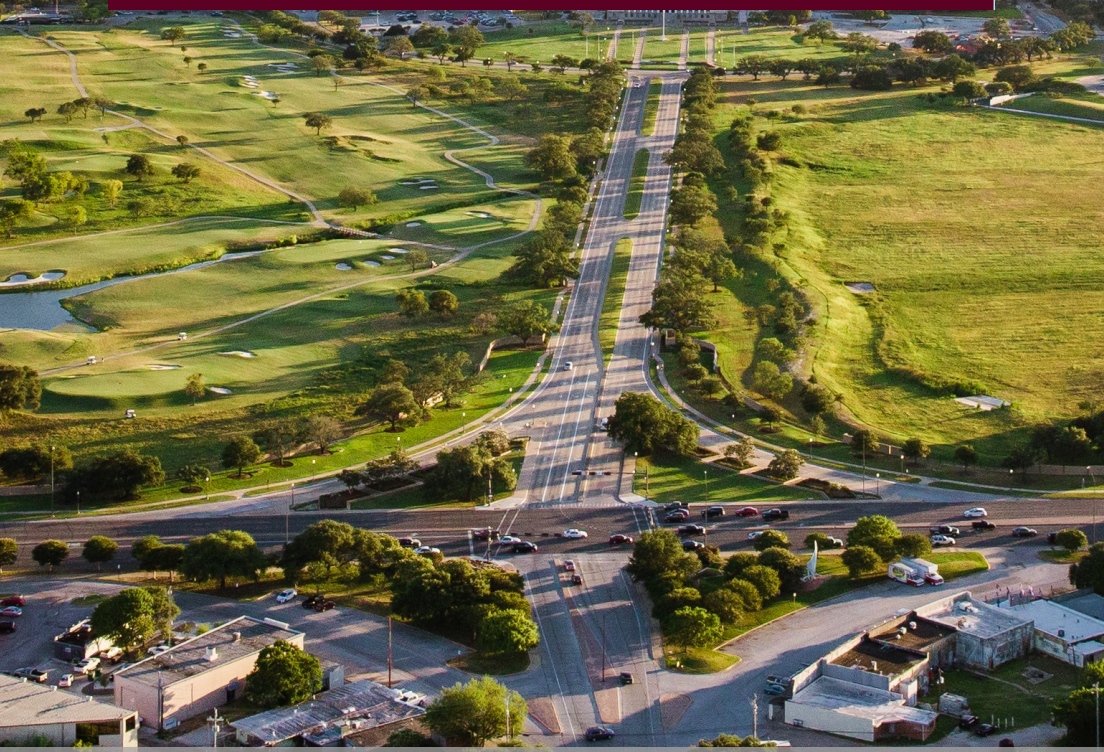
TPEC 2024

The 8th Annual IEEE Texas Power and Energy Conference

February 12 – 13th, 2024



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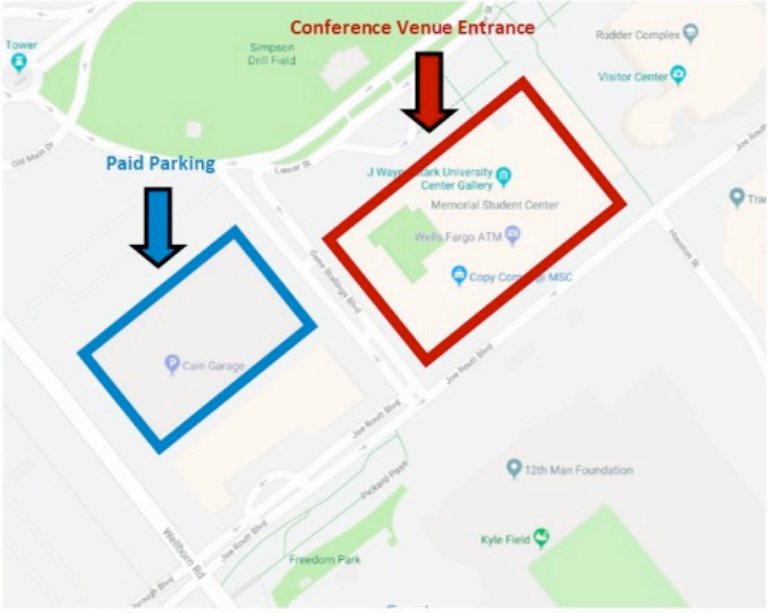
CIR (Center for Infrastructure Renewal) Tour

Tuesday, February 13th, 2024

Schedule:

- 4:00 PM – Gather for bus (at registration table)
- 4:15 PM – Bus leaves for CIR
- 4:35 PM – Arrive at CIR
- 4:50 PM – CIR Tour
- 6:10 PM – Bus departs CIR
- 6:30 PM – Tour Concludes at MSC

Parking Information



Dr. Kevin Tomsovic

TPEC 2024 Keynote
Director of CURENT and the CTI Chancellor's Professor of Electrical Engineering and Computer Science at University of Tennessee, Knoxville

Analysis and Quantification of Power System Resilience

Dr. Tomsovic is the Director of CURENT and the CTI Chancellor's Professor of electrical engineering and computer science at UT. He is also a member of the National Academy of Engineering and an IEEE Fellow.

He received his BS in electrical engineering at Michigan Technological University in 1982, and then he received his MS and PhD degrees in Electrical Engineering from University of Washington in 1984 and 1987, respectively. He previously was a professor at Washington State University.

Dr. Tomsovic's areas of interest include intelligent systems and optimization methodologies applied to various power system problems, including distribution system design, electricity market analysis, equipment diagnostics and maintenance, operation of dispersed energy resources, production scheduling, and stabilization control.

Comm'r James Glotfelty

TPEC 2024 Keynote
Commissioner on the Public Utility Commission of Texas

James Glotfelty is currently a commissioner on the Public Utility Commission of Texas, appointed by Governor Greg Abbott on August 6, 2021, for a term set to expire on September 1, 2025. Before his appointment, he served as Founder and Executive Vice President of Clean Line Energy. His public sector experience includes serving as Senior Policy Advisor to U.S. Secretary of Energy Spencer Abraham, Energy Policy Director to Texas Governor George W. Bush and Legislative Director to Congressman Sam Johnson. He founded and led the Office of Electricity at The U.S. Department of Energy, led the joint US-Canadian Power System Outage Task Force and served on the White House Task Force to Streamline Energy Permitting.

Mr. Glotfelty's private sector work also includes various Executive and Managerial roles at Calpine Corporation, ICF Consulting and Quanta Services. He served as Chairman of AWEA on the Transmission Committee and held board positions on ConservAmerica, Texas Housing Finance Corporation and Group NIRE. He regularly participated in the Aspen Institute Energy Forum, the Harvard Energy Policy Group and the Keystone Energy Forum. A former Committee Chairman of the Greater Houston Partnership and an Alumni of the Texas Lyceum, Jimmy received his Bachelor of Science in Political Science and Marketing from Texas Christian University.

Dr. Line A. Roald

TPEC 2024 Keynote

Associate Professor in Electrical and Computer Engineering at University of Wisconsin-Madison

How can consumers most effectively reduce the carbon footprint of their electricity consumption?

