Blechner Center for Industrial Catalysis and Process Development

BGN Ltd

אוניברסיטת בן-גוריון בנגב
Ben-Gurion University of the Negev

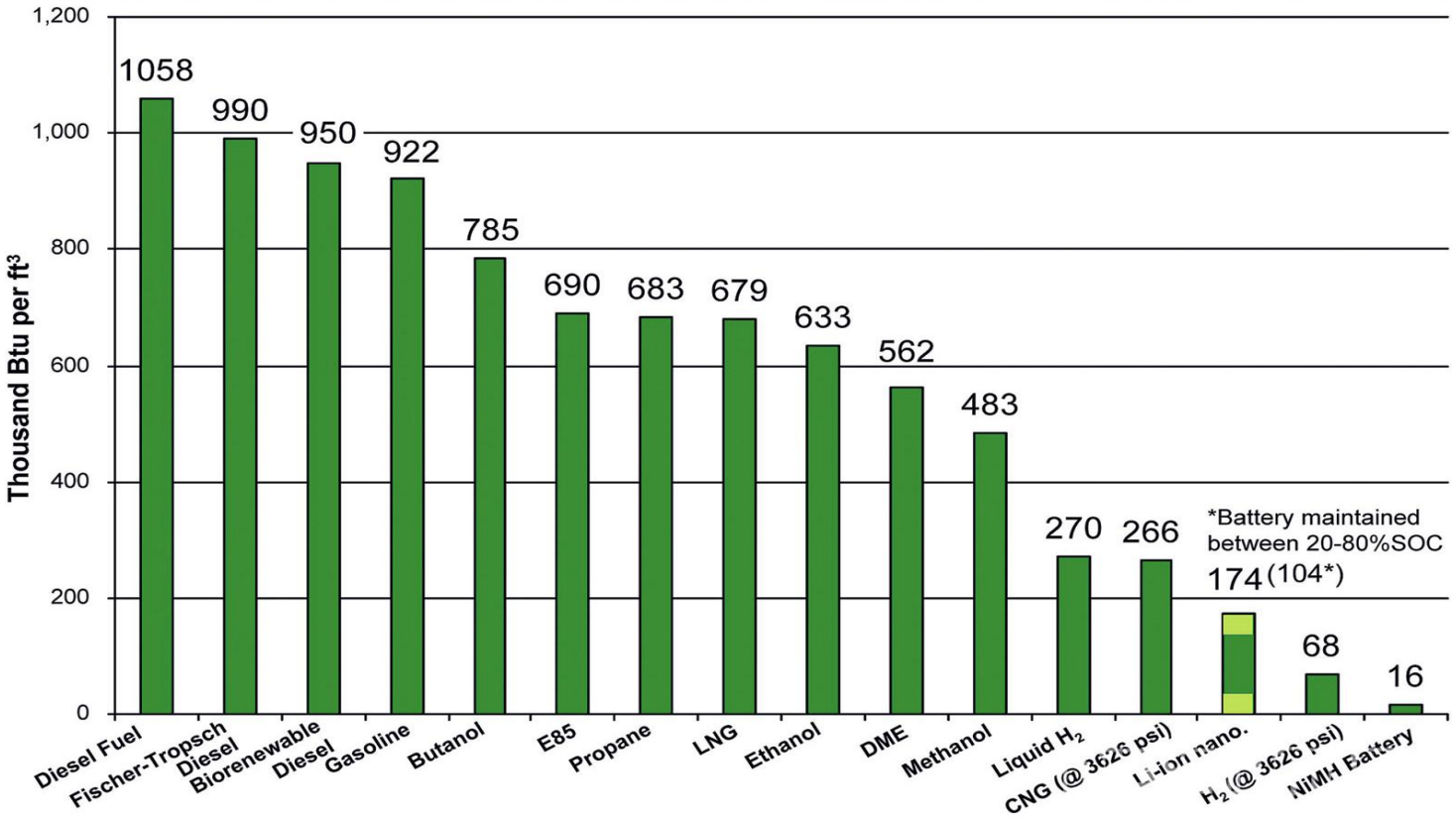
Low-Cost Hydrogen by Water Splitting is the Key to Renewable Liquid Fuels

