

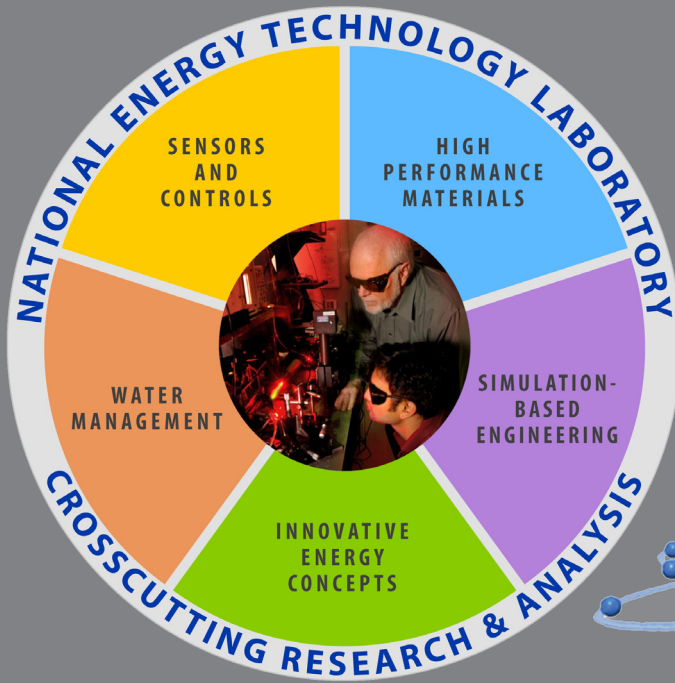
2016

CROSSCUTTING & RARE EARTH RESEARCH ELEMENTS

PORTFOLIOS REVIEW AGENDA

April 18–22, 2016

Sheraton Station Square Hotel
Pittsburgh, PA



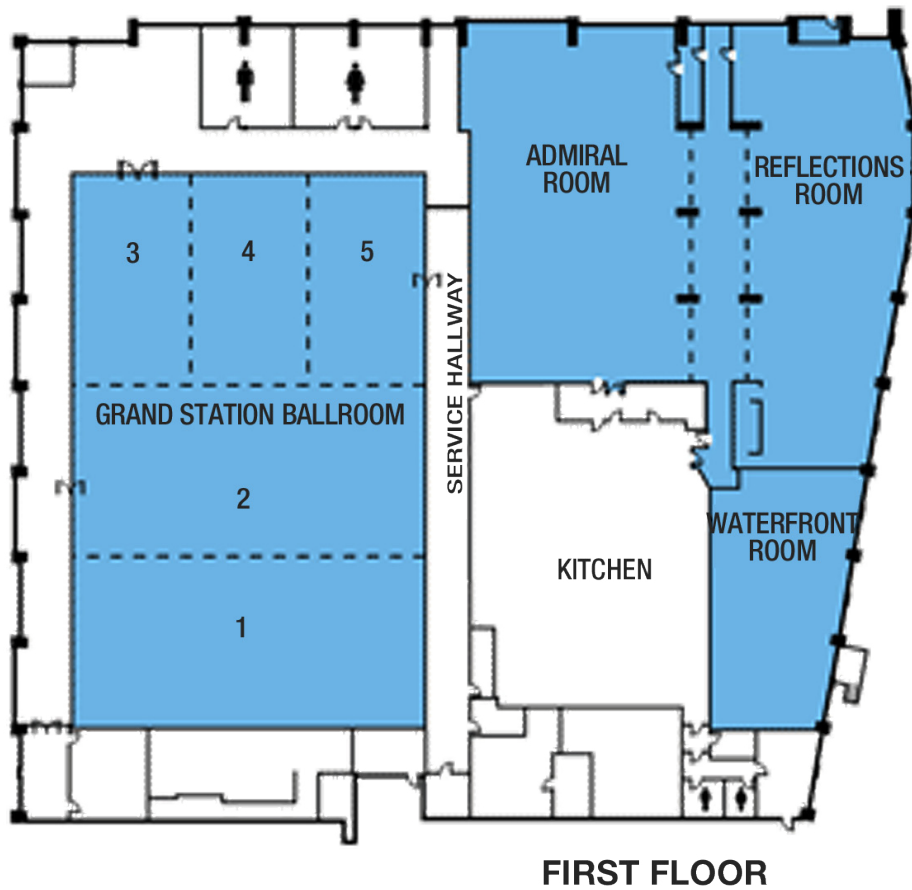
REE
RARE EARTH ELEMENTS
FROM COAL AND COAL BY-PRODUCTS



