



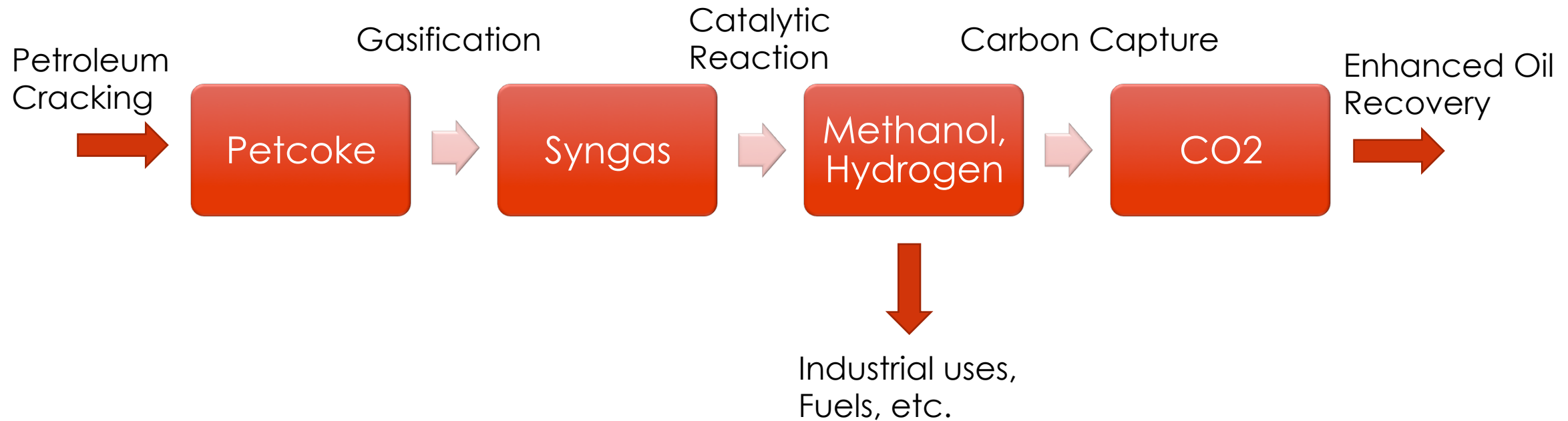
Lake Charles Methanol

3/6/17

Amos Meeks



WHAT IS LAKE CHARLES METHANOL LLC?





