Review of Eastern Proxy Bus Pricing Mechanisms

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LECG

TOPICS

- What are proxy buses and what is their purpose?
- How do New York and PJM use proxy buses to model and price interchange power?
- Proxy bus evolution in PJM – problems with multiple proxy buses.
- Proxy bus evolution in New York – adding proxy buses for controllable lines.

WHAT ARE PROXY BUSES?

Proxy buses are used to define the locations at which a system operator assumes that an adjacent control area will increase or decrease generation to support changes in scheduled net interchange.

- Except in the case of controllable lines (DC or phase angle regulator controlled), proxy buses do not represent the point of interconnection between adjacent control areas.
- Proxy buses are not used for contract path scheduling purposes and do not play any role in inter-control area transaction check-out.

WHAT ARE PROXY BUSES?

The purpose of modeling changes in scheduled net interchange with an adjacent control area as sourcing or sinking at a proxy bus is to approximate the combined effect on congestion *within the modeling control area* (i.e., the change in the flows on binding transmission constraints secured by the modeling control area) of all changes in generation in the adjacent dispatch area that would occur in response to a change in scheduled net interchange between the modeling dispatch area and the adjacent dispatch area.

PROXY BUSES IN NEW YORK AND PJM

PJM and NYISO use proxy buses to model and price scheduled net interchange with adjacent control areas, both market and non-market.

- The NYISO typically defines its proxy buses as a single bus internal to the adjacent region.
- PJM typically defines its proxy buses as a weighted average of several buses internal to the adjacent region.
- Both ISOs price power scheduled to flow over controllable lines at the source or sink of the controllable lines.

PROXY BUSES IN NEW YORK AND PJM

All of the NYISO's proxy buses are defined based on a single node.

- The NYISO proxy buses for the free-flowing interconnections with Ontario, PJM and New England are a single location interior to the other control area and do not correspond to any of the points of interconnection.
- The NYISO proxy buses for controllable lines are generally defined as the line's sink in New York.

PROXY BUSES IN NEW YORK AND PJM

Many of PJM's proxy buses are defined as the weighted average of several locations.

- The Southexp proxy bus is defined as the average of four buses.
- The Southimp proxy bus is defined as the average of eight buses.
- The OVEC proxy bus is defined as the average of three buses.
- The locations used to define the proxy buses are external to PJM and do not correspond to the points of interconnection.

PROXY BUSES IN NEW YORK AND PJM

Imports scheduled from a proxy bus are modeled as sourced at the nodes composing the proxy bus.

- If a proxy bus consists of a single node, imports are modeled as all sourced at that node.
- If a proxy bus consists of several nodes, then imports are modeled as sourced from each node in proportion to the weight assigned to the node in the proxy bus.
- The converse applies to exports, with exports modeled as sinking at the nodes composing the proxy bus.
- The proxy bus price is calculated as the appropriately weighted average of the nodes composing the proxy bus.

EVOLUTION OF PJM PROXY BUSES

The proxy buses PJM uses to price scheduled interchange with external control areas have evolved in four ways since 1998.

- Addition and elimination of proxy buses as PJM has expanded.
- Consolidation of proxy buses.
- Introduction of conditional proxy buses.
- Introduction of a proxy bus for a new controllable line (Neptune).

EVOLUTION OF PJM PROXY BUSES

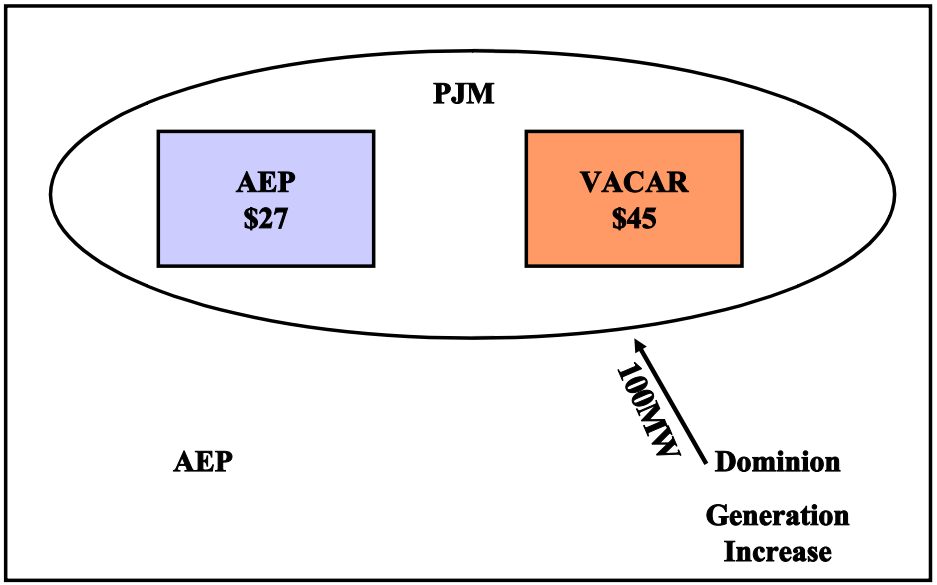
PJM has consolidated external proxy buses on several occasions.