Game-changing technologies are crucial

Liquid Fuels will dominate transportation for many years to come

Liquid hydrocarbons have the highest energy density

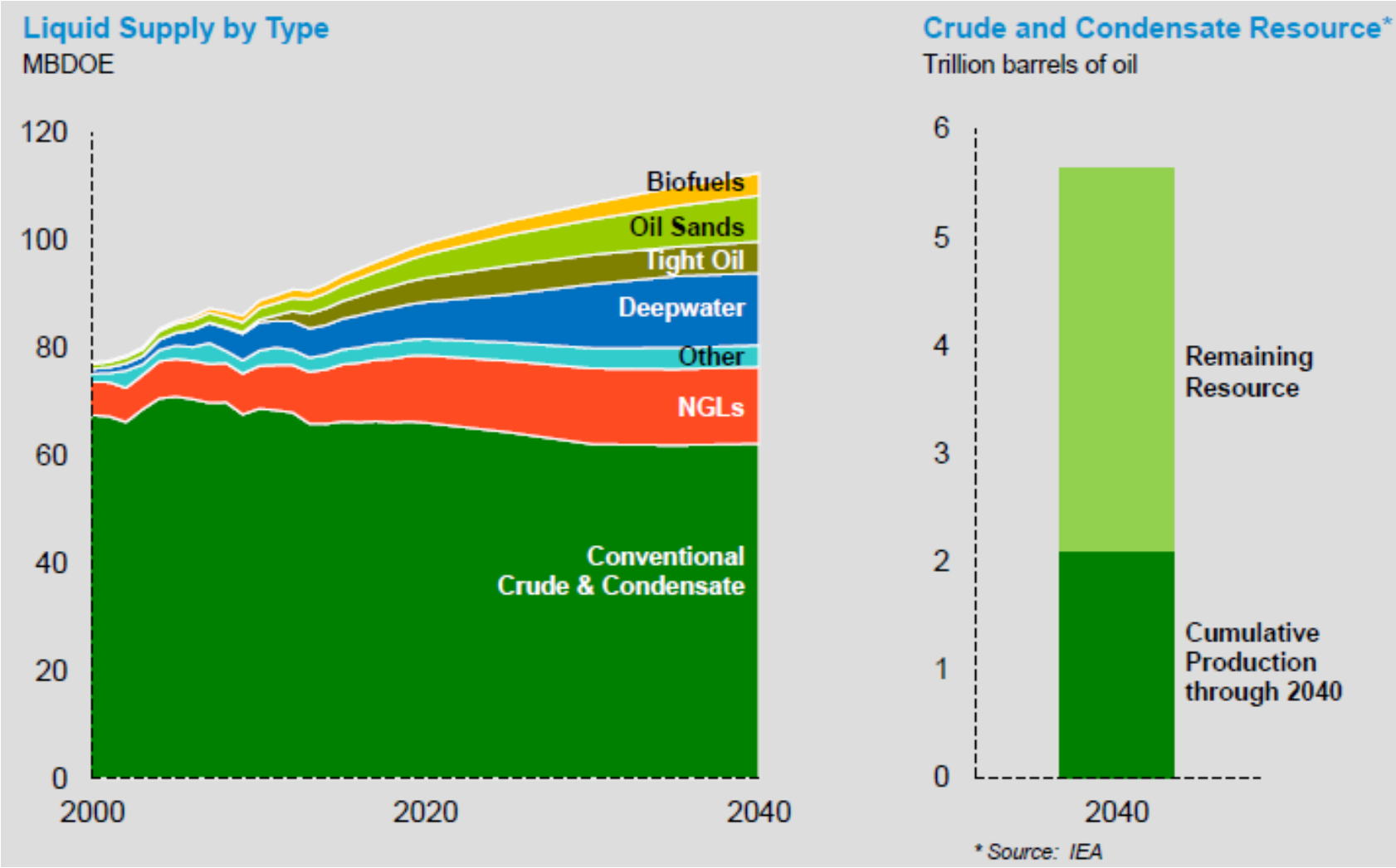
Energy Density of Fuels



U.S. Department of Energy

