Advance Program

American Society of Mechanical Engineers (ASME)

ASME
SETTING THE STANDARD

TURBO EXPO
Turbomachinery Technical Conference & Exposition

POWER & ENERGY
Conference & Exhibition

ICOPE
International Conference on Power Engineering

ASME
INTERNATIONAL GAS TURBINE INSTITUTE

CONFERENCE
JUNE 26–30, 2017

EXHIBITION
JUNE 27–29, 2017

Charlotte Convention Center, Charlotte, NC, USA

Turbocharge Your Time to Market

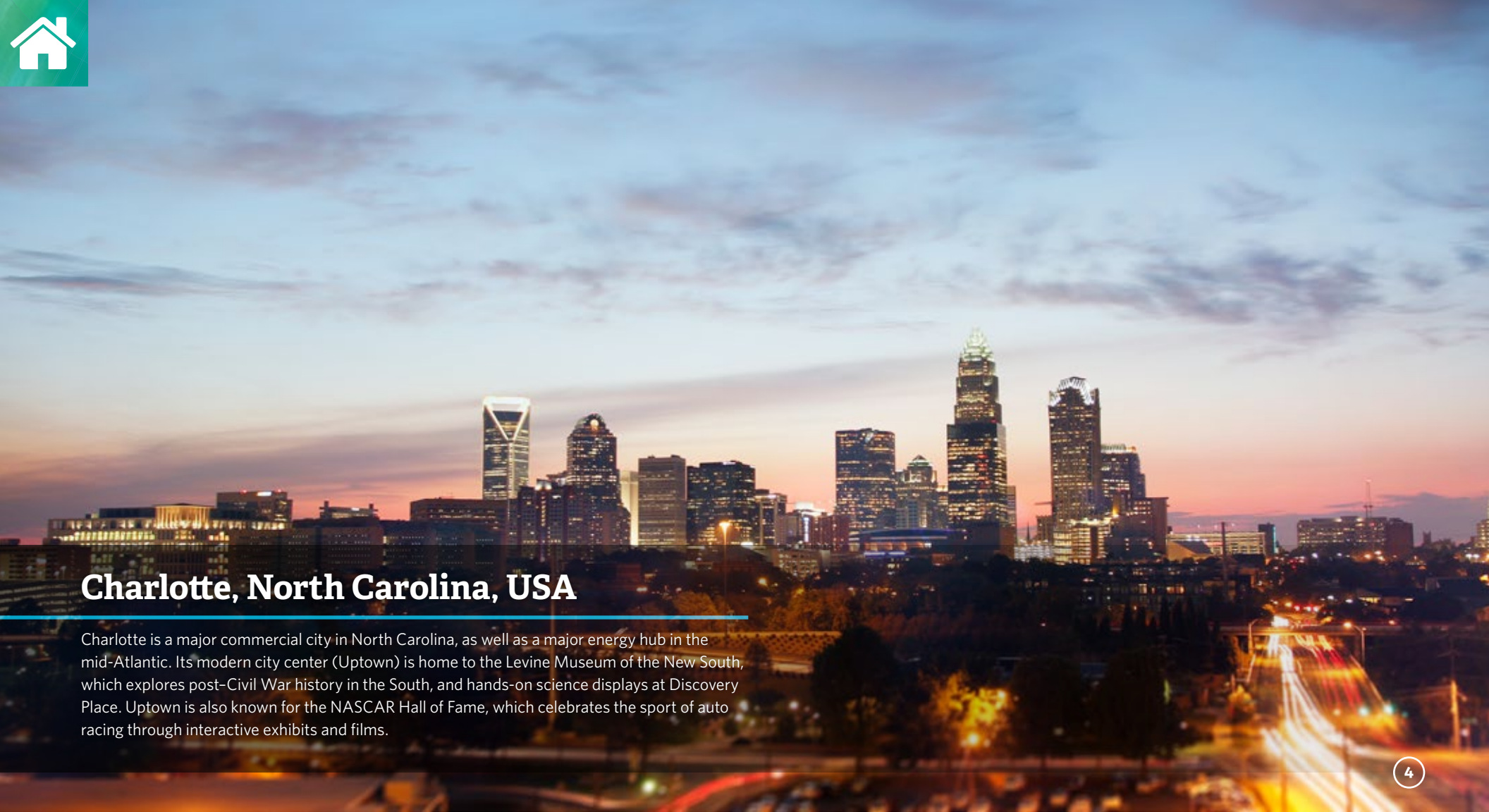
You've already solved your easy problems. Now, only the toughest challenges remain. But even the hardest problems can be solved using ANSYS engineering simulation.

ANSYS solutions help you design your turbo and power products with the highest levels of efficiency and durability, and the lowest emissions and noise, while reducing development time and costs. With ANSYS, you'll get your innovations to market faster than you ever thought possible.

Visit us at Booth #701

TABLE OF CONTENTS

Click any title to skip to desired page. Click the house on any page to come back to this page.



Charlotte, North Carolina, USA

Charlotte is a major commercial city in North Carolina, as well as a major energy hub in the mid-Atlantic. Its modern city center (Uptown) is home to the Levine Museum of the New South, which explores post–Civil War history in the South, and hands-on science displays at Discovery Place. Uptown is also known for the NASCAR Hall of Fame, which celebrates the sport of auto racing through interactive exhibits and films.

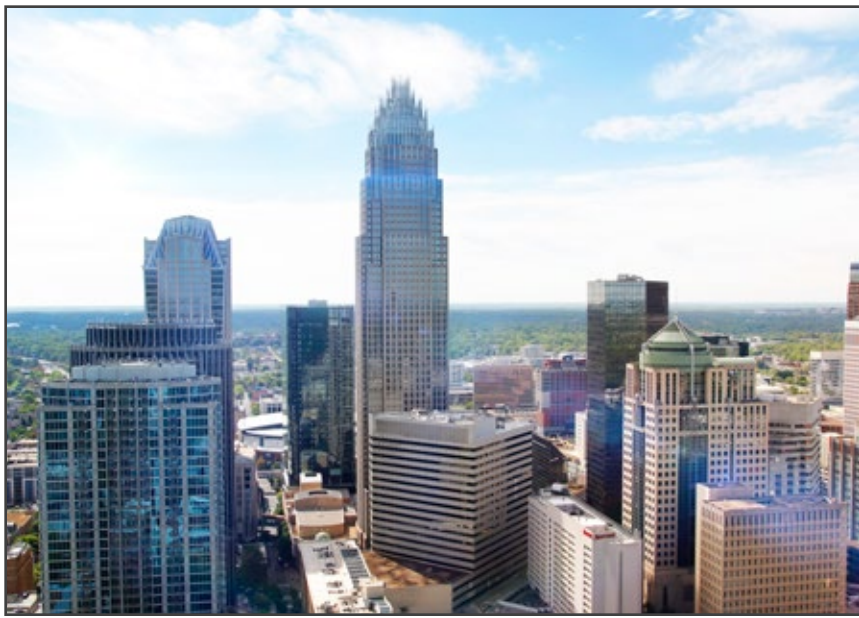
Charlotte

Charlotte is the largest city in the state and is the second largest in the southeastern United States. It is the third fastest growing major city in the United States. Residents of Charlotte are referred to as "Charlotteans". It is listed as a "gamma-plus" global city by the Globalization and World Cities Research Network.

Charlotte Douglas International Airport is a large international hub, and was ranked the 23rd busiest airport in the world by passenger traffic in 2013. Charlotte is home to the corporate headquarters of Bank of America and the east coast operations of Wells Fargo, which along with other financial institutions makes it the second largest banking center in the United States.

Nicknamed the Queen City, like its county a few years earlier, Charlotte was named in honor of Charlotte of Mecklenburg-Strelitz, who had become the Queen of Great Britain just seven years before the town's incorporation. A second nickname derives from the American Revolutionary War, when British commander General Cornwallis occupied the city but was driven out by hostile residents, prompting him to write that Charlotte was "a hornet's nest of rebellion", leading to the nickname The Hornet's Nest.

Charlotte has a humid subtropical climate. It is located several miles east of the Catawba River and southeast of Lake Norman, the largest man-made lake in North Carolina.



Things to Know

City Badge Program: As a conference attendee, you will receive restaurant coupons provided by the City that will participate in the City Badge program. You will either present a coupon or your badge to take advantage of the discounts. The information will be in your attendee bags at Registration.

Sales tax: Sales tax is charged to most purchases and is 7.25%.

Tipping: It is a common practice in the United States to tip 15% or greater of the total food bill to all table waiters (servers) and bartenders. You should tip luggage handlers as well, usually a $1.00 to $2.00 for their service/assistance. For taxi cab/Uber drivers it is customary to tip 10% of your total fare, at the very minimum $1.00 if fare is less than $10.00. Please note Uber tipping must be done in cash.

Charlotte Convention Center

The Charlotte Convention Center opened in 1995 and attracts more than half a million visitors each year. The CCC will be the home of the Power & Energy / Turbo Expo / ICOPE Conferences and Exhibition. Conveniently located at the Center are walk-up restaurants to take snacks/food with you, a souvenir shop, and a banking ATM. During the Show, we will have City staff available with maps to help guide you through the City. There are several convenient restaurants and hotels within walking distance of the Center.

NASCAR Hall Of Fame

The NASCAR Hall of Fame honors drivers who have shown exceptional skill at NASCAR driving, all-time great crew chiefs and owners, and other major contributors to competition within the sanctioning body. The Hall of Fame is conveniently connected to the Charlotte Convention Center and will be the location of the Welcome Reception on Monday evening. You do not want to miss the event!

Restaurants

Planning an evening dinner? Click below to see which restaurants are nearby the Convention Center.

Restaurant List

Getting Around

Click here for travel info

Click here for Charlotte maps

Click here for transportation info

Sprinter Bus
This hybrid-electric bus is an easy and affordable way to get from Charlotte Douglas International Airport to Center City, with stops in central locations. It runs every 20 minutes on weekdays and every 30 minutes on nights and weekends. $2.20 each way. **ridetransit.org**

LYNX Blue Line Light Rail
North Carolina's first rapid-rail system connects South Charlotte to Center City, running along 15 stations. On weekdays, the line is available every 10 minutes during rush hour and every 15 minutes during non-peak hours. Weekend service operates every 20 minutes during the day and every 30 minutes during late-night hours. $2.20 each way. **ridetransit.org**

Charlotte Area Transit System (CATS) Bus Service
With more than 70 routes across the city and county, CATS buses serve more than 25 million passengers each year. Most operate from 4:49 a.m. to 2 a.m. Monday through Saturday and 5:25 a.m. to 2 a.m. on Sundays. $2.20 each way; $3 each way for Express Routes; children under 5 ride free; seniors and youth 5-12 ride for $1. **ridetransit.org**

Crown Cab Company
Crown Cab Company operates a mobile app that allows users to book and track their rides on their phones. Its wheelchair accessible vehicles accommodate handicap users. Service is available 24 hours per day, seven days per week and 365 days per year. $2.50 drop charge (to enter a cab), plus $0.50 per 1/5 mile and $0.50 per minute of traffic wait time. 704.334.6666. **crowncabinc.com**

Yellow Cab of Charlotte
Yellow Cab of Charlotte offers handicap accessible vehicles. Its Taxi Magic mobile app allows users to book, track and pay for their rides on their phones. Service is available 24 hours per day, seven days per week and 365 days per year. $2.50 passenger pickup, plus $2.50 per additional mile and $0.50 per minute of traffic wait time. 704.444.4444. **yellowcabofcharlotte.net**

Uber
Uber uses your phone's GPS to detect your location and connects you with the nearest available driver. Get picked up anywhere, even if you don't know your location's exact address. Service is available 24 hours per day, seven days per week and 365 days per year. View the city's rates in the Uber app. *Bonus: New users can redeem their first ride (of up to $20) free. Visitget.uber.com/go/visitcltuber or download the Uber app, navigate to the Promotions tab and enter the promo code VISITCLTUBER. Enter your pick-up and drop-off locations to get a fare estimate for your trip. **uber.com**

R & R Pedicab Company
The pedal-powered pedestrian taxi service offers service to any location within the Interstate 277 loop, plus the South End area, spanning as far as East Boulevard and West Boulevard. $5 per person for first six blocks, then $1 per person for each additional block. 704.786.6549; **rrpedicabcompany.com**

Cruise Carts
The eco-friendly, ad-driven golf cart shuttle operates seven days a week from 11 a.m. to 3 a.m., offering drop-off and pickup services for locations including: Center City, Dilworth, Elizabeth, Myers Park, NoDa, Plaza Midwood and South End. Free. **cruisecarts.com**

www.rolls-royce.com/futuretechnology

We're working on technology today that will fly his kids around the world.

For 100 years we have inspired generations to take the best that exists and make it better.

Today, as the No.1 engine company for new widebody aircraft, our customers have come to expect the world-leading technology, performance and support that our global teams provide around the clock. But intelligent innovators never stand still - at the forefront of the aerospace industry, we have a responsibility to anticipate the solutions that our customers will need many decades from now.

In just a few years, he will see that this future started life long before he did with our Advance and UltraFan™ engine families - demonstrating our long-term commitment to keep our customers at the top of their game and to continue inspiring for many generations to come.

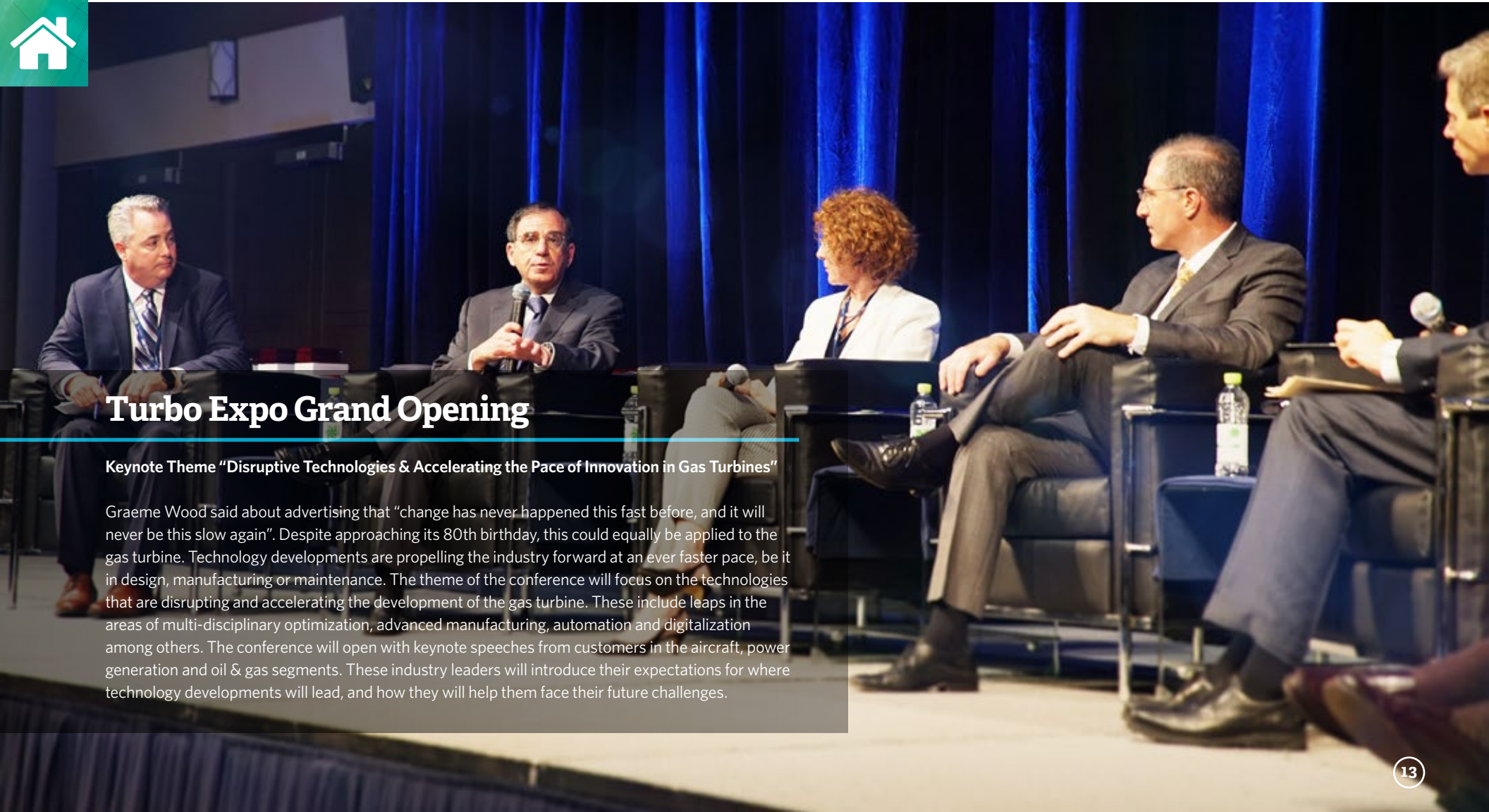
We deliver the best jet engines in the world

The story continues...

Rolls-Royce

ASME Turbo Expo Grand Opening:

Keynote and Awards Program



Turbo Expo Grand Opening

Keynote Theme "Disruptive Technologies & Accelerating the Pace of Innovation in Gas Turbines"

Graeme Wood said about advertising that "change has never happened this fast before, and it will never be this slow again". Despite approaching its 80th birthday, this could equally be applied to the gas turbine. Technology developments are propelling the industry forward at an ever faster pace, be it in design, manufacturing or maintenance. The theme of the conference will focus on the technologies that are disrupting and accelerating the development of the gas turbine. These include leaps in the areas of multi-disciplinary optimization, advanced manufacturing, automation and digitalization among others. The conference will open with keynote speeches from customers in the aircraft, power generation and oil & gas segments. These industry leaders will introduce their expectations for where technology developments will lead, and how they will help them face their future challenges.

Turbo Expo Keynote

Keynote Panel: Disruptive Technologies & Accelerating the Pace of Innovation in Gas Turbines

Following the Keynote address, we will recognize the ASME IGTI award winners. Be sure to join us in celebrating their successes.

Monday, June 26 Crown Ballroom, Charlotte Convention Center - 10:15 a.m. – 12:15 p.m.

Panelists

Dag Calafell
Upstream Machinery Chief, Exxon Mobil

Jean-Paul Ebanga
President & CEO, CFM International

Kevin Murray
PMC Engineering & Construction, Duke Energy

Karen Florschuetz
Vice President and GM, Operations Americas

Moderators

Mark Turner
Professor, University of Cincinnati

Paul Garbett
Head of Large Gas Turbine Engineering, Siemens

ASME Power & Energy Keynote

Tuesday, June 27 | 9:00 – 10:30 a.m.

Power & Energy Keynote Session

Tuesday, June 27 | 9:00 – 10:30 a.m.

ASME Power & Energy focuses on power generation and energy sustainability and showcases industry best practices, technical advances, development trends, research, and business strategies, presented by a broad range of qualified professionals.

Power & Energy Keynote Session

Tuesday, June 27 Richardson Ballroom, Charlotte Convention Center—9:00 - 10:30 a.m.

Michael Bryson
Vice President – Operations, PJM

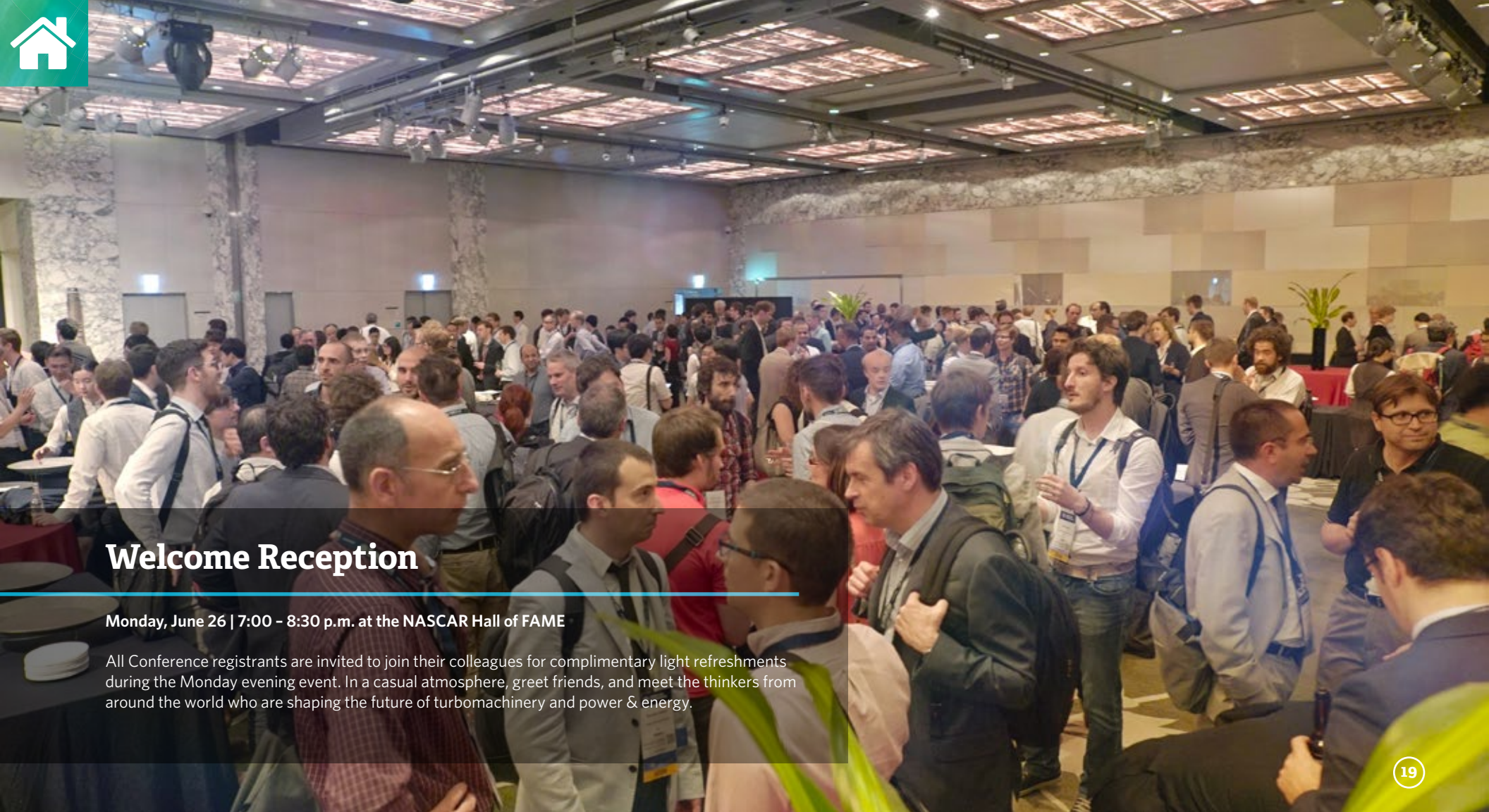
Mr. Bryson is responsible for PJM's Operations Division, including 24x7 transmission operations for real time systems to include scheduling, transmission dispatch and generation dispatch, reliability coordination, and training as well as the engineering analysis required to run the system and support the critical energy management systems. Mr. Bryson had nearly ten years of military experience as a pilot. His responsibilities in the United States Army included operations planning and support, supervision and training of pilots and mechanics, and training and maintenance of tactical computer systems. He was awarded the Bronze Star for Combat Service in Desert Storm.

