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Renewable Energy Communities (RECs): pilots or real applications in Italy

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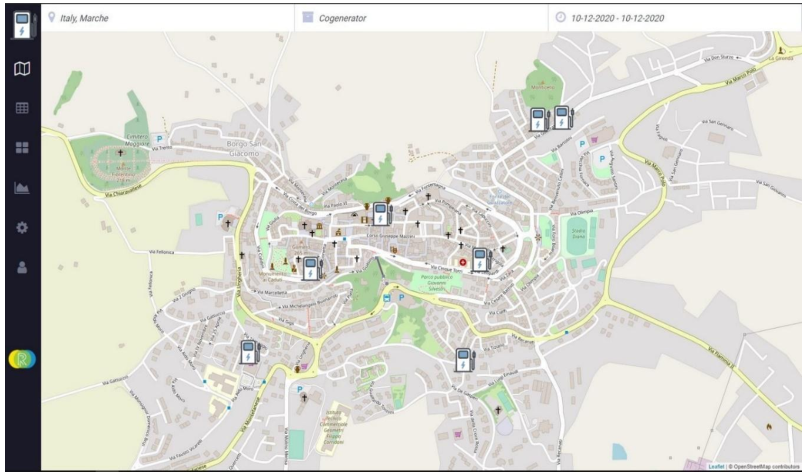
Content

- Case studies in Italy

Projects developed @UNIVPM

Osimo City:

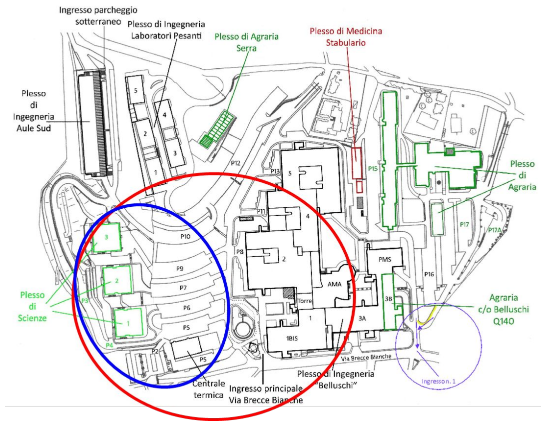
1. Renewable Energy Communities (RECs).
2. Collective energy self-consumption.



Community UNIVPM:

5 Campus.

1 Multi-energy community.



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Potential barriers for RECs

- Implementation/involvement/participation/engagement of residential users.
- Need for a system to monitor the energy production and consumption of individual users and energy community assets.
- Need for visualisation of renewable energy production/consumption in RECs.
- Feed-in tariff is based on self-consumed energy.
- Need to send feedback/advices to end-users on when to consume renewable energy.

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Developed solutions

1. Real-time energy consumption (monitoring platform) for having an overview of the self-consumption.
2. Methodology for identifying the optimal consumer mix to maximize energy self-consumption.
3. Visualisation of individual monitored assets:

- Users;
- Charging stations;
- Community batteries.

4. Anonymous users (display the aggregate consumption only, privacy issue solved!).
5. Each end-user has its own page (web and/or app) where energy consumption can be checked.

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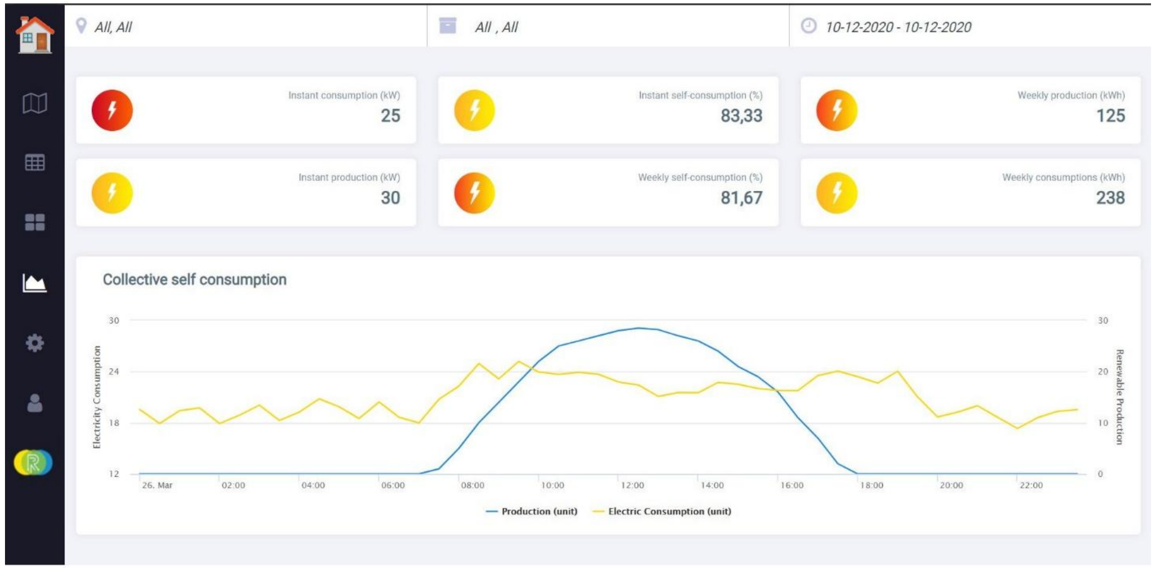
Developed solutions

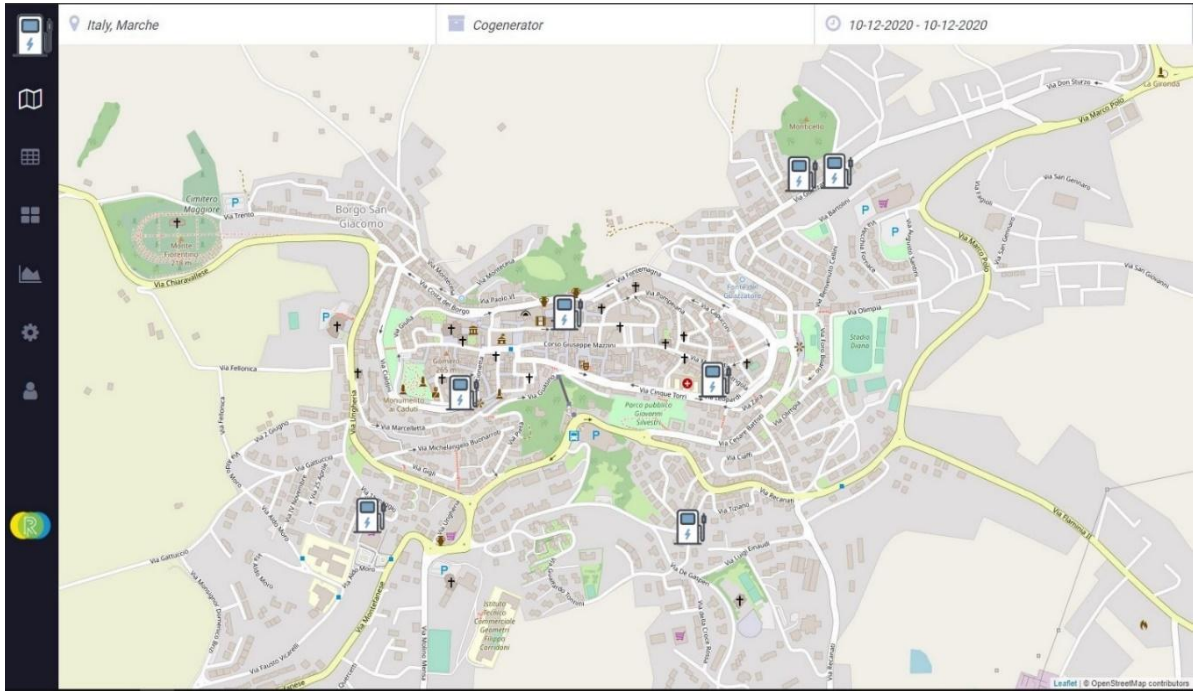
- Real-time display of current renewable energy self-consumption in RECs (important for calculating economic earnings from feed-in tariffs, monitoring purposes as well as increasing the end-user awareness and involvement).

- Alert with messaging to community members for lack of renewable energy self-consumption.



Developed solutions

- Single and aggregated electric charging stations.



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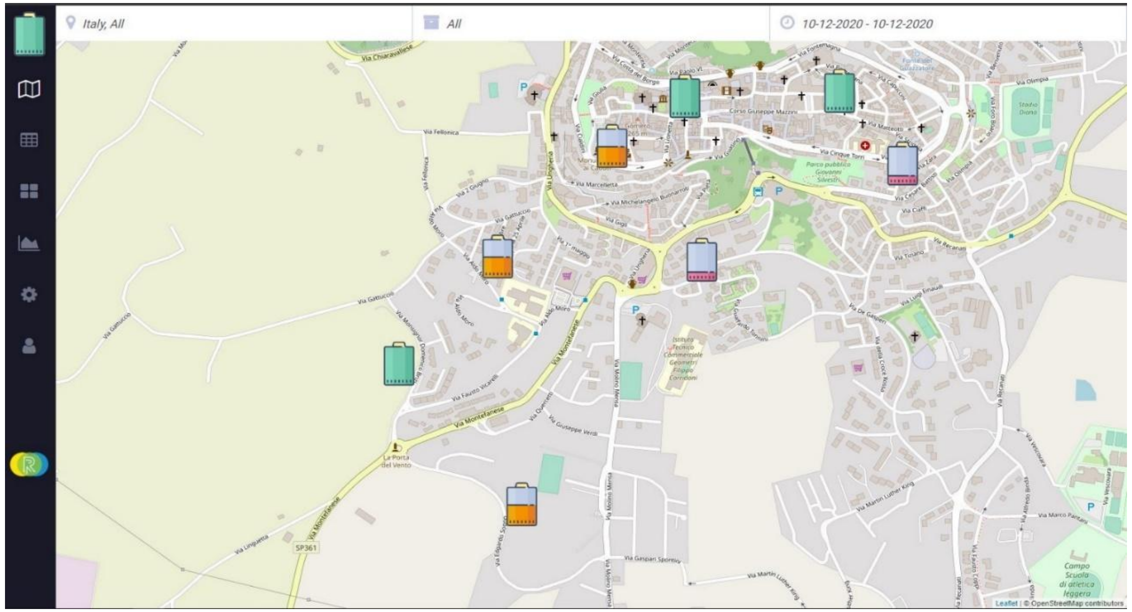
Developed solutions

- Batteries in RECs.



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REC:

PV.

Batteries.

Charging columns.

Collective energy self-consumption

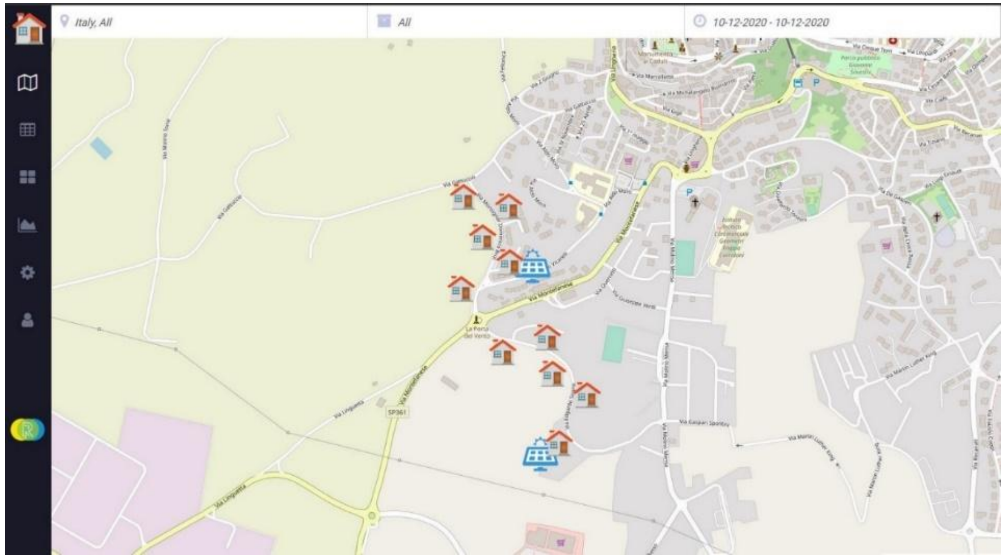
PV.

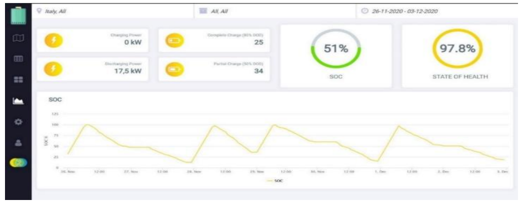
Batteries.

Charging columns.

Controllable loads.

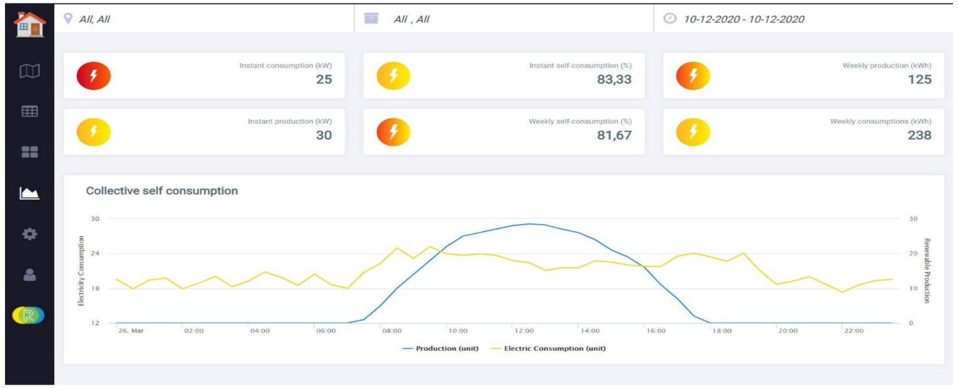
Heat pumps.





Developed services:

- Real-time monitoring of self-consumed energy and economic earnings from the feed-in tariff.
- App for prosumers (e.g., awareness, engagement, empowerment, etc.).
- Coordinated load planning.
- Alert systems for failures.



