



Joint and Common Market

MICHIGAN-ONTARIO PHASE ANGLE REGULATOR (PAR) CONTROL STUDY UPDATE

Objective

- MISO, PJM, NYISO, and IESO have completed an analysis of the operation of the ONT-MI PARs over a year of operation. This presentation will review the results of the analysis.

Overview

- ONT-MI PARs and Lake Erie Loop Flow
- Performance Evaluation
 - Results

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: Jan 2015-Dec 2015
- 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 | 75.7% | 0.9% |
| Outside control band | 22.6% | 0.8% |
| Total | 98.3% | 1.7% |

- 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:
 - 76.6% of the year with PAR control vs. 52.1% of the year without PAR control

A decorative graphic consisting of two horizontal lines. The top line is grey and the bottom line is dark red. Both lines have a double-headed arrow in the center, with the top arrow pointing left and the bottom arrow pointing right.

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.