The National Gas Crisis: Creating Clean Solutions

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Clean Coal Is Not An Oxymoron

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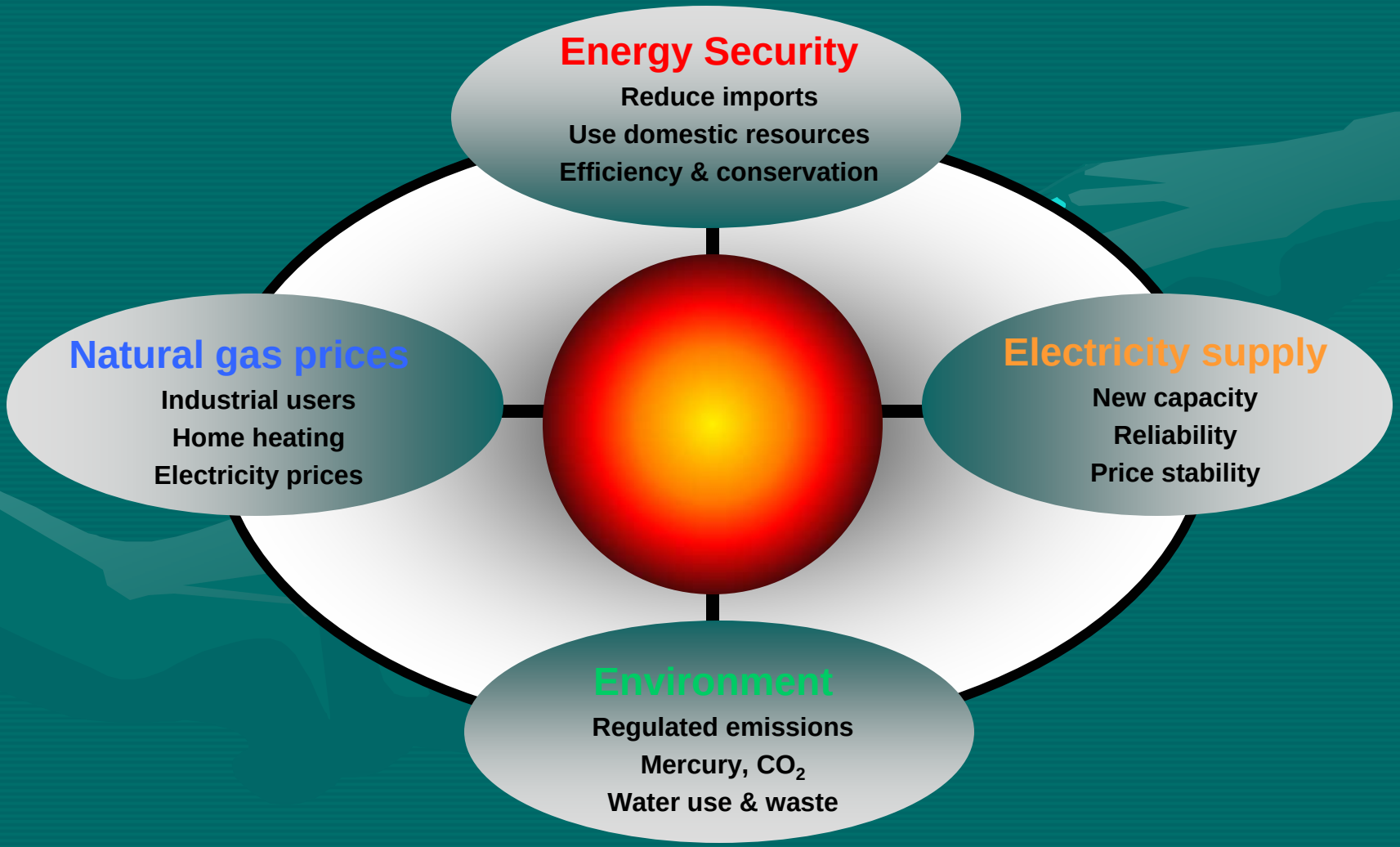
Energy Policy Issues