Dr. Line A. Roald is an Associate Professor in the Department of Electrical and Computer Engineering at the University of Wisconsin-Madison. Prior to joining UW Madison, she received her Ph.D. degree in Electrical Engineering (2016) from ETH Zurich, Switzerland and was a postdoctoral research fellow with the Center of Non-Linear Studies at Los Alamos National Laboratory. Professor Roald is the recipient of an NSF CAREER award, several best paper awards, and the UW Madison ECE Outstanding Graduate Mentor award. Her research interests center around modeling and optimization of electric power systems and interdependent infrastructures, with a particular focus on managing uncertainty and risk from extreme weather and renewable energy variability.

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TPEC 2024 Schedule

Monday, February 12th, 2024		
7:15 AM – 8:15 AM	Breakfast	MSC 2300C
8:15 AM – 8:45 AM	Opening Ceremony	MSC 2300C
8:45 AM – 9:25 AM	Keynote Speaker I: Dr. Kevin Tomsovic *Professor of Electrical Engineering and Computer Science* Presentation Title: *Analysis and Quantification of Power System Resilience*	MSC 2300C
9:30 AM – 9:50 AM	SynchroGrid Sponsor Address	MSC 2300C
10:00 AM – 11:00 AM Paper Block 1	Machine Learning Applications in Power Systems I	MSC 2300A
	Power Electronics I	MSC 2300B
	Power Systems I	MSC 2300D
	Renewable Energy & Smart Grid I	MSC 2300E
11:10 AM – 12:10 PM Paper Block 2	Renewable Energy & Smart Grid II	MSC 2300A
	Power Systems II	MSC 2300B
	Microgrids	MSC 2300D
	Machines, Electromagnetics, and Drives	MSC 2300E

Monday, February 12th, 2024		
12:10 PM – 1:10 PM	Lunch	MSC 2300C
1:15 PM – 1:50 PM	Keynote Speaker II: Commissioner James Glotflety *Public Utility Commission of Texas*	MSC 2300C
2:00 PM – 3:15 PM Paper Block 3	Power Electronics II	MSC 2300A
	Machine Learning Applications in Power Systems II	MSC 2300B
	Cyber and Physical Security	MSC 2300D
	Energy Market & Demand Response	MSC 2300E
3:30 PM – 4:45 PM Paper Block 4	Power Electronics III	MSC 2300A
	Distribution Systems I	MSC 2300B
	Power Systems III	MSC 2300D
	Electric Vehicles	MSC 2300E
5:00 PM – 6:00 PM	Poster Session	MSC 2300
6:00 PM – 8:00 PM	Welcome Reception	MSC 2406

End of Day 1

Tuesday, February 13th, 2024		
7:30 AM – 8:30 AM	Breakfast	MSC 2300C
8:30 AM – 9:10 AM	Keynote Speaker III: Dr. Line A. Roald *Professor, Electrical & Computer Engineering* Presentation Title: *How can consumers most effectively reduce the carbon footprint of their electricity consumption?*	MSC 2300C
9:15 AM – 10:30 AM Paper Block 5	Power Systems IV	MSC 2300A
	Power Electronics IV	MSC 2300B
	Renewable Energy & Smart Grid III	MSC 2300D
	Distribution Systems II	MSC 2300E
10:45 AM – 12:00 PM Paper Block 6	Power Systems V	MSC 2300A
	Power Electronics V	MSC 2300B
	Power Systems VI	MSC 2300D
	Power Systems X	MSC 2300E
12:10 PM – 1:10 PM	Lunch	MSC 2300C

Tuesday, February 13th, 2024		
1:10 PM – 1:30 PM	EPE Sponsor Address	MSC 2300C
1:40 PM – 2:40 PM Paper Block 7	Power Systems VII	MSC 2300A
	Power Systems VIII	MSC 2300B
	Power Systems IX	MSC 2300D
2:50 PM – 3:45 PM	Closing Ceremony	MSC 2300C
4:10 PM – 6:30 PM	CIR Tour	CIR Building, Texas A&M RELLIS Campus

End of Day 2

Paper Block 1 – Machine Learning Applications in Power Systems I
February 12th, 2024

Paper 15: Analysis of Weather and Time Features in Machine Learning-aided ERCOT Load Forecasting
Jonathan Yang, Mingjian Tuo, Jin Lu and Xingpeng Li

Paper 22: A Machine Learning Initializer for Newton-Raphson AC Power Flow Convergence
Samuel Okhuegbe, Adedasola Ademola and Yilu Liu

Paper 23: Photovoltaic Power Forecasting Using Neural Networks for Short and Medium-Term Dependencies
Raaid Kabir, Abdellatif Elmouatamid, Hamza Elkhoukhi and Philip W. T. Pong

Paper 59: Advancing Fault Detection and Classification through High-Fidelity Digital Twin Simulation and AI
Shayan Ebrahimi, S M Safayet Ullah, Samuel Yankson and Farzad Ferdowsi

Paper Block 1 – Power Electronics I
February 12th, 2024

Paper 7: Compact modeling of power GaN Fin-JFETs I-V Characteristics using ASM-HEMT model
Danial Bavi and Sourabh Khandelwal

Paper 10: Soft Start-Up Technique for Solid State Transformer
Himanshu Patel, Sourabh Chahar, Shekhar Bhawal and Kamalesh Hatua

Paper 20: An Optimized Inductorless Ring-Oscillator based DC-DC Boost Converter For TEG-Based
Hamza Hayat, Jackson Johnson and Wala Saadeh

Paper 31: Hamiltonian Control of a 4-Leg Converter for Mitigation of Common Mode-Induced Current Offset
Ronald Matthews, Timothy Donnelly and Lee Rashkin

Paper Block 1 – Power Systems I
February 12th, 2024

Paper 82: Enhancing Overcurrent Relay Coordination to Address Power System Operational and Topological Changes
Oluwatimilehin Adeosun and Valentina Cecchi

Paper 30: Automatic Transfer Switch for Critical Loads Between Renewables, Storage, Mains, or Generator
Roshan Barnwal, Biplov Yogi and Afshin Balal

Paper 32: Dissipativity-based Robust Power Flow Regulation Controllers for Real-time Congestion Mitigation in Power System Networks
Ajul Dinesh, Pratyasa Bhui and Ameer K. Mulla

Paper 35: Power Systems Transient Stability Indices: Hierarchical Clustering Based Detection of Coherent Groups Of Generators
Faycal Znidi, Hamzeh Davarikia and Heena Rathore

Paper Block 1 – Renewable Energy & Smart Grid I
February 12th, 2024

Paper 5: Management Style or Technology: What is hampering the performance of India's Hydroelectric Stations?
Jasleen Kaur and Amritpal Dhillon
Paper 6: A Stochastic Multi-Objective Planning Framework for Distributed Energy Resources as an Alternative to Transmission Expansion
Hossein Saber, Hossein Ranjbar and Hesam Mazaheri
Paper 34: Maximizing Value Factor and Profit for Land-Based Wind Farms with Energy Storage
Reina Chu, Chris Qin and Josue Campos Do Prado
Paper 36: Green Hydrogen Long-term Storage Integration into DC-Microgrid Bus Operations
Ziqi Liu, Mohammed Beshir, Nayef Alhajraf and Zhongxia Zhang

