Lucerne University of
Applied Sciences and Arts

HOCHSCHULE LUZERN

Engineering & Architecture

Applied research in local energy markets and peer-to-peer trading
Competence Centre Digital Energy & Electric Power (DEEP), Hochschule Luzern

Background

Citizen energy will see significant global growth in the next 5 years. The EU Directive on renewable and citizen energy communities is driving significant regulatory effort and prosumer mobilisation in the EU. In Switzerland, there is emphasis on Self Consumption Communities. Across the world, there is marked progress in research efforts and pilot projects on prosumer models, especially local energy markets.

Hochschule Luzern (HSLU) is active in applied research in local energy markets, in particular in peer to peer (P2P) trading systems and their impact on the grid. Our areas of competence include:

- Grid integration of technology and systems

- Market design and economic value

Research themes

Our research activities cover a range of areas in relation to P2P and other innovate local energy markets. The main research questions are covered in the box below. HSLU also leads the grid integration subtask of the IEA's Technology Collaboration Programme on peer to peer.

Research Services

- P2P market design, simulation and analysis

- Dynamic tariffs and grid reflective pricing

- Data acquisition and prosumer forecasting

- Grid impact analysis

- Feasibility studies and literature reviews

- Research project development

Case study

HSLU conducted a study for grid reflective pricing for a P2P market in Liechtenstein.

In a research partnership with Virtual Global Trading, HSLU expanded a commercial P2P trading algorithm by implementing grid reflective pricing and conducted studies using synthetic data. The output of the study showed the possible benefits in implementing grid reflective pricing in peer to peer energy trading on promoting local energy trading between neighbours.

Power system integration of technology, processes and systems

- How can sensors, grid modelling, smart meter data and machine learning be combined to accurately predict and control distributed prosumer communities, especially in innovative marketplaces such as P2P?

- What are the optimal system and data architectures for implementation in the DSO that support the implementation of prosumer communities (eg. edge processing, data exchange / management, smart contracts, communication and control architectures for voltage / DER coordination / resilience / restoration, situational awareness)?

- How must the DSO technology landscape adapt to accommodate the growth of energy communities and innovative marketplaces (eg. adaptive protection, centralised / distributed intelligence, sensors, voltage control and optimisation)?

Transactions, markets and economic value

- What is the optimal architecture of the transaction layer for recording balancing and settlement of imports and exports, including use of distributed ledgers?

- How can algorithms be used for automated trading by participants and the interaction with the evolution of smart contracts on distributed ledger systems?

Social and societal engagement and impacts

- What are the modes of participation/interaction, e.g. automation, gamification, forms of production, exchange, storage and use of energy?

- What is the value gained, lost or redistributed by the P2P model, including measurable changes in energy production / storage / sharing / consumption?

- What are the requirements for data privacy and data access?

Research themes for peer to peer markets and local energy markets at HSLU

Contact: Ben Bowler, Senior Research Associate | benjamin.bowler@hslu.ch | www.hslu.ch/deep