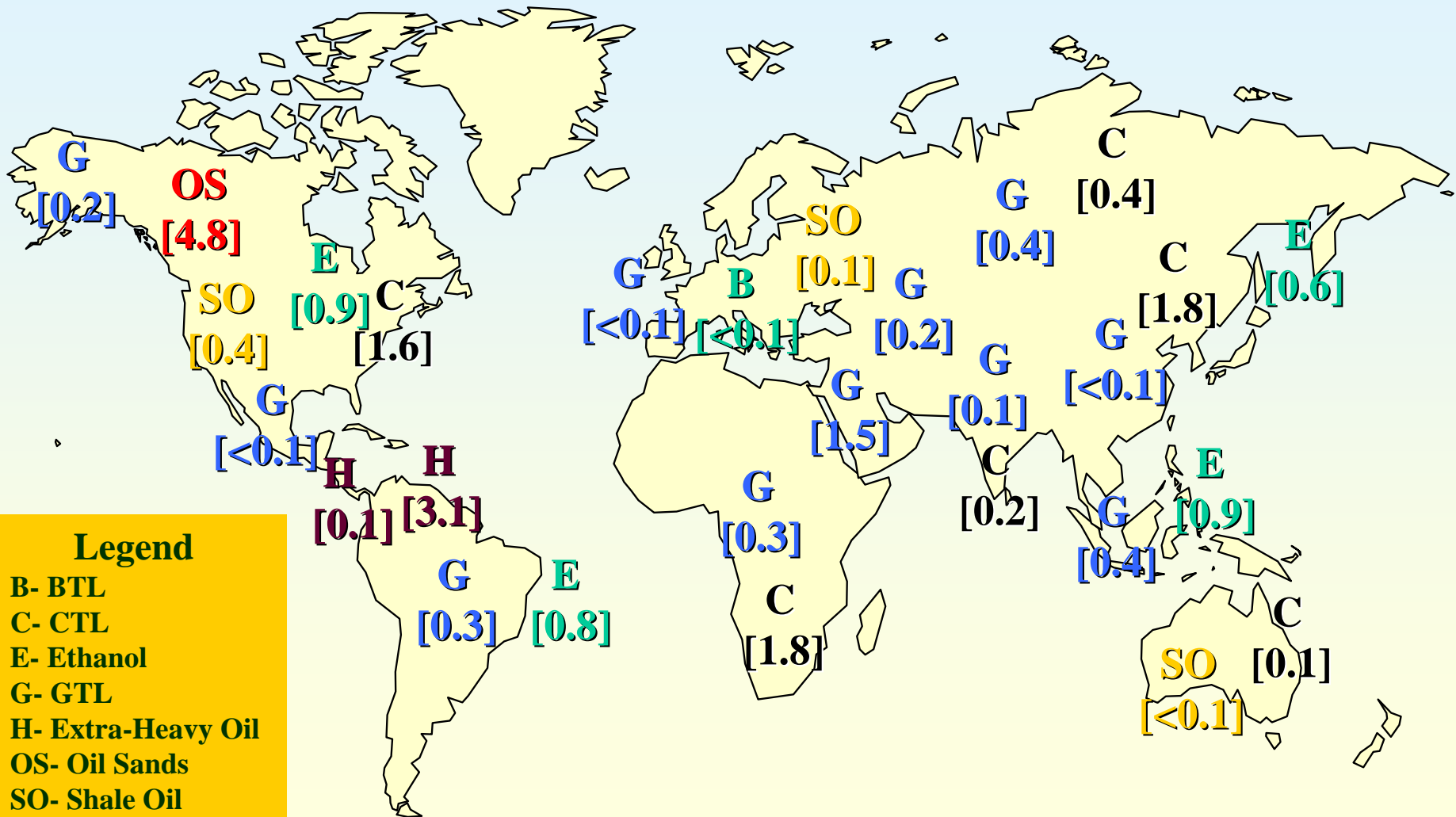


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- B- BTL
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Unconventional Production in High Price Case, 2030



Legend

- B- BTL
- C- CTL
- E- Ethanol
- G- GTL
- H- Extra-Heavy Oil
- OS- Oil Sands
- SO- Shale Oil