Paper Block 2 – Renewable Energy & Smart Grid II
February 12th, 2024

Paper 38: A Probabilistic Approach for Assessing Annual Power Generation and Losses of An Offshore Wind Farm
Gary Chang, Iverson Li, Wilson Nien and Wei-Yun Huang
Paper 77: Techno-Economical Evaluation of an Innovative Integrated EWeC Multifunctional Service Station Utilizing Road Infrastructure
Kazi Meharajul Kabir and Shuza Binzaid
Paper 87: Resource Adequacy Study of PJM Considering Hurricane-Driven Offshore Wind Generation Outages
Mahdi Mehrtash, Benjamin Hobbs, Saroj Khanal and Yury Dvorkin
Paper 104: A Two Step Chance Constrained Day Ahead Portfolio Optimization for a DISCOM in the Presence of Renewable and Energy Storage
Panyam Sweeya Goud, Gagan Meena, Gopal Gajjar and Shreevardhan Soman

Paper Block 2 – Power Systems II
February 12th, 2024

Paper 40: Hardware Implementation and HIL Validation of a Local Measurement Based DC Protection Scheme
Daniel Zintsmaster, Munim Bin Gani, Sukumar Brahma, Matthew Reno, Miguel Jimenez Aparicio and Javier Hernandez-Alvidrez
Paper 45: A High Voltage Test System Meeting Requirements under Normal and All Single Contingencies Conditions of Peak, Dominant, and Light Loadings for Transmission Expansion Planning Studies
Bhuban Dhamala and Mona Ghassemi
Paper 55: Voltage Stability Assessment in Smart Electric Grid Under False Data Injection Attack
Kamal Singh and Sailaja Kumari Matam
Paper 61: Estimation of Series- and Shunt-Capacitances of a Single-Phase Core-Type Transformer Windings
Rajesh Lekkireddy, Pravin Magdum, Dr. Chiragkumar Parekh, and Dr. Krupa Shah

Paper Block 2 – Microgrids
February 12th, 2024

Paper 115: Resilient Dispatch in Synchronous Generator-based Microgrids for Emergency Situations
Pablo Daniel Paz Salazar, Robert Hebner, Shannon Strank and Melanie Johnson

Paper 150: Microgrid Optimal Sizing and Scheduling for Feasibility Studies
Simon Abongmbo, Fatima Ezzahra El Aidos, Driss Benhaddou, Lei Fan, Carlos Gamarra, Tianrun Zhang, Jian Shi and Harish Krishnamoorthy

Paper 152: Performance Evaluation of District Energy Microgrids Planning Tool for Non-Technical Users
Fatima Ezzahra El Aidos, Simon Abongmbo, Driss Benhaddou, Lei Fan, Lennart Johnsson, Carlos Gamarra, Tianrun Zhang and Muhammad Anan

Paper 160: Advancing Microgrid Protection: Unifying Per-Phase Frequency-Synchronized Phasors
Jorge Ignacio D. Cisneros Saldana and Miroslav M. Begovic

Paper Block 2 – Machines, Electromagnetics, and Drives
February 12th, 2024

Paper 60: Breaking the Ceiling of Motor Temperature Rise for Special Applications
Dr. Santosh Ghosh, Dr. Ravindra Birajdar and Kiran Gosavi

Paper 91: Comparative Analysis of Machine Learning Algorithms for Eccentricity Fault Classification in Salient Pole Synchronous Machine
Ashwin Shejwalkar, Latifa Yusuf and Ilamparithi Chelvan

Paper 145: Impacts on the Grid-Side Voltage Due to the Current Unbalance Amplification Caused by Induction Motors
Alexander Cogburn and Prashanna Bhattarai

Paper Block 3 – Power Electronics II
February 12th, 2024

Paper 33: Supertwisted Synergetic Control for DC-DC Power Converter of G2V-V2X Capable Onboard Electric Vehicle Charger
Hafiz Mian Muhammad Adil, Hassan A. Khan, Mashood Nasir, Rahman Syed and Irfan Khan

Paper 46: Unified Switching Loss Comparison Method for SiC MOSFETs in Electric Vehicle Traction Inverters
Christopher S. Dzorkpata, Abhishek Bose and Qingyun Huang

Paper 167: Lifetime Improvement With Predictive Maintenance of Power Electronics Based on Remaining Useful Life Prediction
Biplov Jha, Lin Dong and Le Xie

Paper 53: Comparison of plant-level and unit-level virtual inertia for BESS power converters
James Amankwah Adu, Mohammad Hammad, Giacomo Minaudo, Aram Khodamoradi and Kanniga Vijayshankar

Paper 56: Sustainable Power Distribution Architectures with Multiple Sources and Converter Designs for Lunar Surface
Rahul Raj and Harish S Krishnamoorthy

Paper Block 3 – Machine Learning II
February 12th, 2024

Paper 74: Cascaded Ensemble-based Short-term Load Forecasting for Smart Energy Management
Joshua Ottens, Thangarajah Akilan, Amir Ameli and Mohammad Uddin

Paper 97: A Hybrid Clustering and Neural Network-based Ensemble Method for Day-Ahead PV Output Forecast
Gary Chang, Kelvin Tseng and Elena Chiu

Paper 128: Advancing the MILP-based Load Restoration with Graph Neural Networks
Shihab Ahmed and Wei Sun

Paper 138: Multi-Edge Graph Convolutional Networks for Power Systems
Abhijith Ravi, Linquan Bai, Fei Ding and Hong Wang

Paper 95: Model Explainable AI Method for Fault Detection in Inverter-Based Distribution Systems
Alejandro Reyes, Ambe Chengu, Nikolaos Gatsis, Sara Ahmed and Miltos Alamaniotis

Paper Block 3 – Cyber & Physical Security
February 12th, 2024

Paper 14: An AI-based Approach for Scalable Cyber-physical Optimal Response in Power Systems
Shining Sun, Shamina Hossain-McKenzie, Leen Al Homoud, Khandaker Akramul Haque, Ana Goulart and Katherine Davis

Paper 17: Toward Proactive Cyber-Physical-Human Risk Assessment in Power Systems
Amarachi Umunnakwe, Shining Sun and Katherine Davis

Paper 25: Experimental System for Supply Chain Cyber-Security of Distribution Switch Controls
Joseph Keller, Kevin Hutto, Santiago Grijalva, Vincent Mooney, Trevor Lewis, Ronald Barret, Brian Holland and Eric Patten

Paper 111: Recurrent Neural Network-Based Sensor Data Attacks identification in Distributed Renewable Energy (DER)-Based DC Microgrid
Md Abu Taher, Hasan Iqbal, Mohd Tariq and Arif I. Sarwat

Paper 141: Cyber-Physical Testbed Integrating RTAC with RTDS for Game-Theoretic Topology Control Under Load Altering Attacks
Alaa Selim and Junbo Zhao

Paper Block 3 – Energy Market & Demand Response
February 12th, 2024

Paper 66: Reinforcement Learning-Driven Decision-Making in Deregulated Electricity Markets Involving Greedy Agent-Based Participants
Athanasios Arvanitidis and Miltiadis Alamaniotis

Paper 113: Modified Flower Pollination Algorithm for Energy Forecasting and Demand Management coupled with Improved Battery Life for Smart Building Micro-grid
Ali Hamza, Muhammad Uneeb, Zunaib Ali, Sandra Dudley, Sultan M Alghamdi and Nicholas Christofides

Paper 118: Equitable Transactive Market Design to Coordinate Networked Microgrids with Mixed Ownership
Thanh Long Vu and Kevin Schneider

