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Economic Impacts of Potential Illinois Climate Change Initiatives: Evidence from MIT and Penn State Analyses

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Introduction

Governor Blagojevich has proposed an independent approach for reducing emissions of greenhouse gases in Illinois that could result in billions of dollars of reduced annual economic output and tens of thousands of job losses, based on recent studies of greenhouse gas control options by Penn State University and MIT.

The Illinois Climate Change Advisory Group (CCAG) is charged with developing strategies to meet Governor Blagojevich's proposal to reduce Illinois greenhouse gas emissions to 1990 levels by 2020, with a further 60% reduction below 1990 emissions by 2050. The CCAG will deliver its recommendations on control strategies in July. A controversial element of the recommendations may call for Illinois to impose a CO₂ cap-and-trade program on Illinois electric generators, similar to national cap-and-trade proposals now before Congress. Other proposals may impose stringent CO₂ emission limits on new plants and on power imported from other states.

Illinois is a major coal producing and consuming state, with more than 10% of the nation's recoverable coal reserves. In 2007, coal will supply 49% of Illinois's electric generation. Illinois's electric generation plants provide more than 5% of the nation's electricity, supplying energy to local customers and to the highly competitive PJM market stretching from Illinois to New Jersey.

U.S. EPA projects a 50% increase in Midwestern coal demand over the next two decades, due to new plant investments and widespread construction of scrubbers to reduce sulfur dioxide emissions.¹ More than 10,000 megawatts of new electric generating plants are planned for southern Illinois, representing enough coal demand to reverse most of the market and job losses that Illinois suffered as a result of the 1990 acid rain program. The UMWA supports many of the energy efficiency and conservation programs under consideration by the Illinois CCAG. However, we are concerned that rigid state limits on CO₂ emissions would stifle much of the clean energy growth projected for southern Illinois, shifting investments, jobs and emissions to adjacent states such as Missouri, Kentucky, and Indiana.

¹ U.S. EPA, Final Regulatory Impact Analysis of the Clean Air Interstate Rule (2005), Table 7-7.

Executive Summary

A stand-alone greenhouse gas control program could injure the competitiveness of Illinois's industrial base by raising energy costs above those of competing states, and penalizing new clean energy development in southern Illinois. Economic research indicates that Illinois's economy would suffer as a consequence of higher prices for energy and other consumer goods, and reduced employment and economic growth. Most of these impacts would result from the reduced utilization of coal for electric generation.

This paper uses two recent studies of the economic impacts of greenhouse gas controls – one prepared by MIT² and one by Penn State University³ – to estimate the economic impacts on the Illinois economy of potential greenhouse gas control policies.

These two studies used different approaches to estimate the costs of climate change initiatives. Penn State used an input-output model to measure the direct and indirect impacts on individual state economies of reducing coal use – a principal means to achieve near-term reductions of carbon dioxide emissions. Penn State took into account the positive offsetting employment and output benefits of investments in alternative energy supplies such as renewables and natural gas.

The April 2007 MIT analysis employed a general equilibrium model of the U.S. economy to estimate the costs of achieving economy-wide greenhouse gas reductions based on several climate bills before the U.S. Congress. The emission reduction targets MIT analyzed include proposals very similar to Governor Blagojevich's climate change plan.

Penn State found that states such as Illinois that rely on coal for a substantial portion of electric generation, and that also produce major quantities of coal, obtain significant benefits from the availability of low-cost and reliable electricity. In 2015, coal generation is projected to

² S. Paltsev *et al.*, "Assessment of U.S. Cap-and-Trade Proposals," (MIT Joint Program on the Science and Policy of Global Change, Report No. 146, April 2007). Available on the web at: web.mit.edu/globalchange/www/MITJPSPGC_Rpt146.pdf

³ Adam Z. Rose, Ph.D. and Dan Wei, "The Economic Impacts of Coal Utilization and Displacement in the Continental United States, 2015" (The Pennsylvania State University, July 2006.)

increase Illinois’s economic output by \$66 billion, while creating \$25 billion in personal income and adding 328,000 jobs.

Penn State’s findings for the net economic impacts of reducing the use of coal for electric generation in Illinois by -33% and -66% in 2015 are summarized below. A 33% displacement of coal generation could be expected with an aggressive emission reduction target taking effect after 2015, due to the likelihood that generators would reduce CO2 emissions early in order to “bank” reductions for use in later years. The Penn State estimates shown here are based on the average of alternative low and high-energy price projections.