[0.0] - Million BPD

Unconventional Petroleum Production, 2030

(million barrels per day)

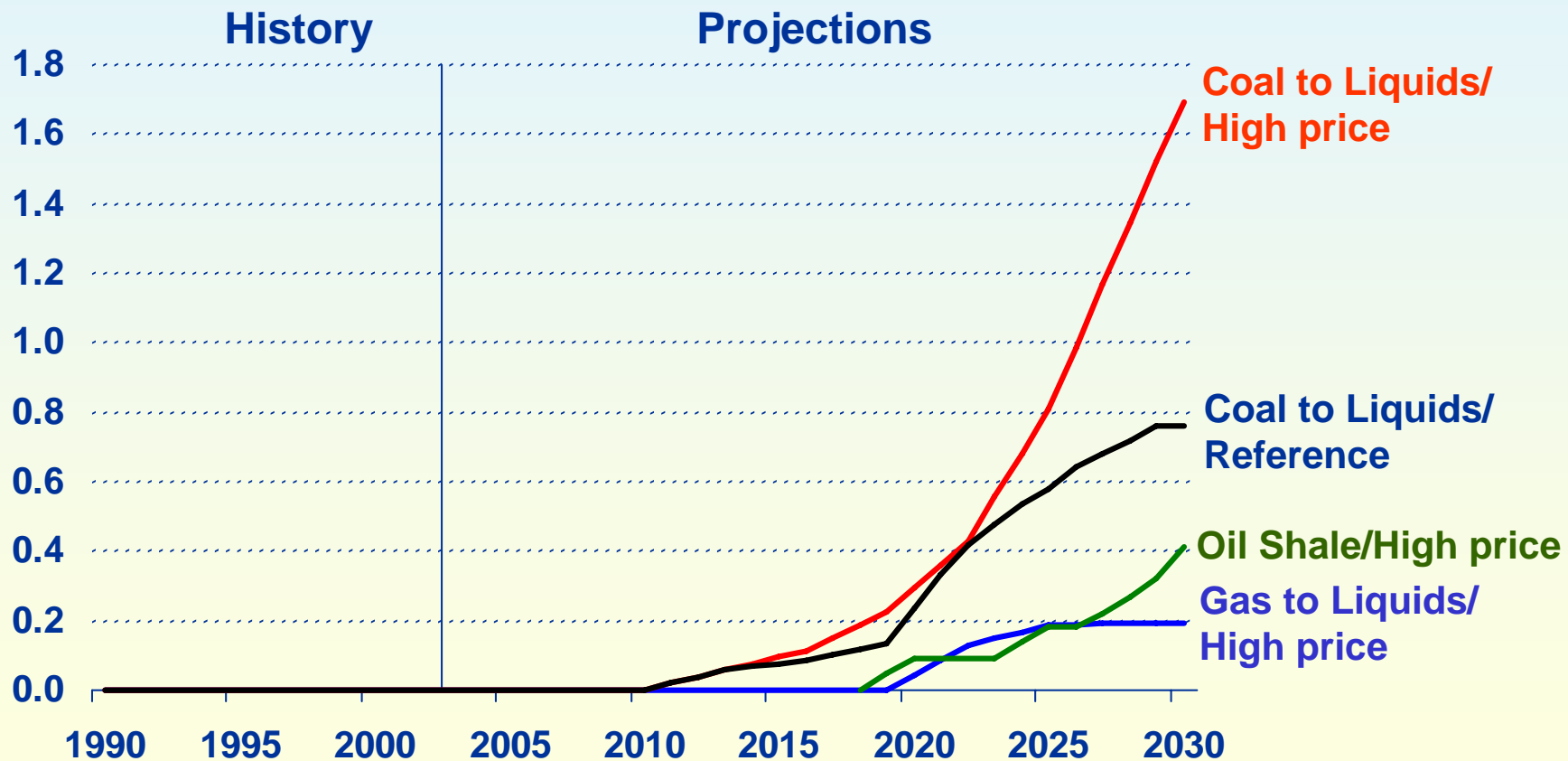
	<u>Synthetic Crudes</u>			<u>Synthetic Fuels</u>			<u>Renewable Fuels</u>		<u>Total</u>
	<u>Oil Sands</u>	<u>Extra-Heavy Oil</u>	<u>Shale Oil</u>	<u>CTL</u>	<u>GTL</u>	<u>BTL</u>	<u>Biodiesel</u>	<u>Ethanol</u>	
<i><u>Reference Case</u></i>									
United States				0.8		N/A	0.02	0.7	1.5
World	3.6	1.7	0.05	1.8	1.1	N/A	N/A	1.7 ^a	10.0
<i><u>High Price Case</u></i>									
United States			0.4	1.7	0.2	N/A	0.03	0.9	3.2
World	4.9	3.1	0.5	2.3	2.6	N/A	N/A	3.0 ^a	16.4

