

17th Annual

July 19-21, 2016

SOLID OXIDE FUEL CELL (SOFC) PROJECT REVIEW MEETING

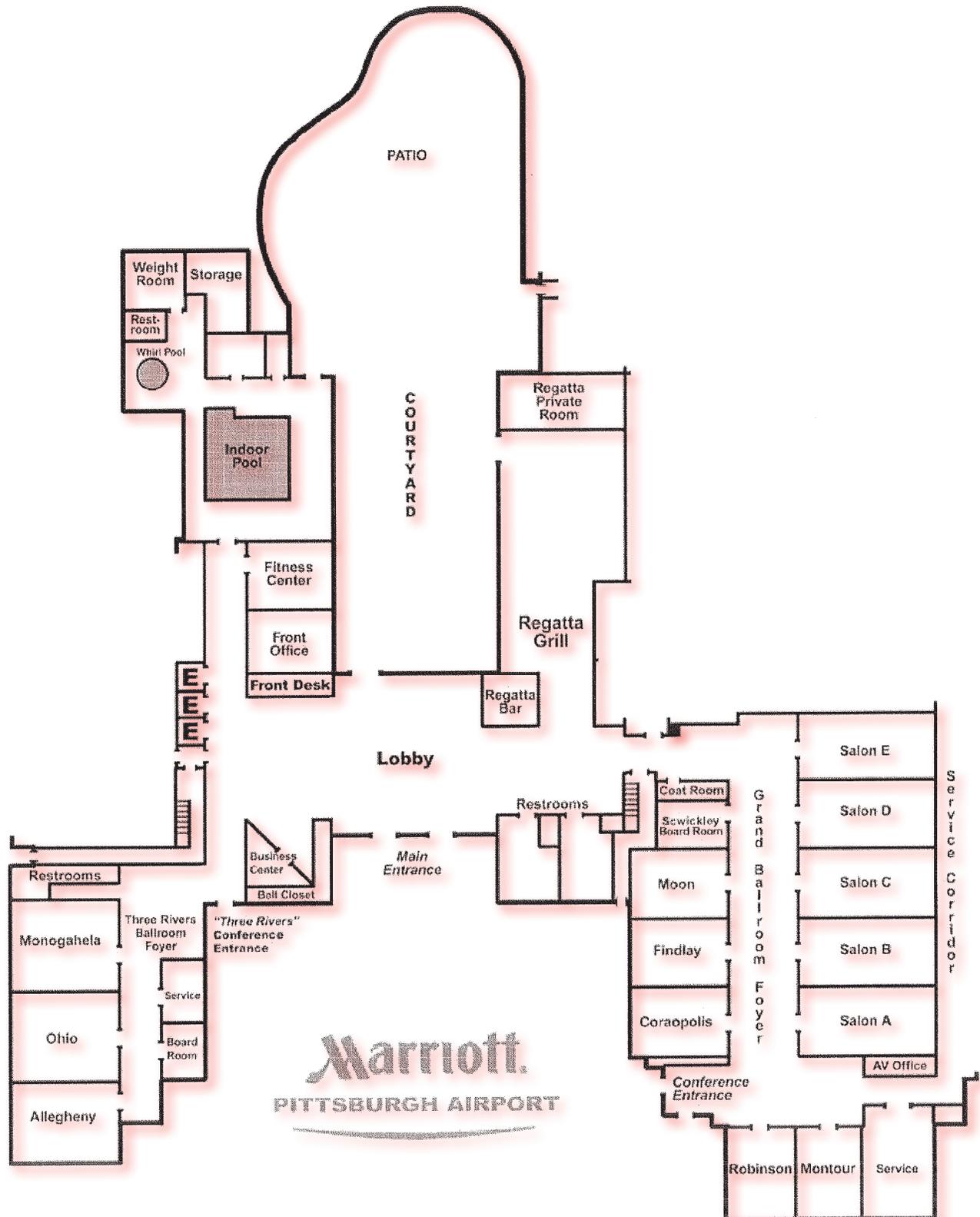
Pittsburgh Airport Marriott Hotel



U.S. DEPARTMENT OF
ENERGY



Pittsburgh Airport Marriott Hotel Floor Plan



TUESDAY, JULY 19, 2016

8:00 – 9:00 am Registration in Salon C Foyer
Continental Breakfast in Coraopolis, Findlay, Moon Rooms

General Session in Salon A, B, C, D

Moderator: Joseph Stoffa, U.S. Department of Energy,
National Energy Technology Laboratory

9:00 – 9:30 am NETL's Fuel Cell Program Overview
Shailesh Vora, Technology Manager for Fuel Cells
U.S. Department of Energy, National Energy Technology Laboratory