Paper 125: Community-Based Transactive Coordination Mechanism for Enabling Grid Edge Systems
John R. Theisen, Anjan Bose, Monish Mukherjee, Dan Burgess, Kenneth Wilhelm and Michael Diedesch

Paper 162: A Demonstration of Virtual Power Plant Program Participant from the Perspective of a Customer
Tung Lam Nguyen, Quynh Tran, Saeed Separi, Marc Matsuura and Leon Roose

Paper Block 4 – Power Electronics III
February 12th, 2024

Paper 62: Pre-charge Strategy and Light-Load Voltage Balance Enhancement for DC/AC Flying Capacitor Converter
Da Jiao and Alex Q. Huang

Paper 63: Power quality assessment of power systems with PV sources using discrete equivalent models
Julio Cesar Godinez Delgado, Aurelio Medina Rios and Rafael Cisneros Magaña

Paper 84: Transient Stability Comparison of Grid-Forming and Grid-Following Inverter-Based Resources
Decheng Yan, Joseph Benzaquen and Deepak Divan

Paper 86: A New LVRT Strategy with Reactive Power Support from Inverter-Based Resources During Unbalanced Faults on a Distribution System
Priya Raghuraman and Mesut Baran

Paper 88: Simulation of Lithium-Ion Battery in Electric Vehicles and Analysis of Performance, Ageing, and Temperature Effects
Hridhya Bibi, Muhammad Ashar Ayaz, Anas Amjad, Muhammad Naveed Iqbal and Irfan Khan

Paper Block 4 – Distribution Systems I
February 12th, 2024

Paper 19: A Fully Distributed Consensus ADMM Approach for Loss Minimization in AC-DC Radial Distribution Networks
Subho Paul, Abhimanyu Sharma, Krishna Murari, Narayana Prasad Padhy and Sukumar Kamalasadan

Paper 54: Shared Autonomous Electric Vehicle Dispatch with Mobility and Distribution System Resilience Benefits
Jake Robbennolt, Javad Mohammadi and Stephen Boyles

Paper 70: Deep Attention GRU-GRBM with Dropout for Fault Location in Power Distribution Networks
Mahdi Khodayar, Ali Farajzadeh Bavil and Mohammad E. Khodayar

Paper 75: Managing Vehicle Charging During Emergencies via Conservative Distribution System Modeling
Alejandro Owen Aquino, Samuel Talkington and Daniel K. Molzahn

Paper 93: Fairness-aware Photovoltaic Generation Limits for Voltage Regulation in Power Distribution Networks using Conservative Linear Approximations
Rahul Gupta, Paprapee Buason and Daniel K. Molzahn

Paper Block 4 – Power Systems III
February 12th, 2024

Paper 64: Adaptive Voltage and Frequency Regulation for Secondary Control via Reinforcement Learning for Islanded Microgrids
Kouhyar Sheida, Mohammad Seyedi and Farzad Ferdowsi

Paper 65: AC Power Flow Informed Parameter Learning for DC Power Flow Network Equivalents
Babak Taheri and Daniel Molzahn

Paper 69: Optimizing Multi-Timestep Security-Constrained Optimal Power Flow for Large Power Grids
Hussein Sharadga, Javad Mohammadi, Constance Crozier and Kyri Baker

Paper 76: Assessment of power quality adverse phenomena in power systems using frequency dependent network equivalent and companion-circuit analysis
Juan Verduzco Durán, Aurelio Medina Rios, Julio Cesar Godinez Delgado, Rafael Cisneros Magaña and Antonio Ramos Paz

Paper 78: Using Power Flow Application Capabilities to Visualize and Analyze US Energy Information Administration Generation Data
Jordan Cook, Farnaz Safdarian, Jonathan Snodgrass and Thomas Overbye

Paper Block 4 – Electric Vehicles
February 12th, 2024

Paper 21: Electric Vehicle Aggregation Review: Benefits and Vulnerabilities of Managing a Growing EV Fleet
Kelsey Nelson, Javad Mohammadi, Yu Chen, Erik Blasch, Alex Aved, David Ferris, Erika Ardiles Cruz and Philip Morrone

Paper 37: Game Theory-Based EV Aggregator Operation Framework to Provide Flexibility Considering Transportation Conditions
Dongjun Han, Jaewon Lee and Dongjun Won

Paper 41: Strategic EV Charging and Renewable Integration in Texas
Mohammad Mohammadi and Jesse Thornburg

Paper 68: Multi-Objective Stochastic Optimization for EV and Renewable DG Integration
Mahmoud Ghofrani and Nawal Hersi

Paper Block 5 – Power Systems IV
February 13th, 2024

Paper 81: Shining Light on Electrical Energy Burden: Affordability and Equity in Rate Design
Amanda West and Santiago Grijalva

Paper 98: Characterizing Nonlinear Field Dependent Conductivity Layers to Mitigate Electric Field Within (U)WBG Power Modules Under High Frequency, High Slew Rate Square Voltage Pulses
Pujan Adhikari and Mona Ghassemi

Paper 83: Average Day-Ahead Spot Price Prediction Using Ensemble of Extreme Learning Machine Models
Joshua Ramirez, Sara Ahmed and Miltiadis Alamaniotis

Paper 85: A Review of Insulation Challenges and Mitigation Strategies in (U)WBG Power Modules Packaging
Pujan Adhikari and Mona Ghassemi

Paper 90: Application of Synthetic Geomagnetic Storms on Transformer Thermal Assessment
Rida Fatima and Adam Birchfield

Paper Block 5 – Power Electronics IV
February 13th, 2024

Paper 89: Fabrication of MVDC Multilayer Insulation Systems as Flat Samples for Wide-Body All-Electric Aircraft
Arian Azizi, Anoy Saha, Md Asifur Rahman, Mona Ghassemi and Jane Lehr

Paper 134: Applying Scientific Machine Learning Techniques to Power Electronics Parameter Prediction
Caleb Harrison, Wei Sun and Touria El Mezyani

Paper 101: Influence of Aircraft-Environment Pressure Range on Negative DC Partial Discharge Inception Voltage
Mohammad Hamidieh, Sai Pavan Kalakonda and Mona Ghassemi

Paper 102: Advanced Sliding Mode Control Techniques Employed on Electric Hybrid Vehicle
Waqas Ahmad, Irfan Ullah, Qudrat Khan and Laiq Khan

Paper 117: Impact of Grid-Forming Converters on Distance Elements Based on the X and M Calculations
Christopher L. Peralta and Hugo N. Villegas Pico

Paper Block 5 – Renewable Energy & Smart Grid III
February 13th, 2024

Paper 110: Floating Solar Power Plant Applications in Turkey
Ibrahim Gunes and Robert Balog
Paper 151: Enhancing Financial Sustainability of Community Minigrids: A Case Study Approach
Madhav Sharma and Anoop Singh
Paper 161: Resilient Interconnected Power-Grid Control Using Sliding Mode Approach
Touria El Mezyani and Gafary Mahmoud
Paper 166: Solar Irradiance Prediction with Ensemble Learning Method as Input for Battery Operation Optimization
Ray Colucci and Imad Mahgoub

