

Loop Flow Study Update

**Joint Stakeholder Meeting
June 1, 2007**



Loop Flow Study Background and Purpose

- On June 26, 2006, the Midwest ISO and PJM included a new Joint and Common Market (JCM) initiative to investigate loop flows across the combined Midwest ISO and PJM footprint
- Purpose
 - Increase the understanding of the impact that external market participants have on the creation of loop flows
 - Provide details on plans and actions to address the problems of external loop flows

Loop Flow Study Report Details

- Midwest ISO and PJM completed a formal report on the JCM initiative to investigate loop flows across the combined Midwest ISO and PJM footprint on May 25th
 - The final report is posted at:
<http://www.jointandcommon.com/documents/documents.html>
- Input into the report was requested from and received by IESO, ITC, NYISO, and TVA
 - Comments and suggestions were incorporated into the report where appropriate
 - Differing opinions to the recommendations of the report may be posted on the JCM webpage at a future date

Definition of Loop Flow Refresher

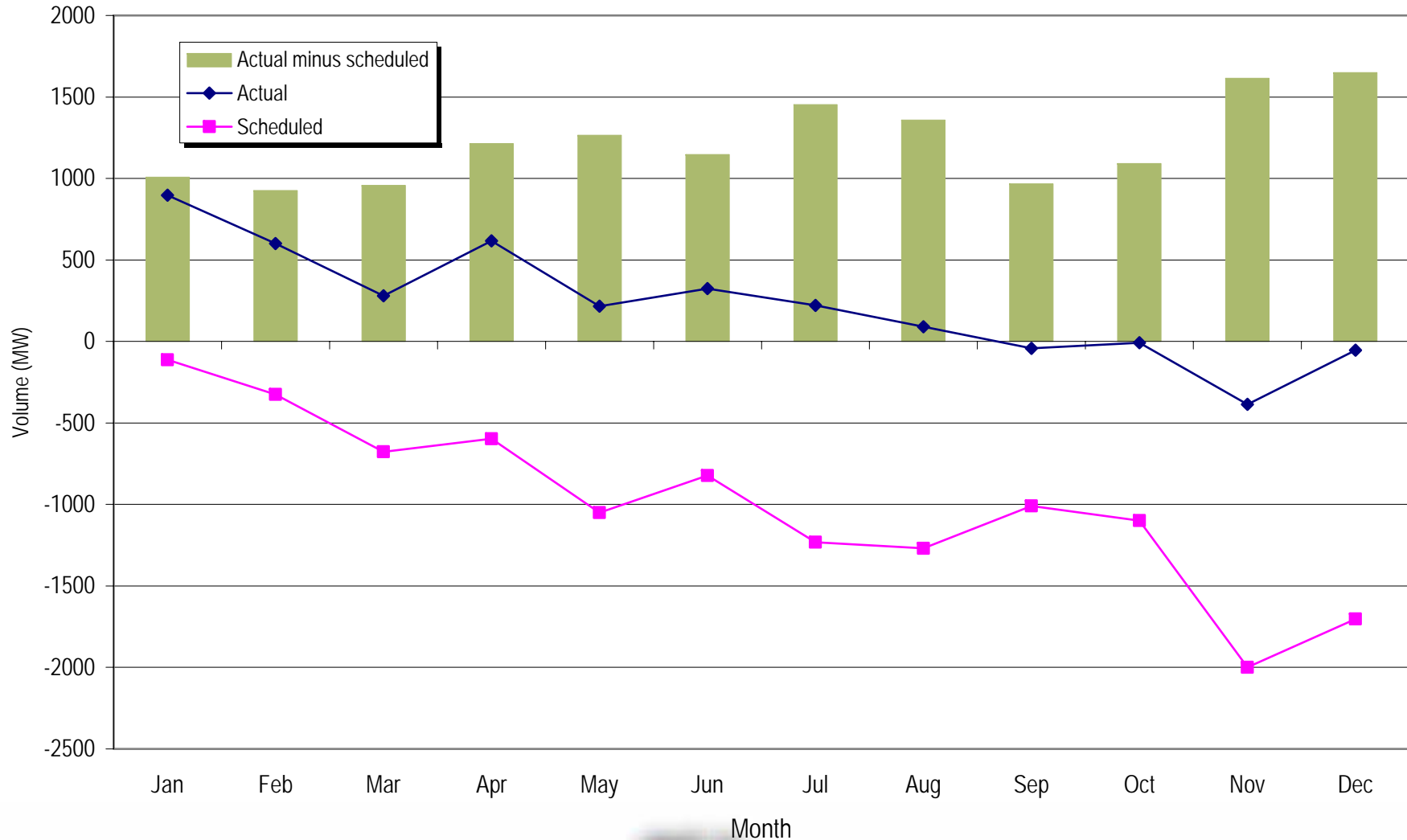
- Energy schedules are made on a “contract path” basis between directly connected transmission paths
- Actual energy flows across interfaces based on Ohms law
 - Energy flow takes the path of least resistance
- Loop flows are created as a result of differences between the scheduled and actual flow of energy across interfaces between control areas