Notes

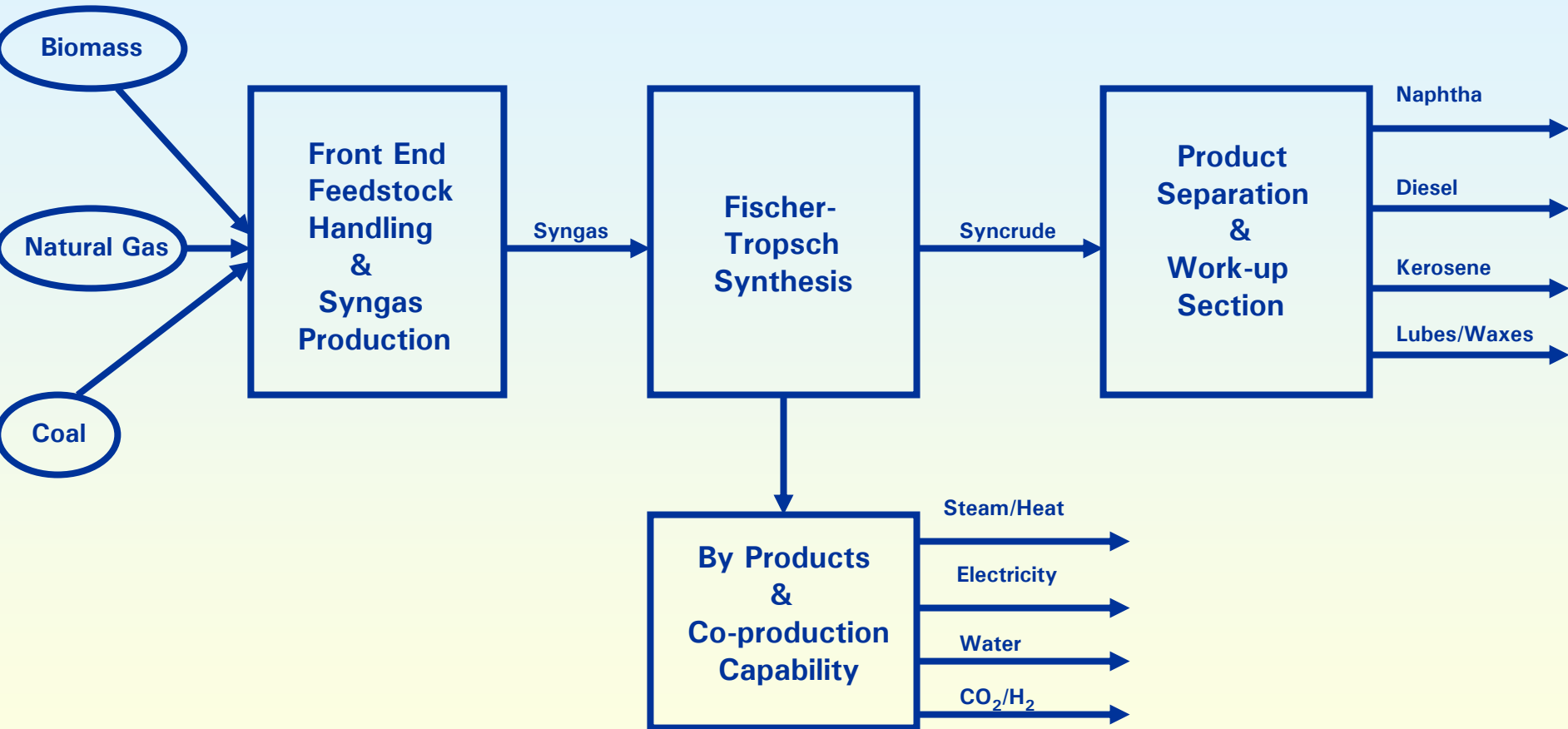
N/A- Not forecast

a- Includes Biodiesel

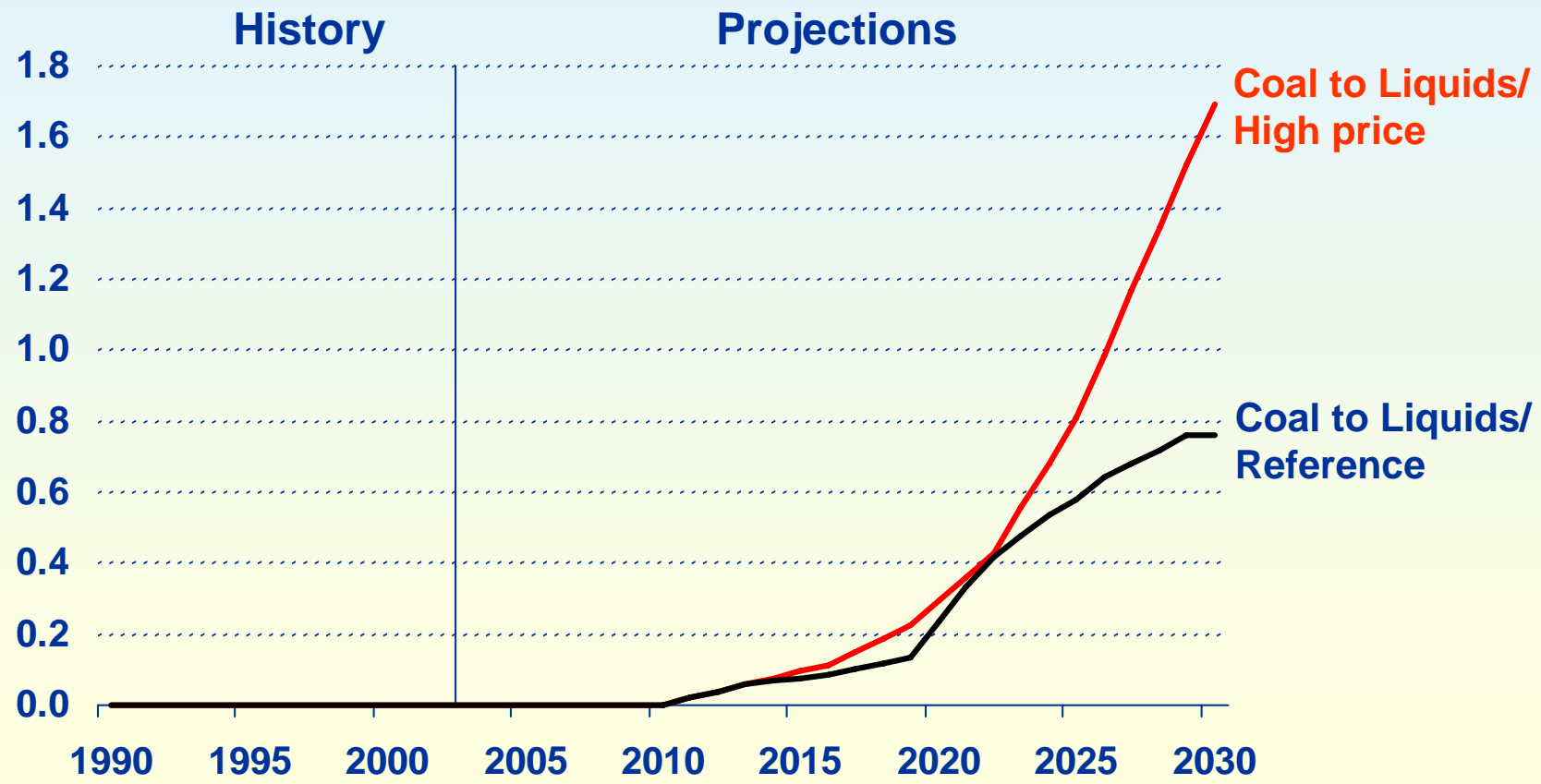
Gas-to-Liquids, Coal-to-Liquids, and Oil Shale Production in the Price Cases, 1990-2030 (million barrels per day)