Paper Block 5 – Distribution Systems II
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Paper 96: Measurement-based/Model-less Estimation of Voltage Sensitivity Coefficients by Feedforward and LSTM Neural Networks in Power Distribution Grids
Robin Henry and Rahul Gupta
Paper 114: Implementing resiliency upgrades on power distribution system using graph theoretic methods
Gowtham Kandaperumal, Chiew Chun and Thomas Mahar
Paper 116: Post-Disaster Dispatch of Transportable Renewable-Powered Resilience-Delivery Sources in Power Distribution Systems
Jinshun Su and Payman Dehghanian
Paper 131: Continuous Markov-based Reliability Analysis of Underground Vault in Distribution Power Systems
Md Abu Taher, Hasan Iqbal, Sukanta Roy, Shahid Tufail, Mohd Tariq and Arif I. Sarwat
Paper 155: Placement, Sizing, and Dispatch Scheme to Maximize the Benefits of Dynamic VAR Compensators on Distribution Systems with High PV Penetration
Keith Dsouza and Mesut Baran

Paper Block 6 – Power Systems V
February 13th, 2024

Paper 142: Transmission System Resilience: A Detailed Analysis of Key Factors, Metrics, and Methods
Saranga Abeygunawardane, Visvakumar Aravinthan and Chanan Singh

Paper 154: Magnetic Field Calculation under Unconventional High Surge Impedance Loading Lines
Easir Arafat, Babak Porkar and Mona Ghassemi

Paper 156: Electric Field Comparison of Conventional TL With The Unconventional TL
Easir Arafat, Babak Porkar and Mona Ghassemi

Paper 163: Engineering Education Project to Promote Active Learning through Innovative Teaching on Power and Energy
Jaehee Park, Wonhyeok Jang and Thomas Overbye

Paper Block 6 – Power Electronics V
February 13th, 2024

Paper 130: Modular Multi Input High Gain Unfolding Inverter for Nano Grid Applications
Fahad Alhuwaishel and Nabil Ahmed

Paper 133: A Novel Fault Ride-Through Scheme for Grid-Forming Inverters under Symmetrical and Asymmetrical Faults in Distribution Systems
Stephen Ambe Chengu, Nikolaos Gatsis, Miltiadis Alamaniotis and Sara Ahmed

Paper 158: Performance Analysis of Multi-Composite Layered Energy Harvesting from Thin-Film PZT Using Smart Charging System
Kazi Meharajul Kabir and Shuza Binzaid

Paper 146: Ramp-Rate Limiting Inverter Control using Predicted Irradiance
Kushal Buch

Paper 157: Performance Evaluation of Triangular-Current Mode (TCM) Zero-Voltage Switching (ZVS) Two-Level Three-Phase Inverter for Electric Vehicle Motor Drive Applications
Khizra Abbas, Hans-Peter Nee and Konstantin Kostov

Paper Block 6 – Power Systems VI
February 13th, 2024

Paper 2: An MVDC Bipolar Power Cable with a Rectangular Geometry Design for Envisaged All-Electric Wide-Body Aircraft
Anoy Saha and Mona Ghassemi

Paper 105: Design and Validation of a Very Low-Power Phasor Measurement Unit
Zachary J. Lythgoe, Thomas F. Long, Michael J. Buchholz, Anthony R. Livernois, Kebba Kanuteh, David R. Allee, Anamitra Pal, Ian R. Graham and Zachary D. Drummond

Paper 123: H∞ Robust Second-Order Generalized Integrator Phase-Locked Loop
Abdullahi Bamigbade, Ahmed Saafan, Adeola Balogun, Abdullateef Bamigbade, Dajr Alfred, Umar Salman and Vinod Khadkikar

Paper 126: Delayed DSOGI-Based Vector Current Control of Distributed Energy Resources Under Distorted and Unbalanced Grid Conditions
Abdullahi Bamigbade

Paper 143: Design of a Novel Islanding Scheme: Experiences with Agra-Lalitpur Power System, India
Pratyasa Bhui, Sagnik Basumallik and Manohar Singh

Paper Block 6 – Power Systems X
February 13th, 2024

Paper 112: A Description of the Texas A&M University Electric Grid Test Case Repository for Power System Studies
Sanjana Kunkolienkar, Farnaz Safdarian, Jonathan Snodgrass, Adam Birchfield and Thomas Overbye

Paper 170: Detailed Hourly Weather Measurements for Power System Applications
Farnaz Safdarian, Melvin Stevens, Jonathan Snodgrass and Thomas Overbye

Paper 144: Optimal Operations of Nuclear-based Integrated Energy Systems with Mixed-Integer Programming
Jianqiao Huang, Binghui Li, Bikash Poudel and Jie Zhang

Paper Block 7 – Power Systems VII
February 13th, 2024

Paper 92: A Data Analytics Method to Pinpoint Causes for Poor Performance of Real Time Distribution Power Flow
Gokhan Cakir, Mesut Baran, Valentina Cecchi, Badrul Chowdhury, Ken Crawford, Oluwatimilehin Adeosun, Cara Decoste Chacko and Mariann Thomas

Paper 106: Quantum-Inspired Optimal Power Flow
Farshad Amani and Amin Kargarian

Paper 140: Enhancing AC Power Flow Analysis: Integrating Newton-Raphson Method with Gradient Descent and Computational Graphs
Masoud Barati

Paper 164: Enhancing Power Flow Studies Through Representative Scenario Selection
Jordan Cook, Maximo Briones, Farnaz Safdarian and Thomas Overbye

Paper Block 7 – Power Systems VIII
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Paper 127: Data-driven Quasi-static Surrogate Models for Nuclear-powered Integrated Energy Systems
Mukesh Gautam, Bikash Poudel and Binghui Li

Paper 129: Prediction of Cryptocurrency Mining Load Tripping Through Learning-Based Fault Classification
Anindita Samanta, Qian Zhang and Le Xie

Paper 132: Martian Energy System Design Considerations
Lefan Wang and Robert Balog

Paper 136: High Power Density, Cost-Effective HVDC Cables for Power Transmission on the Moon
Anoy Saha and Mona Ghassemi

Paper Block 7 – Power Systems IX
February 13th, 2024

Paper 108: A Novel Power-Availability Based EV Distribution Algorithm to Mitigate Grid Congestion & Maximize EV Penetration in Utility Grid
Rahman Syed, Irfan Khan, Nicholas Elizondo, Atif Iqbal and Mousa Marzband

Paper 139: Power Factor Correction of Linear Loads Under Unbalanced Voltage Conditions
Prashanna Bhattarai

Paper 147: Enhancing System Inertia Estimation: Multi-Head Graph Attention Networks Leveraging PMU Measurements
Faisal Albeladi, Kamal Basulaiman and Masoud Barati

Paper 153: Bipolar Hybrid DC Circuit Breaker with Surge Arresting Mechanisms on Source and Load Sides
Mohammadamin Moghbeli, Shahab Mehraeen and David Rush

STUDENT ENGINEERS COUNCIL

TPEC 2024 SILVER SPONSOR

Formed in 1939 by the Dean of Engineering, the Student Engineers' Council is organized as an association for the exclusive purpose of providing advancement to students in the College of Engineering at Texas A&M University by serving as a liaison between the College of Engineering students and the administration and to inform the administration of the concerns of the students, and by providing programs that promote Texas A&M Engineering and engineering as a whole both on and off campus.