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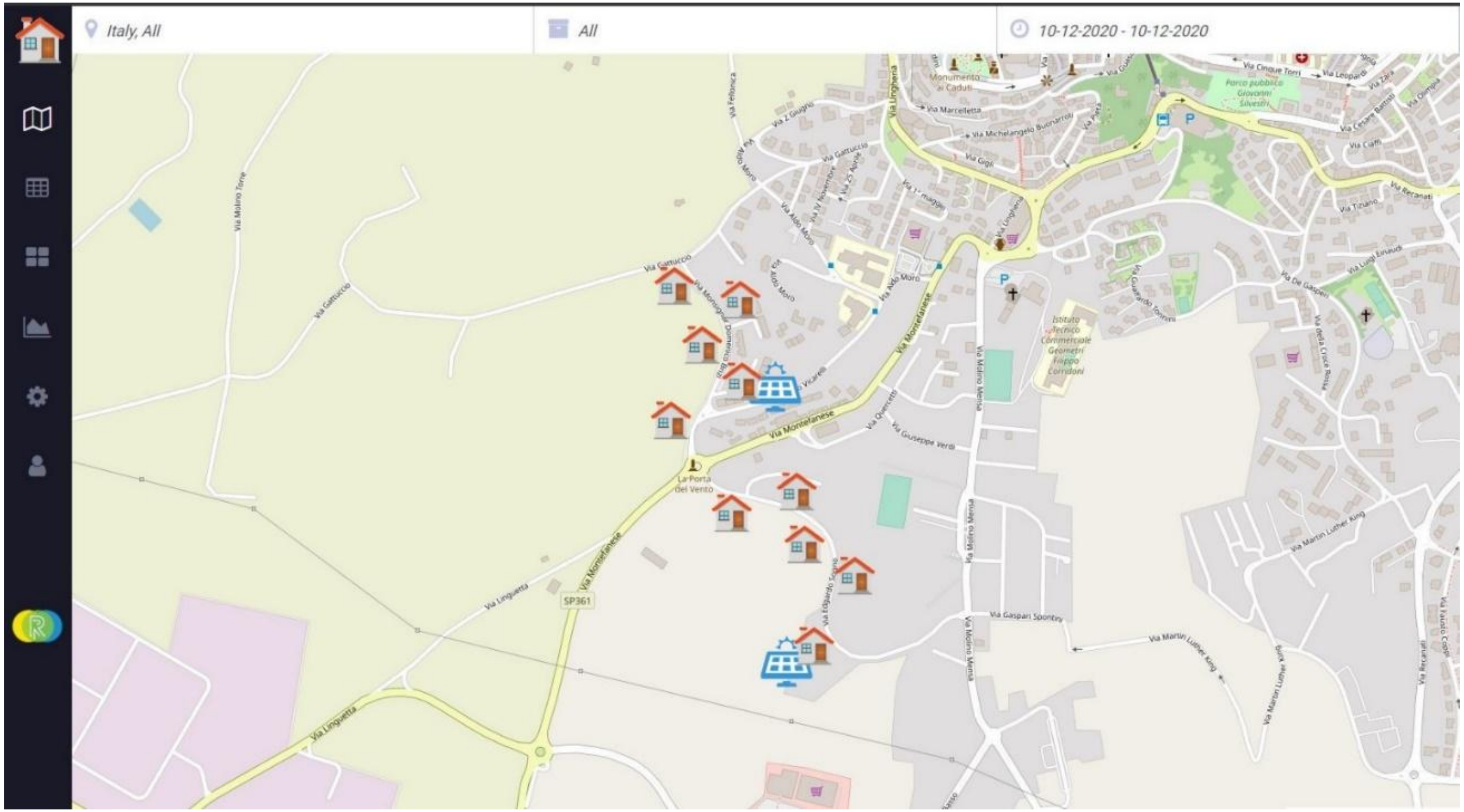

The feed-in tariff is paid only for the renewable energy self-consumed.

The exact number of end-users, with a specific power size and energy consumption, must be found and embedded into the REC!

The system is very simple because it is needed to communicate only the POD number (virtual energy self-consumption!).

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To increase renewable energy self-consumption and, thus, the revenues coming from the feed-in-tariff, the optimal combination of system size and community consumption profile must be studied:

- Residential/tertiary.
- Working vs. holiday profiles.
- Winter vs. summer profiles.
- etc.

Some examples:

- A school that is part of an energy community would consume less in the summer since it is closed.
- Public offices consume low energy on the weekends.

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Thanks for your attention!
Q&As?

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Comparative Research Network:

Renewable Energy Communities (RECs)

Pilots or real applications?
Case studies in Germany

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Content

Introduction

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Current situation in Germany

- Energy communities are **relatively widespread**
- The share of energy cooperatives in total renewable electricity generation = **3%**
- Roughly **2,500 to 3,000 energy communities** (cooperative model and other legal forms)
- **Transition in energy support:** The **number of new cooperatives has fallen** because the legal and economic framework conditions have deteriorated (Pre-2017: Fixed feed-in tariffs and premiums - predictable and profitable, now shift to more competitive system).

Sources: 1, 2

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Governance Framework

Federal Government:

- Broad authority over energy legislation.
- Regulation managed by the **Federal Network Agency (Bundesnetzagentur).**

Federal States (Länder):

- Influence legislation via the **Federal Council (Bundesrat).**
- Set individual climate and energy targets.
- Handle permitting, spatial planning, and zoning for renewables.

Municipalities:

- **Key roles in planning and permitting.**
- **Act as members, shareholders, or facilitators of energy communities.**
- **Provide sites for renewable energy systems (RES).**

Sources: 1

Legal definition

Alignment with the recast Renewable Energy Directive (RED II):

The German implementation of the EU’s RED II directive recognizes RECs as entities meeting certain EU-defined criteria:

- Legal entities based on **open and voluntary participation.**
- Controlled by **members** (individuals, SMEs, or municipalities) who are **located near the project**.
- Primarily aim to provide **environmental, social, or economic benefits** to members or the local area **rather than financial profit**.

Sources: 1, 2

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Legal definition

Germany doesn't have a single legal definition of energy communities.

The laws provide clear parameters for entities such as **"Bürgerenergiegesellschaften" (citizen energy companies)** and **energy cooperatives** that align with the EU's concept of Renewable Energy Communities (RECs).

Sources: 1, 2

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Legal definition

Existing rules (Renewable Energy Act (EEG) and Energy Industry Act (EnWG)):

citizen energy companies (Bürgerenergiegesellschaften)

- At least **51% of voting rights** in energy cooperatives must be held by members who are **natural persons**.
- **The majority of members must reside within a certain proximity** to the renewable energy project (e.g., 50 km for onshore wind projects)
- **No member may hold more than 10% of voting rights.**

energy cooperatives

- The principle of **"one person, one vote," regardless of financial contribution**
- Energy communities must **prioritize environmental and social benefits over profit**. Any profits generated must primarily benefit the community or its members.

Sources: 1, 2

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Challenges and Opportunities for RECs in Germany

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Requirements under RED II

Assessment of Barriers and Potential:

- Member States must evaluate existing barriers and the potential for RECs development.
- Germany: **No official assessment conducted to date.**

Also the specific role that energy communities should play at national level remains mostly vague – there is no strategy: energy communities have not yet played a significant role in the upcoming decisions on shaping the energy markets.

Sources: 1

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Challenges

Administrative and Regulatory Challenges

- **Permitting Processes - time-consuming and complex**, delaying project development.
- **No clear legislative roles for energy communities**, lack of systematic evaluation of their potential and impact.
- **State Participation Laws* - inconsistent**, only some states (e.g., Lower Saxony, North Rhine-Westphalia) enforce mandatory participation laws.
- Municipal Heat Planning - by 2026/2028, municipalities with ≥45,000 residents must include RECs in heating plans, but **smaller municipalities lack guidance and support**.

*State participation laws mandate that renewable energy developers offer local communities or municipalities a financial stake or other forms of participation in renewable energy projects.

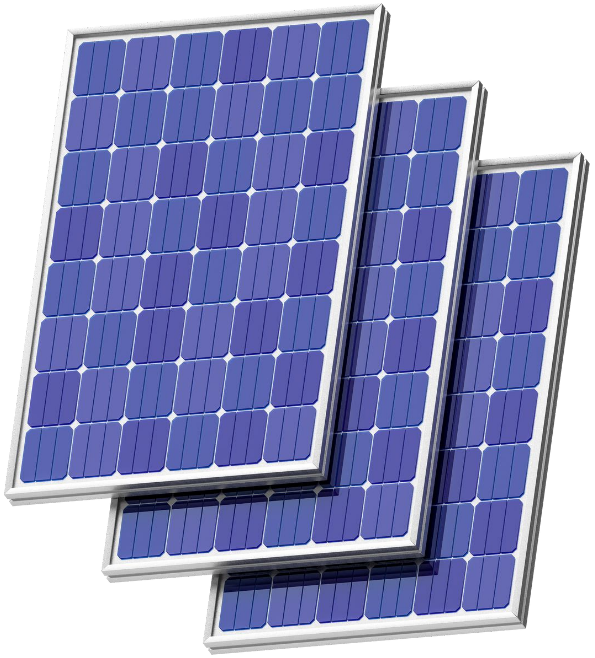
Sources: 1, 2

Co-funded by the European Union

Challenges

Financial and Social Barriers

- **Difficulties in securing funding** and managing fluctuating costs.
- Exclusion of Lower-Income Households - e.g., solar package reforms (April 2024) simplify processes but **exclude energy-sharing options and affordability for low-income households.**



Sources: 1, 2

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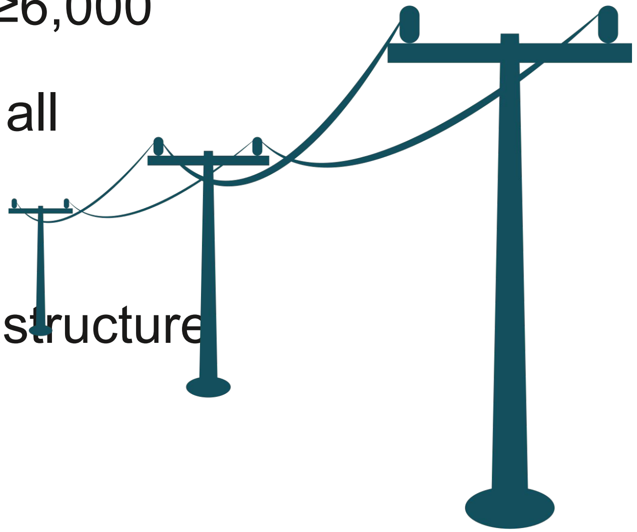
Challenges

Technical Challenges

- **Digital Infrastructure and Smart Meters** - Germany lags in smart meter adoption, **with only 1% of households equipped**.
- **New targets**: by 2025, mandatory installation for consumers with ≥6,000 kWh/year and renewable operators with >7 kW capacity, by 2032, all consumers to have modern metering devices.
- **Grid Challenges** - integrating renewable energy into existing infrastructure while maintaining stability and efficiency.



Sources: 1, 2

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Opportunities

The recent amendment to the Energy Act introduces measures to reduce administrative barriers for energy communities:

Exemption from Tendering (competitive system):

Starting January 1, 2023, renewable projects by citizen energy societies are exempt from tendering if installations remain below: 18 MW for wind energy, 6 MW for photovoltaic (PV) systems.

Eligibility Conditions:

Exemption applies only if no plants of the same technology and (for PV) the same segment (ground-mounted or rooftop above 1 MW) were commissioned in the previous three years.

Restriction on Repeat Exemptions:

After benefiting from an exemption, citizen energy societies must wait three years before applying for another exemption or tender for the same technology and segment.

Urban Area Considerations:

Exemptions apply only to ground-mounted PV installations, not rooftop solar systems.

Sources: 3

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Opportunities

Access to Finance:

- **Federal Wind Energy Funding Program** (2022, amended 2024):
  - Covers up to 70% of planning costs (max €300,000 per project).
  - Reduces minimum membership for applicants from 50 to 15 persons.
  - Estimated to support 150–200 MW of new capacity annually.
- **State-Level Initiatives:**
  - Bürgerenergiefonds in Schleswig-Holstein (2018): Revolving fund providing risk capital for energy projects in renewable power, heat, efficiency, and mobility.
  - Thuringia’s Fund: Modeled after Schleswig-Holstein’s approach.
- **KfW Bank:** Offers low-interest loans for renewable energy projects.

Sources: 1

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Opportunities

Access to Information:

- **Regional Initiatives:**
  - Baden-Württemberg's "**Citizens Full of Energy**" program: Offers training and advisory services in partnership with cooperative associations.
  - **Energy agencies** in North Rhine-Westphalia and other states offer support and networking opportunities.

- **National Platforms:**
  - DGRV online portal: Information hub for renewable energy communities.
  - BBEn (German Alliance for Citizen Energy): Advocacy and guidance for energy cooperatives.

- **Non-Governmental Networks:**
  - **Netzwerk Energiewende Jetzt e.V.**: Provides training, newsletters, and mutual support for energy cooperatives.
  - **Heinrich Böll Foundation's Energiebürger**: Mentoring and capacity development for energy communities in Schleswig-Holstein.

Sources: 1

Case studies

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Jühnde Energy Village

Energy Sources:
- Biogas plant powered by 17,000 tons of biomass (manure, crop silage, maize, sunflowers) provided by local farmers.
- Wood chip boiler for peak winter heating.
- Decentralized heating grid (5.5 km) supplying heat to 140 households (~70% of the village).
- Photovoltaic system

Outputs:
- Electricity: ~5 million kWh/year
- Heat: ~4.5 million kWh/year

Sustainability Cycle: Digestate from the biogas plant was returned to fields as fertilizer.

Community Engagement:
- Transparent information campaigns (village gatherings, newsletters) to gain community trust and participation.
- Collaborative effort between local experts, farmers, municipality, and residents.

Problems:
- Financial struggles from legal disputes, missed bonus payments, insufficient equity and rising costs.

Sold in October 2019 due to financial constraints.

Lower Saxony,
First village in Germany to produce heat and electricity from biomass, achieving CO_2 neutrality.
Launched in 2005 after a 5-year implementation phase.

Sources: 4, 5

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Citizens’ Wind Park Ellhöft

Bürgerwindpark (Wind Farm):

- Established in 1995 with six 1.3 MW turbines, generating a total capacity of 7.8 MW.
- Now with four turbines generating enough electricity to power about 4,000 households.
- Part of the energy is sold to Greenpeace Energy, and some is used for green hydrogen production at a local electrolyzer facility.

Bürgersolarpark (Solar Park):

- In operation since 2009, with a capacity of 2 MW.
- A new, larger solar park is being developed with a planned capacity of 50 MW, covering 40-50 hectares, making it one of the largest in the region.

Citizen Participation:

- The solar park project allows all adult residents of Schleswig-Holstein to invest between €1,000 and €25,000

Hydrogen Production:

- The initiative includes the production of green hydrogen, with plans to supply a hydrogen fueling station in Westre.
- Future plans aim to channel one-third of the solar park's output into hydrogen production, supporting regional climate goals.

Dual Use with Wind Power:

- The solar park will be integrated with existing wind turbines, optimizing land use.
- Safety measures will be in place to protect solar panels from ice shedding off wind turbines.

Schleswig-Holstein, Community-driven renewable energy initiative, including a wind farm and solar park.

Managed and owned by local citizens.

Revenues reinvested in community projects.

Sources: 6, 7

Wildpoldsried Energy Village

Renewable Energy Projects:

- Biogas plant expansion (+1000 kW).
- 8 planned intercommunal wind turbines as citizen wind energy projects.
- Promotion of solar PV systems with local energy storage (post-EEG).
- Energy-efficient municipal services powered by solar, including water pumps and streetlights.
- District heating network expansion to industrial and residential zones.

E-Mobility and Sustainable Transportation:

- 100% electric municipal fleet.
- E-bike rentals and repair services through local companies.
- Car-sharing initiatives.
- Pedestrian and bike-friendly infrastructure.
- Traffic calming through shared space designs.

Educational and Community Engagement:

- Workshops on household energy savings.
- Public events like “Wildpoldsried Energy Storage Day.”
- Energy consulting for citizens.
- Collaboration with local firms for innovative projects.
- School and kindergarten projects on renewable energy.

Many Global and Regional Cooperation

Challenges:

- Securing the necessary financial investment
- Initiall skepticism or unwillingness of some residents to invest in renewable energy projects.

Bavaria

Global example of community-led energy innovation.

Recognized for climate protection efforts.

Produces 500% more energy than it consumes. Surplus energy is sold to the grid, benefiting the local economy.

CLICK HERE

Sources: 8, 9

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Feldheim Energy Community

Renewable Energy Production:

- Wind Power: 8 onshore wind turbines.
- Solar Power: Extensive photovoltaic (PV) capacity across rooftops.
- Biogas: A local biogas plant supports the energy system.

Self-Sufficiency:

- 100% renewable electricity and heating from local renewable sources.
- Excess energy produced is sold to the grid, benefiting the community financially.

Community Involvement:

- Local Ownership: Feldheim's residents are actively involved in the energy transition through the local cooperative, sharing profits from energy sales.
- Energy Prices: The village benefits from lower energy prices, with revenues reinvested into local infrastructure and projects.

