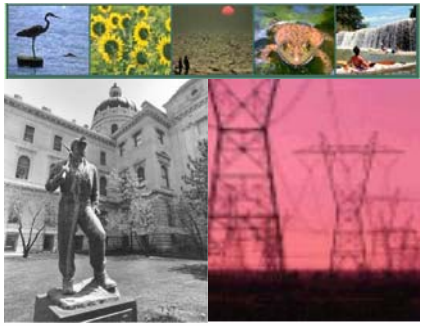
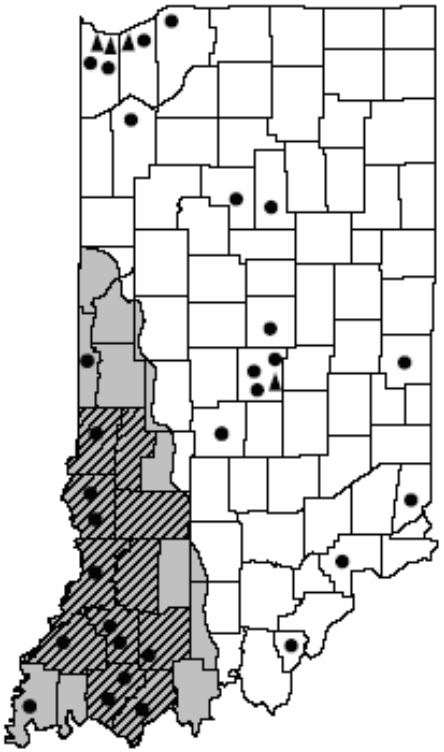
The 2005 Energy Policy Act Illinois Basin Coal Indiana Perspective





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Clean Coal for Transportation Fuels Workshop
Purdue University
December 2, 2005

Coal by Destination State in 2003 - Indiana

State Total of 64,998 Thousand Short Tons & methods of transportation

Wyoming: 15,547 Total
15,547 Electricity Generation
Rail 13,979 River 1,477

Import

Montana: 1,600 Total
1,600 Electricity Generation
Rail1,600

Import

Utah: 167 Total
164 Electrical Generation
Rail 164

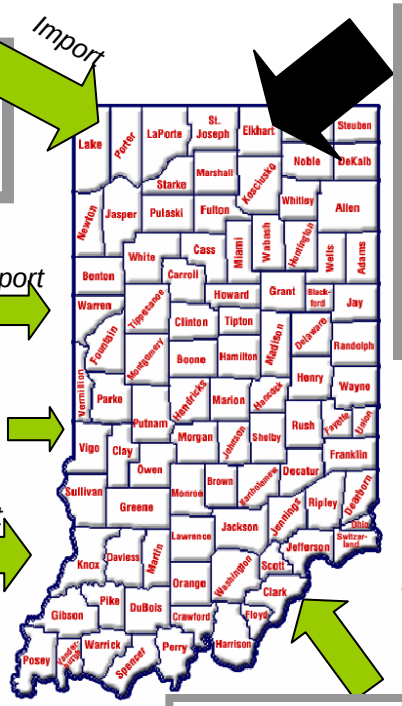
Illinois: 5,273 Total
5,271 Electricity Generation
Rail 3,777 River 587 Truck 906
1 Coke Plants
Truck 1

Import

Kentucky: 551 Total
368 Electricity Generation
Rail 198 Truck 154
57 Coke Plants
Rail 57
125 Industrial Plants
Rail 32 Truck 93

Import

Alabama: 811 Total
811 Coke
Rail811



In state: 31,632 Total
20,526 Electricity Generation
Rail 12,028 River 1,280
Conveyer 684 Truck 6,535
10,777 Industrial Plants
Truck 7,627 River 402 Conveyer 2,748
329 Residential/Commercial
Truck 329

Ohio: 97 Total
97 Electricity Generation
Rail 44 River 14 Truck 39

Import

Pennsylvania: 127 Total
84 Electricity Generation
River 43 Truck 30 Rail 11
11 Residential/Commercial
32 Industrial Plants
ck 16 Rail 16