Governor Bill Ritter Jr.

Governor Bill Ritter was elected Colorado's 41st governor in 2006. During his four-year term, Ritter established Colorado as a national and international leader in clean energy by building a New Energy Economy. After leaving the Governor's Office, Ritter founded the Center for the New Energy Economy at Colorado State University, which works with state and federal policy makers to create clean energy policy throughout the country. Governor Ritter has authored a book that was recently published entitled, Powering Forward – What Everyone Should Know about America's Energy Revolution.

ASME Turbo Expo and Power & Energy Networking Events

Networking during the conference is an effective method of marketing that is used to build new business contacts through connecting with other like-minded individuals. Make sure you attend all of the networking opportunities during the event. Bring your business cards!



Welcome Reception

Monday, June 26 | 7:00 – 8:30 p.m. at the NASCAR Hall of FAME

All Conference registrants are invited to join their colleagues for complimentary light refreshments during the Monday evening event. In a casual atmosphere, greet friends, and meet the thinkers from around the world who are shaping the future of turbomachinery and power & energy.

Daily Lunches

All Technical Conference delegate badges as well as exhibit booth staff badges include a daily lunch. Additional lunches for guests can be purchased onsite during registration. Take the time during lunch to walk the exhibit floor and visit the many exhibitors from around the world showcasing their products and services.

Expo Hall Receptions

Tuesday & Wednesday, June 27 & 28 | 5:00-6:30 p.m.

All registered delegates are invited to the Expo Hall for complimentary drinks and networking with industry colleagues, while viewing the exhibits of the industry's leading companies.

Student/Early Career Mixer

Wednesday, 6:45 – 8:00 p.m.

Unwind after a full day of technical sessions and exhibits with fellow engineering students and early career engineers. This popular event allows students to make new friends and build their professional network in a casual evening atmosphere. Complimentary refreshments will be provided.

Sponsored by Dresser Rand

DRESSER-RAND®
A Siemens Business

Women in Engineering Networking Event

Female registrants are invited to join their colleagues for a networking event that will feature a motivating talk by Diane Beagle, GE Power. Attendees will have the opportunity to network with women in the industry and learn about the career paths of some successful women in the industry. Dinner will follow the talks and is included with your registration.

Tuesday, June 27
7:45 p.m. – 9:00 p.m.
Sponsored by GE

ASME Turbo Expo Technical Conference & Workshops

The Technical Conference has a well-earned reputation as the premier forum on all aspects of gas turbine and related turbine technology. The 2017 program features technical sessions, panel discussion, tutorials, user-focused sessions and more.

NEW at Turbo Expo:

AM3D Day presented by ASME Gas Turbine Segment

Wednesday, June 28, 2017

Learn how additive manufacturing (AM) is impacting the development of gas turbines, its effect on both the development and production of turbine components, and the opportunities for this technology in the gas turbine application. A relatively new technology to the gas turbine industry, AM is having important impacts on the development of gas turbine components and potential impacts on gas turbine repair.

AM is already revolutionizing the gas turbine industry by:

- Enabling new design and material freedoms
- Shortening the development cycle of gas turbines
- Reducing prototype and testing costs and producing parts more easily
- Increasing speed-to-market
- Enabling increased performance through novel design

The day will consist of a plenary session from industry leaders, disciplinary panel sessions, specialized exhibits and a student competition.

Additive Manufacturing Plenary Panel Session:
"Disruptive Technologies and Accelerating Innovation in Gas Turbines – The Role of Additive Manufacturing"

Panelists:
Thomas W. Prete, *Vice President, Engineering, Pratt & Whitney*
Markus Seibold, *Power & Gas Business Lead for Additive Manufacturing, Siemens*
Mike Aller, *The Consortium for Advanced Production & Engineering of Gas Turbines*
Rob Gorham, *Director of Operations, National Center for Defense Manufacturing and Machining, America Makes*

Moderated by:
Rich Dennis, *U.S. Department of Energy National Technology Laboratory;*
Karen A. Thole, *Pennsylvania State University*

Other disciplinary panel will focus on:

- Processes & Materials for Additive Manufacturing
- Design & Performance for Additive Manufacturing
- Challenges and Opportunities in Using AM for Turbine Cooling
- Combustor/Fuel Injector applications for AM

Exhibits
Companies who wish to showcase their additive manufacturing technologies should join the exhibit. Along with being highlighted in the final program with your logo on the AM3D page, exhibitors are encouraged to participate in a poster opportunity to highlight your technologies. Contact ASME IGTI for more information today: **igtiexpo@asme.org.**

Student Engagement
A student competition will be held during Turbo Expo.

For more information visit
https://www.asme.org/events/turbo-expo/program/additive-manufacturing-day

User Sessions & Basics Tutorials

User Sessions

User sessions highlighted throughout the technical conference offer a fantastic opportunity to learn about the industry's most up-to-date best practices. This user-focused material spans a series of tutorials, panel discussions, and technical sessions, offering an ideal setting for industry practitioners to network and exchange the latest technological developments.

Manufacturing Materials & Metallurgy

- Gas Turbine Component Degradation and Life Prediction
- Advanced Repair Technologies

Oil & Gas

- Compressor Surge
- Gas Turbine Monitoring and Life Extension
- Wet Gas Compression
- Gas Turbine and Compressor Fouling
- New Applications
- Performance and Design
- Thermal and Hot Condition Applications
- Commissioning and Operation
- Special Applications

Steam Turbines

- Steam HP/IP turbines
- Steam Turbine LSB Aerodynamic and Vibrational Aspects
- Steam Turbine Exhausts
- Steam Turbine Valves
- Steam Turbine Heat Transfer and Mechanical Aspects

Supercritical CO_2 Power Cycles

- Supercritical CO_2 Power Cycle Path Forward

Tutorials of Basics

This year, industry experts from several committees will present basics tutorials for their respective disciplines in a way that promises to engage and interest engineers from other fields. These tutorials are ideal for learning the fundamentals and key components of specific disciplines within the field of turbomachinery.

Ceramics

- Ceramics Matrix Composites (CMC)

Combustion Fuels & Emissions

- Combustion Fundamentals
- Combustion Dynamics
- Alternative Fuels joint with Coal, Biomass and Alternative Fuels

Coal, Biomass and Alternative Fuels

- Alternative Fuels joint with Combustion Fuels & Emissions

Cycle Innovations

- Introduction to Dynamic Analysis and Modelling of Plant Systems
- Introduction to Thermodynamics for Gas Turbine Cycles and Cycle Simulation

Electric Power

- Combined Cycle Gas Turbine Operational Risk Management: A Utility Industry Perspective

Heat Transfer

- Heat Transfer Overview I & II
- Introduction to Cooling Design and Heat Transfer Technologies for Gas Turbine Vanes and Blades
- Physics-Based Introduction to Vortex, Windage, Rothalpy, Mach Number, Choking, and Misuse of the Bernoulli Equation

Manufacturing Materials & Metallurgy

- Metallurgy for Non-Metallurgists

Steam Turbines

- Steam Turbine Sealing and Leakage Flows

Structures & Dynamics

- Structural Mechanics, Vibration & Damping: Introduction to wavelet transform and applications to vibration data processing
- Probabilistic: Concepts of Model Verification, Validation and Uncertainty Quantification

Supercritical CO_2 Power Cycles

- Supercritical CO_2 Power Cycle Fundamentals
- Supercritical CO_2 Power Cycle Turbomachinery

Wind Energy

- Introduction to Wind Energy

Technical Sessions

Aircraft Engine

Sessions within this track address issues of interest across a broad spectrum of aircraft engine technology subjects. Presenters will cover a range of topics including:

- Conceptual Design and Optimization
- Modeling, Simulation and Validation
- Whole Engine Performance and Novel Concepts
- Operability (inlet distortion, fan-inlet interaction)
- Environmental Effects (ice, rain, sand, and volcanic ash)
- Thermal Management Systems
- Inlets, Nozzles, Mixers and Nacelles
- Propellers and Open Rotors

Additionally, tutorial sessions and panel sessions covering a variety of interesting aircraft gas turbine engine applications are being planned.

Ceramics

Ceramics are important materials for consideration in the extreme environments found in the gas turbine engine hot sections due to their high temperature mechanical and physical properties as well as lower density than metals. The advantages of utilizing ceramic hot section components include weight reduction, improved efficiency as well as enhanced power output and lower emissions. In order to realize the potential of rotating and static ceramic components, some unique technical challenges are being overcome by the engineering community. Specific areas of research and development include:

I. Design, development and processing of monolithic ceramic and ceramic matrix composite (CMC) materials;
II. Development, processing and characterization of Thermal and Environmental Barrier Coatings (TBCs/EBCs);
III. Modeling and validation of material performance;
IV. Life Prediction;
V. NDE;
VI. Test methods and standards;
VII. Design and fabrication of components;
VIII. Engine & laboratory testing of components.

The technical and panel sessions sponsored by the ceramics committee cover breakthrough developments and demonstrations critical for the incorporation of ceramic hot section components for gas turbine engines.

- Ceramic Matrix Composites: Properties and Performance
- Ceramic Matrix Composites: Modeling and Life Prediction

Technical Sessions

Coal, Biomass & Alternative Fuels

Sessions focus on high-interest topics in the area of alternative fuel systems for gas turbines, including steam turbine and other turbomachinery technologies (e.g. Organic Rankine, Kalina etc.). Topics on current experiences and future outlook in planning, operation, problems and solutions for Integrated Gasification Combined Cycle (IGCC) and Coal/Biomass based Polygeneration Gasification plants will be covered. Another topic is Renewable fuels including, Biofuels, heavy liquid fuels, and biomass, which can reduce CO_2 emissions when co-used with fossil fuels. This year a specific session will be dedicated to alternative fuels for jet engines. Sessions will be of interest to researchers/technologists involved in the generation and utilization of non-conventional fuels in gas turbine-based energy systems and for those wishing to start a new activity in this field. Papers are presented by academic, industrial and governmental companies/institutions from all over the world, demonstrating a significant interest not limited by geographic constraints.

- Combustion of Coal, Biomass, and Byproducts
- Technologies and Facilities for Better Usage of Low-Grade Fuels
- Alternative Gaseous Fuels
- Alternative Liquid Fuels I
- Alternative Liquid Fuels II

Combustion, Fuels & Emissions

Aero and Industrial Gas Turbines with low specific fuel consumption and reduced CO_2 emissions require high combustor outlet temperatures with a continued emphasis on reducing emissions, without sacrificing operability or durability. In addition, Combustion systems are increasingly expected to operate with synthetic gaseous fuels or alternative liquid fuels. The Combustion, Fuels & Emissions sessions will highlight new technology and design approaches, using both experimental and computational techniques, employed to achieve improved combustor performance including ultra-low pollutant emissions and enhanced operability such as turndown and transient response. Broad trends for the 2017 conference include a continued focus on combustion dynamics for lean-staged combustion systems, significant innovation in the development of combustion system such Dry Low NOx or novel rotary detonation, maturation of large eddy simulation analyses, as well as continued research of fundamental and applied topics in atomization, mixing, ignition, autoignition, blowout and chemical kinetics. Technical sessions include:

- Ignition & Auto ignition
- Atomization & Sprays
- Fundamental Combustion
- Novel Combustion Concepts
- Flashback & Blowout
- Pollutant Emissions Formation & Control: Combustor Performance
- Combustor Design & Development
- Chemical Kinetics
- Combustion Noise
- Pollutant Emissions: Modeling, Soot and Particulates
- Combustion Dynamics: Basic Mechanisms, Flame Response to Perturbations, Instability, Analysis, Model Development and Damping & Control
- Combustion Modeling: Combustor Simulations and Large Eddy Simulations
- High Hydrogen Combustion
- Dry Low-NOx Combustor Development
- Micro Devices
- Jet-in-crossflow & Swirling Flows
- Combustor Diagnostics

Technical Sessions

Controls, Diagnostics & Instrumentation

The Controls, Diagnostics & Instrumentation Committee will host technical, panel and tutorial sessions that will closely examine the global challenges associated with Gas Turbine Engine Technology. These will include the latest developments in gas turbine engine control, prognostics, diagnostics and health management, artificial intelligence, and instrumentation technology, and the impact these technologies have in enabling more efficient and reliable engines, lowering engine emissions, and reducing engine operating costs. More precisely, the exchange of information between experts from Government, Academia and Industry is promoted on the following topics:

- Control System Technology
- Optimal and Intelligent Controls
- Active Component Control
- Distributed Engine Control
- Engine Health Management
- Gas Path Performance Diagnostics
- Structural and Mechanical Component Health Management
- On-Board Engine Monitoring and Diagnostics
- Prognostics for Gas Turbine Engines
- Novel Sensors and Sensor Technologies
- Development of Standard and High Temperature Test Rigs and Probes
- Optical and Non-intrusive Measurement Techniques
- Flow, Temperature, Pressure and Acoustic Instrumentation
- Advanced Data Reduction Methods
- Integrated Controls and Diagnostics
- Modeling for Controls and Diagnostic Applications
- Life Usage Monitoring and Life Extending Control Algorithms and Sensors

Cycle Innovations

The Cycle Innovations Committee is dedicated to the advancement of technology and innovation, with a particular focus on the thermodynamic cycle of gas turbine–based plants for power generation and propulsion. The Committee traditionally attracts paper submissions from a wide range of disciplines and scientific areas. Some of the thematic areas the Committee currently encompasses are listed below:

- Low or No Emissions Thermal Cycles and Advanced Co_2 Handling
- Supercritical Co_2 Cycles
- H2 Production and Utilization
- Polygeneration Cycles and Process Integration (Power, Heat, Cooling, Fuels, Chemicals)
- Advanced Steam and Humid Air Cycles
- Steam and Water Injection Gas Turbine Cycles
- Closed Cycle Gas Turbine Technology
- Novel Aero Propulsion Systems for Aircraft and Rotorcraft
- Novel Marine Propulsion Systems
- Innovative Heat Recovery Steam Generators & Once Through Steam Generators
- Renewable and Bio-Energy Concepts and Innovative Cycles
- Concentrated Solar Power Systems Incorporating Gas Turbine Technology
- Fuel Cell Driven Cycles and Hybrid Systems
- Externally Fired Gas Turbines and High Temperature Heat Exchangers
- New Cycles for Distributed Power Generation
- Thermo-Economic and Environmental Impact Analysis
- Cycle Simulation and Analysis for Performance and Health Assessment
- Low Temperature Heat Recovery Cycles
- Geothermal Cycles
- Compressed Air Energy Storage
- Innovative Control Systems For Power Plants
- Optimization of Traditional and Innovative Energy and Propulsion Systems

Technical Sessions

Education

Sessions encompass gas turbine/turbomachinery education both in the university and in the industry. Specific teaching tools and techniques will be discussed, including for web based and large scale remote education, along with industry opportunities for gas turbine engineers.

Anyone interested in gas turbine/turbomachinery engineering education is welcome, from students to PhDs. Academics will be exposed to ideas and best practices being used at other institutions as well as innovative approaches for gas turbine/turbomachinery education. Industry will have an opportunity to interact with educators to discuss relevant topic areas and to express the expectations with regard to changing needs. Discussions here have the potential to influence engineering education for a positive impact on future engineers. The sessions provide an active and constructive dialogue about gas turbine/turbomachinery education among practitioners from the industry, students, educators and researchers.

Electric Power

The Electric Power Committee promotes the exchange of significant technical information about the application and operation of gas turbine power plant systems. This committee organizes panels and technical sessions that deal with the gas turbine as a major component of a power plant, its integration into the power plant and optimization of power plant components, as well as optimization of the overall plant. Paper sessions on these topics will be complemented by panel sessions to address current topics of the gas turbine industry. Presenters will include owner/operators, original equipment manufacturers and industry service providers.

The EPC sessions at Turbo Expo 2017 will include the following:

- The Pathway Forward: Future Gas Turbine Products & Technologies – OEM Perspective
- Voice of the Customer: User Experience with Gas Turbine Technology
- Gas Turbine Developments
- Combined Cycle Power Plants
- Enabling Technologies
- Gas Turbine Industry Updates
- Tutorial: Managing Operational Risks

Fans & Blowers

Improvements in fans and blowers are means to address the global energy challenge, with manufacturers increasingly focusing on improvement in fan efficiency under legislative pressure and as a part of their response to global climate change.

The academia-industry collaboration and the up-front use of Computational Fluid Dynamics (CFD) and Experimental Fluid Dynamics (EFD) are the key ingredients to facilitate the advancement from traditional empirical design methodologies. In response to these challenges, the ASME-IGTI Fans and Blowers Technical Committee consider all technical aspects associated with fans and blowers, with a special emphasis on:

- Design and Optimization
- Cfd Methods for Unsteady Aerodynamics
- Noise Generation, Prediction, Innovative Noise Reduction Design

Technical Sessions

- Psycho-Acoustic and Noise Perception in Installations
- Structural Mechanical Aspects (Vibration, Fatigue and Flutter)
- Emerging Technologies in Flow and Noise Control
- Operations and System Effects and Interactions
- Maintenance, Repair & Life Time Management
- Standards, Compliance With Legislation & Regulations
- Evaluation of Education Curricula for Fan Technology and Systems

Heat Transfer

Heat transfer is a pacing technology in the development of advanced high-performance gas turbines for aircraft propulsion and power generation in both simple and combined cycle operations. The heat transfer sessions offered at Turbo Expo 2017 relate to every aspect of the state-of-the-art heat transfer design of turbomachinery, and will include well over 225 technical papers and presentations in 50 sessions.

Heat transfer topics are subdivided into ten tracks, two of which are sponsored jointly with other committees. The Conjugate Heat Transfer track with 2 sessions presents the latest methodology of performing conjugate heat transfer computations for the design of several critical gas turbine components and validation with measurements. While the Numerical Internal Cooling track with 5 sessions primarily focuses on both CFD- and non-CFD-based computations, the Experimental Internal Cooling track with 5 sessions focuses on the advanced experimental methods and benchmark-quality measurements and empirical correlations. Both these tracks present all aspects of internal cooling technology for the design of turbine blades and vanes and adjacent hot sections. Similarly, the Numerical Film Cooling (6 sessions) and Experimental Film Cooling (6 sessions) tracks offer a wide range of information related to the development and recent research activities on film cooling that contribute significantly to heat transfer advancement in cooled turbomachinery components. Both these tracks include sessions detailing novel film cooling holes geometries, film cooling optimization, and recent advances in numerical and computational methods suitable for advanced film cooling design and performance. General Computation Heat Transfer (3 sessions) and General Experimental Heat (4 sessions) cover a broad range of topics from fundamental heat transfer research to the development of advanced CFD/heat transfer methods and tools. Internal Air Systems & Seals track with 9 sessions, offered jointly with the Turbomachinery Committee, represents a key area of gas turbine cooling and sealing technology. Sessions in this track include papers on hot mainstream gas ingestion, pressure loss, free and forced convection heat transfer on rotating surfaces and in closed cavities, including innovative sealing systems and cooling air delivery concepts. The Combustors track is held jointly with the Combustion, Fuels and Emissions Committee. This track with 3 sessions presents numerical and experimental studies on optimal cooling of combustor liners and all aspects of combustor heat transfer. In Turbo Expo 2017, Heat Transfer Committee offers three new tracks, each with one session. These new tracks are Additive Manufacturing, Multiphysics Modeling & Optimization, and Special Sessions, which features the Fred Soechting Memorial Session. The Tutorials track consists of four sessions with multiple tutorial presentations. For all interested conference attendees, this track provides a quick topical introduction to various tracks of Heat Transfer Committee and the basic understanding of key thermofluids concepts used in turbomachinery design.

Technical Sessions

Conjugate Heat Transfer
- Conjugate Heat Transfer with Film Cooling
- Conjugate Heat Transfer with Internal Cooling

Numerical Internal Cooling
- Impingement Cooling
- Ribbed Ducts
- Pin Fins
- Channels, Ducts, and U-Bends
- New Concepts

Experimental Internal Cooling
- Impingement Cooling I
- Impingement Cooling II
- Rotating Rigs
- Ribbed Channels
- Special Topics

Numerical Film Cooling
- LES/DNS Simulation of Film Cooling Designs
- Numerical Simulation of Vanes & Blades Film Cooling Design
- Numerical Simulation of Vane Endwall & Blade Tip Film Cooling
- Numerical Simulation of Effusion and Slot Film Cooling
- Numerical Simulation Modelling Techniques for Film Cooling
- Simulation of Novel Film Cooling and Film Cooling Hole Shape Optimization

Experimental Film Cooling
- Endwall Film Cooling I
- Endwall Film Cooling II
- Experimental Methods & Evaluation
- Hole Geometry Effects
- General Film Cooling
- Shaped holes - External Effects
- Shaped holes - Hole Geometry Effects

General Computational Heat Transfer
- Computational Heat Transfer I
- Computational Heat Transfer II
- Computational Heat Transfer III

General Experimental Heat Transfer
- Thermal Systems Design and Research
- Blade Tip and Shroud Heat Transfer
- Vane Endwall Heat Transfer
- Internal Heat Transfer & Experimental Methods

Internal Air Systems & Seals (with Turbomachinery)
- Air System Analysis
- Air System Components
- Brush Seals
- Oil Systems
- Rotating Cavities
- Rim Seals 1
- Rim Seals 2
- Rim Seals 3
- Shaft and Strip Seals

Combustors (with Combustion, Fuels & Emissions Committee)
- Effusion Cooling
- Combustor Heat Transfer
- Combustor Turbine Interactions

Additive Manufacturing
- Heat Transfer: Additive Manufacturing

Multiphysics Modeling & Optimization
- Multiphysics Modeling & Optimization

Special Sessions
- Fred Soechting Memorial Session

Tutorials
- Heat Transfer Track Overview I
- Heat Transfer Track Overview II
- Introduction to Cooling Design and Heat Transfer Technologies for Gas Turbine Vanes and Blades
- Physics-Based Introduction to Vortex, Windage, Rothalpy, Mach Number, Choking, and Misuse of the Bernoulli Equation

Technical Sessions

Industrial & Cogeneration

Representing gas turbine applications within the cogeneration and process industries, technical sessions in this track cover a wide range of topics on cogeneration/CHP (Combined Heat & power) systems, including but not limited to the following: thermoeconomic analysis, optimization and simulation methods, design, operation & maintenance aspects of Heat Recovery Steam Generators, operation & maintenance issues of cogeneration plants, gas turbine power augmentation technologies (inlet chilling, high pressure fogging, and wet compression or overspray, dry/humid air inject, steam injection, etc.), compressor fouling, inlet air filtration systems, compressor washing, gas turbine upgrades and modifications, environmental and regulatory issues, and lessons learned from field experiences.