U.S. DEPARTMENT OF
ENERGY



SHERATON STATION SQUARE FLOOR PLAN



2016 CROSSCUTTING RESEARCH & RARE EARTH ELEMENTS PORTFOLIOS REVIEW

APRIL 18–22, 2016 • SHERATON STATION SQUARE HOTEL • PITTSBURGH, PA

PROGRAM AGENDA

MONDAY, APRIL 18

7:00 a.m. **REGISTRATION** – Grand Station Foyer **CONTINENTAL BREAKFAST** – Grand Station 3–5

8:30 a.m. **GENERAL SESSION** – Grand Station 1 & 2

Welcome and NETL Overview – *Cindy Powell, Ph.D., Deputy Director Science & Technology*
Strategic Plans & Programs, National Energy Technology Laboratory

Program Overviews –

- Fossil Energy Advanced Energy Systems (FE AES) – *Regis Conrad, Division Director, FE AES*
- NETL Crosscutting Research and Analysis (CCRA) – *Robert Romanosky, Ph.D, Acting Portfolio Manager, CCRA*
- Rare Earth Elements (REE) – *Mary Anne Alvin, Portfolio Manager, REE*
- Radically Engineered Modular Systems – *Jenny Tennant, Portfolio Manager, Gasification and Fuels*

Systems Analysis –

- Direct Power Extraction and Advanced Ultra-Supercritical Power Plants – *Nathan Weiland, Energy Process Analysis*

10:00 a.m. **MORNING BREAK**

CONCURRENT SESSIONS

	TRACK A – Grand Station 1 & 2	TRACK B – Admiral Room
10:30 a.m.	<p>Session 1 – Computational Materials Modeling Moderator – Charles Miller, National Energy Technology Laboratory</p> <ul style="list-style-type: none"> • The SMARTER Project – Science of Multicomponent Alloys: Roadmap for Theoretical and Experimental Research Matthew Kramer, Ames National Laboratory • An Integrated Study on a Novel High Temperature High Entropy Alloy Shizhong Yang, Southern University and A&M College 	<p>Session 1 – Optical Sensors Moderator – Barbara Carney, National Energy Technology Laboratory</p> <ul style="list-style-type: none"> • Robust Ceramic Coaxial Cable Down-Hole Sensors for Long-Term In Situ Monitoring of Geologic CO₂ Injection Runar Nygaard, University of Missouri System • High-Temperature Sapphire Pressure Sensors for Harsh Environments Justin Kiehne, University of Florida
11:30 a.m.	LUNCH (On Your Own)	
1:00 p.m.	<p>Session 2 – Computational Materials Modeling Moderator – Vito Cedro, National Energy Technology Laboratory</p> <ul style="list-style-type: none"> • Weldability of Creep Resistant Alloys for Advanced Power Plants Xinghua Yu, ORNL – Oak Ridge National Laboratory • Modeling Long-Term Creep Performance for Welded Nickel-Base Superalloy Structures for Power Generation Systems Chen Shen, General Electric Company • Corrosion Issues in Advanced Coal Fired Boilers Bruce Pint, ORNL – Oak Ridge National Laboratory 	<p>Session 2 – Optical Sensors Moderator – Karol Schrems, National Energy Technology Laboratory</p> <ul style="list-style-type: none"> • Robust Metal-Ceramic Coaxial Cable Sensors for Distributed Temperature Monitoring in Harsh Environments of Fossil Energy Power Systems Adam Trontz, University of Cincinnati • Reduced Mode Sapphire Optical Fiber and Sensing System Daniel Homa, Virginia Polytechnic Institute and State University • Distributed Fiber Sensing Systems for 3D Combustion Temperature Field Monitoring in Coal-Fired Boilers Using Optically Generated Acoustic Waves Jingcheng Zhou, University of Massachusetts at Lowell