LAKE CHARLES METHANOL

KEY PROJECT FACTS

✓ UP TO \$2 BILLION IN LOAN GUARANTEES



✓ **LPO'S FIRST**

Advanced Fossil
Energy Project
Under its
Title XVII Program



✓ **NATION'S
FIRST**

Petcoke
-to-Methanol
Facility



✓ **WORLD'S
FIRST**

Methanol Facility
to Employ
Carbon Capture
Technology



✓ **WORLD'S
LARGEST**

Industrial
Manufacturing
Carbon Capture
Facility

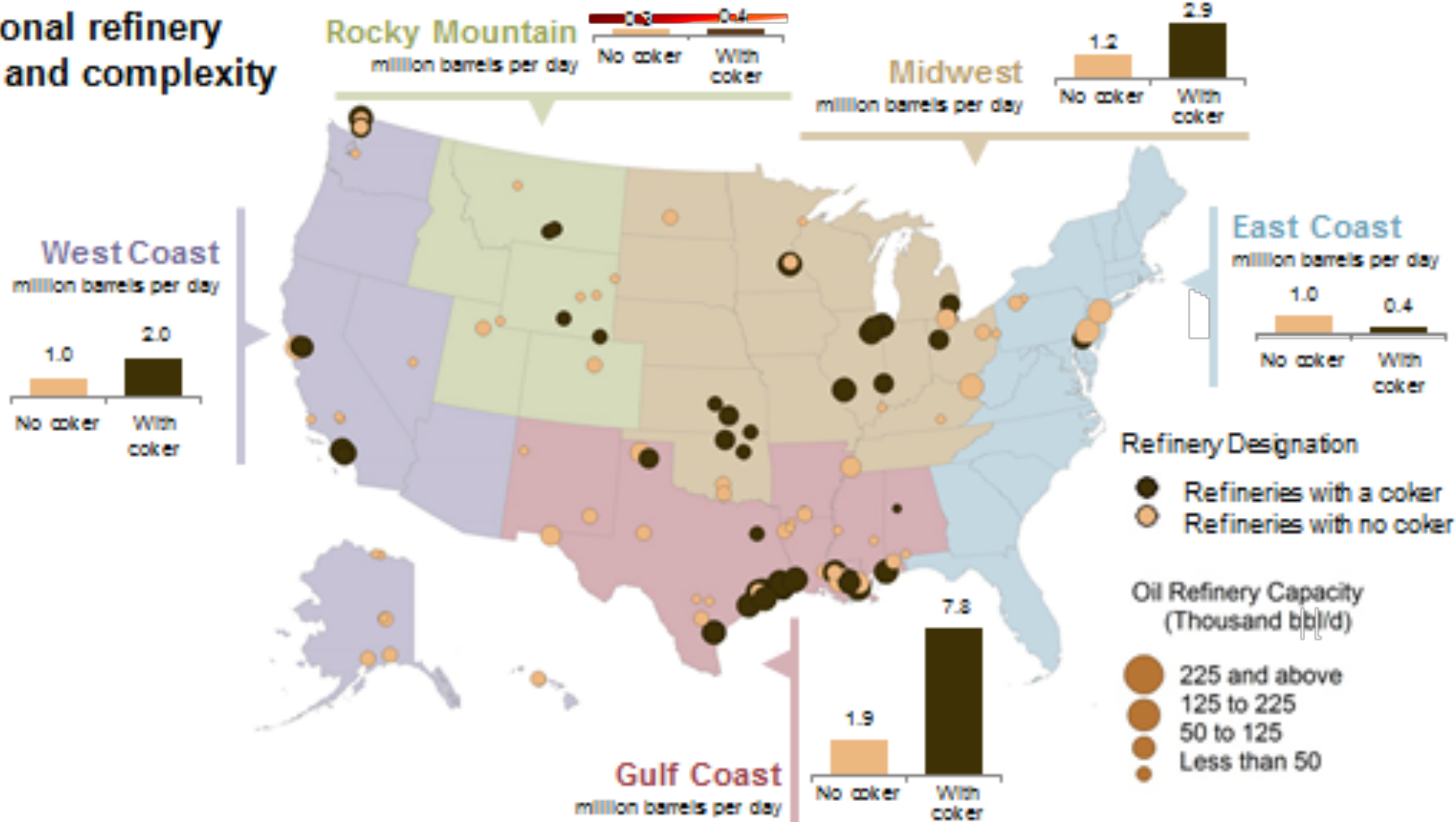


U.S. DEPARTMENT OF ENERGY

LOAN PROGRAMS OFFICE

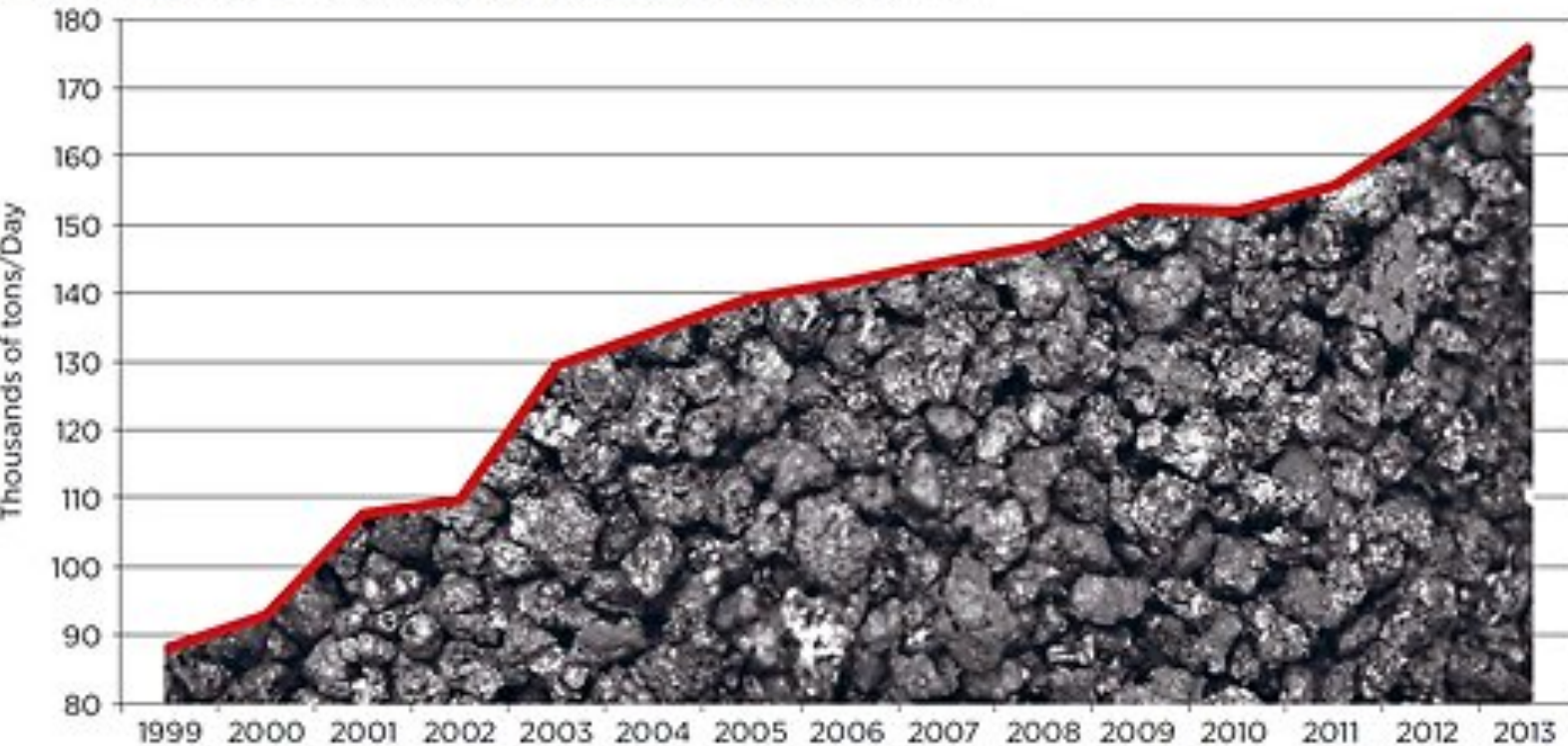
LEARN MORE *at*
energy.gov/lpo

U.S. regional refinery capacity and complexity



WHAT IS PETCOKE?

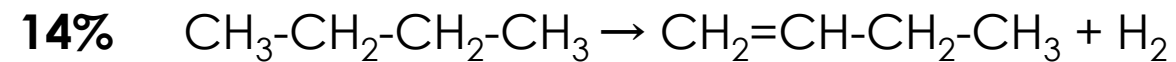
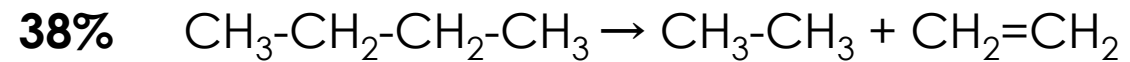
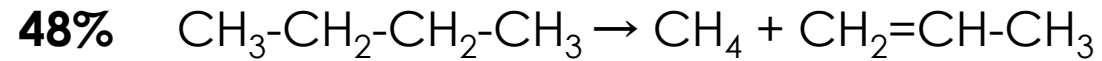
Figure 4: The growth in petcoke production capacity at U.S. refineries.



