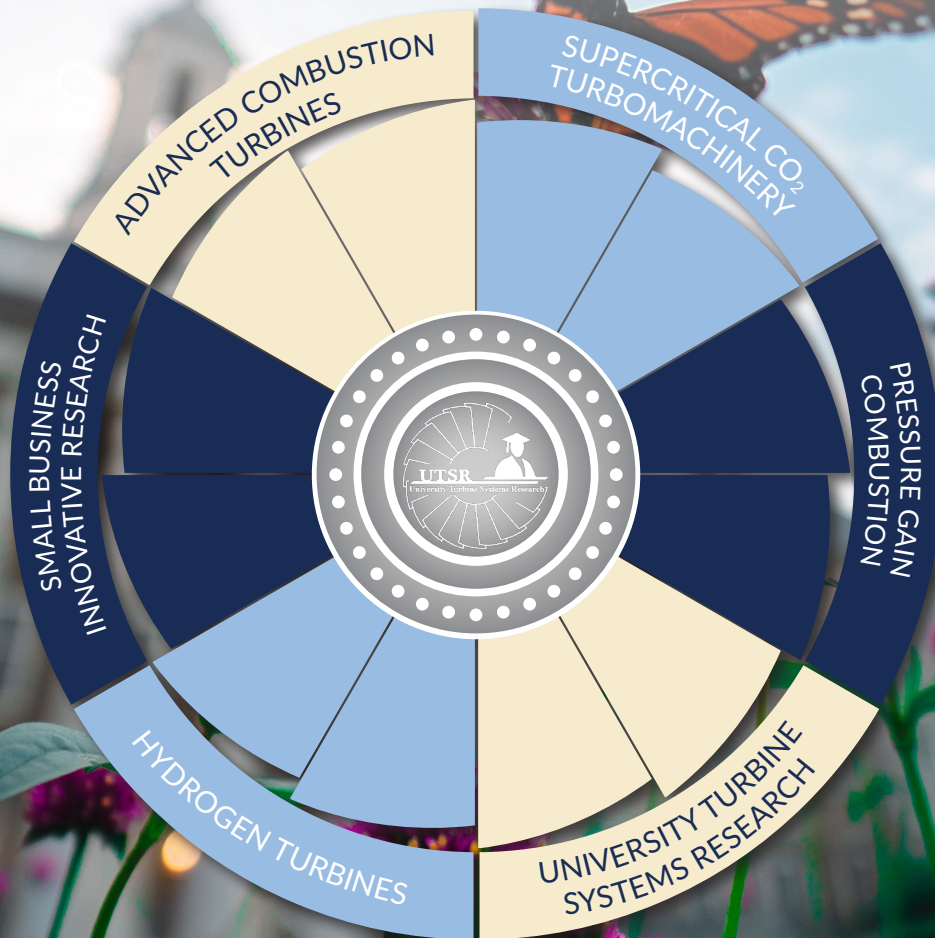


2023 University Turbine Systems Research (UTSR) and Advanced Turbines

Project Review Meeting



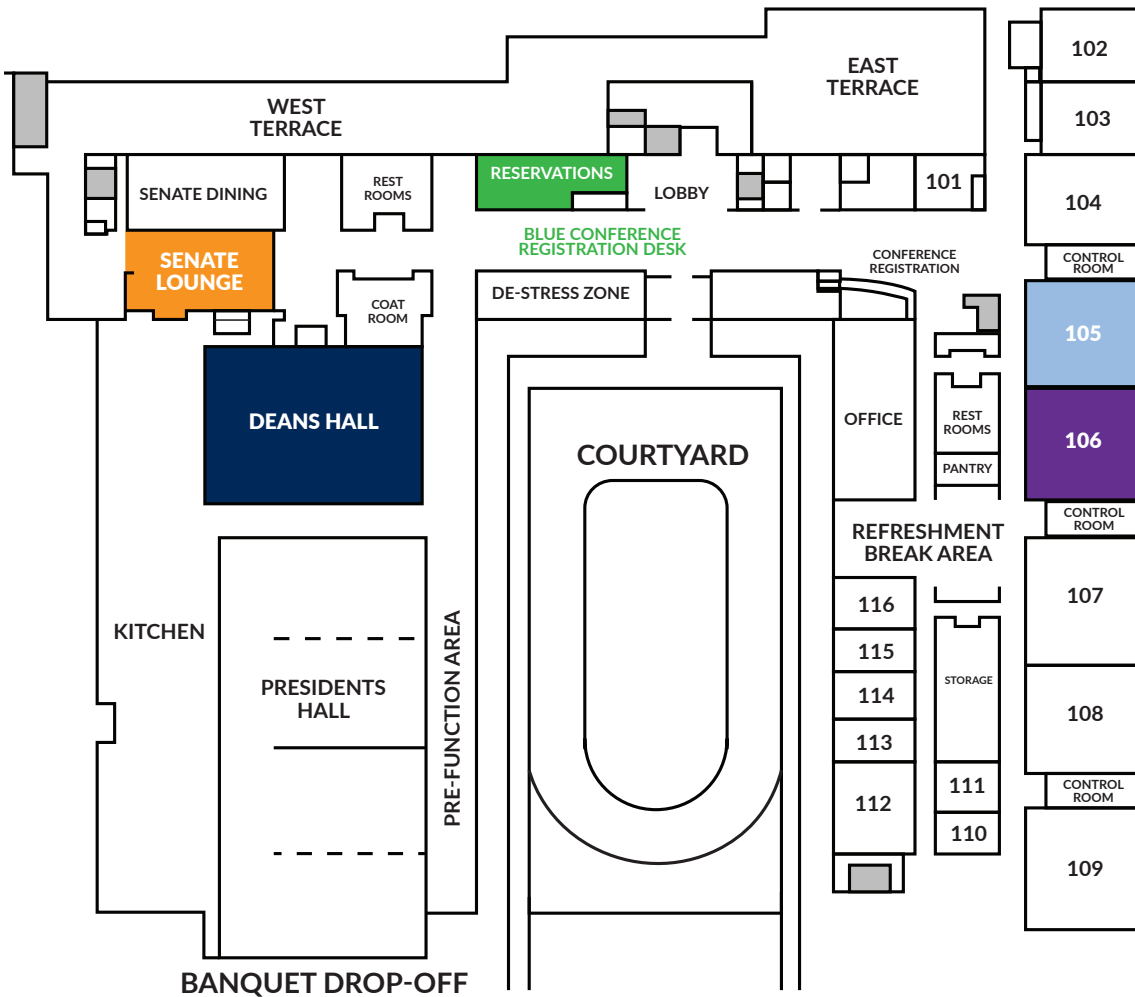
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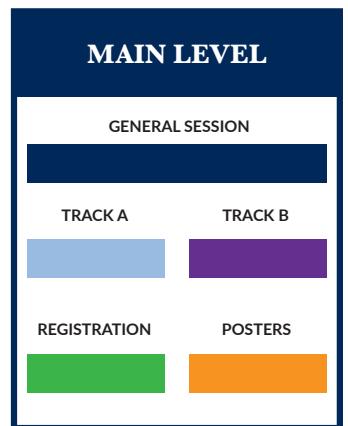


