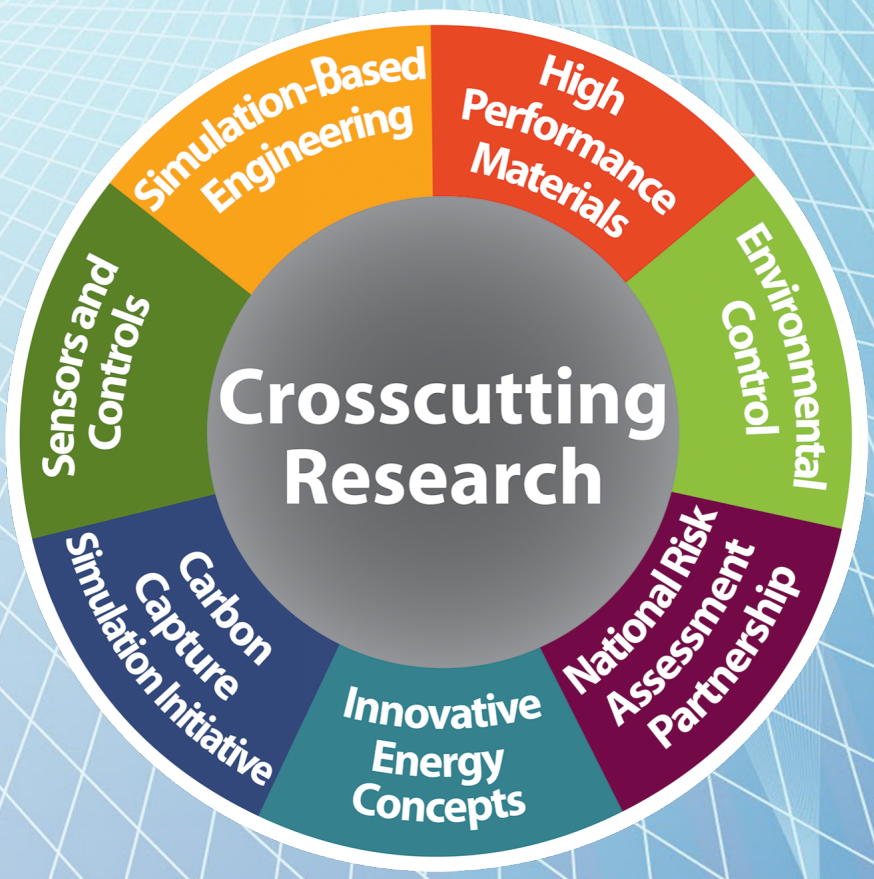
2014 NETL Crosscutting Research Review Meeting

Sheraton Station Square Hotel
Pittsburgh, PA

The National Energy Technology Laboratory's Crosscutting Research Program: Bridging basic and applied research in fossil energy sensors and controls; simulation-based engineering; high-performance materials; and other innovative concepts in advanced power generation



May 19–23, 2014

MONDAY, May 19, 2014

7:00 a.m. Meeting Registration/Continental Breakfast – Grand Station III Foyer

9:00 a.m. JOINT SESSIONS

	KEYNOTE SPEAKERS
Session	JOINT SESSION - Grand Station I
Moderator	*Pat Rawls*
9:00	Welcome Patricia Rawls, Crosscutting Research Division Director National Energy Technology Laboratory, U.S. Department of Energy
9:05	Fossil Energy's Crosscutting Research and Advanced Energy Systems Overview Regis Conrad, Director of Crosscutting Research Office of Fossil Energy, U.S. Department of Energy
9:30	Crosscutting Research Overview Susan Maley, Technology Manager for Crosscutting Research National Energy Technology Laboratory, U.S. Department of Energy

10:00 a.m. BREAK – Grand III Foyer

10:30 a.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Simulation-Based Engineering	High Performance Materials
Moderator	*Steve Seachman*	*Sydni Credle*
10:30	Crosscutting Research (XC) Carbon Capture Simulation Initiative David C. Miller National Energy Technology Laboratory, Office of Research and Development	Synthesis of Core-Shell Structured Microparticles for Fossil Energy Jason Matthews Howard University
11:00	National Risk Assessment Partnership Grant Bromhal National Energy Technology Laboratory, Office of Research and Development	Large Scale Screening of Low Cost Ferritic Steel for AUSC Lizhi Ouyang Tennessee State University