<https://green.blogs.nytimes.com/2013/01/17/2-reports-on-oil-sands-paint-a-dire-picture/>

CRACKING

Example: Cracking Butane



$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$

TWO GRADES OF PETCOKE

Table 1. Petcoke Elemental Composition
By Weight Percent

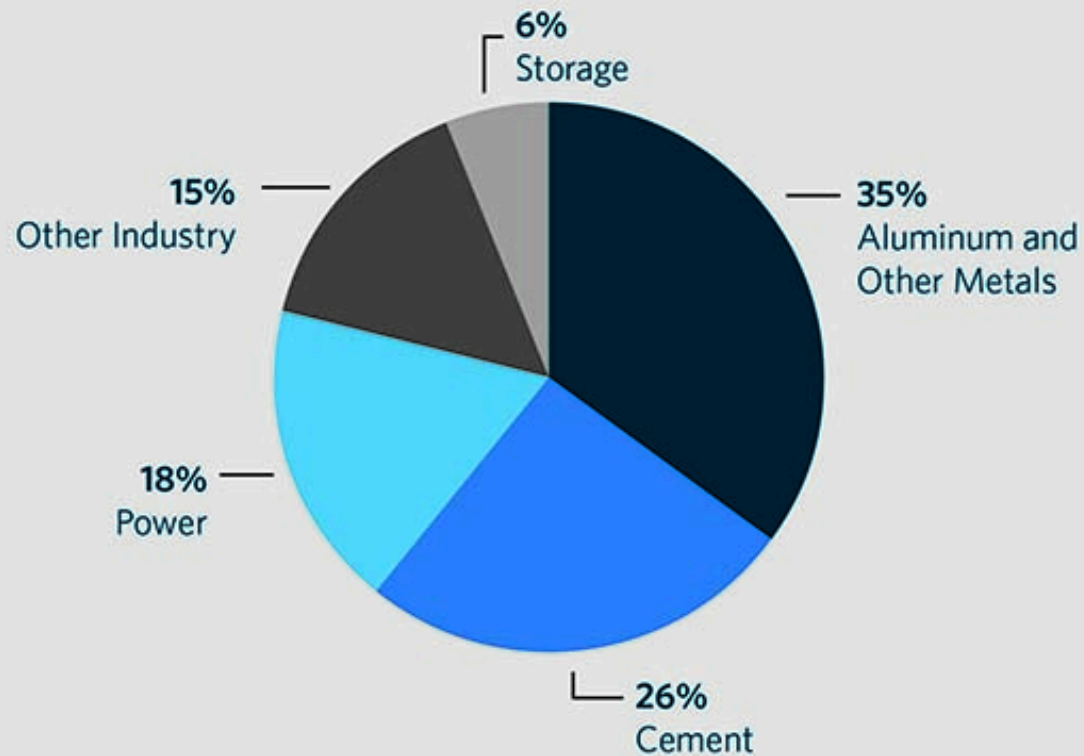
Composition	Green	Calcined
Carbon	89.58–91.80	98.40
Hydrogen	3.71–5.04	0.14
Oxygen	1.30–2.14	0.02
Nitrogen	0.95–1.20	0.22
Sulfur	1.29–3.42	1.20
Ash (including heavy metals such as nickel and vanadium)	0.19–0.35	0.35
Carbon-Hydrogen Ratio	18:1–24:1	910:1

Source: U.S. Environmental Protection Agency, Screening-Level Hazard Characterization, Petroleum Coke Category, June 2011; and H.W. Nelson, *Petroleum Coke Handling Problems*, 1970.

Notes: The process of “calcining” converts green coke to almost pure carbon, with a defined structure to produce carbon anodes for the aluminum industry.