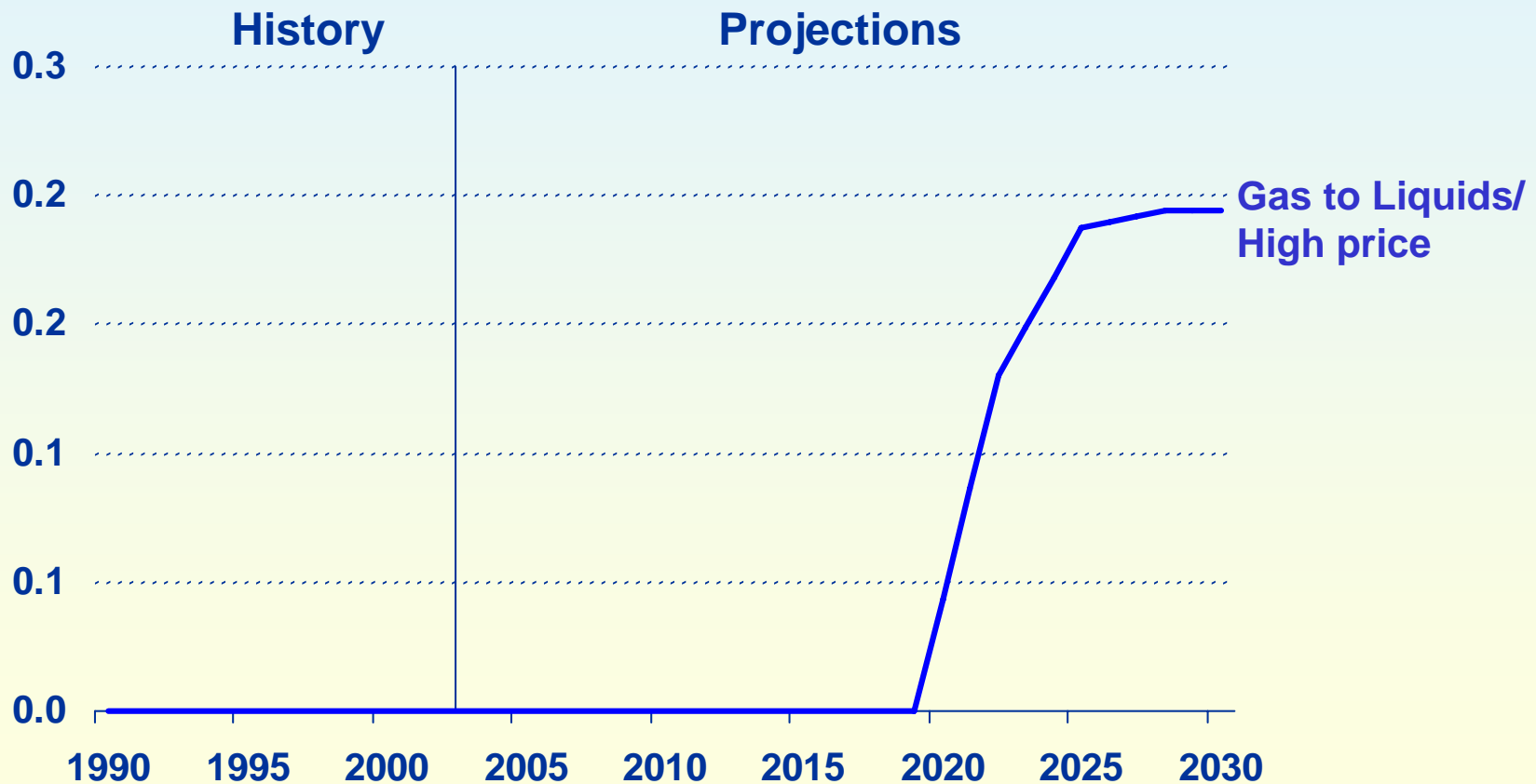
Simplified Synfuels Flow Diagram



Coal-to-Liquids Production in the Price Cases, 1990-2030 (million barrels per day)

