DCEC Company Overview

• Headquarters: Delhi, New York
• Geographic Area Served:
  • South Eastern portion of New York State
  • Greater Catskill Mountains
• 800 miles of distribution lines
• 5,000 member/customers
• 35 Employees
• “Full Requirements” status with New York Power Authority
• System Load: ~15MW peak
• Member of National Rural Electric Cooperative Association (NRECA)

Vital Utility supplier to the Greater Catskill Mountain Area
• Validate objectives of propane fueled hydrogen fuel cells for edge-of-grid residences via a field trial demonstration
  – measure and report technical performance
  – provide raw cost data and economic viability analysis
  – document maintenance and operations concept enhancements specific to residential fuel cells
  – share safety related vulnerabilities analysis and lessons learned
  – promote education of state and local consumers

*Project Objectives*

Technical and economic viability of fuel cell alternative to new line construction.
Budget

- Total project funding: $588,646
  - DOE share: $294,323
  - DCEC share: $294,323
- Estimated FY03 Expenditures: $114,000
  - estimate includes project planning, contract administration/reporting, preliminary engineering, and initial educational efforts
  - estimate assumes no fuel cell purchasing expenditures during FY03.
• DOE Technical Barriers for Fuel Cell Validation
  – DOE designation “I”
  – Hydrogen and electricity co-production
    • Cost and durability not statistically validated
    • Permitting, codes, and standards not established for fuel cells in or around buildings
    • Lack of operational and maintenance experience

Field experience required to overcome barriers.
Technical Performance Objectives

- Efficiency with and without thermal recovery
  - Electrical energy efficiency at rated power
  - Combined heat and power (CHP) efficiency
- Cost
- Transient response
- Cold start time
- Survivability
- Durability
- Power quality
- Noise
- Emissions

Controlled experiments and real time measurement and reporting during operating period.
Sensitivity Analysis Parameters

- Temperature
- Humidity
- Propane odorant variations (constituents, odorants, heating value, etc.)
- In-service time

Real-world range of operating conditions and fuel compositions.
Economic Viability

- Complete economic model for “typical” rural residential customer
- Extending portions of economic model to other rural electric cooperative load types
  - Peak demand and load profiles
  - Non-residential

Enable comparison fuel cells to alternative distribute generation technologies.
Approach

- Install and operate
  - evaluation of alternative fuel cell technologies for rural residential applications
  - propane fueled residential fuel cell
  - thermal recovery for water and space heating
- Rigorous approach to parametric control and monitoring throughout 12 - 18 month operating cycle
- Analyze 12 to 18 months of logged data
  - technical performance, economic viability, safety, operations and maintenance concepts

All activities managed utilizing Six Sigma tollgate approach.
Project Safety Vulnerabilities

- Customer safety regarding operation of switching mechanisms in support of independent (off-grid) operations of fuel cell
- Customer and cooperative personnel safety regarding siting, storage, and access to batteries
- Compliance with and evaluation of fuel cell vendor’s safety recommendations
- Environmental vulnerabilities related to fuel cell, batteries and propane storage

Each safety vulnerability reviewed at tollgates 3, 4, and 5 of Six Sigma process.
Project Safety Documentation


• In-house safety review process focused on fuel cell vendor safety documentation, propane vendor safety documentation, and the cooperative’s governing safety manual.

• Review comments and updated documents (where appropriate) to be provided to NRECA’s Cooperative Research Network and DOE.
• Phase 1 - Project Planning and Stakeholder Definition
• Phase 2 - Preliminary Engineering
  1 Contract finalization
  2 Site selection (Site Selection Report)
  3 Fuel Cell Vendor Contracting
  4 Interconnect engineering

ACF = After Contract Finalization
• Phase 3 - Detailed Engineering, Installation, and Startup
  5  Site work (Installation Report)
  6  Operational verification and startup (Commissioning Letter Report)
• Phase 4 - Operating Period
  7  System operation and data collection (Project Tollgate Reports)
• Phase 5 - Analysis and Closeout
  8  Data analysis and final reports (Final Report on Technical Performance Measures, Economic Viability, and Operations and Maintenance Procedures)
  9  Decommissioning activities

ACF = After Contract Finalization
Interactions and Collaborations

• National Rural Electric Cooperative Association’s Cooperative Research Network –
  – integral component of national research program
  – providing research methodologies and consolidating results with other cooperative demonstrations

• New York Power Authority
  – providing engineering, permitting, and interconnection support

• Fuel Cell Vendor
  – providing fuel cell plant, technical resources, and data acquisition analysis and reporting

• 1st Rochdale Electric Cooperative
  – potential involvement with NYSERDA (New York State Energy Research and Development Authority) in urban residential application
  – joint data analysis and peer review