PROJECT facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

VISION 21

06/2000

ZERO EMISSIONS POWER PLANTS MADE POSSIBLE

PRIMARY PARTNER

Siemens Westinghouse Power Corporation
Pittsburgh, PA

TOTAL ESTIMATED COST

$3,072,953

COST SHARING

DOE	$2,300,000
Non-DOE	$772,953

WEB SITE

www.netl.doe.gov

Description

Siemens Westinghouse Power Corporation, with team member Praxair, will develop the technology that would enable Vision 21 power plants to achieve zero emissions, including carbon dioxide emissions. The approach is to modify the design of a tubular solid oxide fuel cell (SOFC) in order to separate the anode and cathode exhaust streams and then deliver the anode exhaust to an afterburner stack of tubular oxygen transport membranes (OTM). Air would be introduced to the OTM stack and the ionically transported oxygen would oxidize the residual fuel in the SOFC anode exhaust to carbon dioxide and steam. Since the exhaust contains no nitrogen, by condensing the steam the carbon dioxide could then be easily separated for eventual sequestration.

The focus of the proposed project is to develop ceramic OTMs that are chemically and mechanically stable in the SOFC anode exhaust environment and have an adequate oxygen flux to economically oxidize the residual fuel in the exhaust. The work will include:

- Systems study to set cost and oxygen flux targets for OTMs.
- Selecting candidate materials for OTMs and characterizing their physical, chemical, and mechanical properties.
- Fabricating the selected material in tubular OTMs and testing in the SOFC anode exhaust stream.
- Conceptual design of the SOFC and OTM modules.

Goal

Technologies to economically achieve zero carbon dioxide emissions in any type of power system do not yet exist. This project seeks to develop a true zero emissions power system by combining SOFC and ceramic OTM technology.

Benefits

OTM technology provides a much more efficient method of supplying the oxygen necessary to oxidize the remaining fuel in the SOFC exhaust than conventional cryogenic air separation technology. In addition, the comparable operating temperatures of SOFCs and OTMs allow for a very energy-efficient and cost-effective integration. OTMs can also be packaged very compactly compared to a cryogenic system, allowing for a system with a much smaller footprint.

NETL

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PROJECT PARTNER

Praxair
Tonawanda, NY

Milestones

System Study to Set Targets	December 2000
Materials Development	June 2001
Design and Fabrication of Tubular OTMs	June 2002
Measurement of Oxygen Flux in Tubular OTMs	September 2002
Seal Development	October 2002
Conceptual Design of a Combined SOFC-OTM Module	October 2002
Final Report	January 2003

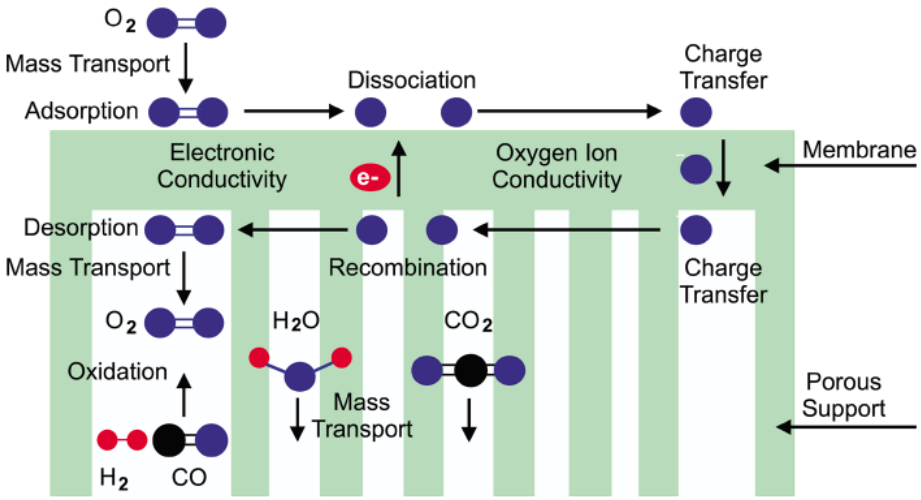

Illustration of transport mechanism of oxygen through a composite OTM with the porous support exposed to fuel.