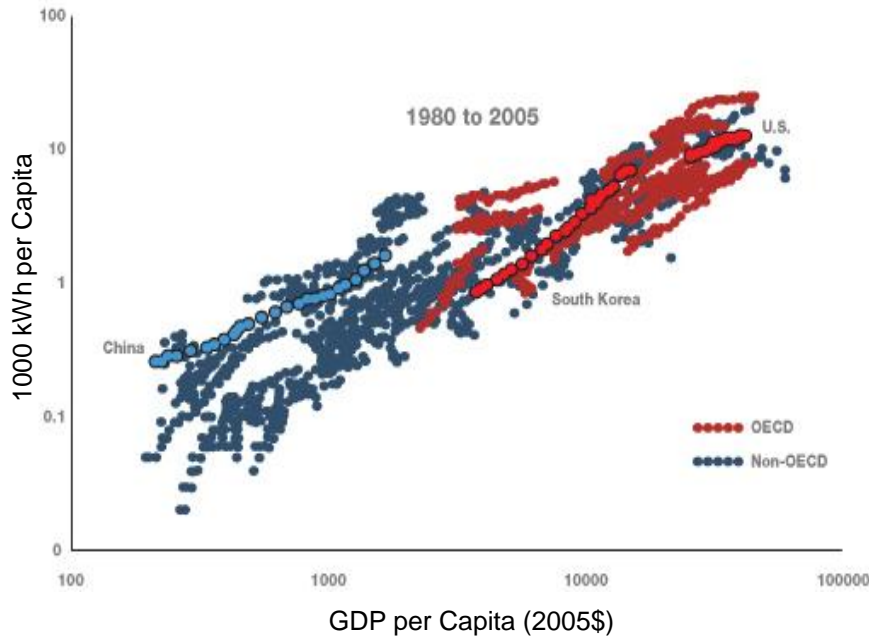

Cleantech Forum XXI

Dirk McDermott – Moderator: Dirty Energy Panel



How do we meet the energy challenges of modern society while simultaneously rebuilding global prosperity...

Electricity Demand vs. GDP



“It is counter productive to pit solar, wind, and biofuels against domestic oil and gas, which today contribute roughly 30 times as much net energy to the US economy, and could do more.”

– Geoffrey Styles, Managing Director of GSW Strategy Group

...by focusing on a set of bridge technologies which provide economic and greener solutions in the immediate term



Today we face many energy challenges

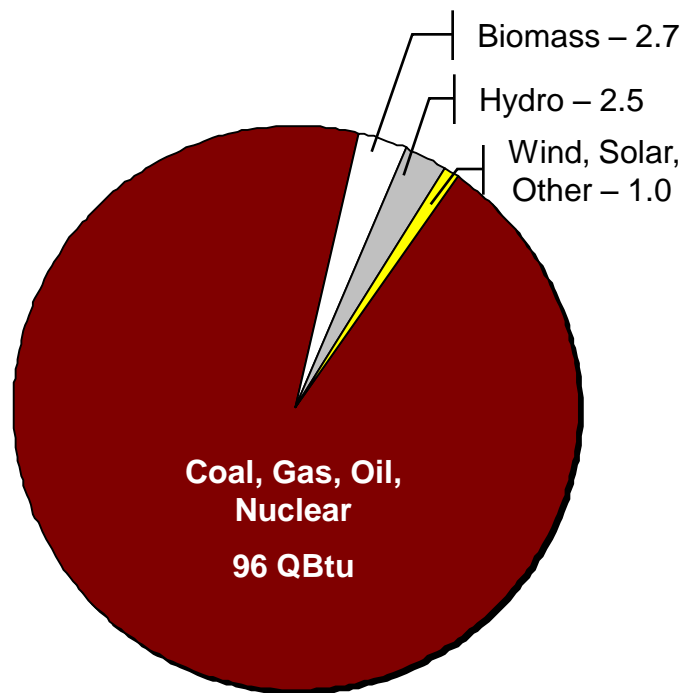
- **Demand** from emerging Asia's industrial revolution was insatiable, and will certainly return with an economic rebound
- Despite record investment, **supply** failed to keep pace
- The current **economic malaise** has constrained investment – setting the stage for even greater supply/demand imbalances in the future
- **Security**, although taking a back seat to current economic issues, remains a significant threat to the global economy
- Climate change, and the resultant **regulatory uncertainty**, has created an ambiguous investment landscape
- The **scale** of the challenge is daunting – tens of trillions of energy investment dollars are required between now and 2030 vs. a stimulus package of ~\$150B

What are the roles for clean and dirty energy technology?



