ASME® POWER 2021

Power Conference

CONFERENCE
July 20–22, 2021

Virtual, Online

Program

https://event.asme.org/POWER

The American Society of Mechanical Engineers®
ASME®

ASME®
SETTING THE STANDARD

ASME 2021 POWER CONFERENCE ORGANIZING COMMITTEE

Conference Chair

Steven Greco
Retired

Technical Program Chair

George Mesina
Idaho National Laboratory

Technical Program Co-Chair

Navid Goudarzi
University of Maryland

Student Programs Coordinator

André Teixeira
EDP

POWER COMMITTEE MEMBERS

Chair

Steven Greco
Retired

Vice Chair

Tina Toburen
T2E3, Inc. - Energy Efficiency Enterprises

Secretary/Treasurer

Brian Wodka
RMF Engineering

Members

Navid Goudarzi,
University of Maryland

Jane Hutt,
National Electric Coil

Jason Lee, *P.E.,*
Riley Power Inc.

George Mesina,
Idaho National Laboratory

Frank Michell, *Retired*

André Teixeira, *EDP*

Welcome to the ASME 2021 Power Conference!

The ASME Power Conference is an annual event brought to you by the Power Division, one of ASME's largest technical divisions. The Division has put together a great program of peer-reviewed technical papers presented by the authors along with presentations from others industry professionals sharing their experiences with you.

Our conference with be virtual again this year due to the Coronavirus pandemic. We had a very successful first ever virtual conference last year. We are anticipating and looking forward to having some form of an in-person conference next year.

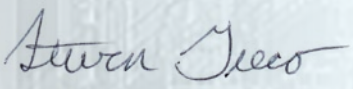
In addition to a packed schedule of technical paper presentations, we have much more for you to engage in and learn about through our virtual experience. From expert technical presentations, panel sessions, and tutorials, you will have many options from which to choose how you spend your time.

A special thank you to our volunteer leadership who have spent countless hours putting together a top-notch technical program, particularly during these unprecedented and challenging times.

We would also like to thank all our sponsors and exhibitors for their support of the program, many of whom have supported ASME Power year after year! We would also like to thank you, our attendees, for joining us for this virtual conference.

Have a great conference and thank you again for attending this year's event!

Steven Greco



Conference Chair
ASME Power Division

Contents

Keynote

TUESDAY, JULY 20, 2021

Juan Gutierrez
CEO Service

Siemens Gamesa Renewable Energy

Title: ***Reshaping the future of energy - How Wind will Energize a Low Carbon World***

Abstract: *Meeting the growing demand for affordable Energy to avoid an environmental catastrophe is the greatest challenge of our age. In this keynote speech, Juan Gutierrez will outline how Wind Energy in close symbiosis with other Energy sources are already meeting this challenge.*

As Renewable Energy will double its generation share to 70% within the next 20 years, further groundbreaking technological innovations are needed. Juan will outline solutions that will support and accelerate the Renewable penetration and show how Wind Energy is harnessing innovation in integrating Hydrogen and Energy Hybrid models.

Plenary Speaker

WEDNESDAY, JULY 21, 2021

Jacob Andersen
Chief Operating Officer
Stiesdal

Title: ***Missing Links in the Green Transition of the Energy Sector***

Abstract: *The world is currently experiencing a positive climate action feedback loop between public policy, technology advancement, investor ,and societal preferences. Affordable solutions are needed in all parts of the world, along with energy security and sector-wide implementation. We need to start cleaning up the atmosphere.*

In this plenary speech, Jacob Andersen will discuss some of the elements needed to make the transition by innovation, collaboration, and accelerated industrialization. The world craves much more renewables, much more integration, much more green fuel. We now see a clear pathway to a carbon-free energy future – Together we need to make it happen.

Power Conference

Schedule at a Glance

Schedule at a Glance

Eastern Time	Tuesday, July 20, 2021
10:00AM to 10:15AM	**Welcome Messages** Opening: **Tom Costabile,** CEO, ASME **Conference Chair: Steve Greco**
10:15AM to 11:00AM	**Keynote** **Juan Guitierrez,** CEO Service Siemens Gamesa Renewable Energy
11:05AM to 12:20PM	Technical Sessions
12:20PM to 12:30PM	**Break**
12:30PM to 1:30PM	**Panel: Electric Power Generation Changes and Retirements**
1:35PM to 2:50PM	Technical Sessions
2:50PM to 3:10PM	ASME Energy Storage Committee Presentation
3:10PM to 4:10PM	**Panel: Robotics and Drone ASME Codes & Standards and Development of Route-Operable Unmanned Navigation of Drones (ROUNDS)'**
4:25PM to 5:40PM	Technical Sessions
4:25PM to 5:40PM	**Panel: Power Student Panel**
5:40PM to 6:00PM and 6:05PM to 6:25PM	**Networking Roundtables** Join us for roundtables on pressing topics in the Power generation industy. Each session will be 20 minutes long and then you can switch to another session. Attendees will join the facilitors and have their opinions and thoughts heard. • POWER of Diversity of Thought • Texas Power Grid • Women in Power Generation • Cybersecurity

Eastern Time	Wednesday, July 21, 2021
10:00AM to 10:10AM	**Welcome Message** **Technical Program Chair: George Mesina**
10:10AM to 11:00AM	**Plenary** **Jacob Andersen,** Chief Operating Officer Stiesdal
11:05AM to 12:20PM	Technical Sessions
11:05AM to 12:20PM	Tutorial on Repowering Options Available for Coal-Fired Steam Plants to Extend Operational and Commercial Life
12:20PM to 12:35PM	**Break**
12:35PM to 1:35PM	**Panel: Digital twin environments for energy system design and performance monitoring with the support of AI methodologies**
1:35PM to 2:50PM	Technical Sessions
2:50PM to 3:05PM	**Break**
3:05PM to 4:05PM	**Panel: Decarbonization of Power Generation**
4:10PM to 5:25PM	**Technical Sessions**
Eastern Time	**Thursday, July 22, 2021**
11:00AM to 12:15PM	Power Technical Committee Meetings

Power Conference

Panels

Plenary Panel: Electric Power Generation Changes and Retirements

Tuesday, July 20: 12:30PM - 1:30PM

Moderator: *Frank Michell*

Panelist: *Tony Licata*

Panelist: *Dr. Peter Schwarz*

Description: *The topics for the panel will include information on power plant retirements, the need to keep all forms of generating technologies in the mix, pros & cons for each generation technology and the economics driving the changes/retirements. Will explain that energy supply decisions need to be based upon sound economic analysis and include policy goals, impact on the environment, and sustainability. Future generations will bear the effects of decisions made today with regards to energy generation and supply technology changes. Challenges that utilities have with trying to reach low to zero net book value on an asset before retiring it will be discussed.*