Sustainability:

- Energy Storage: Advanced energy storage systems to manage supply and demand.
- Climate Goals: Significant contributions toward reducing CO_2 emissions in the region.
- Tourism: The village attracts visitors and has become a model for other communities pursuing energy independence.

Impact:

- Recognition: Feldheim serves as an international example of community-led energy transformation.
- Future Plans: Continued expansion of renewable energy projects and innovation in energy systems.

Brandenburg, Germany
The Energy Self-Sufficient Village.
A pioneering energy community became energy self-sufficient in 2014, producing more energy than it consumes.
Transitioned to 100% renewable energy from local, decentralized sources.

Sources: 10

Energy community Sprakebüll

Wind Energy:

- The initial wind park, established in 1998, comprised 5 turbines, each with a capacity of 1.65 MW, owned by local villagers. A repowering project in 2014 upgraded the original turbines to 3.6 MW each.
- A second wind park followed, involving 183 citizen investors.
- In 2011, the Stadum-Sprakebüll wind park was added, featuring 3 turbines with 2.5 MW capacity each.

Solar Energy:

- In 2009, Sprakebüll constructed a 100 MW photovoltaic system on 7 hectares of land

Biogas and District Heating:

- The village operates a biogas plant that supplies heat to all homes via a district heating network established in 2013, reducing reliance on oil and enhancing energy self-sufficiency.

Community Involvement and Economic Impact:

- Predominantly owned by local citizens, ensuring that profits and tax revenues benefit the community directly.
- **Widespread support** for renewable energy initiatives within the village.
- Transition to renewable energy has provided economic stability, countering the decline in traditional farming activities and preventing rural exodus.

Nordfriesland in Schleswig-Holstein,
Successful energy community thanks to comprehensive adoption of renewable energy sources.
Since 1998, multiple wind farms, solar installations, and a biogas-powered district heating network.
Collectively producing 50 times more electricity than the village's consumption.

Sources: 11, 12, 13

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Impacts on energy poverty

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- **Lower Energy Costs for Participants**
- **Opportunities for Low-Income Households** - Many RECs offer smaller investment shares or grant access to affordable energy without requiring significant upfront contributions.
- Communities have more **control over their energy supply**, increasing security and resilience against price fluctuations.
- **Local Economic Development** - Revenues often reinvested into the community, funding social programs or infrastructure improvements that indirectly benefit energy-poor households.
- **Better understanding** of energy usage and efficiency

−

- **High Upfront Costs** - initial membership fees or investment shares can still exclude the poorest households (e.g., €1,000 minimum).
- Many RECs **do not explicitly prioritize energy-poor individuals**, focusing instead on general community participation and environmental goals.
- **Complex regulations and administrative processes** for REC formation and operation may hinder the development of inclusive models that actively address energy poverty.
- Selling surplus energy to the grid may not always translate to direct benefits for the energy-poor unless specific policies, such as reduced tariffs or energy-sharing subsidies, are in place.

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Policy recommendations

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Policy needs

1. Provide **grants or subsidies to help low-income households join RECs**.
2. Support **energy-sharing models with reduced tariffs for vulnerable groups**.
3. **Simplify regulations** to make it easier to start and run RECs.
4. Allow energy sharing and reform grid fees to encourage local energy use.
5. Set up local contact points and "one-stop shops" to guide communities.
6. Offer incentives like reduced fees or bonuses for energy sharing.
7. Fund pilot projects to test REC models in energy-poor areas.
8. Help municipalities lead REC initiatives with funding and resources.
9. Expand RECs to all towns over 10,000 people and connect them across regions.
10. **Regularly assess REC progress, impact, and benefits** for reducing energy costs.
11. Speed up smart meter installation to improve REC efficiency.

Sources: 1, 2, 15

Sources

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2. Policy Brief: Establishing Energy Communities as a pilar of climate-neutral energy system
3. https://energy-cities.eu/updated-german-renewables-law-opens-new-opportunities-for-energy-communities/
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Thank You

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DURATION: **01/06/2024 to 30/05/2026**

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Renewable Energy Communities (RECs)
Pilots or Real Applications
Case Studies in Greece

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Comparative Research Network

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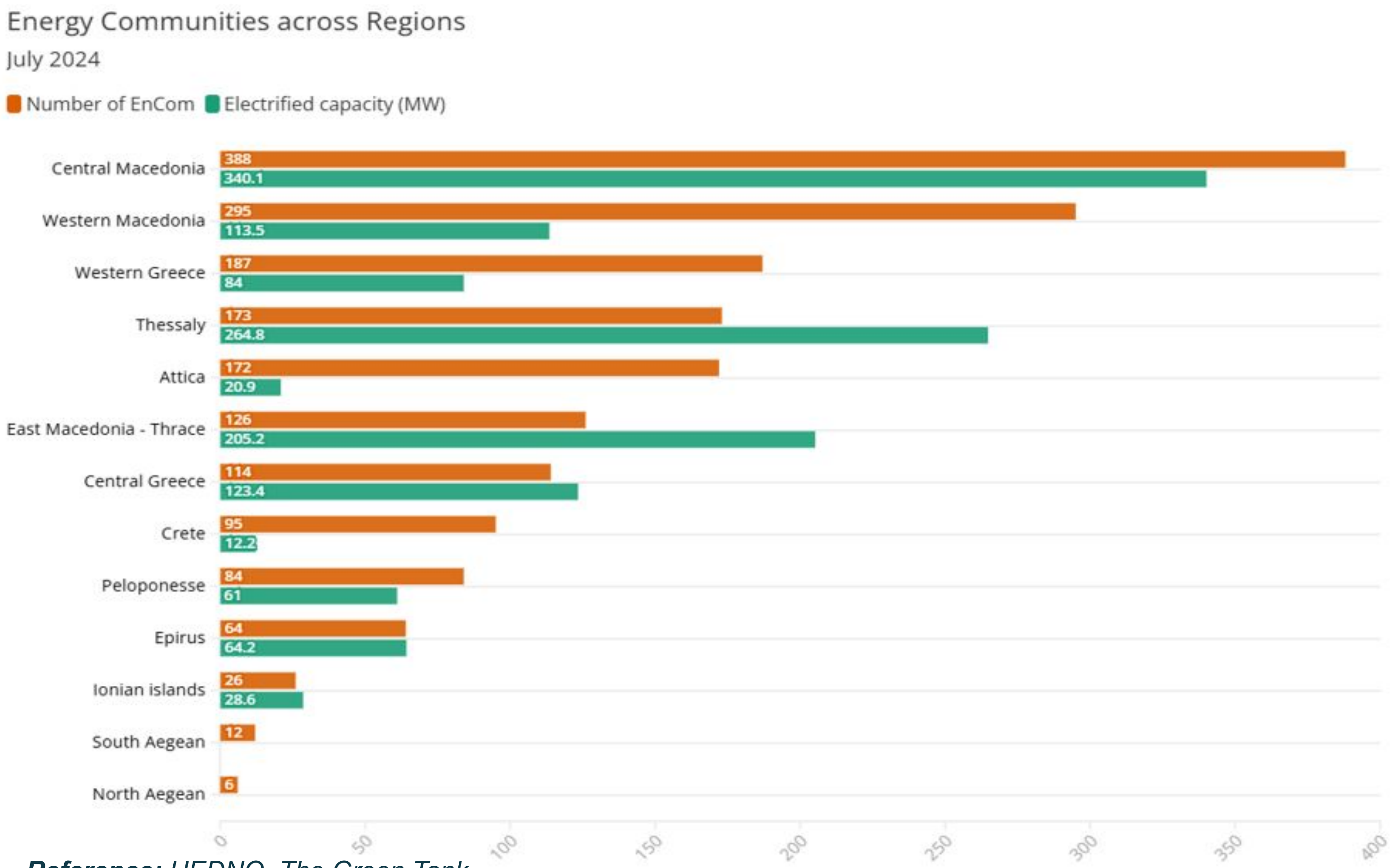
Renewable Energy Communities (RECs) in Greece



***Reference:** HEDNO, The Green Tank*

1,742 active Energy Communities (Sep. 2024)

- 1,685 are Energy Communities under Law 4513/2018
- 40 Renewable Energy Communities (RECs) and 17 Citizens' Energy Communities (CECs) were established under the new institutional framework (Law 5037/2023) adopted in March 2023.

Most connected RES projects by EnComs

- Central Macedonia: 340.1 MW
- Thessaly: 264.8 MW
- Eastern Macedonia - Thrace: 205.2 MW
  Central Greece: 123.4 MW
- Western Macedonia: 113.5 MW

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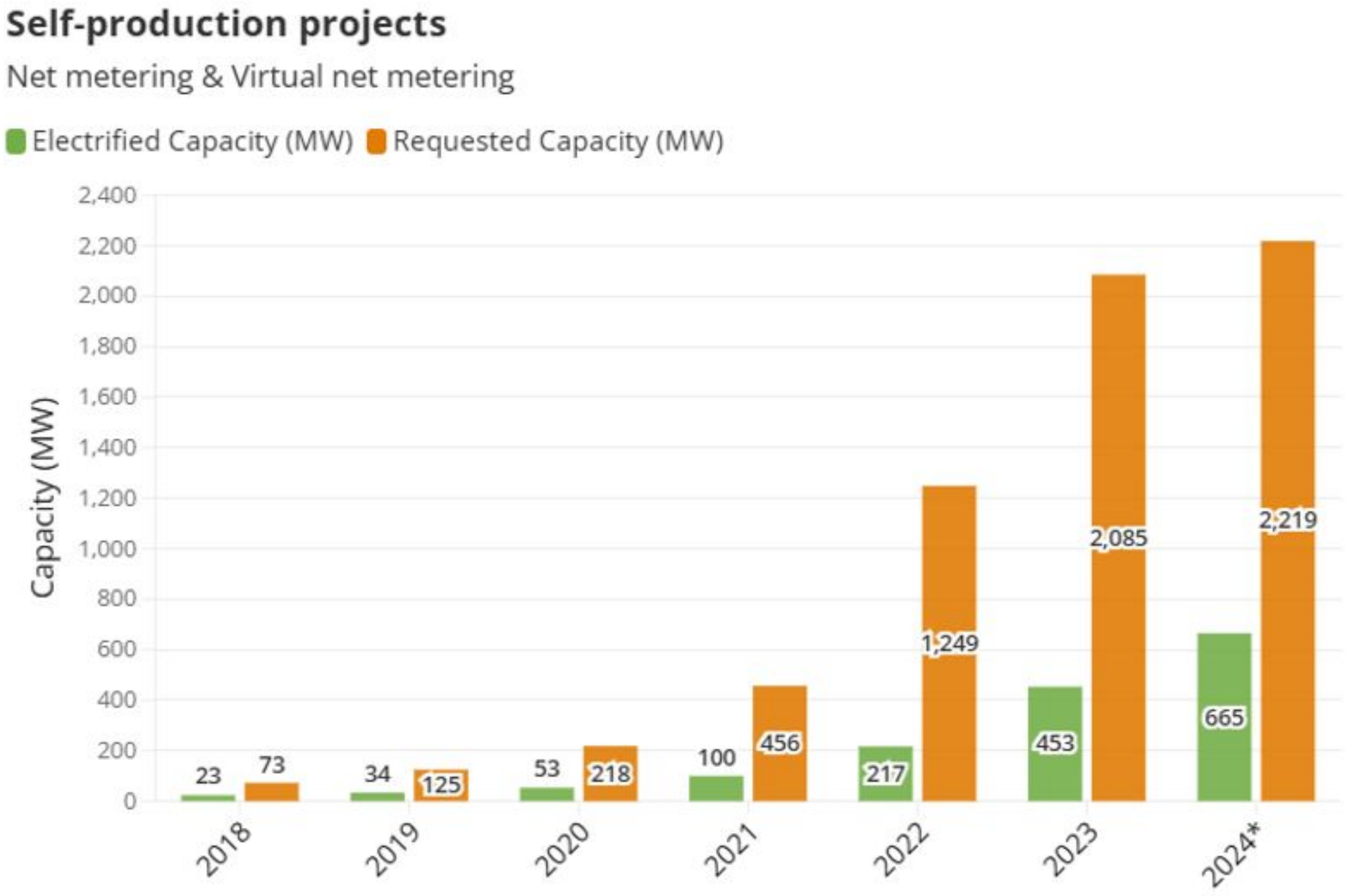
Renewable Energy Communities (RECs) in Greece



Of the 665 MW of electrified capacity:

- 616 MW are net metering projects
- 49 MW are virtual net metering projects, **of which**
  - *28 MW by energy communities*
  - *21 MW by households, businesses and other entities*
- 9% of the requested capacity (194 MW) of self-production projects has been **cancelled**
- 50.6% of self-production projects (1,123 MW) are pending, of which 291 MW correspond to self-production projects by energy communities

Reference: *HEDNO, The Green Tank (Data: up to July 2024*

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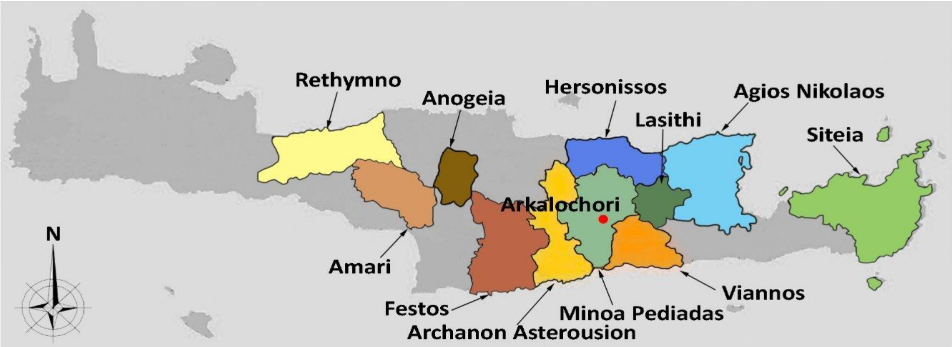
Case Study: Minoan Energy Community



Foundation: 9 October 2019 in the small town of Arkalochori.

Members: 1.300 members, with 13 Municipalities and the Regional Authority of Crete.

Target: To undertake an essential and leading role in a fair, rational and democratic energy transition in Crete, claiming the maximum possible benefits for the local community.

Case Study: Minoan Energy Community

1st PHOTOVOLTAIC PLANT

Power: 405 kW

Participants: 89 members

Construction Period: 10-12. 2021

Connection: 13.05.2022

2nd PHOTOVOLTAIC PLANT

Power: 1.000 kW

Participants: 190 members

Free electricity for 50 low-income, earthquake-victim families

Construction Period: 8-10.2022 | Connection: 28.05.2023

Case Study: Minoan Energy Community

3rd PHOTOVOLTAIC PLANT

Power: 1.025,44 kW

Participants: 125 members

Licensing: July 2023 - January 2024

Construction: March 2024 – July 2024

IN PROCESS…

4th Virtual net metering – P/V Plant – Power: 1 MW
5th Virtual net metering – P/V Plant – Power: 1 MW

Case Study: Minoan Energy Community

Free electricity for earthquake victim families

SOCIAL RESPONSIBILITY

Monday, 27.09.2021. 9:25 a.m.

Earthquake of 6.1 Richter

20% of the population drops off the village of Arkalochori.

Minoan Energy Community provides free electricity for 100 earthquake victim families of low income.

