

The Illinois Budget Policy **TOOLBOX**



Tools to Address Revenue

A Permit Trading Program for Carbon Dioxide (Cap and Trade)

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The IGPA's Budget Policy Toolbox contains analyses of the Illinois income tax, sales tax, and other standard sources of revenue. Here is a different idea. Since taxing anything decreases the incentive to participate in that activity, and since Illinois may need to tax something to generate state revenue, then perhaps the state could tax "bad" economic activity like polluting emissions instead of "good" economic activity, like labor earnings and investment.

A tax on polluting emissions could help the state generate revenue while reducing acid rain, ozone formation, and consequent health problems in Illinois. Some pollutants are currently controlled by permit trading programs that do not raise any revenue. Here, we discuss a revenue-generating permit trading program for carbon dioxide (CO₂), a greenhouse gas (GHG) that contributes to climate change.¹

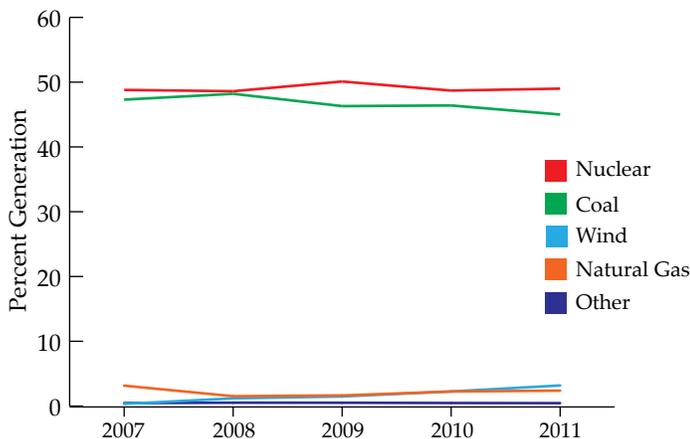
This "cap-and-trade" program has the potential to raise significant revenue because almost half of electricity generated in Illinois is from coal-fired power plants

¹This paper draws on Fullerton, Don and Karney, Daniel H., (2014). Cap-and-trade for Illinois? *The Illinois Report 2014*. You can also see that paper for more background on California's AB-32 and more detail on calculations for Illinois.

(See Figure 1). We calculate that permit auctions could raise \$1 billion to \$4 billion per year, with a reasonable estimate of \$2 billion in the initial years. Figure 2 shows that this \$2 billion would balance the budget in FY2015, and fill almost half of the projected deficits for fiscal years 2016-2018. This program could also reduce the level of CO₂ being emitted, thus contributing to climate change relief.

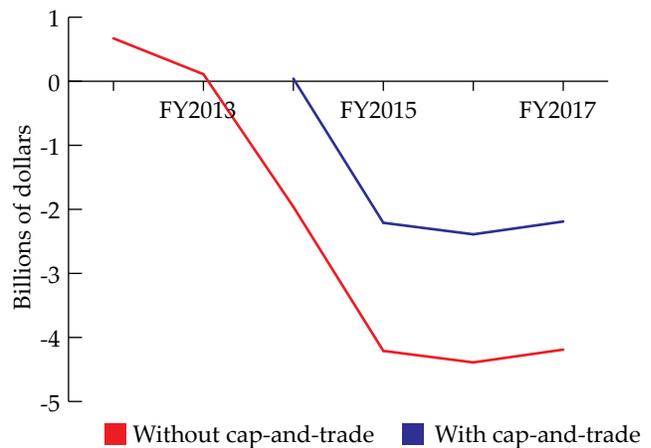
We use California's cap-and-trade program (called AB-32) as a model that Illinois could follow. We describe that program, calculate revenue for Illinois, and discuss economic and distributional effects. While the electricity generating companies would pay the state for the carbon emissions, our analysis shows that the true economic burden for such a program would likely be shifted through higher prices, lower wages, or lower rates of return. Conventional wisdom holds that most of the economic burden of such a program falls on electric utility customers and on workers in industries covered by the cap. In contrast, we show that most of the economic incidence of an Illinois cap-and-trade policy would fall on out-of-state stockholders of publicly traded electric utilities. Therefore, under a cap-and-trade policy such as the one described below, Illinois citizens could benefit with higher state revenue, while people and businesses outside the state would bear most of the cost through effects on their corporate stock prices.