Track Panel: Robotics and Drone ASME Codes & Standards and Development of Route-Operable Unmanned Navigation of Drones (ROUNDS)

Tuesday, July 20: 3:10PM - 4:10PM

Moderators: *Frank Michell & Navid Goudarzi*

Panelist: *John Grimes, ASME*

Panelist: *Luis Pulgarin, ASME*

Panelist: *Ahmad Al Rashdan, Ph.D., Idaho National Laboratory*

Description: *The panel will present information on ASME's Robotics for Inspection and Maintenance (RfIM) Event and an update on the ASME's Robotics standard Development activities which include UAS (drones) and Crawlers for Inspection and new robotic initiatives.*

The panel will also discuss applications of drones in nuclear power plants and present an example of cutting edge drone technology enabling route-operatable unmanned navigation of drones (ROUNDS) without use of GPS under development by the Idaho National Laboratory.

Track Panel: Power Student Panel

Tuesday, July 20: 4:25PM - 5:40PM

Moderator: *Andre Texiera*

Panelist: *Steve Greco*

Panelist: *Jason Lee*

Panelist: *Mike Smiarowski*

Panelist: *Frank Michell*

Description: *Do you dream of working in the Power industry? Are you curious about the long-term strategies that will help you find success and thrive in industry or R&D? If you are asking these questions, this panel is here to help. Panelists will highlight their experience, their paths and their vision for the future in the power industry to give you a taste of the different opportunities available for you. You will hear about career development, alternative careers in the industry and the its development.*

Plenary Panel: Digital twin environments for energy system design and performance monitoring with the support of AI methodologies

Wednesday, July 21: 12:35PM - 1:35PM

Moderator: *Paolo Pezzini, Ph.D., Ames Laboratory, Department of Energy*

Panelist: *Chris Ritter, Ph. D., Digital Innovation Center of Excellence, Idaho National Laboratory (INL)*

Panelist: *Bobby Noble, Christopher Perullo, Electric Power Research Institute (EPRI), USA*

Panelist: *Luca Mantelli, Professor Mario Ferrari, Ph. D., University of Genoa, Italy*

Panelist: *Martina Hohloch, Ph.D., Matthias Metten, Ph.D., German Aerospace Center (DLR), Germany*

Panels

Description: *This panel session will discuss the development of digital twin environments used to monitor dynamic performance operation of existing power assets and support the design of new integrated energy systems. The fundamental change of operating nuclear and fossil-based power plants due to the penetration of non-dispatchable resources exposed traditional power plants to aggressive electric load following operations and required the design of novel low/zero carbon technologies that can achieve high efficiency target at part-load condition. Real time models and digital twin environments with the support of artificial intelligent methodologies are becoming powerful tools used to monitor performance of existing power plants but they have been also extended to design new integrated energy systems that can achieve near-zero emission targets. Specifically, digital twin models have been coupled to supplemental data analytics, artificial intelligence techniques, and machine learning methodologies to predict power plant performance, detect failures, but also to optimize the design of new energy systems. Regarding the monitoring of existing power plants, digital twin model supports the prompt detection of abnormal operations and the optimization of scheduled maintenance and repair services of operators, which will avoid costly forced shutdowns, thereby increasing plant availability. Regarding the design of new energy systems, digital twin environments can reduce the risk of failures in the design and development of new low/zero carbon technologies. The panelists in this session will cover the state-of-the-art of digital twin systems in both areas, existing power plants and innovative cycles.*

Plenary Panel: Decarbonization of Power Generation

Wednesday, July 21: 3:05PM - 4:05PM

Moderators: *Jason Lee and Mike Smiarowski*

Panelist: *Spencer Moore, VP Strategic Planning, Siemens Energy, Inc., Orlando, FL*

Panelist: *Xavier Dorai, EVP & Chief Strategy Officer, Babcock Power, Inc, Marlborough, MA*

Panelist: *TBD*

Description: *There are six main decarbonization focus area: Hydrogen/Green fuels, storage, brownfield transformation, solar PV, and hybrid solutions. OEMs are working are developing these technologies and integrating them into the power grid to offer hybrid decarbonized solutions. The current focus on existing coal plants has prompted many of these units to take the first step to evaluate of take the first step of fuel conversion from coal to natural gas. The speakers will discuss this current activity and the future steps, which will highlight future technologies that their respective companies are working on to support decarbonization and hybrid solutions. The discussion will also provide recent industry examples.*

TUTORIAL

Tutorial on Repowering Options Available for Coal-Fired Steam Plants to Extend Operational and Commercial Life

Wednesday, July 21: 11:05AM - 12:20PM

Speaker: *Michael Smiarowski, Siemens Energy, Inc.*

Speaker: *Thorsten Wolf, Siemens Energy, Inc.*

Speaker: *Brian Vitalis, Babcock Power Systems*

Abstract: *The dramatic increase of the negative effects of climate change requires swift actions to reduce the emission of Carbon Dioxide, the leading cause of the greenhouse effect in our atmosphere.*

Simply shutting down existing coal-fired power plants and relying on the hope that increased renewable generation will satisfy the ever-increasing electricity hunger of our society isn't an option. Variable resources, like wind and solar, need fossil-fired electrical generation back-up, the grid needs rotating machines with enough inertia to supply a stable frequency and reactive power to keep a stable voltage and to transport electricity over long distances.

A straight-forward solution to drastically reduce the CO2 emissions of a coal-fired steam plant is the change to a more environmentally friendly fuel like natural gas. Stable gas prices between $2.5 and $3.0 per MMbtu makes this the logical dispatchable generation option for the long term. Power plant owners in the U.S. should consider the economic alternative to convert existing coal-fired assets to gas which is ideally suited to co-exist next to renewable energy, reduce emissions, and keep the fossil asset meaningful for further decades.