Other applications such as non-gas turbine based cogeneration/CHP systems (steam turbine and reciprocating engine based systems, solar energy based systems, etc.), cogeneration and cold energy recovery in LNG plants, hybrid cogeneration systems (combined with fuel cells), and organic Rankine cycle based systems are also included.

Panel/Tutorial sessions cover topics on cogeneration technologies, compressor washing technologies, inlet air filtration systems, gas turbine power augmentation technologies, dynamic modeling of cogeneration/CHP systems, gas turbine combustion processes and emissions issues, fuel related issues, and Impact of Shale energy market.

- Design and Evaluation Considerations of Waste Heat Recovery Technologies
- Techno-Economic Analysis of CHP Systems
- Operational & Maintenance Aspects
- Gas Turbine Power Augmentation Technologies
- HRSG's Design & Operational Issues
- Inlet Air Filtration for Gas Turbines
- Combustion & Emissions
- Gas Turbine Applications Involving Heavy Fuel Oils and Crude Oils
- Dynamic Modeling of CHP Systems
- Condition monitoring and diagnostics for CHP systems

Manufacturing Materials & Metallurgy

The field of materials and metallurgy associated with gas turbine manufacturing has traditionally been the source of numerous disruptive technologies such as the development of superalloys, precision single-crystal investment casting and ceramic coatings. These in turn have allowed an incredibly accelerated pace of innovation. Next generation materials and processes will allow even higher efficiency and reliability as well as greater flexibility operational mode. A major goal is to balance these with lower emissions and lower life-cycle cost of turbomachinery.

Materials with higher strength, lighter weight and improved durability are required for these applications. The continuing development in metallurgy and materials science

Technical Sessions

has resulted in newer materials, better surface protecting methods, and more reliable component life. Development in manufacturing technologies, including better process planning/optimization, advance machining operations, additive manufacturing, newer coating and repair methods, helps to reduce the manufacturing cost and decrease overall operating cost of gas turbines. Condition assessment of parts after service and advanced repairs are required to further reduce life cycle cost and impact to the environment. The MMM committee is organized to disseminate the latest developments and research results in the areas of manufacturing, materials and metallurgy to gas and steam turbine designers, manufacturers, users, repair and service vendors, researchers and consultants. In addition to technical paper sessions, panel sessions are planned where highly experienced panel members will discuss their latest experiences and knowledge in manufacturing methods, repair/coating processes and component inspections. Tutorials and lectures will be given on gas turbine materials.

- Additive Manufacturing
- Advanced Manufacturing Technologies
- Thermal Barrier Coatings
- Gas Turbine Component Degradation and Life Prediction
- Advances In Gas Turbine Materials
- Advanced Repair Technologies
- Metallurgy for Non-Metallurgists
- Advanced Turbomachinery Manufacturing

Marine

Gas turbines are increasingly being used in both naval and commercial marine applications. Marine sessions showcase the latest developments and best practices for gas turbines in marine electrical power and propulsion systems. Paper subjects cover a variety of gas turbine related topics ranging among hot corrosion of advanced material, design of reversing turbine, inlet filtration, electric start systems and control systems. In addition, there will be a tutorial session Holistic Gas Turbine Design.

Technical Paper Session Topics include:

- Design & Development
- Applications
- Auxiliaries and Support systems
- Controls

Tutorial Session Topic includes:

- Holistic Gas Turbine Design

Technical Sessions

Microturbines, Turbochargers & Small Turbomachines

- Alternate/Opportunity Fuels: Technical issues and economic viability (bio-fuels, landfill gas, etc.)
- Auxiliary systems (such as generators, power electronics and high speed alternators)
- Energy markets and the competitiveness of microturbines vs. recips in DG applications
- Heat exchangers (recuperators, regenerators, CHP) design and optimization (CFD, heat transfer, stress analysis) and associated materials and materials degradation Intelligent control/engine health monitoring/life evaluation
- Microturbine technologies for long life, fuel efficiency, high power density, wide operability and robust design
- Microturbines systems and concepts for Distributed Power
- Materials for microturbines and small turbomachines: materials
- Issues including durability and high temperature capability (creep, oxidation, fatigue, etc.), and raw material cost (i.e., the need for lower cost materials)
- Microturbine and small turbomachines component design & optimization (compressors, turbines, rotordynamics, bearings, etc.)

Turbochargers and Superchargers

- Aero, aerothermal, and aeroacoustical analysis of radial, axial, and mixed-flow compressors and turbines (e.g. effects of downscaling, heat transfer, map enhancement, surge, choke, etc.)
- Novel charging solutions for downsized and low-emission engines (e.g. regulated multi stage charging, turbo compound, electrically assisted charging, variable compressor and turbine geometries, exhaust gas recirculation, etc.)
- Interaction between turbocharger and SI / CI engines (Transient performance, e.g. ball / air / magnetic bearings, TiAl / ceramic turbine wheel, charging concepts, etc.)
- Optimization techniques for multidisciplinary design challenges (e.g. boost pressure vs. efficiency vs. map width vs. transience vs. mechanical constraints vs. packaging vs. etc.)
- Microturbines: Design and Testing of Microturbines
- Microturbines: Innovative Microturbine Design and Uses
- Microturbines: Innovative fuels and uses in microturbines. Recuperator materials
- Turbochargers: Heat transfer & Systems
- Turbochargers: Concepts & Performance
- Turbochargers: Turbines
- Turbochargers: Compressors
- Turbochargers & Small Turbomachinery: Bearing systems & NVH

Oil & Gas Applications

The Oil & Gas industry is a large user of turbomachinery. The demand for oil and gas is consistently growing, and changing market conditions require innovative solutions. Operation and optimization of turbomachinery in a variety of Oil & Gas applications is therefore of great interest. Moreover, potentially extreme operation environments require the consideration of innovative design and operational attributes. Sessions in the Oil &

Technical Sessions

Gas Applications Committee address both theoretical and practical Oil & Gas industry perspectives. The technical sessions provide the latest information on gas turbines and compressors in pipeline and compression stations. Particular emphasis is given to design, operation and maintenance, management, dynamic behavior, diagnostics and vibration and noise, as well as to all engineering issues in Oil & Gas applications.

Wet gas compression and multi-phase pumping are also addressed, due to the increasing interest in many installations. The Oil & Gas Applications Committee brings industry experts together in panel and tutorial sessions jointly held by both academic educators and industry professionals. Both basics of Oil & Gas installations and off-design operation issues will be covered, aimed to ensure improved efficiency and safe and reliable operation. The latest information about environmental impact, product upgrade, risk assessment, standards and legislation of gas turbines and compressors in Oil & Gas applications is also provided.

- LNG Liquefaction Plants
- Wet Gas and Multiphase Compression
- Gas Turbine Degradation and Water Washing
- Particle Behavior and Degradation
- Turbomachinery Performance Testing
- Design Details
- Compressor Stations
- Machinery Issues
- Oil and Gas Applications
- Surge Control and System Dynamics
- Hydrodynamic Torque Converters for Oil & Gas Compression and Pumping Applications: Basic Principles, Performance Characteristics and Applications
- Natural Gas Pipelines: Equipment Technology
- Wet Gas Compression
- Compact Compression
- Subsea Compression
- Gas Turbine Upgrades and Uprates
- Turbomachinery Instrumentation Components, Practices, and Uncertainty

Organic Rankine Cycle Power Systems

The use of an organic fluid in place of water (steam) in Rankine cycles is in general advantageous if the thermal energy source is at low/medium temperature, and/or the power capacity is small (few kW to few MW). In these cases the proper selection of the fluid allows to obtain comparatively higher efficiency and solves several technological problems such as, e.g., the design (related to the design) of the expander. In the rather new framework of decentralized conversion of low temperature heat into electricity, the Organic Rankine Cycle (ORC) technology offers an interesting alternative, which is partly explained by its modular feature: a similar ORC system can be used, with little modifications, in conjunction with various heat sources such as waste heat, geothermal, biomass combustion or solar power. The technical sessions cover the latest research and operational experience in this field, with a special focus on working fluid, expansion machines, modeling and optimization issues.

Steam Turbines

ASME Turbo Expo 2017 includes a track dedicated to Steam Turbines. While many of the analyses, computational methods, and experimental techniques are common for steam turbines and gas turbines, there are some unique features on steam turbines that warrant special consideration. Separate, co-located, steam turbine sessions at Turbo Expo provide a natural way of sharing many of the cutting edge technologies while giving the steam turbine community a dedicated forum for unique technical challenges associated with wet steam, long last stage blades, industrial and cogeneration steam turbines, erosion, stresscorrosion-cracking (SCC) and more.

Technical Sessions

- Steam Turbine Panel I
- Steam Turbine Panel II
- Steam Turbine Tutorial
- Steam Turbine Discussion
- HP/IP Turbines
- LSB Aerodynamic Aspects
- LSB Vibrational Aspects
- Steam Turbine Exhausts
- Valves & Seals
- Steam Turbine Mechanical Aspects
- Steam Flow Modeling
- Steam Turbine Heat Transfer & Thermal Aspects

Structures & Dynamics

The expanded use of gas turbines in extreme environments introduces new demands on the structural integrity of aero and industrial gas turbine development and operation. The program of seven Structures & Dynamics tracks, including (1) Emerging Methods in Design & Engineering, (2) Fatigue, Fracture & Life Prediction, (3) Probabilistic Methods, (4) Rotordynamics, (5) Bearing & Seal Dynamics, (6) Structural Mechanics, Vibration & Damping and (7) Aerodynamic Excitation & Damping, covers highly relevant issues concerning the mechanical integrity of gas turbine engines, compressors steam and wind turbines as well as turbochargers.

Papers in the Structures and Dynamics Committee deal with best-in-class structural mechanics solutions by contributing fluid, acoustic, thermodynamic, and cooling interactions, which have an impact on the reliability and lifetime prediction or failure-free operation of mechanical components. Modeling and design methodologies based on analytical, numerical, probabilistic and experimental approaches are presented in more than 40 technical sessions organized by internationally recognized industry leaders and academic researchers. International networking is arranged among all attended engineers, designers and researchers representing industry, academia and government from different countries.

All participants benefit from scientific discussions and identification of cutting edge technological news and trends in mechanical integrity for meeting today's and tomorrow's challenges in gas, steam and wind turbine industry for the best cross-product methodology synergy. The diversity of subjects covered will boost attendees' knowledge and contribute to their professional career development. The S&D panel and tutorial sessions, organized in collaboration with other Congress Committees, leverage engineer's knowledge for topics of the highest interest to the international mechanical engineering society.

Emerging Methods in Design & Engineering
- Optimization & New Methods Development
- Experimental Test and Evaluation
- Under Platform Damping Design

Fatigue, Fracture & Life Prediction
- Crack growth modelling
- Creep and Thermomechanical Fatigue modelling
- Fatigue Life modelling of Blades
- Integrity of engine components
- Structural modelling and Life prediction

Technical Sessions

Probabilistic Methods
- Probabilistic Methods Development
- Probabilistic Methods Applications

Rotordynamics
- Rotordynamic Analysis 1
- Rotordynamic Analysis 2
- Rotordynamic Effects of Bearings and Seals
- Rotordynamic Testing and Balancing

Bearing & Seal Dynamics
- Gas Bearings
- Tilting-Pad Bearings
- Magnetic Bearings
- Bearings Modeling & Validation 1
- Bearings Modeling & Validation 2
- Bearings Modeling & Validation 3
- Labyrinth Seals
- Seals Modeling & Validation

Structural Mechanics, Vibration & Damping
- Mistuned Blisks and Bladed Disks I & II
- Frictional Joints I: Shrouds, flanges, bolts, and root joints
- Frictional Joints II: Under-platform dampers
- Dynamics of Bladed Disks with Nonlinearities
- Dynamics of Blades and Bladed Disks
- Vibration Measurement Techniques
- Damping Methodologies and Estimation
- Rotor-Stator Interaction
- Aerodynamic Excitation & Damping (with Turbomachinery)
- Turbomachine Aeroelasticity and Computational Methods 1
- Turbomachine Aeroelasticity and Computational Methods 2
- Turbomachine Aeroelasticity and Computational Methods 3
- Turbomachine Aeroelasticity and Computational Methods 4
- Turbomachine Aerodynamic Interaction and Forced Response 1
- Turbomachine Aerodynamic Interaction and Forced Response 2

Supercritical CO2 Power Cycles

Supercritical CO_2 based power cycles provide significant efficiency and cost of electricity benefits to waste heat, thermal solar, nuclear, ship-board propulsion and fossil fuel power generation applications. They also provide for separation, compression, transportation, and storage (geologic) of CO_2 from fossil fuel power plants. The approach to geologic storage of CO_2 benefits greatly from the existing technology and knowledge amassed around CO_2 utilization and management in the oil & gas industry. While the end goals of the CO_2 based power cycles and the CO_2 storage applications are different, the properties of the working fluid, thermodynamics, technology and machinery used for

Technical Sessions

these applications are very similar. The confluence of interests related to the use and management of supercritical CO_2 has created an imperative to further the understanding of these applications. The Supercritical CO_2 Power Cycle committee organizes sessions that focus on the dissemination of machinery and cycle related technologies of sCO_2 power plant applications.

- Fundamentals of sCO_2 Power Cycles
- sCO_2 Heat Exchangers
- Turbomachinery for sCO_2 Cycles
- sCO_2 Cycle Analysis and Optimization
- Materials for sCO_2 Cycles
- sCO_2 Power Cycles R&D
- sCO_2 Turbomachinery
- sCO_2 Cycle Testing
- sCO_2 Cycle Modeling
- sCO_2 Cycle Components

Turbomachinery

The Turbomachinery Committee of ASME IGTI at Turbo Expo is the premier forum for the world's experts from academia, industry, and government to share advances in the state of the art in turbomachinery aero/thermodynamics technology. Technical paper sessions address aerodynamics topics on fans, compressors, turbines, and ducts in axial, radial and mixed flow configurations.

The technical content covers not just a wide range of gas turbine applications for air and marine propulsion and power generation, but also other important sectors such as oil and gas, industrial gas compression, and expanders for waste heat recovery.

Design concepts and processes, experimental results, and analytical approaches for modeling with CFD and simpler models are addressed. Design topics include such areas as optimization strategies, endwall profiling, leakage effects, tip clearance effects, quality effects, flow control, casing treatments, unsteady flows, and stall inception and control. Modeling topics include turbulence and transition modeling, LES and DNS, accelerated steady and unsteady formulations, and multi-stage steady CFD, as well as lower-order (non-CFD) models.

The increasing emphasis on interaction effects between adjacent components and between multiple disciplines is reflected in specific sessions on these subjects. In addition, several sessions sponsored jointly with other committees focus on important areas of cross-disciplinary interest: with Heat Transfer, sessions on turbine cooling and secondary flow circuits; with Structures, on aeromechanics; and with Aircraft, on noise and acoustics. A new track was added this year to address all facets of deposition, erosion, fouling, and icing; sessions in this track are jointly sponsored by several other committees.

Axial Flow Fan & Compressor Aerodynamics

- Compressor Performance
- Stators
- Transonic Compressors
- Multistage Compressors
- Tip Flows

Technical Sessions

- Endwall Flows & Corner Separations
- Casing Treatments
- Flow Control I
- Flow Control II
- Tandem Stators
- Fans
- Experiments

Axial Flow Turbine Aerodynamics

- Tip Leakage flows I
- Secondary flows
- Endwall profiling I
- Low pressure turbine aerodynamics I
- Turbine cascade aerodynamics
- Aerodynamic losses
- Cavity flows
- Combustor-turbine interactions
- Tip Leakage flows II
- Aerodynamic performances & Design
- Unsteady flows & Transition
- Turbine aerodynamic testing
- Low pressure turbine aerodynamics II

Design Methods & CFD Modeling for Turbomachinery

- LES and DNS Methods and Applications I
- LES and DNS Methods and Applications II
- LES and DNS Methods and Applications III
- Compressor Design Methods and Applications I
- Compressor Design Methods and Applications II
- Turbine Design Methods and Applications I
- Turbine Design Methods and Applications II
- Optimization Methods and Applications I
- Optimization Methods and Applications II
- Optimization Methods and Applications III
- Preliminary Design Methods I
- Preliminary Design Methods II
- Radial Turbomachinery Design Methods and Applications
- Methods and CFD Modelling for Turbomachinery Design I
- Methods and CFD Modelling for Turbomachinery Design II
- Methods and CFD Modelling for Turbomachinery Design III
- Methods and CFD Modelling for Turbomachinery Design IV
- Cavity and Seal Design Methods and Applications
- Fan Design Methods and Applications

Ducts & Component Interactions

- Gas Turbine Engine Ducts and Diffusers
- Gas Turbine Engine Component and Flow Interactions

Noise & Innovative Noise Reduction (with Aircraft Engine)

- Combustion Noise
- Fans, compressors, open rotors, and ducts
- Entropy noise
- Computational aero-acoustics methods and jet noise

Radial Turbomachinery Aerodynamics

- Radial and Mixed Flow Turbine I
- Radial and Mixed Flow Turbine II
- Centrifugal Compressors - Map Width Enhancement I
- Centrifugal Compressors - Map Width Enhancement II
- Centrifugal Compressors - Turbocharger Applications
- Centrifugal Compressors - Stall & Surge
- Centrifugal Compressors - Industrial & Multistage
- Centrifugal Compressors - Methods & Tools
- Centrifugal Compressors - Performance Optimization

Unsteady Flows in Turbomachinery

- Unsteady Flows in Turbines I
- Unsteady Flows in Turbines II
- Stall and Surge: Centrifugal Compressors
- Stall and Surge I
- Stall and Surge II
- Stall and Surge III
- Unsteady Flows in Centrifugal Compressors
- Unsteady Flows in Compressors I
- Unsteady Flows in Compressors II
- Unsteady Flows in Compressors III
- Unsteady Flows in Compressors IV

Multidisciplinary Design Approaches, Optimization & Uncertainty Quantification

- Uncertainty Quantification and Robust Design - I
- Preliminary Design Methods & Tools
- Optimization Methods: Surrogate-Assisted and Collaborative Strategies
- Axial Compressor Design
- Radial Compressor and Turbine Design
- Axial Turbine Design: Aerodynamic Optimization and Multidisciplinary Approaches (including cooling)

Technical Sessions

- Automated Design Optimization Applications: Integration, Subsystems, Valves and Bearings
- Uncertainty Quantification and Robust Design - II

Deposition, Erosion, Fouling, and Icing

- CFD with Deposition and/or Erosion
- Modeling the Impact of Deposition and/or Erosion on Engine Performance
- Icing Modeling and Experiments
- Water Droplets and Films - Modeling and Experiments
- Deposition/Erosion Fundamental Modeling & Experiments
- Deposition Experiments

Wind Energy

The rapid expansion of wind power and the steady decrease in the cost of wind-generated electricity has consolidated the position of wind power as an indispensable part of the global energy mix. Thus, the Wind Energy Technical Program will focus on innovations that are driving technological advances in the wind industry. The technical presentations cover aerodynamics, aeroelasticity, structures and condition monitoring aspects of wind turbines, as well as the interaction of wind turbines with other energy systems. These topics are addressed for small and large wind turbines, as well as vertical and horizontal axis wind turbines. Special panel sessions highlight the challenges that the industry is facing, as well as research being undertaken in universities and research laboratories.

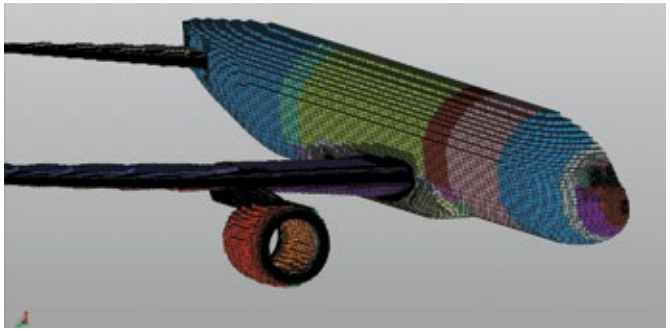
For experts and beginners, tutorial sessions and workshops will be presented to detail developments and tools that are employed in the rapidly growing wind industry.

- Measurements and Simulations
- Structures and Aeroelastic Behavior
- Design and Optimization
- Wind Energy Systems
- Modelling of Wind Turbine Flows
- Vertical Axis Wind Turbines
- Operation & Condition Monitoring
- Small Wind Turbines
- Noise
- Blade Aerodynamics
- Reliability and Risk Analysis
- Data Analytics

Cambridge Flow Solutions conducts strategic, long-term research with Development Partners. Our work is focussed on BOXER – a fully scalable simulation environment coupling an advanced digital geometry model, mesh generation and CFD – aimed at complex, real-world, conjugate applications.

CAMBRIDGE FLOW SOLUTIONS

Proprietary and customised CFD



Digital Geometry

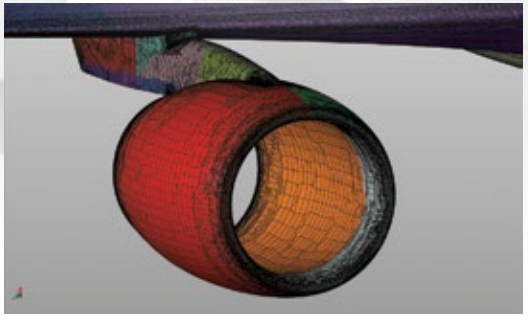
- Direct CAD import
- Very flexible geometry editing & management

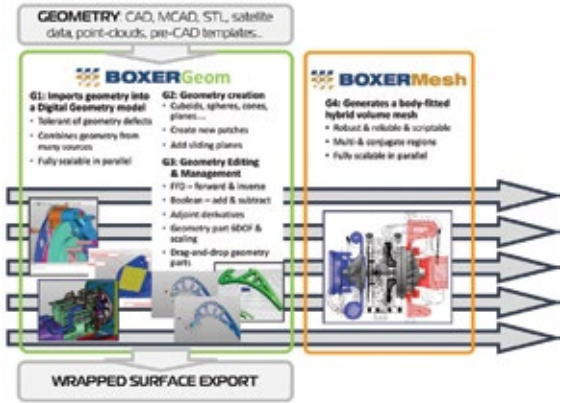
Fast & Scalable

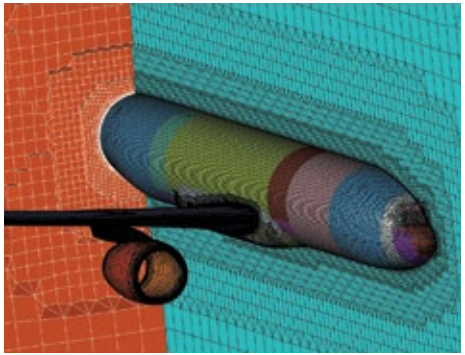
- Fully parallel, including layering
- Runs on laptops, cpu clusters and HPC

Intuitive & Easy to Use

- Simple & powerful GUI
- Fully scripted capability

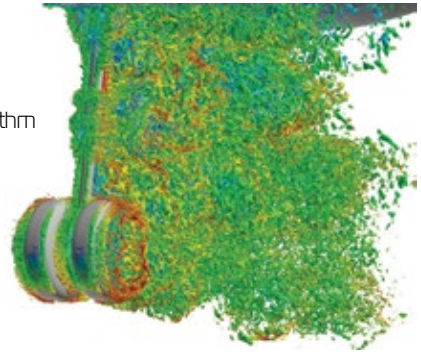






Efficient LES

- Higher order on hybrid unstructured meshes
- Innovative STEFR algorithm
- Runs on cpu clusters & Intel PHI co-processors



CFS distributes & supports BOXER and advanced higher-order LES to Application & Licencing Partners via our specialist network: BOXERsolutions Ltd (UK & Europe), BOXERsolutions kk (Japan) & BOXERsolutions Inc (USA).

