Estimating the State and Regional Benefits of the Mining and Use of Illinois Basin Coals

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INDIANA COAL PRODUCTION

- Indiana mined 34.8 million tons of coal in 2007.
  Of this:

(a) 2.94 million tons were exported at an average price of $28.79/ton, a total export value of $84.8 million. Applying the Indiana coal mining multiplier of 1.959, the total amount of economic activity arising from the mining of this coal was $166 million.

(b) 29.8 million tons were converted into electricity in Indiana, resulting in the generation of an estimated 70e9 kwh, and sales of $4541 million. Applying the Indiana utility multiplier of 1.49, the total amount of economic activity arising from the use of coal was $6766 million.

INDIANA COAL PRODUCTION (continued)

(c) 2 million tons were used by Indiana industry, the bulk to generate or co-generate electricity. Using the same factors as in (b) above, except using the industrial rate to value the electricity, the total avoided cost was $232 million, and the total including the multiplier was $347 million.

TOTAL INDIANA PRODUCTION AND USE VALUES, AND RESERVES

- The total estimated amount of economic activity arising from the export and use of Indiana coal to generate electricity in Indiana including the multiplier effect was $7279 million, 3% of Indiana GSP.

- The total estimated amount of economic activity without the multiplier effect was $4858 million, 7% of Indiana GSP originating in manufacturing, utilities, agriculture, and mining.

- Indiana recoverable reserves are estimated to be 401 million tons.

ILLINOIS COAL PRODUCTION

- Illinois mined 34 million tons of coal in 2007.
  Of this:

(a) 26.7 million tons were exported at an average price of $33.60/ton, a total export value of $896 million. Applying the Illinois coal mining multiplier of 2.109, the total amount of economic activity arising from the mining of this coal was $1890 million.

(b) 4.16 million tons were converted into electricity in Illinois, resulting in the generation of 9.74e9 kwh, and sales of $824 million. Applying the Illinois utility multiplier of 1.57, the total amount of economic activity arising from the use of coal was $1294 million.

ILLINOIS COAL PRODUCTION (continued)

(c) 3.3 million tons were used by Illinois industry , the bulk to generate or co-generate electricity. Using the same factors as in (b) above, except using the industrial rate, rather than the average rate, the electricity avoided cost was $467 million. Using the Illinois multiplier of 1.57, the estimated total economic activity was $733 million.

TOTAL ILLINOIS PRODUCTION AND USE VALUES, AND RESERVES

- The total estimated amount of economic activity arising from the export and use of Illinois coal to generate electricity in Illinois including the multiplier effect was $3917 million, 0.6% of Illinois GSP.
- The total estimated amount of economic activity without the multiplier effect was $2187 million, 2.1% of Illinois GSP originating in manufacturing, utilities, agriculture, and mining.
- Illinois recoverable reserves are estimated to be 1286 million tons.

WESTERN KENTUCKY COAL PRODUCTION

- Western Kentucky mined 27.9 million tons of coal in 2007.

  Of this:

(a) 10.9 million tons were exported at an average price of $32.67/ton, an export value of $354 million. Applying the Kentucky coal mining multiplier of 2.095, the total amount of economic activity arising from the mining of this coal was $742 million.

(b) 16.92 million tons were converted into electricity in Kentucky, resulting in the generation of 39.7e9 kwh, and sales of $2317 million. Applying the Kentucky utility multiplier of 1.56, the total amount of economic activity arising from the use of coal was $3614 million.

WESTERN KENTUCKY COAL PRODUCTION (continued)

(c) 0.14 million tons were used by Kentucky industry, the bulk to generate or co-generate electricity. Using the same factors as in (b) above, except valuing the electricity at the average industrial rate, the avoided electricity cost was $13.8 million. Applying the multiplier results in a total economic activity amount of $21.5 million.

TOTAL WESTERN KENTUCKY PRODUCTION AND USE VALUES, AND RESERVES

- The total amount of economic activity arising from the mining and use of Western Kentucky coal to generate electricity in Kentucky including the multiplier effect was $4379 million, 2.9% of Kentucky GSP.
- The total amount of economic activity without the multiplier effect was $2685 million, 7.2% of Kentucky GSP originating in manufacturing, utilities, agriculture, and mining.
- Western Kentucky reserves are estimated to be 513 million tons.

TOTAL THREE-STATE PRODUCTION AND USE OF ILLINOIS BASIN COALS

- The three states mined 96.7 million tons of coal in 2007. Of this:

(a) 30.2 million tons were exported outside the three state region at an average price of $33/ton. Applying the three state coal mining multiplier of 2.30, the total amount of economic activity arising from the mining of this coal was $2292 million.

(b) 58.7 million tons were converted into electricity in the three states, resulting in the generation of 137.6e9 kwh, and sales of $8861 million. Applying the three state utility multiplier of 1.63 (4), the total amount of economic activity arising from the use of coal was $14,443 million.

TOTAL THREE-STATE PRODUCTION AND USE OF ILLINOIS BASIN COALS (continued)

(c) 6.8 million tons were used by industry in the three states, the bulk to generate or co-generate electricity. Using the same factors as in (b) above, except using industrial electricity prices, the total amount of economic activity was $1464 million.