The mission of the SEC targets three main areas; it strives to be the **representative voice** of all engineering students; it works to increase **engineering awareness** through its programs and events; and it fosters the **professional advancement** of all engineering students within the College of Engineering. These three facets of the Council's mission are carried out through several committees in its Development, External, and Internal divisions.

POWERWORLD

TPEC 2024 SILVER SPONSOR

PowerWorld Corporation (PowerWorld) was founded in 1996 to develop, market, and distribute a power systems software package known as PowerWorld Simulator, that simulates the operation of high voltage systems for the generation, transmission, and consumption of electrical power.

PowerWorld Simulator was originally developed by Professor Thomas Overbye of Texas A&M University as a teaching tool to help students visualize high voltage power systems. A user-friendly and visually-oriented product, PowerWorld Simulator gives customers a comprehensive view of how electrical power flows through the transmission grid. Professor Overbye is still intimately involved with the design and development of the software.

PowerWorld Simulator is offered either in a base package, or with seamlessly integrated add-ons or product extensions. The base package performs a wide range of power flow analysis and visualization tasks, while the add-ons perform more specialized engineering and economic analysis. The base package and all add-ons share a common user interface. Applications for the PowerWorld Simulator cover a wide spectrum across many engineering and economic analysis activities.

Because of its origins as a teaching tool, PowerWorld Simulator was designed from the ground up to be highly graphical, user friendly, and interactive. Simulator's visual nature not only makes the analysis of power systems easier, but also makes it easier to explain the results of that analysis to others. Simulator has been used in presentations to such diverse entities as county zoning boards to state regulatory agencies to a sub-committee of the United States Congress.

IMPERIX

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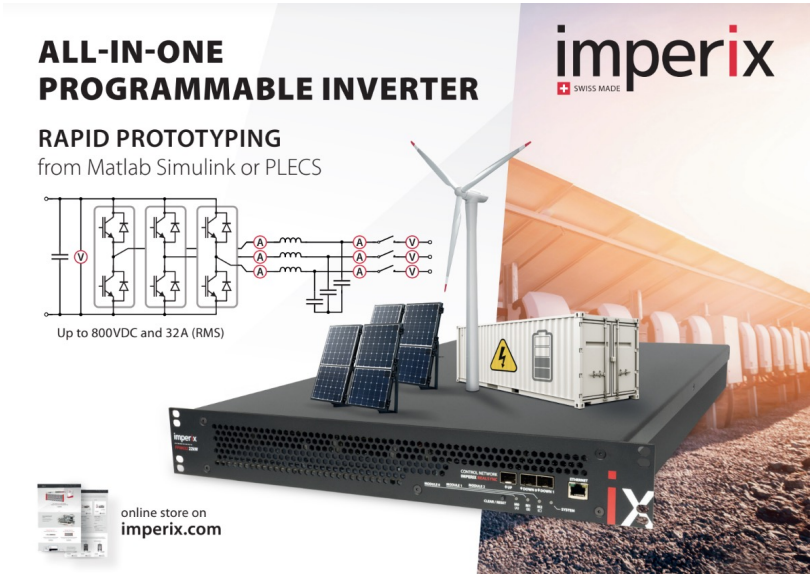

For more information, please visit:
https://imperix.com/company/

TAMU ENERGY INSTITUTE

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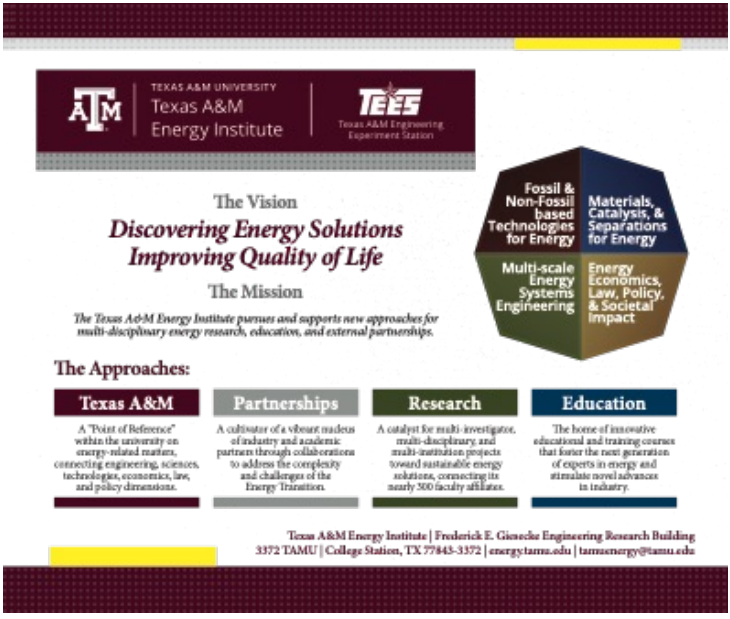
TEXAS A&M ENERGY INSTITUTE



College Station Utilities

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College Station Utilities
Reliable, Affordable, Community Owned

College Station Utilities (CSU) is the ninth largest of 72 Municipal electric utilities in Texas, and within the top 100 largest in the country. CSU serves approximately 44,000 meters with a peak load of 231 MW. The utility employees 90 staff members and operates over 510 miles of distribution (7.2/12.5kV) and 20 miles of transmission (138kV) facilities.

CSU is among only six Municipal electric utilities in Texas to receive national recognition as a top-level Reliable Public Power Provider from the American Public Power Association. Electric utilities receiving the designation are among the nation's best in reliability, safety, workforce development, and system improvement.

IEEE IAS

TPEC 2024 Gold Sponsor

IAS Vision Statement

IEEE Industry Applications Society will be a world leader in the advancement of science and technology linking theory and practice in the application of electrical and electronic systems for the benefit of humanity.

IAS Mission Statement

IEEE Industry Applications Society enables the advancement of theory and practice in the design, development, manufacturing and application of safe, sustainable, reliable, smart electrical systems, equipment and services.

What We Value

- The advancement of theory and practice of electrical and electronic engineering for the benefit of humanity;
- The promotion of safe, reliable, sustainable and economical installations;
- The sharing of knowledge in our domains;
- The creation of engineering standards and recommended practices;
- The professional development of our global membership.

Connect Yourself to the Industry Professionals in Electrical and Electronic Engineering.

If your engineering interests are the needs of the industrial or commercial sector, the Industry Applications Society (IAS) will be a valuable professional connection. One of the largest special interest societies within the Institute of Electrical and Electronics Engineers (IEEE), the IAS focuses specifically on the unique needs of industry and commerce. IAS is a source of professional power to its nearly 14,000 worldwide members. Through a network of over 370 chapters globally, regional events and national and international conferences, the society keeps members abreast of current developments in the area of technology in electricity and electronics. IAS enriches both its individual members and the industry as a whole through the sharing of specific industry-related solutions.

PAYTON PLANAR

TPEC 2024 GOLD SPONSOR

PAYTON PLANAR
Innovation • Design • Performance

Payton Planar Magnetics Ltd. is the world leader in developing and manufacturing of planar magnetic components.