2:30 p.m. **AFTERNOON BREAK**

3:00 p.m.	Session 3 – Structural Materials Moderator – Sydni Credle, National Energy Technology Laboratory	Session 3 – Innovative Process Technologies Moderator – Karol Schrems, National Energy Technology Laboratory
	<ul style="list-style-type: none">• A New Superalloy Enabling Heavy Duty Gas Turbine Wheels for Improved Combined Cycle Efficiency Richard DiDomizio, General Electric Company• Development of Nondestructive Evaluation (NDE) Methods for Structural and Functional Materials Jiangang Sun, ANL – Argonne National Laboratory• Predicting the Oxidation/Corrosion Performance of Structural Alloys in Supercritical CO₂ Steve Kung, Electric Power Research Institute Inc.• Serration Behavior of High-Entropy Alloys Karin Dahmen, University of Illinois	<ul style="list-style-type: none">• Advanced Sensor Materials and Fiber Optic Sensors Paul Ohodnicki, NETL Research & Innovation Center• Creep Optimization in Haynes 282 Through Gamma Prime Coarsening Control: Preliminary Results Jeff Hawk, NETL Research & Innovation Center• LIBS for Subterranean Measurements Dustin McIntyre, NETL Research & Innovation Center• NETL Advanced 9% Cr Steel: Update and Current Development Status Jeff Hawk, NETL Research & Innovation Center

TUESDAY, APRIL 19

7:30 a.m. **REGISTRATION** – Grand Station Foyer **CONTINENTAL BREAKFAST** – Grand Station 3–5

CONCURRENT SESSIONS

	TRACK A – Grand Station 1 & 2	TRACK B – Admiral Room
8:30 a.m.	Session 4 – Advanced Manufacturing Moderator – Sydni Credle, National Energy Technology Laboratory	Session 4 – Novel Sensor Concepts Moderator – Barbara Carney, National Energy Technology Laboratory
	<ul style="list-style-type: none">• Benefits of Hot Isostatic Pressure/Powdered Metal (HIP/PM) and Additive Manufacturing (AM) to Fabricate Advanced Energy System Components Nancy Horton & Roy Sheppard, Energy Industries of Ohio Inc.• Additive Manufacturing of Fuel Injectors Mahdi Jamshidinia, Edison Welding Institute, Inc.• High Temperature Ceramic Heat Exchanger for Solid Oxide Fuel Cell Jose Luis Cordova, Mohawk Innovative Technology, Inc.	<ul style="list-style-type: none">• Development of a CO₂ Chemical Sensor for Downhole CO₂ Monitoring in Carbon Sequestration Ning Liu, New Mexico Institute of Mining and Technology• Heat Sensor-Harsh Environment Adaptable Thermionic Sensor Scott Limb, Palo Alto Research Center Incorporated• Graphene-Based Composite Sensors for Energy Applications Charter Stinespring, West Virginia University Research Corporation

10:00 a.m. **MORNING BREAK**

10:30 a.m.	Session 5 – Functional Materials Moderator – Jessica Mullen, National Energy Technology Laboratory	Session 5 – Novel Sensor Concepts Moderator – Benjamin Chorpene, National Energy Technology Laboratory
	<ul style="list-style-type: none">• Post Combustion Carbon Capture Using Polyethylenimine (PEI) Functionalized Titanate Nanotubes Melisa Stewart, Prairie View A&M University• Reduced Cost Bond Layers for Multi-Layer Thermal/Environmental Barrier Coatings Jeffrey Fergus, Auburn University	<ul style="list-style-type: none">• Metal Oxide/Nitride Heterostructured Nanowire Arrays for Ultra-Sensitive and Selective Multi-Mode High Temperature Gas Detection Bo Zhang, University of Connecticut• Investigation on Pyroelectric Ceramic Temperature Sensors for Energy System Applications Ricardo Martinez, University of Texas at El Paso

