



## **COST-EFFECTIVE REHABILITATION OF PUBLIC BUILDINGS INTO SMART AND RESILIENT NANO-GRIDS USING STORAGE**

### **DEAR READERS,**

It is our pleasure to welcome you to the third edition of the BERLIN Newsletter!

"BERLIN Cost-effective rehabilitation of public buildings into smart and resilient nano-grids using storage" is an ambitious project funded by the European Union under the ENI CBC Med Programme that brings together seven organizations from four Mediterranean countries, Cyprus, Greece, Israel and Italy."

In the 3rd edition of our newsletter we are sharing the progress of our project, the pilot installation activities and the events where BERLIN was presented.

If you would like to keep up with all the latest developments of our project, follow us on Facebook and Twitter.

Kind Regards,  
The BERLIN Consortium

## **PROJECT DURATION**

02 September 2019

01 September 2022



## ABOUT BERLIN

BERLIN focuses on increasing photovoltaics (PV) grid penetration, combined with energy storage systems (ESS) and demand side management (DSM), along with enhancement of energy efficiency in buildings. BERLIN will implement six pilots in Cyprus, Greece, Italy and Israel. The pilots will optimally integrate PV/ESS/DSM in an innovative way and transform each pilot into a self-sufficient nanogrid, as an energy rehabilitation solution in a range of climatic zones. Such a solution can contribute to alleviating the regional and global problem of high-energy consumption in buildings - 1/3 of energy consumption in Mediterranean Partner Countries, 40% in EU- and of resulting CO<sub>2</sub> emissions increase. Equally important is the need to support weak grids that are particularly common in MENA region and rural areas, with low reliability and frequent outages.

To this end, BERLIN will provide knowledge on achieving high levels of building energy self-resilience using smart nanogrids and design the solution as a cost-effective renovation. In addition, MED countries, despite their excellent solar potential, face the problem of its low grid penetration. BERLIN through onsite PV/ESS/DSM, will contribute to achieving higher levels of PV entering the grid whilst ensuring grid stability and power quality. Through these interventions, MED countries will benefit greatly from project's learning curves.

## AIM OF THE PROJECT

BERLIN aims to implement cross-border pilot measures to support innovative and cost-effective energy rehabilitations in public buildings based on the nanogrid concept, the building block for smart microgrids.

The motivation is multi-fold:

- to **address** high energy consumption in building sector that is primarily fossil-fuel based,
- to **support** areas of weak grids, common in MENA region & rural areas, as high energy consumption in buildings can compromise electric service reliability,
- to **achieve** higher grid penetration of RES whilst ensuring grid stability and power quality.



€2.5 MILLION  
EU  
CONTRIBUTION

€2.8 MILLION  
TOTAL BUDGET



## PROJECT IN NUMBERS



**PARTNERS**



**COUNTRIES**



**TECHNICAL OUTPUTS**

### WHAT WILL BE IMPROVED

- **Reduction of energy consumption** and CO2 emissions at the level of pilot buildings.
- **Replication in other Mediterranean/EU regions** and enhanced interest and capacity of public authorities in building energy retrofits.
- **Encourage a widespread policy adoption** for high photovoltaic grid penetration and high levels of self-sufficiency in buildings.
- **Boost SMEs competitiveness, R&D growth, investments** in photovoltaic grid integration, interest from local building professionals to train in new innovations for high efficient buildings, and business and job opportunities in building retrofitting.

### WHO WILL BENEFIT

The main target groups and final beneficiaries are:

1. **Energy stakeholders** (e.g. policy-makers, investors, distribution system operators, regulatory authorities, energy consultants, photovoltaic installers).
2. **Local/regional/national authorities** & their employees and building users.
3. The **scientific community**.
4. **Project consortium**.
5. **General public**.

### EXPECTED ACHIEVEMENTS

- **6 case studies** on the photovoltaic, energy storage solutions and demand side management hybrid technology.
- **Country-specific recommendations** to stimulate the uptake of photovoltaic, energy storage solutions and demand-side management.
- **2 tools** developed for renovating public buildings using photovoltaic, demand-side management and energy storage systems.
- **6 pilot actions** in buildings in 4 countries.
- **3 cost-effective technologies** in public buildings optimally integrated.
- **5 public institutions supported** towards the adoption of cost-effective policies to increase the use and local consumption of photovoltaic energy.





