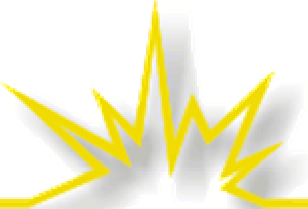


Overview of Distributed Generation Interconnection Issues

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Interconnection: What's Involved

➤ Physical Interconnection

- IEEE 1547 governs physical devices where distributed resources attach to public utility system
- Strictly an engineering standard
- Not an application process or contracting standard
- Now codified as part of EPAct 2005 (see Section 1254)



What's Involved

➤ Utility Process

- Application
- Fees
- Timing
- Studies

➤ Interconnection Agreements

- Utility, customer and (possibly) third-party operator



Two Types of Interconnections: Wholesale & Retail

- FERC has jurisdiction for DG that participates in wholesale markets – even if connected at the distribution level
- For example, PJM has wholesale interconnection standard as part of its Open Access Tariff
- All retail-only (no sales into wholesale market) interconnections fall under jurisdiction of state PUCs
- Ideally, wholesale and retail interconnection requirements will be similar



Market Power & Anti-competitive Behavior

- Thin margins for distributed generation
- Even small barriers can undermine projects
- Time and process costs are biggest problems



Types of Barriers

- Application fees
- Studies
- Interconnection hardware
- Operational constraints
- Utility imposed testing (pre-operational and operational)
- Standby & backup rates
- Demand ratchets



The Inconsistency Barrier

- Requirements vary from utility to utility
- Requirements not transparent
- Requirements not uniformly applied
- “Additional” utility-specific or state-specific requirements



MADRI Experience

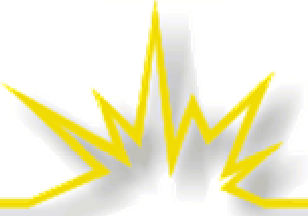
Major Areas of Disagreement

- Fees
- Timelines
- PJM vs. IEEE 1547
- Isolation device
- Fault current as a % of short circuit interrupt capability



Approaches for Success

- Standardized contracts
- Nominal or no fees for small systems
- Pre-certification of DG systems – especially inverter-based systems)
- Stream-lined applications and review processes for smaller systems
- Limitation of “study” requirements for smaller systems
- Regional uniformity



The following slides contain
additional information and
resources



FERC Small Generator Interconnection Rules (May '05)

- Culmination of multi-year process to develop interconnection rules for 0 to 20 MW facilities
- Rule outlines procedures, not technical standards
- Only applies to FERC jurisdictional interconnections – very small % of small DG interconnections
- In spite of limited jurisdiction, rules represent broad stakeholder consensus and provide good blueprint for states
- URL Reference:
<http://www.ferc.gov/EventCalendar/Files/20050512110357-order2006.pdf>



NJ Interconnection Procedures (October '04)

- Applies to <2MW renewable systems
- Paved new ground for expedited review procedures
- Introduced timelines for utility reviews
- Integrated testing and certification requirements
- More detailed Level 3 Review is very similar to PJM procedures
- URL Reference:
<http://www.bpu.state.nj.us/wwwroot/secretary/NetMeteringInterconnectionRules.pdf>



PA Interconnection NOPR (November '05)

- Applies to 2MW and less -- consistent with state renewable energy legislation
- PA integrated their rule development process with MADRI's interconnection activities
- Procedures outlined in NOPR are very similar to MADRI procedures
- Exceptions and differences from MADRI are clearly documented
- URL reference:
<http://www.puc.state.pa.us/PcDocs/571751.doc>



MADRI Interconnection Procedures (November '05)

- **Developed by broad stakeholder group to reduce interconnection barriers across the Mid-Atlantic Region – one of 5 MADRI focus areas**
- Based on FERC & NJ procedures
- Two key considerations:
 - Technical standards (establish common requirements for DG interconnection equipment)
 - Implementation procedures (establish common rules for how DG equipment gets connected)
- URL reference:
http://www.energetics.com/MADRI/pdfs/inter_modelsmallgen.pdf



MADRI Procedures Overview

- Four categories of review
 - Expedited: {
 - Level 1 <10KVA inverter based/certified
 - Level 2 <2 MVA Inverter based/certified
 - Level 3A – DG does not export power
 - Level 3 – Up to 10 MVA
- Reference to PJM Small Generator Technical Requirements (IEEE 1547 Based)
- Procedures to connect to area networks
- Criteria for testing & certification
- Two standard interconnection agreements
 - 10 KVA and Less
 - > 10 KVA to 10 MVA

MADRI Insight

Connecting To Area Networks

- Difficult area to get utility agreement
- MADRI presumption is that it should be safe to connect to area network if:
 - No export of power
 - $DG < 5\%$ of peak load on network up to 50 KW
- Burden is on utility to conduct study showing that DG is not safe
- Study is at utility expense

MADRI Insight

Level 2 & Level 3A Procedures

- MADRI limits Level 2 Review to certified inverter based equipment
 - Need to look at fault currents
 - Need to look at synchronization & protection schemes
 - Unlikely many non-inverter based interconnection systems in 10kVA to 2MVA will be certified
- Level 3A Review developed to provide expedited review for non-inverter based equipment that does not export and does not have a certified interconnection system



MADRI Insight

Testing & Certification

- MADRI made significant progress in integrating IEEE 1547 Technical Requirements with 1547.1 Testing Requirements and clearly defines certification requirements to qualify for expedited reviews
- This integration is key to successful implementation of screens and will help ensure greater standardization among state interconnection procedures



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http://grouper.ieee.org/groups/scc21/dr_shared/