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Case Study: Hyperion Energy Community

HYPERION
SOLAR COMMUNITY

- Based in Athens
- Not for profit
- 128 members
- Different backgrounds
- 4 working groups
  - Energy poverty & solidarity
  - New technologies
  - Legal & admin issues
  - Public presence & Networking
- Solar park 500kW

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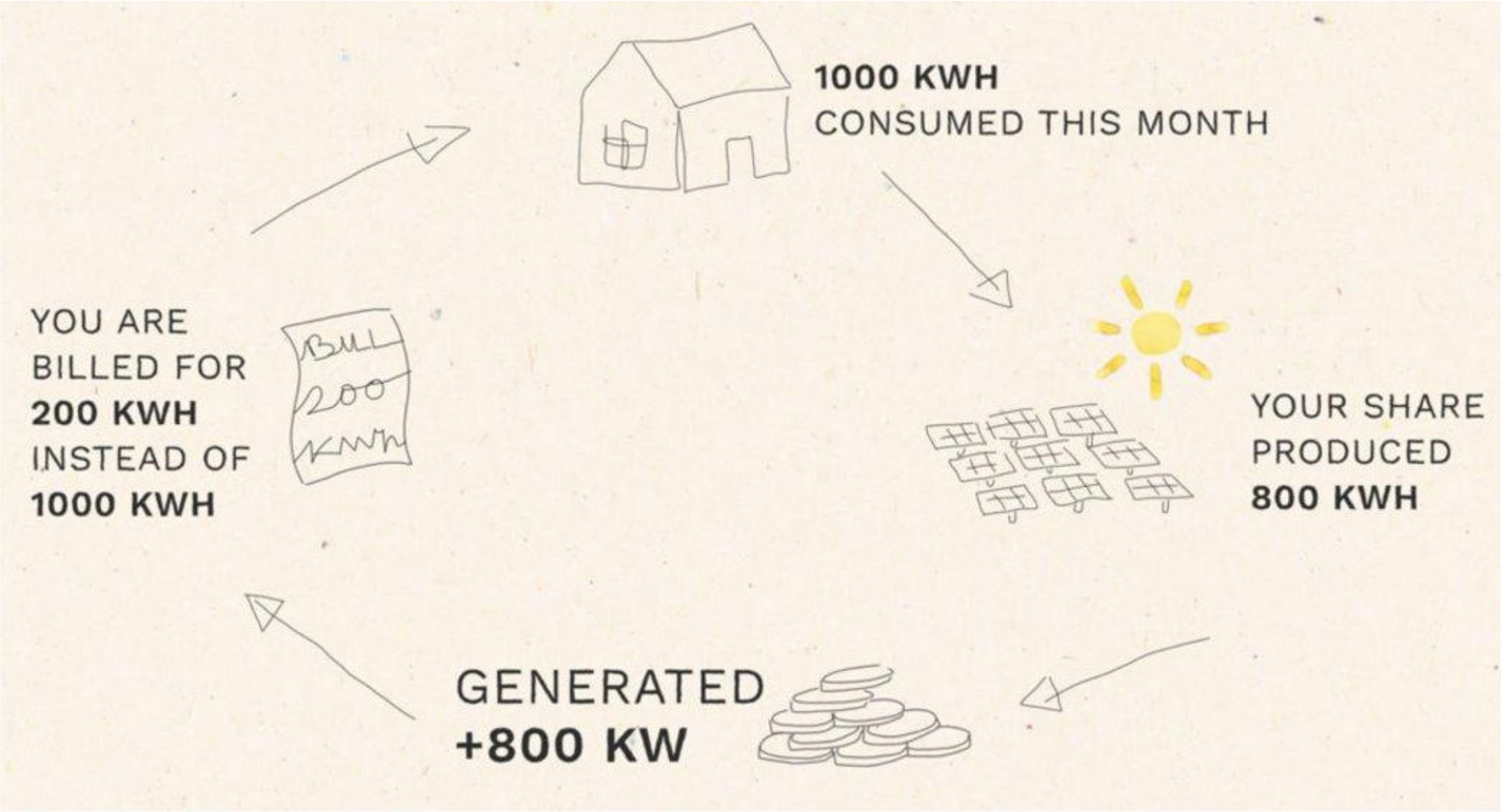
Case Study: Hyperion Energy Community

Virtual Net Metering

Prosuming

(Producing & Consuming)



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Case Study: Hyperion Energy Community

SOCIAL RESPONSIBILITY

Hyperion decided to give 5% of the electricity produced to vulnerable households and solidarity organisations.

- 10 vulnerable households (from 3 different Municipalities)
- 1 cultural centre for African communities - Anasa
- 1 social kitchen - Mano Aperta

Co-funded by the European Union

Case Study: Koinergeia Energy Community of Epirus

63 Members (150 beneficiary persons + 2 vulnerable households)

90% Households
10% Local businesses

Park's Capacity 199,73 KW

Production: 273.000 kWh/year

Case Study: Collective Energy

collective energy

Collective Energy is a non-profit citizen Energy Community founded in Athens in 2020 according to Greek law 4513/2018.

The first project is a solar plant integrated into the virtual net metering scheme.

47 member households and 2 cooperatives based in Athens benefit directly from clean, renewable energy.

2 vulnerable households from Moschato-Tavros Municipality are included to ensure social equity.

The PV plant with a power of 99,7 kW in Argolida has:

Estimated annual energy production: 150.000 kWh/year

CO_2 emission mitigation in the 1st year of operation: 119.000,00 kg

Co-funded by the European Union

Case Study: Association of Energy Communities in Greece

δέσμη ενεργειακών κοινοτήτων

- Advocacy actions
- Outreach and awareness
- Knowledge exchange
- Development of collaborations
- Promotion of equitable access and social justice in the energy sector
- Connection with research organisations

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Case Study: Association of Energy Communities in Greece

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- Ενεργειακή Κοινότητα Φαρμακοποιών — Απόλλων & Ηώς
- Ενεργειακή Κοινότητα Ηλείων Επιχειρηματιών
- Νέα Ενεργειακή Κοινότητα Κοζάνης
- Collective Energy
- ΗΛΙΟΤΡΟΠΙΟ Ενεργειακή Κοινότητα Λέσβου
- ενεργειακή κοινότητα αττικής
- HYPERION SOLAR COMMUNITY
- GOOD ENERGY Energy Community
- ΕΣΕΚ Ενεργειακή Κοινότητα Καρδίτσας
- COOP SIFNOS
- PARITY
- VEC Η ΕΝΕΡΓΕΙΑΚΗ ΚΟΙΝΟΤΗΤΑ ΤΗΣ ΧΙΟΥ
- Solarity Κοινότητα Ανανεώσιμης Ενέργειας
- ΑΛΛΗΛΕΝΕΡΓΕΙΑ ΚΟΙΝΟΤΗΤΑ ΑΝΑΝΕΩΣΙΜΗΣ ΕΝΕΡΓΕΙΑΣ ΣΥΝ.Π.Ε.
- Ενεργειακή Κοινότητα μη κερδοσκοπικού χαρακτήρα Δημ. Υψηλάντη
- ΚΟΙΝΕΡΓΕΙΑ Ενεργειακή Κοινότητα Ηπειρωτών

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Case Study: Association of Energy Communities in Greece

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GREENPEACE

ELECTRA ENERGY.coop

WWF

SMART RUE smartgrids Research Unit ECE NTUA

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Thank you for your attention!
Q&As?

Alice Corovessi, Managing Director INZEB
Country Coordinator for Greece for the EU Climate Pact

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Establishment of five Renewable Energy Communities in the Municipality of Përmet

Meivis Struga

Energy and Climate Consultant
ETMI Albania

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Contents

- Purpose of the study
- What are energy communities?
- Methodology
- Results
- Discussion

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Purpose of the study

This project aims to prepare the conditions for the establishment of five Renewable Energy Communities (RECs) in the municipality of Përmet with the primary goal of generating solar energy to reduce the current costs of electricity for the operation of irrigation pumps.

Piskova, Pacomit, Kutal-Bodar, Qilarisht, and Kaluth

What are energy communities?

Law - European Union
In 2018, the European Commission's Clean Energy Package recognized the right of local communities and citizens to play an active role in the energy sector by defining them as "Energy Communities."

Law - Albania
2023 - ON PROMOTING THE USE OF ENERGY FROM RENEWABLE SOURCES

1. A renewable energy community can:
   a) produce, consume, store, share, sell renewable energy, and offer aggregation, including energy purchase and sale agreements;
   b) have access to all suitable energy markets, directly or through aggregation, on a non-discriminatory basis;
   c) be supported as a producer with priority in accordance with this law. The Council of Ministers may decide to support renewable energy communities with additional measures, treating them as demonstration projects, in accordance with Article 15 of this law.
2. Every renewable energy community will enable and encourage low-income families to become members.

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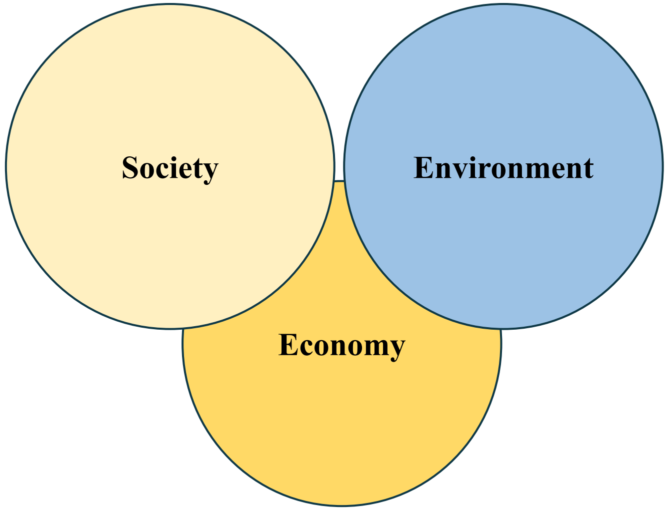
What are energy communities?

The need to mobilize people



The network of people who produce and consume renewable energy

#investments #people #concepts #isolated #communities #energy #green #electricity #renewable #environment #technology #alternative

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Principles of energy communities

- Volunteerism and open participation for everyone
- Democratic and transparent management
- Economic participation with direct ownership
- Autonomy and independence
- Education, training, and information
- Cooperation between communities
- Community concerns

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Issue

The high cost of electricity paid by farmers for irrigation

Target group

- Municipality of Përmet
- Farmers (men and women)
- Local organizations
- OSHE (Electricity Distribution Operator)
- Potential investor

Methodology

- **Data collection** regarding monthly and yearly energy consumption and water demand, which will be used to calculate the power of the PV panel.
- **Validation of the data** with the municipality staff and farmers.
- **Formalization of the cooperation agreement** between the municipality and farmers.
- **Promotion of energy communities** in the region as an alternative to use renewable energy for irrigation.
- **Presentation of the feasibility study** to farmers and the municipality.
- **Finding potential investors** to realize the project.

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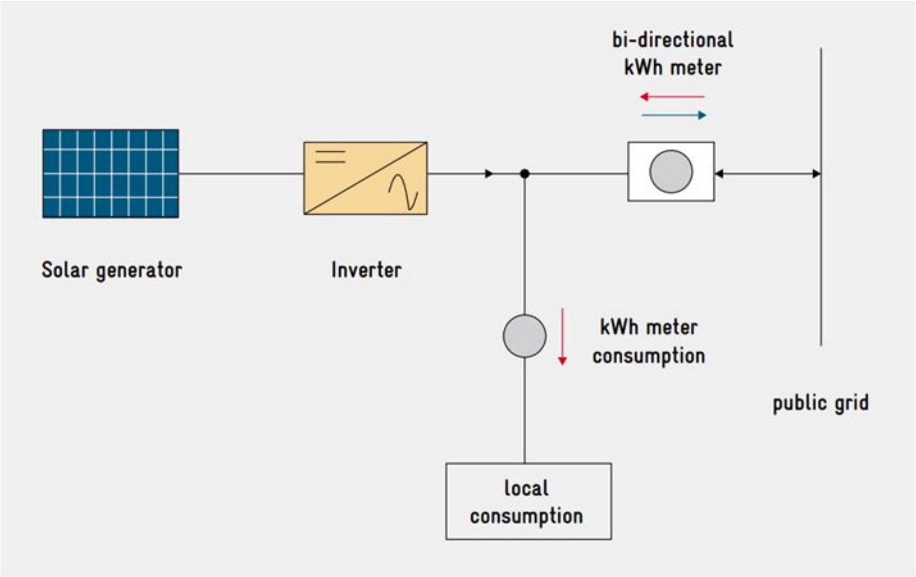
Energy Consumption by irrigation in the Municipality of Permet (2021-2023)

The pumps of municipality	kWh (2021)	kWh (2022)	kWh (2023)
Irrigation pump Kutal-Bodar	14	7810	2666
Irrigation pump Qilarisht /Petran	218	9,070	171
Irrigation pump Piskove	7,112	7,514	5,149
Irrigation pump Pacomit	19,969	11,931	12,293
Total	27,312	41,756	20,280

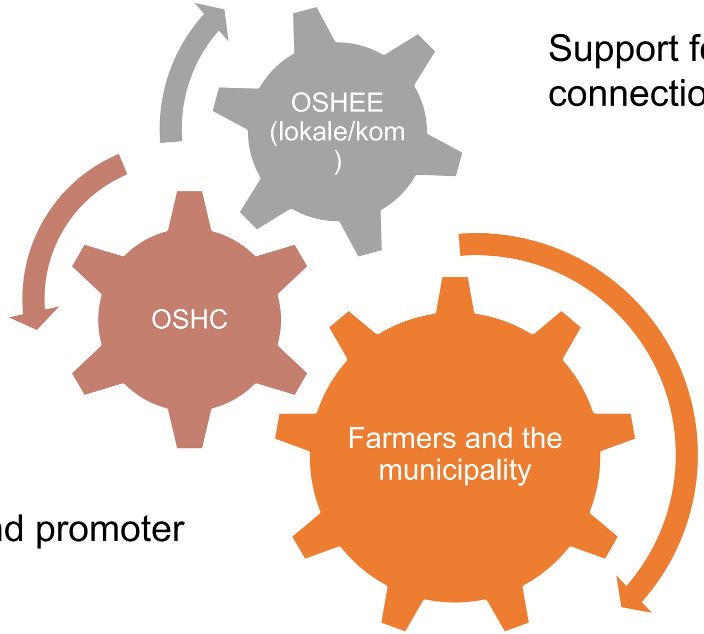
Source: Municipality of Permet

Investment

Installation and connection of PV



Collaboration between actors



Support for the network connection

Supporter and promoter

Key actors and investment

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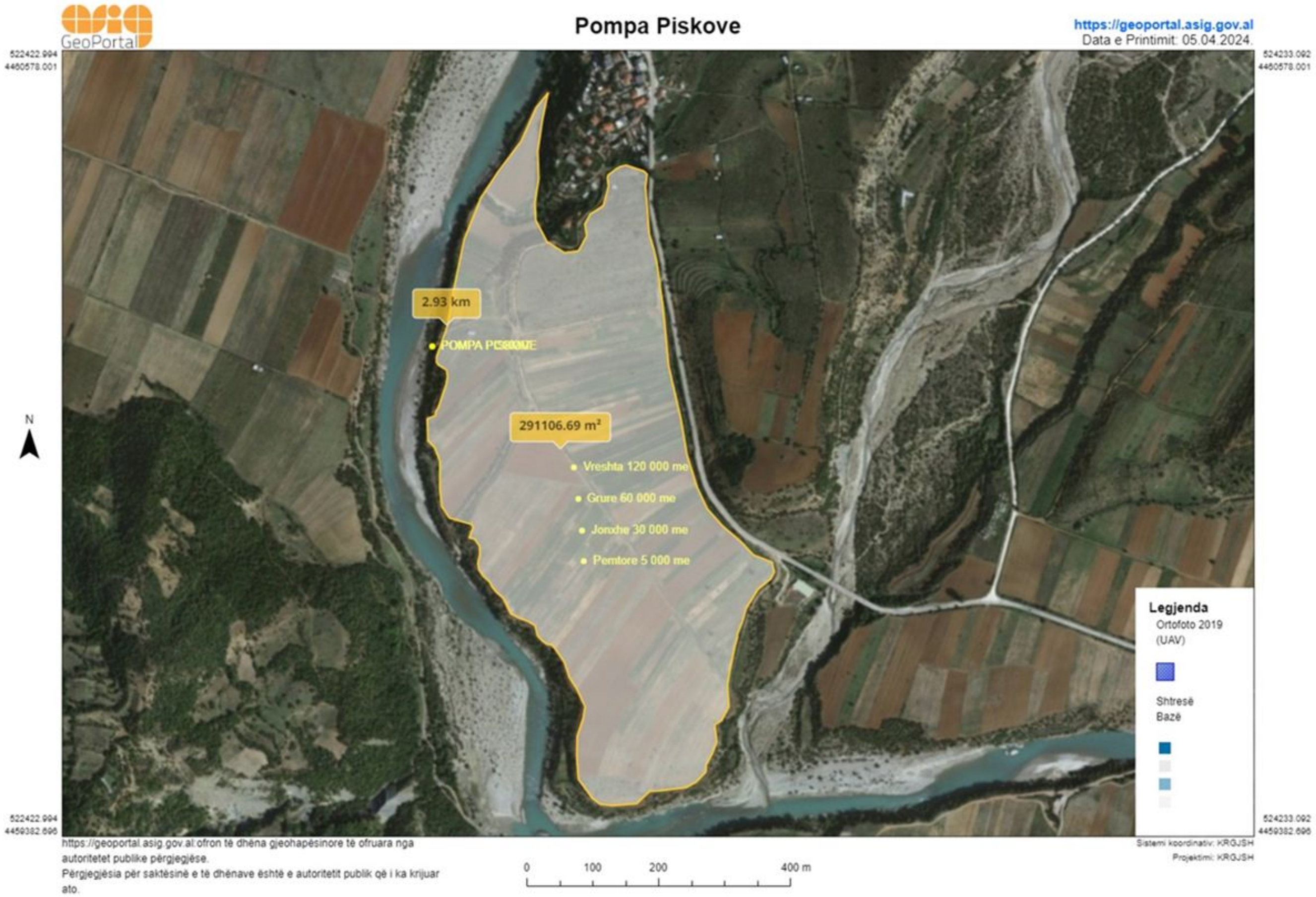

