

## Matrix Study of Aged SOFC Performance and Materials Degradation

#### Project FE0026095

Acumentrics SOFC, Boston University Program Manager: Joe Stoffa



## Problem statement

# Commercial viability of fuel cells requires

#### Acceptance in widespread markets

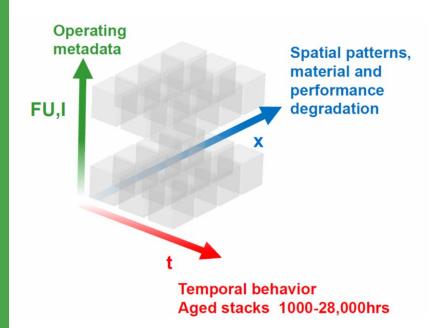
- Customer requirements
  - Superior performance
  - Long service life
  - High reliability
  - Low capital outlay

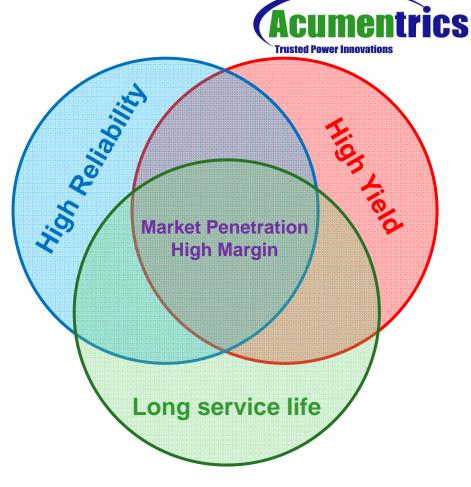
### Inexpensive SOFC product

- Production requirements
  - Low materials cost
  - High yield
  - High throughput

## **Project Statement**

### Matrix Study of Aged SOFC Performance and Materials Degradation





- Degradation behavior
  - Degradation mechanism
    - Cell manufacturing improvement



## Acumentrics SOFC, Inc

- SOFC division established in 2000, "Powder to Power" in single facility in Westwood, MA
- Focus on "rugged" fuel cells, pioneered small tubular SOFC;
  - 30 min startup and shutdown
  - Unattended operation in remote locations with >25,000hrs
- PRODUCTS
  - 250W-10kW products,
  - 250-1500 W commercial power products (NG, APG, LPG) with - 500 MW-hr
  - 3kW and 10kW development products (biofuel, diesel, JP8) for the US military
- FUELS and APPLICATIONS
  - Natural gas, LPG, JP8, biofuel
  - Critical remote power
  - Units all utilize remote monitoring for additional reliability

## **Remote Power Application**



- US Coast Guard Radio
  Network Towers in Alaska
- LPG flown in by helicopter; fuel efficiency highly desirable







# Remote LPG and NG Applications



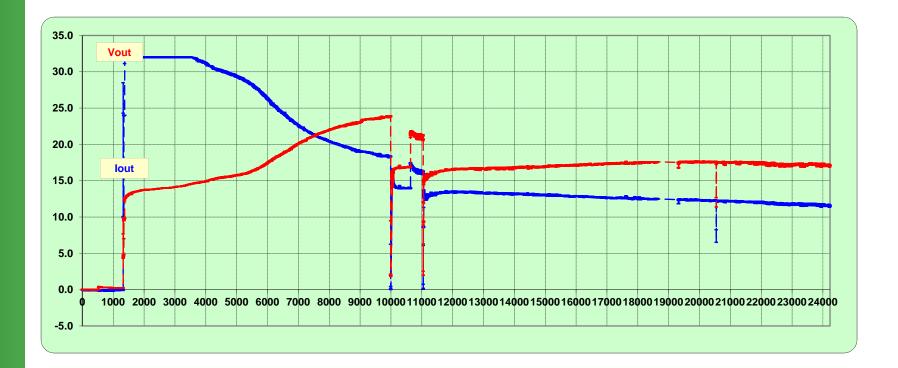








# Commercial SOFC in a Remote Power Application



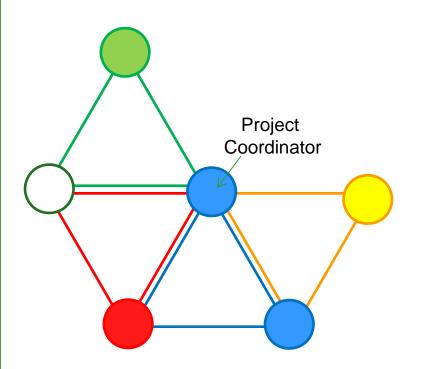
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Hourly averaged data of the voltage and current output from a field unit.



## **Team Arrangement**

- NDA between Acumentrics and BU is already in place
- Teams will transfer technical information on a bi-weekly basis

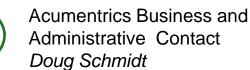




NETL Manager Joe Stoffa



Boston University Professor Gopalan's group





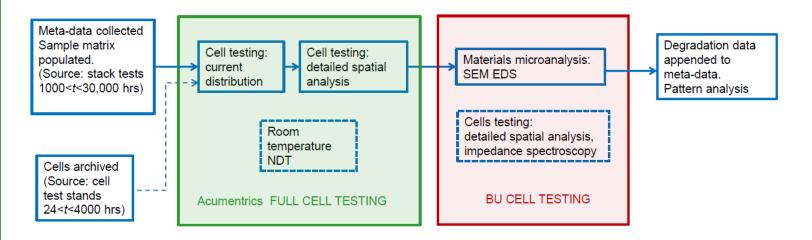
Acumentrics PIs Neil Fernandes, Shawn Ji

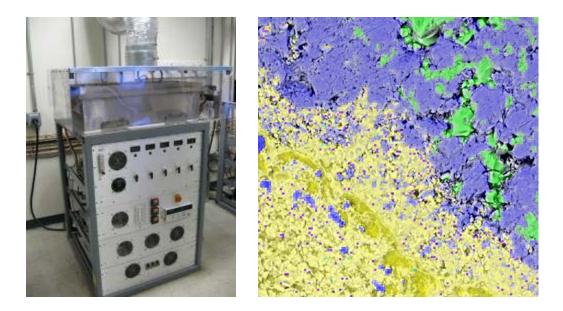


Acumentrics SOFC



## **Project Overview**





# Prof. Gopalan's Group at Boston University



### Impendence test capability

In-situ high temperature measurement

### Microstructure analysis capability

- SEM/EDX
- FIB/FESEM
- XPS
- AES
- Access to facilities in other institutions
- There will be one student dedicated to this project with appropriate training



# **Project Schedule**

ID	Task Name		Quarter 1			Quarter 2			r 3	Qua	Quarter 4			Quarter 5		Quarter 6		Quarte
		Sep	Oct 1	Nov Dec	Jan	n Feb	Mar	Apr	May Ju	n Ju	Aug	Sep	Oct	Nov E	Dec	Jan I	Feb Mar	Apr
2	Matrix Study of Aged SOFC Performance and Materials																	
	Degradation																	
3																		
4	Task 1.0 Project management and planning																	
5	Task 2.0 Survey of metadata and categorization of cells from aged stacks																	
6	Task 3.0 Electrochemical characterization of aged cells																	
7	Task 4.0 Application of NDT techniques for imaging defects in aged cells			I						<u> </u>								
8	Task 5.0 Materials characterization of aged cells														İ			
9	Task 6.0 Pattern analysis of accumulated data																	