

16th Annual *July 14-16, 2015*
**SOLID OXIDE FUEL
CELL WORKSHOP**

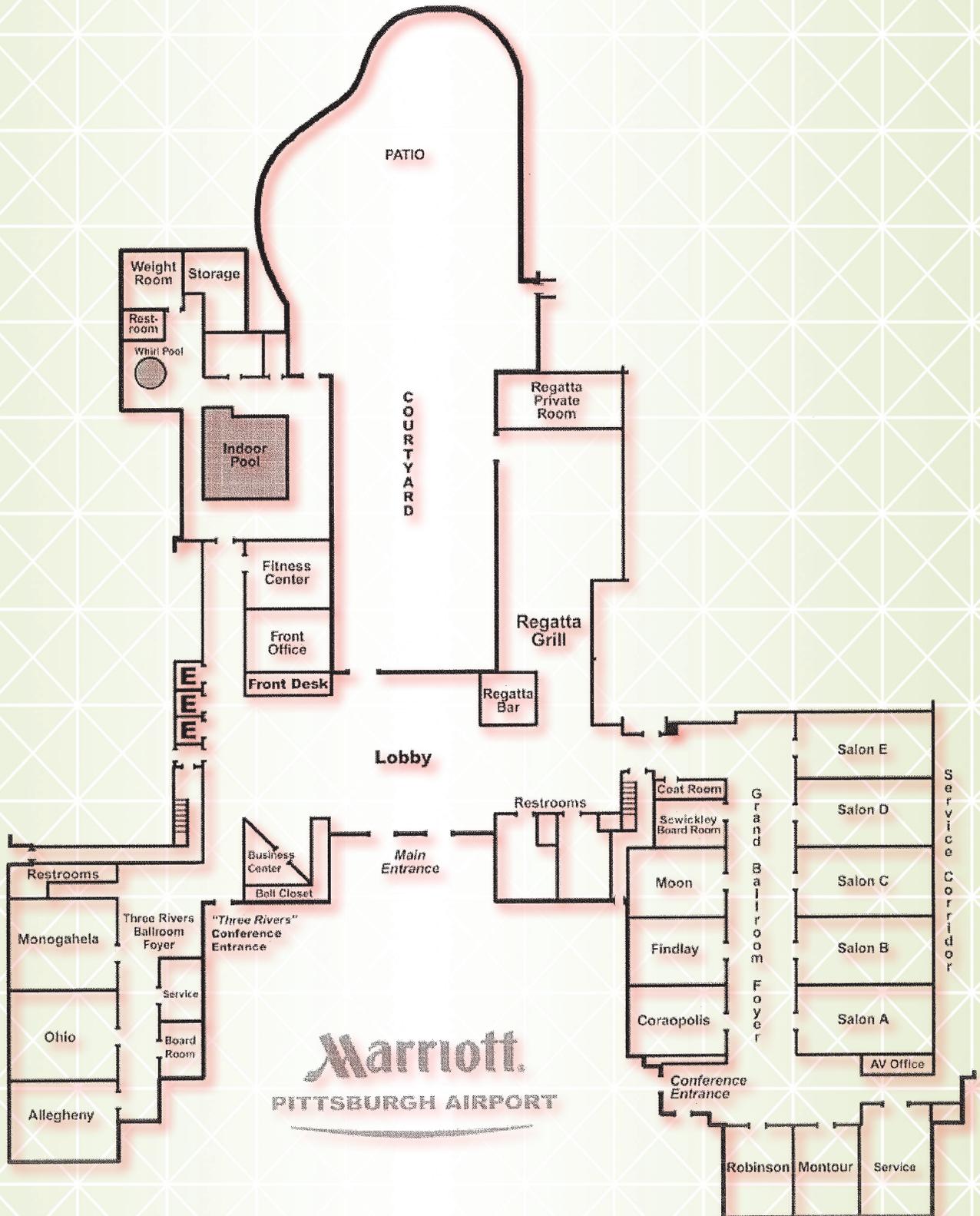
Pittsburgh Airport Marriott Hotel



U.S. DEPARTMENT OF
ENERGY



PITTSBURGH AIRPORT MARRIOTT HOTEL FLOOR PLAN



DETAILED PROGRAM

TUESDAY, JULY 14TH

GENERAL SESSION - SALON A, B, C, AND D

7:30 - 9:00 a.m. **Registration - SALON C FOYER**
Continental Breakfast - CORAOPOLIS, FINDLAY, AND MOON ROOMS