## PROGRESS SO FAR

Even though the **COVID-19 pandemic** has caused certain delays on some project activities, the BERLIN partners continued to work collaboratively towards achieving the objectives of the project, in the context of the different tasks. Partners' work focused mainly on the technical preparation of the pilots in the four countries in order to launch the required public procurement processes in relation to the purchase and installation of all the necessary equipment and turnkey solutions. The selection of the **public buildings** in the four MED countries (**Cyprus, Italy, Greece and Israel**) and the **pilot** specificities which are necessary for the public procurement in relation to the equipment purchasing has been completed. The public procurement in some regions has started and some pilots will be in place in the next few months.



## UPCOMING CONFERENCE

9th International Conference on Modern Power Systems

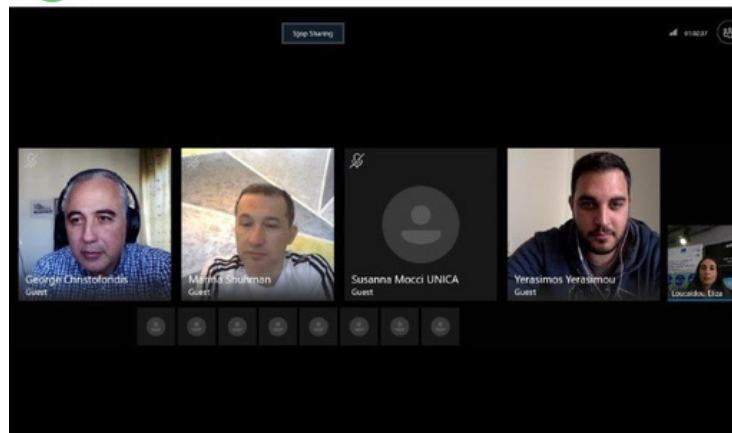
Cluj-Napoca, Romania

15th-17th of June 2021



## PROJECT MEETINGS

Project partners meet frequently online in order to discuss the project activities and latest developments in each country and work constructively towards implementing the objectives of the project and realizing all the tasks effectively. The last meeting took place on the 14th of April 2021. On the 2nd of February an extended virtual meeting also took place, replacing the physical one due to current traveling restrictions.



## BERLIN WAS PRESENTED ON GREEK TELEVISION

BERLIN project was presented on Greek national television by Prof. Georgios Christoforides of the University of Western Macedonia! Prof. Christoforides informed the audience about the project's vision in terms of improving the energy efficiency and **self-sufficiency in public buildings** through the **establishment of nanogrids** and stressed the importance of combining photovoltaics with energy storage and energy management systems for effective demand side management. Even though the cost imposes a challenge on adopting energy efficiency solutions, there are subsidy schemes, which can help especially residential households to install such technical solutions.



# INSTALLATION OF EQUIPMENT IN ITALY

## Equipment in the Public Library Building at Campus UNICA

The University of Cagliari proceeded with the **installation of outdoor weather station** in the Library Building of the Campus, monitored in remote mode. The data logger collects measurements from meteorological sensors, processes these data, stores them, and makes them available for the BERLIN project purpose.



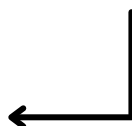
Weather station at UNICA Campus - partners are inspecting the installation



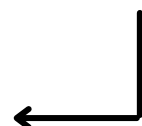
For the power monitoring of the building, several smart multi-meters will be installed in the interface points of the main devices of the nanogrid. So far, smart plugs, sensors and smart multi-meters have been installed in the existing electric distribution of the building for the remote control of loads. In March 2021 the **monitoring phase of the energy consumption started**, even if the pandemic situation does not guarantee the presence of students and regular activities in the building.



