SunSharing

SunSharing - Supporting Solar Energy Communities in SEE

Guidebook on Energy Communities in Greece

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1. Introduction

Energy Communities (ECs) have emerged as a pivotal mechanism for democratizing energy and promoting sustainability. By allowing citizens to act as both energy producers and consumers, ECs support the global shift away from fossil fuels toward renewable energy sources (RES). These cooperatives aim to foster social and economic resilience through local energy initiatives. Recognized as a cornerstone of the EU's "Fit for 55" strategy, ECs are integral to achieving climate neutrality by 2050. They empower communities to manage energy production and consumption locally, contributing to energy efficiency, resilience, and environmental sustainability.

2. Benefits of Energy Communities

ECs address pressing challenges and create significant opportunities:

- **Energy Transition:** ECs facilitate the shift from centralized, fossil-fuel energy systems to localized, renewable solutions. They help reduce dependence on non-renewable energy, ensuring a sustainable future.
- **Economic Equity:** By reducing energy costs and creating opportunities for local revenue generation, ECs address energy poverty and distribute the benefits of renewable energy equitably.
- **Community Empowerment:** ECs foster active citizen engagement, enabling local decision-making and control over energy resources.
- **Climate Action:** Through decentralized RES projects, ECs directly contribute to reducing greenhouse gas emissions and meeting national and EU climate goals.

3. Legislative framework of Energy Communities in Greece

The legal framework for ECs in Greece was established with Law 4513/2018, which defines ECs as urban cooperatives promoting the social economy through projects related to RES, energy storage, and energy efficiency.

In 2023, Law 4513/2018 was updated with Law 5037/2023 to align with EU Directives 2018/2001 and 2019/944, further enhancing the regulatory framework. This update introduced new provisions and divided ECs into two types, Citizens Energy Communities and Renewable Energy Communities.

4. Establishing an Energy Community

Creating an EC involves a structured process that balances inclusivity, legal compliance, and strategic planning. The process ensures that communities can effectively manage renewable energy projects while fostering democratic decision-making and financial sustainability.

a. <u>Vision and Objectives:</u>

The foundation of an Energy Community lies in a shared vision among its members. This includes:

- Defining the community's primary goals, such as reducing energy costs, promoting sustainability, or generating local revenue.
- Ensuring alignment on long-term objectives, like achieving energy autonomy or supporting environmental initiatives.

b. <u>Drafting the Statute:</u> A comprehensive legal document that must adhere to the provisions of Law 5037/2023. Key inclusions are:

- Name, headquarters, and purpose of the community.
- Details of the founding members and their roles.
- Financial contribution requirements and rules for profit distribution.

c. <u>Registering with GEMI (General Commercial Registry)</u>: Submit the statute along with supporting documents, including:

- Member identification details (ID, tax numbers, etc.).
- Proof of a designated headquarters (rental agreement or ownership document).
- Payment of a nominal registration fee.

5. Organizational Structure of an Energy Community

a. <u>Membership:</u> Natural persons, legal entities, small and medium enterprises, municipalities, and other public or private entities.

b. <u>General Assembly:</u> It is the supreme governing body, making decisions on critical matters such as project approval, financial strategy, and policy formulation. Each member holds one vote, ensuring equality in decision-making.

c. <u>Board of Directors</u>: It is responsible for implementing decisions from the General Assembly, overseeing project development and financial management.

d. <u>Supervisory Council</u>: It oversees the financial and operational activities of the board of directors, ensuring compliance with the community's statute and regulatory obligations.

6. Innovative funding mechanisms: Good examples for crowdfunding initiatives

Solarna Stara	
Location	Serbia, Stara Planina
Investors	229 investors
Duration	1month: May-June 2022
Motivation	• Local opposition to environmentally harmful project • The green energy transition is viable and beneficial for everyone
Objective	The first cooperative owned solar PV on national level

ZEZ Sun- Our energy	
Location	Croatia, Križevci
Investors	127 investors including SMEs and natural persons
Duration	10 days
Objective	Installation of a community solar power plant, ZEZ Sunce, on the roof of the Municipial Market of the city of Križevci

7. Implementation of new energy policies: Net-billing policy

Under Law 5106/2024, the Net-Billing policy was established as the primary compensation mechanism for energy projects installed by ECs in Greece. This system compares the energy produced with the energy consumed over a 15-minute time step to determine excess or deficit energy.