Piskova Water Pump

- Wheat 6 ha
- Vineyards 12 ha
- Orchard 0.5 ha
- Forage crop 3ha

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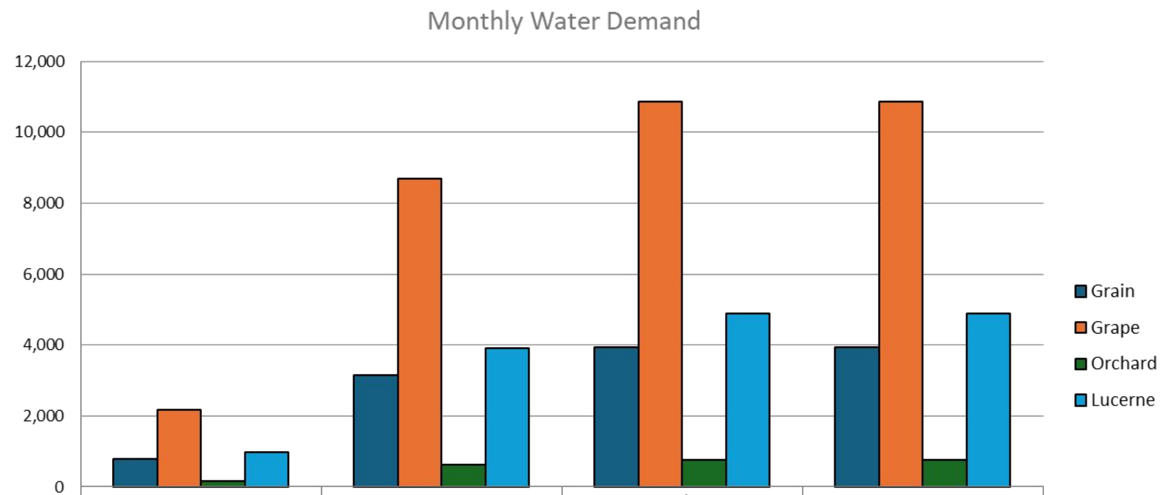
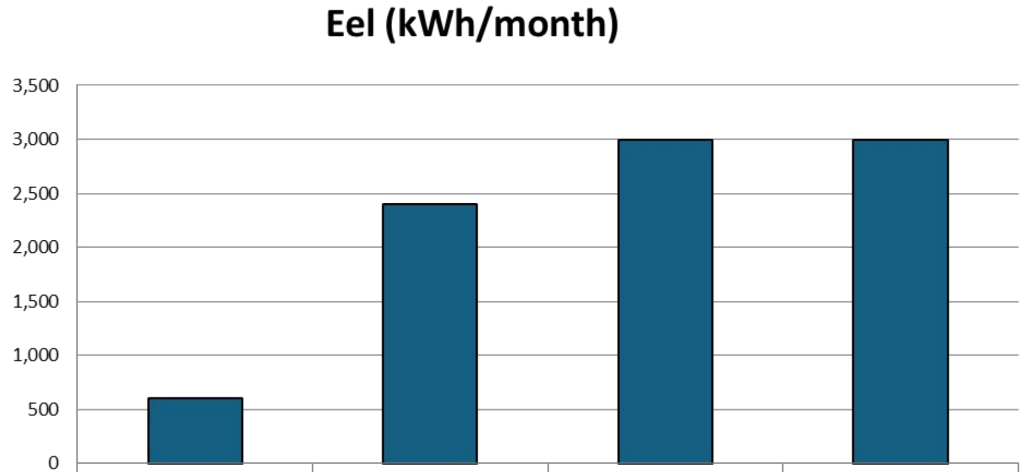
Piskova
Monthly energy and water demand



	May	June	July	August
Grain	788	3,152	3,940	3,940
Grape	2,170	8,682	10,852	10,852
Orchard	154	616	770	770
Lucerne	980	3,920	4,900	4,900



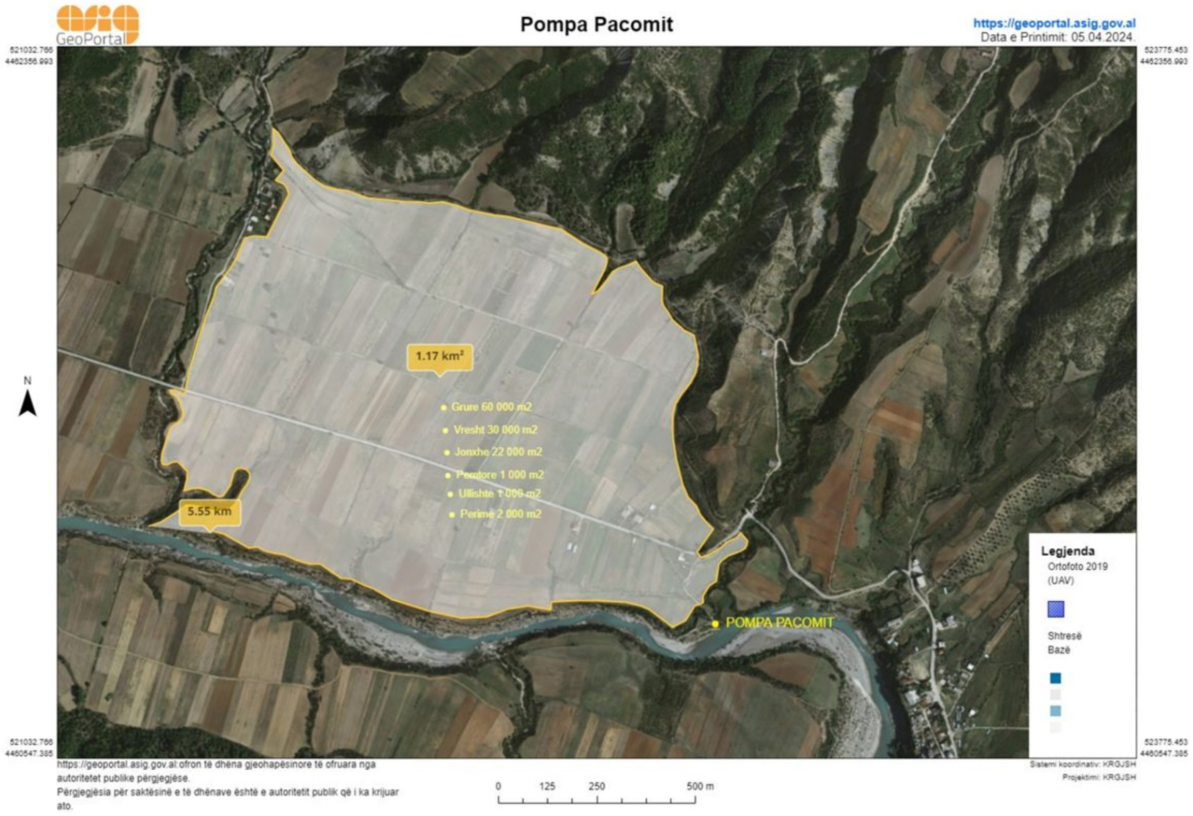
	May	June	July	August
Eel (kWh/month)	600	2,400	3,000	3,000

The capacity of the pump and the solar panel in Piskovë

Month	Electricity [kWh/month]	Pump capacity [kWp]	PV [kWp]	PV production [kWh]
May	600	75	14	2,100
June	2,400	75	14	2,730
July	3,000	75	14	2,940
August	3,000	75	14	2,660

Pacomit
water pump 1.17 km²

- Wheat 6 ha
- Vegetables 0.2 ha
- Vineyards 3 ha
- Olive grove 0.1 ha
- Orchard 0.1 ha
- Forage crop 2.2 ha



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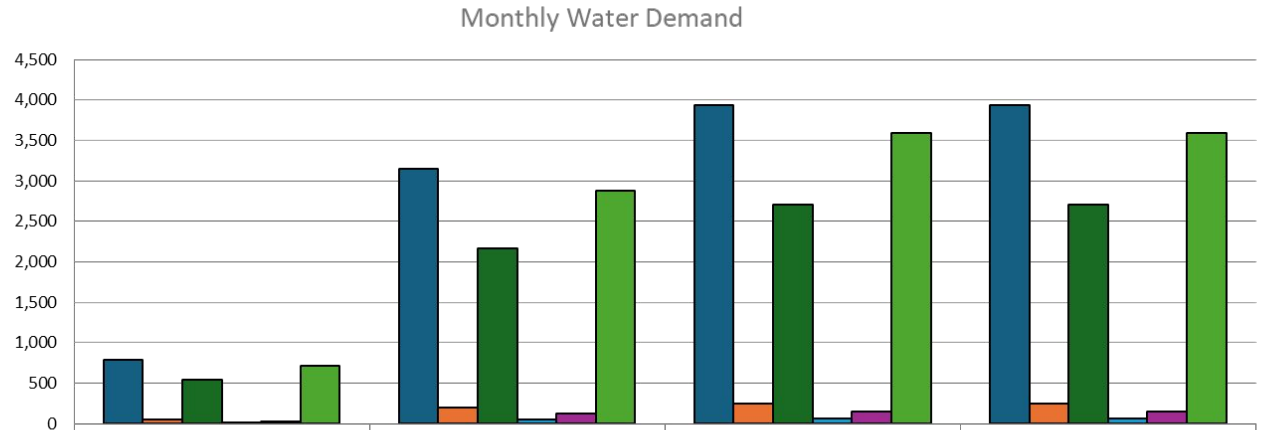
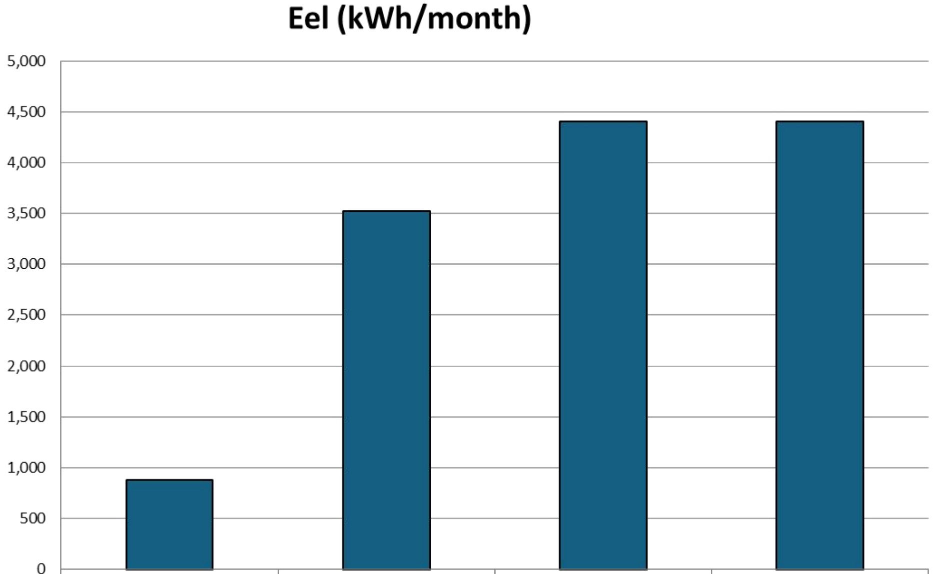
Pacomit
Monthly energy and water demand



	May	June	July	August
Grain	788	3,152	3,940	3,940
Vegetable	49	196	245	245
Grape	543	2,170	2,713	2,713
Olive	12	47	58	58
Orchard	31	123	154	154
Lucerne	719	2,875	3,593	3,593



	May	June	July	August
Eel (kWh/month)	880	3,520	4,400	4,400

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The capacity of the pump and the solar panel in Pacomit

Month	Energy (kWh/onth)	Pump capacity(KWP)	PV -kwp	PV -production
May	880	110	20	3,000
June	3,520	110	20	3,900
July	4,400	110	20	4,200
August	4,400	110	20	3,800

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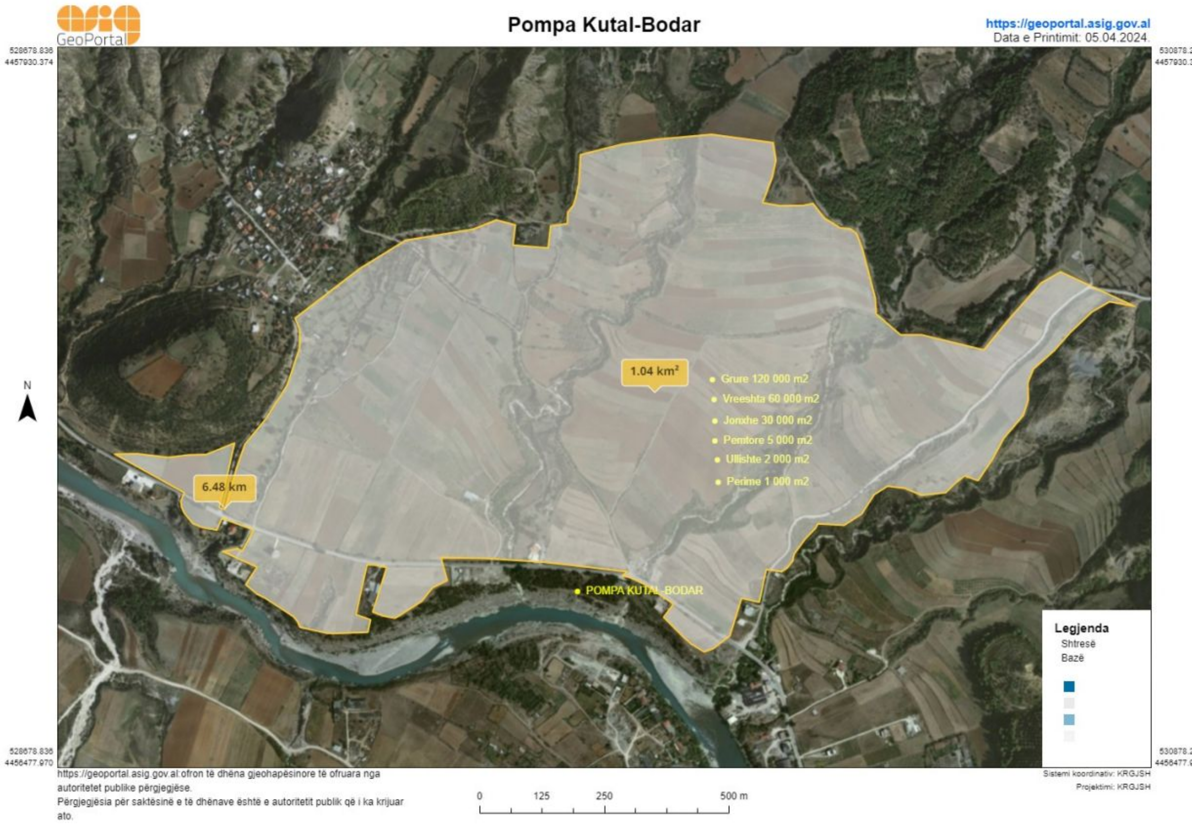
Kutal Bodar water pump 1.04 Km^2