11:30 a.m. LUNCH

1:00 p.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Simulation-Based Engineering	High Performance Materials
Moderator	*Steve Seachman*	*Sydni Credle*
1:00	Development of Pore-Scale Models for Diffusion-Reaction Systems with Application to CO_2 Adsorption Danesh Tafti Virginia Polytechnic Institute and State University	A Computational-Experimental Study of the Plasma Processing of Carbides at High Temperatures Arturo Bronson The University of Texas at El Paso
1:30	Coal Combustion and Gasification Science Chris Shaddix Sandia National Laboratories	Mechanically-Activated Combustion Synthesis of $MoSi_2$-Based Composites Evgeny Shafirovich The University of Texas at El Paso
2:00	Addressing Model Integration Challenges in Energy Systems Kenneth "Mark" Bryden Ames National Laboratory	Design and Optimization of Liquid-Fueled High Velocity Oxy-fuel Thermal Spraying Technique for Durable Coatings for Fossil Power Systems Ahsan Choudhuri The University of Texas at El Paso

2:30 p.m. BREAK - Grand Station III Foyer

3:00 p.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Simulation Based Engineering	High Performance Materials
Moderator	*Sydni Credle*	*Paul Jablonski*
3:00	Uncertainty Quantification Tools for Multiphase Flow Simulations Using MFIX Xiaofei Hu Iowa State University	Advanced Thermal Barrier Coatings for Next Generation Gas Turbine Engines Fueled by Coal-Derived Syngas Nitin P. Padture Brown University
3:30	Implementation and Refinement of a Comprehensive Model for Dense Granular Flows Sankaran Sundaresan Princeton University	Effective Exploration of New 760 ^{0}C Capability Steels for Coal Energy Changdong Wei The Ohio State University
4:00	Development of a 2-Phase Drag Law for Clustered Particles Using Direct Numerical Simulation & Validation Through Experiments Ahmadreza Abbasi Baharanchi Florida International University	HVOF Thermal Spray TIC/TIB2 Coatings of Ausc Boiler/Turbine Components for Enhanced Corrosion Protection Kanchan Mondal Southern Illinois University
4:30	Study of Particle Rotation Effect in Gas-Solid Flows Using Direct Numerical Simulation with a Lattice Boltzmann Method -- Tuskegee University Qiang Zhou The Ohio State University	Synergistic Computational and Microstructural Design of Next-Generation High-Temperature Austenitic Steels Raymundo Arroyave Texas A&M University and Texas A&M Engineering Experiment Station

5:00 p.m. ADJOURN

TUESDAY, MAY 20, 2014

7:00 a.m. Registration/Continental Breakfast – Grand Station V

9:00 a.m. JOINT SESSIONS

	KEYNOTE SPEAKERS
Session	JOINT SESSION - Grand Station I
Moderator	*Susan Maley*
9:00	Electronics, Sensing, and Communications Research for City System Design Kenneth W. Tobin Jr., Ph.D., Corporate Research Fellow and Director Oak Ridge National Laboratory
9:30	The Role of Collaborative Materials Research in the Development of Clean and Efficient Fossil Energy and Related Technologies John Oakey, Director of Power Generation Research Cranfield University

10:00 a.m. BREAK - Grand Station V

10:30 a.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Simulation-Based Engineering	Sensors and Controls High Performance Materials
Moderator	*Jason Hissam*	*Paul Ohodnicki*
10:30	Computational Fluid Dynamic Simulations of a Regenerative Process for Carbon Dioxide Capture in Advanced Gasification-Based Power Systems Shalin Zarghami Illinois Institute of Technology	SENSORS and CONTROLS Metal Oxide Nanostructured Fiber Optic Chemical Sensors Kevin P. Chen University of Pittsburgh
11:00	Quantifying the Uncertainty of Kinetic Theory Predictions of Clustering Peter Mitrano University of Colorado	Experimental and Computational Investigation of High-Entropy Alloys for Elevated High Temperature Applications Peter K. Liaw University of Tennessee

11:30 a.m. LUNCH

1:00 p.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Sensors and Controls	High Performance Materials
Moderator	*Steve Seachman*	*Paul Ohodnicki*
1:00	Ultrasound Measurements of Temperature Profile in Extreme Environments Mikhail Skliar University of Utah	Computational Microstructural Optimization Design Tool for High Temperature Structural Materials Rajiv S. Mishra University of North Texas
1:30	Plasmonics-Based Emission Gas Sensors Michael A. Carpenter The Research Foundation of SUNY	Novel Functional-Gradient Thermal Barrier Coatings in Coal-Fired Power Plant Turbines Jing Zhang Indiana University and Purdue University
2:00	Gallium Oxide Nanostructures for High Temperature Sensors Ernesto J. Rubio University of Texas at El Paso	The Effects of Thermo-Mechanical Treatments on the Microstructure and Mechanical Properties of Iron-Based Superalloy Bin Hu Dartmouth College