Pre-Conference Workshops

The following pre-conference workshops will be held at the Westin Charlotte Hotel. Consider attending one of the workshops and take advantage of the LOW registration fee.
Registration is available online.

High-Performance Aerodynamic Design of a Gas Turbine Exhaust Diffuser Leveraging CFD-Based Entropy Map

Sunday, June 25 | 8:00 am – 5:00 pm

Gas turbine exhaust diffusers play an important role in turbine power output by increasing the pressure ratio across the last stage turbine by making the turbine exit static pressure sub-ambient. The main aerodynamic design goal of an exhaust diffuser is to obtain maximum recovery in static pressure with various design constraints of intervening struts for bearing support and service lines and duct length available for flow diffusion, including the design-to-cost objective. While the diffuser design focuses on realizing an efficient diffusion in the front and mid-section, in the aft section, the design objective shifts to obtaining a more uniform velocity distribution to meet the requirements at the inlet to Heat Recovery Steam Generator (HRSG) in a combined-cycle operation.

Ideal diffusers are characterized by uniform axial velocities with no swirl at both inlet and exit and with no loss in total pressure across the diffuser. Cp (static pressure rise coefficient), which is defined as the rise in static pressure from diffuser inlet to exit divided by the dynamic pressure (the total pressure minus the static pressure) at the inlet, is generally used to assess the diffuser aerodynamic performance. Actual diffusers in gas turbines, however, often have non-uniform profiles of all three velocity components, pressure, and temperature at both inlet and outlet. These non-uniformities present a special challenge in calculating Cp for diffuser performance assessment. CFD-based entropy map can be used to delineate diffuser flow zones for design improvement.

Key Benefits to Participants

- Will clearly understand the role of exhaust diffusers in gas turbine performance.
- Will develop a "common-sense" understanding of exhaust diffuser aerodynamics.
- Will understand Bijay's Six Rules for the aerodynamic design of a world-class exhaust diffuser and leverage the power of 1-D and 3-D CFD technology in design with significantly reduced cost.
- Will improve participant's interaction with gas turbine designers in making good design decisions with reduced design cycle time.

Note: Prior to the workshop, participants are requested to review Chapter 2 (Key Concepts of Thermofluids) and Chapter 5 (Compressible Flow) from the book Fluid Mechanics: An Intermediate Approach (Author: Bijay K. Sultanian) published by Taylor & Francis (CRC Press) on July 28, 2015.

Pre-Conference Workshops

Who Should Attend
Engineers involved in the design of diffusers for advanced gas turbines, including those who are developing physics-based methods and tools to carry out such designs using 1-D and 3-D CFD methodologies.

Workshop Schedule and Content

Module 1 – Why Do We Need a Gas Turbine Exhaust Diffuser
- Role of a gas turbine exhaust diffuser
- Physics-based modeling
- 1-D and 3-D CFD applications in GTED design

Module 2 – Key Concepts of Thermofluids
- Physical understanding of Mach number
- Incompressible and compressible flows
- Static pressure and static temperature
- Total temperature and total pressure
- Dynamic pressure
- Entropy and its calculation
- Stream thrust

Module 3 – Understanding Flow Physics in a GTED
- Reynolds number
- Diffusion in a constant-area duct
- Boundary layer separation
- Sudden expansion pipe flow without swirl
- Sudden expansion pipe flow with swirl
- Vortex Breakdown
- Sudden contraction pipe flow
- Horseshoe vortex
- Flow past a cylinder
- Vortex shedding

Module 4 – Diffuser Pressure Rise Coefficient (Cp)
- Stream Thrust: Drag Force
- Bernoulli Equation
- Ideal incompressible and compressible flows with uniform cross-sectional properties
- Real compressible flow with non-uniform cross-sectional properties
- Integrated turbine-diffuser performance analysis

Module 5 – Axial Stream Thrust Coefficient
- Challenges of Cp calculation in a real diffuser
- Axial Stream Thrust Coefficient
- Advantages of the axial stream thrust coefficient

Module 6 – Bijay's Six Rules of a World-Class GTED Design
- Detailed discussion of the Six Rules and why we s hould not violate them
- Initial design with 1-D CFD

Module 7 – Application of 3-CFD Technology
- Detailed design with 3-D CFD
- Physics-Based post-processing of CFD results
- Dimensionless Entropy
- Entropy map generation and interpretation
- Subscale model testing for design validation
- General discussion

Earn 7 Professional Development Hours (PDH's) and receive a certificate of completion.

Instructors

Dr. Bijay (BJ) K. Sultanian, PhD, PE, MBA, ASME Fellow, Takaniki Communications, LLC

Dr. Riccardo Da Soghe, PhD, Associate Research Manager, Ergon Research

Pre-Conference Workshops

Basic Gas Turbine Metallurgy and Repair Technology

Sunday, June 25 | 8:00 a.m. – 5:00 p.m.

This workshop will explain superalloy metallurgy as it applies to gas turbine components. We will look at component damage experienced from gas turbine service exposure and the techniques used to analyze the remaining life of components removed from service. We will compare and contrast protective coatings, component repair technologies, and repair quality assurance techniques. The workshop includes many case study examples, and the last section is devoted to a workshop where attendees develop component repair solutions. Participants may submit questions in advance regarding repair issues faced in their jobs.

Key Benefits to Participants:

- Review how superalloys are processed making them suited for gas turbine components
- Understand how different damage mechanisms (oxidation, corrosion, erosion) affect the component design, service life and reparability
- Appreciate how quality control affects component repairs and the reliable extension of service life of valuable components

Who Should Attend

- Gas Turbine Repair Shop Personnel
- Component Designers
- Plant Technical Staff
- Operations Engineers
- Maintenance Engineers
- Technicians responsible for gas turbine component repairs
- Technical advisors for gas-plant insurance and investment companies

Earn 7 Professional Development Hours (PDH's) and receive a certificate of completion.

Instructor
Douglas Nagy, Manager, IGT Components Repair, Liburdi Turbine Services Inc.

Uncertainty Quantification and Turbomachinery

Sunday, June 25 | 8:00 a.m. – 5:00 p.m.

The field of Uncertainty Quantification is evolving rapidly and becoming more and more important for turbo machinery predictions, because of the ever increasing sophistication of the computational models used for turbomachinery design. Cavity modeling, advanced description of turbulence (hybrid RANS-LES models, SAS models, etc.), real gases equations of state and in general complex thermodynamic models are just some examples of the increased complexity of the computational models used for turbomachines, in the quest to increase the accuracy and applicability of these models to different industrial applications. As the complexity and the scale of the models grows, the need to quantify the effect of uncertainties due to input variability, model calibration, model form uncertainty, numerical errors and so on becomes more and more important.

In this context, the module will cover different UQ techniques such as Monte Carlo with Metamodels (stochastic collocation), Non-Intrusive Polynomial Chaos and their impact on turbo machinery design. The module will provide examples where different techniques are compared and an example of Gaussian Process Regression will be shown. Industrial applications such as

reliability of gas turbine blades, manufacturing-induced variability of centrifugal compressors performance and inference from experimental data of wind turbines power output will be shown. Participants are requested to bring a laptop.

Who Should Attend

MSc, Phd, Design Engineers, and Academics involved with Turbomachinery Design or Analysis. UQ is becoming a key topic in CFD for turbomachinery.

Earn 7 Professional Development Hours (PDH's) and receive a certificate of completion.

Instructors

Francesco Montomoli, Richard Ahlfeld, Marco Pietropaoli, Audrey Gaymann, Imperial College; Andrea Panizza, General Electric Oil & Gas; Shahrokh Shahpar, Rolls-Royce

Design, Operation and Maintenance Considerations for Cogeneration and Combined Cycle Systems

Sunday, June 25 | 8:00 am – 5:00 pm

This course is designed to provide a comprehensive understanding of design, operational and maintenance issues experienced by owners/operators/consultants of cogeneration, district heat and cooling and combined cycle systems. In addition to refreshing the basics of cogeneration, district heat and cooling and combined cycle technologies and related recent developments, attendees will become familiar with various practical considerations and rules of thumb relating to the key topics listed below on technologies currently used and under development for enhanced performance. This course also covers non-gas turbine based and hybrid cogeneration and combined cycle systems. Cogeneration and combined cycle technologies are gaining renewed attention globally as a means of effective utilization of available energy resources including reduced greenhouse gases. It is projected that globally more than 300,000 MWe of Cogeneration power will be added by the year 2020.

- Basics of cogeneration, district heating & cooling and combined cycle technologies
- Current cogen, district heating & cooling and combined cycle technologies with their advantages and limitations
- Understanding key issues of gas turbines, HRSGs, steam turbines and auxiliaries
- Practical aspects of key components of cogeneration, district heating & cooling and combined cycle system
- Factors affecting performance of cogeneration, district heating & cooling and combined cycle systems and techno-economic evaluation
- Importance of design, performance, operational, and maintenance issues of HRSG system
- Emissions related issues, best available emissions control technologies and environmental regulations
- Operational and maintenance considerations with emphasis on performance enhancement technologies
- Case studies of actual systems and lessons learned

Pre-Conference Workshops

After completing the course, the participants should gain insight of:

- Comprehensive overview of cogeneration, district heating & cooling and combined cycle technologies
- Practical considerations in the design, evaluation, operation & maintenance issues and performance enhancement approaches
- Exposure to commercial heat balance simulation tools to design and evaluate cogeneration, district heating & cooling and combined cycle systems
- Attendees will gain a broad appreciation in handling cogeneration, district heating & cooling and combined cycle projects

Who Should Attend

Owners, operators, consultants, designers, engineering, procurement & construction companies, government policy and regulatory staff, and project developers involved with cogeneration, district heating & cooling and combined cycle systems. This course will be useful for those involved in gas turbines and/or waste heat recovery applications and specifically fresh engineers becoming involved with cogeneration, district heating & cooling and combined cycle projects.

Earn 7 Professional Development Hours (PDH's) and receive a certificate of completion!

Instructors

Rakesh Bhargava, Ph. D., Innovative Turbomachinery Technologies Corp.
Cyrus Meher-Homji, P.E., Bechtel Corporation
Manfred Klein, Principal Consultant, MA Klein & Assoc.
Steve Ingistov, P.E., ASME Fellow

Introduction to ISO 55000 Standard for Asset Management

Sunday, June 25 | 8:00 a.m. – 5:00 p.m.

The ISO 55000 Standard for Asset Management was released in January 2014. It is now being implemented through industry best practice and regulation in Australia, Canada, the UK and countries in the European Union. In the US, PG&E has certified to this standard and many utilities in North America are presently considering its implementation.

ISO 55000 is a Management Systems Standard focused on extracting maximum value from assets over their entire life cycle. It requires comprehensive risk-based planning for asset and related system requisitions as well as optimal operation, maintenance and continuous improvement of all assets – material and human. It provides a sustainable framework for asset managers and service providers in many business sectors. It fits well with other management systems standards such as ISO 9000 and ISO 14000 and can be implemented in stages to fit the organization's needs.

This workshop will introduce the Asset Management Standard with Descriptions of its Principles and Examples of its Application through Individual Case Studies coupled with Interactive Exercises. The Instructors are Members of the ISO 55000 Standards Committee and authors of significant portions of the present Standard.

Why Attend?

Asset Management involves the Proper Disposition of ALL Resources over the Duration of a

Pre-Conference Workshops

Business Project. It encompasses the coordinated and optimized planning, asset selection, acquisition/development, utilization, maintenance and ultimate disposal or renewal of individual assets and systems.

ISO 55000 – the Asset Management Standard – is akin to the existent ISO 9000 – Quality Management Standard and ISO 14000 – the Environmental Management Standard. It is in the early stages of Utilization. Given the Universal Application of ISO 9K and ISO 14K, ASME will be a leader in presenting ISO 55K Principles to Practicing Engineers AND Engineering Students.

Items Covered

- Importance of Asset Management & ISO 55000
- Why a New International Standard
- Requirements of the Standard
  - Seven Elements of an Asset Management System
  - Approaches to Implementation

Who Should Attend

- Practicing Engineers-Managers
- Product & System Developers
- Engineering Students – Introduction to a NEW ISO Standard

Earn 7 Professional Development Hours (PDH's) and receive a certificate of completion.

Instructors

Thomas Smith MS, MA, Fellow, Inst. of Asset Management, University of Wisconsin
Scott Morris, Assoc. Dir., Facilities, Genzyme Corporation

Gas Turbine Aerothermodynamics and Performance Calculations

Sunday, June 25 | 8:00 am – 5:00 pm

This interactive workshop provides review and reinforcement of relevant thermodynamic and aerodynamic concepts as applied to gas turbine engines, and introduces performance calculation methods of both aircraft engine and power generation gas turbines. The workshop emphasizes fundamentals which will be helpful for the practicing engineer but is not designed to review industrial practices which are usually proprietary. The acquired knowledge, including the review of illustrative examples, will enhance the participants' ability to excel in various assignments in gas turbine design, development, education, and application. The workshop material has been evaluated by the Department of Mechanical and Aerospace Engineering of North Carolina State University.

The workshop includes: a review of the relevant thermodynamics and compressible flow; introduction to cycle analysis; propulsive, thermal, and overall efficiencies; elements of turbomachinery aero design; familiarization with combustor characteristics; integration of component performances to obtain overall engine performance with illustrative examples of design point and off-design calculations; multivariable solver; and various cycles used for power generation.

After completing the course the participants should be able to apply aerothermodynamic concepts to the analysis of gas turbine engines; analyze turbomachinery velocity diagrams and relate those to thermodynamic parameters; appreciate the usefulness of the degree of reaction and the radial equilibrium equation; comprehend the discipline of operability

Pre-Conference Workshops

and combustor characteristics; analyze cycle analysis problems on integrating the component performances to get the overall engine performance. The illustrative examples on the integration of the component performances to obtain the overall performance will facilitate comprehension of compressor/turbine matching; accounting for turbine cooling flows; the method of sizing critical flow path areas at the design point; method of satisfying conservation laws to achieve cycle balance at off-design; technique of the multivariable solver used in cycle models; making models match test data; and the analysis of various engine cycles in the power generation field including hybrid cycles.

Who Should Attend
Early Career or Experienced Engineers in Turbomachinery and Gas Turbine Engine Design, Development, Application, and Education.

Special Notation: A laptop is recommended for individual reviewing of the materials, on a flash drive, in class.

Earn 7 Professional Development Hours (PDH's) and receive a certificate of completion!

Instructors

Syed Khalid, President, Gas Turbine Systems Solutions, LLC

ASME Power & Energy Technical Conference & Workshops

ASME Power & Energy focuses on power generation and energy sustainability and showcases industry best practices, technical advances, development trends, research, and business strategies, presented by a broad range of qualified professionals.

Technical Sessions

Fuel Cell Science, Engineering, and Technology Conference

Batteries and Electrochemical Energy Storage
The diffuse nature of sustainable energy supply and demand requires the development of flexible and scalable energy storage and conversion technology. Electrochemical systems are increasingly meeting this requirement in mobile and stationary applications. Researchers are encouraged to contribute papers addressing the science, design, and application of batteries, capacitors, and other electrochemical energy storage technology. Contributions are encouraged in areas including, but not limited to: Li-ion Batteries, Li-air and Metal Air Batteries, Materials for Electrochemical Energy Conversion and Storage, Modeling and Analysis of Electrochemical Systems, Advanced Electrochemical Energy Conversion and Storage.

Polymer Electrolyte Membrane, Direct Methanol, & Alkaline Fuel Cells
The diffuse nature of sustainable energy supply and demand requires the development of flexible and scalable energy storage and conversion technology. Fuel cells are increasingly meeting this requirement in mobile and stationary applications. Researchers are encouraged to contribute papers addressing the science, design, and application of low temperature fuel cells including polymer electrolyte membrane, direct methanol, and alkaline fuel cells. Papers addressing experimental and modeling approaches are included.

Phosphoric Acid, Molten Carbonate, & Solid Oxide Fuel Cells
The diffuse nature of sustainable energy supply and demand requires the development of flexible and scalable energy storage and conversion technology. Fuel cells are increasingly meeting this requirement in mobile and stationary applications. Researchers are encouraged to contribute papers addressing the science, design, and application of high temperature fuel cells including phosphoric acid, molten carbonate, and solid oxide fuel cells. Papers addressing experimental and modeling approaches are included.

Fuel Cell Ancillary Systems and Balance-of-Plant
The diffuse nature of sustainable energy supply and demand requires the development of flexible and scalable energy storage and conversion technology. Fuel cells are increasingly meeting this requirement in mobile and stationary applications. Researchers are encouraged to contribute papers addressing the science, design, and application of the ancillary systems and balance-of-plant that support the operation of low and high temperature fuel cells. Papers addressing experimental and modeling approaches are included.

Commercial Applications of Fuel Cells
The diffuse nature of sustainable energy supply and demand requires the development of flexible and scalable energy storage and conversion technology. Fuel cells are increasingly meeting this requirement in mobile and stationary applications. Researchers are encouraged to contribute papers addressing the implementation of fuel cells and fuel cell systems within commercial settings. Papers addressing experimental and modeling approaches as well as case studies from industry are included.

Posters
The diffuse nature of sustainable energy supply and demand requires the development of flexible and scalable energy storage and conversion technology. Fuel cells are increasingly meeting this requirement in mobile and stationary applications. Researchers are encouraged to contribute posters related to the topics above. Contributions from students are particularly encouraged.

Technical Sessions

International Conference on Energy Sustainability

Biofuels, Hydrogen, Syngas, and Alternate Fuels
The track on Biofuels, Hydrogen, Syngas, and Alternate Fuels welcomes contributions in all areas related to the use and production of these fuels; as well as studies relating to other alternative fuels and their integration into sustainable energy systems. Contributions may include experimental results, computational modeling, verification or validation.

Concentrating Solar Power
This technical conference track focuses on advances in Concentrating Solar Power research and technology. It brings together some of the leading international researchers and experts in the field, to discuss recent progress on a broad range of technical aspects relevant for the successful development and dissemination of CSP technologies. Topics may include, but are not limited to: Concentrators and Optics, Receivers, Thermal Energy Storage, System Design and Analysis, and Advanced Power Cycles, and topics related to these areas.

Photovoltaics
The Photovoltaics Track features a range of topics related to photovoltaics, thermo-electrics applications, technology and analysis.

Solar Chemistry
The Solar Chemistry Track features papers and presentations on applications and technology related to the thermal application of solar energy to the production and processing of chemicals for a wide variety of applications.

Wind Energy Systems and Technologies
The Wind Energy Systems and Technology track features presentations and papers on wind energy production and technology.

Geothermal Power, Hydro/Ocean Power, and Emerging Energy Technologies
The track on Geothermal Power, Hydro/Ocean Power, and Emerging Energy Technologies welcomes contributions in all areas related to the evaluation and use of geothermal and hydro/ocean power for power generation; as well as studies relating to other emerging energy technologies for sustainable energy systems. Contributions may include experimental results, computational modeling, verification or validation.

CHP and Hybrid Power & Energy Systems
The track on Combined Heat and Power (CHP) and Hybrid Power & Energy Systems welcomes contributions in all areas related to cogeneration, trigeneration, and multigeneration; as well as studies relating to hybrid, renewable, and alternative power and energy systems. Contributions may include field studies, experimentation, computational modeling, verification or validation.

Thermodynamic Analysis of Energy Systems
This track focuses on thermoeconomic analysis and energy analysis of power and refrigeration cycles in component and system levels.

Environmental, Economic, and Policy Considerations of Advanced Energy Systems
This track will evaluate the policy and finance issues that are relevant to the deployment of advanced technologies into different markets and highlights recent advancements in energy systems modeling and the most recent trends in the energy sector throughout the world.

Technical Sessions

Sustainable Building Energy Systems
The track on Sustainable Building Energy Systems welcomes contributions in all areas related to energy efficient buildings including, but not limited to; efficient building mechanical systems, integrated renewable energy systems to buildings, advanced storage systems for buildings, advanced on combined heat and power systems, whole building energy analysis, energy analysis techniques and technologies for community scales, and integrated transportation systems to building systems. Contributions that include field studies or validation are particularly welcome.

Sustainable Infrastructure and Transportation
This track focuses on advancements in sustainable infrastructure and transportation. Recent advances in cyber-physical systems, use of zeolite catalysts for CO_2 reduction, novel electric drive systems and modeling of air conditioning and fuel consumption of heavy vehicles.

Posters
International Conference on Energy Sustainability welcomes interesting projects and ideas on broad topics of sustainability issues. Any level of authors including, but not limited to, students or early-career engineers are welcome to submit and present their work at the conference.

Nuclear Forum

Nuclear Steam Supply Systems Including Advanced and Small Modular Reactors
The objective of this track is to open discussion and share knowledge on the expected safety and performance features of current nuclear fleet and future builds and of the technical, scientific, economic, and environmental details of the many different designs and concepts for innovative power that can be accomplished from nuclear reactions. This includes reactor designs for near-term deployment (Generations III and III+); small and modular reactors (SMR), remote grid applications, Generation IV design concepts and Fusion.

Papers in the following areas are solicited: Gen-IV reactor design concepts such as Supercritical-water- cooled Reactor, Sodium-cooled fast reactor, Very-high-temperature reactor, Gas-cooled fast reactor, Lead-cooled fast reactor, Molten-salt reactor. New concepts such as Small Modular Reactors (SMR), remote grid applications, design concept features that enhance safety or performance over existing designs, comparative studies on design efficiency, plant safety, cost reductions.