We will custom design the best solution for your magnetic needs by applying our extensive know-how and experience. Transformers made of the planar principle eliminate virtually all the shortcomings of old-fashioned wire wound types. In a planar design, the windings are made so of copper foil lead frames or printed circuit boards. (a flat copper spirals laminated into thin dielectric substrates). These windings are then sandwiched, along with appropriate insulators, between large area, yet thin, state-of-the-art ferrite cores. This construction technique yields a host of benefits:

1. **Efficiency**: Typical efficiency of 98%.
2. **Leakage Inductance:** Low leakage inductance, typically less than 0.2% for ungapped cores.
3. **Size**: Low profile and small volume, suitable for high power density equipment designs.
4. **Frequency Range**: Unparalleled working frequency range from 50kHz to 5MHz.
5. **Repeatability and Predictability**: All windings are pre-tooled, ensuring unmatched repeatability and predictability.
6. **Configurations**: Suitable configurations for all SMPS topologies.
7. **Multiple Windings**: Multiple windings available, ranging from one to seven secondaries.
8. Power **Ratings**: Available in a wide range of power ratings from 10W to 200kW.
9. **Cooling**: Efficient high cooling and heat dissipation.
10. **Weight**: Low weight, approximately 15g per 100W.
11. **EMI**: Minimum Electromagnetic Interference (EMI).
12. **Temperature Range**: Wide operating temperature range from -55°C to +130°C.

Planar magnetics is probably the most cost-effective solution for high frequency high power density power conversion equipment available today.

77TH ANNUAL CONFERENCE FOR PROTECTIVE RELAY ENGINEERS

TPEC 2024 GOLD SPONSOR

77th Annual Conference for Protective Relay Engineers

For 77 years the Annual Conference for Protective Relay Engineers has provided the best available information on protective relay applications and technology. With the changes that have occurred in the electric power industry, including increased concerns over reliability and a business emphasis on efficiency and cost savings, the relay conference is even more important.

The 2024 Conference for Protective Relay Engineers will take place in-person on the Texas A&M University campus from **March 25–28, 2024**. The conference will feature paper presentations and Q&A sessions with presenters, an interactive exhibition hall of industry sponsors, and evening receptions.

Registration Now Open

77th Annual Conference for Protective Relay Engineers

March 25-28, 2024

TEXAS A&M UNIVERSITY®

Electric Power Engineers

TPEC 2024 Platinum Sponsor

About EPE

Electric Power Engineers, LLC (EPE) partners with power and energy clients across the globe to address complex engineering and grid modeling challenges and bridge the gaps necessary to build the grid of the future. Offering comprehensive services and proprietary solutions, our client-centric consultants deliver unmatched expertise and results.

At Electric Power Engineers, we treat each project as our own.

Your Partner in Energy Engineering

Electric Power Engineers, LLC (EPE) is a leading consulting engineering firm focused on the energy transition, providing power systems engineering services to a diverse client base. Founded in 1968, EPE has become a trusted partner to the power industry by utilizing our extensive experience in the evolution of the electric grid, from performing transmission and distribution planning studies to integrating renewable generation and energy storage. EPE offers a wide range of services with a leadership team that brings these services together to provide a holistic and unique solution to the challenges within the power industry.

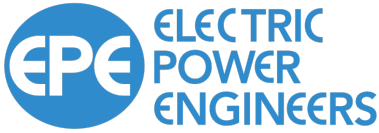
Our expertise is extensive in the ERCOT, SPP, WECC, MISO, CAISO, PJM, ISO-NE, NYISO and Southeast markets. At EPE, there are no geographical limitations to where our services extend. Our global experience allows us to bring solutions from around the world to your project.

Our Values

- **Lead as a trusted partner.** We interact with our clients, employees, and vendors with the highest degree of integrity, ethics, professionalism, and care.
- **Support each other toward excellence**. We put our people first and focus on team collaboration, fostering internal and outward-facing excellence with everything we experience and deliver.
- **Inspire impactful change**. We work together with our clients and amongst each other to understand the value of everything we do and its impact on our clients, our people, and our environment.
- **Embrace inclusion.** We foster a sense of belonging for our people. We respect and value one another's differences and believe that diversity builds strength and enables growth.
- **Go where others think it's not possible**. Innovation is core to our excellence. We work together to be two steps ahead of others in providing solutions for our future, the modern grid.

Who We Serve

EPE serves the needs of investor-owned utilities (IOUs), municipal-owned utilities (MOUs), cooperative utilities, independent system operators (ISOs), project developers, owners, independent power producers, as well as other grid stakeholders. You can rely on us to address constantly changing requirements using our subject matter experts who have wide skillsets across complex regulations and systems.



TPEC 2024 Platinum Sponsor

Power Delivery: Increase efficiency and ensure accuracy by leveraging detail-driven consultants to perform power system studies and guide strategic future-focused decisions across grid modernization, and transmission and distribution planning to continue to serve electric consumers reliably and economically.

Power Generation & Renewables: Gain high-quality project development and interconnection process support with a team of power generation consultants who are highly experienced in tasks including technical, economic, and feasibility studies, plant modeling and project design, market analysis and site selection.

Energy Storage: Achieve maximum results and ensure accuracy by depending on our full-service approach and client-centric team to manage the ongoing complexities of projects including grid modernization initiatives, interconnection and market studies, and sizing optimization.

Distributed Energy Resources: Plan, study, and design DER programs for electric networks that span modernization, T&D planning, and interconnection while navigating regulatory, technical, and policy requirements and ensuring compliance.

Industrial and Commercial: Reach sustainability and clean energy goals while reducing costs by turning to a team of power and energy experts to drive project development, lead modernization initiatives, and implement forward-thinking technologies and solutions

Governments and Universities: Maximize resources by relying on a team of proven power and energy consultants with experience across governments and universities to drive key initiatives including grid modernization, transmission and distribution planning and interconnection.

EPE has supported more than 100 developer, generation and utility clients who have a combined 130 GW in operational renewable energy projects.

Our Work

EPE's capabilities and services cover the full spectrum of transmission, distribution, generation, and technology needs from key client groups. EPE delivers excellence with a tight team of power systems engineers enabled by technology and automation.

We tailor our services to ensure your project's success, and we consider ourselves an extension of your team. We rely on our client-focused and integrated approach that goes beyond scope to provide maximum results and unmatched project success. You can leverage our specialized expertise and wide skill sets across power and energy projects that span Utility Engineering, Grid and Resource Integration, Reliability and Compliance, and Software and Grid Analytics. Address constantly changing requirements by placing your trust in our team of expert regulatory compliance consultants with deep experience across complex regulations and systems. Offload your projects to dedicated teams with exposure and experience across robust industry tools and access to proprietary, industry-leading software.

SYNCHROGRID
TPEC 2024 PLATINUM SPONSOR

Who is SynchroGrid?

SynchroGrid is an innovative engineering consulting company specializing in system protection for generation, transmission, and distribution utilities. Its trailblazing engineering services include relay setting development, protection and control design, substation design, NERC compliance, customized automation solutions, and more. SynchroGrid offers a high level of talent, experience, and innovation, providing reliable and high-quality services for clients nationwide.

History of SynchroGrid

Founded by Joe Perez in 2012, SynchroGrid is a Texas-based company with headquarters near his alma mater. Joe graduated from Texas A&M University in 2003 with a degree in electrical engineering and worked in utility and manufacturing before starting his own company. These experiences provided Joe with a unique, holistic view of the power industry. With an original focus on design and relay settings, Joe saw opportunities for increased efficiency in the engineers' workflow and soon added a software team to automate system protection processes.