SOME ECONOMICS OF PETCOKE

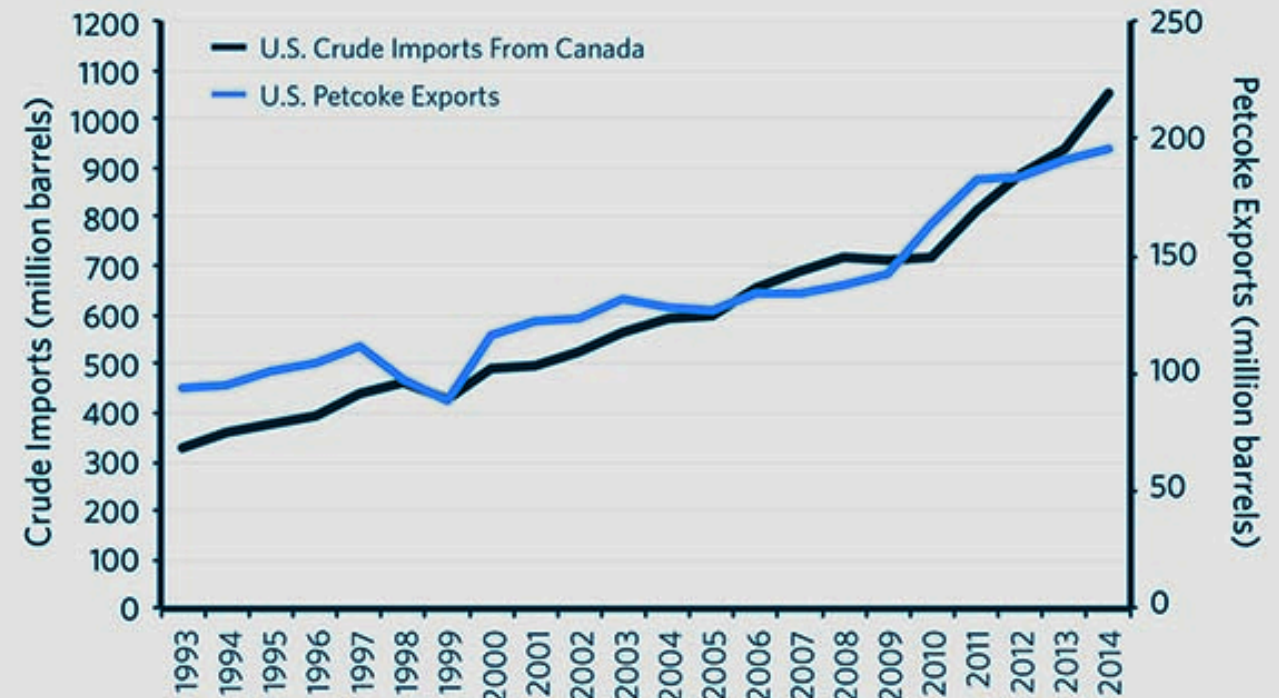
Figure 2. World Petcoke Use



Source: American Fuel & Petrochemical Manufacturers

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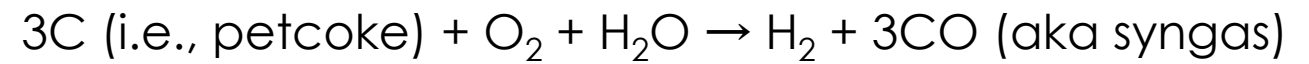
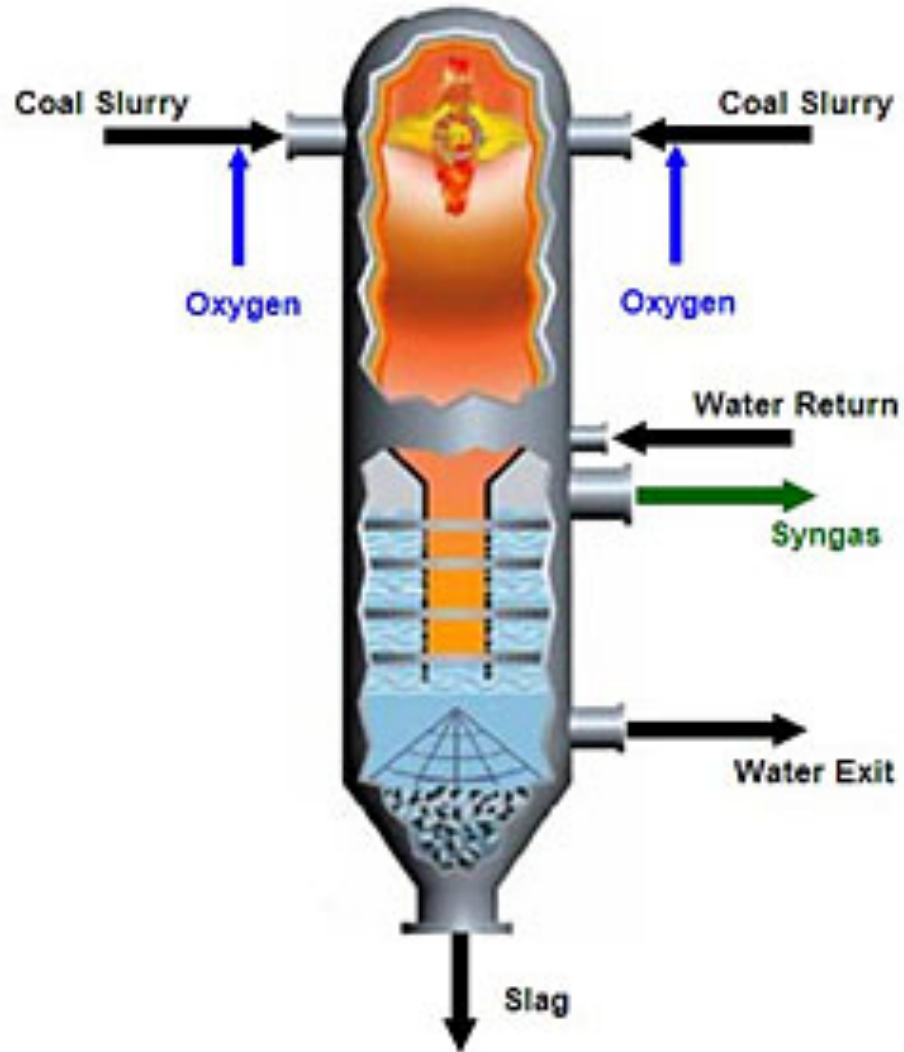
Figure 3. U.S. Crude Imports From Canada and U.S. Petcoke Exports