2:30 p.m. BREAK - Grand Station V

3:00 p.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Sensors and Controls	High Performance Materials
Moderator	*Charles Miller*	*Jason Hissam*
3:00	Intelligent Coordination of Heterogeneous Sensors in Advanced Power Systems Kagan Tumer Oregon State University	Multiscale Computational Design and Synthesis of Protective Smart Coatings for Refractory Metal Alloys Otto Lu-Steffes University of Wisconsin
3:30	Developing Piezo-Dielectric Polymer-Derived Ceramics for Applications in Strain Sensors Yejie Cao University of Central Florida	Novel Nano-Size Oxide Dispersion Strengthened Steels Development Through Computational and Experimental Study Shizhong Yang Southern University and A&M College
4:00	Graphene-Based Composite Sensors for Energy Applications Charter D. Stinespring West Virginia University	An Integrated Study of a Novel Thermal Barrier Coating for Niobium-Based High Temperature Alloy Shizhong Yang Southern University and A&M College
4:30	High-Temperature Nano-Derived Micro-H_2 and H_2S Sensors Edward M. Sabolsky West Virginia University	An Integrated Study on a Novel High Temperature, High-Entropy Alloy Shizhong Yang Southern University and A&M College

5:30 - 8:00 p.m. POSTER SESSION AND RECEPTION - Grand Station V

WEDNESDAY, MAY 21, 2014

7:00 a.m. Registration/Continental Breakfast – Grand Station V

9:00 a.m. JOINT SESSIONS

	KEYNOTE SPEAKERS
Session	JOINT SESSION - Grand Station I
Moderator	*Robie Lewis*
9:00	Rising to the Challenge of Climate Change: The Role of Innovation Darren Mollot, Director, Clean Energy Systems Office of Fossil Energy, U.S. Department of Energy
9:30	Mapping Energy's Future Dianne Anderson, Executive Director Great Lakes Energy Institute

10:00 a.m. BREAK - Grand Station V

10:30 a.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Sensors and Controls	High Performance Materials
Moderator	*Jason Hissam*	*David Alman*
10:30	Self-Powered Wireless Sensor to Monitor Coal Ash Corrosion in a USC Boiler Xingbo Liu West Virginia University	High Temperature Thermoelectric Oxides Engineered at Multiple Length Scales for Energy Harvesting Fumio S. Ohuchi University of Washington
11:00	Wireless Condition-Based Monitoring System for Gas Turbine Rotating Components Joshua McConkey Siemens Energy	Structure and Property Correlation in MAX Phases Wai-Yim Ching University of Missouri

11:30 a.m. LUNCH

1:00 p.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Sensors and Controls	High Performance Materials
Moderator	*Maria Reidpath*	*David Alman*
1:00	Merged Environments for Simulation and Analysis: Building an Extensible Framework for Testing New Engineering Concepts Kenneth "Mark" Bryden Ames National Laboratory	Computational Design of Creep-Resistant Alloys and Experimental Validation in Ferritic Superalloys Peter K. Liaw University of Tennessee
1:30	Innovative Technologies Optical Thin Films for High Temperature Sensing in Advanced Fossil Energy Applications Paul R. Ohodnicki, Jr. National Energy Technology Laboratory, Office of Research and Development	Further Understanding of Furnace Wall Corrosion in Coal-Fired Boilers Steven Kung Babcock & Wilcox Co.
2:00	Development of a CO_2 Chemical Sensor for Downhole CO_2 Monitoring in Carbon Sequestration Ning Liu New Mexico Institute of Mining & Technology	Degradation of HVOF, Iron Aluminide Coatings in Simulated Coal Slag Thomas M. Lillo Idaho National Laboratory