11:30 a.m. **LUNCH** (On Your Own)

1:00 p.m.	Session 6 – Functional Materials Moderator – Richard Dunst, National Energy Technology Laboratory	Session 6 – Novel Sensor Concepts Moderator – Sydney Credle, National Energy Technology Laboratory
	<ul style="list-style-type: none">• Rational Design of Mixed-Metal Oxides for Chemical Looping Combustion of Coal Via Computational Experimental Studies Fanxing Li, North Carolina State University• Novel Silica Nanostructured Platforms with Engineered Surface Functionality and Spherical Morphology for Low-Cost High-Efficiency Carbon Capture Nicholas Pizzi, Delaware State University• HVOF Thermal Spray TIC/TIB2 Coatings of AUSC Boiler/Turbine Components for Enhanced Corrosion Protection Chung-Ying Tsai, Southern Illinois University	<ul style="list-style-type: none">• Advanced Ceramic Materials and Packaging Technologies for Realizing Sensors Operable in Advanced Energy Generation Systems Jason Fish, Sporian Microsystems Inc. (SBIR PROJECT)• Adaptive Electrical Capacitance Volume Tomography for Real-Time Measurement of Solids Circulation Rate at High Temperatures Qussai Marashdeh, Tech4Imaging (SBIR PROJECT)• Real-Time 3-D Volume Imaging and Mass-Gauging of High Temperature Flows and Power System Components in a Fossil Fuel Reactor Using Electrical Capacitance Volume Tomography Qussai Marashdeh, Tech4Imaging (SBIR PROJECT)

2:30 p.m. **AFTERNOON BREAK**

3:00 p.m.	Session 7 – Innovative Process Technologies Moderator – Karol Schrems, National Energy Technology Laboratory	Session 7 – Embedded Sensors Moderator – Maria Reidpath, National Energy Technology Laboratory
	<ul style="list-style-type: none">• Internal to External Oxidation Transition Modeling: Plasticity and Coherence Loss Youhai Wen, NETL Research & Innovation Center• Serrated Plastic Flow in High Entropy Alloys Joe Licavoli, NETL Research & Innovation Center• Advanced Controls and Cyber-Physical Systems David Tucker, NETL Research & Innovation Center• IPT – Direct Power Extraction Rigel Woodside, NETL Research & Innovation Center	<ul style="list-style-type: none">• Additive Topology Optimized Manufacturing with Embedded Sensing Paul Attridge, United Technologies Corporation• Additive Manufacture of Smart Parts with Embedded Sensors for In-Situ Monitoring in Advanced Energy Systems Hai Xiao, University of Missouri System• Smart Refractory Sensor Systems for Wireless Monitoring of Temperature, Health and Degradation of Slagging Gasifiers Edward Sabolsky, West Virginia University• Investigation of “Smart Parts” with Embedded Sensors for Energy System Applications Yirong Lin, University of Texas at El Paso

5:00–
6:45 p.m.