This tutorial addresses several stages of coal-to-gas repowering and describes the advantages depending on parameters like expected capacity factor and required load-following capability. Technologies and solutions that will be addressed are:

Boiler Conversion: *Adding a gas supply system and changing the combustion from coal to low-NOx gas burners is the first step on this journey.*

Steam Turbine Refurbishment: *that not only improves plant efficiency but can recover losses in performance when switching to gas and resets equipment life.*

Plant Flexibility Assessment: *A Plant Flexibility Assessment goes systematically through all systems and evaluates methods to improve flexibility through an optimized control concept and low costs.*

Hot Windbox Repowering: *Adding a small industrial gas turbine to an existing gas fired steam power plant and ducting its exhaust gases into the windbox of the boiler is an excellent method of improving the efficiency of the entire plant.*

Full repowering by replacing the boiler with a new set of gas turbines and heat recovery steam generators that is a significant investment but can be the economical beneficial making the project up to 30% cheaper than an entire new plant.

A new plant using the existing brown field infrastructure, *like an ultra-compact single-shaft combined cycle allows the conversion to most modern technology, still maximizing savings by using infrastructure like cooling tower and grid connection.*

The tutorial will discuss the above options on their technical and economic value in a commercial environment, using economical parameters typical for the US.

Networking Roundtables

Join us and be a part of the Networking Roundtables being held on Tuesday, July 20th from 5:40PM - 6:25PM EST. Take this time to chat with your colleagues and explore important topics to the Power Generation community. You will have time to participate in two of the four topics being offered during this time period. These sessions will be 20 minutes long and repeat so that you can have more than one discussion and can engage with your colleagues.

Panels

Title: ***Cybersecurity in Power Generation***

Description: *Recent events like the Colonial Pipeline ransomware hack have reminded us of the vulnerabilities in our critical infrastructure. NERC has had established standards for 18 years now, known as NERC Critical Infrastructure Protection (CIP). This roundtable will seek to promote discussion around the topic of cybersecurity and what it means for the power generation industry. From suppliers seeking to aid the industry in securing our generation assets from cyber threats using innovative products and services to the end users trying to navigate the web of compliance requirements while maintaining reliable generation, come ready to discuss this important topic with us!*

Moderator: *Jason Lee*

Title: ***The POWER of Diversity of Thought***

Description: *In its policies, ASME defines diversity as "the ways in which we differ as individuals or organizations, and the commonalities and similarities that justify and motivate all people and entities to work collaboratively together in order to achieve mutually beneficial outcomes."*

Our understanding of diversity encompasses Diversity of Experience (including differences in personal and professional experiences, family and lifestyle backgrounds, and socioeconomic backgrounds), Diversity of Thought (including differences in work styles, personality types, and skill sets), and Demographic Diversity (including differences such as age, race, ethnicity, gender).

We've probably all heard that diversity benefits innovation. The different perspectives that people in diverse groups bring to the table help us come up with better solutions to our challenges.

Within the Power Division, we have all these types of diversity. Among our members there are people with careers as power professionals, managers, national labs, academia, regulators, salespeople, and more. We represent product development from conception to construction with theory, experiment, modeling, twinning, prototyping and all the stages connecting the two. We have career levels from student to the corporate CEO and everything in-between. We have participants from their 20s to their 70s. The synergy of these groups brings different viewpoints to the table and contributes in different ways to ultimate success!

Moderator: *George Mesina*

Title: ***Women in Power Generation***

Description: *Join us to hear about a few of the many successful women in the power industry, and share your experiences and/or ideas on how to attract and support the next generation of women in power. All are welcome!*

Moderator: *Tina Toburen*

Title: ***Texas Power Grid***

Description: *The winter storm that struck Texas in February 2021 was extraordinary due to the combination of the low ambient temperatures, duration of the temperatures, and the complexity and coupling between failures of critical infrastructures. The consequences of the February 2021 Texas power failure are well known: Interrupted power to millions of people with cascading consequences of water system failures, loss of heat, loss of essential services like hospitals, and loss of life. During the roundtable we will discuss root causes that lead to the power crisis in Texas and the near total collapse of the electric grid.*

Moderator: *Frank Michell*

Power Conference

Technical Sessions

11:05AM–12:20PM

01-01 Fuels/Combustion

Chair: Ashwani Gupta - University of Maryland
Chair: Jeongmin Ahn - Syracuse University

Publications/Presentations:

EVALUATION OF GAS TURBINE COMBUSTORS RUNNING ON RENEWABLE FUELS PRODUCED FROM CARBON DIOXIDE AIMED FOR GREENHOUSE EMISSION REDUCTION

11:10AM - 11:23AM

Technical Paper Publication: POWER 2021-60860
Boris Chudnovsky - Israel Electric Corporation
Ilya Chatsky - Israel Electric Corporation
Alex Lazebnikov - Israel Electric Corporation

APPLICATION OF A MECHANISTIC EROSION AND ABRASION MODEL TO PULVERIZED COAL (PC) INJECTIONS

11:23AM - 11:36AM

Technical Paper Publication: POWER 2021-63620
Lawrence Berg - SAS, Inc.
Soroor Karimi - University of Tulsa
Siamack Shirazi - University of Tulsa

ENGINUITY'S COMBINED HEAT AND POWER (CHP) SYSTEM PART 1: FUNDAMENTAL DESIGN & PERFORMANCE EVALUATION OF RESIDENTIAL ENGINE SYSTEM

11:36AM - 11:49AM

Technical Paper Publication: POWER 2021-64122
Mehar Bade - Enginuity Power Systems
Vince Meyers - Enginuity Power Systems
Eric Suits - Enginuity Power Systems
Anthony Mannerino - Enginuity Power Systems
Jayaram Subramanian - Enginuity Power Systems

INFLUENCE OF SOME EMULSIFIERS IN IMPROVING THE BIOFUEL CHARACTERISTICS

11:49AM - 12:02PM

Technical Paper Publication: POWER 2021-64223
Victorita Radulescu - University Politehnica of Bucharest

CLASSIFICATION OF MICROCHANNEL FLAME REGIMES BASED ON CONVOLUTIONAL NEURAL NETWORKS

12:02PM - 12:15PM

Technical Paper Publication: POWER 2021-64437
Seyed Navid Roohani Isfahani - Louisiana State University
Vinicius M. Sauer - California State University
Ingmar M. Schoegl - Louisiana State University

11:05AM–12:20PM

07-01 Wind Energy

Chair: David W. Macphee - The University of Alabama
Chair: Gopal Singh - Siemens Gamesa Renewable Energy/ University of Central Florida
Chair: Anthony Di Carlo - Merrimack College

Publications/Presentations:

DEVELOPMENT OF AN ACTUATOR LINE MODEL FOR SIMULATION OF FLOATING OFFSHORE WIND TURBINES

11:10AM - 11:23AM

Technical Paper Publication POWER 2021-60098
Alireza Arabgolarcheh - University of Padova
Ernesto Benini - University of Padova
Morteza Anbarsooz - Quchan University of Technology

COMMON MODE CURRENT EFFECTS AND CHALLENGES FOR WIND TURBINE GENERATOR APPLICATION

11:23AM - 11:36AM

Technical Paper Publication: POWER 2021-63236
Gopal Singh - University of Central Florida
Kalpathy Sundaram - University of Central Florida

THROUGH-BUILDING DUCTS FOR MOUNTING WIND TURBINES: A NUMERICAL STUDY

11:36AM - 11:49AM

Technical Paper Publication: POWER 2021-64181

Hadi Mirian - Quchan University of Technology

Morteza Anbarsooz - Quchan University of Technology

Abbas Hoshyar - Quchan University of Technology

Alireza Arabgolarcheh - University of Padova

SHORT-TERM WIND CHARACTERISTICS FORECASTING USING STACKED LSTM NETWORKS

11:49AM - 12:02PM

Technical Paper Publication: POWER 2021-65866

Navid Goudarzi - UNC Charlotte

Dorsa Ziaei - University of Maryland, Baltimore County

AUTOMATIC ELECTRONIC BRAKING SYSTEM FOR COMMERCIAL MICRO WIND TURBINE

12:02PM - 12:15PM

Technical Paper Publication: POWER 2021-65883

Gretchell M. Hiraldo-Martinez - Universidad Ana G. Mendez

Alex D. Santiago - Universidad Ana G. Mendez

Diego A. Aponte-Roa - Universidad Ana G. Mendez Gurabo

Miguel Goenaga - Universidad Ana G. Mendez

11:05AM–12:20PM

10-01 Plant Performance & Operations

Chair: Brian Wodka - RMF Engineering

Chair: Edward Dundon - DOM

Chair: George Mesina - Idaho National Laboratory

Publications/Presentations:

MODELLING AND PERFORMANCE ANALYSIS OF STATIONARY GAS TURBINES OPERATING UNDER ROTATIONAL SPEED TRANSIENTS

11:10AM - 11:23AM

Technical Paper Publication: POWER 2021-64316

André L. S. Andrade - Federal University of Itajuba

Osvaldo J. Venturini - Federal University of Itajuba

Vladimir R. M. Cobas - Federal University of Itajuba

Vinicius Z. Silva - Federal University of Itajuba

MANAGING RISKS ASSOCIATED WITH TURBINE FIRST STEAM ADMISSION FOLLOWING INADEQUATE BOILER CLEANING

11:23AM - 11:36AM

Technical Paper Publication: POWER 2021-64846

Joseph Roy-Aikins - Eskom

Gary De Klerk - Eskom

Duduzile Ramasimong - Eskom

Kumar Rupnarain - Eskom

UNCERTAIN GAIN AND TIME-DELAY CONTROL OF 300-KW SOFC-GT

11:36AM - 11:49AM

Technical Paper Publication: POWER 2021-64925

Tooran Emami - U.S. Coast Guard Academy

David Tucker - U.S. Department of Energy, National Energy Technology Laboratory

John Watkins - Wichita State University

THE INTRODUCTION AND ANALYSIS OF THE WORLD'S FIRST HIGH-TEMPERATURE RETROFIT PROJECT ON A SUBCRITICAL COAL-FIRED POWER UNIT

11:49AM - 12:02PM

Technical Paper Publication: POWER 2021-65650

Weizhong Feng - Shanghai Waigaoqiao No.3 Power Generation Co., Ltd.

Li Li - Shanghai Waigaoqiao No.3 Power Generation Co., Ltd.

TUESDAY, JULY 20

HELIUM MASS SPECTROMETRY LEAK DETECTION

12:02PM - 12:15PM

Technical Presentation Only: POWER 2021-64837

Robert Mechem - American Efficiency Services

1:35PM–2:50PM

01-02 Fuels/Combustion

Chair: Ashwani Gupta - University of Maryland

Chair: Jeongmin Ahn - Syracuse University

Publications/Presentations:

NUMERICAL STUDY ON THE ADAPTATION OF DIESEL WAVE BREAKUP MODEL FOR LARGE-EDDY SIMULATION OF NON-REACTIVE GASOLINE SPRAY

1:40PM - 1:53PM

Technical Paper Publication: POWER 2021-64537

Ratnak Sok - Waseda University

Beini Zhou - Waseda University

Jin Kusaka - Waseda University

NUMERICAL SIMULATION OF THE EFFECT OF MAGNETIC FIELDS ON SOOT FORMATION IN LAMINAR NON-PREMIXED FLAMES

1:53PM -2:06PM

Technical Paper Publication: POWER 2021-64859

Edison Chukwuemeka - Louisiana State University

Ingmar Schoegl - Louisiana State University

TOWARDS A HIGH-PRESSURE MICROCHANNEL REACTOR FOR FUEL CHARACTERIZATION

2:06PM - 2:19PM

Technical Paper Publication: POWER 2021-64910

David Akinpelu - Louisiana State University

Ingmar Schoegl - Louisiana State University

NEWABLE FUELS: THE PATH TO 100% RENEWABLES FOR CALIFORNIA

2:19PM - 2:32PM

Technical Presentation Only: POWER 2021-68108

Jussi Heikkinen - Wärtsilä Energy

STUDY OF A NON-PREMIXED METHANE / AIR PILOT FLAME

2:32PM - 2:45PM

Technical Presentation Only: POWER 2021-68116

Mohammed El Khalil Bendadi – University of Mascara

1:35PM–2:50PM

07-02 Renewable Energy Systems

Chair: David W. Macphee - The University of Alabama

Chair: Gopal Singh - Siemens Gamesa Renewable Energy/ University of Central Florida

Chair: Anthony Di Carlo - Merrimack College

Publications/Presentations:

SOCIO-ENVIRONMENTAL IMPACTS OF HYDRO POWER TECHNOLOGY- A REVIEW

1:40PM - 1:53PM

Technical Paper Publication: POWER 2021-64157

Aanya Singh - Vellore Institute of Technology

Rohit Mandavkar - Vellore Institute of Technology

Sanjay Singh - Vellore Institute of Technology

Raunak Prabhu Bhembre - Vellore Institute of Technology

Devansh Jain - Vellore Institute of Technology

D. Dsilva Winfred Rufuss - Vellore Institute of Technology

ENERGY SAVING ASSESSMENT OF TRIPLE-HYBRID VAPOR ABSORPTION BUILDING COOLING SYSTEM UNDER HOT-DRY CLIMATE

1:53PM - 2:06PM

Technical Paper Publication: POWER 2021-64470

Gaurav Singh - Indian Institute of Technology Ropar

Ranjan Das - Indian Institute of Technology Ropar

MODELING AND VALIDATION OF HYDRO CASCADE OPERATION CONSIDERING PRICE UNCERTAINTY

2:06PM - 2:19PM

Technical Paper Publication: POWER 2021-65726

Maxime Libsig - ETH Zürich

Elena Raycheva - ETH Zürich

Jared Garrison - ETH Zürich

Gabriela Hug - ETH Zürich

ADJOINT OPTIMIZATION OF HEAT TRANSFER WITHIN A STIRLING ENGINE

2:19PM - 2:32PM

Technical Paper Publication: POWER 2021-65804

Anthony Di Carlo - Merrimack College

Rickey Caldwell - Merrimack College

CONTROL OF WAVE ENERGY CONVERTER WITH LOSSES IN ELECTRICAL POWER TAKE-OFF SYSTEM

2:32PM - 2:45PM

Technical Paper Publication: POWER 2021-64938

Xiang Zhou - Michigan Technological University

Shangyan Zou - Iowa State University

Wayne Weaver - Michigan Technological University

Ossama Abdelkhalik - Iowa State University

1:35PM–2:50PM

04-01 Advanced Tools for Cyber-Physical Systems and Digital Twins and 05-01 Risk Management, Cyber Security, and Safety

Chair: Paolo Pezzini - U.S. Dept of Energy, Ames Lab

Chair: Tina Toburen - T2E3

Chair: Biao Zhang - National Energy Technology Laboratory

Publications/Presentations:

OPTIMIZATION OF THE CAPACITIES OF PRIVATE GENERATORS INSTALLED IN A HOSPITAL BUILDING UNDER THE CONSTRAINT OF DEMAND SUFFICIENCY DURING POWER OUTAGES

1:40PM - 1:53PM

Technical Paper Publication: POWER 2021-62341

Akane Uemichi - Waseda University

Naoki Kaito - The University of Tokyo

Yudai Yamasaki - The University of Tokyo

Shigehiko Kaneko - Waseda University

TUESDAY, JULY 20

FORECASTING OF FOULING IN AIR PRE-HEATERS THROUGH DEEP LEARNING

1:53PM - 2:06PM

Technical Paper Publication: POWER 2021-64665
Ashit Gupta - Tata Consultancy Services
Vishal Jadhav - Tata Consultancy Services
Mukul Patil - Tata Consultancy Services
Anirudh Deodhar - Tata Consultancy Services
Venkataramana Runkana - Tata Consultancy Services

A DIGITAL TWIN ENVIRONMENT DESIGNED FOR THE IMPLEMENTATION OF REAL TIME MONITORING TOOL

2:06PM - 2:19PM

Technical Paper Publication: POWER 2021-65384
Paolo Pezzini - U.S. Department of Energy, Ames Lab
Harry Bonilla - Iowa State University
Grant R. Johnson - Ames Laboratory
Zachary Reinhart - Iowa State University
Kenneth Mark Bryden - Iowa State University

CYBER SECURITY AND YOUR CONDITION MONITORING AND PROTECTION SYSTEM – OR, WHAT DO YOU DO WHEN THE PLANT CALLS YOU AT 2 AM? RUSH IN, OR DIAL IN FROM HOME?

2:19PM - 2:32PM

Technical Presentation Only: POWER 2021-68562
John Kingham - Bently Nevada

4:25PM–5:40PM

07-03 Wind & Wave Energy

Chair: David W. Macphee - The University of Alabama
Chair: Gopal Singh - Siemens Gamesa Renewable Energy/ University of Central Florida
Chair: Anthony Di Carlo - Merrimack College

Publications/Presentations:

CHARACTERIZING THE TRANSITIONAL BEHAVIOR OF WIND TURBINE WAKE FROM NEAR TO FAR WAKE REGIMES

4:30PM - 4:43PM

Technical Paper Publication: POWER 2021-65959
Ravi Kumar - Indian Institute of Technology Guwahati
Ojing Siram - Indian Institute of Technology Guwahati
Niranjan Sahoo - Indian Institute of Technology Guwahati
Ujjwal K. Saha - Indian Institute of Technology Guwahati

A CAPSNET-BASED FAULT DIAGNOSIS METHOD FOR A DIGITAL TWIN OF A WIND TURBINE GEARBOX

4:43PM - 4:56PM

Technical Paper Publication: POWER 2021-66029
Weifei Hu - Zhejiang University
Hao Zhao - Zhejiang University
Zhenyu Liu - Zhejiang University
Jianrong Tan - Zhejiang University

DESIGN CONSIDERATIONS OF SOLAR-DRIVEN HYDROGEN PRODUCTION PLANTS FOR RESIDENTIAL APPLICATIONS

4:56PM - 5:09PM

Technical Paper Publication: POWER 2021-65858
Arturo Berastain - Pontificia Universidad Católica del Perú
Rafael Vidal - Pontificia Universidad Católica del Perú
Carlos Busquets - Pontificia Universidad Católica del Perú
Gonzalo Aguilar - Pontificia Universidad Católica del Perú
Alvaro Torres - Pontificia Universidad Católica del Perú
Jorge Lem - Pontificia Universidad Católica del Perú
Antonios Antoniou - Pontificia Universidad Católica del Perú
Cesar Celis - Pontificia Universidad Católica del Perú

ANALYSIS OF A MULTIGENERATION ENERGY SYSTEM FOR WASTEWATER TREATMENT

5:09PM - 5:22PM

Technical Paper Publication: POWER 2021-65516

Mustafa Erguvan - The University of Alabama

David W. Macphee - University of Alabama

AN INVERSE METHOD FOR PARAMETER RETRIEVAL IN SOLAR THERMAL COLLECTOR WITH A SINGLE GLASS COVER

5:22PM - 5:35PM

Technical Paper Publication: POWER 2021-65601

Ranjan Das - Indian Institute of Technology Ropar

4:25PM–5:40PM

12-01 Experimental and Computational Fluid Dynamics and Thermal Hydraulics and Data Analytics

