Because That's Where the Money Is:[1]
The FERC's Ability to Reduce the Cost of Slowing Global Warming

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Executive Summary

Much of the debate over climate change legislation has focused on containing costs to electricity customers.[2] Limits on the price of allowances in a cap-and-trade program, expanded use of emissions offsets, and more liberal caps on emissions may mitigate costs, but will also make the cap less effective.[3]

A more effective approach to containing costs in a carbon dioxide (CO_2) cap-and-trade program depends on an evolution to a less carbon-intensive electricity infrastructure and to greater energy efficiency. A cap-and-trade program or other measure that puts a price on emissions of CO_2 can support that evolution; however, wholesale electricity markets and the planning of electric transmission can potentially offer far greater support. Indeed, the design and administration of wholesale electricity markets, and the planning of the electric transmission system, already shape how much CO_2 is produced from generating electricity - despite the lack of any express intent to do so.

Federal constraints on CO_2 emissions from electric generation are likely. Federal regulation of transmission and the markets reflecting these likely constraints can protect reliability, support long-term efficiency in the markets, spur wiser long-term investments in our electricity infrastructure, and prevent more CO_2 emissions at a lower cost per ton.

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[1] With apologies to Willie Sutton (who was referring to banks and not regulatory agencies; *see* http://www.fbi.gov/libref/historic/famcases/sutton/sutton.htm), and also to the Federal Energy Regulatory Commission.

[2] *See*, *e.g.*, National Association of Regulatory Utility Commissioners (NARUC), Resolution on Federal Climate Legislation and Cap-and-Trade Design Principles, November 14, 2007.

[3] *See*, *e.g.*, Burtraw, Palmer, and Kahn, "A Symmetric Safety Valve," February 2009, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1352002#.

1. Current efforts to shape our electricity infrastructure lack focus and coherence.

A complex web of often uncertain, conflicting and overlapping decision-making shapes the generation, transmission, sale, and use of electricity. Regional transmission organizations (RTOs) and independent system operators (ISOs), the Federal Energy Regulatory Commission (FERC), electric generation companies, electric utilities, the financial community, State and federal environmental regulators, and state utility regulators all stake legitimate claims of jurisdiction over electricity infrastructure.

Several states have independently embarked on comprehensive planning to meet their energy and environmental needs. These efforts have sought to minimize the cost of energy resources to customers and maximize consumer benefits consistent with the environmental goals and standards.[4] However, these states have also recognized that much of the authority to accomplish these goals lies outside their jurisdiction.

State energy regulators have authority over the retail sale and local distribution of electricity. Under that authority, they have provided some effective support for energy efficiency, demand response, and clean distributed generation. However, concern about minimizing the impact of that support on customers has kept its dollar value at an extremely small fraction of the value of the energy and capacity markets.

State and federal environmental regulators have authority over the air pollution, water pollution, and other permits that conventional electric generators must obtain. However, although this authority can be exercised to halt development of generation that is inconsistent with environmental needs, it cannot force anyone to build generation with less impact on air and water resources. The same regulators have the authority to establish air pollution cap-and-trade programs such as the EPA's NOx SIP Call and the Regional Greenhouse Gas Initiative.

[4] See, e.g., Connecticut Public Act 07-242, sec. 51; New Jersey Energy Master Plan, October 2008; Final Report Of The Public Service Commission Of Maryland To The Maryland General Assembly - Options For Re-Regulation And New Generation, December 10, 2008.

Such programs can encourage the installation of available technology to reduce air pollution, and can raise monies to support other efforts to reduce emissions. These programs alone, however, are unlikely to yield major changes in our overall reliance on traditional electric generation.