Potential Impacts of Electric Utility Carbon Dioxide Limitations on Illinois Output, Household Income and Jobs, 2015

	-33% Coal Displacement	-66% Coal Displacement
State output (\$2005 Bil.)	-\$14.5	-\$31.0
H’hold income (\$2005 Bil.)	-\$6.0	-\$12.8
Jobs	-73,000	-156,200

Source: Penn State University (see fn. 3).

MIT’s macroeconomic study for the U.S. economy examined the impacts of alternative climate change bills before Congress, assuming a nationwide emissions trading program. MIT’s findings for Illinois are summarized below, based on a pro rata (4.5%) allocation of Illinois’s GDP as a fraction of U.S. GDP in 2005:

Potential Impacts on Illinois GDP of Greenhouse Gas Emission Limitations Analyzed by MIT (Billions of 2005 \$)

MIT Case	2015	2025	2050
1 (“Bingaman”)	-\$1.7	-\$5.7	-\$5.6
2 (“Lieberman-McCain”)	-\$3.8	-\$7.0	-\$9.5
3 (“Sanders-Boxer”)	-\$5.1	-\$4.1	-\$18.1

Source: Derived from MIT (see fn. 2).

MIT's GDP estimates cover a range of increasingly stringent greenhouse gas control proposals. The "Bingaman" case imposes a growth cap on greenhouse emissions, but does not include Bingaman's proposed emission allowance safety valve price cap. The "Lieberman-McCain" and "Sanders-Boxer" proposals each require U.S. emissions to return to 1990 levels by 2020, and then to achieve 60% and 80% reductions below 1990 levels by 2050, respectively. The Lieberman-McCain proposal is similar to Governor Blagojevich's proposed climate targets for Illinois.

The MIT and Penn State findings underscore the importance to Illinois of engaging the climate change issue through national legislation, rather than stand-alone state policies. Illinois' manufacturing and agricultural sectors compete both domestically and internationally, and its electric sector is a mainstay of low-cost energy production in the Midwest. Illinois' political leaders should insist upon a level playing field for all states, in the framework of national legislation that includes significant incentives for the participation of major developing nations.

The impact of higher electric generation costs on Illinois' ability to compete in restructured interstate electric markets is a major uncertainty requiring careful evaluation by Illinois policymakers. A central premise of utility restructuring is an expectation of consumer cost savings through competition. Imposing major new regulatory costs on Illinois generators that are not shared by adjacent states would reduce Illinois generation and net exports, likely leading to additional new rate burdens for Illinois consumers and a geographic shift of emissions to nearby states. The UMWA recommends that the University of Illinois and Southern Illinois University be authorized by the General Assembly to undertake a joint evaluation of the potential impacts of the Governor's climate change plans on energy development in southern Illinois, and on Illinois utility compliance costs, consumer rates, and competitiveness in the restructured utility market.

Penn State Research

A July 2006 study by Professor Adam Rose and Dan Wei of Penn State University, "The Economic Impacts of Coal Utilization and Displacement in the Continental United States," estimates the state-specific costs of displacing coal-based electric generation through climate change or similar state legislation. The Penn State study estimates specific economic

and job impacts for Illinois if state climate policies required utilities to reduce their utilization of coal in favor of renewable energy or natural gas generation.

Coal-generated electricity is among the lowest-cost power produced in Illinois. In 2005, Illinois produced 32 million tons of coal, or 3% of U.S. coal production. Electric utilities in Illinois relied on coal to supply 56% of their total generation in 2005.⁴ Industrial electric rates, a critical attraction to energy-intensive manufacturing and processing industries in Illinois, averaged 6.7 cents per kilowatt-hour in February 2007, or 8% above the national average rate of 6.2 cents/kwh.

The Penn State research found that states such as Illinois that rely on coal for a substantial portion of electric generation, and that also produce major quantities of coal, obtain significant benefits from the availability of low-cost and reliable electricity. In 2015, coal generation is projected to increase Illinois's economic output by \$66 billion, while creating \$25 billion in personal income and adding 328,000 jobs.