- New York east and west consolidated April 1, 2001.
- AEP and VACAR proxy buses consolidated March 1, 2003.
- Southeastern (Duke etc) and Southwestern (TVA, etc.) proxy buses consolidated October 1, 2006.

EVOLUTION OF PJM PROXY BUSES

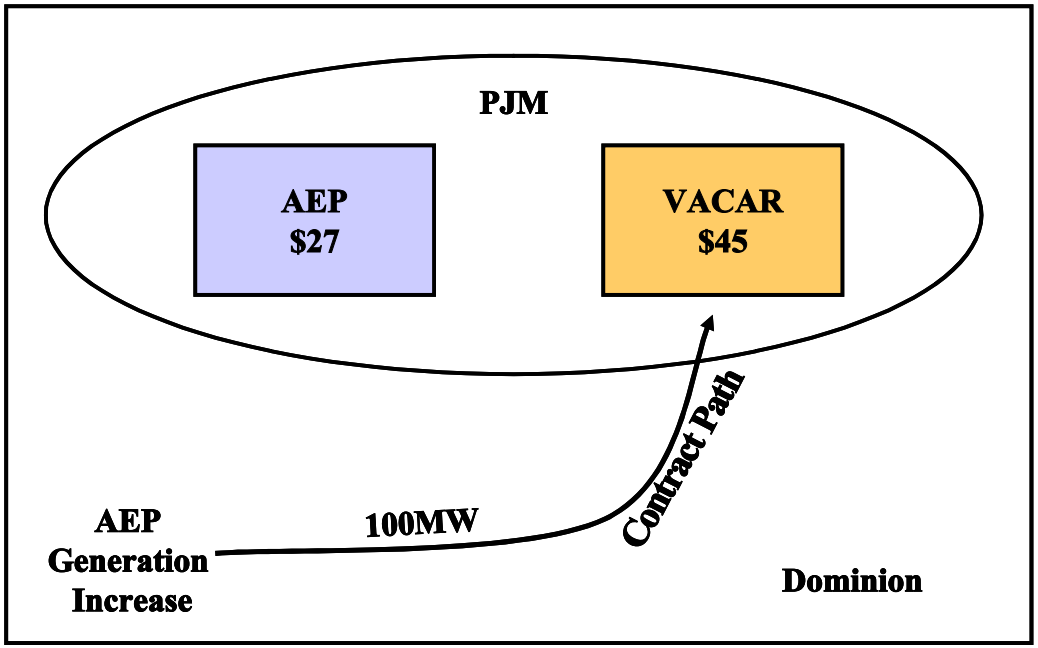
After APS joined PJM on April 1, 2002, PJM used separate proxy buses to model and price inter-change with AEP and VACAR (Dominion).

- Imports scheduled to sink in PJM from the VACAR proxy bus generally would be paid a higher price than imports from AEP because of the more favorable impact of generation in VACAR on internal PJM constraints.



