

Establishment of local energy areas/communities: Barriers and solutions

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Figure: Aardehuizen house and EV-charging garage

The H2020 SERENE project has developed technical solutions for local energy areas by considering user engagement, local regulations, and cooperation with local authorities

The [H2020 SERENE project](#) (Sustainable and integrated energy systems in local communities) has focused on developing and demonstrating cost-effective and customer-centric solutions for the integration of different energy carriers in local energy areas. Technical and socio-economic benchmark models/roadmaps will be set up for replicability possibilities across Europe.

These models include not only a presentation of different technical solutions, but also suggestions for citizen involvement in the development of solutions, and the identification of possible barriers (e.g., economical or regulatory). During the project, solutions for

flexibility provisions from local integrated energy areas will be tested at three demonstration sites in Denmark, the Netherlands, and Poland.

Local energy areas: Technical solutions

The technical solutions presented at the three demonstration sites are focused on the same overall goals, namely, how local energy areas/communities can contribute to a sustainable and integrated energy system. The main goal is to increase the utilisation of renewable energy and electrification of the heat and transport sector in an integrated system. This demands the provision of flexibility from particularly power-intensive devices (such as heat pumps and electric car charging) to ensure peak shaving at the local grid and/or the overall power balancing. In the project, this has led to the development of forecast and prediction methods for production and consumption to control the local energy system optimally.

Different energy management systems (EMS) are designed and demonstrated at the three demonstration sites. The main objective for all sites is the optimisation of self-consumption using the energy from their own solar power production to fulfil their energy demand at the lowest cost. This means that the EMS controls the setup of heat pumps and electric car charging facilities, so they are operated according to local production and are related to dynamic prices in the electricity market.

All demonstration sites have energy storages, either in the form of heat storages and/or battery energy storages, which are used to store energy at low prices and release it at high energy price periods. Finally, as part of the technical solutions, user interfaces are developed in the form of either smartphone apps or dashboards, where the users can get information about system status, energy savings and costs and interact with their system to set their preferences.

Socio-economic aspects: Solutions and barriers

During the project, engaging with the citizens and other local stakeholders like municipalities and local small enterprises has been essential to ensure their willingness to participate in the green transition and adopt more energy-efficient behaviours. During the project, a survey was performed among the citizens, and several meetings were held with the citizens arranged by the municipality, local enterprises and/or the academic partners to get feedback on the suggested solutions, incentives and possibilities for forming local energy communities.

It is evident that most citizens are willing to contribute, but their options are different depending on their income and other preferences. Some citizens are mainly motivated by the economy, meaning they are eager to install new equipment if they can economically benefit from the investment. In contrast, others are willing to pay more (up to 10-15%) if they can contribute to a more environmentally friendly and energy-efficient system. However, some customers are reluctant to use new technologies, so they must see it implemented elsewhere before going for it.

During the project, it has become clear that if customers are not only seen as individual customers but should go together to form local energy communities, then organisation, legal frameworks, and cooperation with municipalities and stakeholders become essential aspects for the realisation. In this aspect, the SERENE project has participated in a Horizon result booster service together with the two H2020 projects, LocalRES and SUSTENANCE, where societal, scientific, technological, industrial and political challenges have been identified.

Some of the main issues related to these aspects are the lack of clear and easily implementable regulations for emerging technologies and the administrative burden of forming energy communities. These energy communities can be newly founded formal ones based on EU law. Still, other existing social communities, such as homeowner organisations, user groups, and neighbourhood and village organisations, can also play an active role in the energy transition.

It might also be challenging for local small enterprises to achieve interoperability and compatibility among the many different non-standardised units employed in local energy communities. Further, it is also a problem in some EU countries to become an aggregator and perform data exchange between different utilities. The three projects have made a [policy brief](#) on these aspects and set up eight recommendations for policymakers to ease the formation and adaptation of local energy communities.

These recommendations include issues like capacity building for local energy communities, alignment between national and EU regulations, scalable plug-and-play solutions, support for start-up companies in the green energy sector, simplified administrative procedures, standardisation for interoperability, ease of flexibility provision and energy sharing, and finally combatting misinformation and raising awareness of the green technology and formation of energy communities.

Local energy areas: Conclusion

The SERENE project has shown it is essential not only to come up with technical solutions for the formation of local energy areas/communities, since socio-economic plays a vital role as well, such as the electricity market, legislation, governance and incentives. To ensure replication, the systems should be easy to implement and understand with as few administrative burdens as possible.



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