

2009 University Turbine Systems Research Workshop

October 27-29, 2009

AGENDA

TUESDAY, OCTOBER 27, 2009

- 6:00 a.m. **Breakfast is available for all Holiday Inn Select Orlando guests in the restaurant starting at 6:00 a.m.**
- 8:00 a.m. **Bus Transportation to University of Central Florida Campus
Workshop Registration**
(Coffee and light continental breakfast will be available at the university)

PLENARY SESSION -- KEYNOTE PRESENTATIONS – PEGASUS D& E

Moderator – Richard Dennis, National Energy Technology Laboratory

- 8:30 a.m. **Welcome and Introduction**
*Richard Dennis, Turbine Technology Manager
National Energy Technology Laboratory*
- 8:40 a.m. **South Carolina Institute of Energy Studies Welcome**
Robert Leitner, South Carolina Institute of Energy Studies
- 8:50 a.m. **Advanced Brayton Cycle System Studies**
Ashok Rao, University of California at Irvine
- 9:35 a.m. **OEM Panel - Perspectives on R&D Needs For Gas Turbine Power Generation in a Carbon
Constrained World**
Moderator, Bill Day
- 10:15 a.m. **BREAK – Pegasus Foyer**
- 10:35 a.m. **OEM Panel - Perspectives on R&D Needs For Gas Turbine Power Generation in a Carbon
Constrained World (continued)**
*Moderator, Bill Day
Adel Mansour, Parker Hannafin, Harold Stocker, Cinergy, Eli Razinsky, Solar Turbines, Kathryn Rominger,
GE Energy, Robert Steele, Electric Power Research Institute, Benjamin Baird, Precision Combustion,
Vinod Philip, Siemens Energy Inc., and Ray Chupp, GE Energy.*
- 11:40 a.m. **Summary of Morning Perspectives and Introduction of Parallel Sessions**
Richard Dennis, National Energy Technology Laboratory
- 12:00 p.m. **LUNCH – Pegasus F**

PARALLEL SESSION – COMBUSTION – PEGASUS A&B

Moderator – Mark Freeman, National Energy Technology Laboratory

- 1:00 p.m. **High Pressure Kinetics of Syngas and Nearly Pure Hydrogen Fuels**
John Daily, University of Colorado



TUESDAY, OCTOBER 27, 2009

- 1:50 p.m. **Turbulent Flame Speed Measurements and Modeling of Syngas Fuels**
Timothy Liewen, Georgia Institute of Technology
- 2:40 p.m. **BREAK – Pegasus Foyer**
- 3:00 p.m. **Fundamental Studies in Syngas Premixed Combustion Dynamics**
Ahmed Ghoniem, Massachusetts Institute of Technology

PARALLEL SESSION – AERO/HEAT TRANSFER AND MATERIALS – PEGASUS G&H

Moderator – Robin Ames, National Energy Technology Laboratory

- 1:00 p.m. **Simulated Particle Deposition and Mitigating Deposition Degradation Effects in Film Cool Turbine Sections**
David Bogard, University of Texas at Austin and *Karen Thole*, Pennsylvania State University
- 1:50 p.m. **Syngas Particulate Deposition and Erosion at the Leading Edge of a Turbine Blade with Film Cooling**
Danesh Tafti, Virginia Polytechnic Institute and State University
- 2:40 p.m. **BREAK – Pegasus Foyer**
- 3:00 p.m. **Deposition of Alternative (Syngas) Fuels on Turbine Blades with Film Cooling**
Jeffrey Bons, Ohio State University
- 3:50 p.m. **Adjourn Session for Day 1**
- 5:30 p.m. **Poster Session Reception – University/ Harris Engineering Center**
- 7:00 p.m. **Bus transportation back to the Holiday Inn Select Orlando**

WEDNESDAY, OCTOBER 28, 2009

- 6:00 a.m. **Breakfast is available for all Holiday Inn Select Orlando guests in the restaurant starting at 6:00 a.m.**
- 8:00 a.m. **Bus Transportation to University of Central Florida Campus**
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PARALLEL SESSION – COMBUSTION – PEGASUS A&B

Moderator – Mark Freeman, National Energy Technology Laboratory

- 8:30 a.m. **NETL Combustion Research**
Peter Strakey, National Energy Technology Laboratory
- 9:20 a.m. **Autoignition Studies of Syngas and Hydrogen (SGH) Fuels**
Robert Santoro, Pennsylvania State University
- 10:10 a.m. **BREAK – Pegasus Foyer**
- 10:30 a.m. **Low-Swirl Injectors for High-Hydrogen Fuel Gas Turbines**
Robert Cheng, Lawrence Berkeley National Laboratory
- 11:20 a.m. **Combustion Dynamics in Multi-Nozzle Combustors Operating on High-Hydrogen Fuels**
Domenic Santavicca, Pennsylvania State University Center for Advanced Power Generation