National Energy Policy

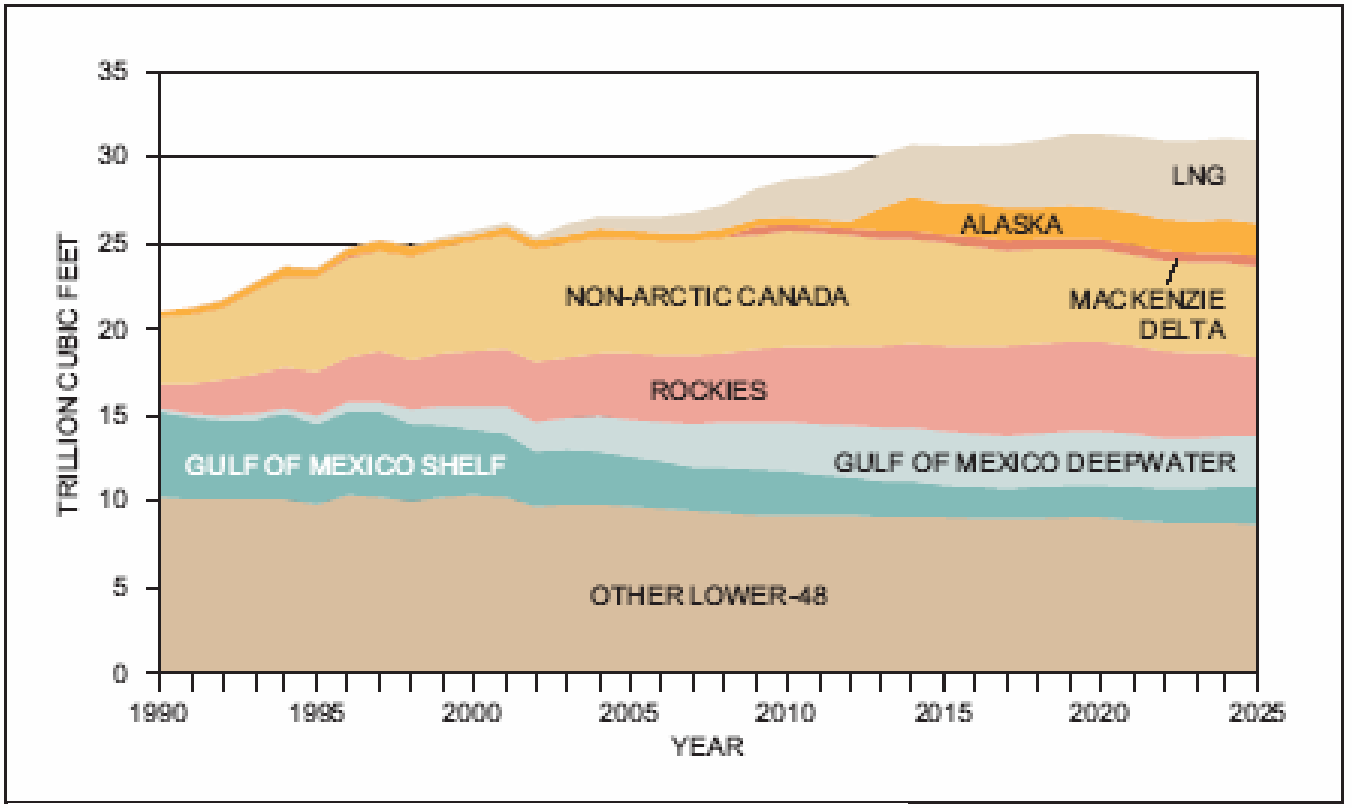
- Use more natural gas
- Since 1993 over 90% of all new generation is gas
- Demand now exceeding U. S. supply
- Deny access to “new gas”

FACTS

- U.S. energy consumption is growing twice as fast as energy production;
- Energy efficiency is increasing – but we will still need additional energy sources and supplies to support economic growth;
- America's dependence on foreign oil is growing – net imports represented 55% in 2001 and are expected to reach 68% in 25 years; and (EIA Annual Energy Outlook 2003)
- Without comprehensive action, we could continue to pit fuel type against fuel type, conservation against production, and energy "haves" against energy "have-nots.

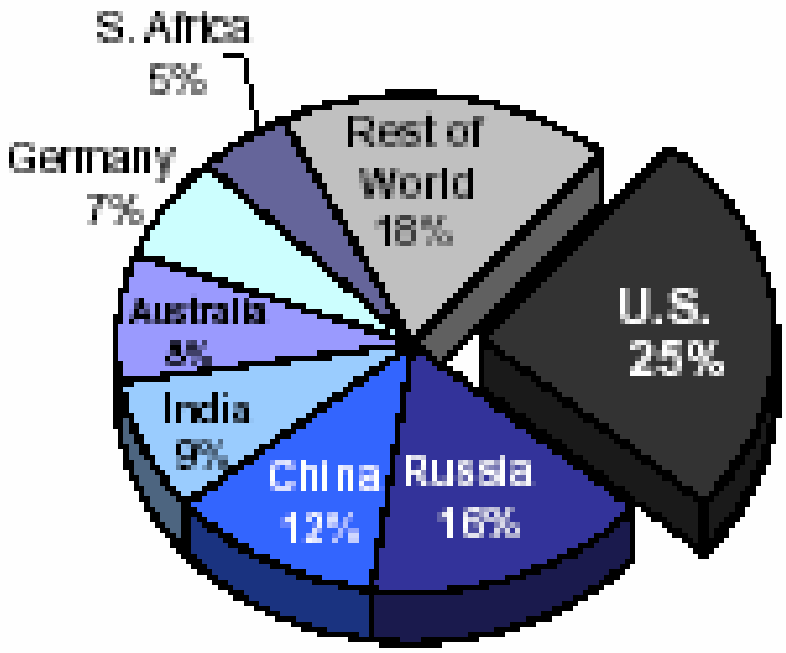
U.S. Natural Gas Supply

Most incremental supply after 2005 projected to come from LNG imports & Alaska pipeline



Source: National Petroleum Counsel, "Balancing Natural Gas Policy,' Sept. 2003.