Chair: Donna Guillen - Idaho National Laboratory

Chair: George Mesina - Idaho National Laboratory

Publications/Presentations:

OPTIMIZING EFFECTIVENESS OF DOUBLE PIPE HEAT EXCHANGER USING NANOFLUID AND DIFFERENT POROUS FINS ARRANGEMENT

4:30PM - 4:43PM

Technical Paper Publication: POWER 2021-64248

Avinash Kumar - IIT Kharagpur

Vinay Arya - IIT Khargapur

Chirodeep Bakli - Indian Institute of Technology Kharagpur

AN INNOVATIVE ELASTO-HYDRODYNAMIC SEAL CONCEPT FOR SUPERCRITICAL CO2 POWER CYCLES

4:43PM - 4:56PM

Technical Paper Publication: POWER 2021-64536

Sevki Cesmeci - Georgia Southern University

Rubayet Hassan - Georgia Southern University

Fuad Mohammad Hassan - Georgia Southern University

Ikenna Ejiogu - Georgia Southern University

Matthew DeMond - Georgia Southern University

Hanping Xu - Ultool, LLC

Jing Tang - Ultool, LLC

OPTIMIZING WATER HARVESTING ON BIOINSPIRED SURFACES: A MESOSCOPIC PERSPECTIVE

4:56PM - 5:09PM

Technical Paper Publication: POWER 2021-64668

Souparna Chakraborty - Indian Institute of Technology Kharagpur

Abhirup Chaudhuri - Indian Institute of Technology Kharagpur

Chirodeep Bakli - Indian Institute of Technology Kharagpur

EFFECT OF FIN ORIENTATION ON PCM MELTING IN A SPHERICAL ENCLOSURE FOR LATENT HEAT STORAGE

5:09PM - 5:22PM

Technical Paper Publication: POWER 2021-65622

Akhalesh Sharma - Indian Institute of Technology Indore

Rohit Kothari - Indian Institute of Technology Indore

Anuj Kumar - Indian Institute of Technology Indore

Santosh Kumar Sahu - Indian Institute of Technology Indore

WEDNESDAY, JULY 21

11:05AM–12:20PM

14-01 Student Competition

Chair: Andre Teixeira - EDP
Chair: Steven Greco - Lectrodryer

Publications/Presentations:

COUPLED ELECTROMAGNETIC AND LATTICE STRUCTURE OPTIMIZATION FOR THE ROTOR AND STATOR OF LARGE ELECTRIC MACHINES

11:10AM - 11:23AM

Technical Paper Publication: POWER 2021-62625
Austin Hayes - University of Colorado Boulder
Gregory Whiting - University of Colorado Boulder

EXPERIMENTAL INVESTIGATION OF A NOVEL COMBINED RAPID COMPRESSION-IGNITION COMBUSTION AND SOLID OXIDE FUEL CELL SYSTEM FORMAT OPERATING ON DIESEL

11:23AM - 11:36AM

Technical Paper Publication: POWER 2021-64197
Andrew Ahn - Fayetteville Manlius High School
Thomas Stone-Welles - Syracuse University
Benjamin Akih-Kumgeh - Syracuse University
Ryan Milcarek - Arizona State University

A COMPARISON OF DIFFERENT FLUID-STRUCTURE INTERACTION ANALYSIS TECHNIQUES FOR THE MARINE PROPELLER

11:36AM - 11:49AM

Technical Paper Publication: POWER 2021-64369
Wajiha Rehman - University of Leeds
Stephane Paboeuf - Bureau Veritas
Joseph Praful Tomy - Bureau Veritas

PREDICTING PEAK ENERGY DEMAND FOR AN OFFICE BUILDING USING ARTIFICIAL INTELLIGENCE (AI) APPROACHES

11:49AM - 12:02PM

Technical Paper Publication: POWER 2021-64492
Yuxuan Chen - Arizona State University
Patrick Phelan - Arizona State University

EXPERIMENTAL INVESTIGATION OF AMMONIA AND SULFUR DEPOSITION CHARACTERISTICS IN ROTARY AIR PREHEATER

12:02PM - 12:15PM

Technical Paper Publication: POWER 2021-65660
Rongze Gao – Xi'an Jiaotong University
Haojia Sun – Xi'an Jiaotong University
Limin Wang – Xi'an Jiaotong University
Yufan Bu – Xi'an Jiaotong University
Chao Wang - Inner Mongolia Power Research Institute Co., Ltd.
Defu Che – Xi'an Jiaotong University

11:05AM–12:20PM

07-04 Energy Storage

Chair: David W. Macphee - The University of Alabama
Chair: Gopal Singh - Siemens Gamesa Renewable Energy/ University of Central Florida
Chair: Anthony Di Carlo - Merrimack College

Publications/Presentations:

A PLAN FOR BIOMASS POWER GENERATION WITH NEGATIVE CARBON EMISSIONS

11:10AM - 11:23AM

Technical Paper Publication: POWER 2021-65822
*Marc Parke*r - Southern Company, University of Alabama at Birmingham

DESIGN OF SOLAR POWERED CHARGING STATION FOR ELECTRIC VEHICLES- BASED ON INDIAN POLICIES

11:23AM - 11:36AM

Technical Presentation Only: POWER 2021-69418

Aanya Singh - Vellore Institute of Technology

Shubham Sanjay Shaha - Vellore Institute of Technology, Vellore

Y Raja Sekhar - Vellore Institute of Technology

ENABLING THE ENERGY TRANSITION WITH EFFICIENT, LOW COST COLD LIQUIDS STORAGE

11:36AM - 11:49AM

Technical Presentation Only: POWER 2021-69443

Nick White - EZNG Solutions LLC

STATE OF THE ART AND RESEARCH DIRECTIONS FOR COLD THERMAL ENERGY STORAGE (CTES) AT SUB-ZERO TEMPERATURES

11:49AM - 12:02PM

Technical Presentation Only: POWER 2021-70844

Alessandro Romagnoli - Nanyang Technological University

Lizhong Yang - Surbana Jurong - Nanyang Technological University

11:05AM–12:20PM

02-01 Combustion Turbines and Combined Cycle and 12-02 Experimental and Computational Fluid Dynamics and Thermal Hydraulics and Data Analytics

Chair: Jeffrey Cobb - Sargent & Lundy

Chair: Donna Guillen - Idaho National Laboratory

Chair: George Mesina - Idaho National Laboratory

Publications/Presentations:

COMBUSTION TURBINE EXHAUST DUCT, SILENCER, AND STACK SCALE MODELING

11:10AM - 11:23AM

Technical Paper Publication: POWER 2021-64118

Robert Craven - Tennessee Tech University

Keith Kirkpatrick - McHale and Associates

Stephen Idem - Tennessee Tech University

AIR-ARGON-STEAM OR ORGANIC FLUID COMBINED POWER CYCLE WITH PULSE DETONATION COMBUSTION FOR ELECTRIC POWER PLANTS

11:23AM - 11:36AM

Technical Paper Publication: POWER 2021-64141

Pereddy Nageswara Reddy - Gudlavalleru Engineering College

FIRST NUMERICAL EVALUATION OF THE THERMAL PERFORMANCE OF A TUBULAR RECEIVER EQUIPPED WITH RASCHIG RINGS FOR CSP APPLICATIONS

11:36AM - 11:49AM

Technical Paper Publication: POWER 2021-65714

Hossein Ebadi - Politecnico Di Torino

Andrea Allio - Politecnico Di Torino

Antonio Cammi - Politecnico Di Milano

Laura Savoldi - Politecnico Di Torino

EFFECT OF FLOATING BODY MOTION ON HEAT FLUX TO THE COLD CAP IN A WASTE GLASS MELTER

11:49AM - 12:02PM

Technical Presentation Only: POWER 2021-64856

Donna Guillen - Idaho National Laboratory

Alexander Abboud - Idaho National Laboratory

WEDNESDAY, JULY 21

1:35PM–2:50PM

02-02 Combustion Turbines and Combined Cycle

Chair: Jeffrey Cobb - Sargent & Lundy

Publications/Presentations:

COMBINED CYCLE GAS TURBINES WITH ELECTRICALLY-HEATED THERMAL ENERGY STORAGE FOR DISPATCHABLE ZERO-CARBON ELECTRICITY

1:40PM - 1:53PM

Technical Paper Publication: POWER 2021-65528
Daniel Stack - MIT
Charles Forsberg - MIT

INVESTIGATION OF AIR EXTRACTION AND CARBON CAPTURE IN AN INTEGRATED GASIFICATION COMBINED CYCLE (IGCC) SYSTEM

1:53PM - 2:06PM

Technical Paper Publication: POWER 2021-65537
Shisir Acharya - University of New Orleans
Ting Wang - University of New Orleans

INVESTIGATION OF THE PERFORMANCE OF AIR-STEAM COMBINED CYCLE FOR ELECTRIC POWER PLANTS USING LOW GRADE SOLID FUELS

2:06PM - 2:19PM

Technical Paper Publication: POWER 2021-64788
Pereddy Nageswara Reddy - Gudlavalleru Engineering College

EVOLUTION OF THE TURBX ATKINSON CYCLE ENGINE INTO A CARNOT CYCLE ENGINE

2:19PM - 2:32PM

Technical Presentation Only: POWER 2021-65527
Michael Wilson - MWTurbX LLC

GAS TURBINE EVAPORATIVE COOLING, A NOVEL METHOD FOR COMBINED CYCLE PLANT PART LOAD OPTIMIZATION

2:32PM - 2:45PM

Technical Paper Publication: POWER 2021-65289
Jose Eugenio Torres Carmona - AFRY

1:35PM–2:50PM

14-02 Student Competition

Chair: Andre Teixeira - EDP
Chair: Steven Greco - Lectrodryer

Publications/Presentations:

SELECTION OF A HEAT EXCHANGER FOR A SMALL-SCALE LIQUID AIR ENERGY STORAGE SYSTEM

1:40PM - 1:53PM

Technical Paper Publication: POWER 2021-60523
Alex Fredrickson - Naval Postgraduate School
Anthony Pollman - Naval Postgraduate School
Anthony Gannon - Naval Postgraduate School
Walter C. Smith - Naval Postgraduate School

EXPERIMENTAL EVALUATION OF DEWAR VOLUME AND CRYOCOOLER COLD FINGER SIZE IN A SMALL-SCALE STIRLING LIQUID AIR ENERGY STORAGE (LAES) SYSTEM

1:53PM - 2:06PM

Technical Paper Publication: POWER 2021-60565
Howard Swanson - Naval Postgraduate School
Anthony Pollman - Naval Postgraduate School
Alejandro Hernandez - Naval Postgraduate School

PERFORMANCE AND COMPLEXITY TRADE STUDY OF CANDIDATE LIQUID AIR GENERATION TECHNIQUES

2:06PM - 2:19PM

Technical Paper Publication: POWER 2021-63957
Masis Torosyan - Naval Postgraduate School
Anthony Pollman - Naval Postgraduate School
Alejandro Hernandez - Naval Postgraduate School
Anthony Gannon - Naval Postgraduate School

PERFORMANCE OPTIMIZATION OF THERMAL ENERGY STORAGE BASED SOLAR COLLECTOR

2:19PM- 2:32PM

Technical Paper Publication: POWER 2021-64127

Vivek Pawar - University of Missouri-Kansas City

Sarvenaz Sobhansarbandi - University of Missouri-Kansas City

INVESTIGATION OF PHASE CHANGE MATERIAL INTEGRATED WITH HIGH THERMAL CONDUCTIVE CARBON FOAM INSIDE HEAT SINKS FOR THERMAL MANAGEMENT OF ELECTRONIC COMPONENTS

2:32PM - 2:45PM

Technical Paper Publication: POWER 2021-65569

Anuj Kumar - Indian Institute of Technology Indore

Rohit Kothari - Indian Institute of Technology Indore

Santosh Sahu - Indian Institute of Technology

Shailesh Kundalwal - Indian Institute of Technology Indore

Akhalesh Sharma - Indian Institute of Technology Indore

1:35PM–2:50PM

08-01 Heat Exchanger Technologies and 03-01 Boilers/HRSG

Chair: Andrew Rister - Duke Energy

Chair: Paul Weitzel

Chair: George Mesina - Idaho National Laboratory

Publications/Presentations:

