

CALL FOR PAPERS
SPECIAL SESSION ON

Machine Learning and Foundation Models for Renewable Energy Forecasting and Failure Prognostics

for ICCAD 2027
July 6-8, 2027, Paris, France

Session Co-Chairs:
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Session description:

Wind farms, solar plants and battery storage fleets stream sensor, SCADA and weather data around the clock. These time series hold the answers to two questions that drive reliability and profitability: how much energy will the farm produce, and when will something fail? Yet non-stationary weather, variable loads, missing values and rare failure events make both hard to predict in time to act. Limited labelled failure data and differences between sites further challenge predictive modelling and transfer across installations.

This special session focuses on machine learning that looks forward: forecasting energy production and anticipating failures and outages from time-series data, rather than diagnosing faults that have already occurred. We welcome contributions on time-series forecasting, anomaly forecasting, classical machine learning, deep learning, time-series foundation models, self-supervised learning, transfer and federated learning, and uncertainty-aware methods that give operators actionable lead time.

Our aim is to bring together researchers and industry practitioners around farm- and fleet-level prediction methods that link production forecasts with failure risk, generalize across installations, and remain accurate, explainable and deployable. We particularly encourage rigorous comparisons between pretrained and conventional models, including their data efficiency and robustness under industrial conditions. Studies based on public benchmarks, simulation and real plant data are all welcome.

Topics of Interest:

We invite original contributions on topics including, but not limited to:

- Machine learning and deep learning for the prediction of energy production and failures in wind, photovoltaic, hydro and hybrid renewable energy farms.

- Short- and long-term forecasting of wind and solar energy production from time-series, SCADA and weather data.
- Early-warning systems, future failure-risk prediction and remaining useful life estimation for renewable power plants and storage fleets.
- Joint modelling of energy production and failure risk: impact of failures and degradation on power output and availability.
- Weather- and climate-driven variability and failure risk: extreme events, ageing and environmental stress.
- Handling missing data, non-stationarity, class imbalance and rare failure events: data augmentation and self-supervised representation learning from unlabelled SCADA data.
- Probabilistic forecasting and uncertainty quantification for risk-aware operation and market participation.
- Transfer learning, domain adaptation and federated learning across farms, turbines and plants, including cross-site generalization and data-efficient model adaptation.
- Time-series foundation models for zero-shot and few-shot forecasting, fine-tuning and adaptation to renewable energy applications.
- Explainable, trustworthy and physics-informed AI for energy forecasting, asset reliability and operational decision support.
- Benchmark datasets, rigorous temporal and cross-site evaluation, reproducibility and industrial case studies.

SUBMIT YOUR PAPER

Submit your paper electronically for peer review by**: January 31, 2027**
https://www.iccad-conf.com/submission/

Papers must be written in English, describe original work and not exceed 6 pages in the standard IEEE conference double-column format. We look forward to welcoming you in Paris!