Import

West Virginia: 7,557 Total
1,804 Electricity Generation
Rail 1,102 River 550 Truck 151
4,834 Coke Plants
Rail 4,267 River 567
906 Industrial Plants
Rail 856 River 11 Truck 39

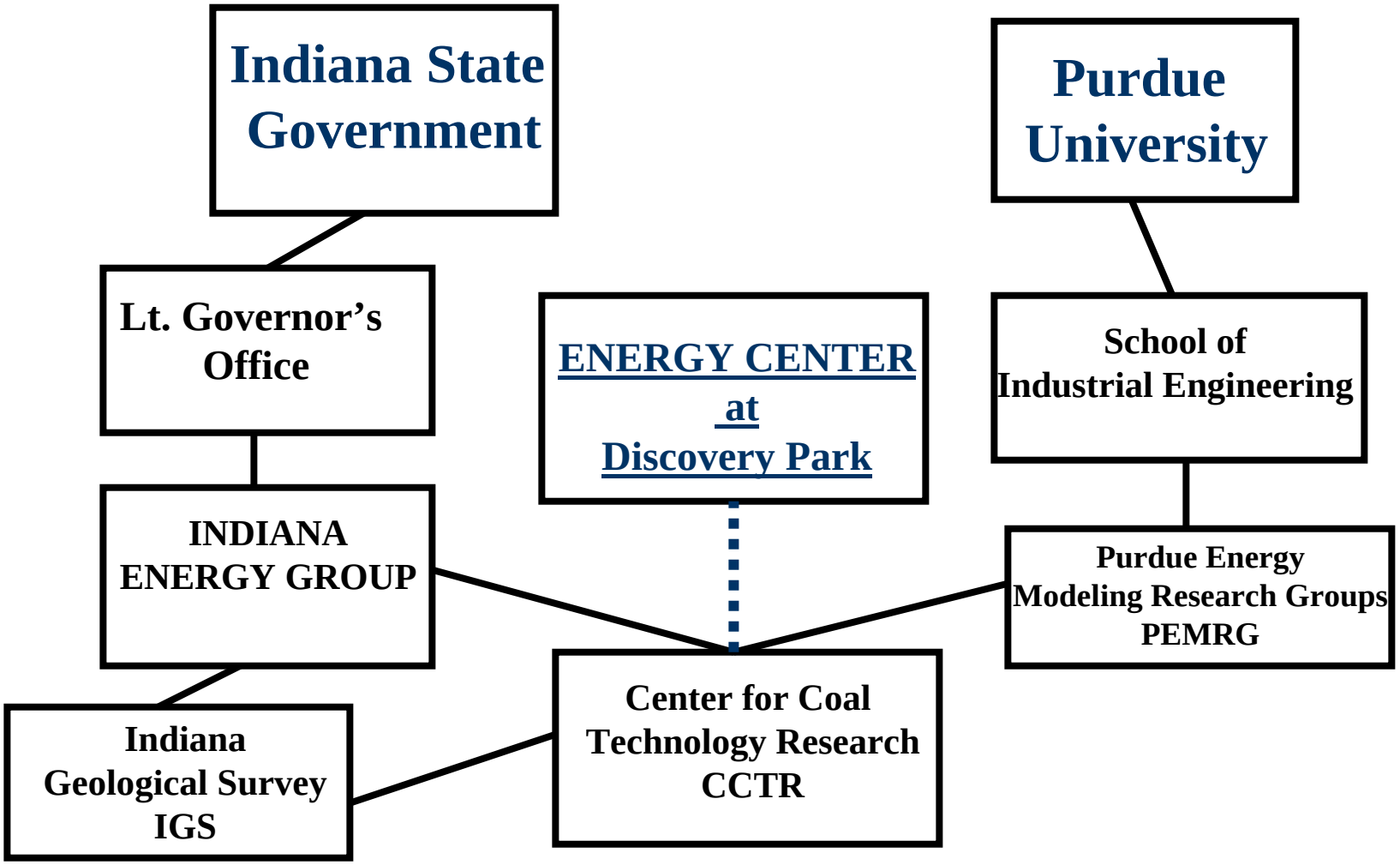
Virginia: 1,727Total
628 Electricity Generation
Rail 628
529 Coke Plants
Rail 529
570 Industrial Plants
Rail 570

