

## Energy communities and local energy markets paradigm as enablers for sustainable energy systems

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### ABSTRACT / SCOPE

This special session focuses on Energy communities and local energy markets paradigm as enablers for sustainable energy systems in modern power systems with high DER penetration. Emphasis is placed on market-control co-design and on architectures that enable scalable coordination across prosumers, aggregators, energy communities, and distribution system operators. Topics include peer-to-peer (P2P) trading, energy communities and sharing mechanisms, and the integration of flexibility and demand response as market products. The session also covers the provision of ancillary services at the consumer edge - including demand response, local voltage/reactive power support, congestion management, and flexibility-based services - together with the control and communication requirements needed to ensure safe operation. Contributions addressing coordination across timescales (planning/operation/real-time), interoperability, cyber-physical constraints, and practical deployment lessons are particularly welcome.

### TOPICS OF INTEREST

- **Design and operation of energy communities**  
Architectures, governance models, and operational strategies for energy communities integrating renewables, storage, EVs, and flexible demand.
- **Local energy markets and peer-to-peer trading**  
Market mechanisms, pricing strategies, transactive energy frameworks, and peer-to-peer trading platforms enabling local energy exchange.
- **Distributed control, optimization, and energy balancing**  
Control strategies, multi-agent systems, and optimization methods for energy balancing and coordinated operation in community-scale energy systems.
- **Digitalization, data, and enabling technologies**  
ICT platforms, blockchain, AI, digital twins, cybersecurity, and interoperability supporting local markets and community energy systems.
- **System integration, regulation, and real-world implementations**  
Integration of energy communities into distribution networks, regulatory frameworks, pilot projects, demonstrations, and lessons learned from field deployments.

All special session papers are peer reviewed through the same process as all the other submitted technical papers.