Figure 1: Percent Electricity Generation by Fuel Type in Illinois by Year



Notes: Calculations include generation from independent power producers and electric utilities only.

Figure 2: State of Illinois Five-Year Projections: General Funds Operating Surplus (Deficit) with and without Cap-and-Trade Revenue (2013 dollars)



Notes: State of Illinois five-year budget projections from IIFS (2013). Potential cap-and-trade revenue based on \$10 per metric ton CO₂ permit price for all fixed-point sources with emissions larger than 25,000 metric tons CO₂ annually and transportation fuels, totaling \$2.0 billion annually (starting 2015).

How cap-and-trade works—California’s AB-32

The goal of California’s law AB-32 is to return the state to 1990 levels of greenhouse gas emissions by 2020. This program has two basic elements. The “cap” sets a limit on total GHG emissions statewide. The “trade” part of the program allows buying and selling of permits, where the fixed number of permits enforces the cap. Legislative rules specify which emission sources are covered by the cap. AB-32’s cap covers all fixed-point smokestack sources that emit more than 25,000 metric tons of CO₂ (MTCO₂) annually. The California law covers approximately 600 of these sources, such as electric utility power plants.

California uses the 25,000 MTCO₂ per year threshold because the U.S. Environmental Protection Agency (EPA) already requires fixed-point sources above that threshold to report their emissions under the GHG Reporting Program. According to 2011 EPA data, Illinois has 216 fixed-point, industrial plants that emit more than 25,000 MTCO₂, and the majority of these emissions are from electric utilities’ power plants. In addition, if Illinois follows the AB-32 model, then the cap would cover transportation fuel used in mobile emission sources such as trucks and cars. Since the cost of technology to measure emissions from millions of mobile sources is prohibitive, the cap instead applies to transportation fuel directly at the distributor level.

In order to enforce the cap, the state issues “permits,” each of which allows the bearer to emit one metric ton of CO₂. In the first year of a cap-and-trade program, the cap can be set just below the projected business-as-usual emission level in the absence of the program.

The cap then tightens over time, decreasing overall emissions.

Supply and demand determine the trading market price of a permit. The supply of available permits rises when businesses can forgo emitting CO₂ or other GHGs because they’ve taken steps to reduce emissions. Abatement methods could include: (1) capital improvements that increase fuel efficiency, (2) switching from high-carbon to low-carbon fuels, and (3) carbon capture and storage (CCS) technology, such as the FutureGen project here in Illinois.

The demand for permits comes from the desire to emit GHGs in the production of goods or services, like electricity. Thus, the market price of a permit is the value of emitting one unit of CO₂, which in equilibrium is expected to reflect the cost of abating one unit of CO₂. The market mechanism encourages businesses to undertake low-cost abatement opportunities in order to sell excess permits. It also means that producers of high-value commodities and services can continue to operate, even if abatement is costly.

A carbon tax is another mechanism that can be used to reduce GHG emissions and to raise revenue. With no uncertainty about either the supply or the demand for permits, a carbon tax and cap-and-trade program would yield identical outcomes. With uncertainty,

Table 1: Initial Year Estimates of Revenue from a Cap-and-Trade Program in Illinois under Full Permit Auctioning (2013 dollars)

Scenario	Permit Price (\$/metric ton)	Emissions Reduction (percent)	Fixed-Point Revenue (\$ billion)	Mobile-Source Revenue (\$ billion)	Total Revenue (\$ billion)
1	5	1.0	0.69	0.33	1.02
2	10	2.0	1.37	0.66	2.03
3	20	4.0	2.69	1.29	3.97