World Coal Reserves



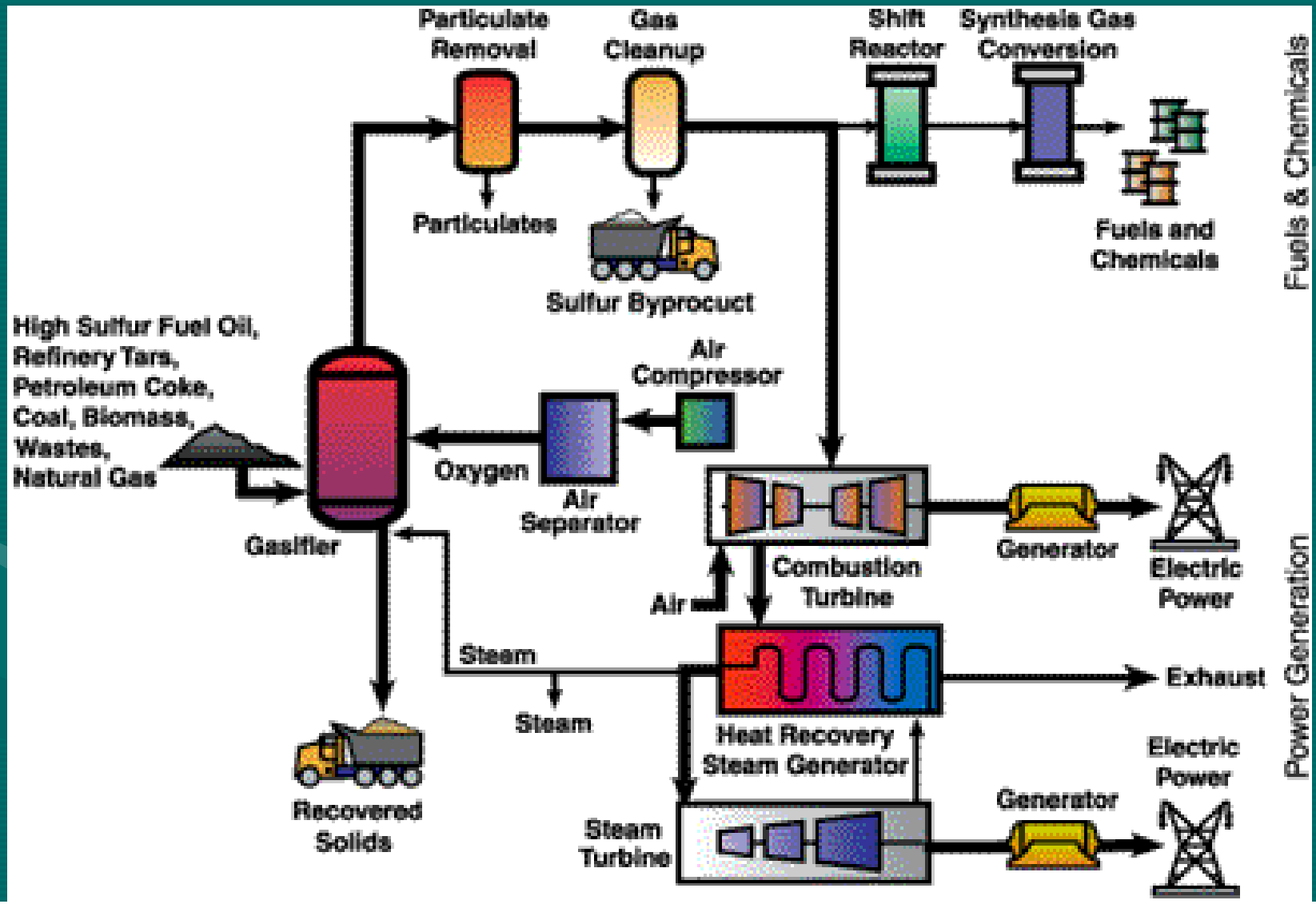
In contrast U.S. holds:

-- 2% of world oil reserves

-- 3% of world natural gas reserves

Integrated Gasification Combined Cycle

IGCC



IGCC Technology Offers the *Potential* to Significantly Improve:

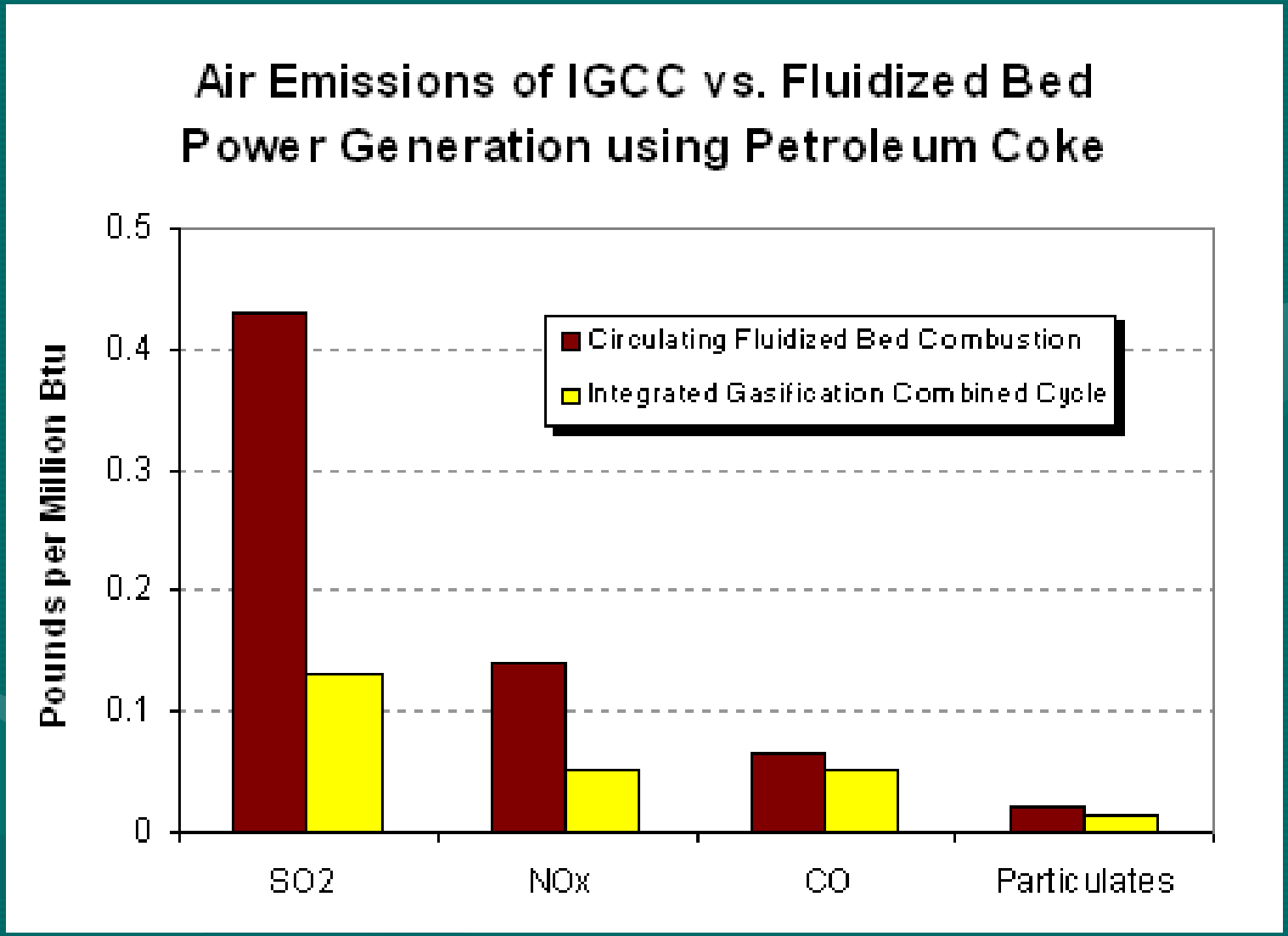
- Generation Efficiency
- Utilization of Existing Coal Infrastructure
- Reduce Air Emissions
- Spinning Reserves
- By-Products
- Customer Satisfaction
- Legal Position
- Regulatory Certainty
- Stranded Assets

While at the Same Time:

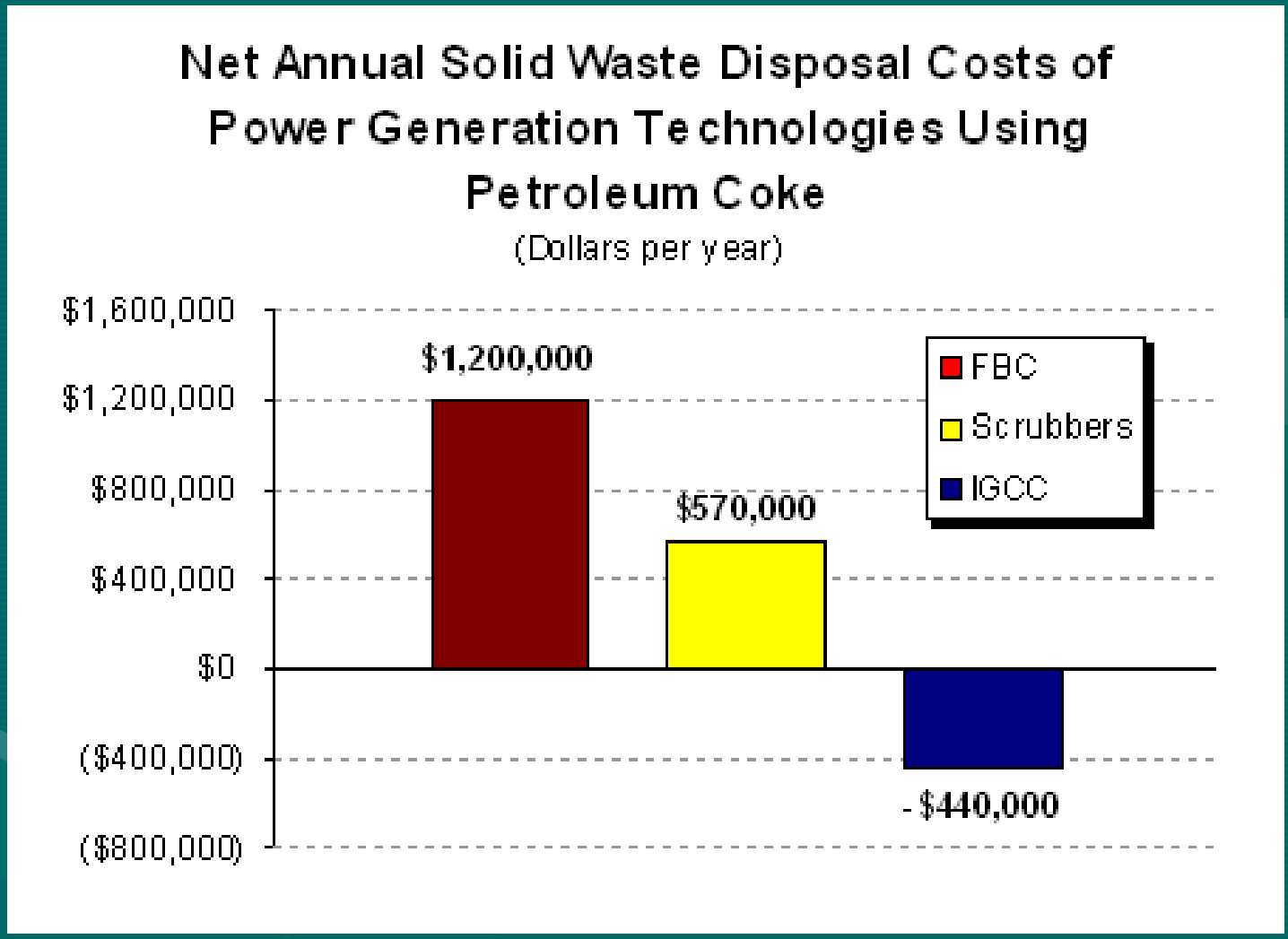
- Help Reduce Pressure on Natural Gas
- Helps Improve Supply & Price for Other Sectors of Economy
- Helps Improve Economic Development
- Helps Maintain U.S. Jobs
- Help Reduce U.S. Dependence on Imported Fuels
- Support National Energy & Homeland Security

Deployment of IGCC

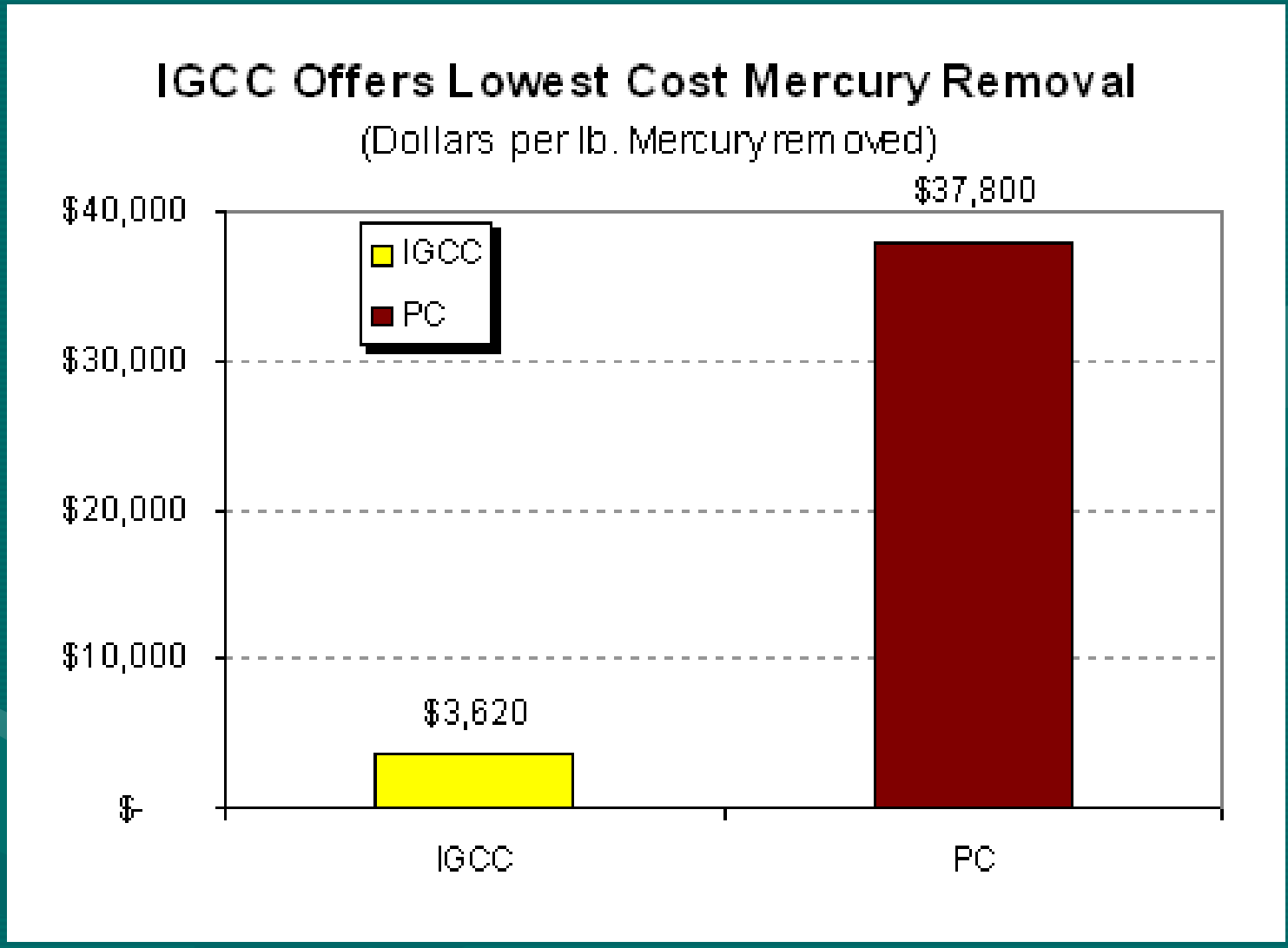
- **Baseload electricity power plants**
- Refueling idle or bankrupt NGCC
- Industrial power plants
- Poly-generation
- R & D