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Map Directory



THE PENN STATER
Conference Center  Hotel





About the University Turbine Systems Research and Advanced Turbines Program Review Meeting

The National Energy Technology Laboratory University Turbine Systems Research (NETL-UTSR) program manages a portfolio of university-based turbine research projects funded by the US DOE Office of Fossil Energy and Carbon Management (FECM). FECM sponsors the annual UTSR meeting where projects within the Advanced Turbines Program are publicly reviewed. The UTSR program offers a Gas Turbine Industrial Fellowship funded by sponsoring gas turbine manufacturers. This fellowship has helped to facilitate the transition of the best students from academia to the gas turbine industry, thereby helping to maintain U.S. leadership in this important area of technology.

The success of the UTSR program has been made possible by a network of universities, the collaborating gas turbine industry, and the DOE Advanced Turbines program - all of which are facilitated by an annual UTSR project review meeting, which is open to the public and brings together experts from academia, industry, and government to present and discuss ongoing turbine research sponsored by the DOE Office of FECM under existing cooperative agreements.

The UTSR program committee selects meeting venues at or close to leading universities directly involved in UTSR research. The 2023 UTSR project review meeting, co-hosted by The Pennsylvania State University, will be held at The Penn Stater Hotel & Conference Center on October 30 – November 1, 2023. The theme of this year's review meeting is "Partnerships and Workforce Development." Four speakers will provide keynote addresses:

- Mr. Robert Schrecengost, Division Director of Hydrogen with Carbon Management, Department of Energy – "FECM efforts to Decarbonize the Energy Sector."
- Mr. John Crane, Advanced Turbines Technology Manager, National Energy Technology Laboratory – "Turbines Role Towards Net Zero"
- Dr. Karen Thole, Distinguished Professor, Department of Mechanical Engineering, The Pennsylvania State University – "The National Experimental Turbine: Progress and Results."
- Mr. William W. Follett, Program Director, GTI Energy - "sCO₂, Ammonia and Hydrogen: Advanced Turbine System Technologies at GTI Energy"

The meeting will feature a panel discussion on the topic of "Partnerships and Workforce development" Moderated by Steve Lynch, Associate Professor of Mechanical Engineering and Director of the Penn State Center for Gas Turbine Research, Education, and Outreach. Panelists will include:

- Dr. Atul Kohli, Principal Technical Fellow at Pratt & Whitney
- Dr. Vincent McDonnell, Director of the UCI Combustion Laboratory and Professor of Mechanical and Aerospace Engineering at the University of California, Irvine
- Mr. John Mason, Director, Technology and Product Development Engineering at Solar Turbines
- Mr. Andy Buckenberger, New Technology - Business Partner Manager at Siemens Energy

Project reviews will be organized into two parallel technology tracks: (1) Carbon Free Fuels and Pressure Gain Combustion; and (2) Advanced Manufacturing and Materials, Supercritical CO₂, and Aerodynamics/Heat Transfer. The meeting will feature a broad range of DOE-sponsored projects in the form of oral and poster presentations, including the majority of NETL's extramural projects within the Advanced Turbines Program, as well as internal NETL R&D projects.