TOTAL THREE-STATE ILLINOIS BASIN COAL PRODUCTION AND USE

- The total amount of economic activity arising from the export and use of Illinois Basin coal to generate electricity in the three states including the multiplier effect was $18199 million, 1.8% of the three-state GSP.

- The total amount of economic activity without the multiplier effect was $10,755 million, 5.1% of the three-state GSP originating in manufacturing, utilities, agriculture, and mining.

- Note that the total with the multipliers is 17% higher than the sum of each states individual totals primarily because of less leakage (larger multipliers) and within region exports to utilities valued at their electricity value, not their export value.

PRODUCTION, USE AND FLOWS – ILLINOIS BASIN (millions of tons)

State	Mined	Used in State	Exports	Imports	Reserves
Indiana	34.8	29.8 elec 2 ind	2.9 (2 to IL/KY)	38.8	401
Illinois	34	4.1 elec 3.3 ind	26.7 (6 to TN, 4.8 to IN, 3.5 to FL, 2.1 to OH, 1.4 to MO)	54.1	1,286
W. KY	27.9	16.9 elec 0.14 ind	10.9 (6 to FL, 2 to AL, 1 to SC, 0.6 to IL/KY)	NA	513
Combined	96.7	58.7 elec 6.8 ind	30.2	NA	2,200

Observations

- Production split roughly equally
- Indiana uses 92% of production within the state, exports 8% of production, imports 55% of demand
- Illinois uses 21% of production within the state, exports 78% of production, imports 88% of demand
- Western Kentucky uses 61% within the state, exports 39% of production
- Illinois has ~ 60% of reserves, Indiana 18%, Western Kentucky 22%
- Coal-by-wire a possibility for Illinois and Kentucky
- Import substitution a possibility for Indiana and Illinois

VALUE OF PRODUCTION AND USE – ILLINOIS BASIN (millions of dollars)

State	Export w/o mult	Export w/ mult	In-state elec gen w/o mult	In-state gen w/ mult	In-state ind use w/o mult	In-state ind use w/ mult	Total w/ mult
Indiana	85	166	4,541	6,766	232	347	7,279 (3% of GSP, 7% of Mfg/Util/Ag/Min)
Illinois	896	1,890	824	1,294	467	733	3,917 (0.6% of GSP, 2% of M/U/A/M)
W KY	354	742	2,317	3,614	14	22	4,379 (2.9% of GSP, 7.2% of M/U/A/M)
Combined	996	2,292	8,861	14,443	898	1,464	18,202 (1.8% of GSP, 5.1% of M/U/A/M)

Observations

- Combined is 17% higher than sum of three individual – higher multipliers, within region trade
- Mining and use a substantial part of IN and KY economies, IL less so because of size of IL economy (50% larger than sum of IN/KY)
- IN adds more in-state value because of in-state electricity generation use

WHAT WOULD HAPPEN IF:

(1) IB coals recaptured 77.78 million tons of Western coal now shipped into our region?

- Answer: Total economic activity including the multiplier effect of mining would increase by an estimated $5801 million, or 31% (neglects impact on FGD products, electricity price effects)

(2) IB Coal Use decreased by 37%(35 million tons) as a result of Lieberman/Warner cap and trade CO_2 legislation, as forecast in the ACCF/NAM study?

- Answer: Total economic activity including the multiplier effect of mining would decrease by an estimated $2626 million, or 14% (neglects impact on FGD products, electricity price effects)

EASTERN KENTUCKY APPALACHIA COAL PRODUCTION

- Eastern Kentucky mined 81.3 million tons of coal in 2007.

  Of this:

(a) 72.2 million tons were exported at an average price of $47.27/ton, an export value of $3413 million. Applying the Kentucky coal mining multiplier of 2.095 , the total amount of economic activity arising from the mining of this coal was $7150 million.

(b) 8.19 million tons were converted into electricity in Kentucky, resulting in the generation of 20.3e9 kwh, and sales of $1188 million. Applying the Kentucky utility multiplier of 1.56, the total amount of economic activity arising from the use of coal was $1855 million.

EASTERN KENTUCKY APPALACHIA COAL PRODUCTION (continued)

(c) 0.898 million tons were used by Kentucky industry, the bulk to generate or co-generate electricity. Using the same factors as in (b) above, except valuing the electricity at the average industrial rate, the avoided electricity cost was $91 million. Applying the multiplier results in a total economic activity amount of $143 million.

TOTAL EASTERN KENTUCKY PRODUCTION AND USE VALUE, AND RESERVES

- The total estimated amount of economic activity arising from the mining and use of Eastern Kentucky coal to generate electricity in Kentucky including the multiplier effect was $9149 million, 6% of Kentucky GSP.
- The total estimated amount of economic activity without the multiplier effect was $4692 million, 12.5% of Kentucky GSP originating in manufacturing, utilities, agriculture, and mining.
- Eastern Kentucky reserves are estimated to be 669 million tons.