9:30 – 10:00 am ARPA-E's REBELS Program Overview
Paul Albertus and Grigorii Soloveichik,
Program Directors for REBELS
U.S. Department of Energy, ARPA-E

10:00 – 10:30 am System Analysis of Fuel Cell Plant Configurations
with Vent Gas Recirculation
Gregory Hackett, Technical Project Monitor for Fuel Cells
U.S. Department of Energy,
National Energy Technology Laboratory

10:30 – 10:45 am BREAK in Coraopolis, Findlay, Moon Rooms

SOFC Industry Teams

Moderator: Joseph Stoffa, U.S. Department of Energy,
National Energy Technology Laboratory

10:45 – 11:30 am Advances in SOFC Power System Development
Hossein Ghezal-Ayagh, FuelCell Energy, Inc.

11:30 – 12:15 pm Update of LG Fuel Cell System Projects – Performance,
Durability, Cost
Shung Ik Lee and Adam Babcock, LG Fuel Cell Systems, Inc.

12:15 – 1:30 pm LUNCH in Coraopolis, Findlay, Moon Rooms

SOFC Core Projects: Reliability, Robustness, and Endurance SOFC

Moderator: Patcharin Burke, U.S. Department of Energy,
National Energy Technology Laboratory

1:30 – 3:10 pm Impurity Effects on SOFC Cathodes
Srikanth Gopalan, Boston University (25 min.)

Materials and Approaches for the Mitigation of SOFC Cathode
Degradation in SOFC Power Systems
Prabhakar Singh, University of Connecticut (25 min.)

Performance and Microstructural Changes in LSM–Based SOFC
Cathodes under Accelerated and Conventional Testing
Mark De Guire, Case Western Reserve University (25 min.)

SOFC Defect Detection and the Role of Manufacturing
Defects on Stack Reliability
Neil Fernandes, Atrex Energy (25 min.)

3:10 – 3:25 pm **BREAK** in Coraopolis, Findlay, Moon Rooms

ARPA-E REBELS Projects: IT Fuel Cells for DG

3:25 – 4:40 pm Advanced Low Temperature SOFCs
Bryan Blackburn, Redox Power Systems (25 min.)

Development of an Intermediate Temperature Metal Supported
Proton Conducting SOFC Stack
Tianli Zhu, United Technologies Research Center (25 min.)

A Novel, Intermediate Temperature Fuel Cell
Tailored for Efficient Utilization of Methane
Meilin Liu, Georgia Institute of Technology (25 min.)

4:40 pm **ADJOURN**

4:45 – 6:30 pm **Poster Session** in Coraopolis, Findlay, Moon Rooms

WEDNESDAY, JULY 20, 2016

7:00 – 8:00 am Registration in Salon C Foyer
Continental Breakfast in Coraopolis, Findlay, Moon Rooms

General Session in Salon A, B, C, D

Moderator: Patcharin Burke, U.S. Department of Energy,
National Energy Technology Laboratory

8:00 – 10:00 am National Energy Technology Laboratory R&D: SOFC Materials
Development and Degradation Modeling
Gregory Hackett, U.S. Department of Energy,
National Energy Technology Laboratory (30 min.)

Durability and Reliability of Materials and Components for SOFCs
Edgar Lara-Curzio, Oak Ridge National Laboratory (30 min.)

Evaluation of Cathode Materials for SOFC Performance Reliability
Brian Ingram, Argonne National Laboratory (30 min.)

SOFC Development at PNNL: Overview
Jeff Stevenson and Brian Koepfel,
Pacific Northwest National Laboratory (30 min.)

10:00 – 10:15 am BREAK in Coraopolis, Findlay, Moon Rooms

SOFC Core Projects: Reliability, Robustness, and Endurance SOFC

Moderator: Arun Bose, U.S. Department of Energy,
National Energy Technology Laboratory

10:15 – 11:55 am Towards Durable, Impermeable SOFC Brazes
Jason Nicholas, Michigan State University (25 min.)

Cost-Effective Manufacturing of SOFC Cathodes
Raymond Gorte, University of Pennsylvania (25 min.)

Highly-Active and Durable Cathodes: Development and
Characterization to Support Lower Cost SOFCs
Xiao-Dong Zhou, University of South Carolina (25 min.)

Scalable and Cost-Effective Barrier Layer Coating to Improve Stability and Performance of SOFC Cathodes
Xingbo Liu, West Virginia University (25 min.)

11:55 – 1:30 pm LUNCH in Coraopolis, Findlay, Moon Rooms

ARPA-E REBELS Projects: Load Following IT Fuel Cells and Liquid Fuel-Producing IT Fuel Cells

Moderator: Seth Lawson, U.S. Department of Energy,
National Energy Technology Laboratory

1:30 – 2:45 pm Intermediate Temperature Fuel Cells for Transportation Applications
S (Elango) Elangovan, Ceramatec, Inc. (25 min.)