UTSR Technology Summary

Since the inception of the DOE Advanced Turbines program, the NETL-UTSR program has sought to support the underlying scientific research necessary to develop advanced turbines and turbine-based systems in support of the DOE Advanced Turbines program's strategic goals and program mission needs. The UTSR program has two primary goals. One is to produce results that resolve technical issues associated with DOE's Office of Fossil Energy and Carbon Management Advanced Turbines Program and the other is to maintain and enhance university-based turbine engineering capabilities in the United States. These two UTSR Program goals will continue to be realized through the involvement of professors and students in research and development on advanced turbine technical issues, while enhancing the education of future scientists and engineers in the U.S.

This is accomplished by funding university-based research projects that address scientific R&D and technical challenges in turbine-based systems and technology. This research focuses on the fundamental and applied issues associated with advancing the performance and efficiency of turbines in power generation beyond current state-of-the-art.

Technical areas of interest include hydrogen and ammonia combustion technology, supercritical CO₂ based power cycles, oxy-fuel combustion, materials, aerodynamics, heat transfer, and pressure gain combustion/rotating detonation engines.

The UTSR projects are typically three years in duration and focus on applied laboratory/bench scale R&D. Currently 12 universities and 14 projects are involved in the NETL-UTSR program. The innovations and scientific understanding generated under this program will then be transferred to industry manufacturers for incorporation into their next generation turbine technology products with the goal of producing reliable, affordable, clean, efficient, and cost-effective energy supplies.

One of the main purposes of this UTSR project review meeting is to facilitate peer-to-peer knowledge sharing and collaboration across boundaries to create a network of expertise and facilitate the acceleration of advancements in relevant fields.

Organizing Committee

- **Matthew Adams** – U.S. Department of Energy, National Energy Technology Laboratory
- **John Crane** – U.S. Department of Energy, National Energy Technology Laboratory
- **Patcharin (Rin) Burke** – U.S. Department of Energy, National Energy Technology Laboratory
- **Karen Lockhart** – WE2
- **Katie Hart** – WE2
- **Karen Thole** – The Pennsylvania State University

Keynote Speakers

Mr. Robert Schrecengost

Acting Director and Senior Program Manager in the Hydrogen with Carbon Management Division
U.S. Department of Energy

Bob Schrecengost has over 38 years of fossil power industry experience in heading technology development programs, emissions reduction projects, and solving combustion and operational issues. Bob is currently with the Department of Energy's Office of Fossil Energy and Carbon Management, where he is Division Director of Hydrogen with Carbon Management and leads R&D programs in Advanced Turbines, Advanced Gasification, reversible Solid Oxide Fuel Cells, and Advanced Energy Materials. Prior to joining DOE in January 2020, Bob spent 12 years as the boiler R&D program manager for Alstom Power and GE Steam Power, managing an R&D portfolio that included both internally- and externally-funded projects.

Mr. John Crane

Advanced Turbines Technology Manager
U.S. Department of Energy National Energy Technology Laboratory

Mr. John Crane is currently the Technology Manager for Advanced Turbines Program at the U.S. Department of Energy's National Energy Technology Laboratory (NETL). John has a BS in Aerospace Engineering from the University of Florida, an MS in Aerospace Engineering from the Georgia Institute of Technology, and an MS in Engineering Management from the University of Central Florida. From 2009 to 2023, John worked at Siemens Energy on development of high efficiency gas turbines with a focus on hot gas path components and associated technologies. His early career centered on development of emissions reduction technology for the H-class combustion system. Later, he led the transformative technology acceleration program that culminated in the 9000HL product family. He joined NETL in 2023 as the Technology Manager for Advanced Turbines to guide the technology development in support of the DOE mission to deliver low-cost, clean, and carbon-free electric power.

Dr. Karen Thole

Distinguished Professor Department of Mechanical Engineering
The Pennsylvania State University

Dr. Karen A. Thole is a Distinguished Professor in the Department of Mechanical Engineering at The Pennsylvania State University where she also previously served as the Department Head. Dr. Thole's expertise is heat transfer, additive manufacturing, and instrumentation development. She directs the Steady Thermal Aero Research (START) Lab where experimental and computational studies are conducted to advance aviation sustainability and power generation through highly efficient turbines. She is a Fellow of ASME and AIAA. Her work has been recognized by ASME's R. Tom Sawyer, George Westinghouse Gold, Edwin F. Church and Heat Transfer Memorial Awards. From AIAA, she has been awarded AIAA's Air Breathing Propulsion and Thermophysics Awards. Dr. Thole received her BSME and MSME from the University of Illinois and her PhD from the University of Texas.

Mr. William W. Follett,

Program Director for Supercritical Transformational Energy Production (STEP) Project
GTI Energy

What do you do when you don't want to be a Rocket Scientist anymore? Mr. Follett, from GTI Energy, is the Program Director for the Supercritical Transformational Energy Production (STEP) project, the world's largest indirect-fired supercritical CO₂ power plant. He started his career at a rocket engine company and spent the next 20 years in hypersonics developing ramjet and scramjet engines. Yearning for projects that would make positive and tangible impacts, he moved into the clean energy side of the company eleven years ago. He has been leading clean energy technology development projects at GTI Energy for the last eight years and is currently responsible for supercritical CO₂ technology development. He received his Master's degree in Mechanical Engineering from Stanford University.