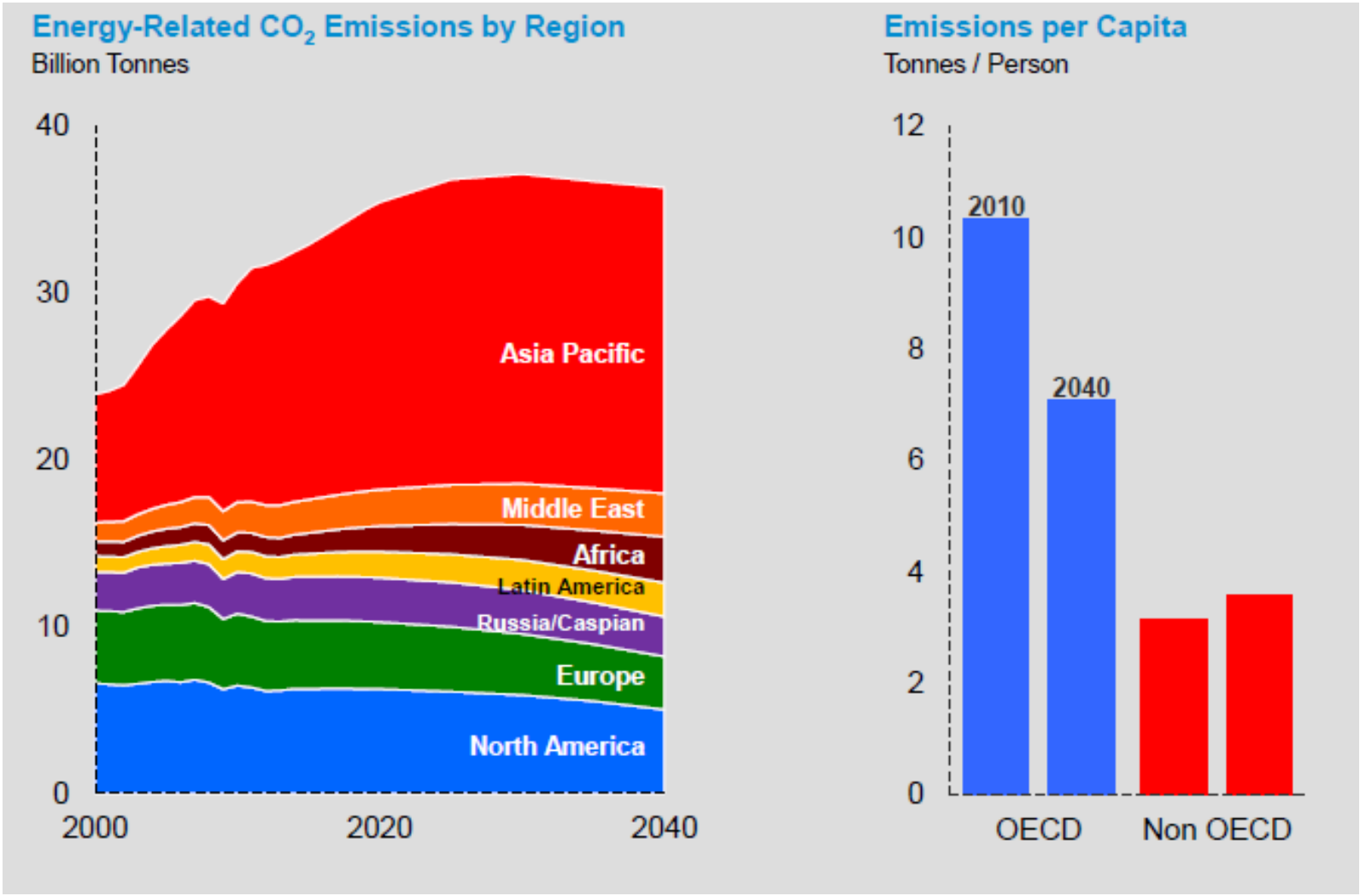
Energy Efficiency and Renewable Energy

Unless novel technologies will be introduced, crude oil will continue to be a monopoly



ExxonMobil 2014 Outlook for Energy

No practical solution to GHG is foreseen in spite of detrimental environmental impact

