Challenges in Developing a Standard for Interconnecting Distributed Resources With Electric Power Systems

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N. Richard Friedman, Chairman
Resource Dynamics Corporation
8605 Westwood Center Drive
Vienna, Virginia 22182
703/356-1300 E-mail: nrf@rdcnet.com

The Return of Distributed Generation

- "Reappearing" After a Long Absence
- The Concept of Distributed Power is Not New
  - "Total Energy" Experiment in the 1960s
  - Packaged Cogeneration of the 1980s

Electric Power Systems Not Designed for Distributed Power Resources

- Utility Circuits Typically Radial, Designed for “1-Way” Operation
- Selling Power into the Grid Was Not an Issue Until PURPA

Systems Designed to Accommodate Impact of System Disturbances

- Transmission Line Faults
- Equipment Failures
- Sudden Loss of Generation or Load
- Variation in Line Flows

Major Goad - Maintain a Reliable Electric Power System

Interconnection is Not a New Issue

- Customer Generation Has Been Around for Over 50 Years (Frequently CHP)
- Interconnection of Larger Generator (> 25MW) Accomplished at Customer-Owned Substation
- Smaller Projects Used All Power On Site, Paralleling Grid for Backup/Supplementary Power
- Power Sometimes Provided to Grid in Emergency and Special Situations

Utility Motivations in Past

- Maintain Grid Stability and Reliability
- Minimize Problems from Uncontrolled Customer Generation
- Obtain Protective Relaying to Protect the Grid
- Discourage Customer Generation
  - Discount Retail Rates
  - Discredit Customer Cogen Proposals
  - Take a Position in Development of Project

Interconnection is Not a Simple Issue

Utility Concerns

- Electric Power Distribution Systems Designed for One-Way Operation
- Personnel Safety and Grid Stability Are Dominant Concerns
- Utilities Reluctant to Rely on Unfamiliar, Customer-Supplied Protective Relaying Schemes
- Integrated Interconnection “Packages” Not Generally Accepted and Known

Interconnection is Not a Simple Issue

Customer Concerns

- Utility Interconnection Costs Can Be a “Deal Breaker” for Smaller-Sized Projects
- Some Requirements Not Understood by Customer, and May Appear Unreasonable
- Manufacturer, Customer and Utility DG Activities are Frequently Not Coordinated
- Interconnection Requirements Are Far From Standard

Interconnection Getting A Lot of Attention Today

- New Vendor Packages Available, Often Integrated With the Inverter
- Under the EEI Umbrella, Utilities Identifying Issues of Concern
- Interconnection Being Addressed at State Level
- Interconnection “Flagged” in Administration’s Restructuring Legislation
- IEEE Standards Coordinating Committee Developing Interconnection Standard

IEEE Interconnection Standard

- Being Developed by IEEE SCC21-P1547
- Responsible for Standards Development in Areas of
  - Fuel Cells
  - Photovoltaics
  - Dispersed Generation
  - Energy Storage
- Reports to IEEE Standards Board

IEEE Interconnection Standard

- *Title:* Standard for Interconnecting Distributed Resources With Electric Power Systems
- *Purpose:* Provide a Uniform Standard for Interconnection of Distributed Resources With Electric Power Systems, and Requirements Relevant to the Performance, Operation, Testing, Safety Considerations, and Maintenance of the Interconnection

IEEE Standards Committee Plans

- Spring 2001 Completion Date
- Working Group of Over 121
- Meetings Every 2 Months
- Richard DeBlasio, NREL is Chair

Interconnection Concerns Covered in Standard

- Safety
- System and Equipment Protection
- Power Quality and Reliability

Technical Requirements Fall Into Several Categories

- General
- Faults
- Power Quality
- Islanding

Challenges in the Standards Process

- Technical Issues
  - Evaluating DR Penetration on the Grid
  - Understanding Inverter-Based Protective Relaying Packages
  - “Independent” Testing & Certification
  - Understanding Broad Span of Utility Interconnection Concerns
- Other Issues
  - “Fast Tracking” An Important Standard
  - Allowing for Organized Input from All Stakeholders

What to Expect Next?

- Continued Attention to Easy, Low Cost and “Standardized” Interconnection - Will Not Work at All Points on Utility System
- Utilities Nervous and Uncertain of Impact on Their T&D Operations
- Legislating Standardized Interconnection May Not be Realistic or Feasible
- Improved Manufacturer Interconnection Packages

What to Expect Next (cont.)?

- Accelerated Activity at State Level Regarding Interconnection, But Deferral to IEEE Standard
- Standard Completed by March 2001 - Functional Rather Than Prescriptive Approach
- Utility Specification of “Preferred Points of Interconnection” Likely

Future IEEE SCC21-P1547 Meetings

- January 26-27, 2000
  - Albuquerque, NM
- April 2000
  - Pittsburgh, PA