INTELLIGENT Project

Blockchain-Based P2P Trading and Standardization Gaps

Energy Nexus Cluster - Joint Standardization Workshop

Maja Fišić
Dr Jovana Simić

InoSens

Funded by the European Union

Project funded by
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

INTELLIGENT

INteroperable Tools for nEtwork-aware, Ledger-based Local energy sharIng and flexibility manaGEment leveraging user engagement

Duration: Dec 2024 – Nov 2027

Coordination: R2M Solution Spain

Challenge & Objective

- Existing energy-sharing solutions and regulatory restrictions limit advanced peer-to-peer (P2P) energy trading, while grid operators face increasing challenges in managing distributed energy resources.
- INTELLIGENT aims to develop and demonstrate an open-source, interoperable and grid-aware P2P energy trading infrastructure that empowers citizens and supports grid flexibility and stability.

Key Technologies & Solutions

- **Blockchain-based P2P energy trading platform** (GSY DEX) – enabling secure and decentralised energy trading.
- **AI and Machine Learning (AI/ML)** – optimising energy trading decisions and resource management.
- **Smart flexibility management and dynamic grid fees** – supporting efficient energy use and grid stability.
- **Secure and interoperable data exchange** – enabling communication between energy trading platforms, grid operators and other energy systems.

Pilot Sites – Use Cases

4 Demonstrations in 3 Countries

- **Switzerland – Lugaggia Innovation Community (LIC)**: Testing local energy sharing and P2P trading within an established energy community.
- **Switzerland – Collaborative Energy Living Lab (CELL)**: Demonstrating smart energy management and flexibility using solar generation, battery storage and electric vehicles.
- **Portugal – Greenvolt Energy Communities**: Testing energy sharing and trading in collective self-consumption communities.
- **Ireland – Aran Islands Energy Community**: Exploring P2P energy trading and flexibility solutions in an island energy system.

Standards INTELLIGENT Builds On

Protocol-agnostic stack: EWDS 2.0 data exchange, GSY DEX trading and FOS flexibility services, validated in pilots in Switzerland, Portugal and Ireland

Identity & Trust
W3C · eIDAS

- **W3C DIDs** – identity of every EWDS participant
- **W3C Verifiable Credentials** – role-based access
- **OAuth / JWT** – API security
- **eIDAS 2.0** – alignment for KYC, billing and payment

Grid & DER Messaging
IEEE · OpenADR

- **IEEE 2030.5** – smart energy profile
- **OpenADR** – demand response
- **MQTT / WebSockets** – pub/sub telemetry
- **OpenAPI REST** – service interfaces
- **Modbus** – RES assets at pilots

E-Mobility
OCPP · OCPI

- **OCPP** – charge point communication
- **OCPI** – charging data via OCN 2.0
- **ISO 8601** – UTC timestamps, 15-min resolution

Semantics & Data
IEC · ETSI

- **IEC CIM** (61970-301) – grid assets, metering points, feeders
- **SAREF / SAREF4ENER** – devices, tariffs
- **INTELLIGENT ontology** – extensions for P2P and flexibility orders

Regulatory Frame
EU law

- **Directive (EU) 2024/1711** – energy sharing
- **RED II (EU) 2018/2001** – renewable energy communities
- **GDPR** – personal and consumption data
- **National metering rules** – e.g. PT Reg. 815/2023

Adopt, then extend: INTELLIGENT reuses existing standards at every layer and adds its own extensions only where P2P trading and local flexibility concepts are missing.

Gaps We See and What Is Needed

Evidence from INTELLIGENT pilots, technical work in WP3–WP4 and the D2.2 regulatory analysis of P2P trading

1

Semantics for local markets

IEC CIM and SAREF lack terms for P2P bids, flexibility orders and sharing keys. INTELLIGENT and PARMENIDES (PECO) each built their own extensions.

Need: a harmonised energy-community / P2P profile

2

Community ↔ DSO data exchange

Sharing coefficients, meter data access and settlement follow national formats and timings (PT: dynamic, ex post; ES: yearly, changes once per quarter).

Need: a common data exchange profile for energy sharing

3

Open device interfaces

Pilot assets run through vendor clouds and proprietary protocols (e.g. MELCloud heat pumps); some behaviours are vendor-locked.

Need: open flexibility interfaces for DER, heat pumps and EVs

4

Trust & identity for energy roles

W3C DIDs and Verifiable Credentials work in EWDS, yet credential schemas for energy roles (asset, prosumer, DSO, aggregator) and the link to eIDAS 2.0 wallets are open.

Need: common energy-role credential schemas

INTELLIGENT → SDOs

- **Open ontology, schemas and APIs** on GitHub (EWDS 2.0, OCN 2.0, GSY DEX)
- **KER-5:** contribution to energy sector standardisation
- Dialogue via **BRIDGE, AIOTI and INATBA**

Our question to SDOs

Which TC / WG should host an energy-community and P2P data profile?

INTELLIGENT

Funded by the European Union

Project funded by

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

R2M SOLUTION
RESEARCH TO MARKET

UNIVERSITÄT ZU KÖLN

GS_y
GridSingularity

energyweb

bloo
#TrustHacktivist

smartEn
SMART ENERGY EUROPE

HSLU Lucerne University of Applied Sciences and Arts

AEM

greenvolt
Comunidades

e-REDES
Distribuição de Eletricidade

Ollscoil na Gaillimhe
University of Galway

INOSENS

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

Comharchumann Forbartha Árann

Lactec