POSTER SESSION – Grand Station 3–5

WEDNESDAY, APRIL 20

7:30 a.m. **REGISTRATION** – Grand Station Foyer

CONTINENTAL BREAKFAST – Grand Station 3–5

CONCURRENT SESSIONS

	TRACK A – Grand Station 1 & 2	TRACK B – Admiral Room
8:30 a.m.	<p>Session 8 – Multidisciplinary Computational Tools Moderator – Jason Hissam, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Engineering of Complex Systems Kenneth Bryden, Ames National Laboratory• Evaluation and Demonstration of Commercialization Potential of Carbon Capture Simulation Initiative Tools within gProms Advanced Simulation Platform Alfredo Ramos Plasencia, Process Systems Enterprise	<p>Session 8 – Wireless Sensors Moderator – Benjamin Chorpeneing, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• High-Temperature Wireless Sensor for Harsh Environment Condition Monitoring Mauricio Pereira da Cunha, University of Maine System• Novel Temperature Sensors and Wireless Telemetry for Active Condition Monitoring of Advanced Gas Turbines Anand Kulkarni, Siemens Corporation• Distributed Wireless Antenna Sensors for Boiler Condition Monitoring Haiying Huang, University of Texas at Arlington
10:00 a.m.	MORNING BREAK	
10:30 a.m.	<p>Session 9 – Advanced Manufacturing Moderator – Richard Dunst, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Compact, Ceramic Microchannel Heat Exchangers Charles Lewisohn, Ceramatec Inc.• Solid State Joining of Creep Enhanced Ferritic Steels Glenn Grant, PNNL – Pacific Northwest National Laboratory	<p>Session 9 – Advanced Process Controls Moderator – Maria Reidpath, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Advanced Control Architecture and Sensor Information Development for Process Automation, Optimization, and Imaging of Chemical Looping Systems Tien-Lin Hsie, Ohio State University• Development of Integrated Biomimetic Framework with Intelligent Monitoring, Cognition and Decision Capabilities for Control of Advanced Energy Plants Debangsu Bhattacharyya, West Virginia University
11:30 a.m.	LUNCH (On Your Own)	
1:00 p.m.	<p>Session 10 – Advanced Ultrasupercritical Materials Moderator – Vito Cedro, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Materials for Advance Ultrasupercritical Steam Turbines – Advanced Ultrasupercritical Component Demonstration Horst Hack, Energy Industries of Ohio Inc.• Advanced Ultrasupercritical (AUSC) Materials Thick-Walled Cycling Header Development for ComTest-AUSC Buchi (Reddy) Ganta, GE Power• Advanced Ultrasupercritical (AUSC) Tube Membrane Panel Development Jim Pschirer, GE Power	<p>Session 10 – Water Management Moderator – Charles Miller, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Simultaneous Waste Heat and Water Recovery from Power Plant Flue Gases for Advanced Energy System Dexin Wang, Gas Technology Institute• Field Demonstration Study for Heat and Water Recovery at a Coal-Fired Power Plant Russell Noble, Southern Company Services, Inc.• Exploring Energy-Water Issues in the United States Vince Tidwell, SNL – Sandia National Laboratories
2:30 p.m.	AFTERNOON BREAK	

3:00 p.m.	Session 11 – Advanced Ultrasupercritical Materials Moderator – Vito Cedro, National Energy Technology Laboratory	Session 11 – Advanced Process Controls / Sensor Placement & Networks Moderator – Sydney Credle, National Energy Technology Laboratory
	<ul style="list-style-type: none"> Component Test Facility (ComTest) Phase 1 Engineering for 760 °C (1400 °F) Advanced Ultrasupercritical (AUSC) Steam Generator Development Paul Weitzel, Babcock & Wilcox Power Generation Group, Inc. Ultra-Supercritical Steam Cycle Turbine Materials Phil J. Maziasz, ORNL – Oak Ridge National Laboratory Materials for Ultra-Supercritical Steam Power Plants Peter Tortorelli, ORNL – Oak Ridge National Laboratory Creep-Fatigue-Oxidation Interactions: Predicting Alloy Lifetimes under Fossil Energy Service Conditions Sebastien Dryepondt, ORNL – Oak Ridge National Laboratory 	<ul style="list-style-type: none"> Evolving Robust and Reconfigurable Multi-Objective Controllers for Advanced Power Systems Kagan Tumer, Oregon State University An Information Theoretic Framework and Self-Organizing Agent-Based Sensor Network Architecture for Power Plant Condition Monitor Kenneth Loparo, Case Western Reserve University Sensors and Controls – Merged Environment for Simulation and Analysis IMESA Paolo Pezzini, Ames National Laboratory Multi-Objective Optimal Sensor Deployment under Uncertainty for Advanced Power Systems Urmila Diwekar, University of Illinois

THURSDAY, APRIL 21

7:30 a.m. **REGISTRATION** – Grand Station Foyer **CONTINENTAL BREAKFAST** – Grand Station 3–5