COMBINED EAST AND WEST KENTUCKY IMPACT

- The sum of the two coal regions contribution to the Kentucky economy with the multipliers is estimated to be $13,528 million, 8.9% of Kentucky GSP.

- The sum without the multipliers is $7377 million, 19.7% of Kentucky GSP originating in manufacturing, utilities, agriculture, and mining.

IMPACT OF WESTERN KENTUCKY AND EASTERN KENTUCKY ON KENTUCKY ECONOMY (millions of tons)

Region	Mined	Used in State	Exports	Imports	Value w/o mult	Value w/ mult
W KY	27.9	16.9 elec 0.14 ind	10.9	NA	2,685	4,383
E KY	81.3	8.2 elec 0.9 ind	72	NA	4,700	9,149
Combined	109.2	25.1 elec 1 ind	83.1	16.7	7,385 (20% of M/U/A/M)	13,532 (9% of GSP)

Observations

- Coal is very important to Kentucky – 4 times bigger share of M/U/A/M than IB
- Major export product for Kentucky
- Coal-by-wire an obvious economic development candidate

USE OF FGD SYNTHETIC GYPSUM

- In Indiana, an estimated 1.2 million tons of synthetic gypsum was used to produce wallboard, valued at $555 million.
- In Illinois, an estimated 0.46 million tons were used to produce wallboard, valued at $233 million.
- In Western Kentucky, an estimated 0.92 million tons were used to produce wallboard valued at $197 million.
- These values are about 7% of the value of the mining and use of coal to generate electricity in the three state region.

F.T. SPARROW - DATA SOURCES

(1) “Domestic Coal Distribution 2007 by Origin State… Total," 2007, EIA

(2) Ref (1), total exported to other States, 2007, EIA

(3) “Average Open Market Sales Price of Coal by State and Coal Rank, 2007," EIA; state open market average assumed to hold for exports, since 83%, 90%, and near 100% of exports for Indiana, Illinois and Kentucky respectively are open market sales.

(4) “RIMS II Multipliers (2006), Table 2.5, Total Multipliers for Output…," by Individual State, and by three state aggregation, BEA, 2009

(5) Ref (1), Electricity Generation within State

(6) Estimate obtained by multiplying state coal tonnage used to generate electricity by the EIA average of 11,800 btu/lb for Illinois Basin Coals (“Coal News and Markets," EIA, June 8, 2009) and dividing by 10,067 btu/kwh, the average heat rate of generating units burning Illinois Basin coals in Indiana (FERC forms 1 and 767)

(7) Estimate obtained by multiplying the kwh from (6) by state average retail price in “Average Retail Price for Bundled and Unbundled Consumers by Sector, Census Division, and State,” EIA, 2007

(8) Ref (1), industrial use within State

(9) “Gross Domestic Product by State-2007," BEA Regional Economic Accounts, Interactive tables, 2007. It is incorrect to express total economic activity including the multipliers as a % of value originating in Mfg/Util/Ag/Mining, since multipliers include the effect on all sectors, not just these four

(10) This is 25% less than the 40 million ton total of individual state exports because much of the individual state exports go to the other states within the Illinois basin

(11) This is the export tonnage weighted average of the average open market price of coal delivered in the three states

(12) This is 10% more than the 54 million ton total of individual state utility use because much of the individual state exports go to other states within the Illinois basin for electricity generation

(13) Estimate obtained using method described in (6) above

(14) Estimate obtained by multiplying kwh from (13) by the kwh weighted three state average retail price from source cited in (7) above

(15) This is 25% more than the 5.4 million ton total of individual state industrial use because much of the individual state exports for industrial use go to other states within the Illinois basin

(16) Results of a phone survey of Indiana utilities in 2007 cited in Shaffer, N.R. and, Sadowski, R.," Indiana Limestones and Dolomites for Flue Gas Desulfurization,” in press, Indiana Geological Survey

(17) Estimate obtained by assuming calcination reduces weight by 85% (assumes ¾ of water driven off during calcining; “Mineral Facts and Problems,” U.S. Bureau of Mines, 1985), 70% of the weight of wallboard is calcined gypsum (“Material Safety Data Sheet- Wallboard,” and the average price of ½ inch wallboard is $176/ton (United States Geological Survey Minerals Yearbook-Gypsum, Table 5, 2006)

(18) Estimate based on ACAA 2007 Coal Combustion Product survey which showed that 8.254 million tons of FGD gypsum were used to produce Gypsum panel Products in the US in 18 plants, 2 each in Indiana and Kentucky, and one in Illinois (Mike McDonald ACAA presentation), and then assuming all plants had the same capacity, which resulted in an estimate of .917 million tons produced for Indiana and Kentucky, and .458 million tons for Illinois. The .917 million ton estimate for Indiana is 20% lower than the survey estimate for Indiana reported in (16) above

(19) “Domestic Coal Distribution 2007 by Destination State” EIA

(20) Economic Impact of the Lieberman/Warner Legislation, ACCF/NAM study released March 13, 2008

(21) Recoverable Coal Reserves and Average Recovery Percentage by State, 2007," EIA