STEAM INLET EXPANSION JOINT DESIGN & CASE STUDY: SURFACE CONDENSER APPLICATION

1:40PM - 1:53PM

Technical Paper Publication: POWER 2021-64836

Kevin Squires - American Efficiency Services

THE SANDIA NATIONAL LABORATORIES NATURAL CIRCULATION COOLER

1:53PM - 2:06PM

Technical Paper Publication: POWER 2021-65399

Bobby Middleton - Sandia National Laboratories

Patrick Brady - Sandia National Laboratories

Serafina Lawles - Sandia National Laboratories

GENERALIZED REYNOLDS ANALOGY: AN ENGINEERING PROSPECTIVE OF THERMO-FLUID PHYSICS FOR HEAT EXCHANGER DESIGN

2:06PM - 2:19PM

Technical Paper Publication: POWER 2021-65820

Abhijit Som - Clemson University

4:10PM–5:25PM

13-01 Water Management for Power Systems and Environmental Issues

Chair: Jessica Mullen - U.S. DOE/National Energy Technology Laboratory

Chair: Nicholas Siefert - U.S.DOE/National Energy Technology Laboratory

Publications/Presentations:

NEW SOLUTION WITH SYNTHESES INHIBITORS FOR THE CHEMICAL CLEANING OF ORGANIC POLLUTANTS FROM THE WATER SUPPLY SYSTEM OF GENERATORS

4:15PM - 4:28PM

Technical Paper Publication: POWER 2021-64314

Victorita Radulescu - University Politehnica of Bucharest

WEDNESDAY, JULY 21

THE PALO VERDE WATER CYCLE MODEL (PVWCM) – DEVELOPMENT OF AN INTEGRATED MULTI-PHYSICS AND ECONOMICS MODEL FOR EFFECTIVE WATER MANAGEMENT

4:28PM - 4:41PM

Technical Paper Publication: POWER 2021-65768
Bobby Middleton - Sandia National Laboratories
Patrick Brady - Sandia National Laboratories
Jeffrey Brown - Arizona Public Service Company
Serafina Lawles - Sandia National Laboratories

NOVEL ON-LINE METHODS FOR MONITORING DISCHARGE OF TRACE METALS FROM A POWER GENERATION SITE

4:41PM - 4:54PM

Technical Presentation Only: POWER 2021-67668
Ken Kuruc - Hach

TREATING FOSSIL POWER PLANT EFFLUENT STREAMS

4:54PM - 5:07PM

Technical Presentation Only: POWER 2021-70419
Nicholas Siefert - U.S.DOE/National Energy Technology Laboratory

4:10PM–5:25PM

14-03 Student Competition

Chair: Andre Teixeira - EDP
Chair: Steven Greco - Lectrodryer

Publications/Presentations:

TRANSIENT EXERGY ANALYSIS OF THE DYNAMIC OPERATION OF A COMBINED CYCLE POWER PLANT

4:15PM - 4:28PM

Technical Paper Publication: POWER 2021-64311
Raphael Wittenburg - University of Rostock
Moritz Hübel - Modelon Deutschland GmbH
Dorian Holtz - University of Rostock
Karsten Müller - University of Rostock

RENEWABLE ENERGY SYSTEMS FOR DEMAND-SIDE MANAGEMENT IN INDUSTRIAL FACILITIES

4:28PM - 4:41PM

Technical Paper Publication: POWER 2021-64381
Joseph Elio - Arizona State University
Patrick Phelan - Arizona State University
Rene Villalobos - Arizona State University
Ryan Milcarek - Arizona State University

SIMULATION RESEARCH ON EXPLOSIVES DETECTION SYSTEM BASED ON D-D SEALED NEUTRON GENERATOR

4:41PM - 4:54PM

Technical Paper Publication: POWER 2021-65387
Yadong Gao - Northeast Normal University
Dedong He - Northeast Normal University
Ke Gong - Northeast Normal University
Guangyu Shi - Northeast Normal University
Siyuan Chen - Northeast Normal University
Chenxi Zhu - Northeast Normal University
Shiwei Jing - Northeast Normal University

DESIGN AND FINITE ELEMENT ANALYSIS (FEA) OF SPUR AND HELICAL GEAR TRAIN FOR PORTAL AXLE SYSTEM

4:54PM - 5:07PM

Technical Presentation Only: POWER 2021-65497
Dhruvin Patel - Gujrat Technical University
Rushil Shah - Aditya Silver Oak Institute of Technology
Devansh Shah - Aditya Silver Oak Institute of Technology

THERMO-ECONOMIC ANALYSES OF ADVANCED SOLID OXIDE FUEL CELL-GAS TURBINE HYBRID SYSTEMS

5:07PM - 5:20PM

Technical Presentation Only: POWER 2021-67817
Fabian Rosner - University of California, Irvine
Scott Samuelsen - Advanced Power and Energy Program

4:10PM–5:25PM

09-01 Steam Turbines, Generators, and Auxiliaries

Chair: Michael Smiarowski - Siemens Energy, Inc.
Chair: Steven Greco - Lectrodryer
Chair: John Sassatelli - General Electric
Chair: Steven Radke - Siemens Energy, Inc.
Chair: Davi Squaiella - Black & Veatch

Publications/Presentations:

STATOR LEAKAGE MONITORING SYSTEM IN WATER-COOLED GENERATORS: PROBLEMS AND SOLUTIONS

4:15PM - 4:28PM

Technical Paper Publication: POWER 2021-65471
Matthias Svoboda - SvoBaTech, Inc.
Thomas Bauer - SvoBaTech, Inc.

EFFECTS OF CONTAMINANTS ON HYDROGEN GAS FOR HYDROGEN COOLED GENERATORS

4:28PM - 4:41PM

Technical Presentation Only: POWER 2021-63186
Stephanie Bradley - Lectrodryer, LLC
John Mcphearson - Lectrodryer, LLC
Blanca Ramirez - Lectrodryer, LLC

OCCUPATIONAL RADIATION EXPOSURES ALARA REDUCTION THROUGH FAST PURGING OF HYDROGEN COOLED GENERATORS FOR BOILING WATER NUCLEAR REACTORS,

4:41PM - 4:54PM

Technical Presentation Only: POWER 2021-64854
Ted Warren - Lectrodryer
Keith Quick - Southern Nuclear

STEAM TURBINE MODERNIZATIONS: RECENT TRENDS IN THE GREENING WORLD

4:54PM - 5:07PM

Technical Presentation Only: POWER 2021-73001
Michael Smiarowski - Siemens Energy, Inc.

CORONA IN HIGH VOLTAGE ROTATING MACHINES STATOR COILS: CAUSES, REPAIR AND LABORATORY PROGNOSIS

5:07PM - 5:20PM

Technical Presentation Only: POWER 2021-73982
Anna Gegenava - National Electric Coil
Aleksandr Khazanov - National Electric Coil
Fred Dawson - National Electric Coil

ASME® POWER 2021
Power Conference