- Wheat12 Ha
- Vegetables 0.1 Ha
- Vineyards 6 Ha
- Olive grove 0.2 Ha
- Orchard 0.5 Ha
- Forage crop 3 Ha



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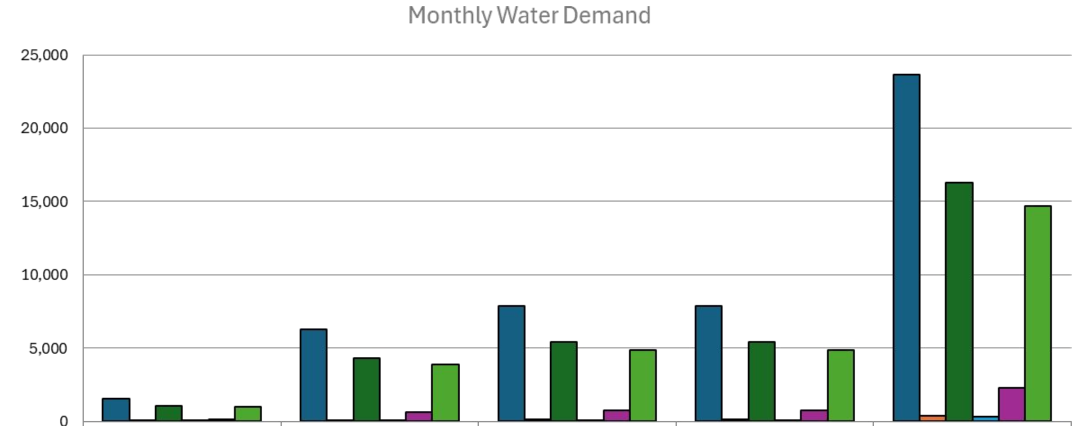
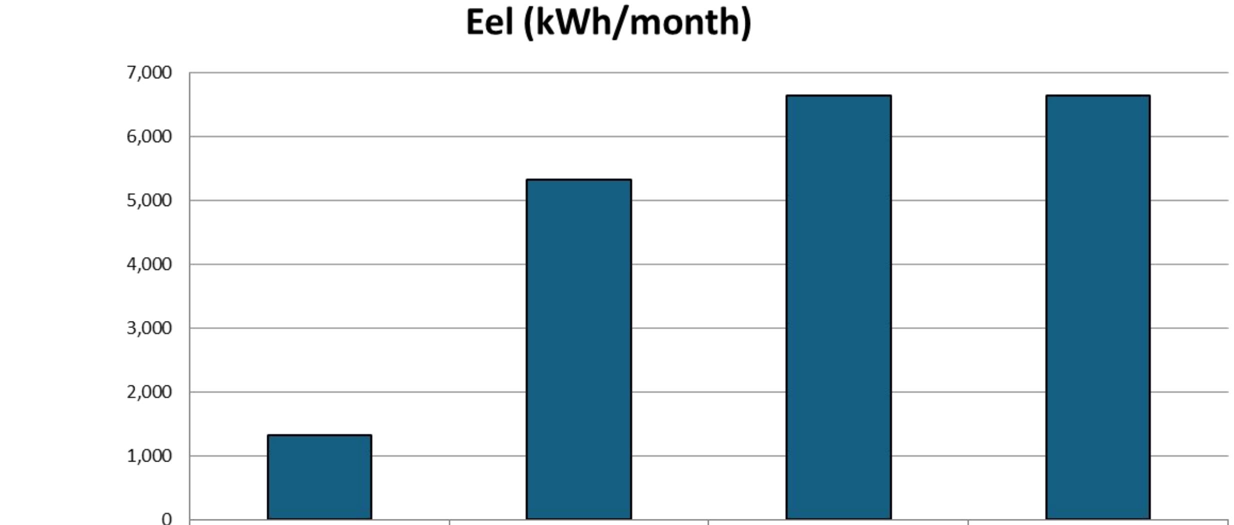
Kutal-Bodar
Monthly energy and water demand



	May	June	July	August	Total (m3)
Series1	1,576	6,304	7,880	7,880	23,640
Series2	24	98	122	122	367
Series3	1,085	4,341	5,426	5,426	16,278
Series4	23	93	117	117	350
Series5	154	616	770	770	2,309
Series6	980	3,920	4,900	4,900	14,700



	May	June	July	August
Eel (kWh/month)	1,328	5,312	6,640	6,640

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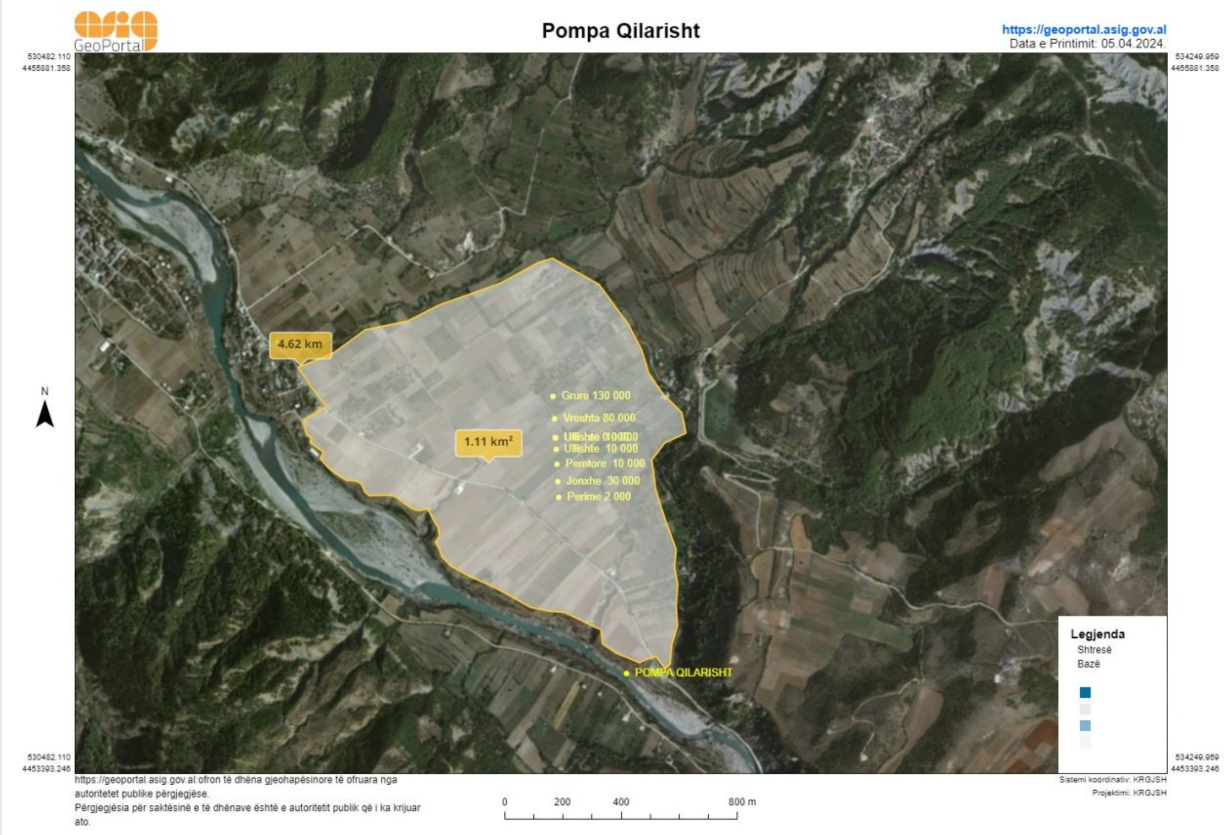
The capacity of the pump and the solar panel in Kutal - Bodar

Muaj	Energy (kWh/month)	Pump capacity(KWP)	PV -kwp	PV -production
May	1,328	166	30	4,500
June	5,312	166	30	5,850
July	6,640	166	30	6,300
August	6,640	166	30	5,700



Qilarisht water pump 1.11 Km^2

- Wheat 13 Ha
- Vegetables 0.2 Ha
- Vineyards 8 Ha
- Olive grove 1 Ha
- Orchard 1 Ha
- Forage crop 3 Ha

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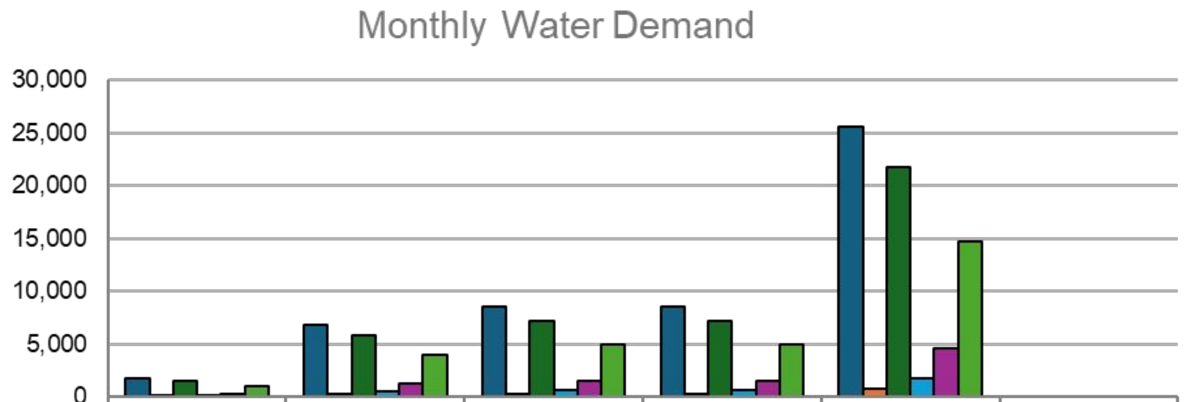
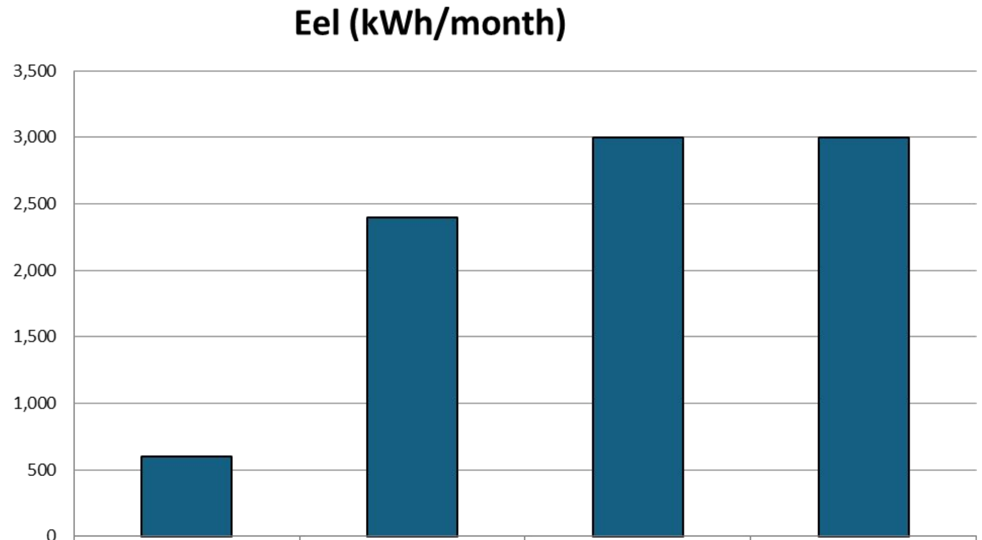
Qilarisht-Petran
Monthly energy and water demand



	May	June	July	August	Total (m3)
Grain	1,707	6,829	8,537	8,537	25,610
Vegetable	49	196	245	245	735
Grape	1,447	5,788	7,235	7,235	21,704
Olive	117	467	584	584	1,752
Orchard	308	1,231	1,539	1,539	4,617
Lucerne	980	3,920	4,900	4,900	14,700



	May	June	July	August
Eel (kWh/month)	600	2,400	3,000	3,000

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The capacity of the pump and the solar panel in Qilarisht

Month	H (hourmonth)	Q – Water demand (m3/muaj)	Energy (kWh/muaj)	Pump capacity (KWP)	Radiation (kwh/m2/muaj)	PV -kwp	PV -production
Maj	8	4,608	600	75	150	14	2,100
Qershor	32	18,431	2,400	75	195	14	2,730
Korrik	40	23,039	3,000	75	210	14	2,940
Gusht	40	23,039	3,000	75	190	14	2,660

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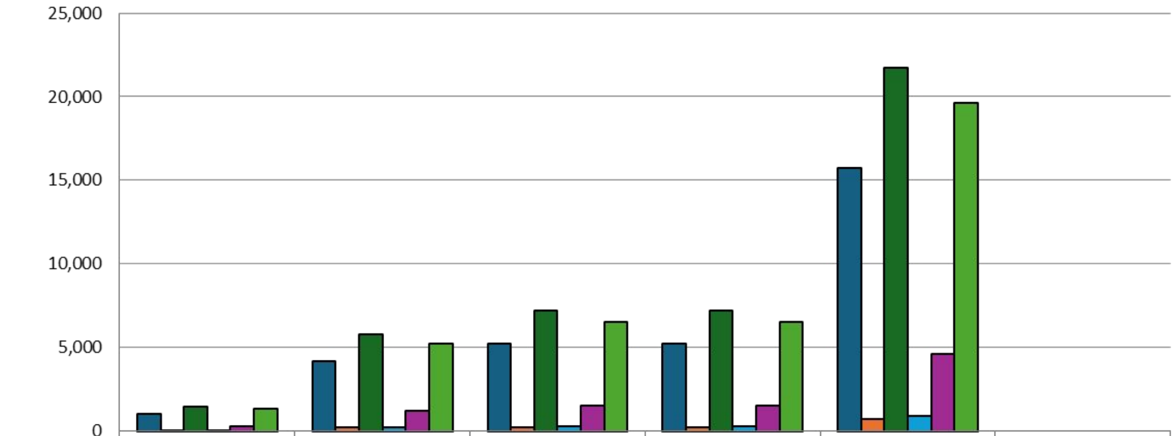
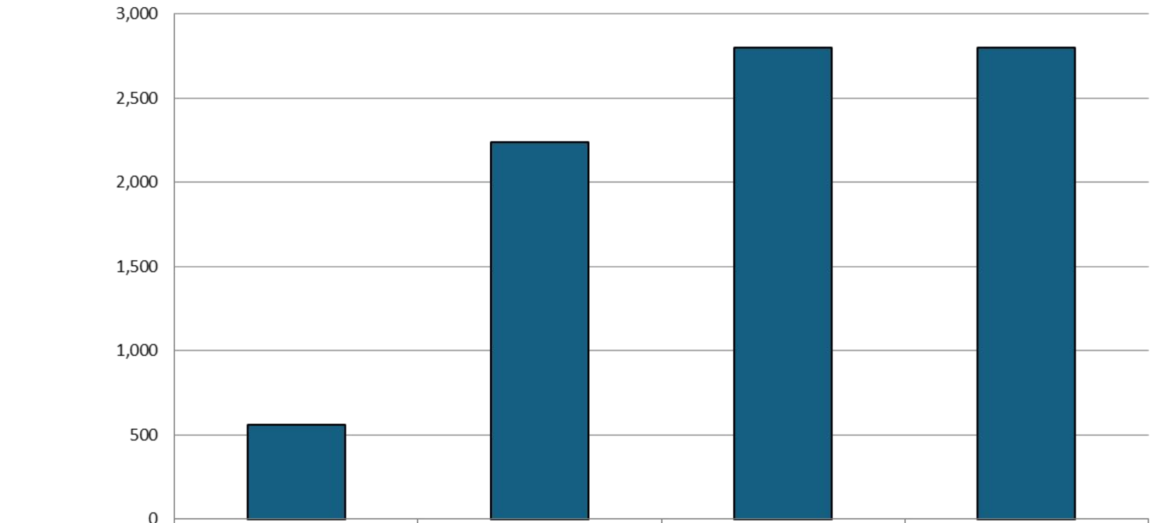
Kaluth
Water pump 3.64 Km^2