- *Excess Energy:* When production exceeds consumption, the surplus is injected into the grid, and the EC is compensated for the injected energy.
- *Energy Deficit:* When consumption surpasses production, the EC imports the required energy from the grid to cover its needs and purchases this energy.

- To enhance understanding and assess the implementation of the Net-billing policy for installing a PV system in an EC, an illustrative example is provided in this guidebook. The scope of this is to assess the profitability of EC's investment, considering:
- the impact of installing various PV sizes,
- the impact of the price magnitude of compensating the PV surplus,
- the impact of integrating different storage system capacities with the PV system,
- the impact of installing various PV-storage capacities under different storage investment costs.

The presented example assumes the existence of an EC located in Western Macedonia that consists of 10 residential consumers. This analysis uses real-meter consumption and production data collected by meters in the University of Western Macedonia's living lab named SMART LL[1] . Additional input parameters influencing the results, such as installation costs, electricity purchase prices, and other financial and technical parameters, are presented in Table 1.

Table 1 Input Parameters

Input parameter	**Value**	**Input parameter**	**Value**
PV degradation	0.2%[2]	Production charge [€/kWh]	0.16 €/kWh
Inverter efficiency	95%[1]	Networks charge	0.02744 €/kWh[3]
O&M cost	2%[1]	Energy Taxes	0.017 €/kWh[2]
Discounted rate	4%[1]	VAT	6 %[2]
Inflation rate	2%[1]	PV installation cost	1000 €/kWp[1]

[1] https://livinglab.ece.uowm.gr/about/
[2] N. S. Kelepouris, *et all*, "Cost-Effective Hybrid PV-Battery Systems in Buildings Under Demand Side Management Application," in *IEEE Transactions on Industry Applications*, vol. 58, no. 5, pp. 6519-6528, Sept.-Oct. 2022, doi: 10.1109/TIA.2022.3186295
[3] A. I. Nousdilis, *et all*, "Profitability of Building Integrated PVs Enhanced by Storage and Load Management," *2023 EEEIC / I&CPS Europe*, Madrid, Spain, 2023, pp. 1-6, doi: 10.1109/EEEIC/ICPSEurope57605.2023.10194609

The EC's financial benefits under Net-billing policy arise from both the reduced energy costs and the revenue provided by selling the excess energy into the grid. Therefore, the selling price of electricity plays a crucial role in determining the optimal size and design of the energy system. To examine the impact of this, a parametric analysis is conducted assessing the installation of various PV system sizes for the EC under different selling prices on the Net Present Value (NPV) of the investment over a 20-year period. As illustrated in Figure 1, this study evaluates scenarios with PV system sizes ranging from 10 to 100 kWp and average selling prices ranging from 0 to 50 €/MWh.

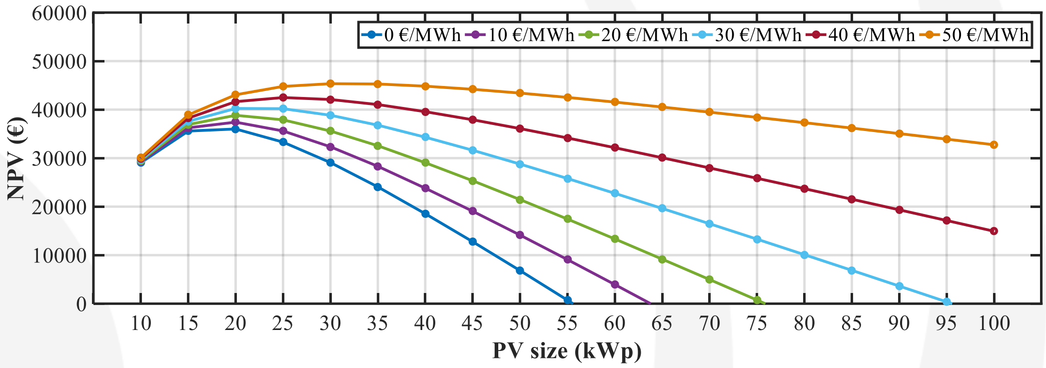

Figure 1 Impact of PV size and PV surplus selling price on expected Net-Present Value for PV investments.