EVOLUTION OF PJM PROXY BUSES

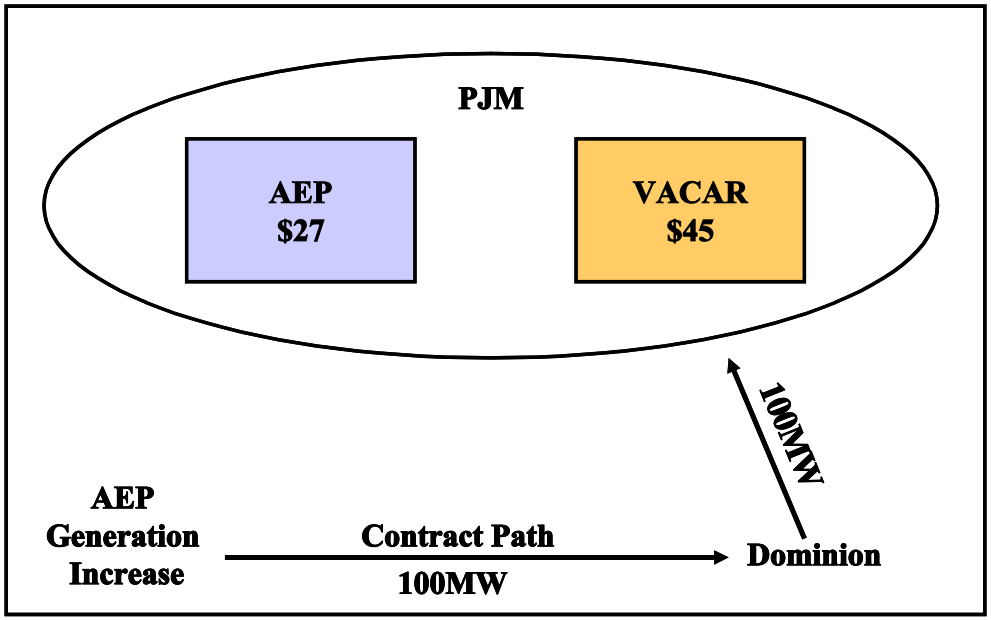
PJM observed over time that the actual change in flows on its system associated with an increase in imports from VACAR was often not consistent with a VACAR generation source and determined from a review of etags that many transactions scheduled at the VACAR proxy bus were actually sourced in ECAR.



EVOLUTION OF PJM PROXY BUSES

Effective July 19, 2002, PJM began applying the AEP proxy bus price to transactions scheduled to sink at the VACAR proxy bus but having an etag indicating an ECAR source.

- This rule could be circumvented, however, by unbundling the transaction, so the AEP and VACAR proxy buses were combined into a single bus on March 1, 2003.



EVOLUTION OF PJM PROXY BUSES

PJM continued to separately check out transactions with AEP and Dominion; however, transactions were paid the same price regardless of which control area the transaction was sourced from.

EVOLUTION OF PJM PROXY BUSES

Following the integration of AEP, Dayton and Dominion into PJM and the formation of the MISO, PJM had separate southeast (Duke, Carolina Power & Light) and southwest (TVA, LG&E, East Kentucky) proxy buses.

- During 2006, PJM observed an increasing disparity between contract path schedules (imports from southeast, exports to southwest) and the actual power flows on the PJM system.
- The southwest and southeast proxy buses were combined on October 1, 2006 and separate proxy buses established for exports and imports.

EVOLUTION OF PJM PROXY BUSES

In early 2007 PJM, Duke, Progress Energy Carolinas, and the North Carolina Municipal Power Agency implemented Interfacing Pricing Arrangements under which Duke, Progress, and the North Carolina Municipal Power Agency can buy and sell power to PJM at prices calculated for generator nodes on their system (rather than the South IMP or South EXP proxy bus prices).

- The Duke, Progress, and the North Carolina Municipal Power Agency specific prices will generally not be applicable if these entities are purchasing power outside their control area.
- Progress, Duke, and the North Carolina Municipal Power Agency agreed to provide confidential and auditable data to PJM as part of the agreement.