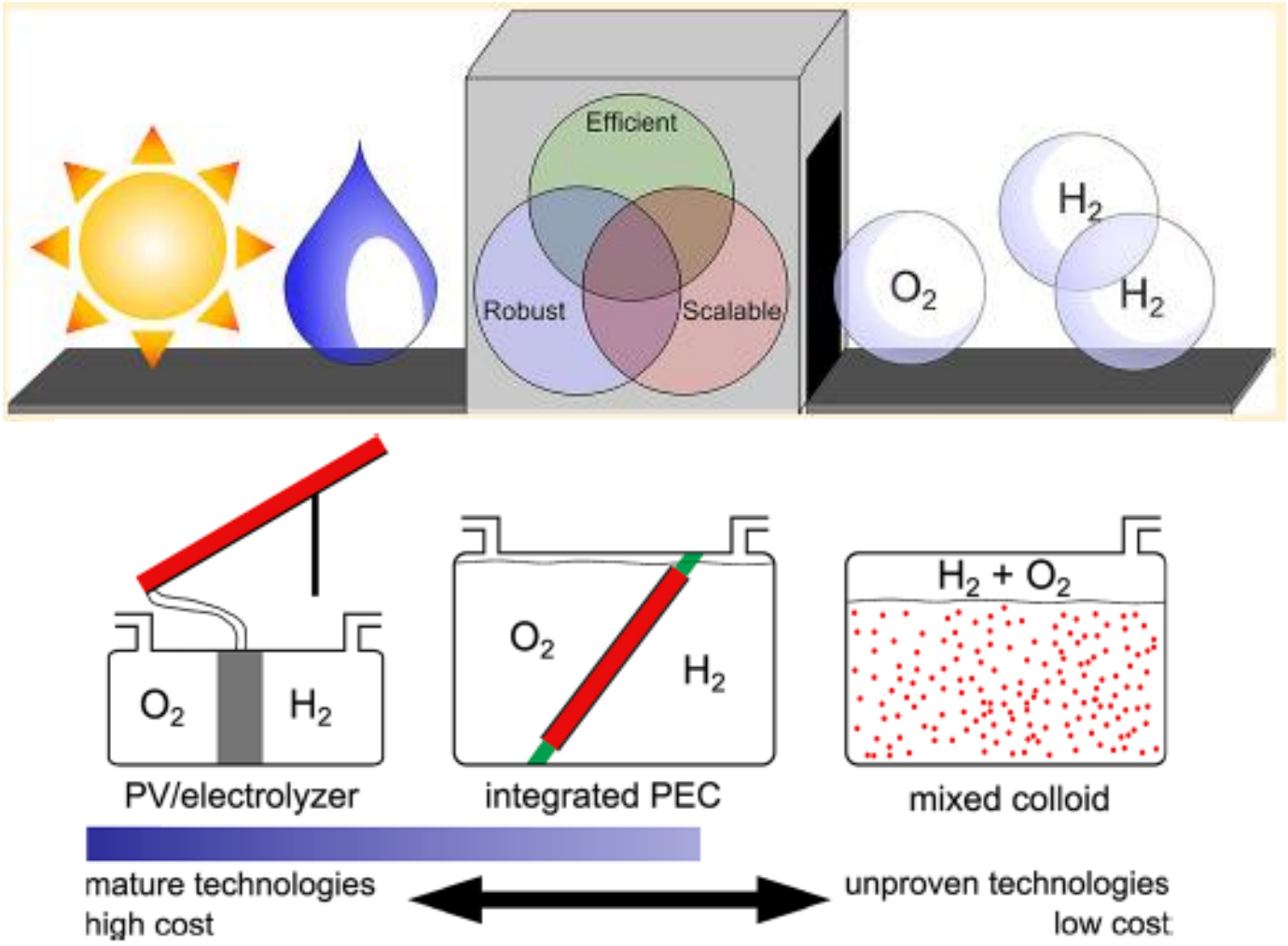


ExxonMobil 2014 Outlook for Energy

Production of renewable H-P liquid fuels for transportation requires innovation

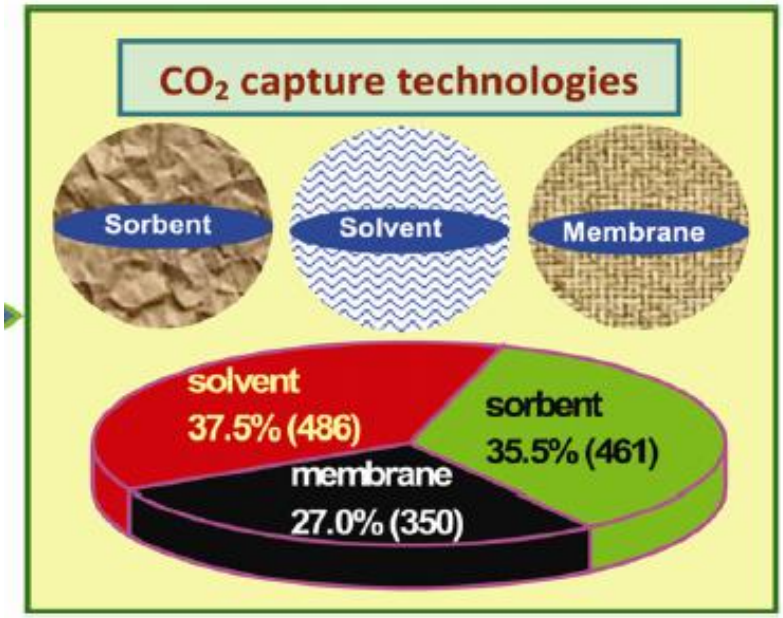
- **Conversion of natural gas or coal** by a two-stage process: **gasification to syngas** followed by **Fischer-Tropsch (FT) synthesis**
- **Conversion of biomass** (cellulose, starch and lipids) by a wide variety of processes
- **Conversion of carbon dioxide and water:**
  - **Artificial photosynthesis** through photocatalytic and photoelectrochemical processes
  - **Water splitting** combined with **carbon dioxide hydrogenation**

