

Green Hydrogen Systems

ORGANIZED BY

Pratyasa Bhui, IIT Dharwad, India
Animesh Kumar Sahoo, IIT Dharwad, India

The increasing penetration of variable renewable energy sources has intensified the need for long-duration, large-scale energy storage and sector coupling solutions, positioning green hydrogen as a promising enabler of a flexible, low-carbon power system. Produced via electrolysis using renewable electricity, green hydrogen offers unique opportunities for grid balancing, congestion management, seasonal storage, and decarbonization of hard-to-abate sectors. However, large-scale grid integration of green hydrogen introduces significant challenges related to dynamic modelling, power electronic interfacing, coordinated control, market participation, protection, and system-level stability. This special session aims to provide a focused forum for researchers, system operators, and industry practitioners to share recent advances, practical experiences, and emerging research directions in the grid integration of green hydrogen technologies.

Topics of interest include, but are not limited to:

- **Dynamic modelling and control of electrolyzers for grid-connected green hydrogen production**
- **Power electronic interfaces for electrolyzers and hydrogen-based energy conversion systems**
- **Grid support services from green hydrogen systems, including frequency regulation, voltage support, and inertia emulation**
- **Coordinated operation and control of green hydrogen systems with renewable generation, energy storage, and demand response**
- **Stability analysis of power systems with high penetration of electrolyzers and hydrogen-based resources**
- **Flexibility provision, congestion management, and renewable energy curtailment mitigation using green hydrogen**
- **Integration of hydrogen energy storage with microgrids, islanded systems, and weak grids**
- **Protection, fault response, and grid code compliance of hydrogen-based power electronic systems**
- **Market participation, techno-economic assessment, and optimal sizing of green hydrogen facilities for grid services**
- **Planning and operational strategies for large-scale deployment of green hydrogen in future power systems**
- **Power electronic converter topologies and hardware architectures suitable for green hydrogen**
- **Grid forming load using hydrogen electrolyzers**
- **Compliance to IEEE 2800-2022 grid code.**

ORGANIZER 1

Pratyasa Bhui

Associate Professor, Department of Electrical Engineering
Indian Institute of Technology (IIT), Dharwad, North Karnataka, India, 580011
Email: pbhui@iitdh.ac.in

SHORT BIO

Dr Pratyasa Bhui (Member, IEEE) received the M.Tech. degree in electrical engineering from the Indian Institute of Technology (IIT Kharagpur), Kharagpur, India, and the Ph.D. degree in electrical engineering from IIT Delhi, New Delhi, India. He is currently an Associate Professor with the Department of Electrical, Electronics and Communication Engineering, IIT Dharwad, Dharwad, India. He completed a Postdoctoral Fellowship with Texas A&M University, College Station, TX, USA. His current research interests include power system dynamics and control, synchrophasor-based wide area monitoring, grid forming inverters, green hydrogen systems, and cybersecurity in smart grids.

RELEVANT EXPERIENCE

- Associate Editor, IEEE Access
- Reviewer in all IEEE PES Transactions, IJEPES (Elsevier), IEEE Transaction on Industry Applications, etc.
- Finance Chair, IEEE PESGRE 2025
- Student Volunteer, IEEE ICPS 2016.
- PI and Co-PI in several government and Industry funded projects worth INR 4,00,00,000/-

ORGANIZER 2

Animesh Kumar Sahoo

Assistant Professor, Department of Electrical Engineering
Indian Institute of Technology (IIT), Dharwad, North Karnataka, India, 580011
Email: animesh.sahoo@iitdh.ac.in

SHORT BIO

Dr. Animesh Sahoo, (Member, IEEE) received his Ph.D. degree from the University of New South Wales (UNSW), Sydney, Australia in 2021 and MS by research degree from the Indian Institute of Technology (IIT), Madras, in 2016, both in electrical engineering. He is presently working as an Assistant Professor in the Department of Electrical Engineering, Indian Institute of Technology (IIT), Dharwad, Karnataka. Prior to joining IIT Dharwad, he was working as a Power System Engineer at Aurecon Australasia Pvt Ltd, Sydney, Australia from 2022 to 2023 and as post-doctoral (PDF) researcher at the Research and Development Centre of Dubai Electricity and Water Authority (DEWA), Dubai from 2021 to 2022. From 2016 to 2017, he was working as a research engineer in the electrical machines and drives laboratory (EMDL) at the National University of Singapore (NUS), Singapore. His research includes grid integration of renewables, energy storage (hydrogen, BESS), grid forming/grid following technology.

RELEVANT EXPERIENCE

- Received student travel grant from IEEE ECCE USA 2020, IEEE ISGT ASIA 2018
- Reviewer in IEEE ECCE ASIA 2025
- Publicity Chair, Session chair and Reviewer in IEEE PESGRE 2025
- Organizer of GIAN course (an initiative from Ministry of Education, Government of India) on Green Hydrogen Energy Systems.
- Principle Investigator of an Ongoing Indo-Italy research project on Green Hydrogen Energy Systems.