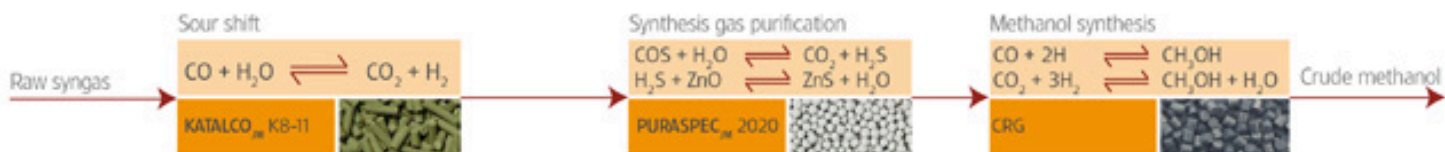
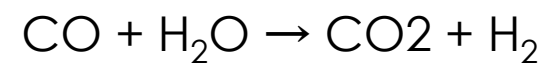
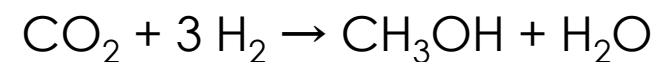
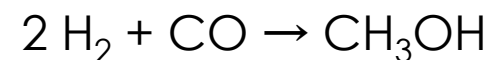
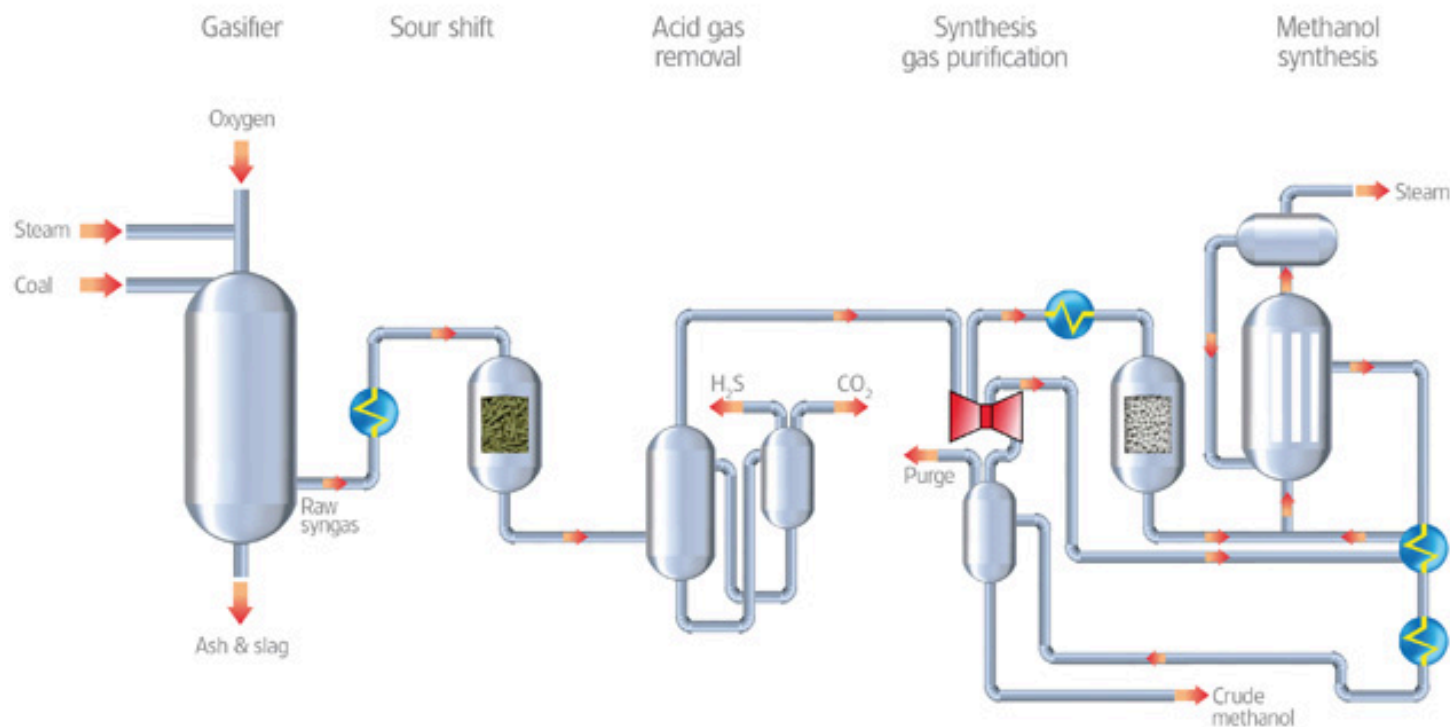
Source: U.S. Energy Information Administration data

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GASIFICATION

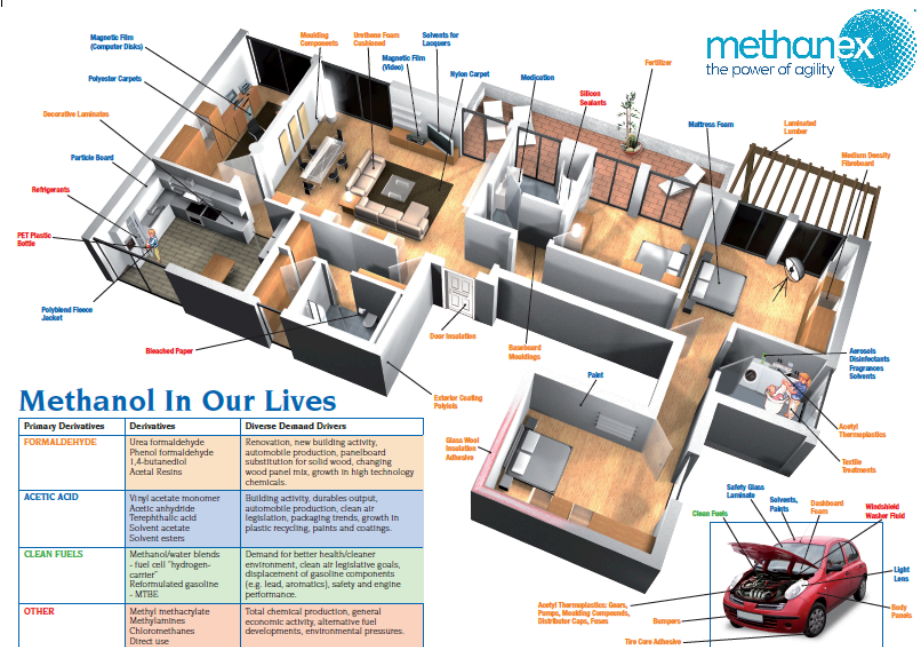


METHANOL PRODUCTION



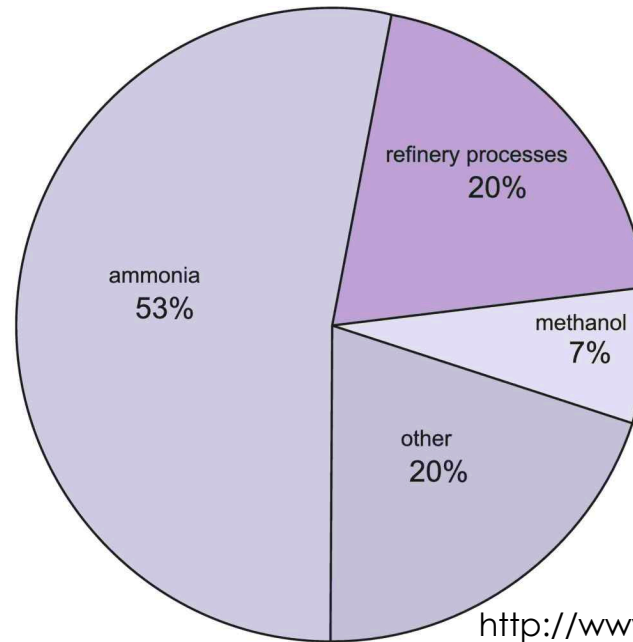
WHAT ARE THEY DOING WITH IT?

