

Transmission Planning Considerations for DERs with Reverse Power Flow

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Paper Session - Grid of the Future 2019



Overview

- Reverse Power Flow
- Generation Interconnection (GI) study
- Modelling considerations for DERs
- Transmission Industry trends
- Future considerations



Reverse Power Flow (RPF)

- Cause
 - Excess generation and power flow from high penetration aggregate DERs, DG and end-use residential sources
- Problem
 - May begin to see reliability impacts of RPF on transmission system
 - If DERs are to be assessed for these impacts, a criteria, procedure, or regulation will be needed to tie any necessary transmission system mitigations and costs may be allocated to the distribution resources.



Generation Interconnection Studies

- Generation Interconnection (GI) process for transmission system
- Future studies for RPF may introduce similar impacts as seen in GI studies
 - Steady State: overloading or voltage impacts
 - Short Circuit: verify new short-circuit level
 - Stability: Evaluate instability of new and existing generators, as well as transmission system



Modelling Considerations

- Legacy models show DERs aggregated with distribution loads at the transmission bus
- Modelling DERs independently for RPF analysis will be key, especially in dynamic studies
 - WECC DER_A model is being implemented now



DERs within the Transmission Industry

- Understand how the transmission industry is focusing on DER impacts now to position for future studies involving reverse power flow.
- Assessing the known impacts of DERs on current business practices is acceptable with today's DER capacity
- Identify takeaways for future transmission planning procedure for DERs in modelling or analysis.



MISO

- Looking at all renewable impacts through RIAs
- Identify “inflection points” in system reliability where DER impacts need to be considered in future planning
- DERs modelled as constant-current negative loads
- Issue tracking



ERCOT

- DER Reliability Impact Assessment in 2017
- DERs mapped to loads for transmission base cases
- Register all DERs > 1 MW that participate with the market



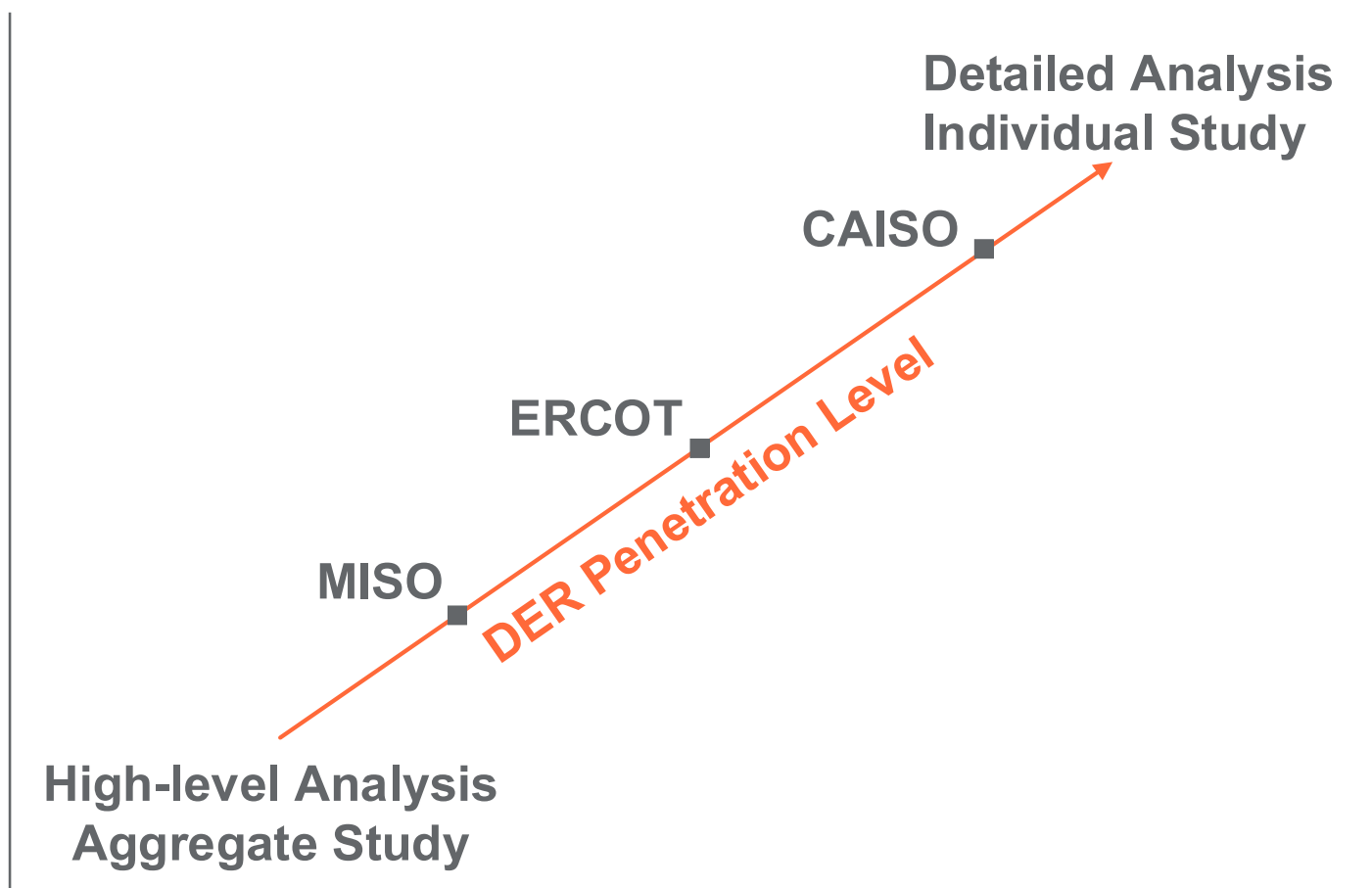
CAISO



- CAISO: 2-Step Planning process
 - Step 1: Aggregate DER deliverability transmission study, results communicated to distribution entities for DER approvals
 - Step 2: Projected aggregate DER capacity provided by distribution, used as DG input in transmission loads in base case

DER Study Trend

- Industry is looking at both high-level and localized impacts of DERs depending on current levels of penetration





Future Considerations

- Cost allocations for mitigations/network upgrades?
 - Criteria for assigning cost responsibilities
 - Allocation to individual or group of DERs?
- RPF network upgrades can benefit generators in GI process
- Strengthened and continuous communication between transmission-distribution entities

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