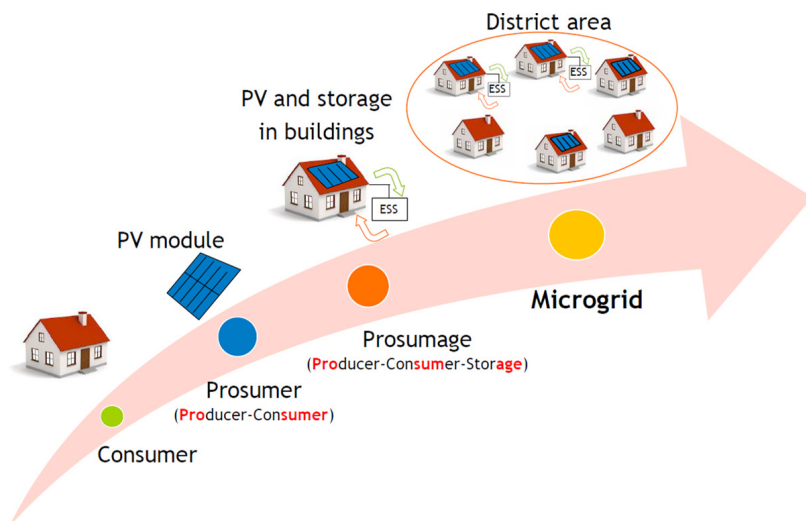


## Simulation of Functioning Microgrids in 7 pilots across EU

In the **PEGASUS** project (Promoting Effective Generation And Sustainable UseS of electricity), 10 partners from MED countries are working together to study into more details microgrids, focusing on rural and island areas. The objective is to implement a set of tools and measures that aim at facilitating the development of microgrids. The inovative approach of the project is focused on experimenting a simulation of functioning of microgrids in 7 pilot areas jointly. Solutions will be based on concrete situation with real data.

The **PEGASUS** project aims to give evidence of the feasibility of microgrids acting on technical or administrative obstacles which are hindering the use of microgrids in disadvantaged areas.



# Microgrid tests in Saint-Julien-en-Quint, Auvergne-Rhône-Alpes

**The Regional Energy and Environment Agency of Auvergne-Rhône-Alpes is studying a microgrid in a small rural village in the frame of the PEGASUS Interreg-MED project.**

In the village of Saint-Quentin-en-Quint, power outages can occur after strong winds and threaten the electricity supply for farmers' cold stores or woodchip boilers. As a result, local representatives and inhabitants are searching for innovative solutions that can help the village to become independent regarding its energy supply, thanks to local energy sources.



The perimeter is delimited by the 45 consumers connected to the main local powersubstation. They have already equipped 32

houses in the village with measurement devices. The remaining buildings are mainly unoccupied and it was not relevant to make measurements inside.

There are two different types of measurements, depending on the preference of the owner and what is technically feasible. The measurement apparatus is either located on the electric internal board of the house or located on the meter. This second type allows for more detailed load curves. Where it was possible, controllable loads, such as electric water tanks, were registered. They also have an online visualisation platform where they can monitor power and voltage every 10 minutes. They are trying to get measurements on the local substation as well. At the moment they are in the process of starting the modelisation of the grid.

**For more information, contact [Auvergne Rhône-Alpes Energy Agency](#)**

## Slovenia Pilot: Sport park Ruše

**In the Sport Park Ruše in Slovenia, the pilot site is based in a sports resort and includes two existing PV plants of 50 kWp each. A group of four buildings was selected that would represent the loads of a micro-grid with about 500 MWh/year total electricity consumption.**

A system was established for continuous monitoring of the generated electricity by PV plants and the consumed electricity supplied by PV plants and public grid. The measures are taken every 15 minutes. With the measurements, ENERGAP will develop the consumer and production profiles and model the needs for potential electricity storage. On the basis of these measurements, technical and financial models will be prepared which will help to simulate the operation of microgrids under different conditions.



The pilot aims to demonstrate the economic and environmental advantages for users and producers through an energy-efficient microgrid which would help to make the best use of existing resources, eventually using storage systems, and would provide cheaper electricity to end-users while ensuring at the same time a good remuneration to the PV generators. The pilot can be a showcase for other public facilities.

