

Evaluation Considerations for Phase Angle Regulators (PARs) seeking Injection and Withdrawal Rights in PJM

Aaron Berner
Manager, Interconnection Analysis
PARTF
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The purpose of this presentation is to outline initial thoughts surrounding the studies and coordination necessary to allow phase angle regulators to obtain injection and withdrawal rights, assuming these rights are available to this technology. Additionally, operational considerations are also discussed.

(These studies and proposed requirements are being reviewed and will be modified as necessary for implementation in the PJM Manual(s))

- Feasibility and Impact Study phases
 - Assume taps fixed at maximum power transfer for post contingency evaluation
 - Summer peak evaluations conducted for Feasibility & Impact Study phases
 - Light Load studies conducted for Impact Study phase

- Feasibility Study phase
 - Identify proposed project to entity outside of PJM
 - Injection
 - Generation Deliverability
 - Common Mode (multiple facility contingency – excludes N-1-1)
 - Short Circuit
 - Withdrawal
 - Generation Deliverability
 - Load Deliverability (firm portion only)
 - Short Circuit

- Impact Study phase (All studies to be coordinated with entity outside of PJM – Location of remote end connection as well as other potentially impacted parties)
 - Injection
 - Generation Deliverability
 - N-1 Thermal and voltage
 - Common Mode (multiple facility contingency)
 - N-1-1 for firm portion only
 - Short Circuit
 - Stability

- Impact Study phase (continued)
 - Withdrawal
 - Load Deliverability (firm portion only)
 - Generation Deliverability
 - Short Circuit
 - Stability

- Review impacts to other phase angle regulators installed on system
- Evaluate controls response impacts
 - Harmonics
 - SSR
 - Power Line Carrier Interference
 - Dead band required for tap switching?
- Evaluate Interface transfer impacts
- EMTP

- Operational controls
 - Automatic and manual controls required for PARs
 - Operating procedures may be necessary but are to be minimized through system reinforcement
 - Evaluate impacts to interface transfer limits
 - Tap changes not permitted to eliminate overload conditions or constraints identified in studies
 - Determine impacts if PAR facility bypass is incorporated in design
 - Protection coordination