Source: GTC from Industry data



Source: GTC from DOE based on industry data



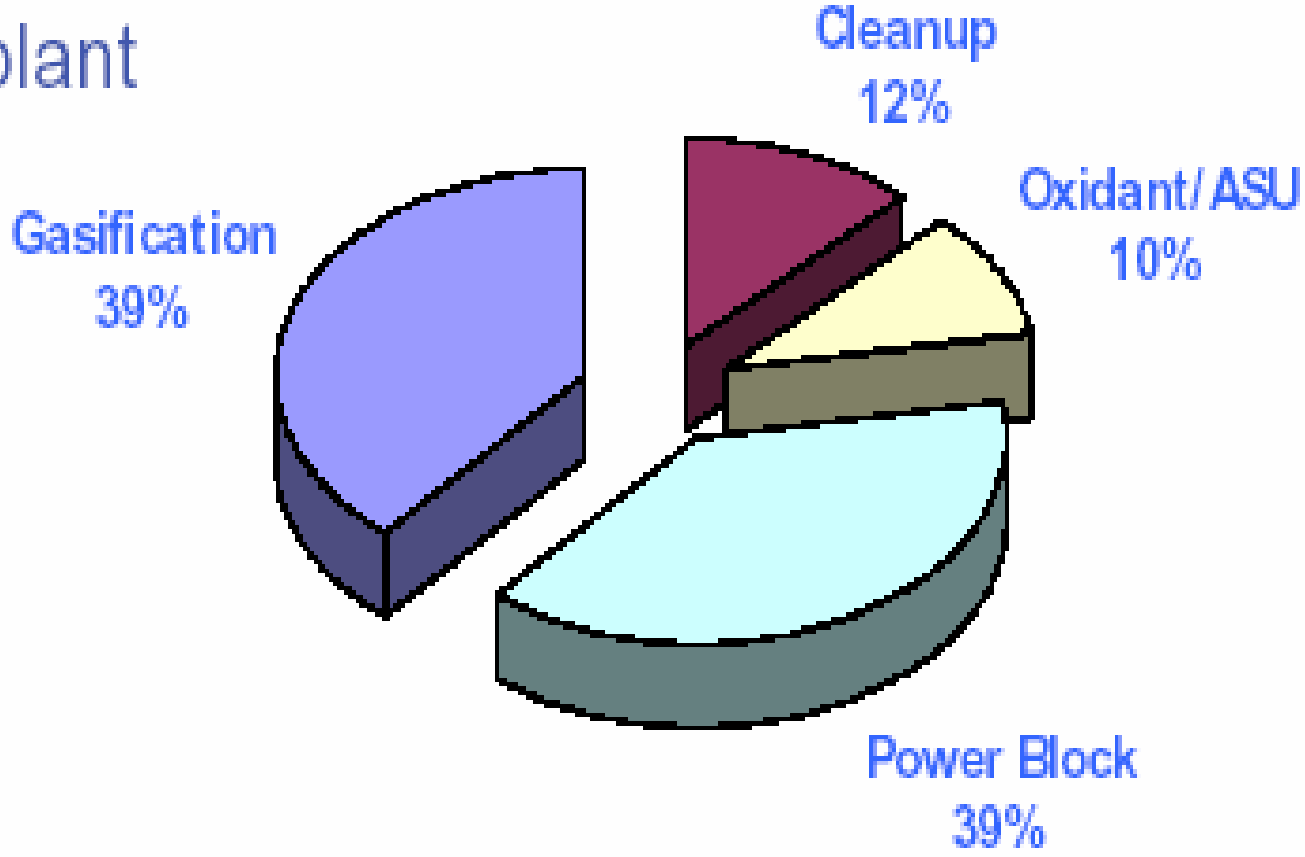
Source: GTC from SFA Pacific

Deployment of IGCC

- Baseload electricity power plants
- **Refueling idle or bankrupt NGCC**
- Industrial power plants
- Poly-generation
- R & D