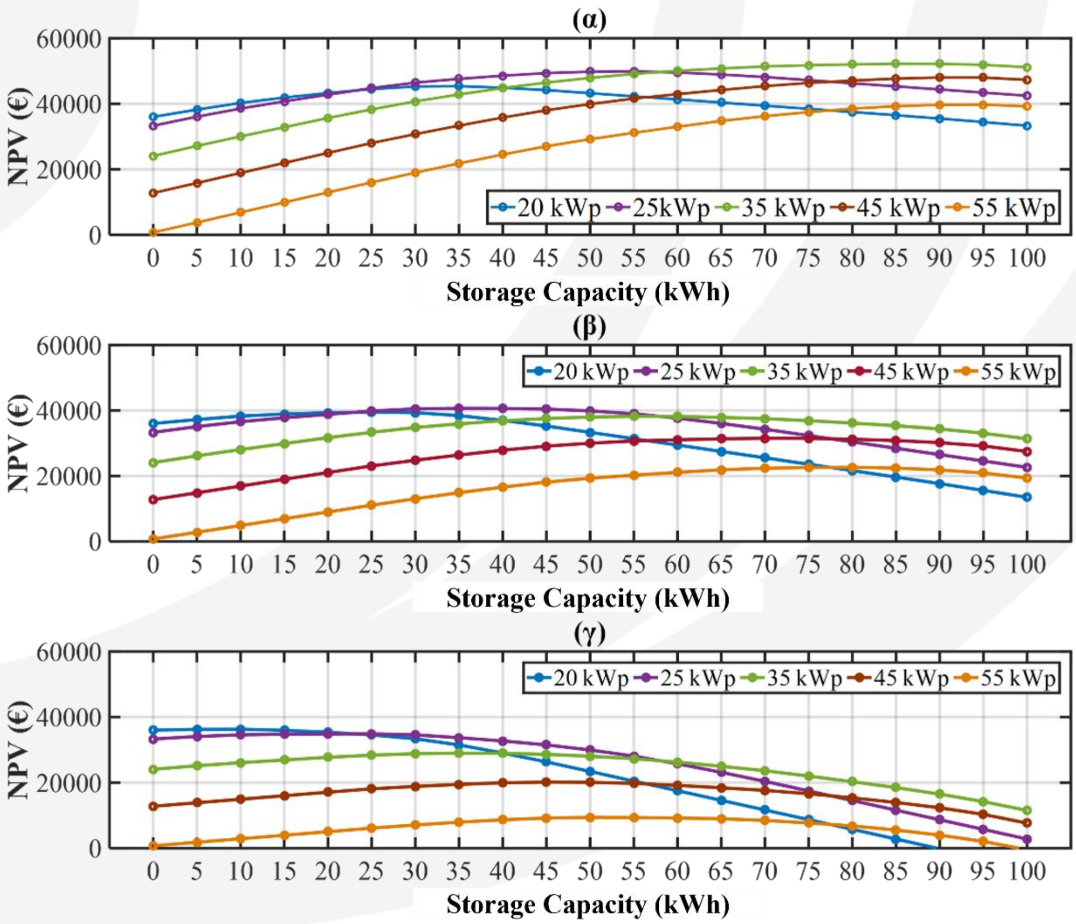

Figure 2 The NPV of PV-storage systems is evaluated with zero compensation for power injection into the grid, considering the storage system's installation cost of: (a) 200 €/kWh, (b) 350 €/kWh, and (c) 500 €/kWh.

The integration of storage systems enhances the management of PV production by balancing produced and consumed power. This integration leads to increased levels of self-consumption and self-sufficiency ratios in the EC, thus reducing the reliance on grid-purchased energy and, therefore, the energy costs for the EC members. However, the cost of acquiring and installing ESS is a critical factor to the profitability of a PV-storage system investment. To explore this, Figure 2 presents the NPV provided by installing various PV-storage system sizes in the EC considering the storage system's installation cost ranging from 200 - 500 €/kWh.

Key points of the presented example:

- The profitability of the investment increases as the selling price for PV surplus rises.
- The installation of oversized PV systems may fail to offset their high installation costs, raising concerns about their financial viability.
- The integration of storage systems contributes to further utilizing the PV production, thus potentially increasing the NPV of such investments.
- The installation cost of storage systems significantly impacts the NPV of PV-storage investments.