Recent Loop Flow Observations

- Unscheduled flows increased around 1,000 MW (about 200%) on the TVA-PJM and MECS-PJM interfaces in the 2005 to 2006 time frame
- Unscheduled flows increased by 500 MW (about 100%) on the NY-PJM interface for the same time period
- Unscheduled flows increased by 600 MW (about 60%) on the Michigan-Ontario interface for the same time period

2005 PJM Southwest Interface Average Flows

Southwest
2005
(TVA & East Kentucky Power Cooperative)

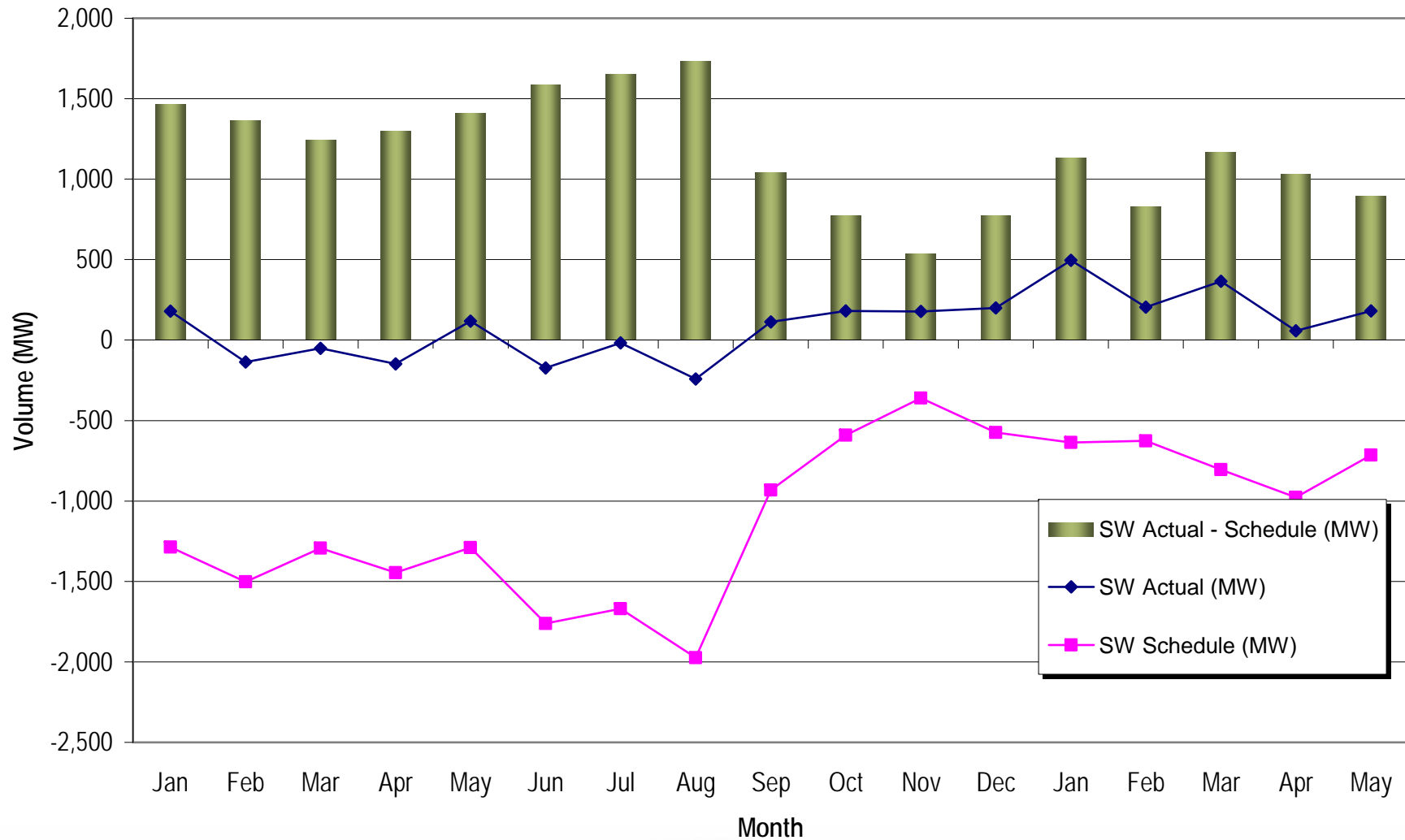


Mitigation Actions Taken

- PJM announced on August 31, 2006, that the Southeast and Southwest pricing points would be combined on October 1, 2006
- Interface weightings continue to be adjusted periodically to reflect physical flow on the ties
- Results to date have shown a reduction in the amount of loop flow on the Southeast, Southwest and NYISO interfaces

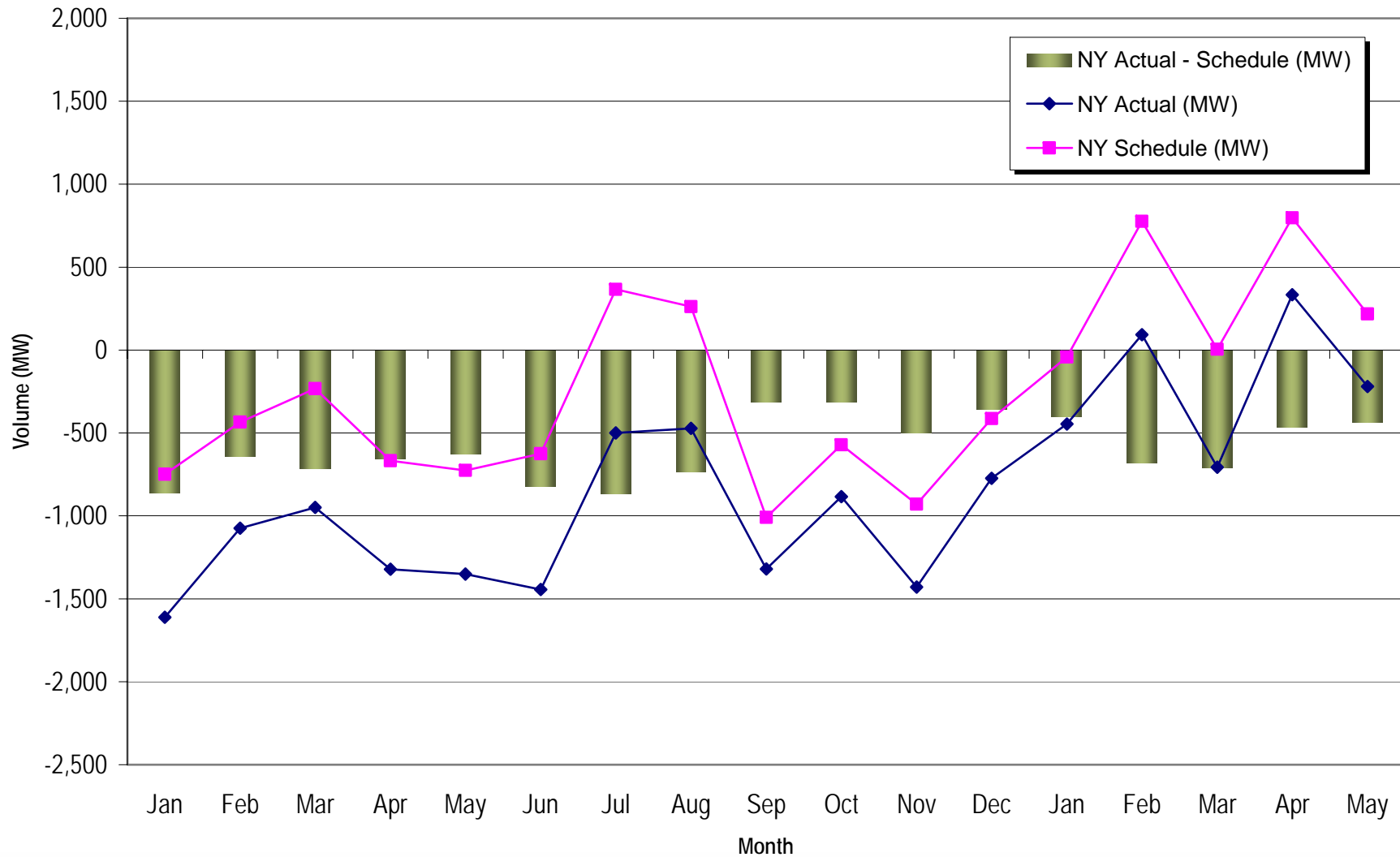
2006-07 PJM Southwest Interface Average Flows