OPENING SESSION

9:00 - 9:05 a.m. **Workshop Opening and Introduction**
Heather Quedenfeld, Director, Advanced Energy Systems Division,
U.S. Department of Energy, National Energy Technology Laboratory

9:05 - 9:15 a.m. **Welcoming Remarks**
Grace M. Bochenek, Ph.D., Director,
U.S. Department of Energy, National Energy Technology Laboratory

9:15 - 9:45 a.m. **National Energy Technology Laboratory's Fuel Cell Program Overview**
Shailesh Vora, Technology Manager, Fuel Cells,
U.S. Department of Energy, National Energy Technology Laboratory

9:45 - 10:15 a.m. **BREAK - CORAOPOLIS, FINDLAY, AND MOON ROOMS**

SOFC INDUSTRY TEAMS

MODERATOR: JOSEPH STOFFA, U.S. DEPARTMENT OF ENERGY, NATIONAL ENERGY TECHNOLOGY LABORATORY

10:15 - 12:00 p.m. **Reliable SOFC Systems**
Hossein Ghezal-Ayagh, FuelCell Energy, Inc.

SOFC Power System Development
Rick Kerr, Delphi

LG Fuel Cell Systems Program and Technology Update
Zhien Liu and Cris DeBellis, LG Fuel Cell Systems, Inc.

12:00 - 1:30 p.m. **LUNCH - CORAOPOLIS, FINDLAY, AND MOON ROOMS**

SOFC CORE PROJECTS: RELIABILITY, ROBUSTNESS, AND ENDURANCE

MODERATOR: PATCHARIN BURKE, U.S. DEPARTMENT OF ENERGY, NATIONAL ENERGY TECHNOLOGY LABORATORY

1:30 - 3:10 p.m. **Mitigation of Cr Impurity Effects**
Srikanth Gopalan, Boston University

Materials and Approaches for the Mitigation of SOFC Cathode Degradation in SOFC Power Systems
Prabhakar Singh, University of Connecticut

Long-Term Degradation of LSM-Based SOFC Cathodes: Use of a Proven Accelerated Test Regimen
Mark R. De Guire, Case Western Reserve University

Advanced SOFC Quality Control and the Role of Manufacturing Defects on Stack Reliability
Neil Fernandes, Acumentrics SOFC, Inc.

3:10 - 3:25 p.m. **BREAK - CORAOPOLIS, FINDLAY, AND MOON ROOMS**

DETAILED PROGRAM

TUESDAY, JULY 14TH

GENERAL SESSION - SALON A, B, C, AND D

ARPA-E REBELS PROJECTS: INTERMEDIATE TEMPERATURE FUEL CELLS FOR DISTRIBUTED GENERATION

3:25 - 4:40 p.m. **Reliable Electricity Based on Electrochemical Systems (REBELS): Program Overview**
John Lemmon, U.S. Department of Energy, Advanced Research Projects Agency

Low Temperature Solid Oxide Fuel Cells for Transformational Energy Conversion
Bryan Blackburn, Redox Power Systems

Nanocomposite Electrodes for a Solid Acid Fuel Cell Stack Operating on Reformate
Alex Papandrew, University of Tennessee

4:40 p.m. **ADJOURN**

4:45 - 6:30 p.m. **POSTER SESSION/RECEPTION - CORAOPOLIS, FINDLAY, AND MOON ROOMS**

WEDNESDAY, JULY 15TH

GENERAL SESSION - SALON A, B, C, AND D

7:00 - 8:00 a.m. **Registration - SALON C FOYER**
Continental Breakfast - CORAOPOLIS, FINDLAY, AND MOON ROOMS

NATIONAL LABORATORIES

MODERATOR: BRIGGS WHITE, U.S. DEPARTMENT OF ENERGY, NATIONAL ENERGY TECHNOLOGY LABORATORY

8:00 - 10:30 a.m. **NETL R&D: SOFC Materials Development and Degradation Modeling**
Kirk Gerdes, U.S. Department of Energy, National Energy Technology Laboratory

Durability and Reliability of Materials and Components for SOFCs: Measurement of Residual Stresses
Edgar Lara-Curzio, U.S. Department of Energy, Oak Ridge National Laboratory

