NE-IECCE 2026 Special Session (SS-07)

Title of Proposed Session:

Sustainable Energy Infrastructure through Solar PV and Energy Storage Integration

Technical Outline of the Session

Solar photovoltaic integration into power systems is rapidly emerging as a transformative solution for the global energy transition to support the vision of net zero and mission of decarbonization. However, issues exist as Solar PV is only available during the daytime and reduces system inertia. The weather dependency and intermittency call for expensive storage accessories and use of accurate forecasting methodologies. Impact of energy transactions and energy market of such renewable energy integration needs extensive investigation. Solar PV in connection with electric transportation is another area where a development of solar PV fed microgrids with proper energy storage may promote EV charging in remote locations. Efforts are ongoing to develop converter systems that are reconfigurable to enhance performance and stability. Grid Forming Control (GFM), Grid Following Control (GFL), their hybrid, Virtual Synchronous Generators (VSG) etc. are proposed to handle such systems. This special section will explore upcoming technologies and potential solutions to all the issues for massive Solar PV integration to the power grid. Key focus areas of this special section will include power electronics, optimization, forecasting techniques, computational intelligence, hybrid energy networks, advanced control strategies for enhanced stability, and resiliency, evolving power grid to avoid congestion, and energy storage.

Topics of Session

The scope of this Special Session includes, but is not limited to, the following topics:

1. Advanced power electronics for efficient PV-grid integration.
2. 2. Research on Enhancing Performance, Reliability, Testing, and Standardization Frameworks for Long-Term Stability of PV Systems.
3. 3. Advanced Forecasting, Energy markets and Policy Frameworks for Sustainable Solar PV Growth.
4. 4. Power System Planning, Stability, Reliability, and Smart Grid Operations using Solar PV and Hybrid Energy Systems with Advanced Grid-Forming and Grid-Following Control Strategies.
5. 5. Artificial Intelligence and Machine Learning for Managing PV Intermittency, Developing Smart Solar Infrastructure with Embedded Sensors, and Enhancing Sensing, Monitoring, and Maintenance of Solar Panels.

Special Session Organizers

1. Dr. Suraj Gupta
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Dr. Suraj Gupta completed his B. Tech in Electrical and Electronics Engineering from Uttar Pradesh Technical University in 2013. He completed his M. Tech in Power Electronics and Drives from the National Institute of Technology Mizoram in 2018, graduating as a gold medalist. He received his PhD from the National Institute of Technology Mizoram in 2023. Currently, he is working as an Assistant Professor in Electrical Engineering Department, NIT Meghalaya, Sohra, India. His broad area of research includes power electronics and drives, Application of electrical drives in renewable energy systems & EVs, Computational intelligence and optimization of machine drives systems. He has published impactful research in leading SCI indexed journals, presented his work at major international conferences, contributed book chapters in areas related to electric vehicles and filed two patents.	
2. Dr. Sunanda Sinha, Assistant Professor, Malaviya National Institute of Technology Jaipur sunanda.cee@mnit.ac.in	
Dr. Sunanda Sinha is an Assistant Professor in Centre for Energy & Environment at Malaviya National Institute of Technology, Jaipur, Rajasthan, India. She has a notable track record in guiding students, having successfully completed the supervision of 1 Ph.D. student in 2023, with 3 ongoing. Additionally, she has guided 16 M.Tech students. In terms of research, Dr. Sunanda Sinha has published almost more than 30 research papers in reputed journals. Her research has garnered significant attention, with good number of citations, H-index and i10 index. Her research interest in mainly on renewable energy-based systems. She has one patent registered with the Government of India. She has been recognized as one of the top 2% researchers globally, according to the database of Stanford University. She is also a reputed reviewer of different renewable energy related journals. Dr. Sinha bagged best paper award in conferences and Best Young Women Researcher award too. She also organized few workshops-research conclaves-IEEE conferences as team member/lead and act as session chairs, speakers in different international and national conferences.	
3. Dr. Neha Tak, Assistant Professor, BITS-Pilani, Hyderabad Campus, India neha.tak@hyderabad.bits-pilani.ac.in	
Dr. Neha Tak received the B.Tech degree in Electrical and Electronics engineering from Rajasthan Technical University, Udaipur, Rajasthan, India, in 2012, and the M.Tech. degree in Electric Drives and Power Electronics from the Indian Institute of Technology Roorkee, Roorkee, India, in 2016. Neha Tak did her Ph.D in the area of Power Electronics from the Indian Institute of Technology Delhi, New Delhi in 2023. Currently, she is an Assistant Professor in the Department of Electrical and Electronics Engineering at BITS-Pilani, Hyderabad Campus, India, she has over 5 years of teaching and research experience. She got 'Global Distinguished Young Scientists award': Issued by the IEEE Industry Application Society in March 2023. She has published over 20 research articles in reputed International Journals (SCI) and international Conferences and filed more than 5 patents. Her broad area of research includes multilevel inverter topology, modulation techniques and applications for solar PV, wind and EV applications and economic utilization of upcoming power electronic devices and power electronic converter.	

4. Dr. Kapil Chauhan, Assistant Professor, Motilal Nehru National Institute of Technology Allahabad, Prayagraj, India
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Dr. Kapil Chauhan completed his M.Tech from the National Institute of Technology Hamirpur in 2016 and his PhD from the Indian Institute of Technology Ropar in 2021. Subsequently, he served as an Institute Postdoctoral Fellow at the Indian Institute of Technology Bombay in 2022 and held the position of Postdoctoral Research Fellow at Nanyang Technological University Singapore from 2022 to 2023. Presently, he serves as an Assistant Professor at MNNIT Allahabad.

Dr. Chauhan's primary research focuses on the application of wide-area measurement for seamless renewable integration, as well as optimization and control of modern power systems. He has been recognized for his contributions, receiving the POSOCO Power System Award in 2021 for his PhD thesis. Additionally, he has been honoured twice with the DST AWSAR Award in 2020 and 2022 for his exemplary skills in popular scientific story writing.