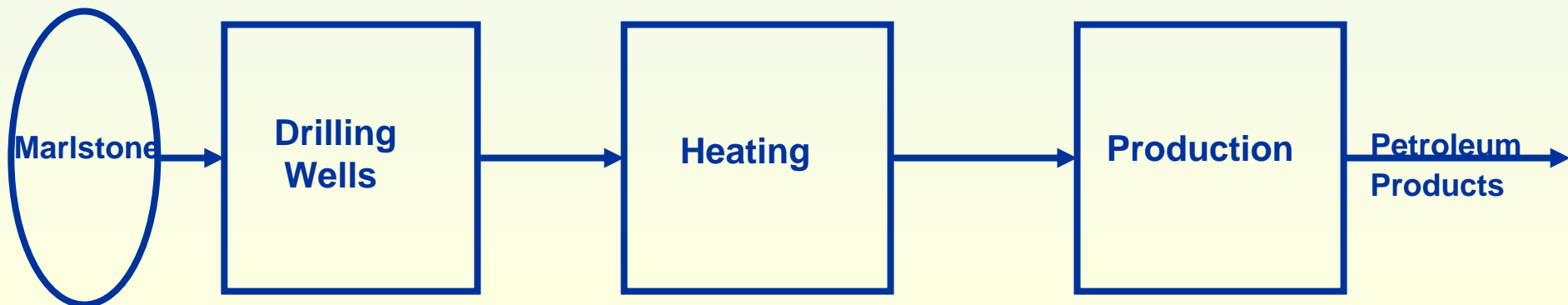
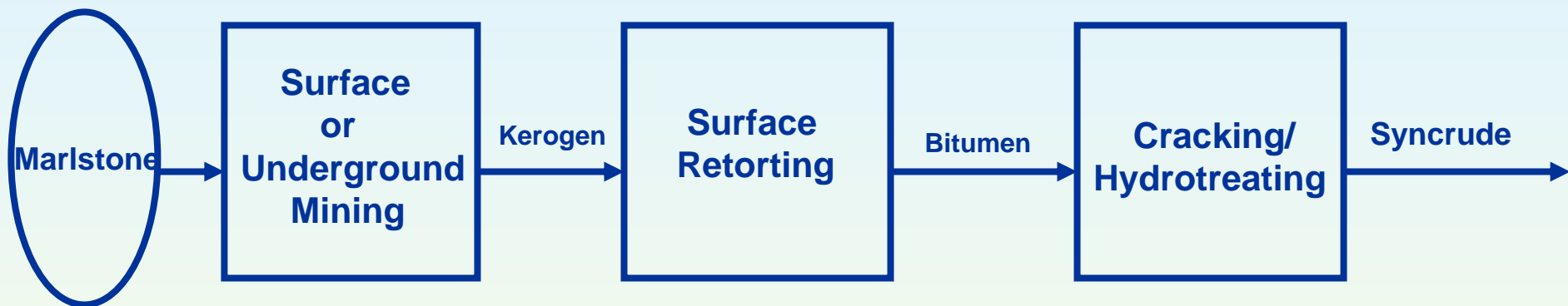


Gas-to-Liquids Production in the High Price Case, 1990-2030 (million barrels per day)