Evaluation of Feedstock Materials for SOFC Performance Reliability
Brian Ingram, U.S. Department of Energy, Argonne National Laboratory

SOFC Development at PNNL: Overview
Jeff Stevenson, U.S. Department of Energy, Pacific Northwest National Laboratory

Integrating the PNNL SOFC Multi-Physics Model into the NETL Aspen System Model as a Reduced Order Model
Gregory A. Hackett, U.S. Department of Energy, National Energy Technology Laboratory

10:30 - 10:45 a.m. **BREAK - CORAOPOLIS, FINDLAY, AND MOON ROOMS**

DETAILED PROGRAM

WEDNESDAY, JULY 15TH

GENERAL SESSION - SALON A, B, C, AND D

SOFC CORE PROJECTS: RELIABILITY, ROBUSTNESS, AND ENDURANCE

MODERATOR: BRIGGS WHITE, U.S. DEPARTMENT OF ENERGY, NATIONAL ENERGY TECHNOLOGY LABORATORY

10:45 -12:00 p.m.

Durable, Impermeable Brazes for Solid Oxide Fuel Cells

Yue Qi, Michigan State University

Cost-Effective Manufacturing and Morphological Stabilization of Nanostructured Cathodes for Commercial SOFCs

Tae-Sik Oh, University of Pennsylvania

Development of Durable and High Performance Mixed Conducting Cathodes Supportive of Lower Cost SOFCs

Xiao-Dong Zhou, University of South Carolina

12:00 - 1:30 p.m.

LUNCH - CORAOPOLIS, FINDLAY, AND MOON ROOMS

ARPA-E REBELS PROJECTS: INTERMEDIATE TEMPERATURE FUEL CELLS FOR DISTRIBUTED GENERATION

MODERATOR: SETH LAWSON, U.S. DEPARTMENT OF ENERGY, NATIONAL ENERGY TECHNOLOGY LABORATORY

1:30 - 3:10 p.m.

Development of an Intermediate Temperature Proton Conducting SOFC Stack with Internal Fuel Reforming

Dave E. Tew, United Technologies Research Center

Low-Cost, Intermediate Temperature, Fuel-Flexible Protonic-Ceramic Fuel Cell and Stack

Jianhua Tong, Colorado School of Mines

A Novel Intermediate Temperature Fuel Cell Tailored for Efficient Utilization of Methane

Meilin Liu, Georgia Tech

Medium-Temperature, Oxygen-Conducting Fuel Cell Based on a Novel Membrane Structure

Ashish V. Pattekar, Palo Alto Research Center

3:10 - 3:25 p.m.

BREAK - CORAOPOLIS, FINDLAY, AND MOON ROOMS

ARPA-E REBELS PROJECTS: LOAD-FOLLOWING INTERMEDIATE TEMPERATURE FUEL CELLS

3:25 - 4:15 p.m.

Direct Hydrocarbon Fuel Cell–Battery Hybrid Electrochemical System

Masaru Tsuchiya, SiEnergy Systems

Fuel Cells with Dynamic Response Capability Based on Energy Storage Electrodes with Catalytic Function

Yunfeng Lu, The University of California

4:15 p.m.

ADJOURN

DETAILED PROGRAM

THURSDAY, JULY 16TH

GENERAL SESSION - SALON A, B, C, AND D

7:00 - 8:00 a.m.

Registration - SALON C FOYER

Continental Breakfast - CORAOPOLIS, FINDLAY, AND MOON ROOMS

SOFC CORE PROJECTS: RELIABILITY, ROBUSTNESS, AND ENDURANCE

MODERATOR: STEVE MARKOVICH, U.S. DEPARTMENT OF ENERGY, NATIONAL ENERGY TECHNOLOGY LABORATORY

8:00 - 10:30 a.m.

Fundamental Investigations and Rational Design of Durable, High-Performance Cathode Materials

Meilin Liu, Georgia Tech

Mechanistic Enhancement of SOFC Cathode Durability

Eric Wachsman, University of Maryland

Surface-Modified Electrodes: Enhancing Performance Guided by In Situ Spectroscopy and Microscopy

Michael Machala, Stanford University

Enhancement of SOFC Cathode Electrochemical Performance Using Multi-Phase Interfaces

Dane Morgan, University of Wisconsin

Novel Nanostructure Tailored Highly Active and Stable Electrocatalytic Architecture on Surface of Cathode of SOFCs

Xueyan Song, West Virginia University

Scalable and Cost-Effective Barrier Layer Coating to Improve Performance and Stability of SOFC Cathode

Xingbo Liu, West Virginia University

10:30 - 10:45 a.m.