CONCURRENT SESSIONS

	TRACK A – Grand Station 1 & 2	TRACK B – Admiral Room
8:30 a.m.	Session 12 – Multiphase Flow Moderator – Jason Hissam, National Energy Technology Laboratory <ul style="list-style-type: none"> Kinetic Theory Modeling of Turbulent Multiphase Flow Bo Kong, Ames National Laboratory MFIX-DEM PHI: Performance and Capability Improvements Towards Industrial Grade Open-Source DEM Framework with Integrated Uncertainty Quantification Manogna Adepu and Shaohua Chen, Arizona State University MFIX-DEM Enhancement for Industry-Relevant Flows Thomas Hauser, University of Colorado 	Session 12 – Water Treatment and Reuse Moderator – Barbara Carney, National Energy Technology Laboratory <ul style="list-style-type: none"> Model-Based Extracted Water Desalination System for Carbon Sequestration Ryan Adams, GE Global Research Water Desalination Using Multi-Phase Turbo-Expander Kimberly Hammer, General Electric Company Advanced Integrated Technologies for Treatment and Reutilization of Impaired Water in Fossil Fuel-Based Power Plant Systems Jason Trembly, Ohio University
10:00 a.m.	MORNING BREAK	
10:30 a.m.	Session 13 – Functional Materials Moderator – Richard Dunst, National Energy Technology Laboratory <ul style="list-style-type: none"> Novel Functional-Gradient Thermal Barrier Coatings in Coal-Fired Power Plant Turbines Jing Zhang, Indiana University – Purdue University Indianapolis Ceramic High Temperature Thermoelectric Heat Exchanger and Heat Recuperators in the Power Generation Systems Xueyan Song, West Virginia University 	Session 13 – Water Treatment and Reuse Moderator – Jessica Mullen, National Energy Technology Laboratory <ul style="list-style-type: none"> An Integrated Supercritical System for Efficient Produced Water Treatment and Power Generation Seyed Dastgheib, University of Illinois Fouling-Resistant Membranes for Treating Concentrated Brines for Water Reuse in Advanced Energy Systems Zachary Hendren, Research Triangle Institute

11:30 a.m. **LUNCH** (On Your Own)

1:00 p.m.	<p>Session 14 – Structural Materials Moderator – Vito Cedro, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Advanced Alloy Design Concepts for High Temperature Fossil Energy Applications Yukinori Yamamoto, ORNL – Oak Ridge National Laboratory• Optimization of Advanced Steels for Cyclic Operation Through an Integration of Material Testing, Modeling and Novel Component Test Validation John Siefert, Electric Power Research Institute Inc.• Experimental and Computational Investigation of High Entropy Alloys for Elevated High Temperature Applications Peter Liaw, University of Tennessee	<p>Session 14 – Water Treatment and Reuse Moderator – Maria Reidpath, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Low-Energy Water Recovery from Subsurface Brines Zachary Hendren, Research Triangle Institute• Treatment of Produced Water from Carbon Sequestration Sites for Water Reuse, Mineral Recovery and Carbon Utilization James Irvin, Southern Research Institute• Development of Membrane Distillation Technology Utilizing Waste Heat for Treatment of High Salinity Wastewaters Omkar Lokare, University of Pittsburgh
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2:30 p.m. **AFTERNOON BREAK**

3:00 p.m.	<p>Session 15 – Computational Materials Modeling Moderator – Youhai Wen, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• New Mechanistic Models of Long Term Evolution of Microstructure and Mechanical Properties of Nickel Based Alloys Jamie Kruzic, Oregon State University• Computational Design and Performance Prediction of Creep-Resistant Ferritic Superalloys Peter Liaw, University of Tennessee• Computational Design of Weldable, High-Cr Ferritic Steel David Snyder, QuesTek Innovations LLC (SBIR PROJECT)• Large Scale Screening of Low Cost Ferritic Steels Designs for Advanced Ultra Supercritical Boiler Using First Principles Methods Lizhi Ouyang, Tennessee State University	<p>Session 15 – Innovative Energy Concepts Moderator – Jason Hissam, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Vertically-Aligned Carbon-Nanotubes Embedded in Ceramic Matrices for Hot Electrode Applications Yongfeng Lu, University of Nebraska• High Temperature High Velocity Direct Power Extraction Using an Open Cycle Oxy Combustion System Manuel Hernandez, University of Texas at El Paso• Precursor-Derived Nanostructured Silicon Carbide Based Materials for Magnetohydrodynamic Electrode Applications YiHsun Yang, University of Washington• Boride Based Electrode Materials with Enhanced Stability under Extreme Conditions for MHD Direct Power Extraction Krishnan Raja, University of Idaho
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FRIDAY, APRIL 22