This track also includes all reactor designs for near-term deployment (including but not limited to reactortypes such as VVER, AP1000, ESBWR, ABWR, System 80+, EPR, APWR, ACR Series, GT-MHR and PBMR), standard and certified designs, government programs supporting deployment, safety, economics of nuclear power, sustainability, construction and project management techniques. Topics may also include policy and programmatic issues, computational methods, neutronics, advanced light water reactor concepts, fuels, structures, materials, and components, experiments and testing facilities, government programs supporting deployment, siting issues, environmental issues, safety issues, and economics of the various reactor types, sustainability, construction and project management techniques, fusion nuclear design, analysis, technologies and materials, code development. Design & analysis of components/systems for fusion reactors/devices (blankets, shields, divertor, cooling systems, etc.); fusion technologies, including plasma heating, fuelling, controls and diagnostics, tritium reprocessing and handling; operations and remote maintenance of reactors, safety, decommissioning, and waste management, fuel cycle etc.; fusion related materials development, specifically, design, analysis, technologies and materials for ITER, fusion devices and DEMO reactors.

Technical Sessions

Risk Management, Safety and Cyber Security

This track addresses risk management, and safety and security topics, such as: site and infrastructure security, political and public perception issues, international safety studies, advances in safety analysis codes and techniques, safety culture, risk management, regulatory issues, probabilistic safety assessment, plant safety analyses, accident management, severe accident analysis and mitigation, criticality safety and radiological safety, public health issues, personal and fire safety, safety and security of digital I&C systems.

This track also discusses dissemination of knowledge by presenting research results, new developments, and novel concepts related to Probabilistic Risk (Safety) Assessment (PRA/PSA), use of risk measure in the design of new plants and operation and maintenance of existing, and development and use of risk informed rules and regulation. The focus also includes novel risk-informed models for reactor decommissioning; industry and regulatory lessons learned from application of risk-informed technical specification initiatives 4b and 5b, NFPA 805 transition process including MCR abandonment analysis, and quantification methods for external events in PRA.

Codes, Standards, Licensing and Regulatory Compliance

This track covers the globalization of codes and standards, risk-informed codes & standards and their applications (ISI/IST), probabilistic risk assessment standards, regulatory issues (risk-informed Part 50 and Part 50.59), AOV & MOV code issues, crane applications, piping repair & replacement, design & QA issues, standards and certification of software, strategic planning, license extension, licensing actions and developments, international licensing approaches, licensing of standardized plant designs, siting issues, plant licensing issues (build, operate), licensing of non-power and research reactors, environmental qualification.

Structures, Components and Materials

This track will focus on dissemination of knowledge by presenting research results, new developments, and novel concepts related to plant systems, structures and components, including components reliability and material and chemistry issues in nuclear power plants.

This includes subjects not limited to advances in structural design and analysis methods, failure modes and mechanisms, seismic design and analysis, linear and non-linear structural dynamic analyses, flow-induced vibrations and mitigation, fluid transient analyses in piping systems, fluid-structure interactions in reactor components, noise reduction, building and equipment isolation, vibration damping, containment and building mechanics, structural aspects of shock and explosion, wear experience and mitigation, nuclear power plant construction technology and management, reactor vessel internals wear/corrosion issues, irradiation damage and material behavior, assessment and management of aging, environmentally induced materials degradation and damage, design and manufacturing initiatives and in-service issues with balance of plant components, steam generators material degradation and life management, hydrazine optimization for steam generator systems, databases for aging, aging effects on failures, computational advances in material evaluation, material testing and property databases, tribology, crack behavior and stress corrosion cracking mitigation technology, low temperature embrittlement of welds, boric acid corrosion control, flow accelerated corrosion, crud and corrosion mitigation techniques, coolant/water chemistry control/optimization, in-service inspection, non-destructive examination technology, fatigue management (thermal and environmental), effects of cold work/residual plastic strain, modeling of environmental degradation processes and probabilistic analysis, risk-based degradation and life cycle management requirements for extended operation, application of advanced materials for operating reactors, corrosion and degradation management for balance of plant systems, buried pipeline corrosion in nuclear power plant.

Technical Sessions

I & C, Digital Controls, and Influence of Human Factors

This track focuses on I&C for next generation plants, integrated control rooms, hybrid control rooms, I&C refurbishment, analog component supply issues, digital versus analogue I&C, analog to digital conversion, cabling, reliable communication, digital networks, protection against common cause failures, qualification of digital systems, configuration management, harmonization of standards, licensing and regulatory issues, aging and obsolescence issues, on-line monitoring, FPGA- versus CPU-based systems, I&C system upgrades in research reactors, I&C risk modeling, I&C diagnostics and prognostics, in-pile instrumentation, wireless technologies, small modular reactors I&C, advanced sensors, software dependability, software verification and validation, software qualification, cyber security, neutron immunity systems and human-machine interface technologies.

Plant Operations, Maintenance, Aging Management, Reliability and Performance

The technical sessions in this track will focus on the topics related to optimizing and improving plant operations, maintenance, modifications and upgrades, aging management, performance evaluations, risk and outage/work window planning and management. This includes subjects not limited to component degradation, plant aging, operational experiences, operations management, maintenance experiences, maintenance plans, engineering design development and implementation, quality assurance, performance measures and indicators, human factors and workforce aging, O&M cost optimization, outage experience and techniques, in-service inspection, equipment repair, major equipment replacement experience (steam generators, etc.) and techniques, balance of plant issues and experience, power up-rating, plant systems maintenance and reliability improvements, cable and equipment evaluation testing, asset management, equipment reliability, component lifetime, risk based maintenance, reliability engineering, life cycle management, life extension experience and issues, technologies enabling life extension, economics of life extension, engineering design, modifications and analyses.

Energy Storage Forum

Commercial Applications of Energy Storage

This track explores how energy storage provides new economic opportunities and value to different types of power generation systems. Techno-economic analysis of different energy storage technologies and business models provide a basis for exploring how commercial scale energy storage can impact power generation technologies. Papers in this track can explore a variety of energy storage approaches and scales for very large and distributed power generation markets.

Batteries and Electrochemical Energy Storage

The diffuse nature of sustainable energy supply and demand requires the development of flexible and scalable energy storage and conversion technology. Electrochemical systems are increasingly meeting this requirement in mobile and stationary applications. Researchers are encouraged to contribute papers addressing the science, design, and application of batteries, capacitors, and other electrochemical energy storage technology. Contributions are encouraged in areas including, but not limited to: Li-ion Batteries, Li-air and Metal Air Batteries, Materials for Electrochemical Energy Conversion and Storage, Modeling and Analysis of Electrochemical Systems, Advanced Electrochemical Energy Conversion and Storage.

Compressed Air & Mechanical Energy Storage Systems

This track explores how advances in compressed air and mechanical energy storage systems are enabling new applications for large scale storage. Papers in this track explore both modeling and unique system design to make compressed air and/or mechanical storage more viable for large-scale applications. The use of both conventional compressed air energy storage, flywheels, and gravitational storage are considered as well as hybrid systems that involve one or more mechanical storage approaches along with other technologies.

Technical Sessions

Thermal Energy Storage Systems
The application of thermal energy storage (TES) technologies is increasing due to their benefits in reducing energy consumption, matching the supply and demand of energy, increasing flexibility of operation, etc. Researchers are encouraged to submit papers in areas including, but not limited to: Sensible, Latent, Cryogenic, Thermochemical, Thermal battery, Molten-salt, Ice-based, and Phase change material TES systems. The papers addressing science, design, and application of TES technologies, particularly papers related to TES materials, storage media, performance, safety, durability, cost, optimization are in the scope of the TES Track.

Posters
This session provides researchers a venue for presenting groundbreaking work in energy storage through poster presentations. Topics include batteries and other electrochemical energy storage approaches, thermal energy storage, mechanical and compressed air energy storage, and energy storage operational and business models.

Power Conference

Fuels, Combustion & Material Handling
This track covers advanced combustion systems and combustion issues such as combustion performance, burner design, modeling and research associated with solid, liquid and gaseous fuels.

Combustion Turbines
As the marketplace has demanded additional efficiency, operational flexibility and fast startup of gas turbines (in both simple and combined cycle applications) manufacturers have continued to enhance their designs to respond this demand. This track will cover an extensive range of issues, applications and related papers where improvements are discussed.

Boilers & Heat Recovery Steam Generators
The use of steam to power steam turbine generators, heat process equipment, and for other safe, constructive uses is a fundamental necessity of our industrial society. The design, operation, and maintenance of these steam generators and their auxiliaries is the focus of this track. For fossil-fired equipment, these steam generators include drum type boilers, once-through subcritical and supercritical steam generators, HRSG's, thermo-siphon re-boilers, and other heat exchangers whose end use includes the generation of steam or vapor. Improvements in the design of these devices are discussed and recent updates in design codes and operating practices are included in these discussions.

Risk Management, Safety and Cyber Security
Assessment of risk and cyber security are important issues for any business to address to remain successful. Not properly accessing, understanding and having methods in place to understand and guard against cyber security issues and conducting and thorough risk analysis can have financial impact to energy companies as well as the general public in the event of wide spread electric power interuptions. This Track will include information on risk analysis methods energy systems and electric generating equipment.

Plant Construction Issues and Supply Chain Management
This Track will cover an extensive range of issues and applications related to the Plant Construction and Supply Chain Management. It includes the life-cycle analysis, life-time buy optimization, numerical and experimental solutions, as well as equipment procurement management.

Renewable Energy Systems: Solar, Wind, Hydro and Geothermal
This Track will cover an extensive range of ongoing advanced and applied renewable energy systems research projects:

Technical Sessions

- The challenges and emerging technologies in designing advanced renewable energy technologies to improve their performance, efficiency, and reliability, and reduce their cost of energy
- The challenges and emerging technologies in industrial applications of renewable energy systems
- Life-cycle performance and cost analysis of renewable energy systems
- The challenges and emerging technologies in small scale energy resources penetration into transmission and distribution networks
- Novel approaches for renewable energy systems integration and optimization
- The emerging technologies used to improve power system operation, control, and management
- The challenges and emerging technologies in analysis, simulation, and optimization of advanced heat and power cycles with focus on sustainable fuel and renewable energy resources

Heat Exchangers, Condensers, Cooling Systems, and Balance-of-Plant
This Track promotes concepts revolving around the Design, Operation, Maintenance and Testing of and Improvements and Resolutions to problems for Heat Transfer Equipment (Water and Air-cooled Condensers, Feedwater Heaters, Shell &Tube Heat Exchangers, Cooling Towers, etc.) and Balance of Plant Equipment.

Steam Turbine-Generators, Electric Generators, Transformers, Switchgear, and Electric BOP & Auxiliaries
This session will discuss the latest developments and projects in major steam turbine power plant components from the aspect of repair, refurbishment, design improvements and trends. Changes in plant configuration, machine design, manufacturing techniques, duty cycles, maintenance strategies and workforce skill sets have all played a role in the variety of challenges faced by today's owners and operators. We will also discuss the challenges and consequences as they apply to operating and maintaining the power generation fleet for long term reliable operation.

I&C, Digital Controls, and Influence of Human Factors
Instrumentation and control technologies consist of the essential mean of interaction of operators with the various components of power plants and energy installation. Technological and economic factors in power plants are driving a transition from analog to digital instrumentation and control technologies. Therefore, the role of how information is displayed in the control room plant console is significant for the overall installation safety. Human operator stimulation and reaction, known as human factors, occurs through the control room systems and more particularly via the console systems. So, there is a mutual interaction between control systems and human factors. In this track, the whole range of topics pertained to design, analysis modeling and security of instrumentation, digital controls and human factors related to power and energy installations are highlighted.

Plant Operations, Maintenance, Aging Management, Reliability and Performance
Building on the one hundred years of prosperity and safety produced by ASME's Boiler and Pressure Vessel Code (BPVC), power engineers worldwide are continuing to use the principles of collaboration and cooperation that built the code to produce advancements that can, just as significantly, make electricity great again by improving the living conditions of billions of people worldwide who have yet to enjoy this prosperity. If we follow the pattern used by China in its electrification programs to lift 700 million people out of poverty, the material presented by

Technical Sessions

ASME, CSPE, and JSME participants in Track 1-11 shows that power engineers are able to provide affordable and sustainable power to the one to two billion people of us who still suffer in poverty as a result of a lack of electricity. The work of these engineers prove we can build affordable power plants today that reduce CO2, offer excellent environment protection, and can safely, efficiently and reliably respond to the increased use of renewable energy sources. For example, a highlight of this track will be a presentation by "China's Thomas Edison" Professor Weizhong Feng who is the 2016 winner of the ASME Prime Mover Award, the Power Division's top honor. His achievements have worldwide implications for the increased use of High Efficiency Low Emission (HELE) clean coal technology. Professor Feng has innovatively applied a Traditional Chinese Medicine whole-body/whole-power plant approach to produce what can be called a unified energy theorem for power plants, in which the strongest environmental protection technology, which is normally associated with reduced efficiency, is used in a way that achieves record-setting efficiency and correspondently low CO2 emissions. His presentation PowerEnergy2017-3035, "A High Efficiency Coal-Fired Power Technology with Elevated and Conventional Turbine Layout", discusses the PingShan II project which is expected to have a net design efficiency of 49.8% (LHV) when it is online in 2019. Due to its very high efficiency, this 1350 MW double-reheat Ultra-Supercritical (USC) coal fired power plant is expected to meet the US EPA's New Source Performance Standard (NSPS) for CO2, without using carbon capture or reduction technology, even though it uses advanced NOx, SOx and particulate reduction systems. His design is also very important to the development of Advanced Ultra-Supercritical (A-USC) systems and their higher efficiency and lower CO2 rates because it will greatly reduce their cost. Currently, A-USC materials cost about 10X more than traditional USC ones, but his cross-compound turbine arrangement will eliminate most of the prohibitively expensive lines in A-USC systems by locating one section of the turbine at the boiler outlets.

Thermal Hydraulics and Computational Fluid Dynamics

Thermal hydraulics is the study of hydraulic flow in thermal fluids. Computational fluid dynamics, usually abbreviated as CFD, is a branch of fluid mechanics that uses numerical analysis and algorithms to analyze and solve problems that involve fluid flows. New experimentation, advancement of theory, and development in computations for TH and CFD are featured in this track.

Topics include one- and two-phase flows, flows with and without particulates or noncondensable gasses, flows in porous media, flows through rotating machinery, flows around obstacles, and flows comprised of different fluids including water, air and many others. Some advances include novel application of existing CFD and TH techniques, others extend existing analysis methods, and still others involve brand new methods of analysis.

Energy Water Sustainability

From industrial to residential activities involving the consumption of energy and water, society uses water to mine, refine, and convert energy resources while also using energy to collect, treat, and distribute fresh water. Thus, the energy-water nexus covers a broad array of activities and technologies including desalination, power plant cooling, water and wastewater treatment, water reuse, mining, and biofuel production, amongst others. Papers are also sought on the topic of minimization of the use of fresh water for the cooling of thermal power plants, primarily, but not necessarily, based upon a steam cycle. Paper topics for power plant design papers include (but are not limited to) best practices and design case studies of:

- Dry and Hybrid cooling towers
- Nonfresh water use for power plant cooling (municipal/industrial wastewater, brackish/sea/saline water, produced water, etc.)
- Water consumption minimization, reuse, and treatment in power plants

Technical Sessions

- Water consumption minimization, reuse, and treatment for carbon capture and storage
- Equipment and materials design for unconventional water use in power plants (e.g. valves, piping, corrosion resistant materials and coatings, etc.)
- Heat exchanger design innovations for energy-water nexus
- Impact of regulations and economics on design and environmental impact of power plant cooling systems
- Role of combined heat and power (CHP) in water minimization at power plants and utilization of waste heat to minimize cooling water needs
- Approaches to reduce environmental and ecological impacts of once through cooling, including improved intake designs and improved water management approaches
- Integration of desalination approaches and technologies to increase water reuse within a power plant including use of blowdown, brackish water, etc
- Vapor capture to minimize water use, and reduced water use for carbon capture
- Utilization of advanced water monitoring and control techniques to improve water management, support water reuse, and water use efficiency improvements in power plants.

Student Competition

The purpose of this competition is to encourage active participation of students in the ASME Power and Energy Conference by submitting high quality technical papers on various aspects of Power Engineering. Students participating in this competition are required to make a presentation during a technical session dedicated to student papers.

This Competition seeks to promote the interaction of future engineers with practicing and experienced engineers and to help them establish mentoring and networking links with experts in their areas of interest. Student Paper subjects address various aspects of Power Engineering.

Posters

The Poster Session is a Technical Track where materials are presented in a concise, visual manner as a single large Poster (see author resources for details on Poster dimensions). Students and Early Career engineers are encouraged to present their work as a poster. During the review process, authors are asked to describe the work presented to those visiting and viewing their poster.

Pre-Conference Workshops

From Engineer to Manager: A Roadmap for a Successful Transition

Sunday, June 25 | 1:00 pm – 5:00 pm; Cost: $200 person

This workshop is for ALL engineers and students who may at some point in their careers assume a management role or consider a career move from technical professional into management.

Most engineers will at some point in their careers assume a management role (e.g., as a project manager or team leader) or consider a move into a full-time management position. The change in role is usually quick to occur but in few cases has there been any preparation to assist in a smooth transition. As a result most engineers are not aware of what being a new manager is all about before it's thrust upon them. Would you be ready for the change? What should you really expect? What are the critical things you need to know as a new manager?

The workshop will be a practical look at some of the key elements in preparing for a successful transition from technical professional to manager. As opposed to being a "How to Manage" session, the speaker will relate lessons he has learned as he crossed over into management and assumed increasingly responsible management positions. He will share lessons from his personal experiences that have enhanced his effectiveness and the "little things" that can assist the attendee in becoming an effective manager – be it as a project manager, team leader or as a full-time manager in a supervisory position. If you are an engineer about to assume a managerial role, an engineer who may be contemplating a move into management or even if you are a new manager who is now experiencing some managerial growing pains, this session is for you. And for the student engineer or early career professional, it's never too early to consider the requirements and steps to be taken in preparing for future management roles and positions.

Presenter:
John T. Bozewicz, Division Head, Naval Surface Warfare Center

Workshop on Evaporative Cooling for Power Plant Heat Rejection

Monday, June 26- 8:00 am- 12:00 pm

The Environmental Protection Agency has promulgated final rules to implement the requirements of Section 316(b) of the Clean Water Act which are to be implemented through the National Pollution Discharge Elimination System permits. Plants with intake flows of over 2 million gallons of water per day taken from the waters of the United States must implement the "best technology available" to reduce injury and death of fish and other aquatic life that may be impinged on or entrained in the intake. Existing facilities that withdraw more than 125 million gallons of water per day are required to conduct comprehensive technical feasibility and cost evaluation studies to help their permitting authority determine whether and what site-specific controls, if any, would be required to reduce the number of aquatic organisms entrained by cooling water systems. One of the acceptable means of complying with the new rules would be to convert the plant to a closed-cycle re-circulating heat rejection system consisting of cooling towers, spray systems, etc. or combinations of the same.

Pre-Conference Workshops

The workshop on evaporative cooling for power plant heat rejection will present practical engineering analysis tools for evaluating the performance of evaporative cooling systems such as cooling towers, spray ponds and cooling lakes and combinations thereof to assist the engineer in performing the required studies. The workshop will include the following:

- Types of cooling towers and fills
- Derivation of the Merkel equation
- How to evaluate cooling tower test results
- Analysis of cooling lakes from thermal tests
- Types of spray systems and expected efficiencies of each
- Possible combinations of cooling towers, spray systems and cooling lakes.

Instructor:

Chuck Bowman is a registered Professional Engineer with over 50 years of experience in engineering various types of evaporative cooling systems for rejecting power plant waste heat.

Challenges and Solutions to Maximizing Performance of Power Generating Assets

Monday, June 26- 1:00 pm- 5:00 pm

This workshop is intended for personnel engaged in engineering, performance, operations, and maintenance of their power generating plant assets. It will also benefit plant management staff who are attempting to maximize revenues given the limited resources and other challenges that they have to contend with on a daily basis. The workshop presupposes a basic knowledge of power plant equipment and processes.

Deregulation, competition, changes in workforce/demographics, attrition, environmental regulations, obsolescence and technological changes are posing enormous challenges for power plant owners. These challenges are not mutually exclusive and have adversely impacted capacity, availability and reliability and efficiency of power generating assets as well as total cost of ownership and return on investment.

This workshop discusses the challenges and solutions by harnessing three elements – people, process and technological tools – that are essential to understanding and addressing the new paradigm of doing more efficiently with less. It also examines the initiatives of several organizations in the power industry in addressing the various issues.

Workshop Highlights:

The Energy Picture

- Primary Energy Sources
- Current Energy Mix
- Life Cycle of Generating Assets
- Capacity Utilization/Changes

Challenges to Maximizing Performance of Power Generating Assets

- Age/Size/Mix of Power Generating Assets
- Workforce – Demographics, Attrition, Industry Participation
- Efficiency – Age, Fuel, Capacity Utilization, Environmental
- Environmental – Regulations, Compliance Considerations

Pre-Conference Workshops

- Economics – Fuel, Capital, O&M, Revenues
- Technology – Lack of Tools, Impact of Obsolescence/Advances, Workforce Issues
- Knowledge Management – Lack of Process, Tools & Techniques

Solutions to Maximizing Performance of Power Generating Assets
- People – Training, Mentoring, Incentivizing
- Power Plant Processes – Enhancing Understanding, Providing/Utilizing Tools, Training
- Technology – Utilizing Tools/Advances to Do More Efficiently with Less

Power Industry Initiatives in Maximizing Performance of Power Generating Assets
- American Society of Mechanical Engineers (ASME)
- Electric Power Research Institute (EPRI)
- North American Electric Reliability Corporation (NERC)/Generating Availability Data System (GADS)
- Department of Energy (DOE)/National Energy Technology Laboratory (NETL)
- International Atomic Energy Agency (IAEA)
- International Energy Agency (IEA)
- World Energy Council (WEC)
- World Nuclear Association (WNA)
- Others (Vendors, Research Organizations, Academia, Consultants)

Instructor:
Komandur Sunder Raj

Engineering Ethics in Action

Monday, June 26- 1:00 pm – 5:00 pm

Designed to meet continuing training requirements for practicing engineers, this workshop has been conducted more than 75 times at ASME conferences and industry locations across North America. This workshop is limited to 30 participants.

At the conclusion of this workshop, within a given area of technical competence, participants will be able to perform engineering duties in accordance with an engineering code of ethics. In support of this objective, participants will:

- Identify factors that can lead to unethical decision-making
- Apply an engineering code of ethics to a situation requiring ethical decision-making
- Analyze past & present situations that require ethical decision-making
- Draw conclusions about the engineer's role in the business world

This four-hour workshop features interactive discussion, a video presentation, and a focus on technical decisions that engineers must make in the workplace.

Instructor:
Andrew Taylor, P.E., senior manager in the Nuclear Power Technologies Group at Sargent & Lundy Corporation, is the lead for Second License Renewal projects.

ASME Turbo Expo & Power & Energy Exposition

Gain access to professionals in the power generation and turbomachinery fields from industry, R&D, academia and government over three days while showcasing your products and services and building your customer base.

Exposition Hall

Why Exhibit?

To gain access to professionals in the power generation and turbomachinery fields from industry, R&D, academia and government over three days while showcasing your products and services and building your customer base.