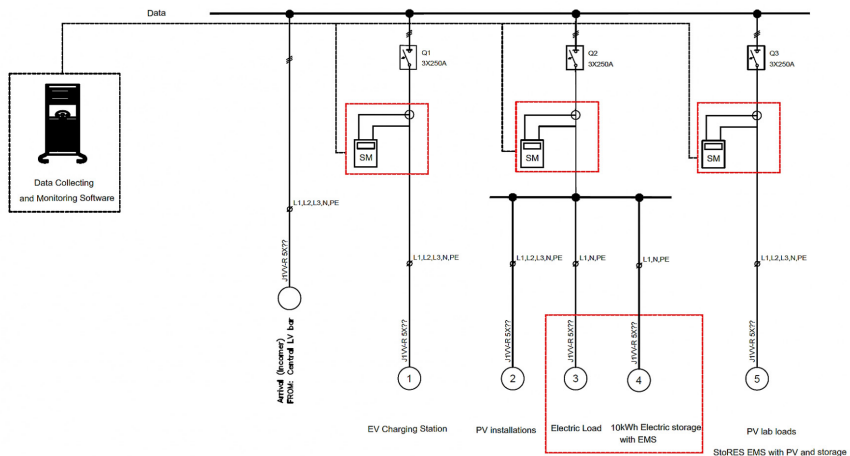
**For more information, contact the  
[Energy Agency of the Podravje Region \(ENERGAP\)](#)**

# The Cyprus Nanogrid Pilot: The UCY nanogrid solution

## The University of Cyprus (UCY) will test the functioning of a nanogrid.

Nanogrids are small microgrids, typically serving a single building or even a single load. We can define a nanogrid as a small electrical domain which is connected to the grid, is no greater than 100 kW and is limited to a single building structure. This electrical domain represents devices, such as DG (Distributed Generation), storage, EVs (electric vehicles), and smart loads. It is capable of islanding and/or energy self-sufficiency through some level of intelligent DER (distributed energy resources) management or controls.

The main goal of UCY's nanogrid test is to model commercial and residential loads. Its smart meters will be able to measure consumption and generation parameters (such as active power, reactive power, voltage, current etc.) with high precision and accuracy. Through the nanogrid operation, FOSS research center aspires to provide a living-lab environment for the development, validation and qualification of innovative Smart Grid technologies and architectures.



*Single-line drawing of Cyprus nanogrid test-site*

The UCY's nanogrid solution has been designed by taking into consideration the special technical requirements and the purchase of equipment that is necessary for the implementation of the project's goals.

To facilitate minimum level of measuring and analysis capability, the following equipment will be installed through PEGASUS or other running projects within the university:

- Three 3-phase smart meters with associated Current Transformers, wiring and auxiliary equipment. The smart meters are able to measure, calculate and display the main electrical parameters for the 3-phase systems (balanced or unbalanced).
- An electrical load to facilitate alternative load capabilities and extend the investigation possibilities of the nanogrid set up. The electrical load has already been acquired. It is designed for testing Uninterruptible Power Supplies (UPS), Off-Grid Inverters, AC sources and other power devices such as switches, circuit breakers, fuses and connectors. The programmable load can simulate load conditions under high crest factor and varying power factors with real time compensation even when the voltage waveform is distorted. This special feature provides real world simulation capability and prevents over-stressing, which allows for reliable and unbiased test results.
- A 10 kWhr storage system with an associated energy management system that will be coordinated with the local PV systems of an approximate capacity of 35 kWp.
- An EV charging/discharging station that will be installed within the university campus along with a battery storage at the installation point of the EV station and that will perform the discharging operation of the EV station.
- Central software management system with data collection infrastructure, analysis platform and reporting capabilities. This management system will sit at a higher level in the university microgrid and will be able to offer services to the nanogrid.