7:30 a.m. **REGISTRATION** – Grand Station Foyer

CONTINENTAL BREAKFAST – Grand Station 3–5

CONCURRENT SESSIONS

	TRACK A – Grand Station 1 & 2	TRACK B – Admiral Room
8:30 a.m.	<p>Session 16 – Computational Materials Modeling Moderator – Charles Miller, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Predicting Microstructure-Creep Resistance Correlation in High Temperature Alloys Over Multiple Time Scales Vikas Tomar, Purdue University• Computational Design and Discovery of Ni-Based Alloys and Coatings: Thermodynamic Approaches Validated by Experiments Bicheng Zhou, Pennsylvania State University• Computational System Dynamics (Computational Design of Multiscale Systems) Richard LeSar, Ames National Laboratory	<p>Session 16 – Multiphase Flow Moderator – Mehrdad Shahn timer, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Development of Reduced Order Model for Reacting Gas-Solids Flow Using Proper Orthogonal Decomposition Sohail Reddy, Florida International University• Use of an Accurate DNS Method to Derive, Validate and Supply Constitutive Equations for the MFiX Code Yifei Duan, University of Texas at San Antonio
10:00 a.m.	MORNING BREAK	
10:30 a.m.	<p>Session 17 – Multifunctional Materials Moderator – Sydni Credle, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Developing Novel Multifunctional Materials for High-Efficiency Electrical Energy Storage Feng-Yuan Zhang, University of Tennessee• Engineering Accessible Adsorption Sites in Metal Organic Frameworks for CO₂ Capture Saki Golafale, Clark Atlanta University	<p>Session 17 – Process Efficiency and Heat Utilization Moderator – Jessica Mullen, National Energy Technology Laboratory</p> <ul style="list-style-type: none">• Evaluating the Techno-Economic Feasibility of Forward Osmosis Processes Utilizing Low Grade Heat: Applications in Power Plant Water, Wastewater, and Reclaimed Water Treatment Meagan Mauter, Carnegie Mellon University• The COHO – Utilizing Low-Grade Heat and Carbon Dioxide at Power Plants for Water Treatment Aaron Wilson, Idaho National Laboratory
11:30 a.m.	ADJOURN	

2016 CROSSCUTTING RESEARCH & RARE EARTH ELEMENTS PORTFOLIOS REVIEW

GRAND STATION 3-5

POSTER PRESENTATIONS

TUESDAY, APRIL 19 – 5:00–6:45 P.M.

ADVANCED SENSORS

- 1 • **Passive Wireless Sensors Fabricated by Direct-Writing for Temperature and Health Monitoring of Energy Systems in Harsh-Environments**
– *Ioannis Kortidis and Michael Comparetto, West Virginia University*
- 2 • **High Temperature Integrated Gas and Temperature Wireless Microwave Acoustic Sensor System for Fossil Energy Applications**
– *Anin Maskay, University of Maine System*
- 3 • **Low-Cost Efficient and Durable High Temperature Wireless Sensors by Direct Write Additive Manufacturing for Application in Fossil Energy Systems**
– *Rahul Panat, Washington State University*
- 4 • **Wireless Three Dimensional (3D) Nanorod Composite Arrays-Based High-Temperature Surface Acoustic Wave Sensors for Selective Gas Detection through Machine Learning Algorithms** – *Dongwook Kwak, University of Connecticut*
- 5 • **Metal Three Dimensional (3D) Printing of Low-Nitrous Oxide (NO_x) Fuel Injectors with Integrated Temperature Sensors** – *Jorge Mireles, University of Texas at El Paso*