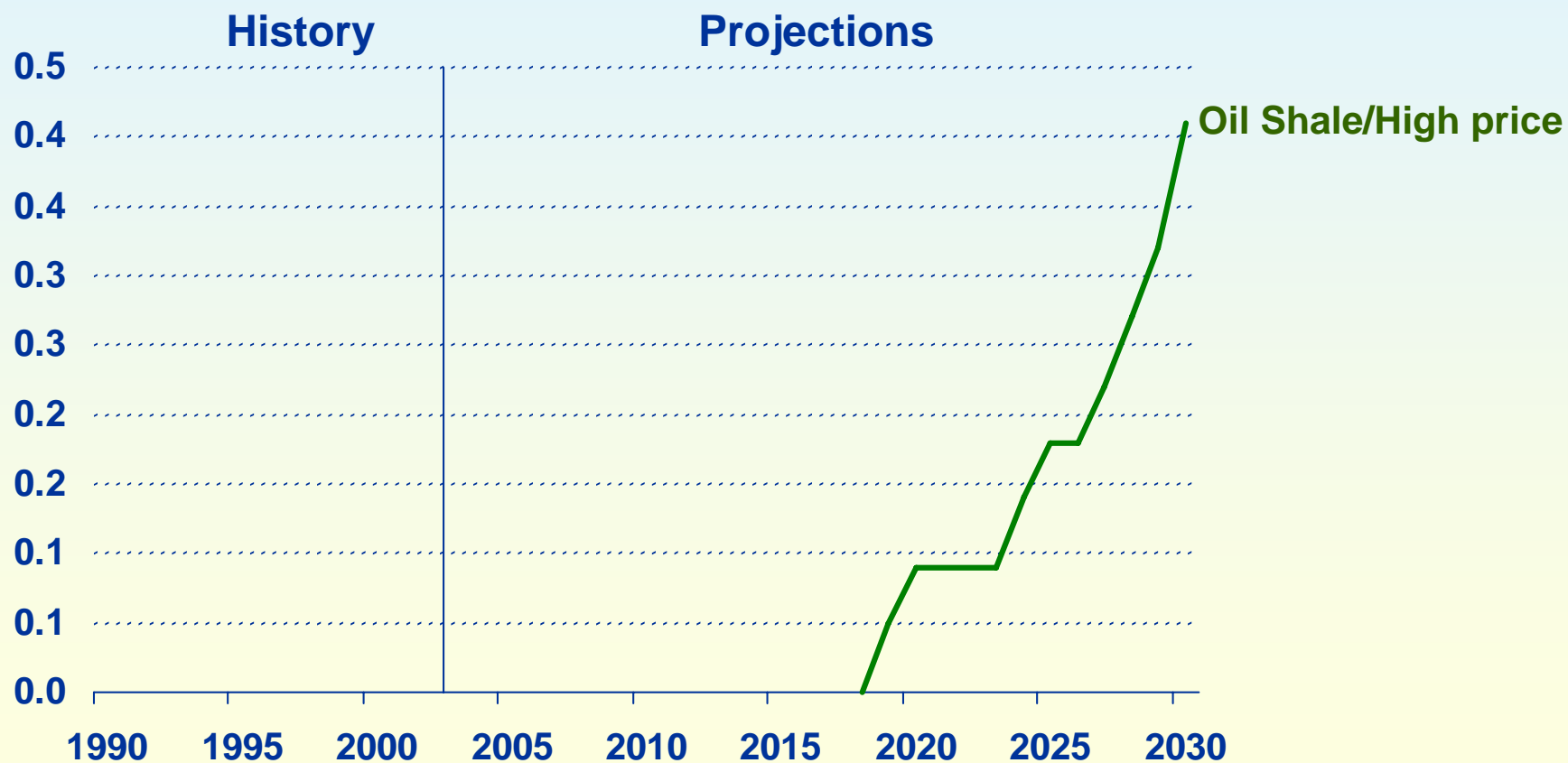
Simplified Oil Shale Process Diagram

Mining Process



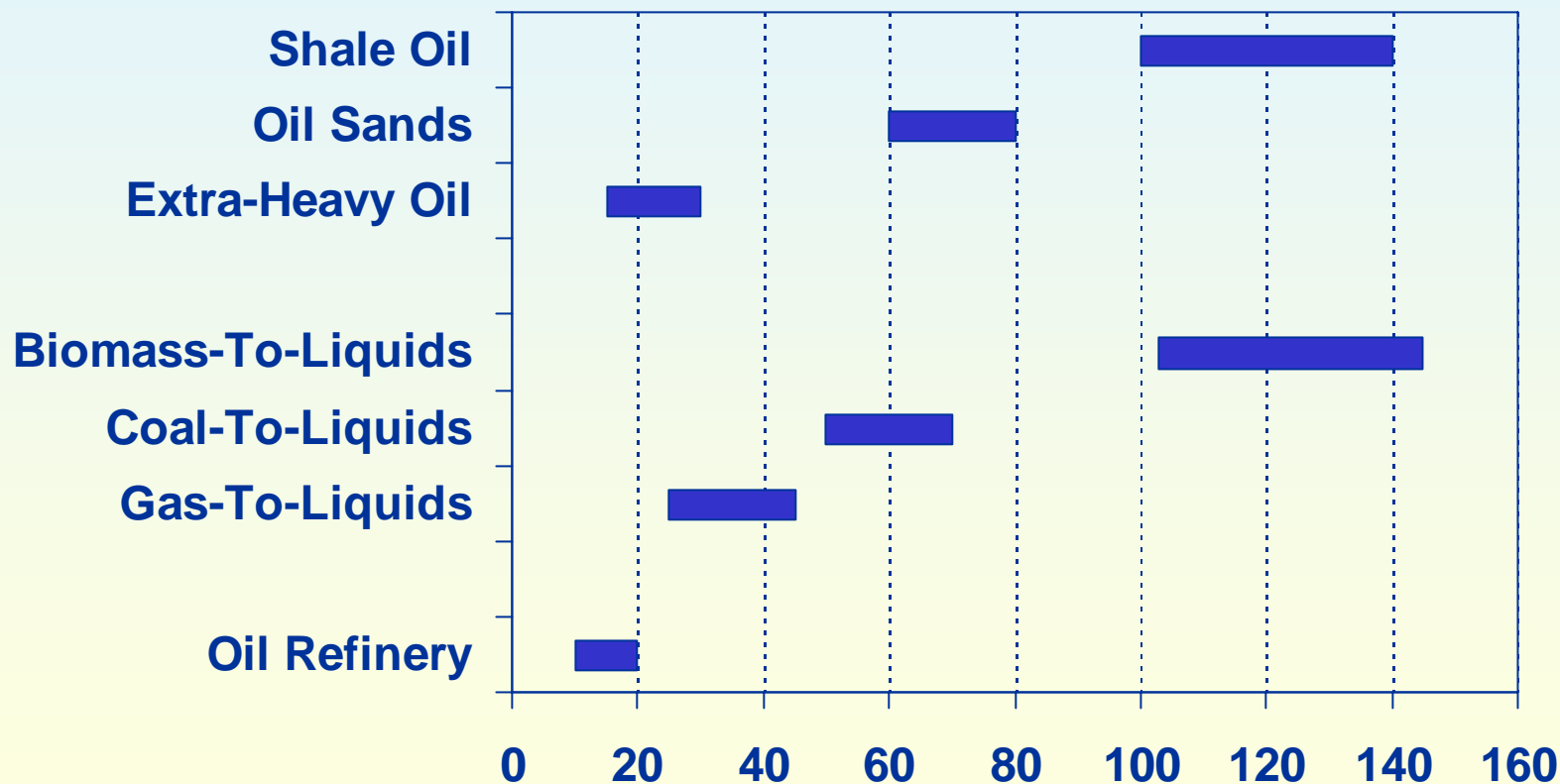
In Situ Process

Oil Shale Production in the High Price Case, 1990-2030 (million barrels per day)



Unconventional Petroleum Liquids Capital Investment Costs

(Thousand 2004 dollars per daily barrel of capacity)



Production Challenges

Biomass-to-Liquids-	Material handling; large catchment areas required
Coal-to-Liquids-	Material handling; gasifier reliability
Gas-to-Liquids-	Efficiency; capital costs; stranded gas supplies
Extra-Heavy Oil-	Future investment for expansion
Oil Sands-	Fuel costs; diluents
Shale Oil-	Capital costs; open pit vs <i>in-situ</i> process

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Summary

United States (2030)

- Unconventionals represent 5 to 13 percent of national supply across the price cases.
- CTL is the largest contributor at 7 percent of national supply in the high price case.

World (2030)

- Unconventionals represent 8 to 16 percent of total world supply across the price cases.
- Oil sands and extra-heavy oil are the largest global supply contributors at 5 and 3 percent, respectively, in the high price case.



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