- Wheat 8 Ha
- Vegetables 0.2 Ha
- Vineyards 8 Ha
- Olive grove 0.5 Ha
- Orchard 1 Ha
- Forage crop 4 Ha

Klauth
Monthly energy and water demand



	May	June	July	August	Total (m3)
Grain	1,051	4,203	5,253	5,253	15,760
Vegetable	49	196	245	245	735
Grape	1,447	5,788	7,235	7,235	21,704
Olive	58	234	292	292	876
Orchard	308	1,231	1,539	1,539	4,617
Lucerne	1,307	5,227	6,533	6,533	19,600



	May	June	July	August
Eel (kWh/month)	560	2,240	2,800	2,800

Comparative
Research
Network:

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The capacity of the pump and the solar panel in Klauth

Month	Energy (kWh/muaj)	Pump capacity (KWP)	PV -kwp	PV -production
May	560	70	12	1,800
June	2,240	70	12	2,340
July	2,800	70	12	2,520
August	2,800	70	12	2,280

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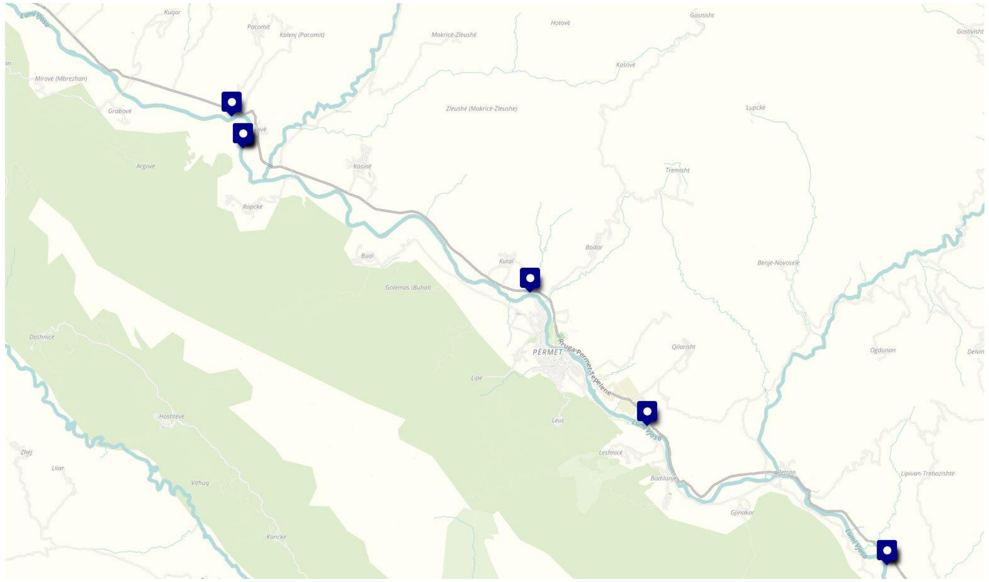
Investment plan for the 5 pumping stations

Pumping Station	PV -Installation [kWp]	Investment [Euro]	Reduction of CO_2 emissions [tons/year]
Piskova	14 **kWp**	15,750	12.89
Pacomit	20 **kWp**	21,450	18.42
Kutal-Bodar	30 **kWp**	30,950	29.81
Qilarisht - petran	14 **kWp**	15,750	12.89
Kaludh	12 **kWp**	13,850	11.05
Total	**90 kWp**	**97,750**	**85.06**



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Conclusions and Recommendations

- By using renewable energy sources (RES), the municipality will reduce electricity costs by an average of 4,500 EUR per year and will produce an energy surplus worth 110 MWh.

- The study estimated that a total capacity of 90 kWp of solar panels is required to produce 138,168 kWh per year. This means that each of the five villages should have a solar panel installation with a capacity ranging from 14 to 30 kWp, which would correspond to avoiding CO_2 emissions of about 86 tCO_2 eq per year.

Results

- The installation of PV infrastructure for irrigation will reduce energy consumption for production and will indirectly increase investments for the other needs of the community.
- Reduces CO_2 emissions
- Engagement/collaboration of decision-makers and farmers as producers and consumers of energy
- Economic, social, and environmental benefits for the community
- Increase in the engagement of female and male farmers, as well as their family members, in economic and social well-being.

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Thanks for your attention!

Q&As?

POWERING CITIZENS

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ZonOpSchool: Empowering Communities through Renewable Energy

A Case Study of Solar Energy Integration in Education and Community Development

Presented by:
ECREC

Co-funded by the European Union

Co-funded by the European Union

Introduction

What is ZonOpSchool?

- A Netherlands-based initiative combining solar energy production, education, and community participation.
- Aims to reduce energy costs, carbon emissions, and foster sustainability awareness.

Key Objectives

Goals of ZonOpSchool:

- Utilize school rooftops for solar energy production.
- Engage communities through shared ownership models.
- Educate students on sustainability.

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Solar Panel Technology

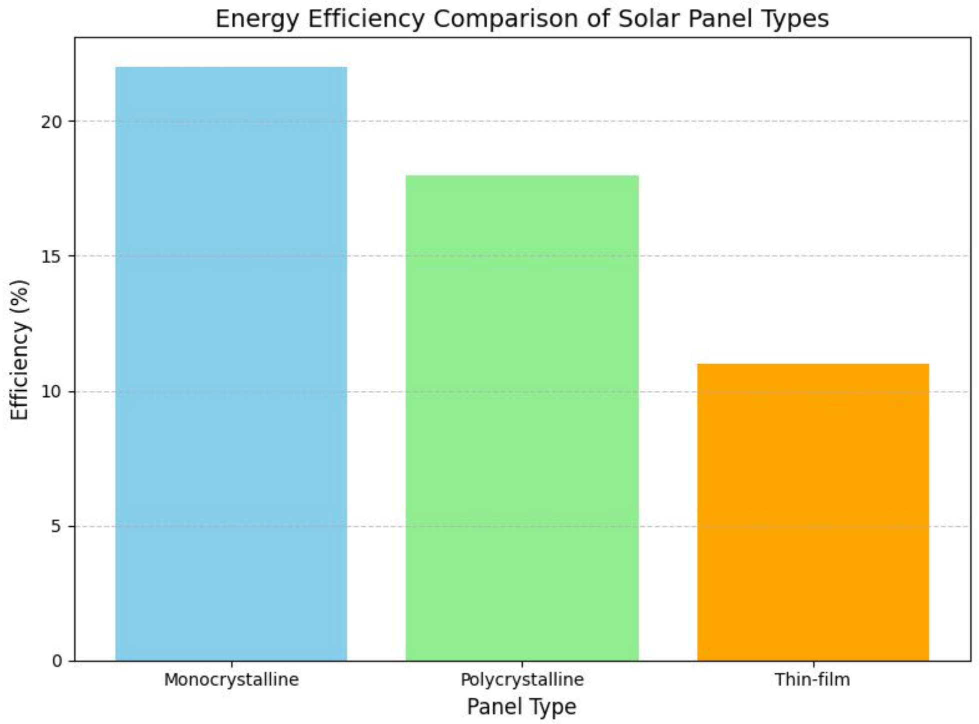
Technical Specifications:

• Monocrystalline silicon panels with 22% efficiency.

• Capacity per school:

50-250 kWp.

• Real-time IoT monitoring systems.



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Energy Output

- **Annual Energy Production:**
- Typical installation of 100 kWp generates ~85,000 kWh/year.
- Distribution: 70% consumed by schools, 30% fed into the grid.

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Installation Process

Step-by-Step Implementation:

1. Feasibility studies and structural assessments.

2. System design and rooftop optimization.

3. Installation and grid integration.

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Community Engagement Overview

The Core of ZonOpSchool:

- Shared ownership empowers residents to invest in renewable energy.
- Transparent financial and operational reporting builds trust.

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Community Investment Model

How It Works:

- Residents buy shares ranging from €50-€500.
- Annual dividends: 4-6% return on investment.
- Funds are reinvested into community projects

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Community & Social Benefits

Direct and Indirect Advantages:

- Lower energy costs for schools (€5,000-€15,000 annually).
- Dividends reinvested in local infrastructure like libraries and playgrounds.
- Greater social equity through prioritization of low-income areas.

Social Impact:

- Energy savings funded new educational programs, including coding workshops and environmental science projects.
- Low-income families near the schools benefited from reduced energy costs.

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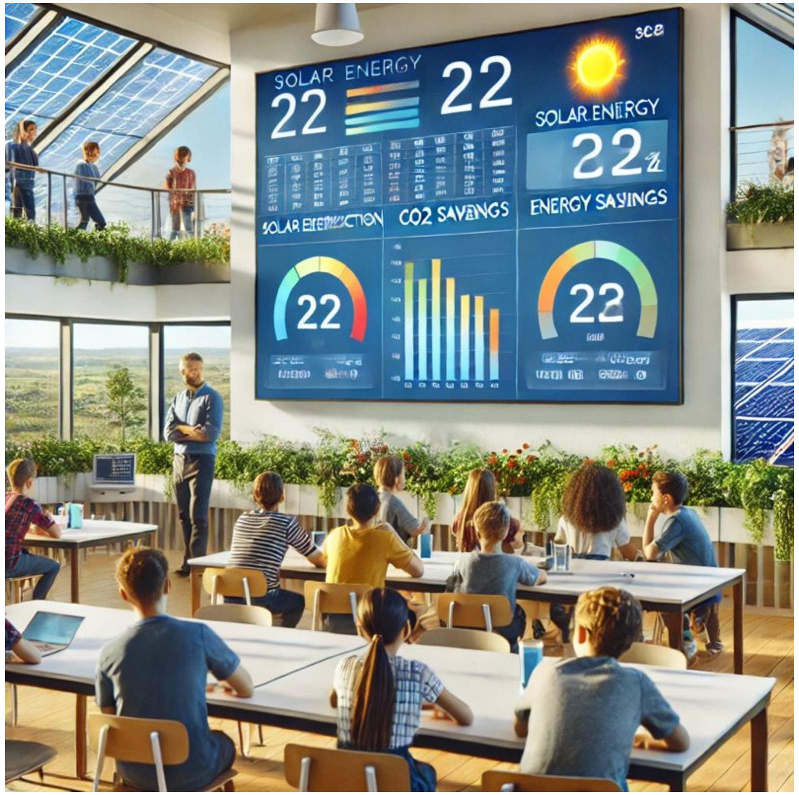
Educational Integration

Empowering the Next Generation:

- Interactive learning tools displaying real-time energy data.
- Curriculum integration: Renewable energy workshops and science projects.
- **Case Study:** Haarlem schools saw increased student engagement in sustainability programs.



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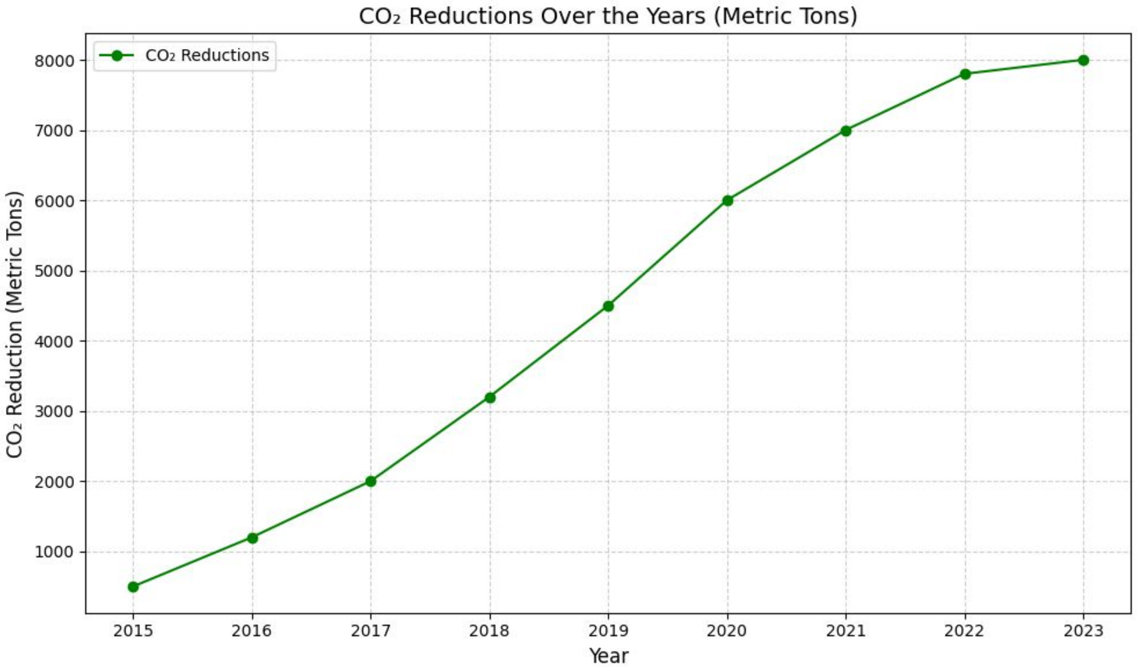
Environmental Impact

Carbon Emission Reduction:

• Each 100 kWp system offsets 40 metric tons of CO_2 annually.

• Total impact across all installations: ~8,000 metric tons/year.