Southwest
January 2006 - May 2007
(TVA and East Kentucky Power Cooperative)



PJM NYISO Interface Average Flows

PJM - NYISO
January 2006 - May 2007



Lake Erie Loop Flows

- The Midwest ISO and PJM have completed an in-depth study with IESO, Midwest ISO, NYISO and TVA to understand the sources of loop flows around Lake Erie
- Loop flows around Lake Erie flow predominantly in a counter-clockwise direction (PJM to NYISO to IMO to MECS)
 - Loop flows around Lake Erie were observed to be as high at 1,500 MW in 2006

Lake Erie Generation-to-Load Impacts

- **Midwest ISO Generation-to-Load Impacts**
 - Creates a general counter-clockwise contribution to Lake Erie loop flows ranging from 100 to 250 MW
- **PJM Generation-to-Load Impacts**
 - Creates a general clockwise contribution to Lake Erie loop flows ranging from 200 to 500 MW
- IESO and NYISO are not currently parties to the JOAs that require the calculation of market flows
- The Midwest ISO and IESO conducted an off-line study to calculate IESO Generation-to-Load Impacts
 - Creates a general counter-clockwise contribution to Lake Erie loop flows ranging from 125 to 275 MW

PAR Operation Impact on Lake Erie Loop Flows



- Operation of Phase Angle Regulators (PARs) by the four markets around Lake Erie can influence the amount of loop flows
 - PARs can alter the direction of flows to follow a different electrical path
 - PARs are designed and used to address specific transmission issues and needs
 - Less effective at controlling flows during conditions that deviate from initial design

Congestion Management Process Enhancements

- The Midwest ISO and PJM will continue to improve the accuracy and effectiveness of the market flow calculator
 - Will work with affected parties to further refine the Congestion Management Process
 - Includes identifying mechanisms for mitigating significant loop flow impacts as part of the JOA process by developing a broader regional Congestion Management Process
- The Midwest ISO and PJM currently calculate and post to the IDC all generation-to-load impacts on neighboring transmission facilities which are curtailable via the TLR process
 - A worthwhile enhancement to the existing Congestion Management Process would be the real-time calculation and accounting for generation-to-load impacts by all neighboring entities where such real-time calculations do not currently occur

Recommendations

- Commissioning of the Michigan-Ontario PARs as soon as possible to mitigate the loop flows around Lake Erie
 - PJM/NYISO and NYISO/IESO commit to review NY/PJM and St. Lawrence PAR operations to assess contributions to Lake Erie Loop Flow
 - The four parties will develop a comprehensive plan on the operation of the Michigan-Ontario and NYISO/PJM PARS to control loop flows around Lake Erie
- IESO and NYISO should adopt a Congestion Management Process whereby they report their market flows to the IDC and participate with Midwest ISO and PJM to manage circulation flows around Lake Erie when congestion occurs
- Create an Energy Schedule Tag Archive that contains tag impacts, market flow impacts, and generation-to-load impacts for flowgates in the IDC