Penn State simulated cases where alternative energy supplies (including natural gas, nuclear, and a 10 percent mix of renewables) displace coal-based electricity generation at levels of 66 percent and 33 percent. The two displacement scenarios were calculated using low, high, and average projections for the costs of alternative energy supplies. These levels of coal displacement could be anticipated if Illinois adopted carbon dioxide restrictions, such as a cap-and-trade program, on Illinois electric utilities. The findings take into account the positive offsetting benefits of alternative investments in natural gas and renewable energy sources, such as wind and biomass.

The following table estimates the economic and job impacts of reducing Illinois's coal-based electric generation by 33% and 66% by the year 2015. These estimates are based on the average of Penn State's results for its low and high energy price scenarios.

⁴ Energy Information Administration, State Energy Profile – Illinois (2007).

Potential Impacts of Electric Utility Carbon Dioxide Limitations
on Illinois Output, Household Income and Jobs, 2015

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Source: Penn State University (see fn. 3)

The magnitude of these estimates reflects the importance of coal-based generation to Illinois's economy. More than \$14 billion of annual state economic output could be lost as a consequence of shifting one-third of coal-based generation to higher-cost forms of electric generation. At the higher 66% displacement level, Illinois would stand to lose \$31 billion of projected annual economic output. Household income loss estimates for the two displacement scenarios range from \$6 billion to nearly \$13 billion, with potential employment losses ranging from 73,000 to 156,000 jobs.

The key alternative energy price variable underlying Penn State's calculations is the price of natural gas used in lieu of coal. Penn State used low and high estimates for the price of natural gas. In the 33% displacement scenario, Penn State assumed that the delivered price of natural gas in 2015 would range from \$5 per mcf (low case) to \$9 per mcf (high case). In the 66% displacement case, natural gas prices were projected to range from \$6 to \$10 per mcf. The current wellhead price of natural gas is approximately \$8 per mcf. Penn State's estimates, using an average of the low and high energy price cases, are likely conservative.

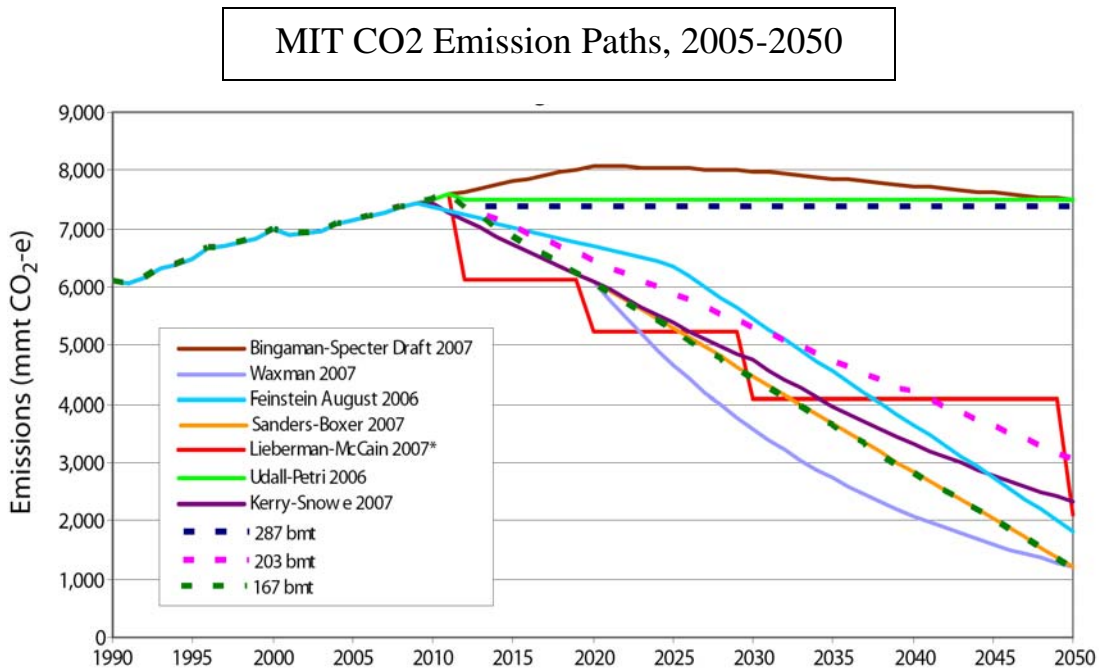
MIT's 2007 Cap-and-Trade Analysis

An April 2007 report from the MIT Joint Program on the Science and Policy of Global Change analyzes the economic impacts of all major greenhouse gas cap-and-trade bills before the U.S. Congress. The MIT study groups these bills into three cases, based on the cumulative number of carbon dioxide-equivalent (CO₂e) emission allowances issued from 2010 to

2050. An emission allowance confers the right to emit one ton of CO₂. The cumulative emissions allowed by MIT's three cases are 167, 203 and 287 billion metric tons.