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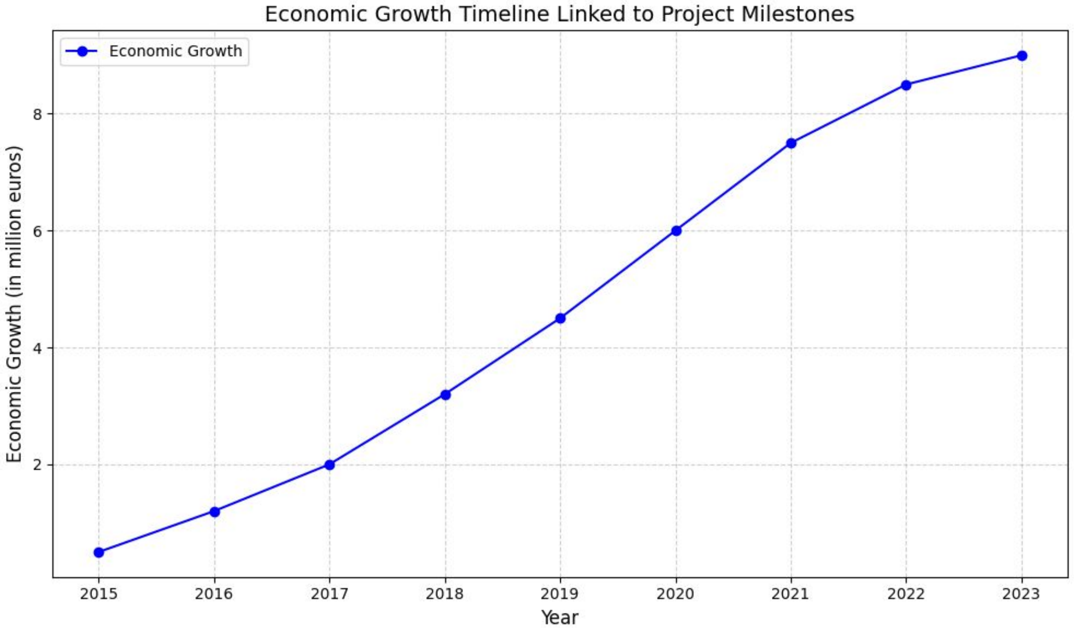
Economic Impact

Driving Local Economies:

• Revenue from energy sales reinvested in the community.

• Over 300 jobs created in installation, maintenance, and management.



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Challenges - Community Engagement

Obstacles Faced:

• Initial skepticism about financial risks.

• Concerns about aesthetic impact on school building

Solutions:

• Transparent communication and regular updates.

• Highlighting financial and environmental benefits.

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Challenges – Technical Issues

Barriers in Implementation:

- Structural limitations of older school buildings.
- Variability in energy storage options for non-school hours.

Solutions:

- Lightweight panels and advanced mounting systems.
- Exploring battery storage for surplus energy.

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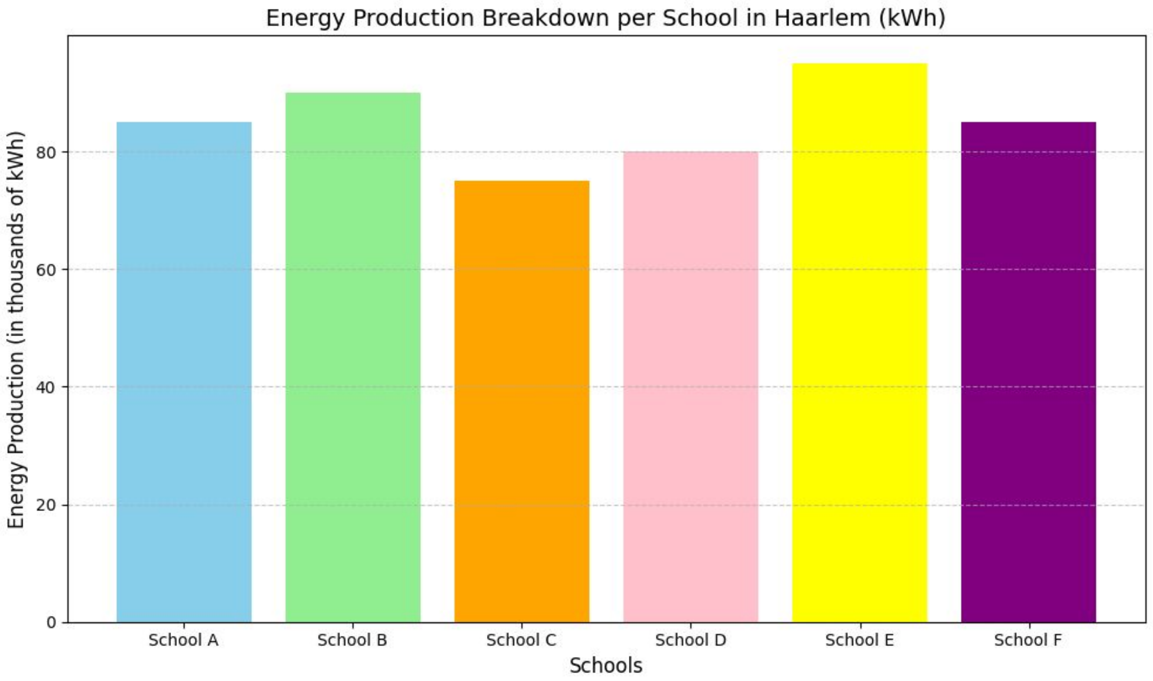
Case Study: Haarlem

Key Achievements:

- 6 schools outfitted with solar panels.
- 510,000 kWh/year produced, powering 170 households.
- Over 500 community investors.



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Policy Support

Key to Success:

• Government subsidies covering 30% of costs.

• Stable feed-in tariffs encourage community participation.

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Global Scalability

Potential for Expansion:

- Cooperative model adaptable to other regions.

- Knowledge sharing through international partnerships.

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Future Goals

By 2030:

- Expand to 1,000 schools nationwide.
- Add 200 MW of solar capacity.

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Innovations

Exploring New Technologies:

• Bifacial panels to maximize sunlight capture.

• Battery storage for surplus energy utilization.

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Community Impact Highlights

Key Metrics:

- 85% of surveyed residents report increased trust in local renewable initiatives.

- Students’ awareness of sustainability increased by 75%.

Lessons Learned

What Worked:

- Early community engagement.
- Clear and transparent communication.

What Needs Improvement:

- Faster adaptation to technical challenges.
- Scaling financial participation tools.

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Conclusion

Takeaways:

• ZonOpSchool integrates technology, education, and community collaboration effectively.

• A scalable, impactful model for global renewable energy efforts.

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Thank You

PROJECT CODE: **01147083-POWERINGCITIZENS-CERV-2023-CITIZENS-CIV**

DURATION: **01/06/2024 to 30/05/2026**

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Powering citizens

Renewable Energy Communities (RECs) in Kosovo: Potential Applications

Balkan Green Foundation

Liri Kuçi - Researcher

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Definitions and Diagnoses about RECs

Legal entities where citizens, SMEs, and local authorities collaborate to produce, consume, and manage renewable energy.

1. **Economic Advantages-** Localized energy reduces costs, generates employment, and fosters economic resilience.
2. **Environmental Gains-** Reducing carbon emissions, promote renewable adoption, and align with climate goals.
3. **Social Empowerment-** Decentralize energy control, increasing community engagement and energy autonomy.
4. **Energy Efficiency-** Local generation minimizes transmission losses, enhancing system efficiency.
5. **Resilience-** RECs can bolster energy security, particularly during crises or grid disruptions.

RECs= transformative model for achieving the European Union's (EU) ambitious climate and energy targets, including carbon neutrality by 2050.

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Key Legislation:

-Law on Energy ***Nr. 05/L -081***
-Law on Electricity
-Law on Natural Gas
-Law on Thermal Energy
-Law on Energy Efficiency (incorporates Directive 2012/27/EU) ***Nr. 06/L-079***
-Law on Energy Performance of Buildings
-Law on Pressure Equipment (with exclusions for certain energy-related equipment)

***Despite these laws, Kosovo's energy consumption remains inefficient, with a high reliance on non-renewable sources.**

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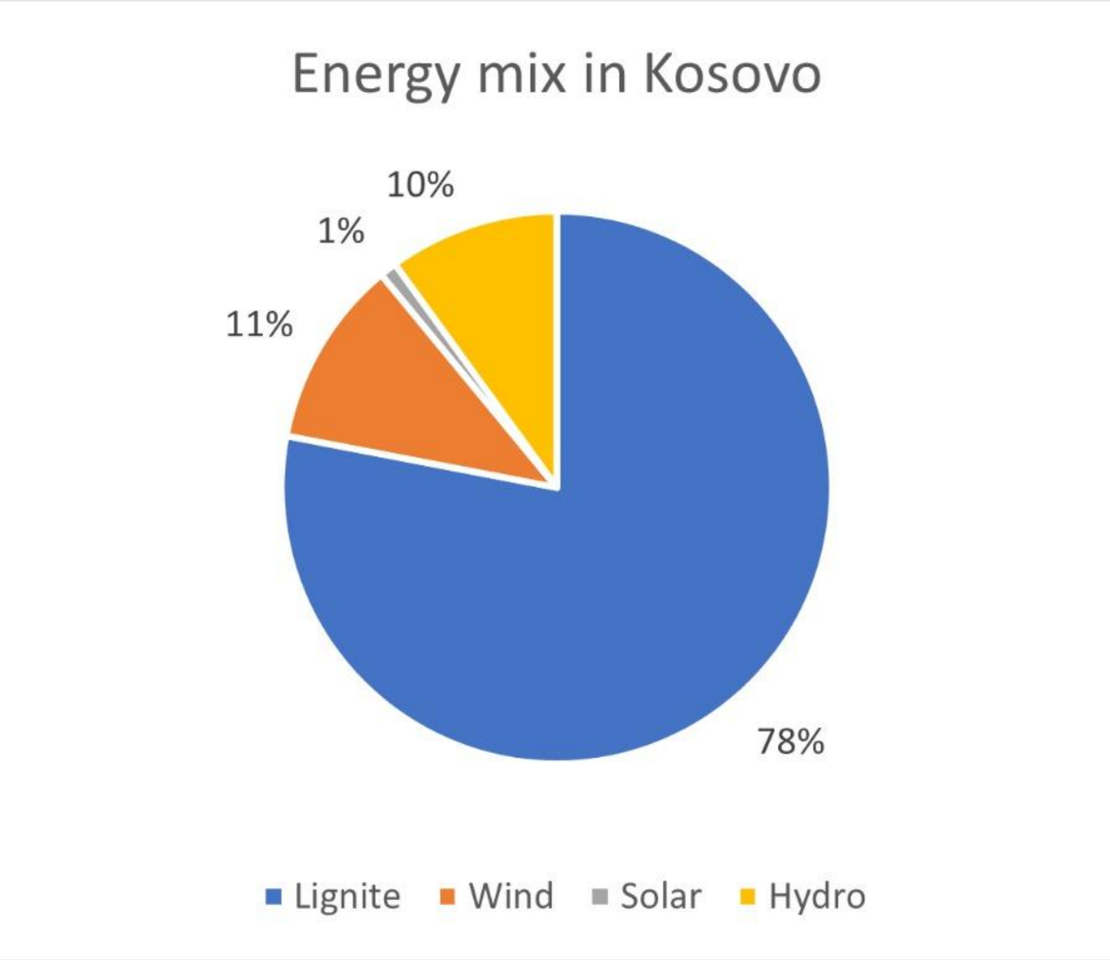
The Energy Landscape in Kosovo

Current Energy Mix: Predominantly reliant on lignite coal, with over 78% of electricity generated from coal-fired plants.

Contextual Importance

The Western Balkans remain heavily reliant on coal for electricity generation, contributing to environmental degradation and carbon emissions.

Transitioning to renewable energy sources through RECs can drive both energy independence and environmental sustainability.



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Legal and Policy Framework for RECs in Kosovo

Existing Legislation: The Law on Renewable Energy Sources (RES) adopted in 2024, aligning with EU directives.

EU Alignment: Efforts to harmonize with the Renewable Energy Directive II (RED II) to facilitate RECs development.

Gaps Identified: Need for secondary legislation to fully operationalize RECs and provide clear guidelines.

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Challenges Facing the lack of RECs in Kosovo

There is a Lack of Clear Legal Framework

Financial Barriers- High initial capital investment requirements.

Public Awareness - Limited understanding and engagement in renewable initiatives.

Political Challenges - Potential resistance due to vested interests in traditional energy sectors.

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Structural Barriers to RECs Development in Kosovo

Aging grid infrastructure hindering integration of decentralized energy sources (*Infrastructure Limitations*)

Complex procedures for obtaining necessary permits and approvals *(Administrative Hurdles)*

Limited access to funding and lack of financial incentives for community-led projects *(Financial Constraints*)

Shortage of local expertise in renewable energy technologies *(Technical Expertise)*

<u>-No dedicated subsidies or tax reliefs for RECs.</u>
<u>-Limited pilot projects or programs to promote RECs.</u>

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Renewable Energy Potential:

Solar: High solar irradiation, especially in the southwestern regions.
Wind: Significant potential in areas like Bajgora and Kitka.
Hydropower: Existing plants like Ujmani with room for expansion.

Role of RECs in the current picture:
Potential to diversify the energy mix and promote sustainable development.

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What is about to come up?- Powering Up with Big Batteries ^ Turning Ash Fields into Solar Power

*(These auctions are part of Kosovo's **National Energy Strategy (2022-2031)** to encourage investments in renewable energy projects like wind and solar):* Kosovo is planning to install **giant energy storage batteries** -(think of them as massive power banks for the country's electricity). These batteries will:

-They'll save energy when there's too much and release it when it's needed most, like during cold winter nights or summer heatwaves (**Store extra power)**.

- Wind and solar energy aren't always available -These batteries will make it easier to use renewable energy whenever it's needed (**Help Renewables Work Better)**

*** It will generate enough electricity to power (tens of) thousands of homes ***

Environmental Impact: It will cut down about 152,000 tonnes of carbon emissions every year -the equivalent of taking tens of thousands of cars off the road.

Funding ^ Timeline: The project is backed by the **European Union**, with a total investment of about €104.7 million. Expected to be finished by **2027**.

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Turning Ash Fields into Solar Power

Kosovo is also building a massive **solar power plant** - a field of solar panels that will soak up sunlight and turn it into electricity. It's being built on an old industrial ash dump, turning a polluted area into something positive for the environment. This is planned to be implemented on reclaimed ash dump fields near the **Kosovo A thermal power plant**, located in the **Obiliq** municipality, close to the capital city, Pristina.

Why This Location?

The site was previously used to dump ash waste from coal-based energy production. By turning this polluted and underutilized land into a solar energy facility, the project gives the area a new lease on life **(Environmental Restoration)**

Close Proximity to Existing Infrastructure: Being near **Kosovo A** ensures that the solar energy generated can be quite well integrated into the country's power grid.

Symbolic Transition: It represents Kosovo's shift from a coal-heavy past to a cleaner, renewable energy future.

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What is the RECs potentiality out of these initiatives:

S**olar4Kosovo** has the potential to provide a consistent renewable energy supply that RECs can tap into for localized generation. Academic studies (e.g., Seyfang et al., 2013) highlight how decentralized solar power enhances community resilience by reducing reliance on centralized grids.

The **BESS project**, with its significant storage capacity, can support RECs by providing grid stability and ensuring the availability of renewable energy even during periods of intermittency, a critical factor for localized systems to thrive.

-Linking large-scale solar and storage projects with RECs could address affordability concerns and reduce energy poverty, a persistent issue in Kosovo. Evidence from similar EU initiatives (e.g., Germany's Bürgerenergie model) demonstrates that community-owned renewable projects lead to broader economic benefits by keeping energy revenues within local communities.

-The large capacity of the BESS can act as a **virtual power plant**, allowing RECs to balance supply and demand effectively - importance of storage technologies in enhancing the operational flexibility of distributed energy systems.

Alignment with EU Energy Directives:

As Kosovo aspires to integrate further with EU energy markets, aligning with policies promoting RECs will strengthen its compliance with European Green Deal goals and Renewable Energy Directive mandates. The role of RECs in meeting renewable targets has been explicitly highlighted in policy frameworks (IEA, 2022).

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Recommendations for the Establishment RECs in Kosovo

Develop Clear Legal Framework: Establish specific laws supporting RECs formation and operation.

Financial Incentives: Provide subsidies, tax reliefs, and access to low-interest loans.

Collaboration (local, regional, governmental, international, and between NGO's)

Good Practices Database and application

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