The 3-day exposition will be held June 27-29 in Charlotte, North Carolina with some value added activities to promote traffic! Daily lunches in the exhibit hall are included in the registration package for exhibit booth staff.

The events are known for their high-quality exhibitions of leading companies in the power and energy and turbomachinery industry. This is your chance to attract new clients, visit with current ones, learn more about the changing needs of the international power and turbomachinery industries—and ultimately, increase your sales.

ASME Power & Energy Conference brings together five of ASME's technical conferences on power generation, energy and energy sustainability. Power & Energy includes:

- ASME Power Conference—focused on the power industry's latest research, technical advances, development trends, and business strategies, including power plant operations, maintenance, performance, economics, regulatory compliance, and construction presented by a broad range of qualified power professionals.
- ASME Energy Sustainability Conference—focused on identifying innovative technologies, research and design advances, and solutions toward a path of renewable and other energy sustainability options, including utility-level integration.
- ASME Fuel Cell Conference—focused on fuel cell research and design, including practical and commercial applications from small-scale to utility-grade generation applications.
- ASME Energy Storage Forum—focused on introducing progressive research and commercial advances in energy storage technologies including utility-level storage options to mitigate system operator net load challenges and further advance renewable energy solutions.
- ASME Nuclear Forum—focused on the most recent developments in the nuclear power industry.

ICOPE (International Conference on Power Engineering), is co-sponsored by the Japan Society of Mechanical Engineers (JSME), the American Society of Mechanical Engineers (ASME) and the Chinese Society of Power Engineering (CSPE). ICOPE-17 is focused on both fundamental and applied topics in power engineering.

ASME Turbo Expo brings together, from around the world, the top players in the turbomachinery industry and academia—attracting a key audience from aerospace, power generation and other prime mover-related industries interested in sharing the latest in turbine technology, research, development, and application.

Together, Power & Energy, ICOPE, and Turbo Expo attract over 3,000 power and turbomachinery professionals.

Exposition Hall

Click here for online floor plan

Click here if you have questions

Exhibition Information

Secure your booth now for prime space availability and see how this co-located event can generate bottom-line results for your marketing dollars. Visit the online floor plan and reserve your booth today. Click on the desired booth space and select RESERVE BOOTH. You will then be prompted to complete an application. Contact igtiexpo@asme.org if you have any questions or issues with space selection.

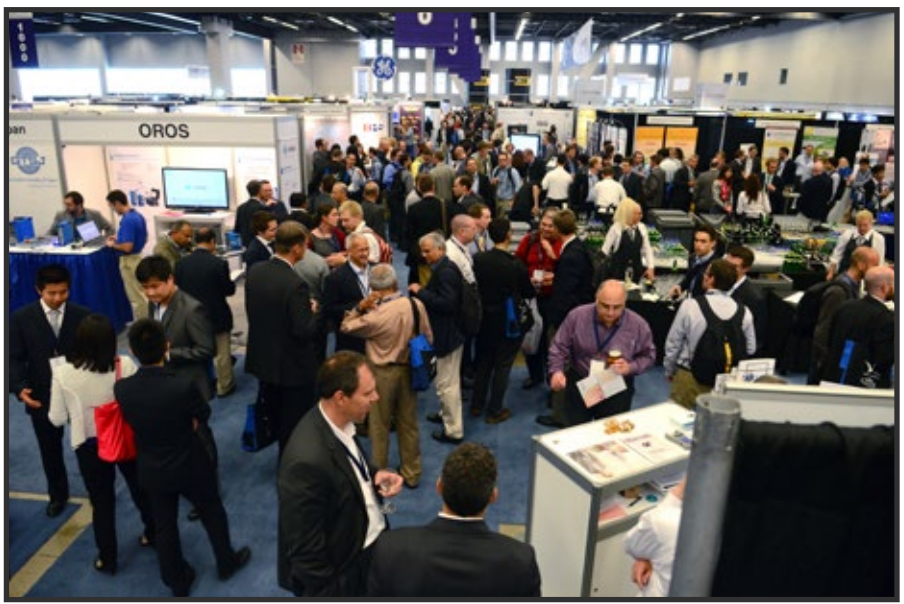
Booth Space Pricing:

Exhibit space rates in Charlotte, North Carolina:
Booth Space: $32.00 USD per square foot (For island or corner booths, add $2.00 USD per sq. ft.)

All exhibitors receive:

- Exhibit space with 8' black draped booth backdrop, 3' side dividers and booth sign
- 3 booth personnel badges per 100sf of exhibit space
  - Tuesday, Wednesday and Thursday exhibit hall lunch
  - Keynote and Opening Luncheon (RSVP required)
- Complimentary lead retrieval unit
- Free exhibit booth passes to share with customers and prospects
- Significantly discounted Technical Conference registration for company employees
- 15-word company listing in the printed Conference Program
- Discounted advertising opportunities
- Product category and company description in the online exhibitor directory

Stay ahead of the competition and meet your customers face to face.



Race Car Simulator

The Show will host Cordell Racing's NASCAR simulator during the exhibition this June 27-29, in Charlotte. The full sized simulated NASCAR is a great photo opportunity while in Charlotte at the exhibition; however, why not take a high speed spin around the track? If you are the fastest lap winner of the Conference, you will be awarded the Grand Prize - a pair of tickets to any NASCAR race in the United States. Just for racing, one lucky drawing winner will be awarded (1) NASCAR Racing Experience ride-along giveaway.

Be sure to come to the exhibition and visit with the exhibitors and try to be the fastest lap driver of ASME Turbo Expo – Power & Energy – ICOPE 2017!

Exhibitors

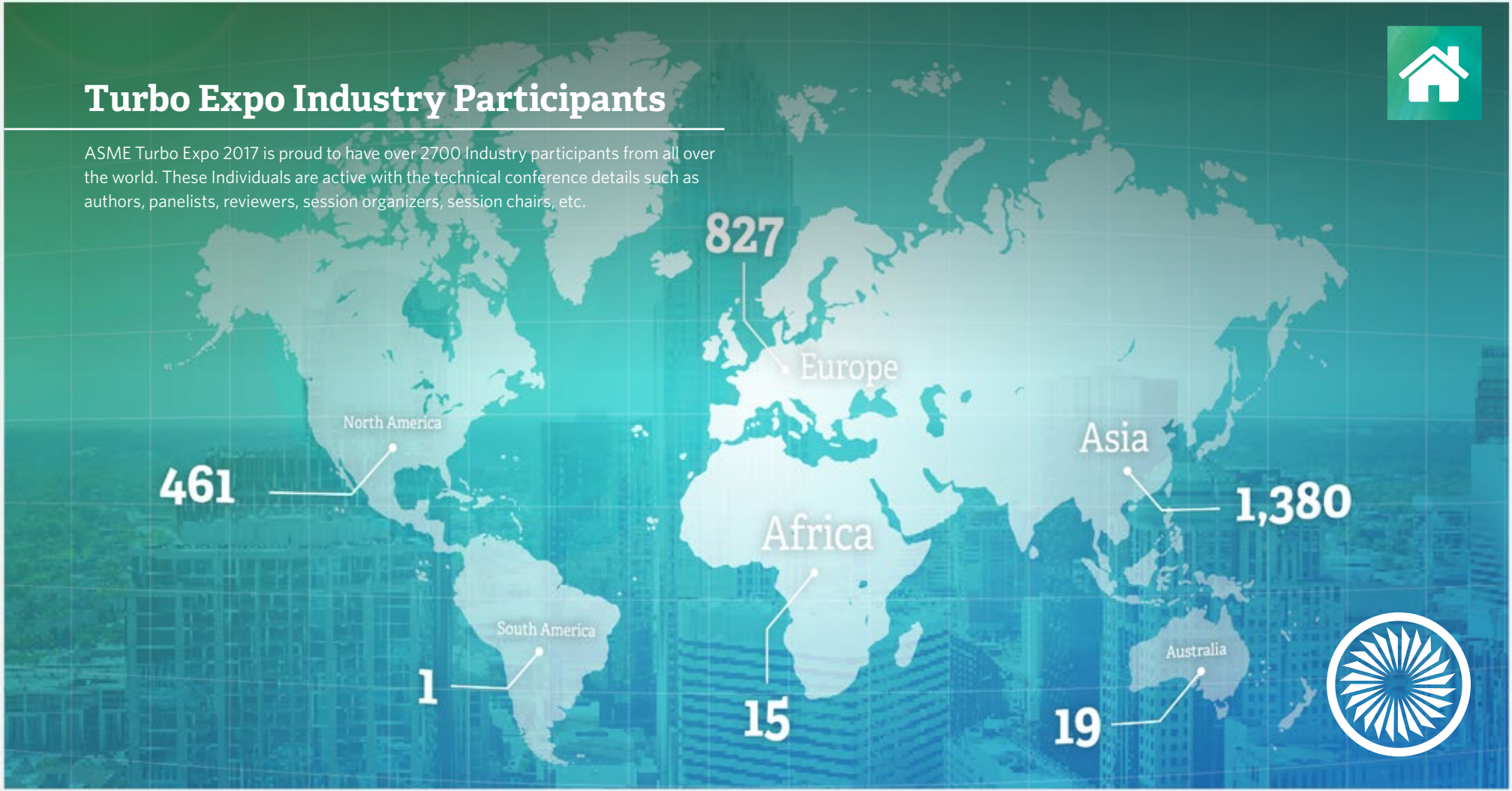
For a complete exhibitor list and floor plan, click here.

Click here if you have questions

4D Technology Corporation
A Shot of Texas Magazine
Advanced Design Technology Ltd.
Aerodyn
Aeroprobe Corporation
Aikoku Alpha Corp.
Alta Solutions, Inc.
American Society of Mechanical Engineers (ASME)
AneCom AeroTest GmbH
ANSYS
APEX Turbine Testing Technologies
Applied Flow Technology
ASME Turbo Expo
Babcock Power/TEi
Bosal
Calnetix Technologies
Cambridge Flow Solutions Ltd
Capture 3D, Inc.
Celeroton AG
CEROBEAR GmbH
CFturbo Software & Engineering GmbH
CleanAir Engineering
Combustion Science & Engineering
COMPRESSORtech2
Concepts NREC
Conco Services Corporation
Convergent Science, Inc
Cradle North America Inc
Creare LLC
Cross Manufacturing
Dassault Systèmes SIMULIA
Diesel & Gas Turbine Worldwide
E+A
Elsevier Science
EOS GmbH- Electro Optical Systems
EPRI
Extrude Hone
Flow Systems, Inc.
Flownex Simulation Environment
FOGALE nanotech
Franke Industrie AG
Gas Turbine Society of Japan
GE
Haynes International, Inc.
HGL Dynamics
IHI Ionbond AG
IfTA GmbH
Industrial Heating
Intelligent Light
IR Telemetrics, Inc.
Kawasaki Heavy Industries, Ltd.
Komax Systems, Inc.
Kulite Semiconductor Products, Inc.
LG Tech-Link Global, LLC
Liburdi Turbine Services Inc.
Mechanical Engineering Magazine
Mee Industries Inc.
MMP Technology
MTU Aero Engines
Muller-BBM Vbroakustik Systeme
National Aeronautics and Space Administration (NASA)
NORD-LOCK Inc.
NRC Aerospace
NUMECA International
OPRA Turbines BV
OROS
OSRAM
Parker Hannifin Corporation
PCA Engineers Limited
PCB Piezotronics, Inc.
Pentair Technical Solutions UK Ltd
Photron USA, Inc.
Pointwise, Inc.
Pollution Equipment News
Pratt & Whitney
Präwest Präzisionswerkstätten GmbH & Co. KG.
Precision Filters, Inc.
Prime Photonics, LC
První brnenská strojírna Velká Bíteš, a.s.
Quantum Technology Group (Singapore) Pte. Ltd.
Renishaw Inc
REM Surface Engineering
RetubeCo, Inc.
Scanivalve
Siemens
SmartUQ
SoftInWay Inc.
Sohre Turbomachinery Inc.
Southwest Research Institute
Strategic Power Systems, Inc.
Superheat FGH Services
TE Connectivity
Telemetrie Elektronik GmbH
Test Devices, Inc.
Thermal Wave Imaging
Torquemeters Ltd.
Turbocam International
Turbomachinery Laboratory
Turbostream Ltd
UNC Charlotte - EPIC
University of Notre Dame
University of Sheffield, The
Vacuum Process Engineering, Inc.
Versa Integrity Group
Vectoflow GmbH
Waukesha Bearings Corporation

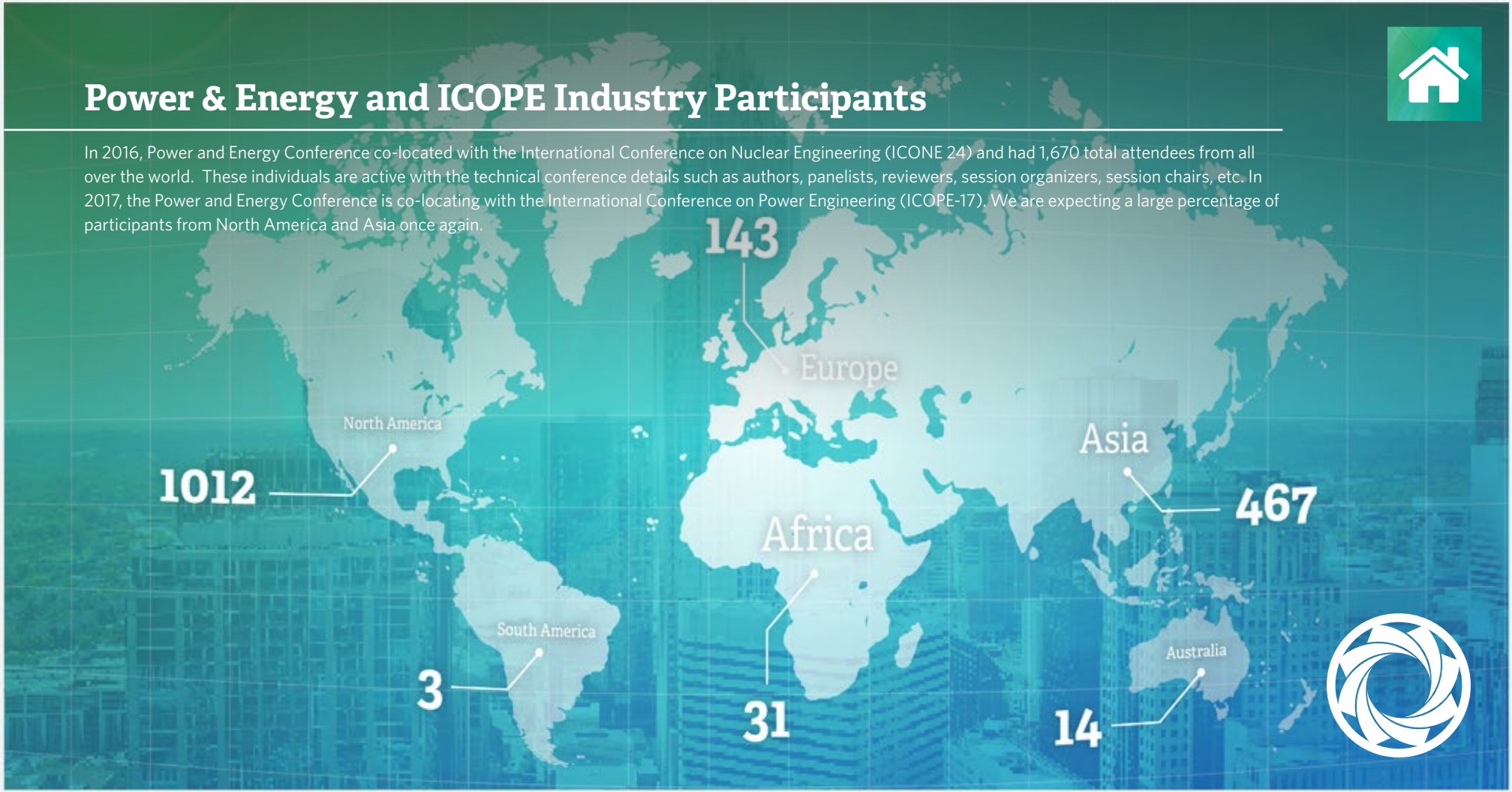
Turbo Expo Industry Participants

ASME Turbo Expo 2017 is proud to have over 2700 Industry participants from all over the world. These Individuals are active with the technical conference details such as authors, panelists, reviewers, session organizers, session chairs, etc.



Power & Energy and ICOPE Industry Participants

In 2016, Power and Energy Conference co-located with the International Conference on Nuclear Engineering (ICONE 24) and had 1,670 total attendees from all over the world. These individuals are active with the technical conference details such as authors, panelists, reviewers, session organizers, session chairs, etc. In 2017, the Power and Energy Conference is co-locating with the International Conference on Power Engineering (ICOPE-17). We are expecting a large percentage of participants from North America and Asia once again.



JOIN this SOCIAL EXPERIENCE!

ASME
SETTING THE STANDARD

FutureME Mini-Talks

Monday, June 26, 2017 - 4:00 -5:30PM

- Listen to 4 short mini-talks focused on energizing your career development
- Engage with the presenters; ask questions
- Meet-up with other engineers to network professionally
- Network like a Pro; bring plenty of business cards

Check us out at youtube.com/ASMEFutureME

Snacks and refreshments will be served and an Apple IPad mini 2 will be given away! (must be present to win)

Registration Information

Be sure to register for ASME Turbo Expo, Power & Energy, and ICOPE as soon as possible as rates will increase as the conference approaches. Continue reading to see full details on rates and benefits.

Registration

Technical Conference Registration

Includes:

- Access to every session in the Technical Conference
- Conference DVD
- Access to the Online Final Papers
- Professional Development Hours (PDHs) Certificate

Admission to the following networking events:

- Turbo Expo Keynote & Awards Program
  - Keynote Panel: Disruptive Technologies & Accelerating the Pace of Innovation in Gas Turbines, Monday, June 26
  - Plenary, Tuesday, June 27
  - Plenary, Wednesday, June 28
- Welcome Reception, June 26
- Daily Lunch, June 26 – 30
- Power & Energy Keynote, June 27
- Exhibition, June 27 – 29
- Exhibit Hall Receptions, June 27 – 28
- Opportunity to attend Facility Tours

REGISTRATION TYPE	Register by April 10	Register After April 10
ASME Member 5-Day	$850	$950
ASME Member 3-Day	$650	$775

The following may register at the discounted Member rate(s):

- ASME Members
- Point Contacts, Vanguard Chairs
- Session Chairs, Session Co-Chairs
- Authors, Presenters, Speakers (5-Day rate only)
- ASME IGTI Committee Members
- ASME Power and Energy Advisory Committee
- Members of Reciprocating or Participating Organizations

ASME Life Member 5-Day	$375	$425
Platinum Sponsor Employee 5-Day	$625	$725
Exhibiting Company Employee 5-Day	$665	$765
Non-Member 5-Day	$1,000	$1,100
Non-Member 3-Day	$675	$800
Student Member 5-Day	$375	$425
Student Non-Member 5-Day	$425	$475

Registration

Exhibition Personnel

Admission to the following networking events:

- Turbo Expo Keynote & Awards Program
- Keynote Panel: Disruptive Technologies & Accelerating the Pace of Innovation in Gas Turbines, Monday, June 26
- Plenary, Tuesday, June 27
- Plenary, Wednesday, June 28
- Welcome Reception, June 26
- Daily Lunch, June 26 – 30
- Power & Energy Keynote, June 27
- Exhibition, June 27 – 29
- Exhibit Hall Receptions, June 27 – 28
- Opportunity to attend Facility Tours

Registration Type	On or before April 10	After April 10
Booth Personnel Three (3) free badges per 100 sf of booth space	Free	Free
Additional Booth Personnel Booth purchase includes one technical conference badge per 100 sf of booth space.	$200	$200

Visitor/ Guest

- Admission to the following networking events:
  - Welcome Reception, June 26
  - Exhibition and Exhibition Receptions, June 27-29

Registration Type	On or before April 10	After April 10
Visitor/ Guest 3-Day	$150	$150

Registration

Pre-Conference Workshops

Turbo Expo workshop registration includes Presentation CD and Lunch

Registration Fees
All fees are in dollars ($US). Photo identification will be required for all badge pickups. Students will be required to provide student identification.

Additional Fees
Additional Lunch $50

Free ASME Membership
The following paid registrants will receive a free one-year ASME membership:
- Non-Member 5-Day/Non-Member 3-Day
- Student Non-Member 5-Day

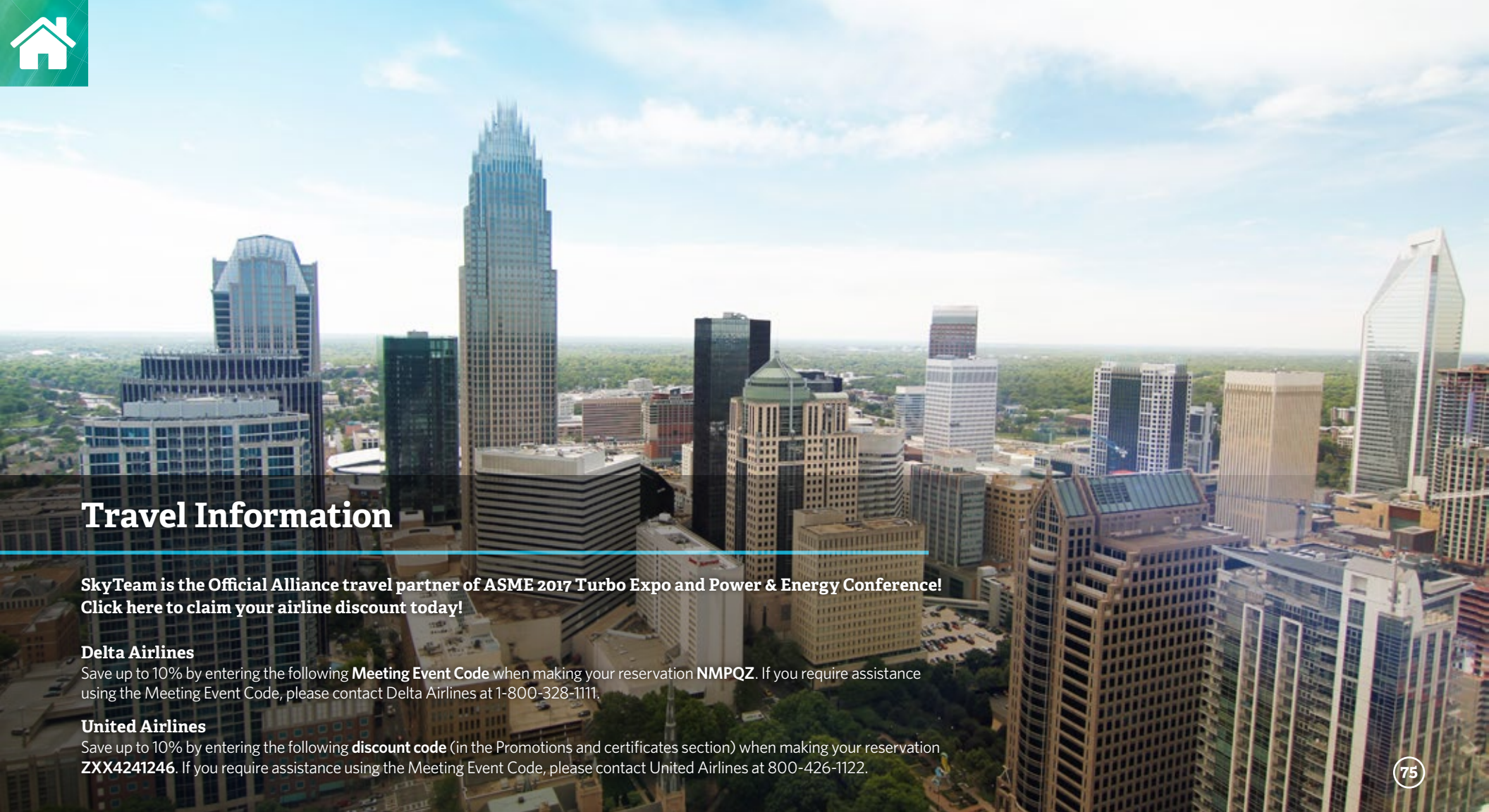
ASME will contact eligible registrants and invite them to join within 90 days after the conference.