The single largest concentration of influence over how electricity is generated, delivered, and used resides with the FERC. The FERC regulates wholesale sales of electric energy, capacity, and ancillary services; regulates the transmission of electricity in interstate commerce; oversees compliance with reliability standards for the bulk power system; and in some circumstances can issue permits to build transmission within the National Interest Electric Transmission Corridors designated by the U.S. Department of Energy (USDOE). Furthermore, the RTOs and ISOs that plan the electric transmission system and design and administer wholesale markets do so under regulation by the FERC.[5]

Through the exercise of its regulatory powers, the FERC guides the flow of tens of trillions of dollars annually in the wholesale electricity markets, and also guides the planning and development of transmission improvements that expand market opportunities for electric generation. In comparison, a CO_2 cap-and-trade program can make it somewhat more expensive to produce electricity, possibly leading some generation facilities to curtail their operations or shut down entirely; but the same cap-and-trade program alone is unlikely to lead to the construction of less CO_2-intensive generation.[6] As a result, the FERC can potentially harness far greater forces than a cap-and-trade program alone to shape the generation, delivery, and use of electricity.

[5] FERC, "About FERC – What FERC Does," http://www.ferc.gov/about/ferc-does.asp.
[6] PJM Interconnection, ""Potential Effects of Proposed Climate Change Policies on PJM's Energy Market," p. 7 ("Widespread switching from coal to combined cycle natural gas is not to be expected until a CO_2 price of around $40/short ton is reached . . . This threshold increases as natural gas prices increase.")

2. Federal regulation of wholesale electricity markets and transmission already shapes our electric generation infrastructure.

The FERC has exercised its authority over wholesale electricity markets and transmission with the express intent to ensure reliability of the grid, reduce congestion, and support competitive markets – while historically disclaiming intent to serve environmental goals. Nonetheless, the FERC's regulation of wholesale markets and transmission planning has shaped the generation of electricity in ways that influence CO_2 emissions.

a. Markets shape our electric generation fleet.

A decision to invest in a new electric generation facility of any kind depends largely on an expectation of the revenues the facility can expect to earn from selling the electric energy it generates, selling the availability of its capacity, and (to a much smaller extent) selling the ancillary services it can provide.[7] State and federal incentives can provide other revenue sources such as tax benefits or renewable energy certificates, but the total dollar amount of these incentives pales in comparison to the total revenues from energy and capacity.

Especially in states that have restructured the regulation of the electricity industry so that electric generation is no longer subject to regulation by the state utility commission, the markets for energy and capacity shape what our electric generation fleet looks like. Decisions to build a new electric generation facility, and decisions to retire, retain, or expand an existing facility, depend largely on the prospects for earning revenues from these markets. Since the FERC has the authority to shape the design and administration of those markets, the manner in which the FERC exercises that authority can potentially promote, hinder, or be irrelevant to the evolution of the electric generation fleet and the reduction of its CO_2 emissions.

[7] Kirschen and Strbac, "Fundamentals of Power System Economics," 2004, p. 205.

Without expressing any intent to link electricity markets and CO_2 emissions, the FERC's exercise of its authority over markets has influenced the following outcomes relevant to CO_2 emissions:

- Existing nuclear power plants are being retained and upgraded.[8]
- Existing fossil-fueled plants are being retrofitted with air pollution controls in order to continue operating.
- Older, inefficient plants are having their retirements forestalled or canceled.[9]
- Few new power plants are being developed.[10]
- Development of new plants has focused on those with the lowest capital costs and fastest time to market – primarily simple-cycle combustion turbines, with a significantly smaller number of combined-cycle units.[11]

The purpose of listing these outcomes is not to pass judgment on their wisdom, but to point out that market designs approved by the FERC have helped to bring them about – without any express intent by the FERC to do anything beyond maintaining reliability and fostering competition in wholesale markets.

The links between these outcomes and FERC-approved market designs are outlined below.

Energy markets. Tens of trillions of dollars worth of electric energy are sold on United States wholesale energy markets each year.[12] In the wholesale spot markets for electric

[8] Nuclear Regulatory Commission, "Fact Sheet on Power Uprates for Nuclear Plants," February 2008, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/power-uprates.pdf, and "Status of License Renewal Applications and Industry Activities," http://www.nrc.gov/reactors/operating/licensing/renewal/applications.html#completed.
[9] See, e.g., The Brattle Group, "Review of PJM's Reliability Pricing Model," prepared for PJM Interconnection L.L.C., June 30, 2008.
[10] Id.
[11] Id.
[12] See Energy Information Administration, "Wholesale Market Data," http://www.eia.doe.gov/cneaf/electricity/wholesale/wholesale.html, wholesalet1.xls, and wholesalet2.xls, accessed June 30, 2009.

energy,[13] prices are typically set through an auction that produces a single clearing price. Generators selling energy into that market state the price at which they are willing to sell electricity at a particular time. The highest-priced generation called upon to run at that time sets the clearing price; all generators selling into the market at that time are then paid at that same clearing price.

