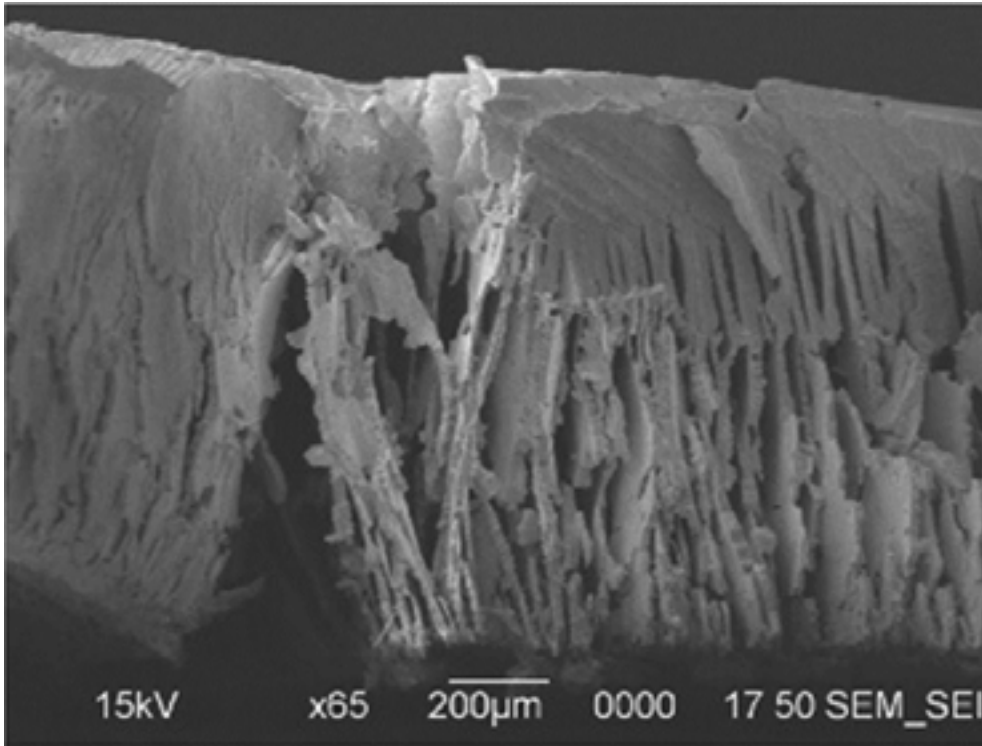


# Manufacturing and Performance Improvements for Solid Oxide Fuel Cells



*Internal structure of cells demonstrated by Petra Power*

## PROBLEM

Current advanced combustion engines operate at a typical efficiency of only 35-40%. With the small and lightweight nature of solid oxide fuel cells (SOFC), this technology should be capable of converting fossil fuels with up to 75% efficiency. These benefits enable the production of auxiliary power units that can reduce the Department of Defense (DoD) auxiliary fuel usage by up to 90%, saving countless lives otherwise lost in the transport and securing of fuel, and significantly reducing the greenhouse gas emissions of the DoD.

## OBJECTIVE

The objective of this effort is to provide technical engineering and manufacturing support for the development of SOFC power systems that can reduce DoD auxiliary fuel usage, reduce in-field casualties of servicemembers transporting and securing fuel, and significantly reduce the greenhouse gas emissions of the DoD. This includes activities such as the development and construction of fuel cells, balance of plant (BOP) components, and manufacturability improvements to support the deliverable of SOFC prototype: lightweight, 3kW laboratory-grade demonstration unit.

This project aligns to:



**Manufacturing Assessments**

**PROJECT START DATE**  
JANUARY 2023

**EXPECTED END DATE**  
JANUARY 2025

## PROJECT SUMMARY

### TECHNICAL APPROACH

NCDMM is assessing manufacturability approaches to include both product design and manufacturing process reviews. Design reviews include feedback and improvements to Petra Power's in-house designs for recommendations of custom equipment, parts, and integrated systems (including the deliverable). Review includes recommendations regarding manufacturing processes, supply chains, quality control, testing, inspection, and operations. The manufacturability assessments also include the creation and joining of electrochemical elements (cells), production of ceramic elements, and metallic fabrication processes. NCDMM leverages knowledge of advanced manufacturing to develop improved techniques for manufacturing SOFC. This includes the identification of custom equipment, optimized tooling, manufacturing process rates, and production workstations. Emphasis is placed on arranging equipment in a sequence that supports a smooth flow of materials and components through the production process. NCDMM is working with Petra Power to design and build a custom manufacturing cell that includes standard and custom-designed equipment utilized in manufacturing SOFC.

### FUNDING

**\$5.9M total project budget**

### PROJECT PARTICIPANTS

#### Project Principal:

Petra Power

#### Other Project Participants:

NCDMM

U.S. Army Combat Capabilities

Development Command (DEVCOM)

Ground Vehicle Systems Center (GVSC)

Rolls-Royce LibertyWorks

#### Public Participants:

U.S. Department of Defense

### About NCDMM

NCDMM delivers innovative and collaborative manufacturing solutions that enhance our nation's workforce and economic competitiveness. NCDMM has extensive knowledge and depth in commercial and defense manufacturing areas to continually innovate, improve, and advance manufacturing technologies and methodologies. Our experienced team specializes in identifying the needs, players, technologies, and processes to attain optimal solutions for our customers. We connect the dots. That's the NCDMM methodology. NCDMM also manages America Makes, AMARII, AMIIC, and El Paso Makes, and is a subsidiary of the Manufacturing Technology Deployment Group, Inc. (MTDG).