Cancellation/Refund Policy
Cancellations received on or before May 26, 2017 will receive a full refund, less a $100 administration fee. No refunds will be granted after May 26, 2017. NO EXCEPTIONS. No-shows will not be eligible for refunds.

Visas and Letters of Invitation
You will be able to request your Conference Letter of Invitation during the Registration process.

Registration Inquiries:
Contact us at asme@orchideventsolutions.com

Sunday, June 25 8:00 am – 5:00 pm	**Register on or Before April 10**	**Register After April 10**
• High-Performance Aerodynamic Design of a Gas Turbine Exhaust Diffuser Leveraging CFD-Based Entropy Map • Gas Turbine Aerothermodynamics and Performance Calculations • Design, Operation and Maintenance Considerations for Cogeneration and Combined Cycle Systems • Uncertainty Quantification and Turbomachinery • Basic Gas Turbine Metallurgy and Repair Technology Workshop • Introduction to ISO 55000 Standard for Asset Management		
Member	$395	$495
Non-Member	$495	$595
Student Member	$250	$300
Student Non-Member	$275	$325
Life Member	$250	$300
Power & Energy Workshops Cost: $200 person (registration includes coffee break and lunch)		
• From Engineer to Manager: A Roadmap for a Successful Transition, Sunday, June 25 1:00 pm – 5:00 pm • Engineering Ethics in Action, Monday, June 26, 1:00pm- 5:00pm • Workshop on Evaporative Cooling for Power Plant Heat Rejection, Monday, June 26, 8:00am- 12:00pm • Challenges and Solutions to Maximizing Performance of Power Generating Assets, Monday June 26, 1:00pm- 5:00pm		



Travel Information

SkyTeam is the Official Alliance travel partner of ASME 2017 Turbo Expo and Power & Energy Conference! Click here to claim your airline discount today!

Delta Airlines

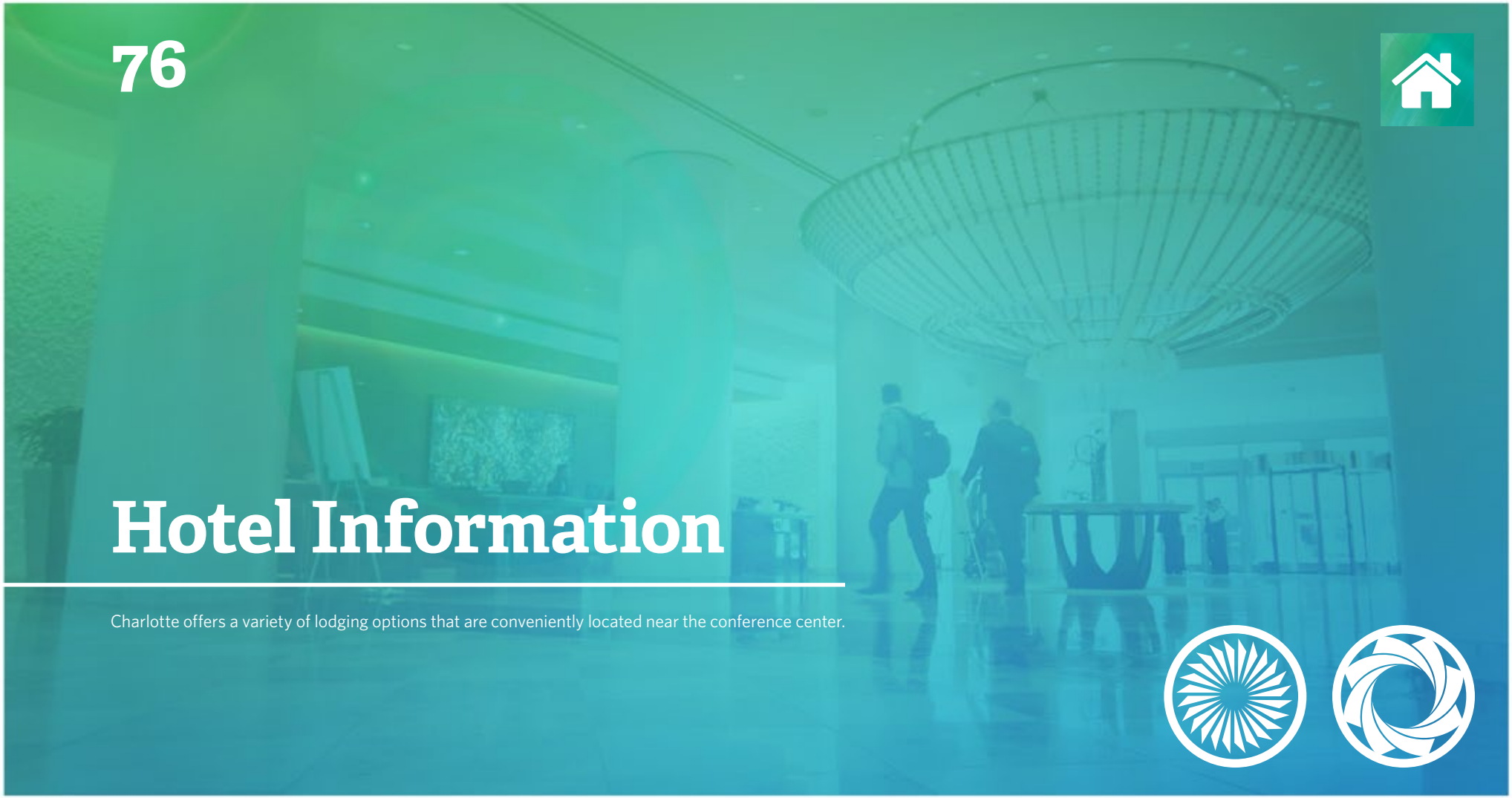
Save up to 10% by entering the following **Meeting Event Code** when making your reservation **NMPQZ**. If you require assistance using the Meeting Event Code, please contact Delta Airlines at 1-800-328-1111.

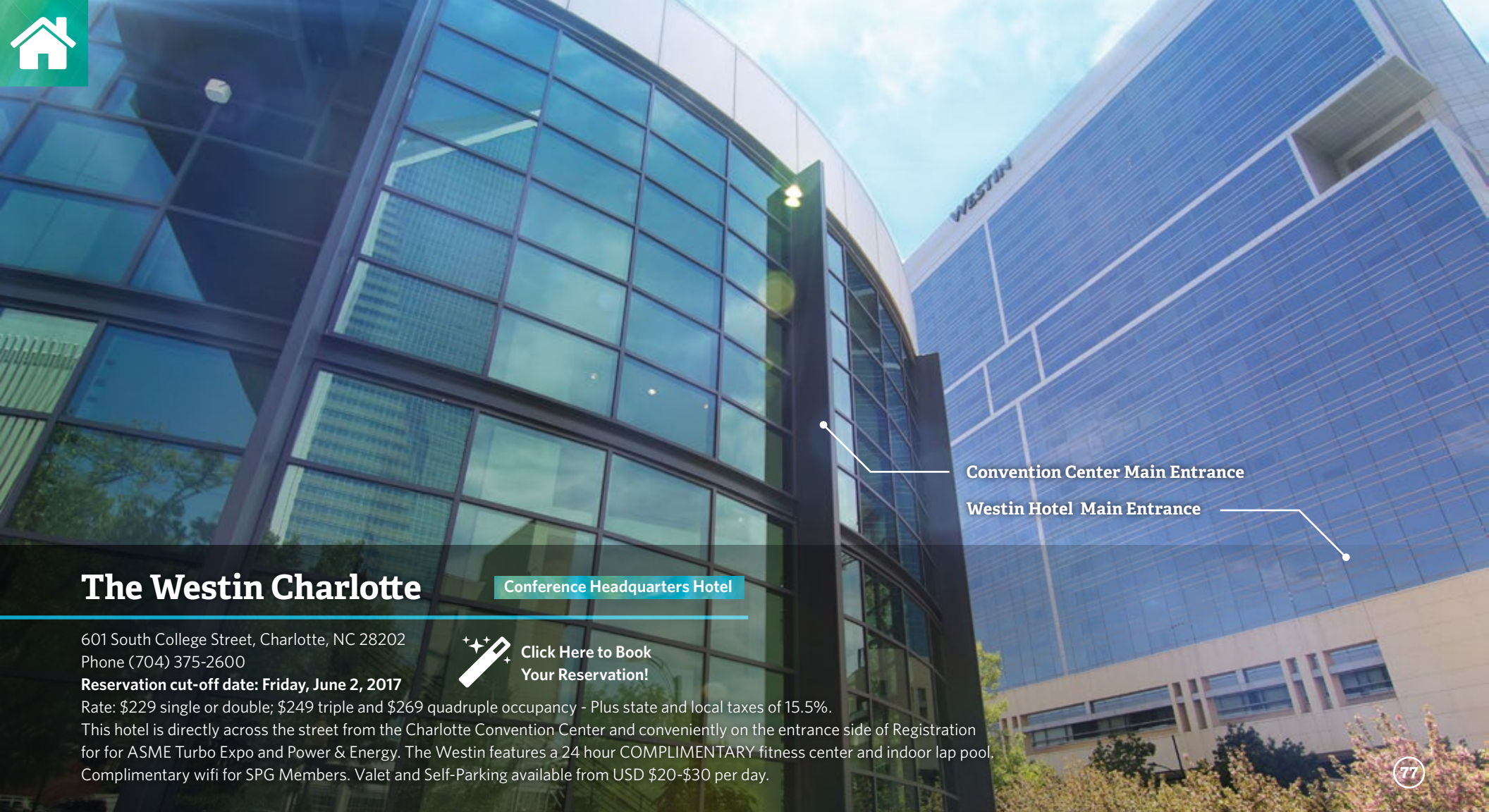
United Airlines

Save up to 10% by entering the following **discount code** (in the Promotions and certificates section) when making your reservation **ZXX4241246**. If you require assistance using the Meeting Event Code, please contact United Airlines at 800-426-1122.

Hotel Information

Charlotte offers a variety of lodging options that are conveniently located near the conference center.





The Westin Charlotte

Conference Headquarters Hotel

601 South College Street, Charlotte, NC 28202
Phone (704) 375-2600

Click Here to Book Your Reservation!

Reservation cut-off date: Friday, June 2, 2017

Rate: $229 single or double; $249 triple and $269 quadruple occupancy - Plus state and local taxes of 15.5%.
This hotel is directly across the street from the Charlotte Convention Center and conveniently on the entrance side of Registration for for ASME Turbo Expo and Power & Energy. The Westin features a 24 hour COMPLIMENTARY fitness center and indoor lap pool. Complimentary wifi for SPG Members. Valet and Self-Parking available from USD $20-$30 per day.

Hilton Charlotte Center City

222 East 3rd Street, Charlotte, NC 28202
Phone (704) 377-1500
Reservation cut-off date: Friday, June 2, 2017

Click Here to Book Your Reservation!

Rate: $219 single or double; $249 triple and $269 quadruple occupancy - Plus state and local taxes of 15.5%
The hotel is across the street from the Charlotte Convention Center. Self-Parking Fee: USD $18 per day; Valet Parking $25 for overnight valet. In/Out Privileges: Yes.

0.6 miles from Charlotte Convention Center (approximately 12 minute walk).

Le Méridien Charlotte

Click Here to Book Your Reservation!

555 South McDowell Street, North Tower, Charlotte, NC 28204
Phone (704) 372-9610
Reservation cut-off date: Saturday, June 3, 2017
Rate: $188 single or double; $203 triple and $218 quadruple occupancy - Plus state and local taxes of 15.25%
Complimentary WiFi for SPG Members. Complimentary shuttle to Charlotte Convention Center Monday-Friday; 7-9 am & 5-7 pm. Self-Parking Fee: USD $20 per night; Valet Parking $25 for overnight valet. In/Out Privileges: Yes.

Sheraton Charlotte

Click Here to Book Your Reservation!

555 South McDowell Street, South Tower, Charlotte, NC 28204
Phone 844-203-5029
Reservation cut-off date: Saturday, June 3, 2017
RRate: $164 single or double; $179 triple and $194 quadruple occupancy - Plus state and local taxes of 15.25%
Complimentary wifi. Complimentary shuttle to Charlotte Convention Center Monday-Friday; 7-9 am & 5-7 pm. Self-Parking Fee: USD $20 per night; Valet Parking $25 for overnight valet. In/Out Privileges: Yes.

ASME Turbo Expo Student News & Awards & Scholarships

Networking during the conference is an effective method of marketing that is used to build new business contacts through connecting with other like-minded individuals. Make sure you attend all of the networking opportunities during the event. Bring your business cards!

Student News

The Student Advisory Committee (SAC) is a group of students who work to foster student engagement in the IGTI community and improve the Turbo Expo conference every year. Toward this goal, the SAC organizes various sessions and events during the conference, provides opportunities for students to work behind the scenes with leaders in their technical area, and awards travel funds to eligible degree seeking individuals.

SAC Committee Members

Chair
Jacob Snyder, Penn State University

Secretary
Michelle Wood, University of Houston

Vice Chair
Zhiping Mao, Duke University

Past-Chair
Kathryn Kirsch, Penn State University

SAC Sessions at Turbo Expo

The sessions organized by the SAC during the technical conference are focused on professional development and are open to all conference attendees. In previous years, the SAC has curated panel sessions led by community leaders on Turbomachinery Careers and Networking, as well as tutorial sessions titled "Effective Technical Presentations", and "The Art of the Peer Review Process".

Poster Session

The Student Advisory Committee is once again sponsoring a student poster session at ASME Turbo Expo. Student posters will be on display on the main exposition floor on Tuesday, June 27th and on Wednesday, June 28th from 12:30 – 2:30 p.m. Be sure to stop by the poster session to see the results of their work and encourage them to become active in the ASME IGTI community.

Cash Prizes for Poster Session Winners

1st Place - $500
2nd Place – $250
People's Choice - $100

Technical Committee Student Liaison Application

Applications are now being accepted to join the student liaison subcommittee designed to encourage interaction between the Student Advisory Committee (SAC) and the ASME IGTI technical committees. The student will be expected to serve as a link between the SAC and the leadership of the technical committee to which they are assigned. The potential outcomes of this relationship include, but are not limited to, collaboration for future tutorial sessions at IGTI Turbo Expo, communication of ideas and announcements between the SAC and the technical committee, and opportunities for professional development.

Applicants for these positions must be students who are or, plan to be members of the SAC. The liaison will be expected to communicate directly with the leadership of the technical committee to which they are assigned.

Further, the liaison should be in attendance at the ASME IGTI Turbo Expo 2017 Conference in Charlotte, North Carolina USA. Because attendance at Turbo Expo may not be guaranteed, applicants should apply with the intention to attend Turbo Expo 2017. Communication with the SAC leadership team may be requested prior to, during, and following Turbo Expo. The service period will extend from April 1, 2017 to March 31, 2018.

To apply for a position as a liaison to the IGTI technical committees on behalf of SAC, please submit a resume or CV with the application to the SAC via email at sac.igti@gmail.com by March 1, 2017.

If several applicants desire to represent the same technical committee, the SAC leadership team will choose representatives based on the contents of this application. You will be notified of the status of your application by March 31, 2017.

Download the Application

Student News

Mini Talks and Info

Program- FutureME Mini-Talks
Monday, June 26 4:00 - 5:30 p.m.
Join the ASME Early Career Engineer Programming Committee and the ASME IGTI Student Advisory Committee for this social experience! You will have the opportunity to hear four short, relevant, and inspirational Mini-Talks given in an informal setting by experienced engineers sharing their perspective on career development.

In addition to the Mini-Talks, you can meet up with other mechanical engineers who have similar interests to network professionally, and make new connections with ASME leadership and/or renew past friendships. Bring plenty of business cards for networking!

Event Highlights
- Opportunity to get connected with fellow early career engineers
- Mini-Talks covering diverse topics relevant for early career engineer career development
- Ice cream will be served to create an informal setting for networking

Networking during the conference is an effective method of marketing that is used to build new business contacts through connecting with other like-minded individuals. Make sure you attend all of the networking opportunities during the event. Bring your business cards!

Awards & Scholarships

Young Engineer Turbo Expo Participation Award

The ASME Gas Turbine Segment Young Engineer Turbo Expo Participation Award (YETEP) is intended for young engineers at companies, in government service, or engineering undergraduate or graduate students in the gas turbine or related fields to obtain travel funding to attend ASME Turbo Expo to present a paper which they have authored or co-authored. The purpose is to provide a way for more to participate in the annual Turbo Expo.The nominee must have obtained an academic degree (Bachelor, Master, PhD, or equivalent degrees) in an engineering discipline related to turbomachinery within five years from the year of the Turbo Expo that the applicant wishes to attend. The research results the applicant wishes to present at the conference can have been obtained either while pursuing an academic degree, or afterwards (students, professionals or young academics are eligible).

For 2017, ASME IGTI will provide YETEP Award winners with:

- One Complimentary ASME Turbo Expo Technical Conference Registration
- Complimentary hotel accommodations (Sunday to Friday)
- Up to $2,000 toward approved travel expenses

Nomination deadline for ASME Turbo Expo 2017 - March 1, 2017:

Click Here for More Information

Awards & Scholarships

ASME IGTI Student Scholarship Program

ASME International Gas Turbine Institute has a long and proud history of providing scholarships to students who show promise for their future profession in the turbomachinery field. The aim is to attract young talent to the profession and reward their commitment, favoring their upcoming enrollment and active participation. ASME IGTI has supplied more than one million dollars to fund these scholarships over the years. The scholarship is to be used for tuition, books and other University expenses. The check will be made out to the University on the student's behalf. Student application deadline is June 15, 2017 for the 2017-2018 School Year. Scholarship winners will be notified by the end of October 2017. Scholarships will be dispersed in November.

Eligibility of the Applicants

The nominee must be pursuing an academic degree (Bachelor, Master, PhD, or equivalent degrees) in an engineering discipline related to turbomachinery. Students must be currently registered at an accredited university (either U.S. or international). The university must have a gas turbine program of some type and only requires that a gas turbine or power course that has significant gas turbine content be offered.

Application Requirements

The application package must contain:

1. A succinct motivational letter (max 1 page) illustrating reasons that should lead to a positive decision by the selection committee;
2. The application form listing the data allowing to assess the eligibility of the applicant, duly signed; and the IRS Foreign W8BEN Form (if a non-US citizen)
3. A nomination form and recommendation letter by the applicant's academic supervisor, or by an industry professional involved in his/her studies. Student should follow up with nominator to confirm the packet has been sent to ASME.
4. Any other document the applicant wishes to attach in order to support the application. (Proof of awards and honors, memberships in honorary or professional societies showing offices held, extra-curricular activities, etc.)

Click Here for More Information

Student Advisory Committee Travel Award

The Student Advisory Committee (SAC) represents the interest of the students who attend Turbo Expo and serves as a student-specific liaison to the Gas Turbine Segment Leadership Team. The Committee will engage students by creating student-oriented programs at ASME Turbo Expo, such as poster presentation, tutorial sessions and activities that facilitate student interaction and networking with turbomachinery professionals. This year the SAC is sponsoring up to 20 travel awards for students who actively contribute to the growth of the committee. The awards are reimbursement awards that cover up to $2,000 of travel expenses for the recipients.

To apply for the Student Advisory Committee (SAC) travel award, please submit all documents in one PDF file to sac.igti@gmail.com by March 1, 2017. All applicants will be notified of the decision on their application by March 31, 2017.

Click Here for More Information

ASME Turbo Expo & Power & Energy Leadership

ASME Turbo Expo, Power & Energy, and ICOPE would not be possible without the dedication of the conference leadership.

ASME Turbo Expo Leadership

ASME Gas Turbine Segment Leadership Team

Piero Colonna
Segment Leader
Delft University of Technology

Tim Lieuwen
Representative
Georgia Institute of Technology

Jaroslaw Szwedowicz
Vice Leader
GE, Power Services

Richard Dennis
Member
NETL, Office of Fossil Energy (FE)
U.S. Department of Energy (DOE)

Anestis Kalfas
Member
Aristotle University of Thessaloniki

Ruben Del Rosario
Advisor
NASA

James Maughan
Member
GE Global Research

Hany Moustapha
Member
École de Technologie Supérieure

Karen Thole
Advisor
Pennsylvania State University

Local Liaison Committee

Chair
Brian Maragno
Siemens

Neil Breedlove
Atlas Copco Compressors LCC

David Causey
UNCC EPIC

Tom Christiansen
Strategic Power Systems, Inc.®

Sal DellaVilla
Strategic Power Systems, Inc.®

Tom Eshelman
Atlas Copco Compressors LCC

Peter Kyriacopoulos
Atlas Copco Compressors LCC

Bobby Noble
Electric Power Research Institute

Brian Tribble
Liburdi Turbine Services, Inc.

Katie Wilson
Siemens

Lindsay Yontz
Atlas Copco Compressors LCC

Lynne Bellizzi
Strategic Power Systems, Inc.

ASME Turbo Expo Leadership

2017 Turbo Expo Organizing Committee

Executive Conference Chair
Paul Garbett, Siemens Energy, Inc.