EVOLUTION OF PJM PROXY BUSES

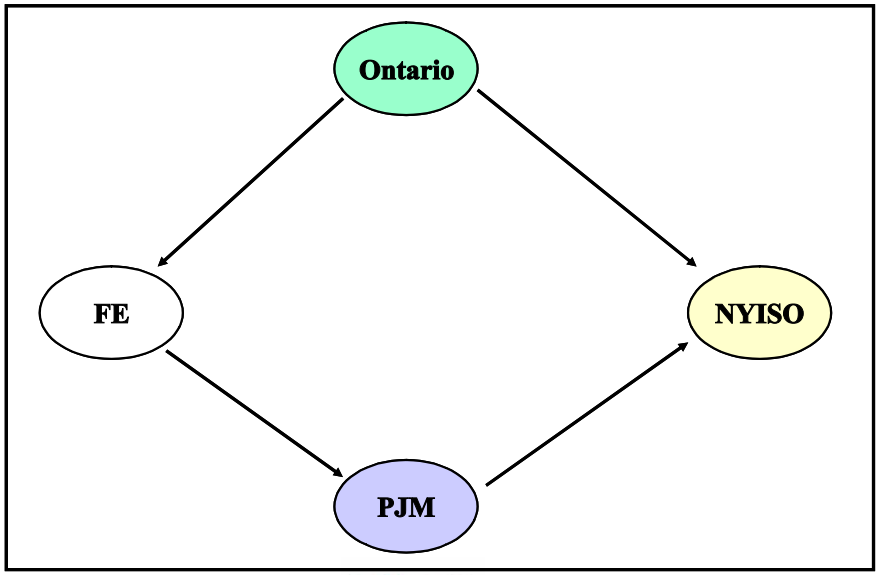
These provisions enable PJM to pay a higher price for imports supported by an increase in VACAR generation, while avoiding the uplift costs that would be borne by PJM consumers if PJM were to pay this price for imports supported by generation increases outside VACAR.

- All of these conditional proxy buses are defined as the average of several generator nodes within the external control area.

EVOLUTION OF PJM PROXY BUSES

On August 1, 2003, PJM introduced a separate proxy bus for transactions sourced in Ontario.

- Transactions determined based on etags to be sourced in Ontario are paid the Ontario proxy bus price, rather than the price for the proxy bus to which they are delivered on a contract path basis.
- This distinct proxy bus for Ontario schedules is an effort to better account for loopflow around Lake Erie.



EVOLUTION OF NYISO PROXY BUSES

The proxy buses the NYISO uses to price scheduled interchange with adjacent control areas have evolved since November 1999 with:

- The addition of proxy buses for new controllable lines (Cross Sound cable, 1385 Line, and Neptune); and
- The addition of a proxy bus to separately model wheelthroughs that have special rules relating to transmission contingencies (HQ).
- Another proxy bus (Denison) is in the process of being set up (pending resolution of regulatory issues) for a NYISO-HQ line that is distinct from the main DC interconnection.

LESSONS

PJM and New York's experience shows that:

- Actual powerflows on internal constraints can differ from those calculated based on contract path schedules.
- Market participants will describe their imports as sinking at the highest priced proxy bus for a given control area.
- Market participants will create contract path schedules to sink their imports at the highest priced proxy bus price among alternative control areas.
- Any initial set of proxy buses and proxy bus definitions will likely need to evolve over time.

RELEVANT PJM DOCUMENTS

PJM Market Monitoring Unit, "Report to The Federal Energy Regulatory Commission: Interface Pricing Policy," August 12, 2002, located at http://www.pjm.com/markets/market-monitor/downloads/mmu-reports/200208-report-ferc1.pdf.

PJM Market Monitoring Unit, "Report: Interface Pricing Policy," February 28, 2003, located at http://www.pjm.com/markets/market-monitor/downloads/mmu-reports/20030301-interface-pricing.pdf.

"PJM and Southeast and Southwest Interface Pricing Point Consolidation Approach," August 31, 2006, located at http://www.pjm.com/etools/oasis/downloads/interface-pricing-point-consolidation.doc.

Andrew L. Ott letter to Lance C. Stotts re: Duke Energy Carolinas Interface Pricing Arrangements, January 5, 2007, located at http://www.pjm.com/documents/downloads/agreements/duke-pricing-agreement.pdf.

Andrew L. Ott letter to Robert Caldwell re: Progress Energy Carolinas, Inc. Interface Pricing Arrangements, February 13, 2007, located at http://www.pjm.com/documents/downloads/agreements/pec-pricing-agreement.pdf.

Andrew L. Ott letter to Clay A. Norris re: North Carolina Municipal Power Agency Number 1 Interface Pricing Arrangement, March 19, 2007, located at http://www.pjm.com/documents/downloads/agreements/electricities-pricing-agreement.pdf.

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