HIGH PERFORMANCE MATERIALS

- 6 • **Physics-based Creep Simulation of Thick Section Welds in High Temperature and Pressure Applications** – *Thomas Lillo, Idaho National Laboratory*
- 7 • **Materials Qualification and Deployment for High Efficiency Coal Fired Boilers**
– *Bruce Pint, Oak Ridge National Laboratory*
- 8 • **Microstructure and Properties of Ni-based Components Fabricated by Additive Manufacturing** – *Sebastien Dreyepont, Oak Ridge National Laboratory*
- 9 • **Data Science Initiative** – *Slava Romanov, NETL Research & Innovation Center*

INNOVATIVE ENERGY CONCEPTS

- 10 • **Combustion Synthesis of Boride-Based Electrode Materials for Magnetohydrodynamic (MHD) Direct Power Extraction**
– *Sergio Cordova, University of Texas at El Paso*

SIMULATION BASED ENGINEERING

- 11 • **Interfacing MFIX with PETSC and HYPRE Linear Solver Libraries**
– *Gautham Krishnamoorthy, University of North Dakota*
- 12 • **High Fidelity Computational Model for Fluidized Bed Experiments**
– *Vinod Kumar, University of Texas at El Paso*
- 13 • **Institute for the Design of Advanced Energy Systems (IDAES)**
– *John Eslick, NETL Research & Innovation Center*
- 14 • **Prediction of Discretization Error using the Error Transport Equation**
– *Ismail Celik, NETL Research & Innovation Center*

WATER MANAGEMENT

- 15 • **Wireless Networked Sensors in Water for Heavy Metal Detection**
– *Hang Ruan, Nanosonic Inc.*
- 16 • **Integrated Sensors for Water Quality** – *Laurel Frediani, Sporian Microsystems Inc.*
- 17 • **Advanced Thermally Robust Membranes for High Salinity Produced Brine Treatment via Direct Waste Heat Integration** – *Nick Siefert, NETL Research & Innovation Center*

RARE EARTH ELEMENTS

- 18 • **Recovery of Rare Earth Elements (REEs) from Coal Mine Drainage**
– *Paul F. Ziemkiewicz, West Virginia University*
- 19 • **Recovery of Rare Earth Elements (REEs) from Coal Ash with a Closed Loop Leaching Process** – *Rick Peterson, Battelle Memorial Institute*
- 20 • **Plasma Arc Gasification Based Rare Earth Element Recovery from Coal Fly Ash**
– *Ken Jeffers, Southern Research Institute*
- 21 • **Economically Viable and Environmentally Benign High Performance Technology to Recover Rare Earth Elements from Coal By-products**
– *Gary Carlson & Dean Stull, Tusaar, Inc.*
- 22 • **Novel Membrane and Electrodeposition-Based Separation and Recovery of Rare Earth Elements from Coal Combustion Residues** – *Helen Hsu-Kim, Duke University*
- 23 • **Pilot-scale Testing of an Integrated Circuit for the Extraction of Rare Earth Minerals and Elements from Coal and Coal Byproducts Using Advanced Separation Technologies** – *Rick Honaker, University of Kentucky*
- 24 • **Investigation of Rare Earth Element Extraction from North Dakota Coal-Related Feedstocks** – *Steve Benson, University of North Dakota*
- 25 • **High Yield and Economical Production of Rare Earth Elements from Coal Ash**
– *Prakash Joshi, Physical Sciences Inc.*
- 26 • **A Pollution-Prevention and Economically-Viable Technology for Separation of Rare Earth Elements from Powder River Basin (PRB) Coal Ashes**
– *Maohong Fan, University of Wyoming*
- 27 • **Rare Earth Elements (REE) from Coal and Coal By-Products**
– *Evan Granite, NETL Research & Innovation Center*



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