Panelists

Dr. Steve Lynch

Associate Professor of Mechanical Engineering and Director of the Penn State Center for Gas Turbine Research, Education, and Outreach

The Pennsylvania State University

Steve Lynch is an Associate Professor of Mechanical Engineering and the Director of the Penn State Center for Gas Turbine Research, Education, and Outreach, which brings together multiple faculty working in technical areas relevant to gas turbine engines. Dr. Lynch also directs the Experimental and Computational Convection Lab at Penn State, and is the recipient of the 2023 ASME Westinghouse Silver Medal, given to recognize eminent achievement or distinguished service in the power field of mechanical engineering. He received his Ph.D. and M.S. in Mechanical Engineering from Virginia Tech in 2011 and 2007, respectively, and his B.S. in Mechanical Engineering from the University of Wyoming in 2003

Mr. John Mason

Director of Turbomachinery Technology and Product Development

Solar Turbines

John Mason is the Director of Technology and Product Development in Turbomachinery Products at Solar Turbines. John has over 34 years of turbomachinery experience, with the past nearly 30 years with Solar Turbines in various Engineering and Engineering leadership roles. In his current role, John's team identifies and matures advanced technologies and applies them to gas turbine enhancements and new gas turbine development programs. John holds a BSME from UC Irvine and an MSME from USC.

Dr. Atul Kohli

Principal Technical Fellow Heat Transfer, Analytical Methods

Pratt & Whitney

Dr. Atul Kohli is currently Principal Technical Fellow of Heat Transfer, Analytical Methods in the Aero-Thermal Fluids discipline at Pratt & Whitney (P&W). In his 26 years at Pratt & Whitney, Atul has held positions of increasing responsibility within Turbine Aerodynamics, Multi-Disciplinary Optimization, Turbine Durability and Aero-Thermal Systems disciplines. Atul impacts a broad range of life-limited engine components through improved modeling of cooling and heat transfer. He develops the proficiency of practitioners and standard work by advancing analytical methods and productivity through process improvements.

As the technical focal point for the P&W Center of Excellence at Penn State University, Atul works closely with students and faculty on various research projects. He has more than 30 refereed publications and 15 issued patents with over 30 pending. Atul was elected an ASME fellow in 2009 and currently serves as Chair of the ASME K-14 Heat Transfer Committee.

Atul has a BS in Mechanical Engineering from the Indian Institute of Technology and a MS and PhD in Mechanical Engineering from the University of Texas at Austin.



Dr. Vincent McDonell

*Director of the UCI Combustion Laboratory and Professor of Mechanical and Aerospace Engineering
University of California, Irvine*

Dr. Vincent McDonell is an Adjunct Professor in the Department of Mechanical and Aerospace Engineering at UC Irvine and is Director of the UCI Combustion Laboratory. He has over 30 years of experience in the design, operation, and characterization of continuous combustion systems and associated components, which has been documented in over 90 publications and over 200 papers. He has developed and evolved extensive experimental facilities to support research ranging from basic science to practical configurations. Dr. McDonell's recent research has focused on how low carbon and renewable fuels such as hydrogen and ammonia affect the performance and operation of combustion systems used in consumer appliances, industrial devices, and gas turbines. He is currently on the editorial board of the journals *Atomization and Sprays* and the *ASME Journal of Engineering for Gas Turbines and Power*. He regularly teaches courses on Combustion and Fuel Cell practical systems, Advanced Combustion Technology, and Design of Experiments. He also leads the industry sponsored Capstone Project courses associated with UCI's professional Master of Engineering program.

Mr. Andy Buckenberger

*New Technology - Business Partner Manager
Siemens Energy*

Andy Buckenberger is a New Technology – Business Partner Manager at Siemens energy. Andy has over 30 years of experience in turbomachinery, dealing with IPG and O&G markets. Andy now utilizes learned knowledge to evaluate and create new “green technology” solutions for a sustainable future