BREAK - CORAOPOLIS, FINDLAY, AND MOON ROOMS

ARPA-E REBELS PROJECTS: LIQUID FUEL-PRODUCING INTERMEDIATE TEMPERATURE FUEL CELLS

10:45 - 12:00 p.m.

Intermediate Temperature Electrogenative Cells for Flexible Cogeneration of Power and Liquid Fuel

Greg Tao, Materials & Systems Research, Inc.

Liquid Fuels and Electricity From Intermediate Temperature Fuel Cells

Carl A. Willman, FuelCell Energy, Inc.

Intermediate Temperature Hybrid Fuel Cell System for the Conversion of Natural Gas to Electricity and Liquid Fuels

Theodore Krause, U.S. Department of Energy, Argonne National Laboratory

DETAILED PROGRAM

THURSDAY, JULY 16TH

12:00 - 1:30 p.m. **LUNCH - CORAOPOLIS, FINDLAY, AND MOON ROOMS**

ARPA-E REBELS PROJECTS: LOAD FOLLOWING INTERMEDIATE TEMPERATURE FUEL CELLS AND SOFC PROJECTS
MODERATOR: PATCHARIN BURKE, U.S. DEPARTMENT OF ENERGY, NATIONAL ENERGY TECHNOLOGY LABORATORY

1:30 - 3:35 p.m. **A Bifunctional Ceramic Fuel Cell Energy System**
Kevin Huang, University of South Carolina

Intermediate Temperature Proton Conducting Fuel Cells for Transportation Applications
S. (Elango) Elangovan, Ceramatec, Inc.

Pressurized Testing of Solid Oxide Fuel Cells
Louis G. Carreiro, Naval Undersea Warfare Center Division Newport

Scaling Up WATT Fuel Cell's Additive Manufacturing Process (AMP) for Tubular SOFCs
Benjamin J. Emley, WATT Fuel Cell Corporation

High Temperature Ceramic Heat Exchanger for Solid Oxide Fuel Cell
James F. Walton II, Mohawk Innovative Technology, Inc.

3:35 p.m. **WORKSHOP CLOSES**

POSTER SESSION

TUESDAY, JULY 14

4:45 - 6:30 P.M.

CORAOPOLIS, FINDLAY, AND MOON ROOMS

La₂NiO_{4+δ}-Infiltration to Improve both Performance and Stability of (La_{0.6}Sr_{0.4})_{0.995}Co_{0.2}Fe_{0.8}O_{3-δ} Cathode for Solid Oxide Fuel Cells

Xinxin Zhang and Xingbo Liu, West Virginia University

Fundamental Investigations and Rational Design of Durable High-Performance SOFC Cathodes

Yu Chen, Georgia Institute of Technology

Effects of Steam on Long Term Performance of Metal Ferrite Infiltrated Solid Oxide Fuel Cell

Yueying "Lynn" Fan, AECOM

Degradation of LSM-Based SOFC Cathodes Under Accelerated Testing

Celeste Cooper and Mark R. De Guire, Case Western Reserve University

Large Scale, Homogeneous SOFC Cathode Infiltration by Single Step, Ultrasonic Spraying Process

Shiwoo Lee, AECOM

In-Operando XRD of LSM/YSZ Cathodes in Combined H₂O + CO₂ during 1000+ h SOFC Tests

John S. Hardy, Pacific Northwest National Laboratory

Mechanical Property of Cathode Contact Materials and Surface Texture Effect on Cathode Contact Strength of Solid Oxide Fuel Cells

Y-S Matt Chou, Pacific Northwest National Laboratory

Single-Step, Infiltrated Cathodes for SOFC

Yuan Cheng, University of Pennsylvania

Fluidized Bed Production of Surface Functionalized Powders for SOFC Cathodes

Nick M. Sbrockey, Structured Materials Industries, Inc.