2:30 p.m. BREAK - Grand Station V

3:00 p.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Sensors and Controls	High Performance Materials
Moderator	*Barbara Carney*	*Peter Tortorelli*
3:00	Wireless Battery-Free Harsh Environment Sensor System for Energy Sector Applications Mauricio Pereira da Cunha and Anin Maskay University of Maine	Innovative Technologies Predicting Microstructural Stability For Advanced FE Systems Youhai Wen National Energy Technology Laboratory, Office of Research and Development
3:30	Development of a Ceramic Coaxial Cable Sensor-Based System for Long-Term Down-Hole CO_2 Sequestration Monitoring Runar Nygaard Missouri University of Science & Technology	Innovative Technologies An Integrated Computational Approach to Predicting the Protective Oxide Scale Formation on Alloys in FE Relevant Environments Brian Gleeson University of Pittsburgh
4:00	Microstructured Sapphire Fiber Sensors for Harsh Environments Hai Xiao Clemson University	Bespoke Materials Surfaces Bruce Pint Oak Ridge National Laboratory
4:30	TDL Syngas for In-Situ monitoring of CO, CH_4, CO_2, and H_2O in an Engineering-Scale High-Pressure Coal Gasifier Ronald K. Hanson Stanford University	Understanding Corrosion Mechanisms in Advanced Coal-Fired Boilers Bruce Pint Oak Ridge National Laboratory

5:00 p.m. ADJOURN

THURSDAY, MAY 22, 2014

7:00 a.m. Registration/Continental Breakfast – Grand Station V

8:30 a.m. JOINT SESSIONS

	KEYNOTE SPEAKERS
Session	PANEL SESSION - Grand Station I
Moderator	*Susan Maley*
8:30	Overview of Crosscutting Techno-Economic and Market Assessments Katrina Krulla, Technical Project Manager National Energy Technology Laboratory, Office of Program Performance and Benefits
9:00 to 9:30	Challenges and Opportunities for Intergovernmental Collaborative Research Alexander R. Larzelere, Federal Program Director for the Nuclear Energy Modeling and Simulation Energy Innovation Hub, U.S. Department of Energy Regis Conrad, Director of Crosscutting Research Office of Fossil Energy, U.S. Department of Energy Cynthia Powell, Director, Office of Research and Development, National Energy Technology Laboratory

10:00 a.m. BREAK - Grand Station V

10:30 a.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Sensors and Controls	High Performance Materials
Moderator	*Barbara Carney*	*Jeff Hawk*
10:30	Ultra-high Temperature Thermionic Sensors Saroj Sahu Palo Alto Research Center	Steam Turbine Materials for Advanced Ultrasupercritical (AUSC) Coal Power Plants John Shingledecker Electric Power Research Institute
11:00	Multipoint Pressure Sensing Fiber Optic Cable for Monitoring CO_2 Sequestration Bill Challener General Electric Global Research	Development of Advanced Materials for Ultrasupercritical Boiler Systems John Shingledecker Electric Power Research Institute

11:30 a.m. LUNCH

1:00 p.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Sensors and Controls	High Performance Materials
Moderator	*Barbara Carney*	*Jeff Hawk*
1:00	Intrinsic Fiber Optic Chemical Sensors for Subsurface Detection of Carbon Dioxide Jesus Delgado Alonso Intelligent Optical Systems	Advanced Processing of Metallic Powders for Fossil Energy Applicants Iver E. Anderson Ames National Laboratory and Iowa State University
1:30	Model-Based Sensor Placement for Component Condition Monitoring and Fault Diagnosis in Fossil Energy Debangsu Bhattacharyya West Virginia University	Computational and Experimental Development of Novel High Temperature Alloys Matthew J. Kramer Ames National Laboratory
2:00	An Information-Theoretic Framework and Self-Organizing Agent-Based Sensor Network Architecture for Power Plant Condition Monitor Kenneth A. Loparo Case Western Reserve University	Multiscale Design of Materials for Energy Systems Richard LeSar Ames National Laboratory

2:30 p.m. BREAK - Grand Station V

3:00 p.m. CONCURRENT SESSIONS

	TRACK A - Grand Station I	TRACK B - Grand Station III
Session	Sensors and Controls	High Performance Materials
Moderator	*Ben Chorpening*	*Gordon Holcomb*
3:00	Embedded Active Fiber Optic Sensing Network for Structural Health Monitoring in Harsh Environments Zhihao Yu Virginia Polytechnic Institute and State University	Corrosion Performance of Structural Alloys in Simulated Oxy-fuel Environments Ken Natesan Argonne National Laboratory
3:30	Distributed Fiber Optic Sensor for Online Monitoring of Coal Gasifier Refractory Health Zhihao Yu Virginia Polytechnic Institute and State University	Development of NDE Methods for Ceramic Coatings Jiangang Sun Argonne National Laboratory
4:00	Novel Modified Optical Fibers for High Temperature In-Situ Miniaturized Gas Sensors in Advanced Fossil Energy Systems Brian Scott Virginia Polytechnic Institute and State University	Ni-Based Alloys for Advanced Ultrasupercritical Steam Boilers Peter F. Tortorelli Oak Ridge National Laboratory
4:30	Single-Crystal Sapphire Optical Fiber Sensor Instrumentation Brian Scott Virginia Polytechnic Institute and State University	Materials Testing for Advanced Ultrasupercritical System Turbines Philip J. Maziasz Oak Ridge National Laboratory