The single clearing price in the energy market works to the advantage of generators that have lower costs due to cheaper fuels, greater efficiency, lower emissions of air pollutants regulated under cap-and-trade programs, or some combination of these factors. The single clearing price especially benefits existing nuclear plants, due to their relatively low cost to produce a megawatt-hour of electricity, their ability to run virtually all the time, and the fact that higher-cost plants almost always set the clearing price. Some coal-fired power plants benefit for the same reasons. Plants with zero fuel costs, such as wind and solar generation, also benefit. In contrast, the single clearing price can make less efficient peaking plants, which frequently set the clearing price when they operate, less profitable.

The single clearing price also reduces the efficacy of a cap-and-trade program, in at least two ways. First, it dilutes the market signal sent by a price on CO_2 emissions, by allowing fossil-fueled plants to recover most or all of their allowance costs through higher clearing prices reflecting the cost of allowances.[14] Second, it amplifies the costs that consumers bear for the cap-and-trade program, by increasing energy revenues to nuclear plants and other plants that incur little or no allowance costs. Of course, these increased revenues can

[13] The spot market's importance extends beyond the relatively small portion of sales transacted there (about 35 percent of all sales in PJM, for example; see, e.g., http://legacy.pjm.com/about/downloads/media-kit-profile.pdf). Outside the spot market, prices for bilateral contracts still tend to reflect expectations about spot market prices, as do buyers' decisions to self-schedule their own generation resources.
[14] PJM Interconnection, "Potential Effects of Proposed Climate Change Policies on PJM's Energy Market," January 23, 2009, p. 5.

be seen as indirectly supporting the goals of cap-and-trade programs, by subsidizing zero-emitting and low-emitting plants.

Again, the point is not to judge the wisdom of these outcomes, but to illustrate that the design of the energy market provides large incentives to some types of generation units and disincentives to others. Those incentives and disincentives influence our ability to achieve environmental goals for our energy supply, even when they are not intentionally designed to do so.

Capacity markets. RTOs and ISOs have obtained the FERC's approval of market constructs for the wholesale sales of electric capacity.[15] The markets approved by the FERC were intended to encourage new and expanded electric generation and other capacity resources to be developed in the locations where it was needed most. A locational preference, however, was the only preference expressly stated in the market design; aside from location, the FERC made no policy decision regarding the type of capacity it preferred.

Notwithstanding the lack of an express preference in the design, these markets could be expected to show a preference in their effect. The markets set a single clearing price that is paid to each megawatt of new and existing generation capacity, and of new and existing demand response capability, that offered to sell capacity at or below the clearing price. To the extent that the markets changed in any way what the capacity fleet would look like, it tended to encourage the capacity solutions that had the lowest capital cost and fastest time to market.

For example, one detailed study of the effects of the PJM capacity market concluded that the market was successful in encouraging retirements of older, inefficient electric generation units to be deferred or canceled, and in retaining units that would not have been

[15] See, e.g., PJM Interconnection, L.L.C., 117 FERC ¶ 61,331 (2006); Devon Power LLC, 115 FERC ¶61,340 (2006).

financially viable in the absence of capacity payments.[16] The study also noted the improvement of existing units to provide more capacity, the development of more demand response capability, decreases in net exports from PJM, and generation additions of various types. Simple-cycle combustion turbines as well as some combined-cycle accounted for the bulk of the generation additions – again, the lowest capital cost generation resources with the fastest time to market. One new coal plant and some new renewable generation also followed the implementation of the new capacity market, but the study did not distinguish between the effect of the capacity market and the effect of other incentives for such generation.

