SUSTAINABLE PLACES 2021
Sep. 28 - Oct. 1, 2021 | Rome, Italy

SMI – Smart Meter Inclusive
www.smi.uha.fr

INTERREG V (September 2019)
Djaffar OULD ABDESLAM (coordinator of the project)
15 partners
~ 2 million €

SMI Project Kick-Off Meeting
Mulhouse, Octobre 2019
Background of the project

• “If you cannot measure it, you cannot improve it.”
  *This common management saying also holds true for the area energy efficiency. Without a clear understanding of their energy usage, consumers are unable to take steps to reduce their consumption.*

• The project is multidisciplinary and addresses the following aspects:
  o Social,
  o legal,
  o environmental,
  o technical.
Objectives

- **Mapping smart meters and their types** in order to have a clear and precise understanding of the existing potential in the Upper Rhine.

- Undertake a general public survey to understand what are the barriers for smart meter deployment, how they are being accepted in society and what main features are required for an AI-enabled meter.

- **Design a new AI-enabled and secure smart meter** that will enhance our understanding of how energy consumers in Upper Rhein consume energy and empower these consumers to take action to reduce energy costs and emissions.

- Improve the security level of the smart meter.

- **Modification and harmonization of the current legal framework for smart meters** for a compatible cross-sectoral legal framework.

- **The elaboration of a white paper in 3 languages (French, German and English) about Smart Meters**, showing beyond the state of the art also the prospects for future development.
Research Questions and Challenges

❑ Advanced Power Meters (called “smart meters”):

✓ Real-time consumption display
✓ Energy Saving (around 15%)
✓ Demand Side Management

x No automatic data processing for decision making

❑ Smart Meter Inclusif (SMI)

✓ Linking artificial intelligence and micro-societal analysis for decision making
✓ Design a laboratory prototype that will communicate with power meters of utility companies
Research Questions and Challenges

- Monitoring Energy Consumption
  - Needs clear understanding of the energy usage and activity

the 1st step of the AI-enabled smart meter
SMI: The idea of NILM (Non Intrusive Load Monitoring)

NILM
electricity meter

Intrusive Load Monitoring
Using an individual sensor for each appliance
Analogy of NILM

White light decomposition through a prism
SMI Prototype (AI-enabled smart meter)
SMI in Household (Prosumer)

- Read the power meter data
- Disaggregate and control loads (NILM)
- Control PV, Batteries and EV by prediction of the production and consumption
- Improve Self consumption
- Demand Side Management
- Learning from the user’s habits
- Displays the data (personal)
SMI Learning by HIL (Hardware In-the-Loop)

Google’s Chief Scientist Peter Norvig (2011) says: “We don’t have better algorithms than anyone else; we just have more data,”

**AI needs a big data for better decision making**

- Build the household in HIL
- Create several scenarios
- Build data base
- Perform tests safely
- Test final AI algorithm in easier conditions

**Simulated power system**

**Real Time Digital Simulator**

**SMI Prototype**

**Commands to switch breakers**

**Voltage & Current measurements**
Demonstration of the Smart Meter - Detecting and Predicting Five Different Devices
SMI project was invited for general presentations in:

• Virtual Event on Artificial Intelligence in France, organised by BADEN-WÜRTTEMBERG INTERNATIONAL Agency für International Economic and Scientific Cooperation (March 2021)

• 360 Grand Est (Grand Est Region Event): SmartGrids put digital intelligence at the service of optimized energy management (December 2020)

• Visit of State Secretary Dr. Andre Baumann, the representative of the State of Baden-Württemberg to the Federal Government and State Secretary at the Ministry of State in Stuttgart since February 2020, at Eucor - The European Campus (University of Freiburg) (August 2020)
Thank you

Fonds européen de développement régional (FEDER)
Europäischer Fonds für regionale Entwicklung (EFRE)