

ERE Committee Meeting Panel Discussion on Micro-grids

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Carnegie Mellon Electricity Industry Center

CEIC was founded in 2001 and its primary funding comes from Sloan and EPRI. CEIC research topics include electricity markets, distributed energy resources, transmission issues, demand response, environmental issues, infrastructure reliability and security, etc.

Visit <http://wpweb2k.gsia.cmu.edu/ceic/index.htm>

Mr. King's thesis research

Economic-engineering model of micro-grid systems

Study of regulatory environment for micro-grid systems

Study impact of micro-grid system architecture on innovative activity

Overview

Why are micro-grids worth your interest?

- Potential benefits, costs
- Timing

Different types of micro-grids

- Ownership, operation, design

Regulatory environment for micro-grids

- Legal rights for micro-grids
- Barriers to development

Opportunities and recommendations

Why now?

Development of DERs

- Policy changes for interconnection and operation
- Tech development in generation (ARES, AIMS), controls (solid-state, wireless), and CHP

Increasing value of reliability

- Gas Research Institute estimates 40,000 MW of backup capacity nationwide

Legislative interest in competition

Innovative stagnation

What are the potential *benefits*?

Value to customers

Improved market behavior

- Demand response to price signals
- Increased competition
- Product differentiation
- Increased innovative activity

Societal value

- Provision of ancillary services, reduced T&D burden
- Less risky investment
- Smaller capital investment, flexible resources

What are the potential *system risks*?

How can they be managed?

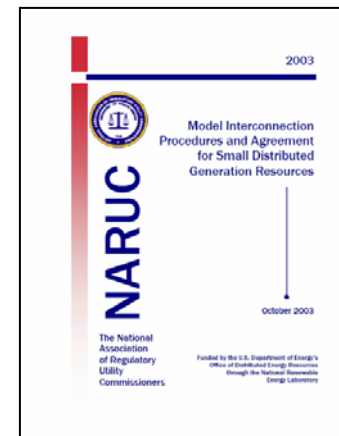
Safety

- Interconnection standards that eliminate unwanted islanding



System reliability

- Interconnection procedures that minimize or eliminate negative system impacts



What are the potential *system risks*? How can they be managed?

Utility sunk costs

- Limit the # or size of micro-grids
- Tariff design to encourage micro-grid development in areas with high congestion and consumer growth

Micro-grid customer satisfaction

- Bilateral contracts with teeth
- Credit / insurance requirements

Different types of interconnected, independent micro-grids

Landlord model

- Landlord providing power to tenants under contractual agreement

Co-op model

- Multiple owners serving their own needs

Customer-generator model

- Single owner serving needs, selling to other co-located customers

District heating model

- Independent owner, selling to other co-located customers

Regulatory Issues: Are micro-grids legal?

Do micro-grids have a legal right to operate?

- “Probably” in 17 states
- “Unclear” in 5 states
- “No” in 5 states
- Micro-grid must avoid “public utility” status

How to avoid public utility status

- Owner(s) must be primary consumer
- Micro-grid customers must be contiguous
- Micro-grid may serve a limited # of customers

Barriers to micro-grid development

**Uncertainty,
Uncertainty,
Uncertainty**

**Uncertain legal status, interconnection
procedures, tariffs, etc. = high risks**

High risks for micro-grids = underinvestment

High risk for utilities = opposition

Barriers to micro-grid development

Service territories / utility opposition

- Even where micro-grids might have a legal right to operate, they will face legal battles

Case study: PEI Power Park vs. PPL utility

- Sept. 1997 PEI started micro-grid project
- PPL argued before the PA PUC that PEI was a public utility in their service territory
- Sept. 1998 PA PUC issued declaratory order that PEI was not a public utility and could proceed
- PPL continued to fight the project in civil court, and PEI abandoned plans as a micro-grid
- “Customers pay more for electricity now”

Sources of Uncertainty

Interconnection procedures

- Timing, necessary studies, etc.
- Technical requirements

Utility tariffs

- Discriminatory rates
- Stand-by charges
- Interconnection “gold-plating”

Customer interactions

- Billing, insurance, credit, dispute resolution

Siting /environmental permitting

Sources of Uncertainty

Out of 27 total states surveyed, and 17 states where micro-grids are probably legal:

- 8 have *tariff rules* that would probably apply to micro-grids
- 10 have *technical interconnection requirements* that would probably apply to micro-grids
- 10 have *interconnection procedures* that would probably apply to micro-grids
- Only 4 states have all three, and their application to micro-grids is only speculated, not legally defined

Recommendations

Formalize the definition and legal rights of micro-grids

- Right to provide electricity and heat to co-located customers
- Right to be served by the local utility
- Right to sell (limited) power to the utility
- Ability to provide the utility with ancillary services
- Distinguish among different types of micro-grids

* Michigan Public Service Commission, Case No. U 11915, June 19, 2000.

Recommendations

Require utility tariffs for customer-generators such as micro-grids

- Non-discriminatory
- Replace stand-by fees with peak demand charges

Adopt standardized interconnection procedures that are applicable to micro-grids

- Timelines
- Procedural steps (Feasibility studies, Impact studies, etc.)

* Michigan Public Service Commission, Case No. U 11915, June 19, 2000.

Recommendations

Limit system and utility risk

- Adopt technical interconnection requirements that are applicable to micro-grids
- Initially set limits on the capacity and # of customers on individual micro-grids
- Set limits on the total # of micro-grids
 - i.e., in NJ total net metering capacity must be less than 0.1% of state peak demand
- Design tariffs to encourage development in areas with congestion and demand growth
- Require micro-grids to provide utilities with plans ahead of time

Recommendations

Formalize the responsibilities of micro-grid owners

- **Standardized operating rules**

For example, in accordance with MI Customer Choice and Electric Reliability Act of 2000, the MI PSC established licensing procedures for alternative electric suppliers.* Suppliers must demonstrate: the products and services it will provide; billing and customers dispute methods; a line of credit; a mechanism for collecting State fees and taxes; and a method for providing data to customers and the State.

- **Provision of information to utilities and the State**

* Michigan Public Service Commission, Case No. U 11915, June 19, 2000.

Recommendations

Allow or require natural gas tariffs for micro-grid and DER customers

- In 2001, NJ Natural Gas Company (NJNG) petitioned for Distributed Generation Service Tariff. NJNG argued that DER loads improved their load factors and asset utilization. The tariff only lowers distribution charges (a total bill savings of 10-25%). It was approved by the NJ Board of Public Utilities in 2003.
- In 2003, NY PSC ordered natural gas utilities to provide DG tariffs that take into account the costs and benefits that DG customers provide.