Lab Tour

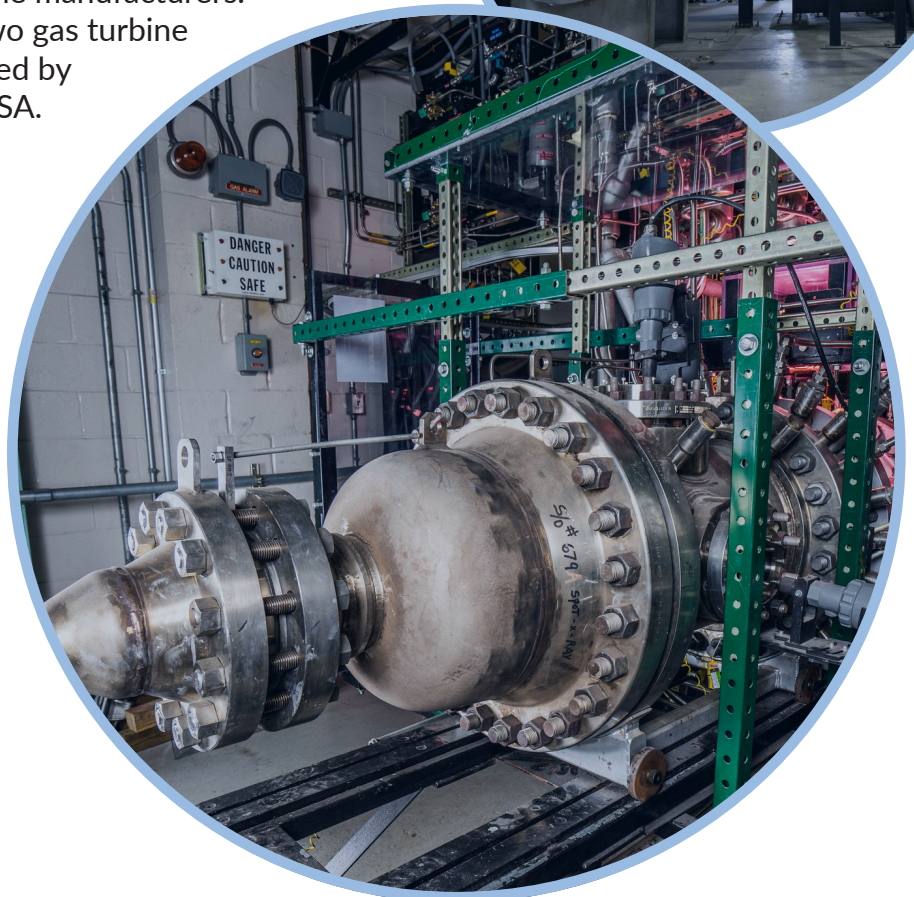
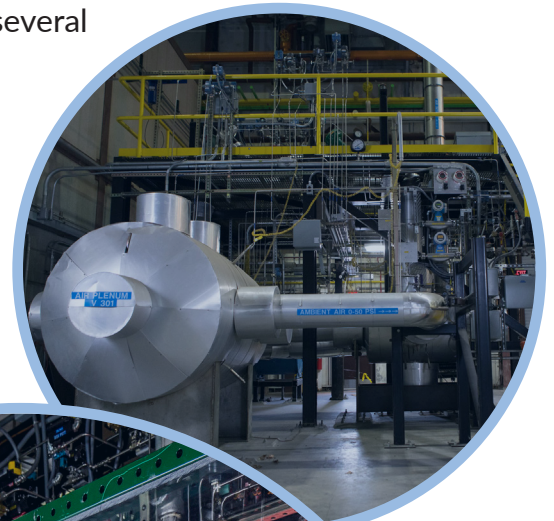
Penn State University will conduct a lab tour of their Reacting Flow Dynamics Laboratory (RFDL) and Steady Thermal Aero Research Turbine (START) Laboratory.

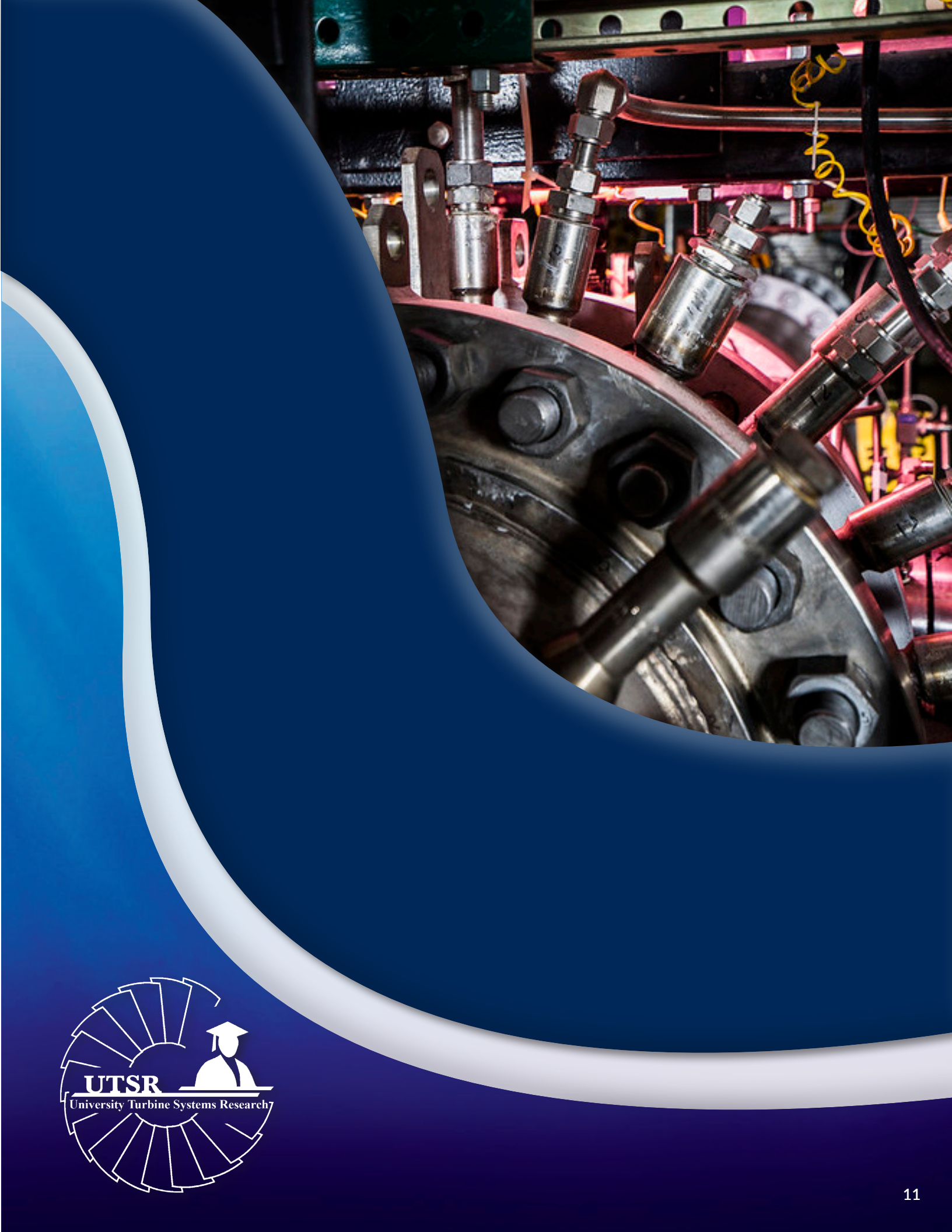
The RFDL studies issues related to combustor operability, renewable fuels, and hot-section durability for a range of power and propulsion technologies, including power generation and aircraft gas turbines, reciprocating engines, and industrial combustion systems. The RFDL team uses a suite of high-speed optical and laser diagnostics to study both fundamental and applied research questions. Our research is supported by the US Department of Energy, the Office of Naval Research, the National Science Foundation, and several industry partners.