Methanol



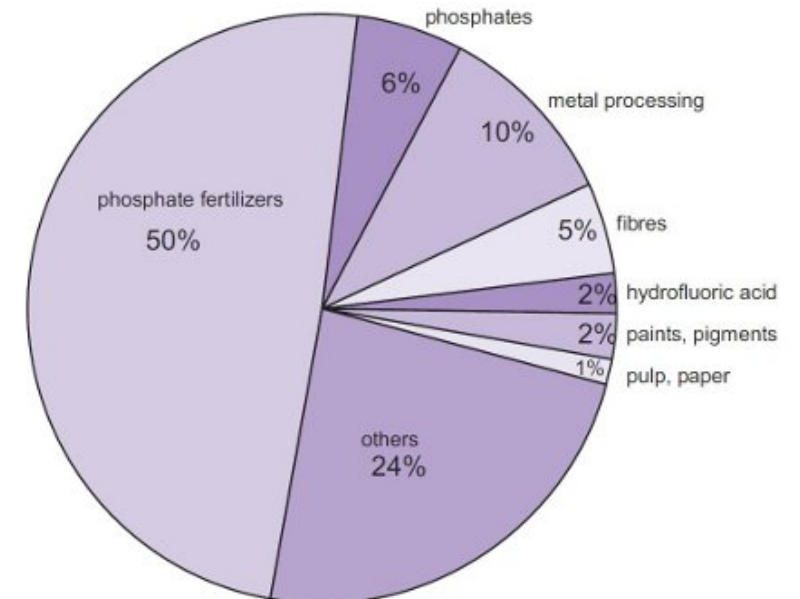
<http://www.methanol.org/chemical/>

Hydrogen



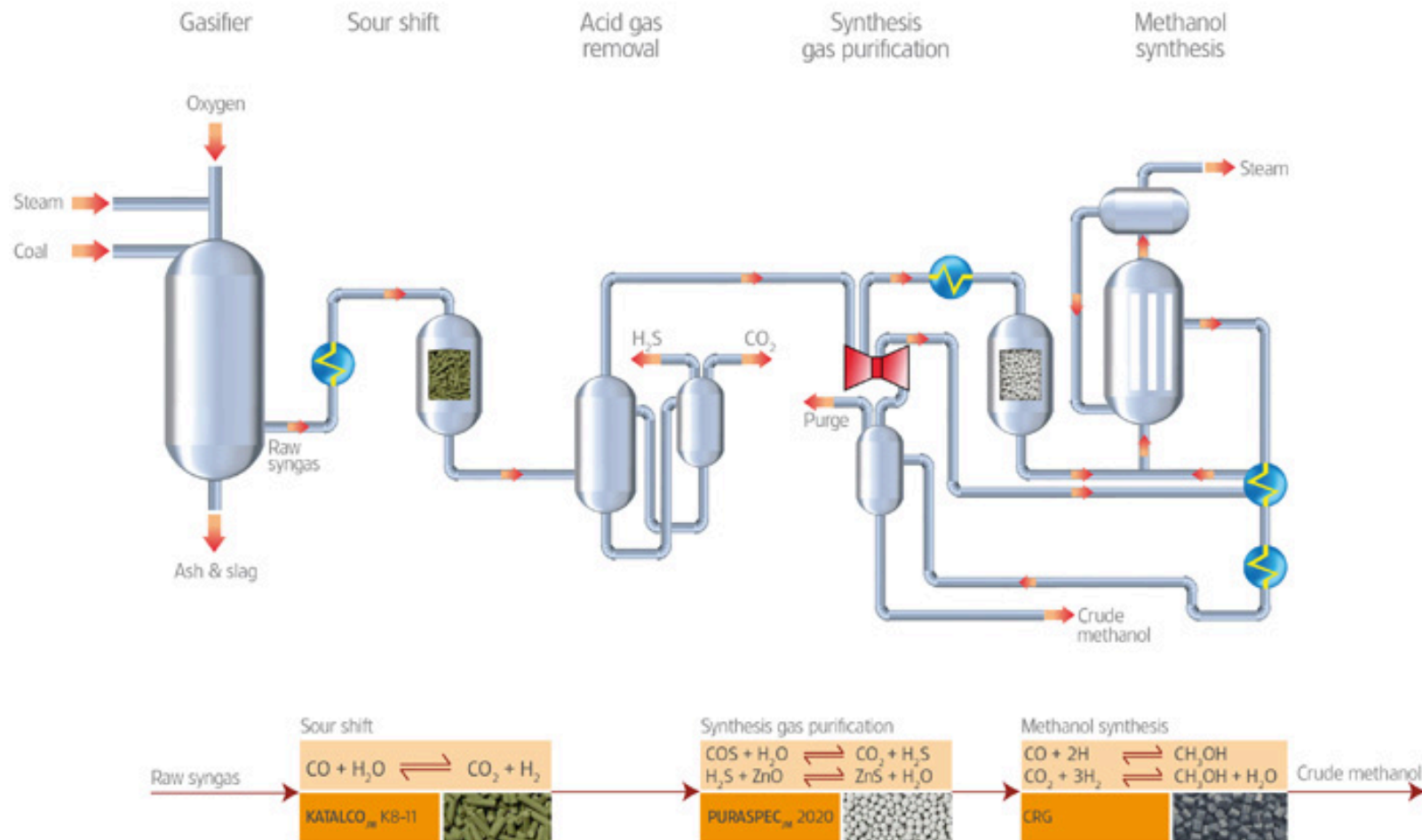
<http://www.essentialchemicalindustry.org/chemicals/hydrogen.html>