State Totals: 46,000 Electricity Generation
6,213 Coke Plants, **12,411** Industrial Plants, 357 Resid/Com

Source: http://www.eia.doe.gov/cneaf/coal/page/coaldistrib/d_in.html

- 30% increase in the use of coal in Indiana since 1987, but only a 3% increase in production of Indiana coal

Coal Research In Indiana



Responsibility of CCTR is to "develop technologies that can use Indiana coal in an environmentally and economically sound manner" [Senate Bill 29, 2002 Session].

Our opinion is that current clean coal technology options (CCTs), including integrated coal gasification combined cycle power plants (IGCC), Fluid Bed Combustion (FBC), Super Critical Pulverized Coal (SCPC), show great promise for substantially increasing the use of Indiana coals while at the same time reducing pollution.

...As well as providing a feed-stock for use in processes which produce transportation fuels from gasified coal.

The present situation regarding the use of Indiana coals:

(a) The enormous increase in the use of Powder River Basin (PRB) low sulfur coals, since the 1970s, has been at the expense of growth in the use of Indiana coals.

(b) Since 1987, coal consumption in Indiana has increased 30%, while Indiana coal production has increased only 3% .

(c) In 2003 50% of the 65 Million Tons of coal consumed for all purposes in Indiana were imported.

(d) 55% of the 46 Million Tons of coal used to generate electricity in Indiana were imported.

66% of those imports (17.3 Million Tons) are from the Powder River Basin

Why? Least cost emissions alternative.

Coal Use in Indiana 2004

Coal Use in Indiana by end User			(000) tons		
	Indiana Produced Coal				
In State	Electric Utility		20526		
In State	Industrial		10777		
In State	Residential/Commercial		329	31632	
Export		Electric Utility	2915		
Export		Industry	761		
Export		Residential/Commercial	2	3678	
Total	**Indiana Coal Production**				**35310**
Coal Imported into Indiana					
Electric Utility		Powder River Basin	17314		
		Low Sulfur Eastern	8252	25566	
Coke Plant			5421		
Industrial			1602		
Residential/Commercial			11	7034	
Total Coal Imported into Indiana					**32600**
Total Coal used in Indiana					**67910**

What would be the economic/jobs impact of recapturing the electricity generation market?

(a) CCTR has estimated (1) that current coal production adds almost $1.3 Billion and 14,000 jobs to the State's economy, (2) that each additional million tons of coal mined would add $60 Million and 800 jobs.

(b) Thus, if Indiana coals were to replace the 25.6 Million Tons of coal now imported to generate electricity, it would add $1.53 Billion and 20,400 jobs to the State's economy.

(c) If Indiana coals were used to generate the electricity needed to satisfy the State Utility Forecasting Group's (SUFG) expected growth in Indiana base load electricity consumption:

- ~ $900 Million added to State economy in 2021
- ~ An additional 12,000 jobs created by 2021

The key questions:

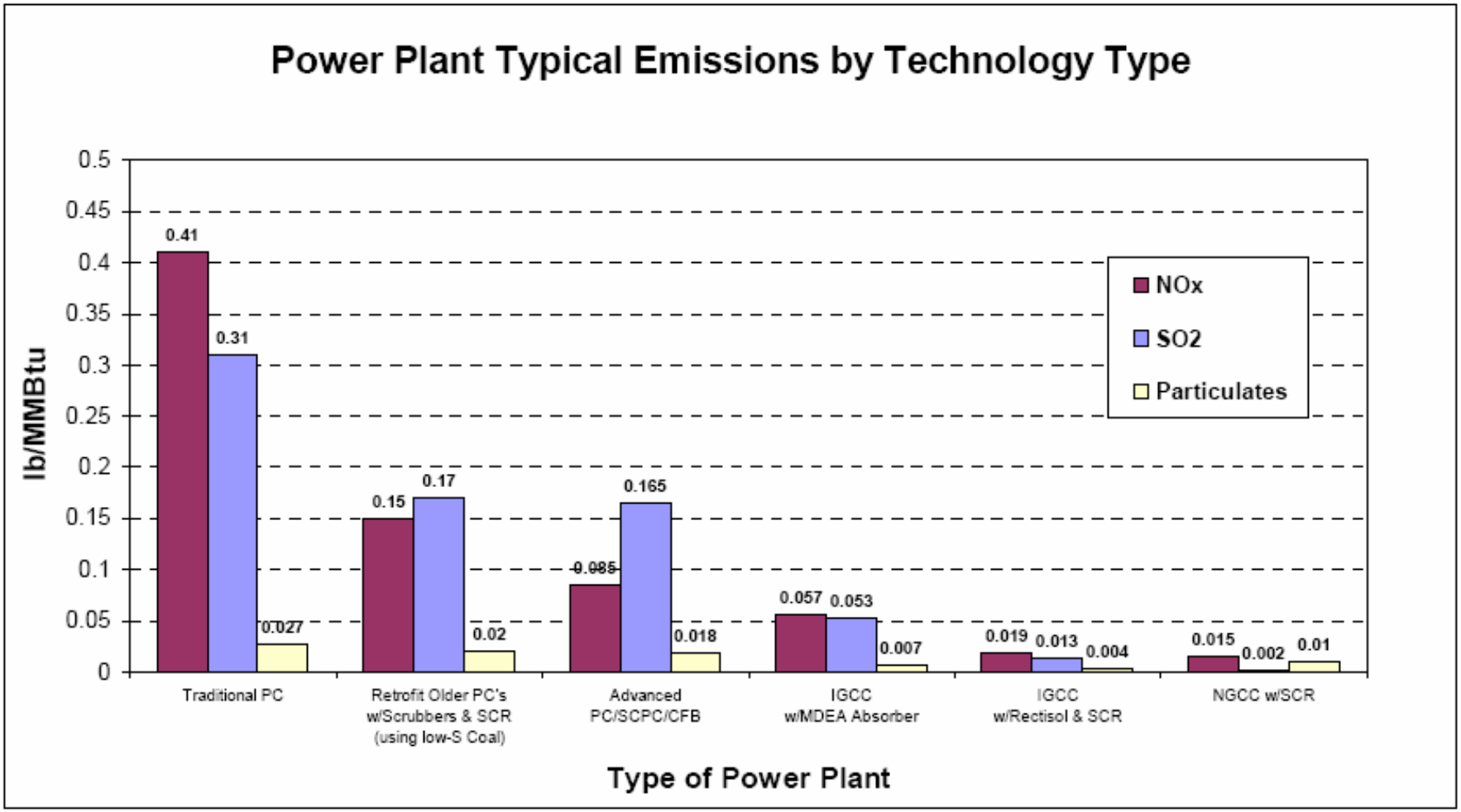
Can we do this, using Indiana coal, without

(a) Further polluting the environment? (Indiana now is the 8th most air polluting State)?

(b) Losing our State's reputation as a low cost producer of electricity? (now only Kentucky and Wyoming have substantially lower electricity costs than Indiana)?

The answer to (a) is certainly yes, if we adopt the newest generation of clean coal technologies such as IGCC, FBC, & SCPC.

For instance – if all the electricity generated by Indiana power plants were to be generated by technologies similar to the present IGCC at Wabash River, SO_2 emissions in these plants would be reduced by 99%! CO_2 would be all but eliminated.