The START Laboratory focuses on sustainable propulsion and power generation through innovating turbine technologies using true-scale engine hardware, developing sensors and instrumentation for smart turbines, advancing manufacturing for turbine applications, and integrating and embedding sensors through additive manufacturing. The test rig houses a single stage turbine including the National Experimental Turbine (NExT) funded by DOE through collaboration with four turbine manufacturers.

START is a center of excellence for two gas turbine manufacturers and is heavily supported by DOE, ARPA-E, FAA ASCENT, and NASA.

Within the START Lab, the tour will feature a facility for the Experimental and Computational Convection Laboratory (ExCCL), which is a high speed true scale linear cascade that has been used for investigations of turbine cooling technologies and development of total pressure field imaging through particle image velocimetry. Subjects being researched include development of advanced non-contact measurement techniques, novel turbine blade cooling techniques, additive manufacturing using metal and ceramic materials, and topology optimization for high intensity heat transfer applications.





Agenda at-a-glance

DAY 1: Monday, October 30, 2023

8:00 AM

Registration - Conf. Lvl. Registration Desk #2
Continental Breakfast - Dean's Lobby

9:00 AM

General Session - Deans Hall 1-2

*The Pennsylvania State University Welcome and Introduction:
Interim Vice President for Research, Andrew Read*

9:25 AM

Opening Remarks

*John Crane, Advanced Turbines & sCO₂ Technology Manager,
National Energy Technology Laboratory*

9:30 AM

FECM Efforts to Decarbonize the Energy Sector

*Robert Schrecengost, Advanced Turbines & sCO₂ Program Manager,
U.S. Department of Energy*

9:45 AM

Turbines Role Towards Net Zero

*John Crane, Advanced Turbines & sCO₂ Technology Manager,
National Energy Technology Laboratory*

10:15 AM

AM Break - Deans Lobby

10:45 AM

**The National Experimental Turbine:
Progress and Results**

*Karen Thole, Distinguished Professor, Department of Mechanical Engineering,
The Pennsylvania State University*

11:30 AM

Lunch - Garden Restuarant (Garden Level)

12:45 PM

Proceed to Breakout Rooms

Track A: Room 105 | Track B Room 106

Track A & Track B details on next page.

4:30 PM

Posters Session - Senate Suites

DAY 1

Breakout sessions

Track A - Carbon Free Fuels: Room 105

Moderators: Matt Adams and Richard Dalton

	Organization	Title	Presenter
1:00 PM	University of Central Florida	FE0032072 - Fundamental Experimental and Numerical Combustion Study of H ₂ Containing Fuels for Gas Turbines	Subith Vasu
1:30 PM	Purdue University	FE0032074 - Investigation Of Flame Structure For Hydrogen Gas Turbine Combustion	Robert Lucht
2:00 PM	Georgia Institute of Technology	FE0032079 - Ignition, Turbulent Flame Speeds, and Emissions from High Hydrogen Blended Fuels	Wenting Sun Tim Lieuwen
2:30 PM	PM Break - 104/105 Foyer		
3:00 PM	Ohio State University; University of Michigan	FE0032076 - Hydrogen Fuel Effects On Stability And Operation Of Lean Premixed And Staged Gas Turbine Combustors	Jeffrey A. Sutton Venkat Raman (U-M)
3:30 PM	University of California - Irvine	FE0032073 - Development and Application of Multipoint Array Injection Concepts for Operation of Gas Turbines on Hydrogen Containing Fuels	Vince McDonell
4:00 PM	San Diego State University	FE0032080 - Development of Design Practices for Additively Manufactured Micro-Mix Hydrogen Fueled Turbine Combustors with High-Fidelity Simulation Analysis, Reduced Modeling and Testing	Gustaff Jacobs