Sulfuric Acid



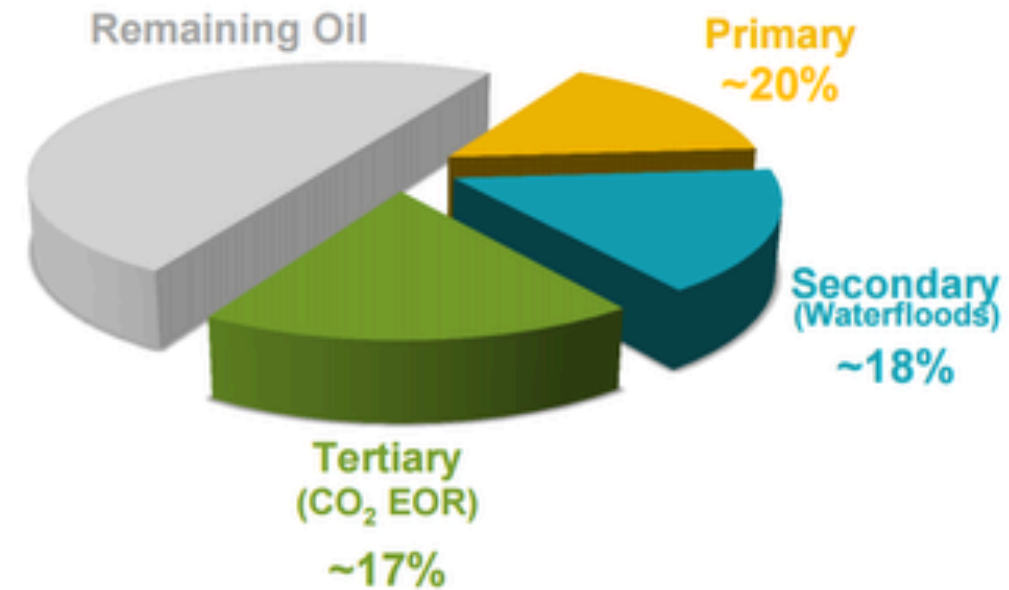
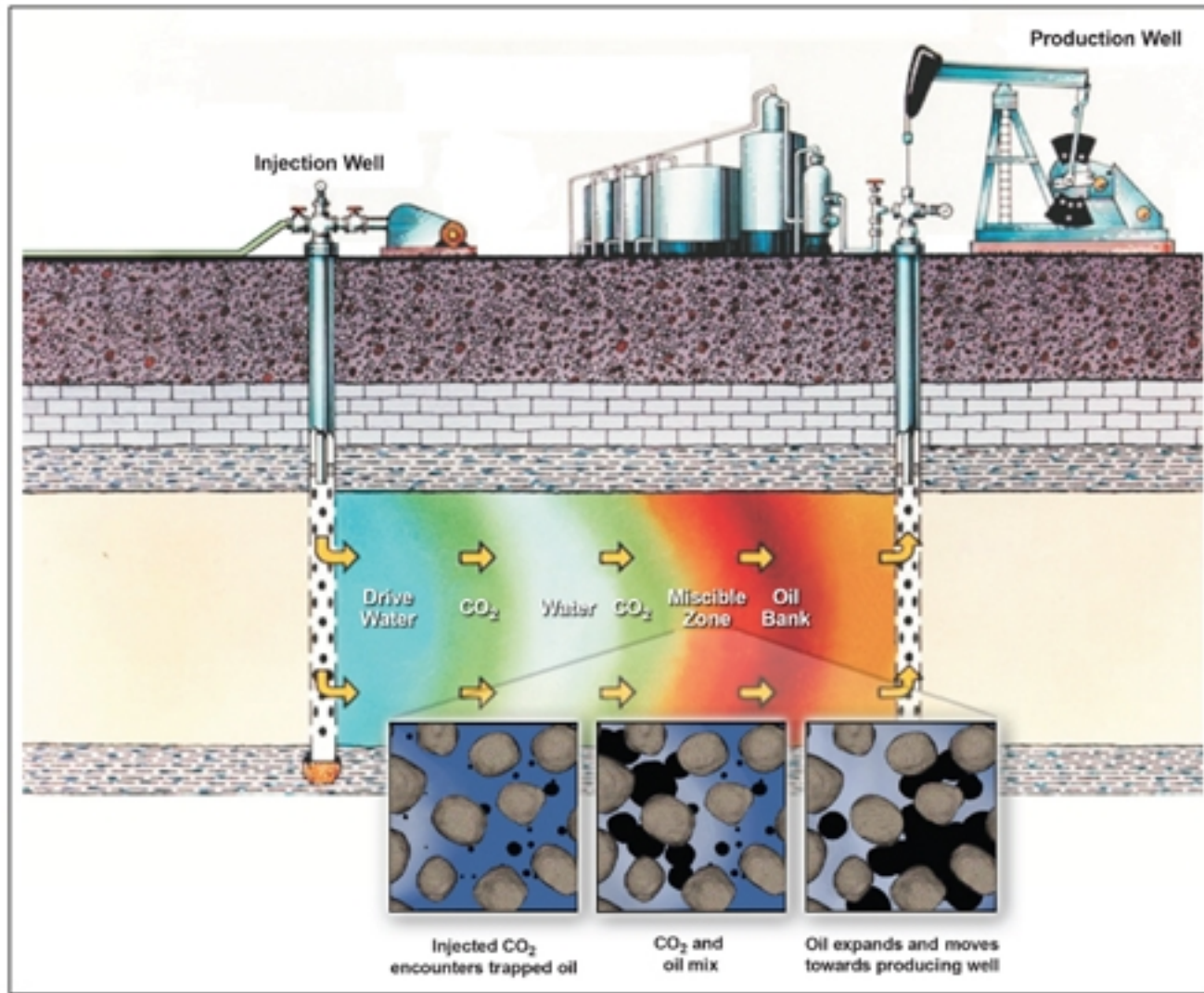
<http://www.essentialchemicalindustry.org/chemicals/sulfuric-acid.html>

WHAT ABOUT THE CO₂?