Joe laid the foundation for SynchroGrid's headquarters in Bryan, Texas. By 2021, SynchroGrid expanded to Denver, Colorado to better serve clients in the Western United States. Today, Synchrogrid has 35 qualified employees and is growing rapidly as the company gains industry recognition for its innovative processes and quality expertise.

Services & Offerings

Since its establishment in 2012, SynchroGrid has grown in recognition as a leading consulting firm in the power industry. The company has a proven record of success in traditional consulting services related to protection design, studies, settings, and NERC compliance. SynchroGrid also has a full software division that focuses on improving procedures through research, development, and the customization of automation solutions for the power industry.

SynchroGrid

Powering A New Direction In System Protection

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Consulting Services

SynchroGrid's experienced professionals become an extension of its client's engineering department, serving as a specialized team that executes critical engineering projects. Consulting services offered to clients include:

- Relay setting development
- Relay coordination studies
- Protection and control design
- Substation design
- NERC PRC compliance (PRC-002 through PRC-027-1)
- Mis-operation analysis
- Wide area coordination studies
- Standardization of drawings and settings
- Arc flash studies
- And more!

Automated Solutions

SynchroGrid's SARA (Setting Automation Relay Assistant) streamlines the work of relay setting engineers by automating functions to avoid costly errors and time-consuming processes. Developed in-house to integrate with short-circuit models such as ASPEN OneLiner™, SARA uses a smart template to drastically reduce workloads while boosting productivity. Automated solutions include:

- SARA relay setting development module
- SARA wide area coordination module
- Software integration services

Partnerships with Industry Leaders

SynchroGrid has successfully formed partnerships with industry giants, including Doble Engineering and ASPEN.

Additionally, SynchroGrid has worked with a multitude of prominent utility companies, including Oncor Electric, CPS Energy, LCRA, College Station Utilities, NRG, BTU, Garland Power and Light, Farmington Electric, Basin Electric, Pattern Energy, Clearway Energy, Alliant Energy, and others.

SMART GRID CENTER

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TEES | SMART GRID CENTER
TEXAS A&M ENGINEERING EXPERIMENT STATION

TEES | SMART GRID CENTER
TEXAS A&M ENGINEERING EXPERIMENT STATION

*Engineering **Innovation** at Work*

What is a smart grid?
The mission of the Smart Grid Center is to form a competitive environment to advance efficient use of electric energy and modernization of the electricity grid, as well as to promote the creation of multidisciplinary research teams to solve problems and deliver innovative and effective smart grid solutions.

When it was first established, the electricity grid was designed to allow electric power to flow along the path of least resistance, but with the addition of renewable generation, microgrids and active loads the grid has become very complex. The smart grid modernized the way electricity is delivered from suppliers to consumers and describes the next generation of power systems incorporating communications and information technology to generate and deliver electrical energy.

THE CENTER'S SPECIFIC GOALS ARE TO:

- Assist expanding the government and private sector's vision of the smart grid.
- Conduct transformational research to generate new concepts, technologies and integrated systems for the 21st century grid.
- Train engineering students and professionals in electric energy-related concepts and technologies.

Director:
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http://smartgridcenter.tamu.edu

Electrical & Computer Engineering at TAMU

TEXAS A&M UNIVERSITY
Department of Electrical & Computer Engineering

TPEC 2024 Gold Sponsor

As a major department with an enrollment of about 1,000 undergraduate, 300 Ph.D. and 450 Master's students pursuing degrees in electrical and computer engineering, our mission is fourfold:

•To create new knowledge and challenge young minds by participation in the process of discovery and invention

•To educate electrical and computer engineers with a solid background of fundamentals, stretching their imaginations

•To prepare graduates for an exciting future

•To serve the society through research, education and outreach activities

RESEARCH AREAS

- Analog and Mixed Signal
- Biomedical Imaging, Sensing and Genomic Signal Processing
- Computer Engineering and Systems
- Electromagnetics and Microwaves
- Energy and Power
- Device Science and Nanotechnology
- Information Science and Learning Systems

AVERAGE STARTING SALARIES FOR GRADUATES, 2021

Computer Engineering	**$70, 117**
Electrical Engineering	**$69, 414**

INSTITUTES

- Texas A&M Institute of Data Science (TAMIDS)
- Texas A&M Energy Institute
- Advanced Robotics in Manufacturing Institute

CENTERS

- Analog and Mixed-Signal Center
- Center for Research in Intelligent Storage
- Hewlett Packard Enterprise Center for Computer Architecture Research
- Smart Grid Center

LABORATORIES

- Capstone and Robotics Laboratory
- Control Engineering Laboratory
- Digital Signal Processing Laboratory
- Downed Conductor Test Facility
- Electric Machines and Power Electronics Laboratory (EMPE)
- Electromagnetics and Microwave Laboratory
- Electronics Laboratory
- Electro-optics Laboratory
- Fluctuation and Noise Exploitation Lab
- Fuel Cell Power Systems Laboratory
- Functional Thin Film Laboratory
- Genomic Signal Processing Laboratory
- Magnetic Resonance Systems Laboratory
- Multimedia Laboratory
- Multimedia Communication and Networking Laboratory
- NanoBio Systems Laboratory
- AggieFab Nanofabrication Cleanroom Facility
- Power Electronics Laboratory
- Power Electronics and Motor Drives Laboratory
- Power Engineering Laboratory
- Power Quality Laboratory
- Power System Automation Laboratory
- Power System Control and Protection Laboratory
- Semiconductor, Sensing, Imaging and Communications Systems Laboratory
- Sensing, Imaging and Communication Systems Laboratory
- Smoke Detector Test Facility
- Ultrasound Imaging Laboratory
- VLSI Laboratory
- Wireless Communications Laboratory

Energy and Power Group

Texas A&M Energy and Power Group

TPEC 2024 Platinum Sponsor

Energy and Power Group

Electric power engineering is a vital part of our evolving infrastructure. Engineers, technical staff, and academics alike are working to achieve a sustainable and secure electric grid. The Energy & Power Group prepares students and professionals to tackle challenges in grid planning, operations, and IT confidently. The Texas A&M Energy and Power Group offers Short Courses and a Certificate in Electric Power Engineering.

Electrical Power Engineering Certificate

This certificate is ideally suited for engineers & analysts who work in power system areas such as grid planning, operational technology, and information technology. The certificate is also useful for technical staff in regulatory agencies, technical managers, graduate students, and academics wishing to gain practical knowledge in the power industry.

For more information, please visit:
https://epg.engr.tamu.edu/electrical-power-engineering-certificate/

> **ELECTRIC POWER ENGINEERING IS A VITAL PART OF OUR EVOLVING INFRASTRUCTURE. ENGINEERS, TECHNICAL STAFF, AND ACADEMICS ALIKE ARE WORKING TO ACHIEVE A SUSTAINABLE AND SECURE ELECTRIC GRID.**

Short Courses

- Short courses are a vital way for companies and employees to gain critical information and skills in the following areas.
- Automating PowerWorld with Python
- Electric Grid Dynamics and Stability
- Electric Grid Impacts of Geomagnetic Disturbances
- Cyber, Physical, and Cyber-Physical Electric Grid Analysis of Threats, Impact, and Defense
- Fundamentals of Electric Transmission System Planning
- Primer on the Planning and Operation of Large-Scale Electric Grids
- Data Science and Machine Learning for Modern Power Systems

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SCAN THE QR CODE TO VISIT THE TPEC WEBSITE.

Notes


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