Transformational SOFC Technology

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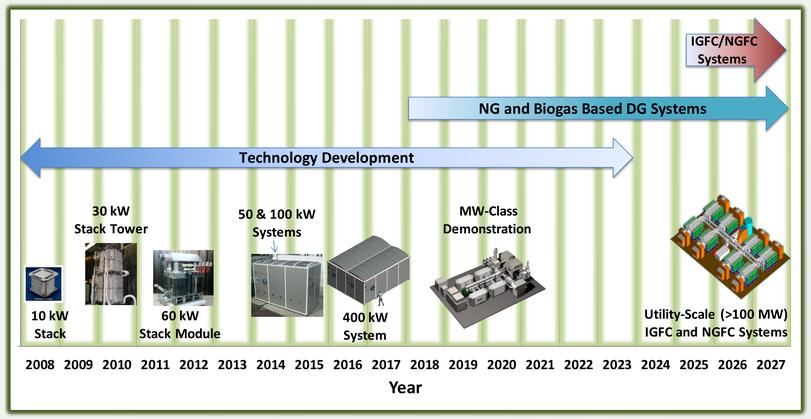
Project Objectives

- Advancing SOFC technology at the cell and stack level to enhance cell robustness and durability, increase performance, and reduce balance-of-plant (BOP) requirements
- Reducing system complexity and maintenance, and increasing power density and efficiency to enhance reliability and reduce cost of installed systems

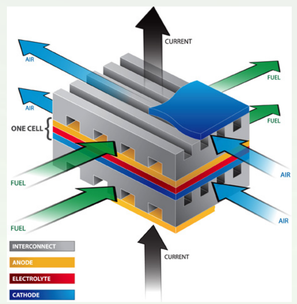
FuelCell Energy's SOFC Technology Development Roadmap

- SOFC-based Integrated Gasification Fuel Cell (IGFC) Systems offer the potential to achieve >60% efficiency (based on higher heating value of fuel) and 97% CO_2 capture at a cost-of-electricity that is approximately 40% below that of presently-available Integrated Gasification Combined Cycle (IGCC) systems
- Continued R&D, especially through implementation of innovative technologies, is driving down SOFC stack costs towards the ultimate goal of IGFC system deployment



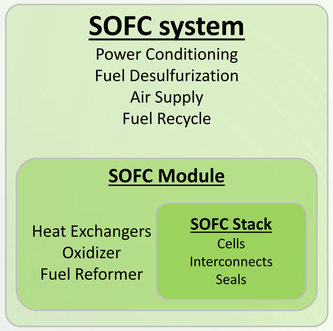
FCE/VPS Solid Oxide Cell and Stack Technology

- Planar anode supported cells (up to 1000 cm^2)
- Wide window of operating temperature (650°C to 800°C)
- Stacks with integrated manifolds and cross-flow gas delivery
- Ferritic stainless steel sheet metal interconnect
- Compressible ceramic gasket seals
- Capable of in-stack Direct Internal Reforming (DIR) of methane to hydrogen
- Standardized stack blocks configurable into stack towers for various power applications



Pathways to Transformational SOFC Technology

- Developing single-step sintered cells with reduced manufacturing cost & enhanced cell durability
- Enhancing redox stability of existing cell technology
- Adapting manufacturing process for improved cell technology
- Incorporating heat exchanger and oxidizer into stack-level assembly
- Investigating anode recycle solutions at the stack level, utilizing incoming fuel as the motive fluid
- Optimizing flow field geometry of cell layers for full utilization of incorporated stack structures
- Designing, fabricating, and testing a stack prototype for ≥1000 hours to demonstrate effectiveness of stack design improvements
- Estimating factory cost of advanced SOFC cell and stack technologies, based on anticipated operating conditions of a commercial SOFC product and high-volume manufacturing



Current system (left) vs proposed system (right)

Innovative Concept	Area of Cost Reduction
Single Step Sintering	Component Manufacturing
Redox Tolerant Cell	Endurance/O&M
Integrated Fuel Recycle	Equipment Cost
Integrated Oxidizer & Heat Exchanger	
Reduced Material	Stack Cost
Dual Function Interconnect	
Hot Stack Swapability	Capacity Factor

Cost reduction in both capital cost as well as operating and maintenance cost of SOFC systems to the level of competitiveness with existing alternative technologies

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