Enhancement of SOFC Cathode Electrochemical Performance Using Multi-Phase Interfaces

Yueh-Lin Lee, Massachusetts Institute of Technology

Tailoring Infiltrate Particle Size Through Precursor Solution Desiccation or Nano-Ceria Preinfiltration

Theodore E. Burye, Michigan State University

Determining the Phase Stability and Oxygen Nonstoichiometry of Lanthanum Strontium Ferrite Structures by Combining Density Functional Theory and Thermodynamics

Tridip Das, Michigan State University

Oxygen Surface Exchange Measurements on Porous Lanthanum Strontium Ferrite Thick Films

Yuxi Ma, Michigan State University

Surface Modified LSCF Powders for SOFC Cathodes

Jeffrey F. Roeder, Sonata, LLC

POSTER SESSION

TUESDAY, JULY 14

4:45 - 6:30 P.M.

CORAOPOLIS, FINDLAY, AND MOON ROOMS

YSZ SOFC Interconnect Barriers via ALD

Jeffrey F. Roeder, Sonata, LLC

Dip Coating Reactive Air Aluminization Process for SOFC Components

Jung Pyung Choi, Pacific Northwest National Laboratory

Protective Ceramic Coatings for Solid Oxide Fuel Cell (SOFC) Balance-of-Plant Components

Raymond Winter, InnoSense, LLC

Protective Coatings for Metallic Components in Solid Oxide Fuel Cell Systems

Chris Corwin, NexTech Materials, Ltd. and Robin Kimbrell, Fuelcellmaterials.com

Cost-Effective Dense YSZ Coatings for SOFC Interconnects

Cheol-Woon Kim, MO-SCI Corporation

An Alkali-Free Barium Borosilicate Viscous Sealing Glass for Solid Oxide Fuel Cells

Cheol-Woon Kim, MO-SCI Corporation

Durability and Reliability of SOFC Materials and Components

Edgar Lara-Curzio, Oak Ridge National Laboratory

A Discrete Element Model for Toughness of Rough Interfaces

Brian J. Koepfel, Pacific Northwest National Laboratory

Reduced Order Model Creation for SOFC Power System Models

Kevin Lai, Pacific Northwest National Laboratory

Prediction of SOFC Performance via Multi-Physics Simulation Tool with Realistic Microstructure Properties

Tao Yang, West Virginia University

High Temperature Ceramic Heat Exchanger for Solid Oxide Fuel Cell

Jose Luis Cordova and James F Walton II, Mohawk Innovative Technology, Inc.

Intermediate-Temperature Fuel Cells Tailored for Efficient Utilization of Methane

Ben Rainwater, Georgia Institute of Technology

POSTER SESSION

TUESDAY, JULY 14

4:45 - 6:30 P.M.

CORAOPOLIS, FINDLAY, AND MOON ROOMS

Advanced Materials and Manufacturing Processes for MW-Scale SOFC Power Systems for Improved Stack Reliability, Durability, and Cost

Charles Osborne, LG Fuel Cell Systems, Inc.

Innovative SOFC Technologies

Hossein Ghezeli-Ayagh, FuelCell Energy, Inc.

High Power, Low Cost SOFC Stacks for Robust and Reliable Distributed Generation

Bryan Blackburn, Redox Power Systems

In-Operando Evaluation of SOFC Cathodes for Enhanced ORR Activity and Durability

Eric Wachsman, University of Maryland

Low-Cost, Durable, Contaminant-Tolerant Cathodes for SOFCs

Yu Chen, Georgia Institute of Technology

Environmentally-Assisted Reactive Sintering of Spinel Layers for SOFC Cathode-Side Contact Application

Jiahong Zhu, Tennessee Technological University

Developing Accelerated Test Protocols and Tuning Microstructures of the Common Materials to Improve Robustness, Reliability, and Endurance of SOFC Cells

Xiao-Dong Zhou, University of South Carolina

Scalable Nano-Scaffold Architecture on the Internal Surface of SOFC Anode for Direct Hydrocarbon Utilization

Xueyan Song, West Virginia University

LSCF-CDZ Composite Cathodes for Improved SOFC Electrical Performance

Gianfranco DiGiuseppe, Kettering University

Investigating Oxygen Exchange Kinetics on Model SOFC Electrodes Using In Situ Optical Transmission Relaxation

Sean Bishop, Massachusetts Institute of Technology

Matrix Study of Aged Cells: Performance and Materials Degradation

Neil Fernandes, Acumentrics SOFC, Inc.

Processing of SOFC Anodes for Enhanced Intermediate Temperature Catalytic Activity at High Fuel Utilization

Soumendra Basu, Boston University



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