Poster Session: 4:30 PM - 6:00 PM | Senate Suites

Track B - Advanced Manufacturing and Materials : Room 106

Moderators: Drew O'Connell and Seth Lawson

	Organization	Title	Presenter
1:00 PM	Purdue University	DE-AC02-07CH11358 Computational Analysis of Thermal Management for Next Generation Gas Turbines	Tom I-P Shih
1:30 PM	Pennsylvania State University (PSU)	FE0031806 - Development And Evaluation of a Novel Fuel Injector Design Method Using Hybrid-Additive Manufacturing	Jacqueline A. O'Connor Guha Manogharan Yuan Xuan
2:00 PM	Siemens Corporation	FE0031808 - Ensemble Manufacturing Techniques for Steam Turbine Components Across Length Scales	Anand A. Kulkarni
2:30 PM	PM Break - 104/105 Foyer		
3:00 PM	GE Research Center	FE0031611 - High Temperature Additive Architectures for 65 Percent Efficiency	Paul Smith
3:30 PM	RTX Technology Research Center (RTRC)	FE0031759 - A Multiphysics Multiscale Simulation Platform for Damage, Environmental Degradation, and Life Prediction of Ceramic Matrix Composites (CMCS) in Extreme Environments	Luke Borkowski
4:00 PM	Oak Ridge National Laboratory (ORNL)	FWP-FEAA149 and FWP-FEAA300 Next Generation Environmental Barrier Coatings	Mackenzie Ridley

Poster Session: 4:30 PM - 6:00 PM | Senate Suites

Agenda at-a-glance

DAY 2: Tuesday, October 31, 2023

8:00 AM	Registration - Conf. Lvl. Registration Desk #2 Continental Breakfast - Dean's Lobby
9:00 AM	General Session - Deans Hall 1-2
9:00 AM	sCO₂, Ammonia and Hydrogen: Advanced Turbine System Technologies at GTI Energy <i>William W. Follett, Program Director, GTI Energy</i>
9:45 AM	AM Break - Deans Lobby
10:00 AM	Panel Discussion <i>Partnerships and Workforce Development</i> <i>Stephen Lynch, The Pennsylvania State University; John Mason, Solar Turbines;</i> <i>Atul Kohli, Pratt & Whitney; Vincent McDonell, University of California, Irvine;</i> <i>Andy Buckenberger, Siemens Energy</i>
11:00 AM	Lunch - Garden Restuarant (Garden Level)
12:15 PM	Proceed to Breakout Rooms Track A: Room 105 Track B Room 106 <i>Track A & Track B details on next page.</i>
4:30 PM	Lab Tour

DAY 2

Breakout sessions

Track A - Carbon Free Fuels : Room 105

Moderators: Richard Dalton and Drew O'Connell

	Organization	Title	Presenter
12:30 PM	Purdue University	FE0032075 - Physics-Based Integration of H ₂ -Air Rotating Detonation into Gas Turbine Power Plant (HydrogenGT)	Guillermo Paniagua
1:00 PM	GE Gas Power	FE0032173 - Advanced Mixed Mode Combustor for Hydrogen F-Class Retrofit	Michael Hughes
1:30 PM	Solar Turbines, Inc.	FE0032106 - Development of a Retrofittable Dry Low Emissions Industrial Gas Turbine Combustion System for 100% Hydrogen and Natural Gas Blends	Rajeshriben Patel
2:00 PM	RTX Technology Research Center (RTRC)	FE0032171 - Development of Hydrogen Burner for FT4000 Aeroderivative Engine	Justin Locke
2:30 PM	PM Break - 104/105 Foyer		
3:00 PM	GTI Energy; Georgia Institute of Technology	FE0032172 - Investigation of Ammonia for Combustion Turbines	John Vega (GTI Energy) Timothy Lieuwen (GIT)
3:30 PM	RTX Technology Research Center (RTRC)	FE0032169 - Low-NO _x , Operable Ammonia Combustor Development for Zero-Carbon Power (Load-Z)	Paul Papas
4:00 PM	Argonne National Laboratory	Ammonia Fuel Preconditioner for Gas Turbines	Sreenath Gupta

Lab Tour: 4:30 PM - 7:00 PM

Track B - Advanced Manufacturing and Materials & Supercritical CO₂: Room 106

Moderators: Matt Adams and Seth Lawson

	Organization	Title	Presenter
1:00 PM	National Energy Technology Laboratory (NETL)	Materials Evaluation of Additively Manufactured Fuel Injector Candidates	Chantal Sudbrack
1:00 PM	GE Research Center	FE0024007 - Development of Low-Leakage Shaft End Seals for Utility-Scale Supercritical Carbon Dioxide (sCO ₂) Turbo Expanders	Rahul Bidkar
1:30 PM	GE Research Center	FE0031924 - High-Temperature Seals for Supercritical CO ₂ Turbines	Rahul Bidkar
2:00 PM	Georgia Institute of Technology	FE0031772 - Advanced Model Development for Large Eddy Simulation (LES) of Oxy-Combustion and Supercritical Carbon Dioxide Power Cycles	Joseph C. Oefelein
2:30 PM	PM Break - 104/105 Foyer		
3:00 PM	GE Research Center	FE0031617 - Novel Modular Heat Engines with Supercritical Carbon Dioxide Bottoming Cycle Utilizing Advanced Oil-Free Turbomachinery	Bugra Ertas
3:30 PM	National Energy Technology Laboratory (NETL)	NETL Activities Supercritical CO ₂ Systems Analyses	Eric Liese
4:00 PM	National Energy Technology Laboratory (NETL)	Internal and External Cooling Technologies for Brayton Cycles	Doug Straub