Notes: All figures are subject to independent rounding. Assumptions: (a) Baseline fixed-point source emissions are 140 million MTCO₂; (b) Baseline mobile-source emissions are 67 million MTCO₂; (c) Emission reduction percentages are directly proportional to the permit price, where each \$5 of permit price results in a 1.0 percent emission reduction.

however, a cap-and-trade program has the advantage of setting an upper-bound on total amount of GHG emissions. Thus, when the cap is tightened over time, a cap-and-trade program guarantees a reduction in total GHG emissions. Alternatively, command-and-control (CAC) regimes can also reduce GHG emissions, simply by requiring how abatement must be achieved by each plant. These CAC policies do not use market incentives and so can be inefficient, leading to a higher social cost per unit of GHG reduction. And they do not raise revenue.

Possible revenue for Illinois

To get started, the state must choose an initial allocation of permits. Even for cap-and-trade, governments often choose to “grandfather” businesses in covered industries, handing out valuable permits for free (based on past GHG emissions and prorated so that the total number of permits matches the cap). This method generates no revenue. Instead, polluting businesses effectively receive a lump-sum payment for past GHG emissions.

Alternatively, the state could sell the permits at an auction, raising revenue to bolster the state’s treasury. California’s AB-32 currently uses a mix of grandfathering and auction methods, but over time it will shift mainly to auctioned permits. In the first year alone, California has raised more than \$500 million from permit auctions, with a price slightly above \$10 per MTCO₂. Although the two methods have different initial permit allocations, permit trading can lead to identical production and abatement outcomes. The difference comes down to whether the state raises revenue with an auction or businesses are given valuable permits for free.

How much revenue could a cap-and-trade program

raise? Assuming that an Illinois program would be similar to AB-32 but auction all the permits, we expect such a program to generate approximately \$2 billion annually in the initial years. AB-32 requires a 2 percent annual emissions reduction in the initial years, and the permit auctions for those years cleared about \$10 per permit. We therefore assume that Illinois also could achieve 1 percent emissions reduction for each \$5 increment in the permit price: That is, a \$10 per metric ton price could yield a 2 percent reduction, while a \$20 per metric ton price could result in a 4 percent reduction in GHG emissions. Then the total revenue is calculated by multiplying the permit price by the total emissions permissible under the cap.

Table 1 presents three different initial-year estimates of revenue. First, note that the 216 industrial plants in Illinois with annual emissions greater than 25,000 MTCO₂ emit about 140 million MTCO₂ in total per year.¹ In the first row of Table 1, we apply a 1 percent reduction to these fixed-point emissions and multiply by \$5 per permit, yielding an estimated \$693 million of revenue. Transportation in Illinois emits about 67 million MTCO₂ annually.² We apply the 1 percent reduction to these mobile-source emissions and multiply by \$5 per metric ton to calculate additional revenue is \$331 million. The estimated total is \$1.02 billion, but actual outcomes depend on many factors, including the percentage of permits auctioned, the tightness of the cap, and economic growth in covered industries.

The second row of Table 1 presents the case similar to California with a \$10 permit price and a 2 percent reduction in emissions. For Illinois, revenue then is estimated to be \$2 billion per year. A \$20 permit price

¹Data retrieved from www.ghgdata.epa.gov (September 2013).

²Data retrieved from http://www.eia.gov/environment/emissions/state/state_emissions.cfm (September 2013).

with a 4 percent emissions reduction would yield almost \$4 billion.

If a cap-and-trade program continues long term, then real revenue after accounting for inflation can rise or fall depending on (1) changes in the economy toward low-carbon industries, (2) interactions with other federal or state programs to reduce GHG emissions, and (3) technological change – whether or not induced by the cap-and-trade.

Economic incidence and distributional effects

A cap-and-trade program like the one in California puts the statutory burden on producers that emit greenhouse gases and on distributors of transportation fuels. A coal-fired power plant's operator must purchase a permit for each metric ton of CO₂ that the plant releases. Because of changes in behavior and changes in prices, however, others could bear the economic burden – through higher prices of carbon-intensive products like electricity, changes in the wage rate at covered industries, and capitalization of higher costs of production into stock prices.