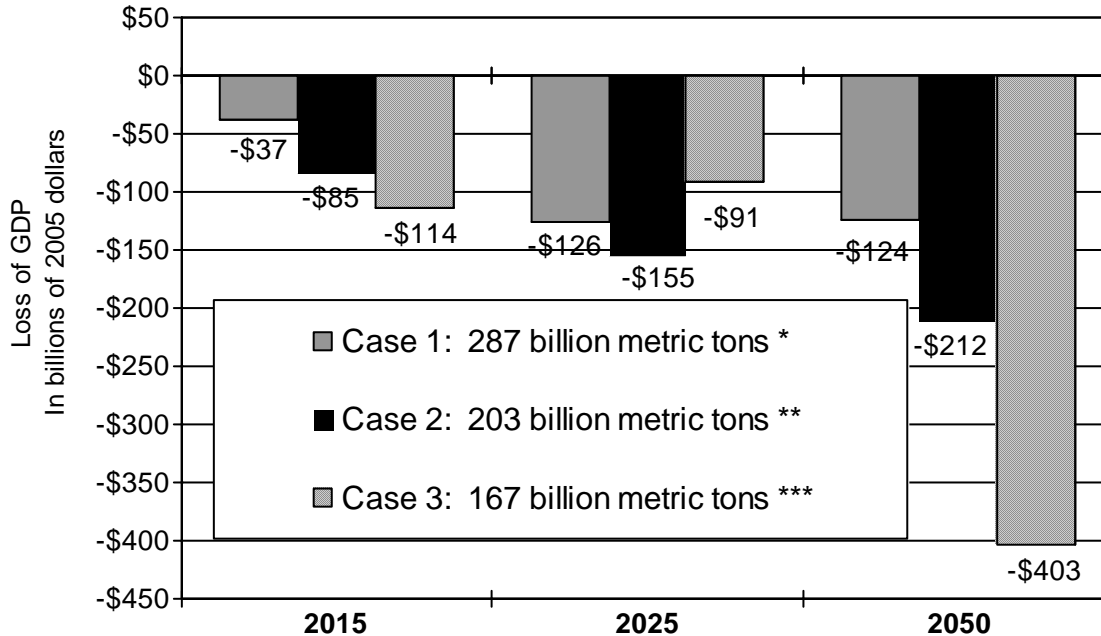
The MIT report offers the first systematic evaluation of the potential effects of alternative cap-and-trade programs on the U.S. economy. Using a general equilibrium model, it finds that bills such as those introduced by Senators Sanders and Boxer (equivalent to Case 3, 167 billion tons of CO₂) and Lieberman-McCain (equivalent to Case 2, 203 billion tons of CO₂) would inflict severe harm on U.S. GDP and would cause sharp energy price increases. MIT found that the Boxer bill and similar measures would increase the price of gasoline at the pump by \$2 per gallon by 2050.

The national carbon dioxide emission paths of MIT's three cases are shown in dashed lines on the chart below, along with several proposed Congressional climate change bills. The "stairstep" reductions of the Lieberman-McCain bill are roughly comparable to Governor Blagojevich's climate targets for Illinois, and to MIT's Case 2:



The projected impacts of MIT's three cases on U.S. GDP are summarized below:

Potential U.S. GDP Losses Due to Greenhouse Gas Emission Limits (Bil. 2005 \$)



*Similar to Bingaman January 2007 proposal (w/o safety valve price cap).

** Similar to Lieberman-McCain bill and to Gov. Blagojevich's proposal.

*** Similar to Sanders-Boxer bill.

In 2005, Illinois's Gross Domestic Product was \$560 billion, or 4.5% of our national GDP of \$12.4 trillion.⁵ Assuming that Illinois maintains this share of domestic output through the MIT forecast period, the following potential impacts on the Illinois economy can be inferred:

Potential Impacts on Illinois GDP of Greenhouse Gas Emission Limitations Analyzed by MIT (Billions of 2005 \$)

MIT Case	2015	2025	2050
1 ("Bingaman")	-\$1.7	-\$5.7	-\$5.6
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Source: Derived from MIT (see fn. 2).

