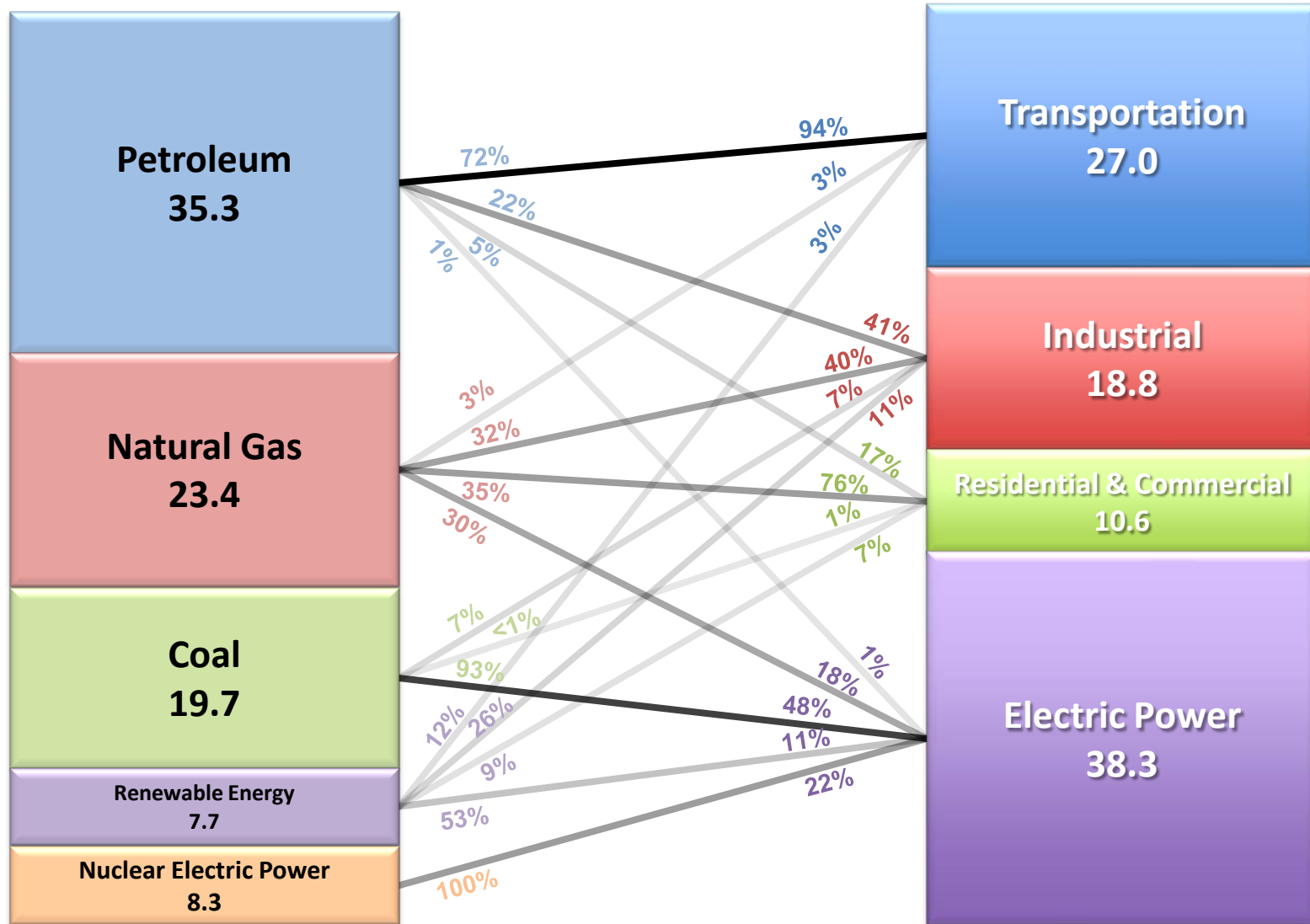


NIChE Workshop Catalysis and Alternative Feedstocks in the Biofuels Industry

An Introductory Perspective

Mark A. Barteau
University of Delaware

US Energy Sources* and Uses 2009



*In Quads, <http://www.eia.doe.gov/basics/energybasics101.html>

US Energy Consumption

Electricity Generation (~40% of total)

48% Coal, 18% Natural Gas, 22% Nuclear, 7% Hydroelectric, 4% Other Renewables, 1% Petroleum

Transportation Fuels (~30 % of total)

94% Petroleum, 3% Natural Gas, 3% Renewables

Very little overlap between energy sources for these two dominant sectors!

- **US *daily* consumption: 20 million barrels of oil (60% imported @ \$1billion per day!)**
- **60 billion cubic feet of natural gas**
- **3 million tons of coal**

“We are not going to have energy independence as long as the US relies on the internal combustion engine.”