Power Meter PM 3255



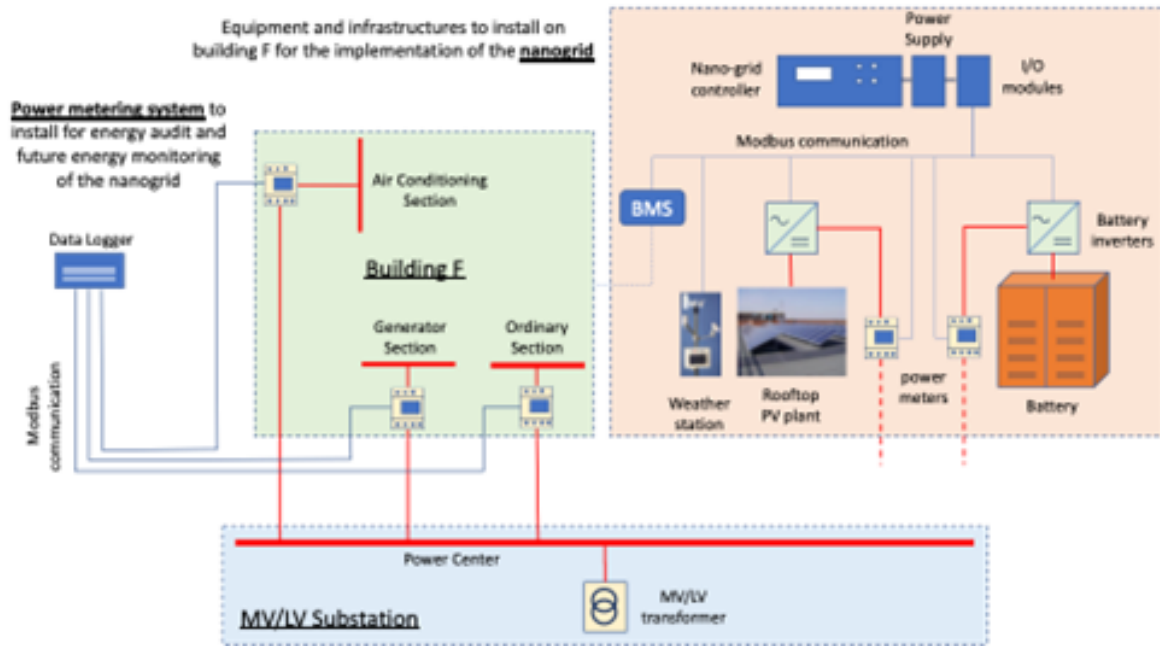
Current transformers installed



# INSTALLATION OF EQUIPMENT IN ITALY

The battery energy storage system (BESS) & EMS procurement has been completed, and they will be installed in the next weeks. The PV design has been completed as well, and the public tender for the procurement of the PV plant is launching.

As soon as the equipment and infrastructures will be installed, they will be active parts of the nanogrid, as shown in the Figure below.



Nanogrid block diagram



# INSTALLATION OF EQUIPMENT IN ISRAEL

## Equipment in Yeelim School in Eilat

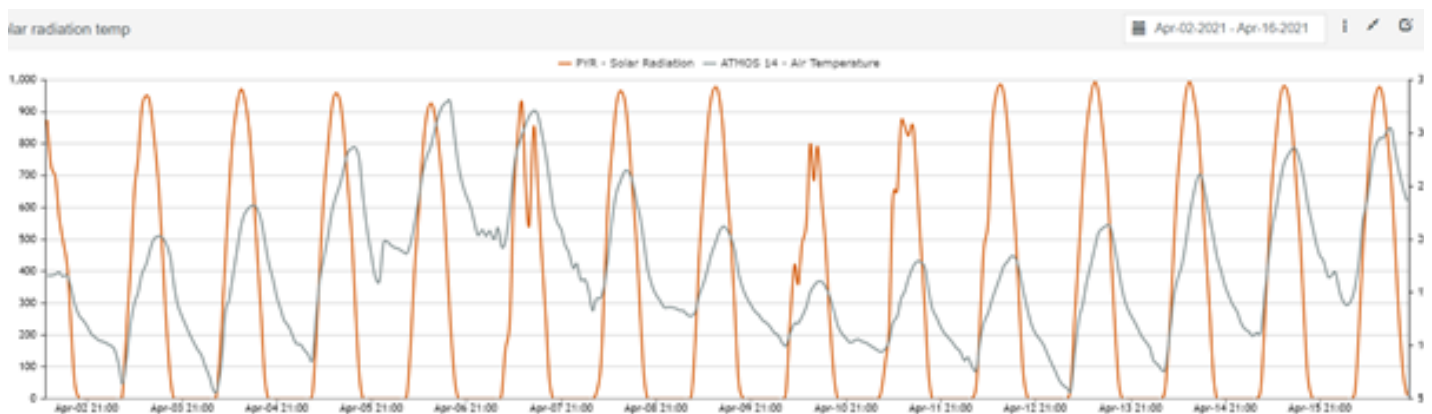
Ben Gurion University (BGU) proceeded with the installation of outdoor weather station in Yeelim School at Eilat.