Review Chair
Zolti Spakovzsky, Massachusetts Institute of Technology

Vice Review Chair
Alberto Traverso, University of Genova

Local Liaison Chair
Brian Maragno, Siemens Charlotte Energy Hub

Conference Chair
Mark Turner, University of Cincinnati

Vice Review Chair
Patricia Cargill, GE Aviation

Exhibitor Representative
Dave Pincince, TURBOCAM International

Technical Program Chair
Ray Chupp, REC Consulting, LLC

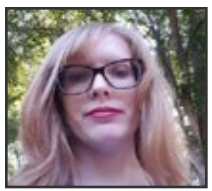
Vice Review Chair
Nirm Nirmalan, GE Aviation

Gas Turbine Segment Liaison
Tim Lieuwen, Georgia Institute of Technology

ASME Power & Energy Leadership

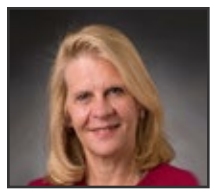
Energy Conversion and Storage Segment

Eduardo J. Barrientos
Segment Leader
General Motors (GM) Global Propulsion Systems



Jennifer Seals Cooper
Member
RCP, Inc.

Frank Michell
Representative
American Electric Power, (AEP)



Karen A. Thole
Member
Pennsylvania State University

Asif Arastu
Member
Unisont Engineering

Ralph S. Hill III
Member
Westinghouse Consulting Engineer

Christopher Rahn
Member
Penn State University

Antonio Bula
Member
Universidad del Norte

Timothy Jacobs
Member
Texas A&M University

Christian Sattler
Member
German Aerospace Center

ASME Power & Energy Leadership

P & E Executive Advisory Committee

Chair
Frank L. Michell, American Electric Power (AEP)

ESC Technical Program Co-Chair
Sophia Haussener, (EPFL)

ESC Technical Program Co-Chair
Hohyun Lee, Santa Clara University

Nuclear Forum Chair
Jovica Riznic, Canadian Nuclear Safety Commission

Nuclear Forum Co-Chair/NED Chair
Bob Stakenborghs, ILD/Evisive

Co-Chair
Jason Lee, Babcock Power

ESC Technical Program Co-Chair
Reza Baghaei Lakeh, Cal Poly Pomona

FCC Technical Program Chair
Partha Mukherjee, Texas A&M University

ESC Technical Program Co-Chair
Keith Sharp, University of Louisville

Advisory Committee Member & Turbo Expo Liaison
Mark Turner, University of Cincinnati

ESC Chair
Robert Braun, Colorado School of Mines

ESC Technical Program Co-Chair
Mark Lausten, US Department of Energy

FCC Chair
George Nelson, University of Alabama Huntsville

ESC Technical Program Co-Chair
Amanda Smith, University of Utah

Advisory Committee Member
Mansour Zenouzi, Wentworth Institute of Technology

ASME Power & Energy Leadership

Energy Storage Forum

Conference Chair
Gregory Jackson, Colorado School of Mines

Conference Co-Chair
Mark Lausten, U.S. Department of Energy

International Conference on Energy Sustainability

Conference Chair
Robert Braun, Colorado School of Mines

Conference Co-Chair
Mark Lausten, U.S. Department of Energy

Technical Program Co-Chair
Hohyun Lee, Santa Clara University

Technical Program Co-Chair
Reza Baghaei Lakeh, California State Polytechnic University, Pomona

Technical Program Co-Chair
Amanda Smith, University of Utah

Technical Program Co-Chair
Keith Sharp, University of Louisville

Technical Program Co-Chair
Sophia Haussener, RPFL

Fuel Cell Science, Engineering, and Technology Conference

Conference Chair
George Nelson, University of Alabama in Huntsville

Technical Program Co-Chair
Partha Mukherjee, Texas A&M University

Power Conference

Conference Chair
Michael Smiarowski, Siemens Energy Inc.

Technical Program Chair
Steven Greco, We Energies

Nuclear Forum

Conference Chair
Robert Stakenborghs, ILD Power

Conference Co-Chair
Jovica Riznic, Canadian Nuclear Safety Commission

ICOPE Conference

Conference Co-Chair
Motonari Haraguchi, Mitsubishi Hitachi Power

Conference Co-Chair
Mingjiang Ni, Zhejiang University

Technical Program Co-Chair
Tomohiro Asai, Mitsubishi Hitachi Power

Technical Program Co-Chair
Takao Nakagaki, Waseda University

Technical Program Co-Chair
Yuso Oki, Criepi

Technical Program Co-Chair
Fei Wang, Institute for Thermal Power Engineering Zhejiang University

Sponsorship Information

Take control of your company's exposure before, during and after the event. Featuring a variety of sponsorship opportunities designed to maximize your company's visibility, the co-located event sponsorship program provides even more ways to stand out from the crowd and make the most of your budget. Additional opportunities can be found at **https://www.asme.org/events/turbo-expo/sponsor-exhibit.**

Sponsorship Information

Click here for more information

Take control of your company's exposure before, during and after the event. Featuring a variety of sponsorship opportunities designed to maximize your company's visibility, the co-located event sponsorship program provides even more ways to stand out from the crowd and make the most of your budget. Additional opportunities can be found at **https://www.asme.org/events/turbo-expo/sponsor-exhibit.**

All Sponsors receive recognition:
- On the official Show website
- In the Advance and Final Programs
- On signage posted during the Show
- In announcements made during the Show
- In the GGTN reaching over 135,000 ASME members

Download the Application for Sponsorship >>
Download the Advertising Form >>

PLATINUM CLUB: $20,000
- Reduced exhibit space rate by 10%
- Five 5-day Technical Confe rence badges
- Special discounted Technical Conference registration rate for employees
- Company provided banner prominently displayed during the Show
- Sponsorship ribbons for badges
- Opportunity to include material in attendee bags (material provided by sponsor)
- Full-page, 4-color ad in the online advance program & printed conference final program
- Sponsorship sign for booth
- Exhibit booth cleaning during Show

GOLD CLUB: $15,000
- Reduced exhibit space rate by 7%
- Four 5-day Technical Conference badges
- Half-page, 4-color ad in the online advance program & printed conference final program
- Sponsorship sign for booth
- Opportunity to include material in attendee bags (material provided by sponsor)
- Sponsorship ribbons for badges
- Exhibit booth cleaning during Show

SILVER CLUB: $10,000
- Reduced exhibit space rate by 5%
- Three 5-day Technical Conference badges
- Quarter-page, 4-color ad in the online advance program & printed conference final program
- Sponsorship sign for booth
- Sponsorship ribbons for badges
- Exhibit booth cleaning during Show

BRONZE CLUB: $5,000
- Reduced exhibit space rate by 2%
- Two 5-day Technical Conference badges
- Quarter-page, 4-color ad in the online advance program & printed conference final program
- Special sign for booth
- Sponsorship ribbons for badges
- Exhibit booth cleaning during Show

Sponsors

Platinum

Rolls-Royce

Women in Engineering

Silver

ANSYS

Pratt & Whitney
A United Technologies Company

Bronze

NUMECA INTERNATIONAL

SIEMENS

Solar Turbines
A Caterpillar Company

Additional

DRESSER-RAND
A Siemens Business

TURBOCAM INTERNATIONAL

Concepts NREC
The Experts in Turbomachinery

Supporting Publications & Participating Organizations

Technical Tours

EPRI & UNCC EPIC

Friday, June 30 8:00 am – 1:00 pm

EPRI is providing a tour of its material and NDE test labs located in its Charlotte, North Carolina office complex. These facilities are utilized by our researchers and members in R&D to solve current and future challenges in the gas turbine power generation industry. The tour will also visit the University of North Carolina at Charlotte's (UNCC) Energy Production & Infrastructure Center, which features state-of-the-art test labs focusing on smart grid integration, manufacturing of large parts, production of photovoltaics, and flexible voltage energy systems. Both campuses are approximately 20 minutes from the convention center. Transportation: Bus transportation provided Lunch: Lunch provided

Schedule:

08:00	Depart Charlotte Convention Center
08:30	Arrive at UNCC EPIC
09:45	Depart UNCC
10:00	Arrive at EPRI
11:30	Lunch at EPRI
12:30	Depart EPRI
13:00	Arrive at Charlotte Convention Center

Tour participation is subject to review by EPRI & UNCC
Advance registration will be required. This tour caps at 40 attendees.

SIEMENS

Thursday, June 29, 2017 | 8:00am- 12:00pm
Bus departs at 8:00am (arrive for loading at 7:45am)

SIEMENS

Siemens in Charlotte is one of the lead facilities in the company's global manufacturing network and serves as the worldwide hub for Siemens 60 Hz large power generating equipment. Opened in 1969, the facility has manufactured and serviced generators and steam turbines for the power generation market for decades. In November 2011, the facility celebrated the opening of a new expansion, adding gas turbine production and service capabilities. The new Gas Turbine facility was designed based on LEAN manufacturing principles and is certified to U.S. LEED Gold green building standards. With its current workforce of 1,600 and more than one million square feet of space under roof, Siemens Energy in Charlotte has become one of the largest manufacturers in the city and also one of the largest among the 250+ Energy companies based in Charlotte. Tour participants will see the manufacturing and servicing of large gas turbines, large steam turbines, and generators. The tour will also cover various aspects of the Siemens Charlotte operation, including its focus on lean manufacturing concepts, workforce development, and more.

Tour participants must wear flat, hard soled, closed shoes. Business flats, running shoes, or hiking shoes with a hard sole are fine. Steel- or composite-toed safety shoes are also fine. Siemens will provide safety glasses. All tour participants must be fully mobile in the event of an emergency.

Tour participation is subject to review by Siemens Energy, Inc.
Advance registration will be required. This tour caps at 55 attendees.

Technical Tours

Universal Technical Institute/ NASCAR Technical Institute

Monday, June 26, 2017 | 10:00 am – 1:00 pm (lunch available for purchase)
Depart Charlotte Convention Center at 9:15 am, Marin Luther King Jr. exit

Headquartered in Scottsdale, Arizona, Universal Technical Institute, Inc. is the leading provider of post-secondary education for students seeking careers as professional automotive, diesel, collision repair, motorcycle and marine technicians. With more than 190,000 graduates in its 50-year history, UTI offers undergraduate degree and diploma programs at 11 campuses across the United States, as well as manufacturer-specific training programs at dedicated training centers. Through its campus-based school system, UTI provides specialized post-secondary education programs under the banner of several well-known brands, including Universal Technical Institute (UTI), Motorcycle Mechanics Institute and Marine Mechanics Institute (MMI) and NASCAR Technical Institute (NASCAR Tech). The Mooresville, NC NASCAR Technical Institute campus is the exclusive education provider of NASCAR technician training.

During the tour, participants will have the opportunity to tour the classrooms and labs at the facility, and participate in two workshops: pit crew and chassis dyno demonstrations. Tour participants must wear closed-toed shoes and safety glasses, NASCAR Tech will provide safety glasses. Photography and video are permitted on campus.

Turbo Expo Schedule at a Glance

Sunday June 25	Monday June 26	Tuesday June 27	Wednesday June 28	Thursday June 29	Friday June 30
GT Workshops 8:00 am – 5:00 pm	**Registration** 7:00 am – 7:00 pm	**Registration** 7:00 am – 6:30 pm	**Registration** 7:00 am – 6:30 pm	**Registration** 7:00 am – 5:30 pm	**Registration** 7:00 am – 3:00 pm
	Speaker Ready Room 7:00 am – 5:30 pm	**Speaker Ready Room** 7:00 am – 5:30 pm	**Speaker Ready Room** 7:00 am – 5:30 pm	**Speaker Ready Room** 7:00 am – 5:30 pm	**Speaker Ready Room** 7:00 am – 3:30 pm
	Session Participant Networking Coffee 7:00 – 7:45 am	**Session Participant Networking Coffee** 7:00 – 7:45 am	**Session Participant Networking Coffee** 7:00 – 7:45 am	**Session Participant Networking Coffee** 7:00 – 7:45 am	**Session Participant Networking Coffee** 7:00 – 7:45 am
	Conference Sessions 8:00 – 10:00 am	**Conference Sessions** 8:00 – 10:00 am	**Conference Sessions** 8:00 – 10:00 am	**Conference Sessions** 8:00 – 10:00 am	**Conference Sessions** 8:00 – 10:00 am
Gas Turbine Segment Meeting 1:00 – 5:00 pm **Registration** 7:00 am – 7:00 pm	**Opening Session: Turbo Expo Keynote Panel & Awards Program** 10:15 am – 12:15 pm	**Coffee Break** 10:00 – 10:15 am	**Coffee Break** 10:00 – 10:15 am	**Coffee Break** 10:00 – 10:15 am	**Coffee Break** 10:00 – 10:15 am
Speaker Ready Room 1:00 – 6:00 pm		**Conference Sessions** 10:15 - 11:45 am	**Conference Sessions** 10:15 - 11:45 am	**Conference Sessions** 10:15 am - 12:15 pm	**Conference Sessions** 10:15 am - 12:45 pm
Council of Chairs Meeting 6:00 – 7:30 pm		**Multidisciplinary Computations and Optimization in Gas Turbine Design** 11:50 am – 12:45 pm	**Disruptive Technologies and Accelerating Innovation in Gas Turbines: The Role of Additive Manufacturing** 11:50 am – 12:45 pm	**Expo Open** 11:30 am – 2:30 pm	
	Opening Lunch 12:30 – 2:30 pm	**Expo Open** 12:30 – 6:30 pm	**Expo Open** 12:30 – 6:30 pm	**Expo Lunch | 12:30 – 2:30 pm** **Closing Ceremony | 1:45 pm**	**Closing Lunch** 12:30 – 2:30 pm
	Conference Sessions 2:30 – 5:30 pm	**Expo Lunch** 12:30 – 2:30 pm **Poster Session** 12:30 – 2:30 pm	**Expo Lunch** 12:30 – 2:30 pm	**Conference Sessions** 2:30 – 5:30 pm	**Conference Sessions** 2:30 – 5:30 pm
	FutureME Mini-Talks 4:00 – 5:30 pm	**Conference Sessions** 2:30 – 5:30 pm	**Conference Sessions** 2:30 – 5:30 pm		
	Scholar Lecture 5:45 – 7:00 pm	**Expo Hall Reception** 5:00 – 6:30 pm	**Expo Hall Reception** 5:00 – 6:30 pm		
	Welcome Reception **Turbo Expo, Power & Energy, ICOPE** 7:00 – 8:30 pm | NASCAR Hall of Fame	**Committee Meetings** 6:00 – 7:30 pm	**Committee Meetings** 6:00 – 7:30 pm	**Committee Meetings** 6:00 – 7:30 pm	

Power & Energy and ICOPE Schedule at a Glance

Sunday June 25	Monday June 26	Tuesday June 27	Wednesday June 28	Thursday June 29
Registration 7 am – 7 pm	**Registration** 7 am – 7 pm	**Registration** 7 am – 7 pm	**Registration** 7 am – 7 pm	**Registration** 7 am – 7 pm
Power & Energy/ICOPE Workshops **From Engineer to Manager: A Roadmap for a successful Transition** 1:00pm – 5:00pm	**Author Breakfast** 7 am – 7:45 am	**Author Breakfast** 7 am – 7:45 am	**Author Breakfast** 7 am – 7:45 am	**Author Breakfast** 7 am – 7:45 am
Power Division Committee Meetings **TBA**	**Technical Tours – NASCAR Technical Institute** 10:00am- 1:00pm **Power & Energy/ICOPE Workshops** **Workshop on Evaporative Cooling for Power Plant Heat Rejection** 8:00am- 12:00pm **Challenges and Solutions to Maximizing Performance of Power Generating Assets** 1:00pm- 5:00pm **Engineering Ethics in Action** 1:00pm- 5:00pm	**Power & Energy/ICOPE Keynote** 9 am – 10:30 am	**Power & Energy/ICOPE Conference-Specific Plenary Sessions** 9 am – 10:30 am	**Power & Energy/ICOPE Conference-Specific Plenary Sessions/Technical Sessions/Power Division Committee Meetings** 9 am – 10:30 am **SIEMENS** 8:00am- 12:00pm
	Power & Energy/ICOPE Technical Sessions, & Workshops 9 am – 10:30 am	**Refreshment Break** 10:30 am – 11 am	**Refreshment Break** 10:30 am – 11 am	**Refreshment Break** 10:30 am – 11 am
	Refreshment Break 10:30 am – 11 am	**Power & Energy/ICOPE Technical Sessions** 11 am – 12:30 pm	**Power & Energy/ICOPE Technical Sessions** 11 am – 12:30 pm	**Power & Energy/ICOPE Technical Sessions** 11 am – 12:30 pm
	Power & Energy/ICOPE Technical Sessions 11 am – 12:30 pm	**Lunch** 12:30 pm – 2:00 pm	**Lunch** 12:30 pm – 2:00 pm	**Expo OPEN** 11:30 am – 2:30 pm
	Lunch 12:30 pm – 2:00 pm	**Expo OPEN** 11:30 am – 2:30 pm	**Expo OPEN** 11:30 am – 2:30 pm	**Expo OPEN** 11:30 am – 2:30 pm

Power & Energy and ICOPE Schedule at a Glance

Sunday June 25	Monday June 26	Tuesday June 27	Wednesday June 28	Thursday June 29
	Power & Energy/ICOPE Technical Sessions 2 pm – 3:30 pm	**Power & Energy/ICOPE Technical Sessions** 2 pm – 3:30 pm	**Power & Energy/ICOPE Technical Sessions** 2 pm – 3:30 pm	**Power & Energy/ICOPE Technical Sessions** 2 pm – 3:30 pm
	Refreshment Break 3:30 pm – 3:45 pm	**Refreshment Break** 3:30 pm – 3:45 pm	**Refreshment Break** 3:30 pm – 3:45 pm	**Refreshment Break** 3:30 pm – 3:45 pm
	Power & Energy/ICOPE Technical Sessions, & Workshops 3:45 pm – 5:15 pm	**Power & Energy/ICOPE Technical Sessions, & Workshops** 3:45 pm – 5:15 pm	**Power & Energy/ICOPE Technical Sessions, & Workshops** 3:45 pm – 5:15 pm	**Power & Energy/ICOPE Technical Sessions, & Workshops** 3:45 pm – 5:15 pm
	Power & Energy/ICOPE/Turbo Expo Welcome Reception 7:00 pm – 8:30 pm at NASCAR Hall of Fame	**Power & Energy/ICOPE/Turbo Expo Exhibitor Reception** 5:00 pm – 6:30 pm	**Power & Energy/ICOPE/Turbo Expo Exhibitor Reception** 5:00 pm – 6:30 pm	
		Energy Sustainability/Fuel Cell Awards Banquet 7:00 pm – 10:00pm Cabarrus Brewery	**Power & Energy/Turbo Expo ECE/ Student Mixer** 6:45 pm – 8 pm	
		Power Division Awards Banquet **7:00 pm – 10:30pm** The Speedway Club at Charlotte Motor Speedway	**Advanced Energy Systems Division/ Solar Energy Division Committee Meetings**	
		Women in Engineering Dinner 7:45 pm – 10:30 pm		

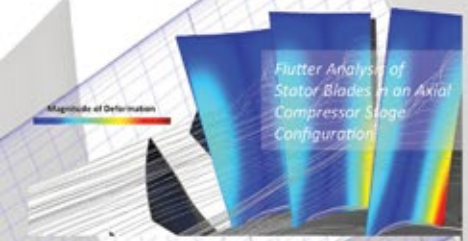
NUMECA's INTEGRATED SOFTWARE ENVIRONMENT FOR TURBOMACHINERY ANALYSIS, DESIGN AND MULTIDISCIPLINARY OPTIMIZATION, INCLUDING UNCERTAINTY QUANTIFICATION

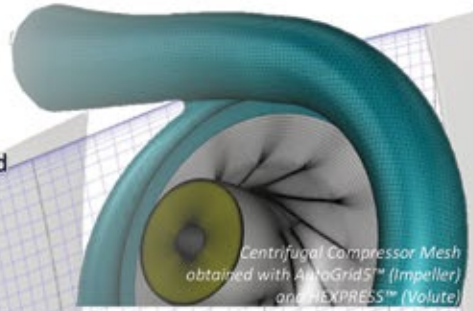
NUMECA INTERNATIONAL

AUTOGRID5™ - The reference for high quality and automatic turbomachinery meshing

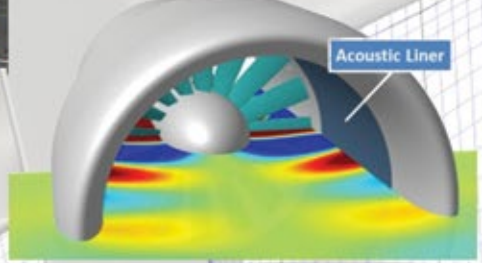
Ultra-fast CFD solvers using **CPU BOOSTER™** technology, **NONLINEAR HARMONIC APPROACH**, and **HPC SCALABILITY** for unsteady simulations with **FINE™/Turbo** and **FINE™/Open with OpenLabs**

FLUTTER ANALYSIS - Coupling of Modal Approach and Nonlinear Harmonic Method



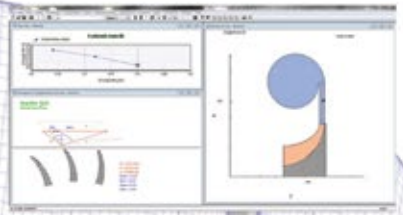


FINE™/ACOUSTICS - The first fully CFD integrated environment dedicated to aero-vibro-acoustic simulations

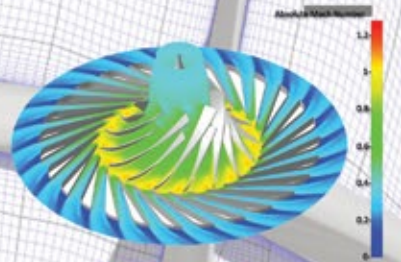


FINE™/AGILE - From preliminary and detailed design to full 3D steady and unsteady CFD in the most accurate environment on the market

MEANLINE DESIGN* for all major turbomachinery configurations

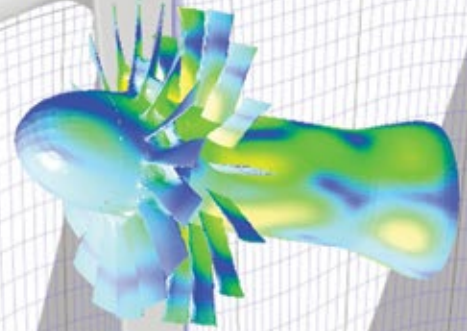


Detailed 3D design for geometry and blading using **AXCENT®**, including throughflow, 2D blade to blade and streamline curvature calculation.



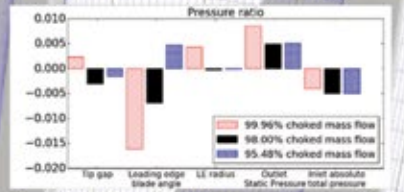
Seamless integration with **FINE™/Design3D** for optimization and our unique **UNCERTAINTY QUANTIFICATION** module

(*) COMPAL™, PUMPAL™, RITAL™, FANPAL™, AXIAL™



UNCERTAINTY QUANTIFICATION -

The first industrial module for operational and geometrical uncertainty quantification



Sensitivity of solution with respect to uncertainties