A Novel, Intermediate Temperature, Bifunctional Ceramic Fuel Cell Energy System
Kevin Huang, University of South Carolina (25 min.)

Intermediate Temperature Electrogenerative Cells for Flexible Cogeneration of Power and Liquid Fuel
Greg Tao, Materials & Systems Research, Inc. (25 min.)

2:45 – 3:00 pm BREAK in Coraopolis, Findlay, Moon Rooms

SOFC Projects: Innovative Concepts

3:00 – 3:30 pm Development of a Thermal Spray, Redox Stable, Ceramic Anode for Metal Supported SOFC
Richard Hart, GE Global Research (30 min.)

SOFC Core Projects: Reliability, Robustness, and Endurance SOFC

3:30 – 3:55 pm Processing of SOFC Anodes for Enhanced Intermediate Temperature Catalytic Activity at High Fuel Utilization
Soumendra Basu, Boston University (25 min.)

3:55 pm ADJOURN

THURSDAY, JULY 21, 2016

7:00 – 8:00 am Registration in Salon C Foyer
Continental Breakfast in Coraopolis, Findlay, Moon Rooms

General Session in Salon A, B, C, D

SOFC Core Projects: Reliability, Robustness, and Endurance SOFC

Moderator: Steve Markovich, U.S. Department of Energy,
National Energy Technology Laboratory

8:00 – 10:05 am Low-Cost, Durable, Contaminant-Tolerant Cathodes for SOFCs
Meilin Liu, Georgia Institute of Technology (25 min.)

In-Operando Evaluation of SOFC Cathodes for Enhanced Oxygen
Reduction Reaction Activity and Durability
Eric Wachsman, University of Maryland (25 min.)

Surface-Modified Electrodes: Enhancing Performance
Guided by In Situ Spectroscopy and Microscopy
William Chueh, Stanford University (25 min.)

Mechanical and Electromechanical Effects of
2° Phase Formation SOFC Anodes
Rob Walker, Montana State University (25 min.)

Novel Nanostructure Tailored Highly Active & Stable
Electro Catalytic Architecture on Surface of Cathode of SOFCs
Xueyan Song, West Virginia University (25 min.)

10:05 – 10:20 am BREAK in Coraopolis, Findlay, Moon Rooms

SOFC Core Projects: Reliability, Robustness, and Endurance SOFC

10:20 – 11:35 Progress Update on Matrix Study of Aged SOFC
Performance and Materials Degradation
Chengxiang Ji, Atrex Energy (25 min.)

ARPA-E REBELS Projects: Liquid Fuel-Producing IT Fuel Cells

Liquid Fuels and Electricity from IT-Fuel Cells
Carl Willman, FuelCell Energy, Inc. (25 min.)

Hybrid Fuel Cell Technology for Producing
Chemicals, Fuels, and Electricity
Ted Krause, Argonne National Laboratory (25 min.)

11:35 – 1:00 pm LUNCH in Coraopolis, Findlay, Moon Rooms

SOFC Projects: Innovative Concepts

Moderator: Arun Bose, U.S. Department of Energy,
National Energy Technology Laboratory

1:00 – 1:30 pm High-Power, Low-Cost SOFC Stacks for Robust and
Reliable Distributed Generation
Bryan Blackburn, Redox Power Systems (30 min.)

SOFC Core Projects: Reliability, Robustness, and Endurance SOFC

1:30 – 2:45 pm Development of Low-Cost, High-Sinterable,
Co-Free (Ni,Fe)₃O₄ Spinel-Based Contact Materials for
SOFC Cathode-Side Contact Application
Jiahong Zhu, Tennessee Technological University (25 min.)

LSCF-CZ Composite Cathodes for Improved
SOFC Electrical Performance
Gianfranco DiGiuseppe, Kettering University (25 min.)

Scalable Nano-Scaffold Architecture on the Internal
Surface of SOFC Anode for Direct Hydrocarbon Utilization
Xueyan Song, West Virginia University (25 min.)