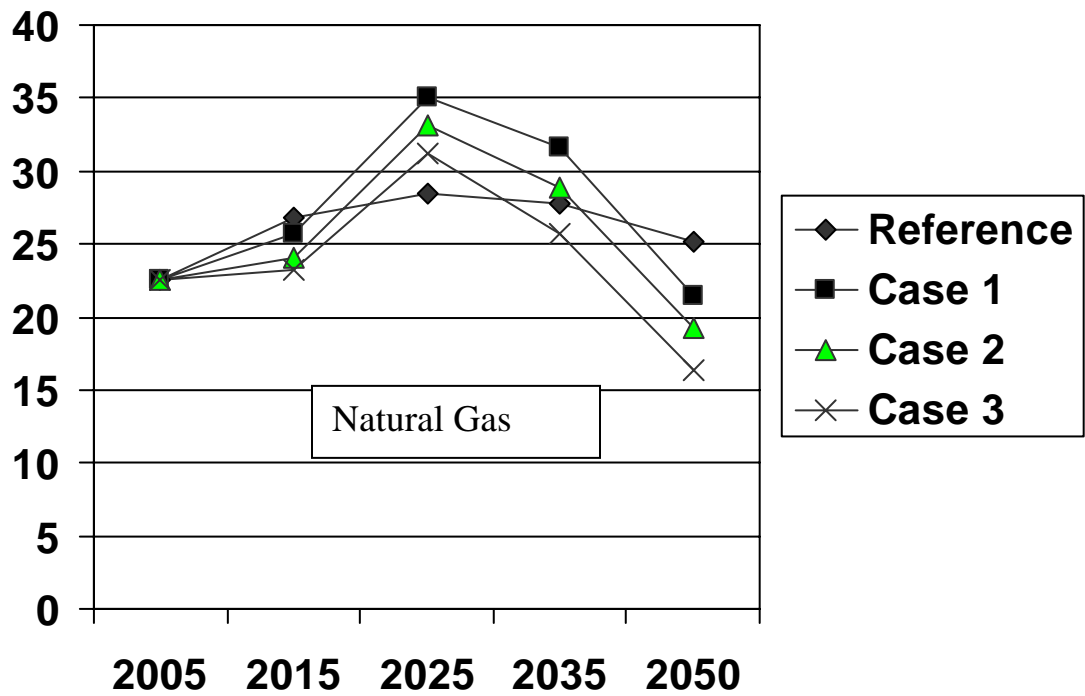
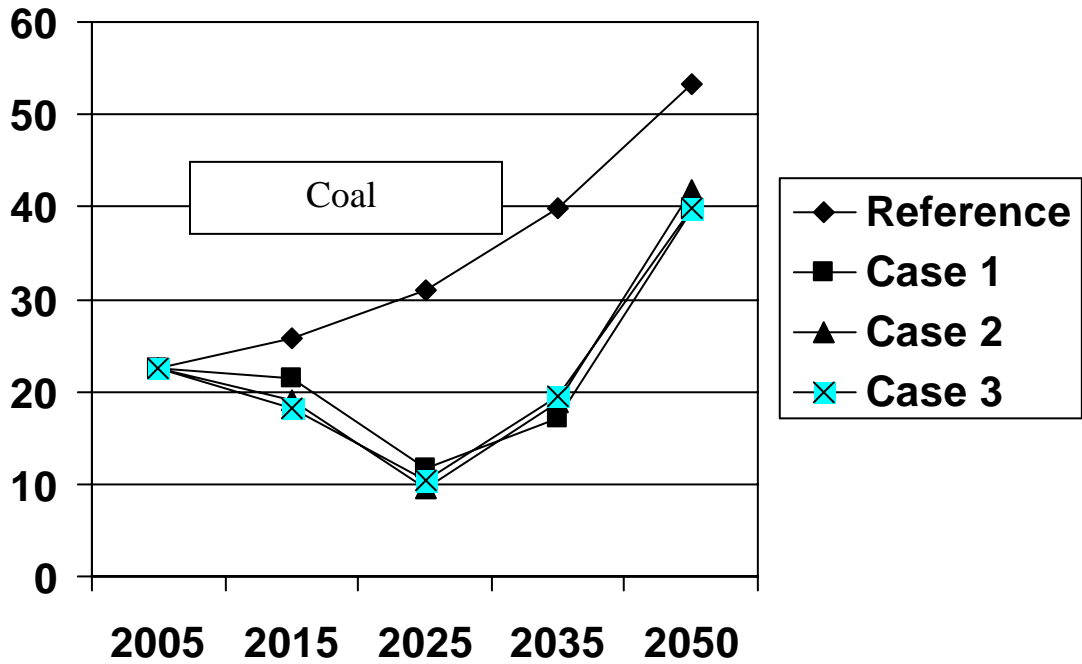
⁵ U.S. Department of Commerce, Bureau of Economic Analysis, Gross Domestic Product by State 2005 (May 2007).

