

SpecialSectionon:

New Trend of Artificial Intelligence Techniques in Integrated Energy System

(Sponsored by: TC on Smart Grid)

Theme: To achieve the carbon neutrality in near future, clean technology such as renewable energy resources has been introduced for replacing fossil fuels. To diversify the energy supply, integrated energy system (IES) is introduced to supply various types of clean technologies into a comprehensive energy system which could involve distributed generations, distributed storages, cogeneration for heating and cooling, gas, hydrogen in the distribution systems. However, the variable and intermittent nature of renewable energy resources can result in a severe instability of power supply which requires a countermeasure against this uncertainty. Artificial intelligence (AI) technology provides a critical way to integrate high penetration of renewable energy in IES because of its great efficiency and high accuracy of decision-making. Tesla Autobidder system for the Hornsdale Power Reserve in South Australia set an excellent example for the application of AI techniques in energy systems, which enables utilities and distributed power supplier to autonomously monetize renewable energy resources and battery assets through real-time trading and control. While these AI-based techniques help IES operators make better decisions, people are still concerned about the reliability and trustworthiness of AI techniques in IES. The development of explainable AI (XAI) techniques has received extensive attention from industry and academia. The aim of the special section is to provide a timely opportunity for researchers and engineers to share their latest findings on the advancements of autonomous and intelligent system designs for integrated renewable energy system.

- ✓ **Graph neural networks based forecasting technique for renewables and energy loads**
- ✓ **Human-interpretable mechanism for AI-based dispatch or energy management in IES**
- ✓ **Interpretable model-free bidding system design of integrated virtual power plants**
- ✓ **Design of wireless battery charger by trustworthy intelligent control**
- ✓ **Intelligent feature selection for interpretable transient stability analytics in IES (e.g., frequency deviations, voltage instability analysis, etc.)**
- ✓ **XAI-based planning, operation and maintenance of IES or micro-grids with renewables**
- ✓ **XAI technique for battery fault diagnosis**
- ✓ **XAI model for station planning of hydrogen fuel cell and electric vehicles in IES**
- ✓ **Multi-agent intelligent system of distributed energy storage system**
- ✓ **Interpretable AI mechanism for demand side management and electricity consumption behavior**
- ✓ **XAI-based applications for power electronics in IES (e.g., remaining life prediction of supercapacitors, detection of inverters, etc.)**

Manuscript Preparation and Submission

Check carefully the style of the journal described in the guidelines “Information for Authors” in the IEEE- IES website: <http://www.ieee-ies.org/pubs/jestie>. Please submit your manuscript in electronic form through: <https://mc.manuscriptcentral.com/jestie-ieee/>. On the submitting page, in pop-up menu of manuscript type, select: “**SS on New Trend of Artificial Intelligence Techniques in Integrated Energy System**”, then upload all your manuscript files following the instructions.

Corresponding Guest Editor

Dr. Chaojie Li
The University of New South Wales, Sydney
Australia
Email: chaojie.li@unsw.edu.au

Guest Editor

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Guest Editor

Dr. Ragini Patel
Vestas Australian Wind Technology PTY LTD,
Australia
Email: patel.ragini@gmail.com

Guest Editor

Dr. Jochen Cremer
Technische Universiteit Delft, Netherlands
Email: j.l.cremer@tudelft.nl

Timetable

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