2:45 pm

WORKSHOP CLOSES

Poster Session

Scalable and Cost Effective Barrier Layer Coating to Improve Stability and Performance of SOFC Cathode
Xingbo Liu, West Virginia University

Fundamental Understanding of Oxygen Reduction and Reaction Behavior and Developing High Performance and Stable Heterostructured Cathodes
Xingbo Liu, West Virginia University

Mitigation of Cathode Poisoning on Lanthanum Strontium Manganite Using Chromium Getters
Chiyang Liang, University of Connecticut

Morphological Evolution and Thermodynamic Prediction of Stability of LSM and LSCF Cathodes in Chromium-Containing Air
Boxun Hu, University of Connecticut

Degradation of LSM-Based SOFC Cathodes under Accelerated Testing
Naima Hilli, Case Western Reserve University

Lower Temperature RAA Process for Planar SOFC Stacks
Jung Pyung Choi, Pacific Northwest National Laboratory

Effect on Sintering Aid on Densification and Contact Strength of SOFCs
Y-S Matt Chou, Pacific Northwest National Laboratory

SOFC Testing in Cathode Air with Quantified Cr Concentration
John Hardy, Pacific Northwest National Laboratory

Evaluation of Cr-Gettering Material in a Generic Stack Test Fixture at Pacific Northwest
Y-S Matt Chou, Pacific Northwest National Laboratory

Enhanced SOFC-MP Software Tool Set
Brian Koepfel, Pacific Northwest National Laboratory

Structural Reliability Considerations for Planar SOFCs – Cathode Contact, Cell Thermal Gradients, and Alternate Stack Geometries
Naveen Karri, Pacific Northwest National Laboratory

A Novel, Methane-Fueled, Intermediate Temperature Fuel Cell
Yu Chen, Georgia Institute of Technology

Low-Cost, Durable, Contaminant-Tolerant Cathodes for SOFCs
Yu Chen, Georgia Institute of Technology

Poster Session

Characterization of SOFC Cathode Impedance under Polarization using Appropriate Counter Electrode Design
Harry Finklea, West Virginia University

Surface Modified LSCF Powders for SOFC Cathodes
Jeffrey Roeder, Sonata LLC

YSZ SOFC Interconnect Barrier via ALD
Jeffrey Roeder, Sonata LLC

Quantitative Interpretation of Impedance Spectroscopy Data on Porous LSM Electrodes using X-ray Computed Tomography and Bayesian Model-Based Analysis
Giuseppe Brunello, U.S. Department of Energy, National Energy Technology Laboratory

Fluidized Bed Production of Surface Functionalized Powders for SOFC Cathodes
Nick Sbrockey, Structured Materials Industries, Inc.

Representative Volumes in Highly Heterogeneous Fuel Cell Materials
William Epting, U.S. Department of Energy, National Energy Technology Laboratory

Pressurized Operation of a Planar SOFC Stack
Louis Carreiro, Naval Undersea Warfare Center Division Newport

Effects of Humidity on Degradation of Sr-Fe-O Infiltrated LSM/YSZ SOFC
Yueying Fan, AECOM

Ab Initio Modeling of the Cation Diffusion in $\text{La}_{1-x}\text{Sr}_x\text{MnO}_{3\pm\delta}$ for Solid Oxide Cell Electrodes Applications
Yueh-Lin Lee, U.S. Department of Energy, National Energy Technology Laboratory

Phase Field Modeling of Microstructure and Conductivity Evolution of SOFC Electrodes
Youhai Wen, U.S. Department of Energy, National Energy Technology Laboratory

Bio-Surfactant Assisted Catalyst Infiltration of SOFC Electrodes
Ozcan Ozmen, West Virginia University

SOFC Protection Coating Based on a Cost-Effective Aluminization Process
Neil Kidner, Nexceris, LLC

Evidence of the Space Charge Layer Evolution at the YSZ Grain Boundaries upon Long-Term Electrochemical Operation of Solid Fuel Cells
Xueyan Song, West Virginia University

High Resolution, Real-Time Inspection of SOFC Materials using Visible Light and Infrared Imaging
Peter Rupnowski, National Renewable Energy Laboratory

Poster Session

Nickel-Based Braze Materials for Planar SOFC Applications
Quan Zhou, Michigan State University

Computational Predictions and Experimental Characterization of Cobalt and Copper
Based SOFC Brazes
Yuxi Ma, Michigan State University

Atomic-Scale Insight into the Long-Range Charge Transfer in Lanthanum Strontium Ferrite (LSF)
Tridip Das, Michigan State University

Chromium Vapor Sensor for Monitoring SOFC Systems
Jeffrey Fergus, Auburn University

Development of Chromium and Sulfur Getter for SOFC Systems: Demonstration at TRL-5
Prabhakar Singh, University of Connecticut

Highly Selective and Stable Multivariable Gas Sensors for Enhanced Robustness and
Reliability of SOFC Operation
Radislav Potyrailo, GE Global Research

Red-Ox Robust SOFC Stacks for Affordable, Reliable Generation Power Systems
Bryan Blackburn, Redox Power Systems, LLC

Transformational SOFC Technology
Hossein Ghezeli-Ayagh, FuelCell Energy, Inc.

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