*The installed equipment measures indoor temperature, relative humidity and concentration of radon gas. The results refer to the example of measurements and the graph refers to the weekly history of radon gas measurement.*

## Equipment in BGU LAB in Sde Boke

In BGU LAB a **mobile meteorological station** was installed. The graph below shows the solar radiation and the outdoor temperature. Overall, the increased of temperature and the higher values of solar radiation are matching. However, there are some inconsistent measurements, such as on April 5 and 6, where the increase in temperature continues after the peak of solar radiation. This kind of analysis can be used for improving the accuracy of an on-site prediction of PV production capacities. A further performance upgrade can be achieved by adjusting the managed load schedule, thus improving demand management platform.





# INSTALLATION OF EQUIPMENT IN ISRAEL

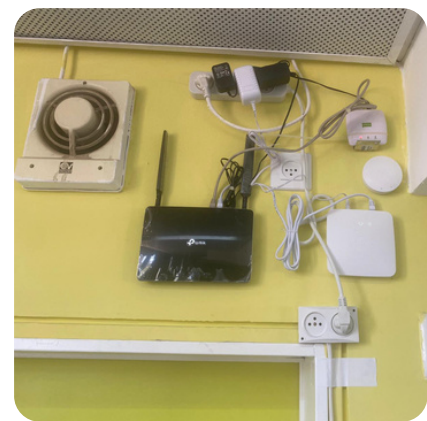
## Equipment in BGU LAB in Beer Sheva

The University also proceeded with the installation of smart plugs and smart meters, which monitors indoor humidity and temperatures. Also, an outdoor weather station was installed. The figure below demonstrates the cloud real time interface of low-cost battery-operated devices, which provide indoor temperature and humidity measurements.



Weather station at Sde Boker

Partners supervising the installation

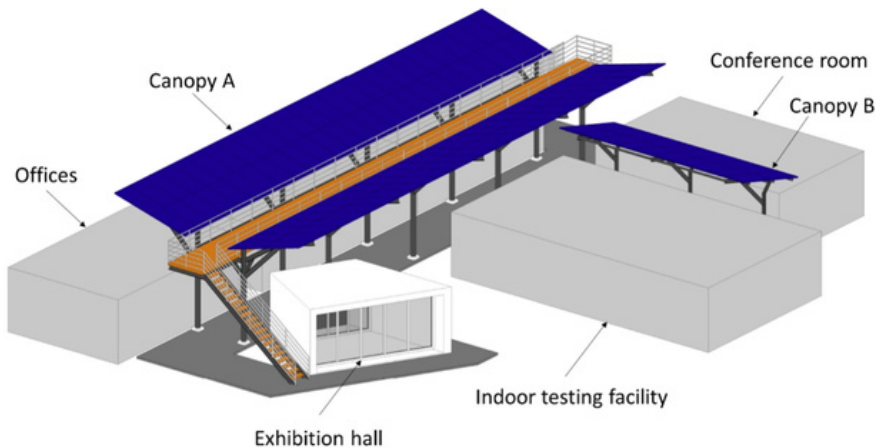


Equipment in pilot class at Yeelim school



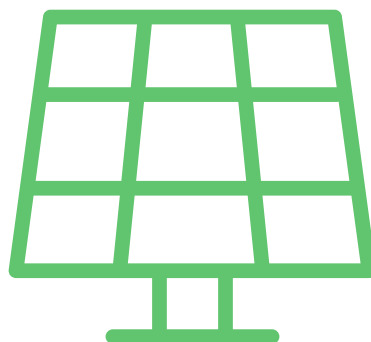
## TURNKEY SOLUTION IN CYPRUS

The turnkey solution in Cyprus will be implemented at the premises of PV Technology Laboratory. It consists of a 40 kWp **building integrated photovoltaic (BIPV)** system installed on metal structures, thus forming a canopy. In addition a 50 kWh battery energy storage system (BESS) based on lithium-ion technology will be utilized, which coupled with the **nanogrid controller** will be able to **increase the self-consumption and self-sufficiency rates** of the laboratory by adjusting the operation of the available flexible loads, without compromising the occupants' comfort, as well as managing the charging and discharging of the BESS.