First, much of the higher production cost might be passed to consumers through higher electricity prices. Since low-income families spend a large portion of income on necessities like electricity, a cap-and-trade program that leads to higher electricity prices could have a regressive burden. But contrary to the conventional wisdom, a cap-and-trade program in Illinois would probably not increase electricity rates significantly. Wholesale markets determine the electricity price for those customers, so those rates depend upon the cost of production at the last power plant that comes online. In Illinois, the carbon-intensive coal-fired power plants are used earlier in the dispatch order. Instead, the relatively low-carbon natural gas plants are the last ones to come online and effectively set the price. Per unit of electricity, natural gas-fired power plants are approximately 60 percent less carbon-intensive than coal-fired power plants. So a cap-and-trade program leads to a relatively small cost increase at natural gas plants that set the electricity price.

If natural gas plants effectively set the price, just breaking even, then the market price of electricity may be too low to cover the higher cost of producing electricity in carbon-intensive coal-fired plants. Seventeen of the 20 coal-fired power plants in Illinois with annual emissions above the 25,000 MTCO₂ threshold are owned by publicly-traded companies. Furthermore, these 17 plants account for 62 percent

of annual fixed-point emissions from sources above the reporting threshold in Illinois. As a consequence, the nationwide stockholders of those firms may take a loss.

Another potential distributional effect could be on the wages and job security of workers at electric utilities and coal mines. But the economic burden via this path also is probably smaller than generally thought. Power plants are long-term investments that are difficult to replace in the short-run. A cap-and-trade program might encourage a somewhat earlier retirement of coal-fired power plants, to be replaced by gas-fired power plants, and workers can gradually move from old to new generation facilities. For coal miners, the effects will be small because coal will still be demanded by power plants in Illinois as well as by other states without GHG limits. However, Illinois could use some of the permit revenue to create a retraining program for displaced miners if that specific industry is hit hard by the cap-and-trade program.

If higher production costs cannot be passed on to consumers via higher electricity prices or to workers via lower wages, then the result is reduced profits. Reduced profitability lowers the value of a business and the stock price of publicly traded companies. Large companies have many stockholders around the world, and they may have well-paid lobbyists operating in Illinois, but only a small fraction of their owners live in Illinois. In terms of magnitude, for a \$10 permit price, the publicly traded company that owns the greatest share of coal-fired power plants in Illinois would incur a 2.5 percent burden relative to annual revenue.

An option to consider

A reasonable cap-and-trade program to reduce greenhouse gas emissions in Illinois could significantly reduce future deficits. Under a program similar to California's AB-32, a full auction of permits could raise \$2 billion annually. Most of the economic burden would fall on stockholders, most of whom live outside Illinois. In addition, Illinois businesses could gain experience operating in a GHG-limited environment ahead of possible future federal limits. Illinois researchers could invent patentable technologies that other states and countries would want in their later efforts to reduce GHGs.

Just like any hike in the Illinois income tax or sales tax, some of the burden of a cap-and-trade program will be felt inside Illinois. The actual outcomes cannot be guaranteed. Some of those burdens may be a high

fraction of income for those with low incomes. Yet a cap-and-trade to raise revenue for Illinois might place a high percentage of its burden on those living outside of Illinois, and some of the revenue can be used to offset burdens on low-income families in Illinois. •

Further Reading

California Environmental Protection Agency Air Resources Board. (2014). Auction information. Available at <http://www.arb.ca.gov/cc/capandtrade/auction/auction.htm>

Dye, Richard, Hudspeth, Nancy and Merriman, David. (2013). Peering over Illinois' fiscal cliff: New projections from IGPA's Fiscal Futures Model. Institute of Government and Public Affairs. Available at <http://igpa.uillinois.edu/system/files/Fiscal-Futures-Projections-Oct-2013.pdf>

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Fullerton, Don, and Karney, Daniel H. (2014). Cap-and-trade for Illinois? *The Illinois Report*. Institute of Government and Public Affairs.

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