Privacy Preserving Cooperation among Microgrids for Efficient Load Management on the Grid

Challenge:

- Two-tier Privacy Preserving Models (Analysis & Cooperation)
- Stochastic and Fluctuated Private Energy Measurement Data
- Other Heterogeneous and Unstructured Private Inputs (e.g., events, topology)
- Non-Linear Cooperative Models
- Arbitrary Data Partitioning

Commercial Microgrids

Scientific Impact:

- Leverage SMC Protocols for Privacy Preserving Data Analytics (e.g., data mining, collaborative optimization)
- Complement the Research of Smart Grid Security & Privacy in untrusted Environments (Semi-honest and Malicious)
- Formal Security & Privacy Proof in the Smart Grid Apps

Solution:

- Secure Multiparty Computation for Distributed Data Analysis
- Privacy Notions for Data Sanitization in the Cooperation
- Formal Security/Privacy Proof
- Experiments on Real Microgrid Data (e.g., generation, consumption)
- System Implementation

Residential Microgrids

Broader Impact:

- More Interactions among Energy Consumers/Suppliers (integrated as microgrids) to Boost Utility via Cooperation (*which was constrained due to Privacy Concerns*)
- Collaboration with National Grid and SolarCity
- Undergraduates in STEM