Key:

PC - Pulverized Coal
Scrubbers - SO_2 Removal Unit
IGCC - Integrated Gasification Combined Cycle
NGCC - Natural Gas Combined Cycle
SCR - Selective Catalytic Reduction (Reduction of NOx in the flue gas)
SCPC - Super Critical Pulverized Coal
CFB - Circulating Fluidized-Bed
MDEA - Methyldiethanolamine (CO_2 Separation/Removal)
Rectisol - Gas Purification Unit

Basis: ChevronTexaco White Paper (3/03), DOE Report (5/99), and Recent EPA Permit Data

Now – Can we adopt CCTs for power generation without increasing the cost of Indiana electricity?

The Answer = We must!

Look at the competition:

Natural Gas Fired Combined Cycle (NGCC):

Low plant costs/kW, but prohibitively high operating costs, with the cost of gas at present levels.

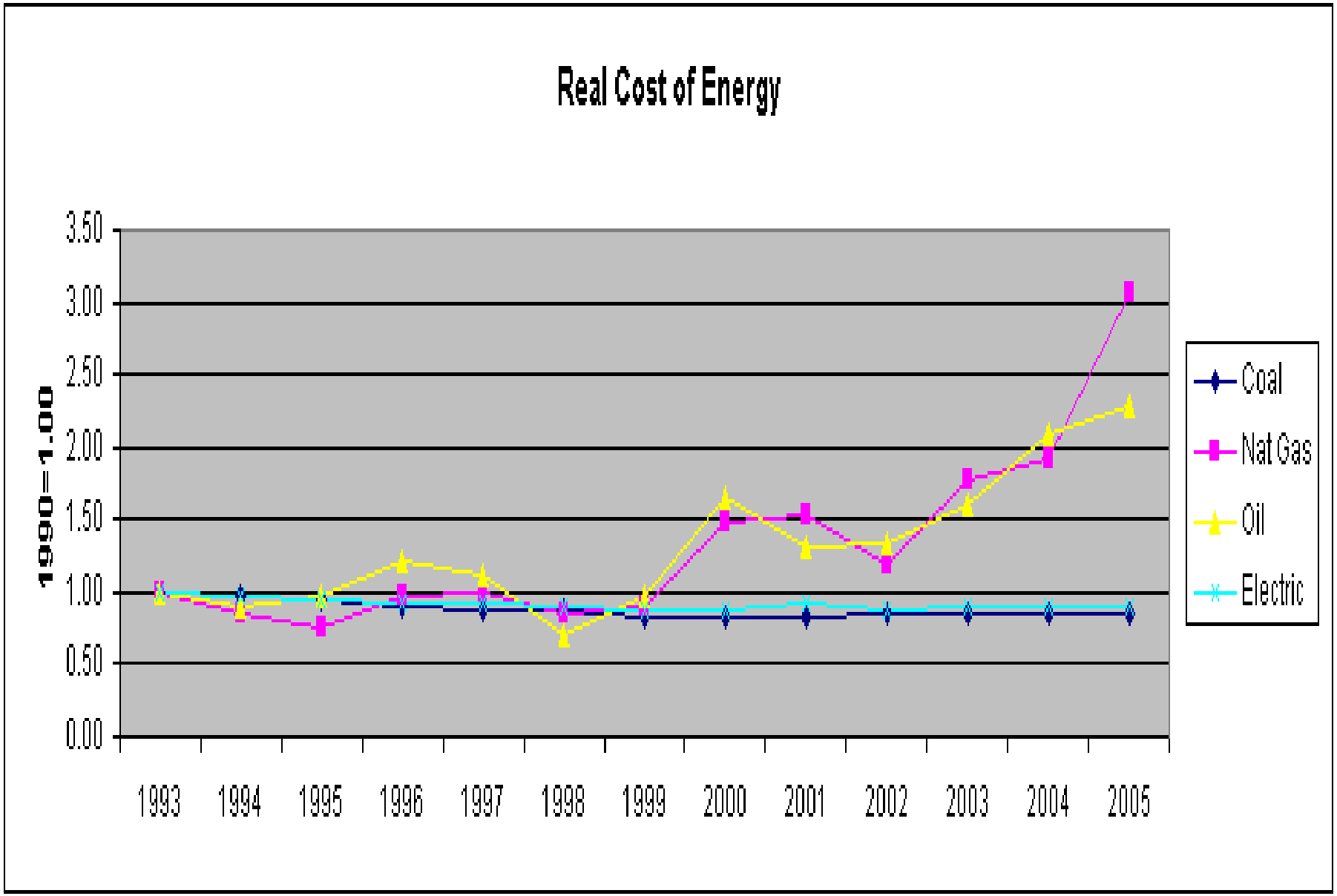
Pulverized Coal (PC):