MIT's GDP impact estimates, assuming a national emissions trading program, are less than Penn State's findings. The \$7.0 billion Illinois GDP loss estimate in MIT's 2025 Case 2 projection – similar to Governor Blagojevich's climate change targets – is roughly one-half of Penn State's \$14.5 billion gross state output loss estimate for the 33% coal displacement scenario in 2015. Part of the difference between the findings of these two studies can be attributed to MIT's assumptions of a national emission trading market, and the participation of major developing countries in a global emission reduction commitment.

In MIT's analysis, significant coal displacements occur in the 2020-2030 timeframe, before carbon capture and sequestration (CCS) technologies are assumed to be deployed on a wide scale. In all three of the carbon cap-and-trade cases, as shown by the charts on the next page, coal utilization declines by more than 50% from 2005 to 2025, and then recovers by 2050 due to the availability of CCS technologies. Initially, natural gas provides most of the alternative energy to replace coal. Later, as both oil and gas supplies dwindle and prices rise dramatically, biomass liquids replace large quantities of natural gas and petroleum.

MIT's energy utilization findings show that the timing of initial emission reductions is the critical factor for maintaining coal use until CCS technologies are available. Short-term targets, such as reducing to 1990 levels by 2020, adversely impact coal use because there are no effective control technologies capable of major emission reductions other than fuel substitution. Energy efficiency and conservation programs, while capable of reducing electric demand, are not sufficiently reliable to support compliance with legally binding emission caps.

U.S. Coal and Natural Gas Utilization, MIT Reference Case
and Alternative CO2 Caps, 2005-2050
(In Exajoules/Quadrillion BTUs)



Source: MIT, Appendix C.

Discussion

The MIT and Penn State findings reflect differences in modeling approaches and assumptions. A key difference is MIT's assumption of a national emissions trading program that reduces overall program costs for Illinois. Penn State's economic impact estimates, in contrast, are more consistent with "stand-alone" state policies such as those under consideration in Illinois.

Another key difference between the MIT and Penn State analyses is MIT's assumption that developing countries will participate in a global emissions control program by 2025. Participation by India, China and other major developing nations reduces world energy prices due to reduced oil demand. It also opens up additional low-cost markets for emissions offsets, reducing the costs of U.S. compliance.

These differences underscore the importance to Illinois of engaging the climate change issue through national legislation, rather than stand-alone state policies. Illinois goods compete both domestically and internationally, and its electric sector is a mainstay of low-cost energy production in the Midwest. Illinois' political leaders should insist upon a level playing field for all states, in the framework of national legislation that includes significant incentives for the participation of major developing nations.

The impact of higher electric generation costs on Illinois' ability to compete in restructured interstate electric markets is a major uncertainty requiring careful evaluation by Illinois policymakers. A central premise of utility restructuring is an expectation of consumer cost savings through competition. Imposing major new regulatory costs on Illinois generators that are not shared by adjacent states would reduce Illinois generation and net exports, likely leading to additional new rate burdens for Illinois consumers and a geographic shift of emissions to nearby states. The UMWA recommends that the University of Illinois and Southern Illinois University be authorized by the General Assembly to undertake a joint evaluation of the potential impacts of the Governor's climate change plans on energy development in southern Illinois, and on Illinois utility compliance costs, consumer rates, and competitiveness in the restructured utility market.