- **Electric power demand = 5.3 TCF (25% of total gas demand)**
- **115,000 MW NGCC Power Plants**
- **Average run time less than 15%**
- **15% = 1 TCF/year NG**
- **65% = 4.3 TCF/year**
- ***That equals a 64% increase in electric generator demand***

Power Block is major cost component of IGCC plant



National Gasification Strategy

Gasification of Coal & Biomass as a Domestic Gas Supply Option

William G. Rosenberg, Michael R. Walker
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U.S. Natural Gas Supply

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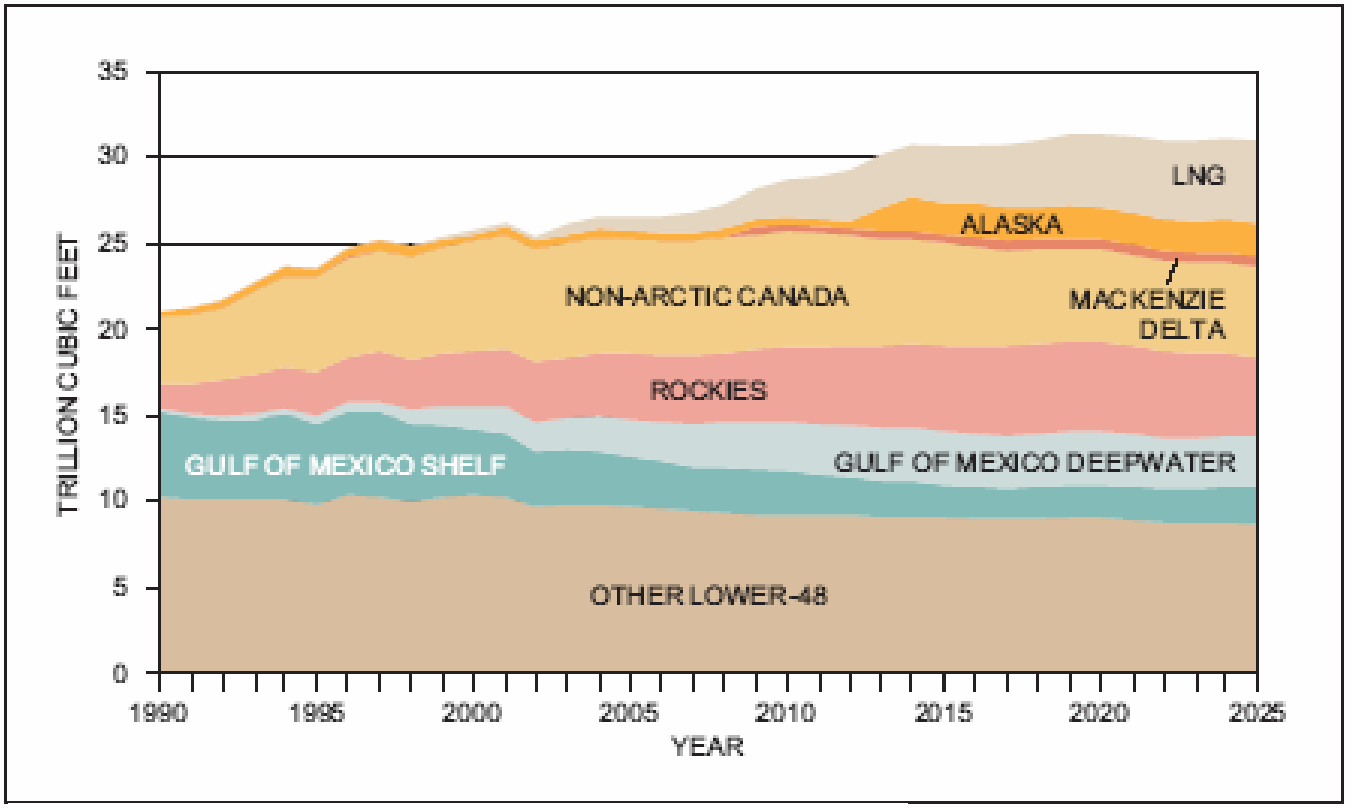

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Reducing NG in Electricity Generation

- Stabilize the price of natural gas
- Free natural gas for use in chemicals, fuels, and fertilizer industries
- Save domestic jobs
- Syngas could additionally provide additional feedstock for these same industries

The most intensive users of gas,
the chemical and fertilizer industries,
have shut down
about 20 percent of their plants since 2000,
Due to high natural gas prices.

