Comments of Anthony Giacomoni, Senior Market Strategist, on behalf of PJM Interconnection

FERC Technical Conference on Carbon Pricing in Organized Wholesale Electricity Markets

Panel 3: Considerations for Market Design Docket No. AD20-14-000

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PJM appreciates the opportunity to participate in this conference and to discuss operational and market design issues that arise as regional transmission organizations (RTOs) and independent system operators (ISOs) further explore the integration of carbon pricing into their energy and ancillary services markets. My name is Anthony Giacomoni, and I serve as a senior market strategist in the Advanced Analytics Department at PJM.

In my current role, I am responsible for the modeling PJM has employed to assess the impacts on PJM's wholesale electricity markets from carbon pricing and different border adjustment scenarios for carbon pricing leakage mitigation. I joined PJM in 2017. Prior to joining PJM, I was a market analyst and, later, senior engineer at ISO New England. As a market analyst, I worked in the Internal Market Monitoring Department, where I helped assess the competitiveness of New England's wholesale electricity markets. As a senior engineer, I worked in the Resource Adequacy Department where I performed production-cost simulations and electricity market studies related to renewable energy integration, transmission congestion, economic transmission planning, resource planning and fuel consumption analysis. I hold a Doctor of Philosophy degree in electrical engineering and a Master of Science degree in electrical engineering from the University of Minnesota. I also hold a Bachelor of Science degree in electric power engineering and economics from Rensselaer Polytechnic Institute.

As a threshold matter, I would like to reiterate that market-based programs are the most efficient and cost effective means to achieve emissions reductions. Even if a carbon price is not the eventual solution, competition – especially on a large, regional scale – can drive innovation and cost efficiency in meeting clean energy goals. In this regard, we can view markets as a tool. Markets can internalize policies and produce the most efficient and cost-effective combination of resources to implement them.

It must be noted that emissions pricing programs for sulfur dioxide and nitrogen oxides have been in use in the PJM region for over two decades. In addition, carbon pricing has been reflected in market outcomes in PJM for well over a decade through the Regional Greenhouse Gas Initiative (RGGI). RGGI is a market-based carbon dioxide emissions reduction program that includes 10 states in the northeastern United States. Since RGGI's inception in 2009, generators in Delaware, Maryland and New Jersey have been able to reflect the cost of emission allowances associated with the RGGI program through their offers in the PJM wholesale energy markets. New Jersey left the RGGI program in 2012 and rejoined in 2020. Virginia currently is planning to join the program in 2021.

In July 2019, a Carbon Pricing Senior Task Force (CPSTF) was created through the PJM stakeholder process to explore the impacts of carbon pricing on the PJM wholesale energy markets and to investigate potential mechanisms to mitigate leakage. Despite the task force's name, PJM has made clear that it does not intend to establish a carbon price. Rather, the issue charge for the creation of the CPSTF consisted of two phases, with the first phase being education and analysis on the topic and the second phase being the development of a common set of rules to integrate carbon pricing and address, among other things, any impacts of leakage resulting from carbon pricing where appropriate.

As part of the first phase education and analysis, PJM conducted a study to model the impacts of a carbon price on the PJM wholesale energy markets and to measure the leakage that may result from its implementation. The modeling included numerous scenarios where a carbon price was applied to a subset of PJM states, as well as a carbon price applied to the entire PJM footprint. In addition, the impacts of two border adjustment scenarios to

mitigate leakage when a carbon price was applied to a subset of PJM states was modeled.[1] The two border adjustment scenarios PJM studied were a one-way border adjustment and a two-way border adjustment with facility-based emissions rates.

The one-way border adjustment was modeled on the mechanism used in the California Independent System Operator (CAISO) Energy Imbalance Market as part of their greenhouse gas program. In the one-way border adjustment, the cost of carbon emissions associated with transfers from the non-carbon-pricing region to the carbon-pricing region are accounted for. In the two-way border adjustment, in addition to accounting for the cost of carbon emissions associated with transfers into the carbon-pricing region, the cost of carbon emissions associated with transfers from the carbon-pricing region to the non-carbon-pricing region are removed. A two-way border adjustment can potentially be used to help mitigate leakage if the carbon-emitting generators in the carbon-pricing region are more efficient than the carbon-emitting generators in the non-carbon pricing region. For both cases, the border adjustments are effectuated through the economic dispatch of the system. Other border adjustment scenarios are also possible, but were not included as part of the study and discussions related to their implementation are typically outside the purview of an RTO.

The results of the study showed that the border adjustment options had varying levels of impacts on reducing leakage associated with carbon pricing in the PJM region. For nearly all the scenarios studied, the one-way border adjustment had minimal impact on the results compared to the base case where no border adjustment was implemented. The main reasons for this result were due to the low levels of transfers from the non-carbon pricing region to the carbon-pricing region for the different subsets of PJM states modeled with a carbon price and resource shuffling.[2] Resource shuffling occurs when resources associated with zero or low carbon emissions are associated with transfers into the carbon-pricing-region while resources with high carbon emissions are not and thus not exposed to the carbon price. As a result, it could not be definitively concluded that the one-way border adjustment would reduce leakage if implemented as modeled.

The two-way border adjustment had much more measureable impacts on the dispatch of the system compared to the base case where no border adjustment was implemented. These impacts included increased emissions in the carbon-pricing region due to an increase in coal and natural gas generation in the carbon-pricing region and increased RTO emissions due to an increase in net exports from PJM to neighboring regions. The two-way border adjustment also resulted in lower prices throughout the system. Due to the increase in net exports from PJM and limited modeling of neighboring regions, it could also not be concluded that the two-way border adjustment would reduce leakage if implemented as modeled.

[1] All of the educational materials, including the study results, can be accessed here: https://www.pjm.com/-/media/committees-groups/task-forces/cpstf/postings/study-and-analysis-references.ashx?la=en.

[2] See the following presentation for an explanation of the resource shuffling or "secondary dispatch" issue: http://www.caiso.com/Documents/UpdatedAgenda-Presentation-RegionalIntegrationCaliforniaGreenhouseGasCompliance-TechnicalWorkshop.pdf.

Currently, the CPSTF is continuing with the first phase of the issue charge and has not yet made any decisions regarding when to proceed with the second phase. PJM's modeling work on the analysis of leakage mitigation mechanisms is just one piece of a larger set of analyses and decision points that need to be considered should policymakers decide to move forward with an individual state or multi-state carbon pricing program and seek to mitigate leakage.