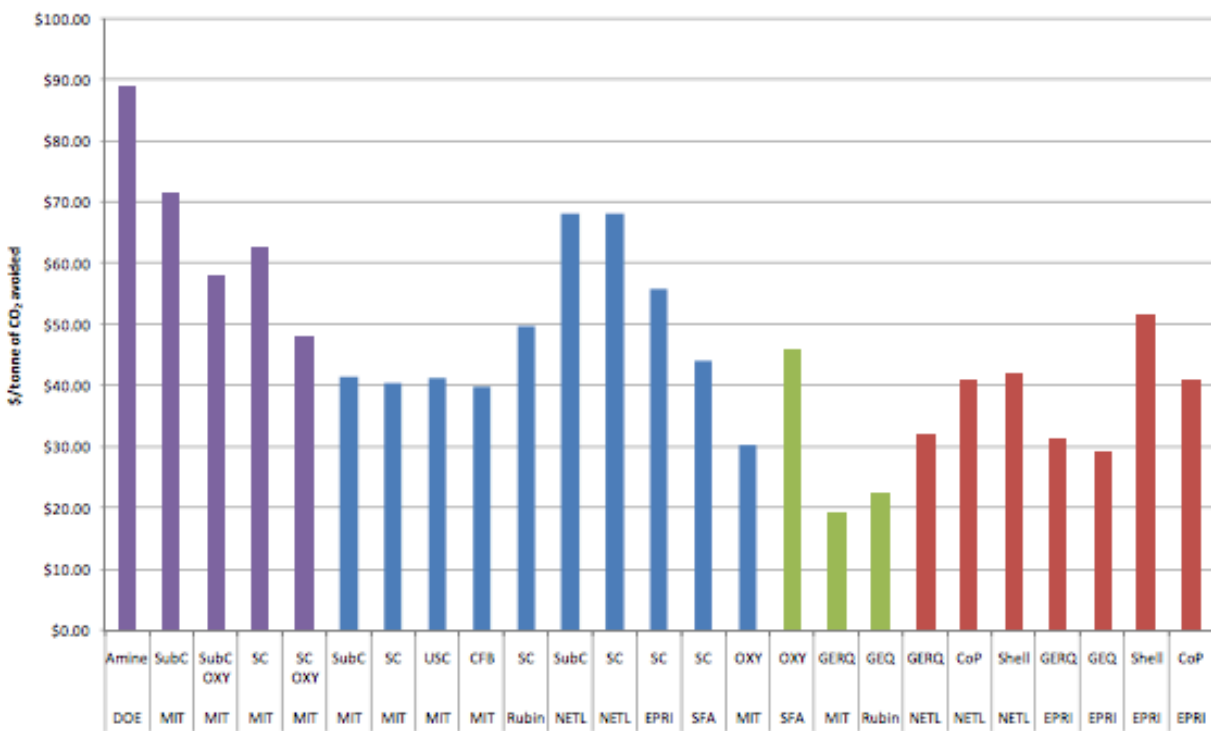
✓ **WORLD'S FIRST**
Methanol Facility to Employ Carbon Capture Technology

WHAT IS EOR?



ECONOMICS OF CARBON CAPTURE AND SEQUESTRATION

Cost per tonne of CO₂ avoided



Activity	Cost (USD/t CO ₂)	Uncertainties
CO ₂ capture (including compression)	5 to 50 (current) 5 to 30 (future)	Low end for pure streams that only need compression; high end for chemical absorption from gas-fired combined cycles
CO ₂ transportation	2 to 20	Depends on scale and distance
CO ₂ injection	2 to 50	Low end for Mt size aquifer storage; high end for certain ECBM projects
CO ₂ revenues	-55 to 0	No benefits for aquifers; highest benefits for certain EOR projects
Total	-40 to 100	

http://ccs-info.org/onewebmedia/iea_oecd_ccs_prospects.pdf


CO2 SEQUESTRATION PER DOLLAR

Lake Charles Methanol

Project Cost	\$3.8 Billion
Oil Production through EOR	4.5 million b/year
CO2 Sequestered by EOR	0.16 - 0.62 t/barrel
Total CO2 sequestered	0.72 - 2.8 Mt/year
Sequestration per dollar	0.19 - 0.74 mt/year/\$
CO2 Release from Oil	0.44 t/barrel
Net Sequestration	-1.26 – 0.81 Mt/year
Net Sequestration per dollar	-0.33 – 0.21 mt/year/\$

Solar

Project Cost	\$3.8 Billion
Cost of Solar	~1 \$/W
Energy Produced per Watt	1.5 kWh/W/year
Total Energy Production	5.7 TWh/year
CO2 emissions from fossil fuels	0.9 kg/kWh
Total emissions saved	5.1 Mt/year
Sequestration per dollar	1.3 mt/year/\$

- 
- “With power, CCS is one of the options, there’s also renewable energy and nuclear energy,” said Kurt Waltzer, managing director of the Clean Air Task Force, an environmental group that supports CCS. “But for the industrial sources, in many cases, CCS is really our current best option to reduce emissions. So getting more industrial CCS projects up and running sets an important precedent.”
 - “While there is still time, we fully intend to push back and make sure that taxpayers aren’t left on the hook for another fossil-friendly boondoggle,” said Lukas Ross, campaigner on climate change and energy for Friends of the Earth, in a statement.



CONCLUSIONS AND DISCUSSION

- What are the benefits and drawbacks of this project?
- Is this a good thing for the government to support, or a boondoggle for the fossil fuel industry?
- Will they be able to raise the \$1.8 Billion more to make the project a reality?