An additional 25 percent of their plants
have been closed temporarily, and industry
officials say persistently high
gas prices may ensure that
they never open again.

The Reality Since 2000

- Since 2000, prices have hit historic highs
- 90% of ammonia cost is natural gas
- 22% of US nitrogen fertilizer production has shut down shut down
- 50% of US nitrogen fertilizer is now imported

Integrated Fuel and Ammonia Retrofit Project (IL)

- Royster-Clark/Rentech Venture
- 1,800-2,000 bpd liquid FT fuels
- 900-950 tpd ammonia
- 10 MWe export power

FT SOLUTIONS, LLC

Energy Security Benefits

- Frees natural gas for the home market equivalent to what is used by **157,500** homes
  - (31,800MMBTU/day)
- Electric generation provided is equivalent to what is used by **20,600** homes
  - (Free up 14Mw and provide 17Mw)
- Produces diesel to fuel **5,900** school buses
  - (5mi/gal at 20,000 mi/yr)

FT SOLUTIONS, LLC

Coal-based FT technology is commercially feasible at today's oil prices.

- The benefits of coal-based FT technology are:
  - Decreased dependence on foreign oil.
  - Increased domestic investment and jobs
  - Environmentally friendly production of ultra-clean transportation fuels
  - Enhanced efficiency through co-production (polygeneration) of electricity, fuels and chemicals

Powder River Basin IGCC-FT Project (WY)

– WY Business Council paid study by Rentech
– 10,000 BPD liquid fuels
– 0-100 MWe export power

FT Diesel is an Ultra Clean Transport Fuel

	Low Sulfur D-975	California CARB	Rentech (FT)	EU (2005)	EPA (2006)
Cetane Index	>40	>48	72	>50	>40
Aromatics (vol %)	<35	<10	<4	<10	<35
Sulphur (ppm)	<500	<500†	<1	<10	<15
Biodegradable	NO	NO	YES	NO	NO

† Note: In 2006, US regulations will require <15 ppm sulphur

FT SOLUTIONS, LLC

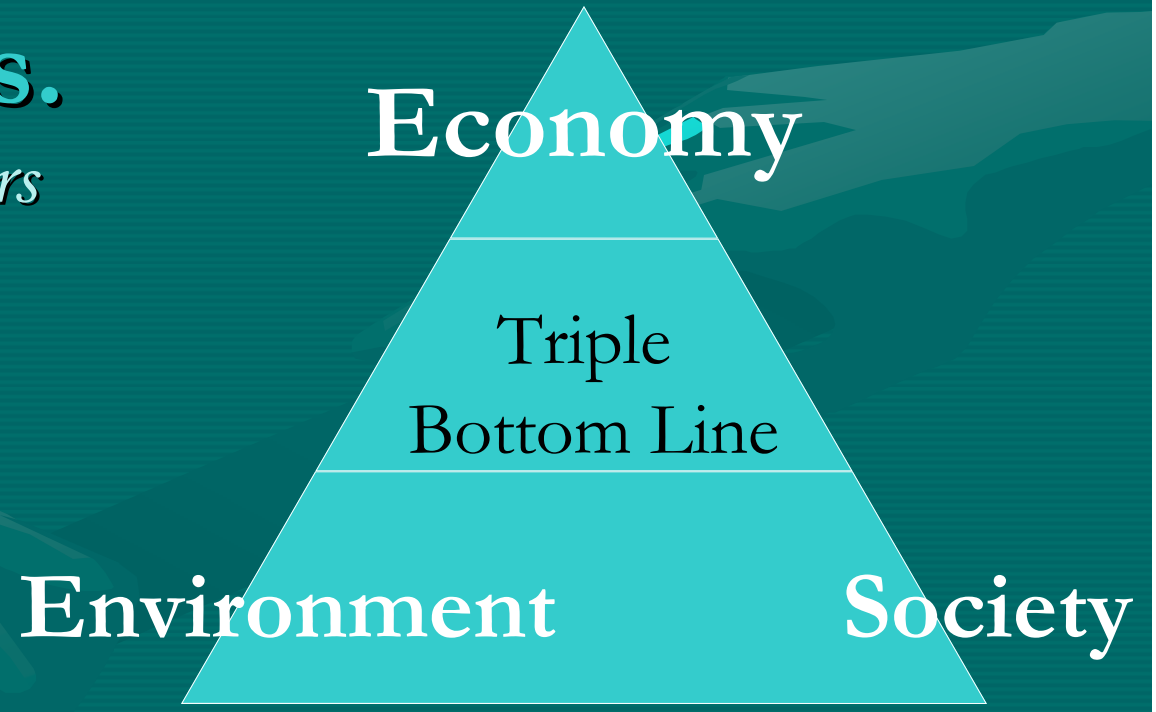
"By reducing greenhouse emissions and ratcheting up new climate-friendly technologies, U.S. companies can create jobs and launch an era of economic growth akin to the start-up phase of the internet"

Timothy Wirth

President
UN Foundation

- **Sustainability is to create value for all shareholders.**

Jim Rodgers



Joseph E. Fiksel