Higher plant costs than NGCC, but much lower operating costs make it the competition.

IGCC:

15% to 20% higher plant costs (with spare gasifier) than PC, roughly the same operating costs.

- Stable coal prices yield stable electric prices.
- Electricity is still the basis of the energy industry.


Real Cost of Energy
1990=1.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
Coal
Nat Gas
Oil
Electric

How can we offset the 15-20% plant cost?

- Federal & State tax breaks
- Indiana incentives
  - SB 29 (2003): up to 3% point adder
  - HB 378: Investment Tax Credits against utility receipts tax for IGCCs
- Develop additional Revenue Streams
- Potential feedstock for chemical plants and by-products

CCTR research in 2005

#1 Assessment of the Quality of Indiana Coal for Integrated Gasification Combined Cycle Performance (IGCC).
-Phase 2 underway

#2 Factors that Affect the Design & Implementation of Clean Coal Technologies in Indiana.
-Further study under consideration

#3 Development of Coking/Coal Gasification Concept to Use Indiana Coal for the Production of Metallurgical Coke & Bulk Electric Power.
-Discussion of continued fully integrated study underway.

CCTR research for 2006

#4 The Impact of Environmental Legislation on the Competitiveness of Indiana Coal for New and Existing Facilities.

#5 Coal Transportation Infrastructure In and Around Indiana.
-Study funded by INDOT and possibly IEG.

#6 Reclaiming Coal Fines from the Settling Ponds of Indiana
-Comprehensive study under discussion

#7 The Obama-Lugar Barriers Study
-Study approved and currently underway

#8 Role for FutureGen and CCT in Indiana

#9 Carbon Policy and Strategic Planning for Indiana

Energy Policy Act of 2005 and the Obama-Lugar Amendment

- Three Universities (Southern Illinois University, Purdue University, and University of Kentucky) The "Coal Fuel Alliance", to ***"…evaluate the commercial and technical feasibility of advanced technologies to convert Illinois Basin coals into Fischer-Tropsch, (FT) and other transportation fuels"***
- $85M authorized for research and a test center from DOE
- DOD has immediate need for 400,000 bbls/day for their use