## JOINT DEVELOPMENT AND DESIGN OF PILOT DEMONSTRATION AND SOLUTION - ACTIVITY 3.1.3

All pilots have followed the same methodology and are based on PVs for generating and a BESS for storing electrical power, as well as a controller for managing the interaction between the aforementioned technologies with the building loads and external power entities, such as the **utility grid**. As each pilot is unique and has its own particularities with respect to the size of the building, the required energy to fulfil its needs, the available space for housing the equipment and infrastructure and the equipment that is already installed and available at the premises, **each solution has been adapted to the specific needs of every pilot**. Activity 3.1.3 forms the basis for the preparation of the tender procedure and the procurement for the equipment and infrastructure purchase, as well as for the installation of the complete solution in each participating country.



## ENERGY EFFICIENCY: BERLIN PRESENTED AT MEDPOWER

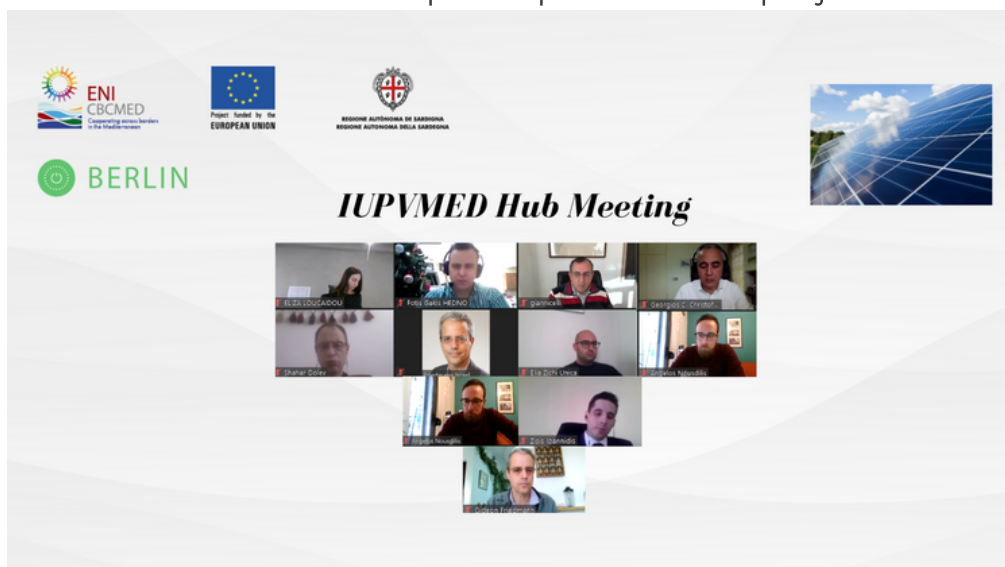
On 11 November 2020, project partners delivered a presentation at the 2020 Mediterranean Conference on Power Generation, Transmission, Distribution and Energy Conversion (MEDPOWER 2020). MEDPOWER 2020 provided the opportunity for engineers, scientists, technicians, researchers, scholars and companies to **exchange ideas and discuss the latest research achievements** in academia and industry.

During the session entitled “Energy Efficiency and Reduction of Greenhouse gas emissions”, BERLIN shed light on the **design of a nanogrid**, consisting of a photovoltaic system and an energy storage system, able to perform demand-side management (DSM) for addressing the high-energy consumption that is common in fossil-fuel buildings and increasing their energy efficiency. Partners presented the paper **“Design Of A Nanogrid For Increasing Energy Efficiency Of Buildings.”**



## BERLIN: FIRST INTELLIGENT UTILIZATION OF PHOTOVOLTAIC TECHNOLOGY HUB MEETING

The first meeting of the Intelligent Utilization of Photovoltaic Technology in the Mediterranean region (IUPVMED) Hub was organized online on 30 November 2020. The Hub consists of **key stakeholders** from the academia, DSOs, industry and local authorities that have committed themselves to a fruitful collaboration for **promoting the wider adoption of distributed energy resources in the Mediterranean region**. The objective of the meeting was to introduce the project and to present the current situation in each country about the photovoltaics (PVs), energy storage systems (ESSs), and demand side management (DSM) to **increase the energy efficiency of buildings using the nano-grid concept**. The participants discussed possible ways to assess the barriers and challenges that exist and prevent the further penetration of distributed energy resources (DERs) in the four Mediterranean countries participated in the project.