5:00 p.m. ADJOURN

FRIDAY, MAY 23, 2014

7:00 a.m. Continental Breakfast – Grand Station III Foyer

	Grand Station III
Session	High Performance Materials
Moderator	*Rick Dunst*
8:00	Joining of Advanced High Temperature Materials Glenn Grant Pacific Northwest National Laboratory
8:30	Low-Cost Fabrication of ODS Materials Glenn Grant Pacific Northwest National Laboratory
9:00	Development of an Improved Creep Resistant Fe-9%Cr Steel Jeffrey A. Hawk National Energy Technology Laboratory, Office of Research and Development

9:30 a.m. BREAK

	Grand Station III
Session	High Performance Materials
Moderator	*Youhai Wen*
10:00	Addressing Materials Processing Issues for USC Steam Turbines Paul D. Jablonski National Energy Technology Laboratory, Office of Research and Development
10:30	Improving the Performance of Creep Strength-Enhanced Ferritic Steels Yukinori Yamamoto Oak Ridge National Laboratory
11:00	Oxy-combustion Environmental Characterization: Fire- and Steam-Side Corrosion Gordon R. Holcomb National Energy Technology Laboratory, Office of Research and Development
11:30	Qualification of New, Commercial ODS Alloys Sebastien Dryepondt Oak Ridge National Laboratory

12:00 p.m. MEETING CONCLUDES

Poster Presentations

Advanced Ceramic Materials and Packaging Technologies for Realizing Sensors Operable in Advanced Energy Generation Systems - Yiping Liu, Sporian Microsystems, Inc.

Investigation on Smart Parts with Embedded Piezoceramic Sensors via Additive Manufacturing
Yirong Lin, University of Texas at El Paso

Investigation on Pyroelectric Ceramic Temperature Sensors for Energy System Applications
Yirong Lin, University of Texas at El Paso

Development of Integrated Biomimetic Framework with Intelligent Monitoring, Cognition, and Decision Capabilities for Control of Advanced Energy Plants - Debangus Bhattacharyya, West Virginia University

Deformation Properties of High-Entropy Alloys - Karin Dahmen, University of Illinois

Multi-objective Optimal Sensor Deployment Under Uncertainly for Advanced Power Systems
Urmila Diwekar, University of Illinois and Vishwamitra Research Institute

Mixed-Oxide for Carbonaceous Fuel Conversion with Integrated CO_2 Capture via Chemical Looping Oxygen Uncoupling (CLOU) - Fanxing Li, North Carolina State University

Direct Numerical Simulation of Heat and Mass Transfer of Spheres in a Fluidized Bed
Zhi-Gang Feng, University of Texas at San Antonio

Bond Coat Layers for Multilayer Thermal/Environmental Barrier Coatings
Jeffrey Fergus, Auburn University

Reduced Mode Sapphire Optical Fiber and Sensing Systems
Daniel Homa, Virginia Polytechnic Institute and State University

ATOMeS: Additive Topology Optimized Manufacturing with Embedded Sensing
Joseph V. Mantese, United Technologies Research Center

Smart Refractory Sensor Systems for Wireless Monitoring of Temperature, Health, and Degradation of Slagging Gasifiers - Edward M. Sabolsky, West Virginia University

Computational Design of Weldable, High-Cr Ferritic Steel
David Snyder, QuesTek Innovations LLC

Evolving Robust and Reconfigurable Controllers for Advanced Power Systems
Kagan Tumer and Logan Yliniemi, Oregon State University

Additive Manufacturing of Smart Parts with Embedded Sensors for In-Situ Monitoring in Advanced Energy Systems
Hai Xiao, Clemson University

Predicting Microstructure-Creep Resistance Correlation in High Temperature Alloys Over Multiple Time Scales
Honsgsuk Lee, Purdue University

Ultra-short Pulsed Laser Micromachining of Sapphire
Daniel Blood, University of Florida

Poster Presentations

An Information-Theoretic Framework for Health and Condition Monitoring of Power Plant Equipment
Wanchat Theeranaew, Case Western Reserve University

A Self-Organizing Agent-Based Sensor Network for Power Plant Condition Monitoring
Hanich Agharazi, Case Western Reserve University