Optimising local energy communities on the path to self-sufficiency

Local energy communities can play a significant role in mitigating climate change and promoting sustainable energy practices.

Their focus on renewable energy employment, energy efficiency and self-sufficiency and community engagement aligns with the goals of mitigating greenhouse gas emissions and transitioning to a sustainable energy future.
And to uphold the Paris Agreement on climate change, the role of local energy communities is becoming increasingly important both in European Union (EU) and worldwide.

Key Points

eNeuron's objectives are in line with EU strategy, working towards carbon neutrality and developing an enabling framework for local energy communities that involve multi-carrier energy.

Policy framework

In Europe, local energy communities are governed by several EU regulations and directives.

The Clean Energy for all Europeans Roadmap included a legislative proposal as a common framework for the implementation of renewable energies in EU, already in 2016. The revised Renewable Energy Directive (RED II) entered into force in 2018.

The purpose of the directive is to **set out the EU's renewable energy targets and establish the regulatory framework for promoting renewable energy production**. It recognises local energy communities as key actors in the transition to renewable energy and includes provisions to facilitate their participation in the energy market.

eNeuron actions supporting local energy communities

To reach its goals, eNeuron provides an integrated framework for designing from scratch, expanding and operating optimally local multi carrier systems utilising the architecture of Energy Hubs under the concept of local energy communities. This is achieved by fostering coordinated effort between various stakeholders, including energy providers, operators, community members, and technology providers. Collaboration, innovation, and a supportive policy environment are key to empower further local energy communities.
The eNeuron framework is currently **being tested at four pilot schemes**: a city and its major energy nodes (Bydgoszcz, Poland), a football stadium and its vicinity (Skagerak, Norway), a naval district with its own distribution grid (Lisbon, Portugal), and a university campus across several sites (Ancona, Italy).

Key Points

Local energy communities offer a decentralised and bottom-up approach to producing, managing and using energy.

Polish pilot – Bydgoszcz Municipality

The city has been actively involved in promoting local energy communities and implementing sustainable energy solutions. While most of the buildings are recent and enjoy some degree of energy-sufficiency, **eNeuron is supporting the evolution of the infrastructure and the implementation of a high-level management architecture able to optimally operate the micro energy hubs** installed in the city nodes. In the past years, Bydgoszcz has been focusing on solar power installations and on the retrofitting of buildings with improved lighting, insulation and smart technologies. Furthermore, the city is exploring the use of renewable and low-carbon energy sources to provide sustainable heating solutions.

To connect all these hubs, and within the eNeuron framework, the **local energy hubs monitoring platform has been created** and data are currently being collected, showing the energy consumption of each node, and allowing the eNeuron toolbox to optimally operate assets coming from different carriers.

Bydgoszcz actively involves the local community in energy-related initiatives, with the aim of fostering a sense of ownership and encouraging fruitful participation in sustainable energy practices.

Norwegian pilot – Skagerak Arena, Skien

The pilot is deployed at the Skagerak Energy Lab which is located at Skagerak Arena, in Skiena football stadium and facility which **combines a photovoltaic plant with battery energy storage system and power electronics**. The installation is entirely functional and test programmes are being organised within the eNeuron project.

In this pilot, eNeuron toolbox is used for optimal expansion by assessing the current configuration for future extensions, considering options like the inclusion of another carrier, to allow the local energy hub-based generation to be maximised and power supply to be always secured.

Anticipated positive impacts for the local community include increased use of green electricity, improved supply quality, enhanced power system stability and reduced grid costs. This will lead to a more sustainable and efficient energy ecosystem.

Portuguese pilot – Naval Base, Lisbon

The Lisbon Naval Base comprises a complex of port infrastructure, facilities and services to provide logistical support to the naval units moored,

Key Points

Integration of energy vectors/ networks, indeed contributes to increasing the flexibility of the energy system, particularly in the presence of a high share of renewable energy.

and anchored there, Marines, Naval Academy, among others.

The site offers the opportunity **for the eNeuron toolbox to optimally integrate and coordinate different energy carriers**, such as electricity, heating, cooling, water, natural gas, and e-mobility, within local energy hubs. This approach aims to increase energy efficiency, reduce greenhouse gas emissions, and enhance the overall sustainability of the local energy system.

The pilot, by employing the eNeuron toolbox, has multiple objectives:

- Reduce primary energy demand and consumption;
- Increase the flexible energy traded and managed;
- Increase self-sufficiency;
- Reduce daily and annual CO_2 emissions;
- Increase the penetration of RES in the local generation mix.

Italian pilot – Università Politecnica delle Marche:

The Italian pilot runs at UNIVPM, which has various campuses across the whole region, overall representing a local energy community.

The pilot, by employing the eNeuron toolbox, has two objectives:

- Demonstrate **the role of the energy aggregator**, namely UNIVPM, for all the sites;
- Demonstrate that the **greater integration of energy vectors/networks contributes to increasing the flexibility of the energy system** in presence of a high share of renewable energy.

The role of Energy aggregators

Energy aggregators play a crucial role in local energy hubs by **facilitating the coordination and optimisation of energy resources and demand within the community**. These aggregators act as intermediaries between energy producers, consumers, and the grid, enabling the efficient management of energy flows.

In eNeuron the testing will demonstrate how energy aggregators operate within local energy hubs and how to implement punctual energy balancing, providing a better integration of energy vectors for the efficient use of various energy storage technologies. Additionally, eNeuron will assess the integration of different energy vectors, enabling sector coupling, where energy from one sector is utilised in another sector.

By integrating energy vectors/networks, the energy system gains flexibility through energy balancing, energy storage, sector coupling,

fuel choice flexibility, and demand response. This enhanced flexibility allows for a smoother integration of renewable energy sources, mitigates their intermittency challenges, and ensures a more resilient and sustainable energy system.

Learn more about eNeuron:
www.eneuron.eu

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