**For more information, contact the**  
**[Research Centre for Sustainable Energy \(FOSS\) of the University of Cyprus](#)**

## Potenza Pilot: Combined Heat and Power system in 2 sites

**The Potenza pilot involves the Santa Lucia escalator, the most powerful and long escalator in the city and the swimming pool of Montereale Sport Park.**

The Potenza pilot site aims to demonstrate the achievable advantages (primary energy, peak shaving, reduction of energy bills) by the Municipality in two different sites. The first site is a swimming pool, where a 165 kW Combined Heat and Power system (CHP) is able to provide about 95 % of the required thermal energy and 85 % of the electricity. The



second pilot site is to feed, through the existing distribution network, about 70 % of the electricity consumed by an electric escalator, having an installed power of 192 kW and being used to transport people from the outskirts to the city centre.

The existing boilers in Montereale swimming pool will be partially substituted by a CHP driven by the heat demand of the swimming pool. The related generated electricity is used to meet the electric demand of Montereale swimming pool; the surplus is fed into the local distribution network in order to be used by the Santa Lucia escalator, by virtue of the regulatory solution called 'Scambio Altrove'.



The assessment of the monitoring carried out on the acquired data in the period from November 2017 until May 2018 identifies in a CHP system, 120 kW in thermal power and 65 kW in electric power, the most profitable solution. In addition to the intrinsic energy benefits of the CHP system, it has been evaluated that there will be 25 MWh/year of reduced losses on the electrical network related to the pilot.

**For more information, contact the [Municipality of Potenza](#)**



## Malta Pilot: Gozo island solution

**The aim of the Gozo pilot is to demonstrate the advantages of implementing community-based micro-grids for small localities on the island.**



The Malta pilot site is located on the island of Gozo and consists of 15 public and private buildings, with both consumers and prosumers profiles. The pilot sites have been selected to allow for the elaboration of consumer and prosumer profiles representative of a small community which is connected to the same sub-station in order to be able to define a micro-grid operating model for the locality.

The pilot is characterised by the following buildings: The Ministry for Gozo (1 large PV system 108 kWp – 166 MWh annual electricity generated), the San Lawrenz Local Council (Prosumer with 1 PV system of 34.5 kWp – 50 MWh annual electricity generated), 1 small office/commercial building and 12 residential households (7 consumers, 5 prosumers for a total of 22 MWh annual electricity generated). MIEMA consulted different business models considering both technical and financial aspects.

Analysis and prediction of energy requirements would allow the micro-grid to be disconnected from the main grid (islanding) in case of main grid failure. Energy monitoring started in November 2017, with measurements being taken every minute.



The Malta pilot focuses on simulation of a micro-grid operation, including energy storage systems and assessing the financial feasibility with respect to different electricity consumption tariffs and feed-in tariffs for generation for renewables. The micro-grid model also aims to reduce the costs of energy for the micro-grid community members, to provide a more reliable energy supply by using renewable sources (possibly in conjunction with energy storage) and to reduce losses in upstream distribution network.

**For more information, contact the  
[Malta Intelligent Energy Management Agency \(MIEMA\)](#)**

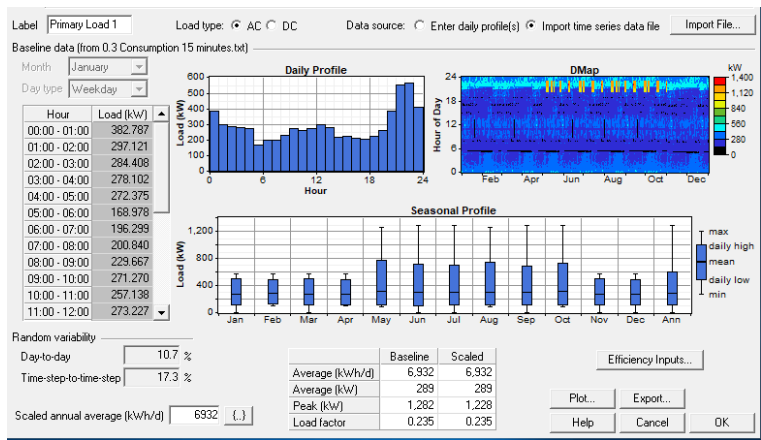
# Greece Pilot: Mega Evydrio solution

The main objective of the Greek pilot is to simulate a micro-grid operation, including storage systems and flexible electricity tariffs. The Greek pilot is going to be connected to the public grid, but it will also be able to operate in 'island' conditions.



