



LASAGNE

digital frAmework for SmArt Grid and reNewable Energies

” *The energy transition calls for AI-powered smart meters to support electric systems and microgrids*

The energy transition needs *microgrids*. To support them, *smart meters* will have to gather data from households to predict/plan energy consumption/production.

We propose a novel AI-powered smart meter concept, dubbed Grid Edge Device (GED), that will be enhanced with collaborative AI algorithms to forecast power usage/production. These algorithms will be the backbone of smart self-adaptive digital services for the electricity market. In essence, we will build a “digital frAmework for SmArt Grid and reNewable Energies” (LASAGNE) and involve four stakeholders: System Integrator, Independent Software Vendors, Edge Equipment Vendors and Need-Owners. LASAGNE will be empowered by marketplace features allowing stakeholders to enact their business process.

To handle the energy transition in a socially acceptable way, we will consider both social and business perspectives in the development of our GED-based system.

Microgrids (Fig. 1) provide neighbourhoods with solutions to actively engage in the energy economy. Networked low- and mid-level GEDs (Fig. 2) will bring the machine learning-based (ML) intelligence needed to build *context-aware* (i.e., specific to operating conditions and settings), *self-adaptive* (i.e., capable of reacting to changing conditions) energy applications for improved power network stability and energy transaction flexibility.

Project Duration

01.04.2022 - 31.03.2025

Project Budget

Total Budget: € 1,426,700.-
Funding: € 937,501.-

Project Coordinator

HES-SO (Switzerland)

Project Partners

- HES-SO (Switzerland)
- UniGe (Switzerland)
- CLEMAP (Switzerland)
- KTH (Sweden)
- TVINN (Sweden)
- ElectricITY (Sweden)

Project Website

<https://lsds.hesge.ch/digital-framework-for-smart-grid-and-renewable-energie/>

Contact

nabil.abdennadher@hesge.ch



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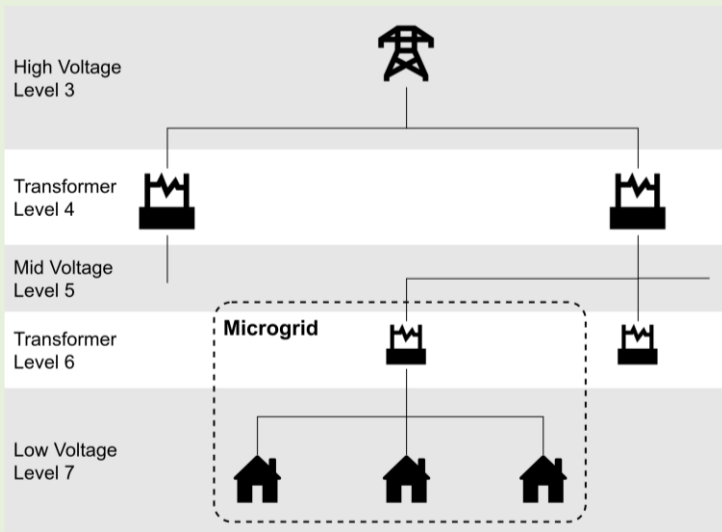


Fig. 1: A microgrid is deployed within a grid cell and spans mid- to low-level voltages.

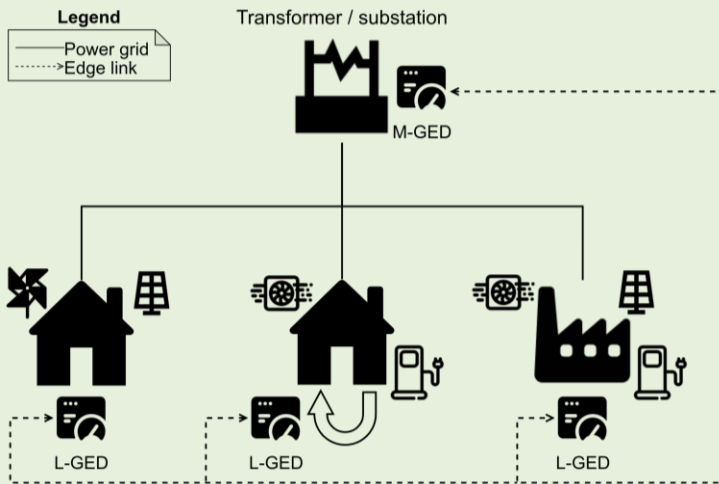


Fig. 2: L-GEDs (low-level voltage) and M-GEDs (mid-level voltage) respectively act on behalf of households and microgrids.

Main Objectives

LASAGNE targets three generic objectives:

- Empower and motivate need-owners to engage in local green-economy business models via personalised GED's adoption.
- Develop a digital framework embedding collaborative machine learning-based electricity consumption/production forecasting and collective interactions and coordination among GEDs.
- Promote a digital marketplace platform where four stakeholders (need-owners, system integrators, independent software vendors and edge equipment vendors) meet to collaborate in the energy application business sector.

Main Results


LASAGNE expects to develop a digital framework for Smart Grid and renewable Energies supporting:

- Social attributes that make the community of Need-Owners share the same social values and therefore fully play the game of cooperation within the microgrid.
- Collaborative learning algorithms for local and global consumption/production at medium/low voltage levels. These algorithms will rely on a coordination model based on intelligent digital twins, incorporating social attributes by design.
- A marketplace platform which provides a federating backbone where the four above-mentioned stakeholders can easily interact, deploy their technical solutions, implement their legal agreements and financial flows.



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