The FERC has remained agnostic about whether capacity markets must allow energy efficiency measures to provide capacity. The FERC has approved capacity markets that include energy efficiency,[17] and has also approved capacity markets that initially did not include energy efficiency.[18]

As is the case with the energy market, the capacity market drives decisions about what electric generation units will be built, kept in service, or retired. Depending on the design of the market, it can also drive decisions to improve energy efficiency, or it can refrain from doing so. Even if the FERC approves capacity market designs without any consideration of how the design will influence the nation's ability to achieve our environmental goals, there will be such an influence.

b. *Transmission not only shapes how electricity is delivered, but also how it is generated and used.*

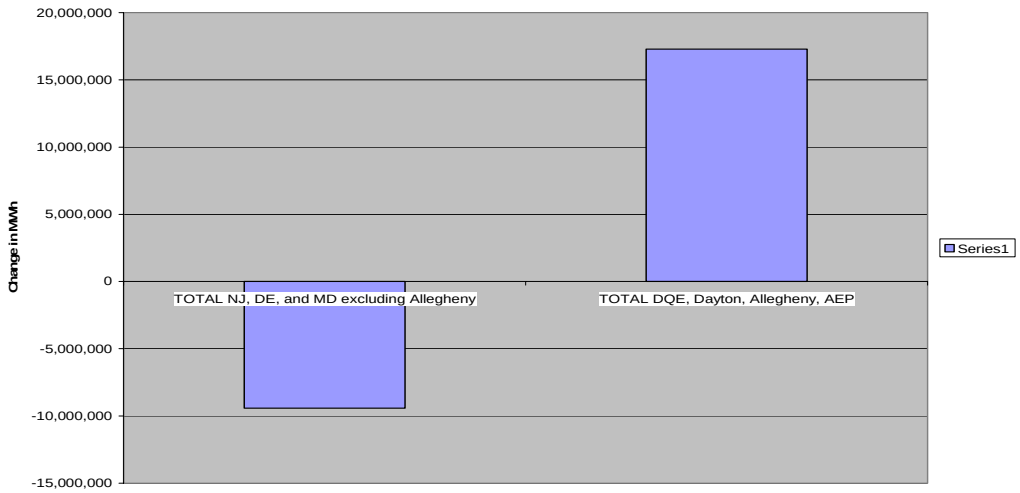
Planning of the electric transmission grid has long focused on preserving reliability over the medium term, typically ranging from five to fifteen years. More recently, however,

[16] See, e.g., The Brattle Group, "Review of PJM's Reliability Pricing Model," prepared for PJM Interconnection L.L.C., June 30, 2008.
[17] See, e.g., ISO New England's Forward Capacity Market.
[18] See, e.g., PJM's Reliability Pricing Model. However, in March 2009, the FERC approved a change to the Reliability Pricing Model that would allow energy efficiency measures to participate in the capacity market.

planning has also focused on promoting wholesale competition and market efficiencies, and on promoting the development of specific types of generation.

It is no surprise that transmission decisions can promote certain types of generation. Transmission upgrades linking generation-rich areas (such as the coal-producing regions in Ohio, western Pennsylvania, and West Virginia) to distant concentrations of electricity demand (such as the corridor from the New York City area to the Washington DC area) improves the generators' access to more lucrative markets, and sends economic signals to develop more generation. Recent analysis by PJM illustrates clearly how transmission projects in its Regional Transmission Expansion Plan will shift generation away from RGGI states in PJM, and toward coal-producing regions, as shown in Figure 1.[19]

Figure 1. Effect of 2012 RTEP on Net Generation



Transmission upgrades not only affect electric generation, but also influence decisions on the use of electricity as well. When transmission upgrades link temporarily cheaper coal-based generation to distant population centers, energy efficiency and demand response are delayed because the market signals that would encourage them are temporarily muted.

[19] Based on data from PJM, "Transmission Expansion Advisory Committee Meeting - 2008 Market Efficiency Analysis, Preliminary Results," August 20, 2008, http://www.pjm.com/Media/committees-groups/committees/teac/20080820-market-efficiency-analysis-update.pdf.

