



Joint and Common Market

III. MODELING OF ONTARIO-MICHIGAN PHASE ANGLE REGULATORS (PARS) IN M2M PROCESS



Objective

- MISO, PJM and IESO have completed an analysis of the operation of the ONT-MI PARs through the first year of operation. This presentation will review the results of the analysis and includes a MISO position and PJM position on recommended changes to how the ONT-MI PARs are modeled in the Market Flow and FFE calculations.



Overview

- ONT-MI PARs and Lake Erie Loop Flow
- Performance Evaluation
 - Results
- Modeling of ONT-MI PARs in M2M Process
- MISO Position
- PJM Position



ONT-MI PARs and Lake Erie Loop flow

- ONT-MI interface consists of 230 kV lines with five PARs available to manage Lake Erie loop flow
- Lake Erie loop flow (also called Lake Erie circulation flow or LEC) is unscheduled flow of energy across the transmission system surrounding Lake Erie
- ONT-MI PARs are used to manage LEC by having actual flow equal scheduled flow within a 200 MW control band

ONT-MI PARs Performance Evaluation

- Objective: Evaluating the performance of PARs on their ability to manage Lake Erie loop flows such that actual flow equals scheduled flow
- Evaluation period: Aug 2012-Aug 2013
- Data used for evaluation: 15 min Average of scheduled flow and actual flow across the interface
- IDC mode (see appendix) was used to determine if PARs were available to fully control LEC
 - Regulated mode
 - Unregulated mode
 - Bypass mode

Evaluation Results

Loop flows within/outside control band (as % of Year)		
	Regulated Mode	Unregulated Mode
Within control band	70.3%	2.8%
Outside control band	25.2%	1.7%
Total	95.5%	4.5%

- Factors attributing to the flows being outside the control band:
 - Large schedule changes
 - Delay time as taps moved
 - Operator judgment that LEC flows will return to the control band without intervention
- PARs provided a noticeable improvement (30%) in control of LEC during the one year period. Loop flows were within the control band for:
 - 73.1% of the year with PAR control vs. 43.4 % of the year without PAR control

Modeling of ONT-MI PARs in M2M Process

	Entitlement Calculation	Market Flow Calculation
Current	Unregulated (free flowing)	Unregulated (free flowing)
MISO Recommendation	Regulated (open circuit) unless one of the PARs, that form an Interface, is out of service in System Data Exchange (SDX)	Regulated (open circuit) when Regulated in IDC and Unregulated (free flowing) when Unregulated or Bypassed in IDC

MISO Position

Loop flows within/outside control band (as % of Year)		
	Regulated Mode	Unregulated Mode
Within control band	70.3%	2.8%
Outside control band	25.2%	1.7%
Total	95.5%	4.5%

- Based on the evaluation, the interface should have been free-flowing only 4.5% of the time (when in Unregulated Mode)
 - Current modeling in market flow and entitlement calculations assume a free-flowing interface 100% of the time
- MISO recommends that the modeling of the ONT-MI PARs in the market flow and entitlement calculations should be consistent with their treatment in the IDC
 - By adopting MISO's recommendation, modeling in market flow and entitlement calculations will be correct 74.8% of the time ($70.3\% + 4.5\% = 74.8\%$) versus 4.5% of the time under current modeling

PJM Position

- PJM believes the ± 200 MW control band which is 25% of the PAR control capability, is too wide to indicate whether the PARs are actually controlling flow.
- PJM opposed the IDC modeling of the ONT-MI PARs prior to their implementation. PJM continues to disagree that the IDC operational protocol provides sufficient control to change from modeling the transformers as free flowing ties.
- PJM disagrees with the characterization that the calculations will be “correct” 74.8% of the time as a result of the modeling change MISO recommends. The calculations would be “correct” almost 50% of the time if they were modeled as free flowing ties (actually 44% of the time because the flow would have been within the band with no control, plus 5% of the time when they are in unregulated mode). Therefore, the PARs are really only incrementally providing control about 25% of the time.
- PJM does not understand how operators can expect the LEC to come back under control “on its own” when the PARs are modeled as open circuits, because the open circuit modeling does not allow for any changes to the loop flow effects that would result in this LEC correction.
- As a result, PJM believes that adopting the MISO recommendation would inappropriately impact M2M settlement via the impacts on market flows and entitlements



APPENDIX



IDC MODES FOR PARS

- Regulated mode - PARs are in-service with enough expected capability to control loop flows.
- Unregulated mode - PARs are in-service but are not expected to be able to control loop flows (devices either at max tap or system conditions preclude device from fully controlling the interface).
- Bypass mode - PARs are physically bypassed or they are in-service but near neutral tap with no intent to control flow.