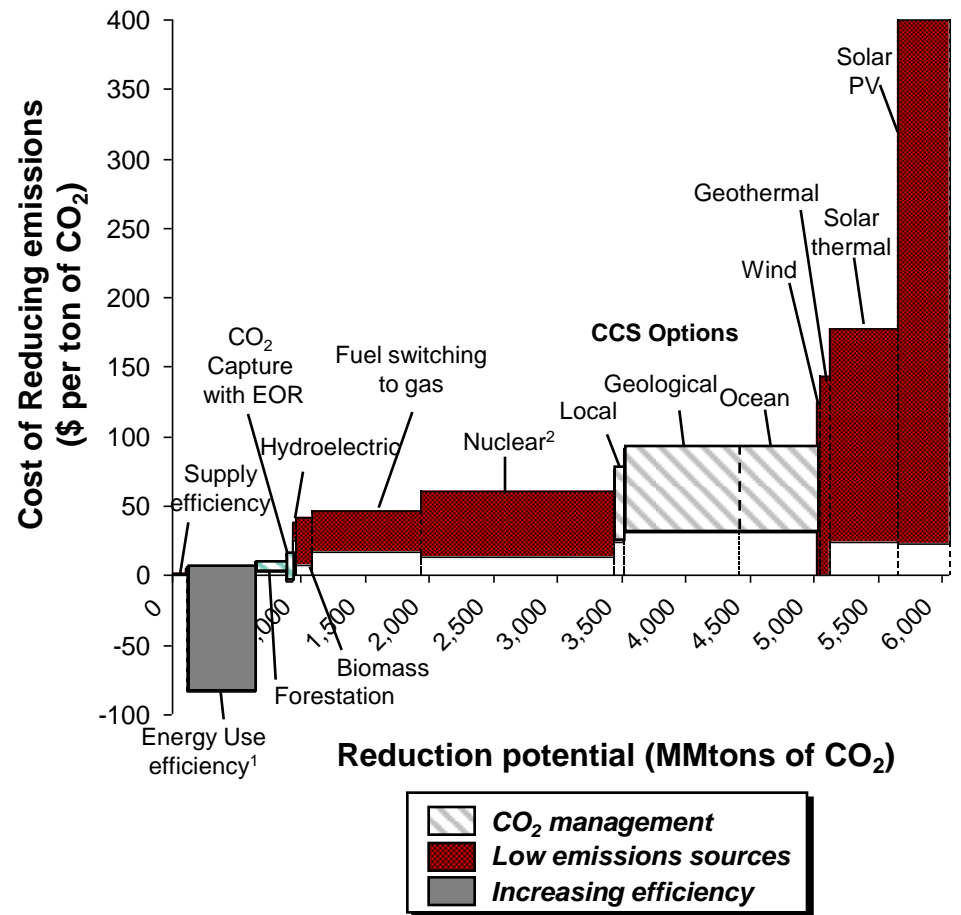
Cleantech will play an increasingly important role – but today lacks materiality and cost/performance competitiveness

2007 Dirty vs. Clean Total US Energy Consumption
Quadrillion BTU



Total = 102 QBtu

Supply Curve for Reducing US CO₂ Emissions



Reduction potential (MMtons of CO₂)

- CO₂ management
- Low emissions sources
- Increasing efficiency

Source: EIA, Toyota, MIT Energy Laboratory; US DOE; Booz Allen Hamilton, Altira

(1) Other studies give a reduction potential from 2 to 3 times higher
 (2) Other studies would project less reduction potential for Nuclear



Proprietary

Unfortunately, although both economic and abundant, 'dirty energy' suffers from multiple myths and misperceptions

Sector

Myths

Reality



Oil & Gas

- Peak Oil
- 'Natural gas crisis'
- Fossil fuels are all dirty

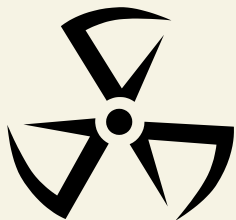
- 'Peak' pertains to conventional – unconventional reserves are tremendous
- Natural gas unlocked with new technologies is so abundant, pundits expect US LNG exports
- 'Green oil' can be produced via CO2 injected recovery methods
- Natural gas reduces CO2 by up to 60% vs. coal



Coal

- Dirtiest of the dirty

- Multiple technologies exist to reduce CO2 from stack gases
- Waste heat opportunity is greater than the combined total of all renewable energy sources
- 'Bigger than the US' – clean coal is an imperative given China's and India's coal plans



Nuclear

- High cost
- Unsafe

- High cost largely 'self inflicted' due to arduous regulatory processes
- New technologies 'break nuclear paradigm' dramatically reducing costs, eliminating proliferation risks, and enabling uranium recycling