The key word is "temporarily." In the current regulatory environment, high-CO_2 emitting generation appears relatively cheap and plentiful because society at large rather than the generators themselves bear virtually all of the cost of CO_2 emissions. As generators begin to bear some of the cost of those emissions under a CO_2 constraint, the price of that generation is likely to increase while the supply declines. Transmission planned without regard for this likely future risks not only tens of billions of dollars in investments in infrastructure expected to be in place for decades; it also risks displacing investments that can also be designed to improve reliability and market efficiency for the long term.

3. Federal regulation of wholesale electricity markets and transmission can lower the cost of constraining CO_2 emissions from electric generation.

Limits on CO_2 emissions from electric generation will not change the FERC's goals of ensuring reliability of the grid, reducing congestion, and supporting competitive markets. However, a meaningful CO_2 constraint will make achieving all of those goals more challenging if it is successful in bringing about the retirement of higher-emitting generation.

The FERC can choose to rely entirely on the CO_2 constraint itself to bring about the evolution of our electricity infrastructure that will achieve compliance with the constraint; alternatively, it can also use its authority over electricity market design and transmission planning to further that evolution. As discussed above, a cap-and-trade program alone can encourage the curtailment or retirement of high-emitting plants, but does little to encourage the development of lower-emitting plants. Meanwhile, wholesale energy markets using a single clearing price dilute the effect of a cap-and-trade program by enabling generators to recover part or all of their allowance costs through higher wholesale energy prices. Those markets also amplify the cost of the cap-and-trade program to consumers, further weakening the will to set and retain a strict cap.

In contrast, a cap-and-trade program paired with appropriate FERC oversight of the electricity markets and transmission planning can potentially harness far greater forces to shape the generation, delivery, and use of electricity. A less CO_2-intensive generation fleet shaped by those forces can reach compliance with the cap at a lower cost.

A market design presented to the FERC for approval that expressly favors evolution toward lower-emitting electric generation will almost certainly be criticized as "picking winners and losers." Before ruling out any such designs, however, it is worth recognizing that the current designs of energy markets and capacity markets are already picking winners and losers. The question is whether the selection of winners and losers should disregard expectations of future limits on CO_2 emissions, or whether they should be informed by those expectations.

In contrast, transmission planning already has some history of "picking winners and losers." The U.S. Department of Energy did so when it expanded the Mid-Atlantic National Interest Electric Transmission Corridor to encompass areas as far west as Ohio and West Virginia, stating that the absence of transmission linking coal-producing regions to the New York-Washington DC corridor was "demonstrably hindering the development of 'desirable generation.'"[20] Recent legislative efforts provide another example, by seeking to encourage transmission that would link wind-based generation to load centers a great distance away from the concentration of wind resources.[21]

The FERC may already have the authority under the Federal Power Act to consider the effect of a market design or transmission planning protocol on CO_2 emissions from electric generation. Regardless of the certainty of such authority, however, express consideration of

[20] Department of Energy, Mid-Atlantic Area National Interest Electric Transmission Corridor, 72 Fed. Reg. 56992, 57000, October 5, 2007
[21] *See, e.g.*, Senate Bill 539, Introduced March 5, 2009.

the effect on CO_2 emissions would likely be met by protracted litigation that would delay action for years.

Legislation could forestall such litigation. It could expressly authorize the FERC to review market designs with consideration of the effect on CO_2 emissions and the efficacy of federal constraints on CO_2 emissions. It could also direct the FERC to compare the costs, benefits, and effect on CO_2 emissions of a proposed transmission project against the costs, benefits, and effect on greenhouse gas emissions of alternative means to relieve transmission constraints using load management resources and the development of electric generation within congested areas.

Statutory clarification of this authority, and the will to exercise it, can protect reliability, support long-term efficiency in the markets, spur wiser long-term investments in our electricity infrastructure, and prevent more CO_2 emissions at a lower cost per ton. Federal legislation establishing a CO_2 cap-and-trade program therefore will be more likely to reduce CO_2 emissions from electric generation significantly, if it is coupled with legislation enabling the FERC to address the goals of the cap-and-trade program in its oversight of wholesale electricity markets and the planning of electric transmission.