WEDNESDAY, OCTOBER 28, 2009

12:10 p.m. **LUNCH – Pegasus F**

1:30 p.m. **Numerical and Experimental Study of Mixing Processes Associated with Hydrogen and High Hydrogen Content Fuels**

Vincent McDonell, University of California at Irvine

2:20 p.m. **An Experimental and Chemical Kinetics Study of the Combustion of Syngas and High Hydrogen Content Fuels**

Robert Santoro, Pennsylvania State University

3:10 p.m. **BREAK – Pegasus Foyer**

3:30 p.m. **Reduced and Validated Kinetic Mechanisms for Hydrogen-CO-Air Combustion in Gas Turbines**

Frederick L. Dryer, Princeton University

PARALLEL SESSION – AERO/HEAT TRANSFER AND MATERIALS – PEGASUS G&H

Moderator – Robin Ames, National Energy Technology Laboratory

8:30 a.m. **The Role of the Biot Number in Turbine Cooling**

Tom Shih, Ames National Laboratory/Purdue University

9:20 a.m. **Designing Turbine Endwalls for Deposition Resistance with 1400oC Combustor Exit Temperatures and Syngas Water Vapor Levels**

Jeffrey Bons, Ohio State University

10:10 a.m. **BREAK – Pegasus Foyer**

10:30 a.m. **Aerodynamics and Heat Transfer Studies of Parameters Specific to the IGCC Requirements: Endwall Contouring, Leading Edge Filletting and Blade Tip Ejection Under Rotating Turbine Conditions**

Meinhard Schobeiri, Texas A&M University

11:20 a.m. **NETL Materials Research: Materials and Component Development for Advanced Turbine Systems**

Mary Anne Alvin, U.S. Department of Energy, National Energy Technology Laboratory

Minking Chyu, University of Pittsburgh

12:10 p.m. **LUNCH – Pegasus F**

1:30 p.m. **Evaluating Coatings Materials with Thermal Property Measurements**

Ted Bennett, University of California at Santa Barbara

2:20 p.m. **Materials for Oxy-Fuel Turbo Machinery Conditions**

Gerald Meier, University of Pittsburgh

3:10 p.m. **BREAK – Pegasus Foyer**

3:30 p.m. **Materials Issues in Coal-Derived Synthesis Gas/Hydrogen-Fired Turbines**

Bruce Pint, Oak Ridge National Laboratory

4:20 p.m. **Adjourn**

4:45 p.m. **Facility Research Tour**

6:00 p.m. **UTSR Workshop Dinner – Live Oak Ball Room**

After Dinner Presentations by

Dean Marwan Simaan, University of Central Florida, *Vinod Philip*, Siemens Energy Inc.

THURSDAY, OCTOBER 29, 2009

6:00 a.m. **Breakfast is available for all Holiday Inn Select Orlando guests in the restaurant starting at 6:00 a.m.**

8:00 a.m. **Bus Transportation to University of Central Florida Campus**
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PARALLEL SESSION – COMBUSTION – PEGASUS A&B

Moderator – Mark Freeman, National Energy Technology Laboratory

8:30 a.m. **Prediction of Combustion Stability and Flashback in Turbines with High-Hydrogen Fuel**
Timothy Lieuwen, Georgia Institute of Technology

PARALLEL SESSION – AERO/HEAT TRANSFER AND MATERIALS – PEGASUS G&H

Moderator – Robin Ames, National Energy Technology Laboratory

8:30 a.m. **Degradation of Thermal Barrier Coatings from Deposits and its Mitigation**
Nitin Padture, Ohio State University

9:15 a.m. **Hafnia-Based Nanostructured Thermal Barrier Coatings for Advanced Hydrogen Turbine Technology**
Chintalapalle Ramana, University of Texas at El Paso

10:00 a.m. **BREAK – Pegasus Foyer**

PLENARY SESSION -- ADVANCED IGCC HYDROGEN GAS TURBINE DEVELOPMENT – PEGASUS D&E

Moderator – Robin Ames, National Energy Technology Laboratory

10:15 a.m. **Advanced IGCC/Hydrogen Gas Turbine Development**
Roger Schonewald, GE Energy

10:45 a.m. **Advanced IGCC/Hydrogen Gas Turbine Development**
Joseph Fadok, Siemens Energy, Inc.

11:15 a.m. **Workshop Feedback (All) and Closing Remarks**
Richard Dennis, Turbine Technology Manager
National Energy Technology Laboratory

12:00 p.m. **Adjourn Workshop**

12:15 p.m. **Return to Hotel by Bus Transportation**