The Greek pilot site is located in the Municipality of Farsala in the area of Mega Evydrio (Thessaly Region), and consists of public, commercial and private buildings and facilities. The number and type of consumers in the area (community) of Mega Evydrio is: 295 houses, 16 shops, 4 public buildings, 471 public street lights, 2 public pumping stations for potable water circulation and 147 private pumping stations for irrigation.

The number and type of prosumers is: 5 houses with PV systems on their roofs with a total installed capacity of 45 kWp, 75 houses with new (to be installed) PV systems on their roofs with a total installed capacity of 168.75 kWp, and 1 public building with a total installed PV capacity of 9 kWp. In the area, there are also 5 electricity producers (PV parks) with total installed capacity of 500 kWp (5\*100).



Configuration of electricity consumption in the Greek pilot with the HOMER software



The model that is being studied is of an "Energy Community" (local consumers & prosumers consortium), with one point of common coupling (PCC) with the distribution network. The expected advantages of the micro-grid are a 30 % reduction on the CO<sub>2</sub> emissions (1,103 t CO<sub>2</sub>) and an increase of the renewable energy production in the energy mix (increase of the installed PVs from 545.00 kWp to 722.75 kWp).

The main objective of the Greek pilot is to simulate a micro-grid operation, including storage systems and flexible electricity tariffs. The Greek pilot is going to be connected to the public grid, but it will also be able to operate in 'island' condition. The energy consumption monitoring started in March 2018, with measurements being taken every minute.

**For more information contact the**  
**[Centre for Renewable Energy Sources \(CRES\)](#)**

## Preko Pilot: Olive oil mill building and PV

The Preko pilot consists of a microgrid using photovoltaic panels as renewable energy source (RES), installed on an olive oil mill acting as prosumer and the 'Pučko otvoreno učilište' building acting as consumer.



The Municipality of Preko is a small island community situated on Preko Island. In 2015, the municipality adopted the Strategy of Sustainable Development where one of the goals is long-term energy efficiency and the promotion of renewable energy.

The Preko pilot project has three major goals:

- to prove the feasibility as well as the economic and environmental benefits of a microgrid solution using photovoltaics as RES;
- to develop a sustainable and applicable business model that can be transferred to other Croatian municipalities and EU regions;
- to overcome existing legal barriers.

The 10kW photovoltaic panel installation on the rooftop of the olive oil mill serves as a renewable energy source in the Preko microgrid project. Photovoltaic panels provide the majority of electricity needed for the neighbouring building of 'Pučko otvoreno učilište'. Currently both buildings are connected to the electrical grid and are owned by the Municipality of Preko.

The olive oil mill was built in the 1960s. Currently being used for the production of olive oil, it has an average monthly energy consumption of 300 kWh. It is important to mention the significant peak that occurs in the season of olive oil production, when the mill operates during 24 hours, which is only for a couple of days (as current olive oil production in Preko is only 20 % of total capacity).

The building 'Pučko otvoreno učilište' was built in 1960 with a total net area of 385,23 m<sup>2</sup>. It is currently occupied by four different users: three public and one private. Each of the users has its own consumption meter installed. One office is used by 'Pučko veleučilište'; the second is a Tourist board; the third user is a multimedia hall used for various local events; and the fourth is a privately-owned cafe and bar.

The building is connected to the local grid. As heating source during winter, air conditioning units are used, thus contributing to the overall electrical energy consumption. Average annual energy consumption is 12.145,00 kWh with annual cost of 1.671,33 EUR, corresponding to annual CO<sub>2</sub> emission from electric consumption of 2.8 t of CO<sub>2</sub> per year.

Currently, the Preko pilot is in the final testing phase. Metering devices were installed in November 2017 and metering started in late December 2017. Preko also added the microgrid as a part of its Sustainable Energy and Climate Action Plan (SECAP).

**For more information, contact the [Municipality of Preko](#)**



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## Promoting Effective Generation And Sustainable Uses of electricity

[www.pegasus.interreg-med.eu](http://www.pegasus.interreg-med.eu)



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