James R. Schlesinger
former Secretary of Energy

America's energy challenges

- Energy security
 - Reliable and economic energy supply
 - **Mostly** about liquid hydrocarbons for transport
 - **Goal: 3.5 M bbl/day reduction in crude use**
- Greenhouse gas emissions
 - **Mostly** about CO₂ from stationary sources (power and heat)
 - **Goal: 17% reduction by 2020, 80% by 2050**
- Significant changes in energy supply, transmission, storage, and use

Identify, develop, and deploy
cost-effective, material, and timely solutions
and
Create jobs in the process

US Energy Consumption

Electricity Generation (~40% of total)

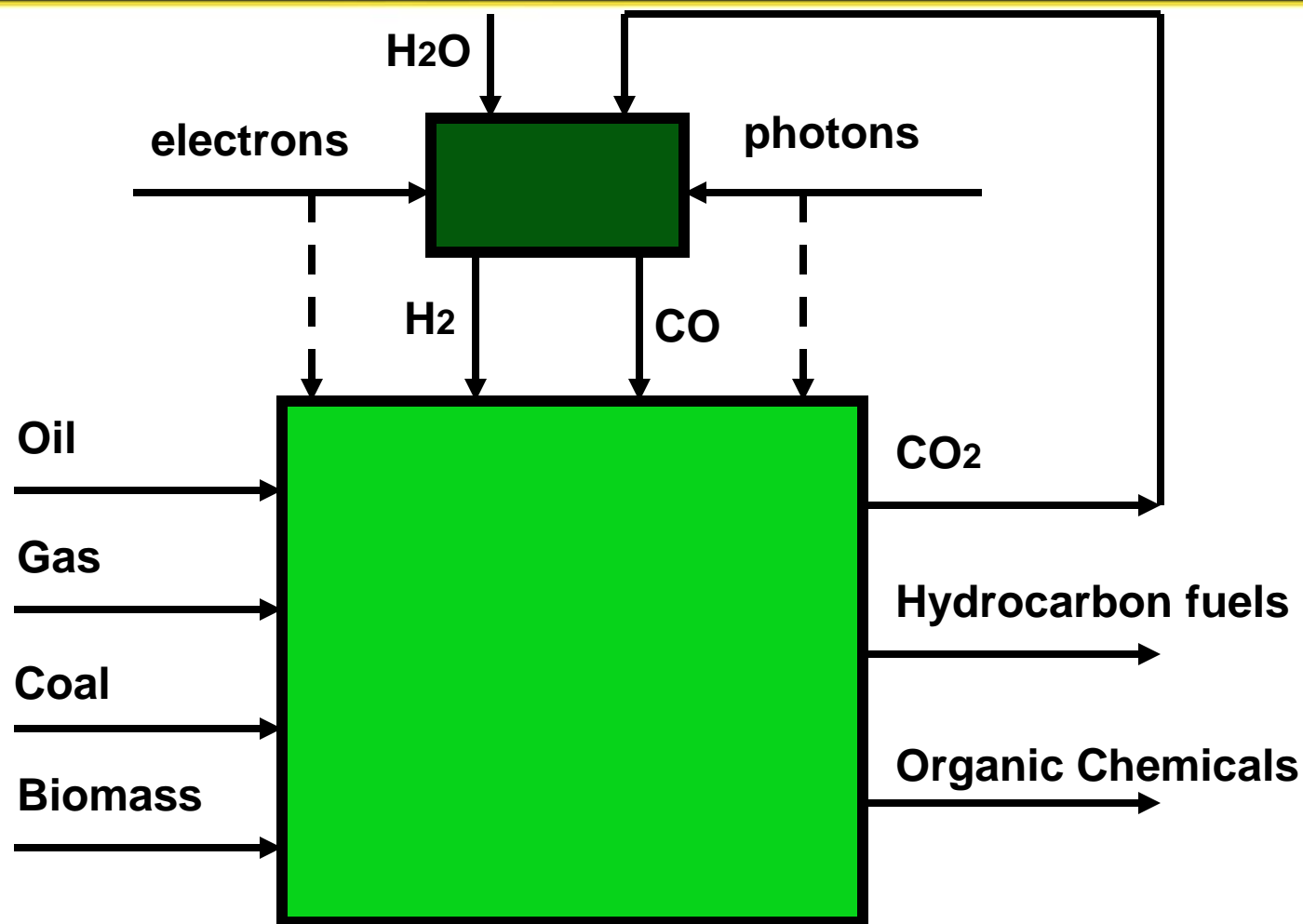
48% Coal, 18% Natural Gas, 22% Nuclear, 7% Hydroelectric, 4% Other Renewables, 1% Petroleum

Transportation Fuels (~30 % of total)

94% Petroleum, 3% Natural Gas, 3% Renewables

Very little overlap between energy sources for these two dominant sectors!

Different fits for different renewables



How can we couple carbon-based resources with carbon-free renewable resources to meet the full spectrum of our energy needs?