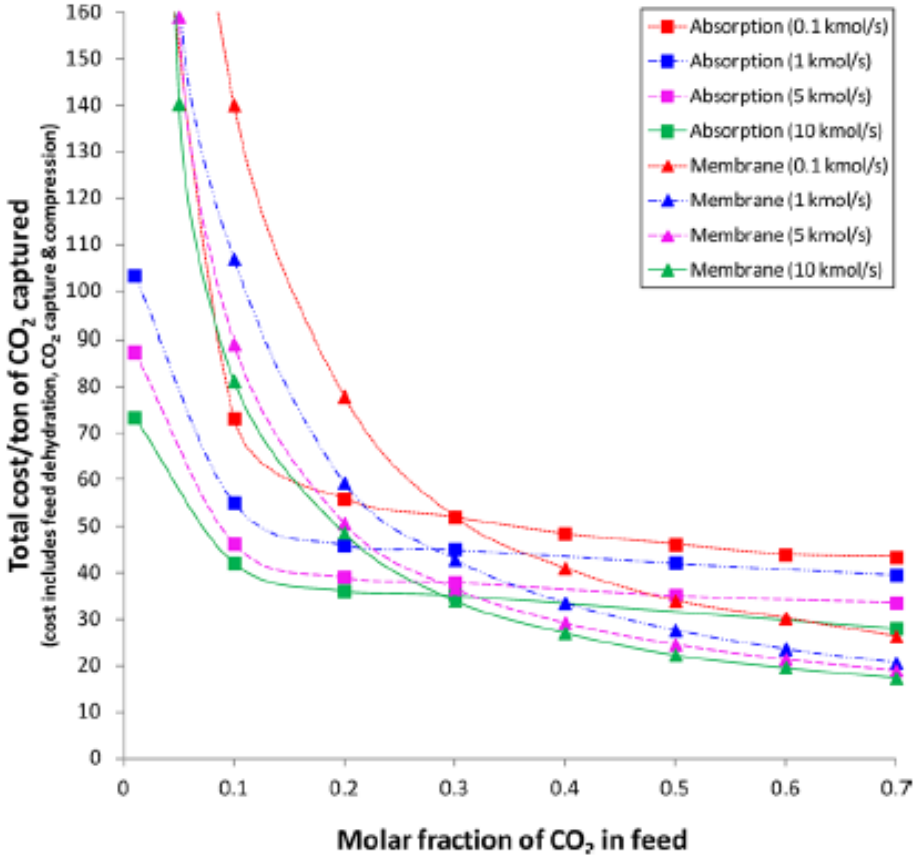
Hydrogen production from water is still an extraordinary challenge



J.R. McKone, N.S. Lewis and H.B. Gray “Will Solar-Driven Water-Splitting Devices See the Light of Day?”, Chem. Mater., 26, 407−414 (2014)

Carbon dioxide capture is technologically and economically viable





M. M. Faruque Hasan and C.A. Floudas, " Modeling, Simulation and Optimization of Postcombustion CO_2 Capture", IE&C Res., 51, 15642-15664 (2012)

Production of liquid fuels from CO_2 and H_2O at high yield is feasible and sustainable

Solar Power

Wind Power

Nuclear Power

Potential sources

Power plants
Cement plants
Natural gas wells
CO_2 wells
Atmosphere

CO_2

Electrolysis

Water

Hydrogen

Oxygen

Renewable Liquid Fuels

Diesel Fuel

Gasoline

Jet Fuel

Natural gas could be an interim feedstock for application of the technology


Solar Power


Wind Power


Nuclear Power

Potential sources

Power plants
Cement plants
Natural gas wells
CO_2 wells
Atmosphere

CO_2


Electrolysis

Water

Hydrogen

Oxygen


ATR

Natural gas

Syngas


Diesel Fuel


Gasoline


Refinery

Jet Fuel