## PROJECT PARTNERS



### UNIVERSITY OF CYPRUS COORDINATOR

[www.ucy.ac.cy](http://www.ucy.ac.cy)

FOSS Research Centre for Sustainable Energy of the University of Cyprus (UCY) is a research powerhouse in the field of sustainable energy solutions and in particular Photovoltaics. Committed to undertaking high quality research in order to tackle the climate and energy security challenges of today and the future, FOSS has currently over 40 active research projects, mainly funded by European grants, achieving imposing results. Through its research projects, FOSS has substantial experience in pilots where Photovoltaics are integrated with Energy Storage, and this knowledge will be transferred in the BERLIN project.

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### UNIVERSITY OF WESTERN MACEDONIA

[www.uowm.gr](http://www.uowm.gr)

The Department of Electrical & Computer Engineering of University of Western Macedonia (UoWM) has been involved in several European, regional and national projects with various tasks such as the integration of renewable energy resources, intelligent control of electric power generation and consumption, photovoltaics and storage hybridization and relevant pilot activities, smart grids and cyber security.

**Contact:**

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### THE MUNICIPALITY OF EILAT

[www.eilat.city](http://www.eilat.city)

The Municipality of Eilat city is a leader in energy efficiency, as 75% of the city's daytime electricity is supplied by renewable energy (RE), and by 2020, the city will become energy independent. As in Eilat region there is more than 1850 sun hours per year, there is an advantage of using PV. The current state and the planned solutions are based on solar PV systems and energy efficiency, mostly in the cooling systems. Eilat is also a member of several H2020 projects in which a planning for a positive energy district is being developed.

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Università degli Studi di Cagliari



## UNIVERSITY OF CAGLIARI

[www.unica.it](http://www.unica.it)

UNICA participates in the BERLIN project through the Department of Electrical and Electronic Engineering (DIEE) that has a long history of participation to EU projects and calls and each year a significant portion of its budget is based on EU projects. The department cooperates with research labs (both industrial and public) and with other academic institutions worldwide.

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## BEN GURION UNIVERSITY

[www.in.bgu.ac.il](http://www.in.bgu.ac.il)

BGU is one of Israel's leading research universities and among the world leaders in many fields. BGU participates in the BERLIN project through the Department of Structural Engineering adding much needed structural/architecture expertise to consortium. Modern structural engineers face a variety of technological developments and challenges.

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# Deloitte.

## DELOITTE LIMITED

[www2.deloitte.com/cy](http://www2.deloitte.com/cy)

Deloitte participates in BERLIN through the Innovation and Entrepreneurship Centre (Deloitte IEC). Deloitte has an important role in the project as it has vast experience in managing successful European and local funded projects. The team of Deloitte IEC uses multiple research methods and tools for European Union-funded and ad hoc research for internal or external purposes in a number of areas covering Cyprus and the rest of Europe. Specifically, Deloitte IEC involvement in EU-funded projects is mainly on socio-economic impact studies, cost-benefit analyses, project and financial management, quality management and communication and dissemination.

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## HEVEL EILOT REGIONAL COUNCIL

<https://www.eilot.org.il>

Hevel Eilat Regional Council contribution will be on the off-grid applications, policy making at regional level and multi-level governance. Hevel Eilat is at the forefront of RE in Israel. The Eilat region established the Company for Renewable Energy (NGO) that works on the regulation and assimilation of innovation in the region. The regional council was the first one in Israel to build a PV solar farm and its developing new project as well as supporting start-ups.

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## ASSOCIATED PARTNERS

	Organization	Country
Associate 1	 <b>MUNICIPALITY OF KOZANI</b>	Greece
Associate 2	 <b>Municipality of Ussaramanna</b>	Italy
Associate 3	 <b>REGIONE AUTÒNOMA DE SARDIGNA REGIONE AUTONOMA DELLA SARDEGNA</b>	Italy

For more information please contact the project coordinator Prof. George E. Georghiou, Director of FOSS Research Centre for Sustainable Energy, University of Cyprus, Tel. +357 22892272, email: geg@ucy.ac.cy.

