Overview

Standard & Code Considerations for Stationary Fuel Cell Installations In the United States

July 14, 2009

Caroline Judy, County of Santa Clara
Karla Conmy
Know Your Audience

- Authorities Having Jurisdiction
  - What type of plan checker for site build permit?
  - What type of in-field inspectors are expected?
  - Who will be the final permit approvers for operation?

- Electric utilities
  - Different levels of knowledge of distributed generation throughout most US-based utilities

Be a resource for interpretation of codes and standards
Sell the Technology & Safety of Installation

Entire site will be built and fuel cells installed per existing, typical plumbing, gas, electrical, other, code requirements:

there are, however, well established, fuel cell-specific standards & codes!

Ensure that permit approvers understand that they can contribute to regional leadership in promoting clean energy
Conventional Energy Production

Power Generation + Transmission

Not quick to permit & build these!
Distributed Generation Technologies

Fuel Cell Power Systems

- Microturbine
- Diesel/Gas Genset
- Wind Turbine
- Solar / Photovoltaic
Specific Stationary Fuel Cell Standards & Codes

- NFPA 853 for installation
- NFPA 70 (NEC), Article 692 for installation
- ANSI/CSA America FC 1-2004 for design/construction
- IEEE P1547 for grid connections
- UL 1741 for grid connections

Safety
Of People & Property
During Operation & Maintenance
Worst Case Scenarios
Installation Requirements & Codes

NFPA 853 – Standard for Installation of Stationary Fuel Cell Power Systems
- General equipment configuration
- Siting and interconnections
- Fuel supplies and storage arrangements
- Ventilation and exhaust
- Fire protection

Manufacturer’s installation instructions
NFPA 70 (National Electrical Code), Article 692 Fuel Cell Systems

- Circuit requirements
  - Circuit sizing and current
  - Overcurrent protection
- Disconnecting means
- Wiring methods
- Grounding
- Markings
- Connection to other circuits
  - Utility interactive (Article 692.65, 2008 NEC)
System Design for Safe Operation


- Construction, Performance, Quality Assurance
- Nationally Recognized Test Laboratory Listing
System & Site Designed for Safe Operation

- Software Control Safety Features
- Hardware Control Safety Features
- External Manual Shut-Offs

EPO Shuts Down Systems
System Disconnects
Shuts Off Gas
IEEE P1547 *Standard for Interconnecting Distributed Resources with Electric Power Systems*

- Technical requirements for DG interconnection
- Addresses requirements relevant to *performance, operation, testing, safety considerations, and maintenance* of the interconnection
Generator device protective relay settings
• Abnormal voltage & frequency settings
• Anti-islanding protection
• Reconnection time
• Breaker synchronization

Generator impact on power quality
• Voltage flicker
• DC injection
• Harmonic distortion
• Voltage regulation limits/modes

Other
• Interaction with utility system grounding
• Field & commissioning tests
• Surge withstand ratings
Interconnection with Electric Power Systems

UL 1741: Inverters, Converters & Controllers for Use in Independent Power Systems

- Anti islanding provisions / protection
Other References to Fuel Cells

Stationary fuel cells are also referenced specifically:

- Uniform Mechanical Code – Chapter 16
- International Mechanical Code – Section 924.1
- International Fuel Gas Code – Section 633.1
Practical permitting for Dummies

- Know your audience
- Know your technology
- Know relevant codes and standards

Communicate and educate!
Thank you!