Lab Tour: 4:30 PM - 7:00 PM

Agenda at-a-glance

DAY 3: Wednesday, November 1, 2023

8:00 AM	Registration - Conf. Lvl. Registration Desk #2 Continental Breakfast - Dean's Hall 1-2
9:00 AM	Proceed to Breakout Rooms Track A: Room 105 Track B Room 106 <i>Track A & Track B details on next page.</i>
10:45 AM	AM Break - 105/106 Foyer
11:00 AM	Proceed to Breakout Rooms Track A: Room 105 Track B Room 106 <i>Track A & Track B details on next page.</i>
12:00 PM	Proceed to General Session Room - Deans Hall 1-2
12:10 PM	Open Discussion <i>Workshop Summary, Closing Comments and Wrap-up</i>
12:30 PM	Adjourn

DAY 3

Breakout sessions

Track A - Pressure Gain Combustion: Room 105

Moderators: Matt Adams and Don Ferguson

	Organization	Title	Presenter
9:15 AM	University of Michigan	FE0031773 - Pressure Gain, Stability, and Operability of Methane/Syngas Based RDEs Under Steady and Transient Conditions	Mirko Gamba Caleb Van Beck
9:45 AM	University of Alabama	FE0032077 - Integrating a Rotating Detonation Combustor with a Power Generating Gas Turbine to Realize the Pressure Gain	Ajay Agrawal
10:15 AM	National Energy Technology Laboratory (NETL)	FWP - CFD Modeling of NO _x Formation in a Rotating Detonation Engine	Pete Strakey
10:45 AM	AM Break		
11:00 AM	Argonne National Lab	TCF-21-25-27 Development of a Neural ODE-based Scientific Machine Learning Framework Towards Acceleration of Combustion CFD Simulations	Pinaki Pal
11:30 AM	GE Research Center	FE0032170 - Demonstration of a Gas Turbine-Scale Rotating Detonation Combustor Integrated with Compressor and Turbine Components at 7FA Cycle Conditions	Kapil Singh Tommy Genova Sarah Monahan
General Session: 12:00 PM Deans Hall 1-2			

Track B - Supercritical CO₂ & Aerodynamics/Heat Transfer : Room 106

Moderators: Seth Lawson and Doug Straub

	Organization	Title	Presenter
9:15 AM	Southwest Research Institute (SwRI)	FE0031929 - Development of Coal Syngas Oxy-Combustion Turbine for use in Advanced Supercritical Carbon Dioxide (sCO ₂) Power Cycles	Michael Marshall
9:45 AM	Parametric Solutions, Inc.	FE0031922 - Supercritical CO ₂ Syngas Oxy-Combustor Development and Testing	David Cusano
10:15 AM	National Energy Technology Laboratory (NETL)	NETL Work on Supercritical CO ₂ Heat Transfer	Matthew Searle
10:45 AM	AM Break		
11:00 AM	Sandia National Laboratories	Primary Heat Exchanger Development for a Supercritical Carbon Dioxide Waste Heat Recovery System	Logan Rapp
11:30 AM	University of Texas at Austin; Pennsylvania State University	FE0031760 - Integrated Turbine Component Cooling Designs Facilitated by Additive Manufacturing and Optimization	David G. Bogard (UT Austin) Karen Thole (PSU)
General Session: 12:00 PM Deans Hall 1-2			

Poster Sessions

Deep Learning CMC Microstructure Reconstruction of High-Fidelity Micromechanics Simulations

Mohamed Hamza, Arizona State University

Using CFD to Develop a Non-Reacting Profile Simulator for the START Facility

Chad Schaeffer, The Pennsylvania State University

Incorporating L-PBF Metal-AM Constraints for Adjoint Shape Optimization of Novel Fuel Injector Designs

Sagar Jalui, The Pennsylvania State University

Impact of Exhaust Gas Recirculation on Static and Dynamic Stability of Swirl-Stabilized Flames

Javier Rodriguez Camacho, The Pennsylvania State University

Contextualizing the Performance of Hydrogen LDI Fuel Nozzles

Malcolm Overbaugh, University of California, Irvine

Multi-Material Laser Powder-Bed Fusion: Opportunities and Challenges for Unlocking New AM Applications

Guha Manogharan, The Pennsylvania State University

Characterizing the Impacts of Material and Machine on Additively Manufactured Cooling Geometries

Abbigail Altland, The Pennsylvania State University

Development of the High-Pressure Ammonia System for Hydrogen-Ammonia Combustion Research

Tristan Shahin, Purdue University



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