Obama-Lugar Amendment

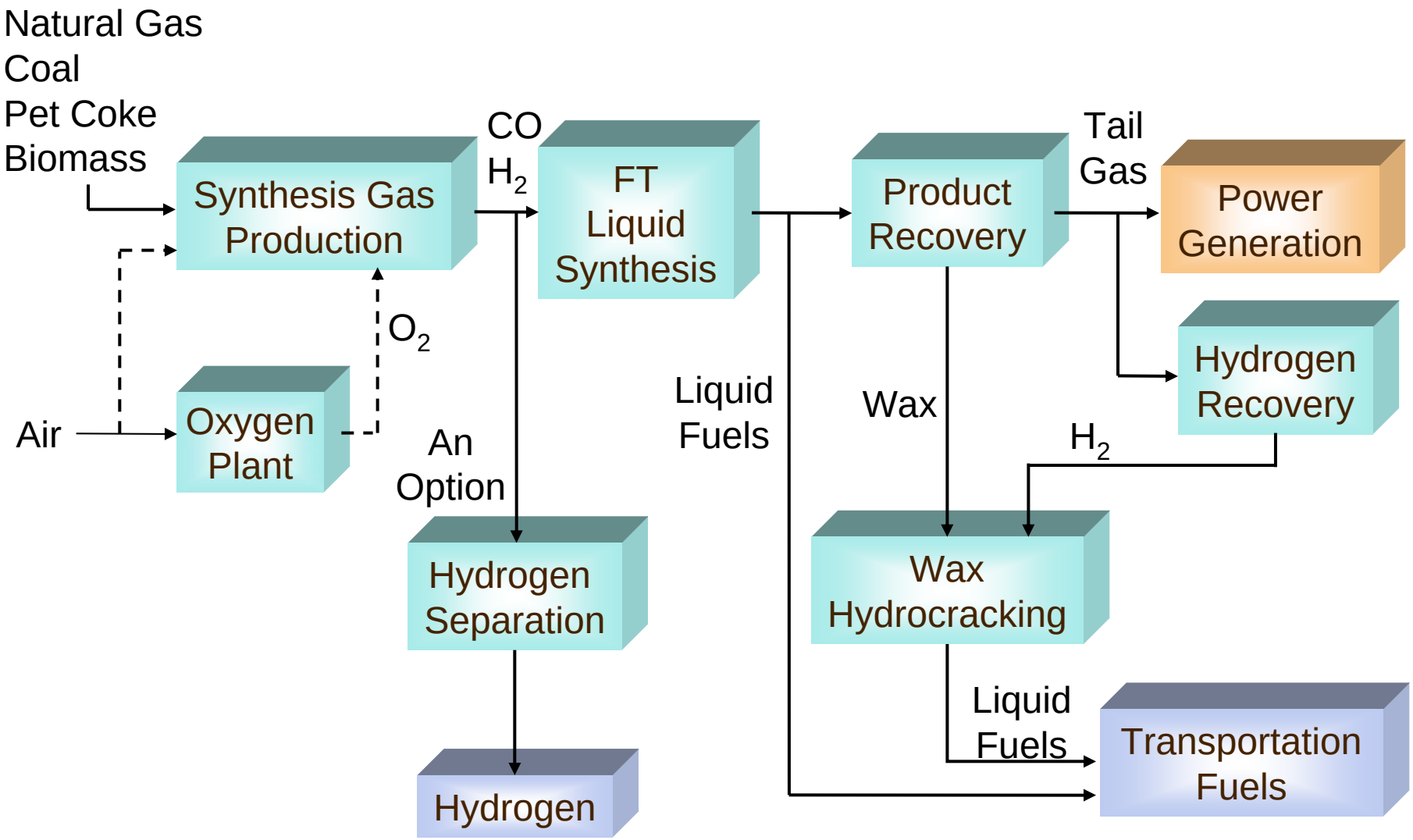
Less dependence on imported fuels, rising prices of fuel and the most abundant energy source in the U.S. - coal

Coal gasification and liquefaction – over 75 Purdue faculty with interest in working in coal related areas:

"….shall <u>construct a test center</u> to evaluate and confirm Liquid and gas products from syngas catalysis in order that the system has an output of at least 500 gallons of FT transportation fuels per day….."

- **Role for Wabash River (IN)** or GTI (IL)?
- Consider benefits of co-production at off-peak times

Fischer-Tropsch Fuel Technology
No Sulfur – Low NO_X – Reduced Particulate



Next Steps

Encouraging the use of clean coal technologies and the production of transportation fuels using Indiana coals will be supported:

1. Use coal's stable price to reduce fluctuations in liquid and gaseous fuel supply and thus price.
2. Use Indiana Coal as the answer to environmental problems of emission control rather than seeing it as the source of the problem.
3. Retain more of the energy capital expended by Indiana and the Midwest within the state. Local energy production has a great impact on regional economic growth.
4. Conduct the applied research and expand the expertise in the 4 major areas identified by the Coal Fuel Alliance.
   - (a) Gasification, Process Design, Implementation
   - (b) Environmental and Health issues
   - (c) Usage, Engines and Turbines
   - (d) Economics and Policy
5. Grow the academic infrastructure needed to supply the nation with the energy engineers/professionals of the near future.