

StoRES

Promotion of Higher Penetration of Distributed PV through Storage for all



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Dear Readers,

It is our pleasure to welcome you to the third edition of the StoRES Newsletter! "StoRES — Promotion of higher penetration of Distributed PV through storage for all" is an ambitious Interreg MED modular project, implemented by a consortium of 18 highly capable and well established organisations (both private and public) spanning across the Mediterranean region.

Through this edition we would like to share with you news about the progress of the project.

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

Kind Regards,
The StoRES Consortium



About StoRES

StoRES foresees the development of an optimal policy for the effective integration of photovoltaics (PV) and energy storage systems (ESS) via testing smart solutions in 5 MED islands and rural areas.

StoRES aims to increase PV penetration in the energy mix of islands and rural areas in the MED region by integrating PV and ESS. This could be feasible, under an optimal market policy by removing the constraints of grid reliability and RES intermittency.

The primary challenge is to achieve high PV penetration in their energy mix through solving all market/ technical/ grid/ tariff issues without compromising grid stability and security of supply.

The project involves regions facing specific needs and challenges: islands with isolated networks, almost 100% fossil-fuel dependency and increasing energy demand; rural areas exhibiting weaker networks, possibly greater energy needs, and higher environmental impact.

Duration:
36 months

Budget:
€2m

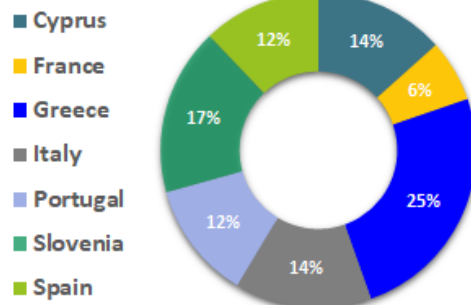
9 Partners

Stakeholders

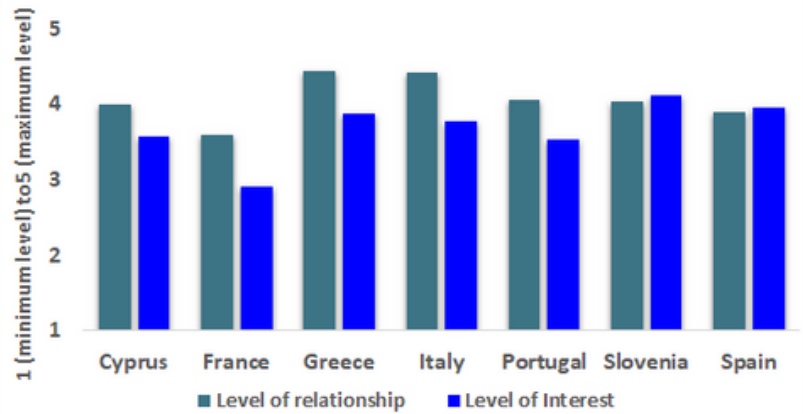
StoRES focuses on 7 EU regions, namely Cyprus, France, Greece, Italy, Portugal, Slovenia and Spain.

Relevant stakeholders have been identified in each country and the respective Level of Relationship and Interest has been calculated.

Allocation between Partner Countries



Average Level of Relationship and Interest

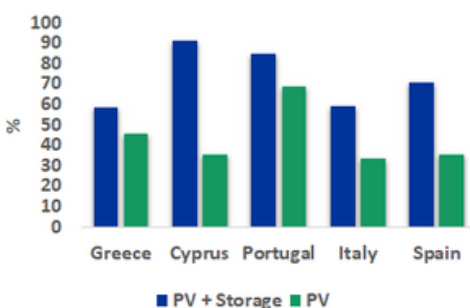


The preliminary results of the residential pilots installations suggest the below:

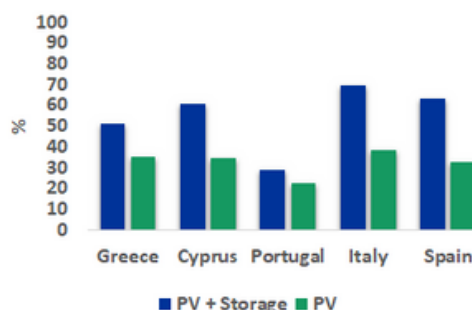
- Significant increase of self-consumption and self-sufficiency.
- Energy consumption covered mostly by PV and storage for Cyprus, Italy and Spain.
- Energy consumption is significantly covered by PV and storage for Greece and Portugal.
- Reduction of PV export to the grid.

Preliminary Residential Pilots Results

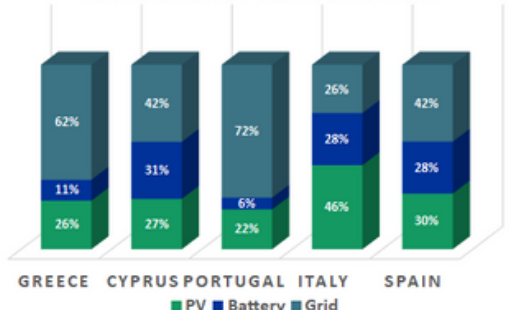
Average Self-Consumption Ratio (SCR)



Average Self-Sufficiency Ratio (SSR)



TOTAL ENERGY CONSUMPTION



PV and Storage Online Optimisation Tool has been built in the framework of the StoRES project.

It has been constructed based on specifications commonly agreed by all partners of the project and ensuring that it is as user-friendly as possible.

The goal of the Optimisation Tool is to provide relevant information to interested stakeholders, investors and researchers about the optimal sizing of both PV and Storage systems based on several parameters. It aims at calculating the optimal size of a hybrid PV and Storage system in terms of net present value of the investment.

The tool requires as inputs: electricity consumption, solar irradiation, PV and battery size, and electricity costs.

The only requirement is to upload sample average consumption profiles to be used in the calculations. In terms of the measurements of PV output power, these can either be provided by the user using a specific template, or the user can select an arbitrary location on the map and the tool will communicate with the PVGIS database to obtain the necessary climatic data for the estimation of the PV output power.

A financial analysis is undertaken for a period of 20 years, taking into consideration technical and financial parameters and various options of energy policies.

Although the current version of the tool focuses on the countries of the StoRES consortium (i.e. Cyprus, France, Greece, Italy, Portugal, Slovenia, Spain) by having in-built average consumption profiles, it can be easily used for any other country/region as well.

The tool can be accessed at the following address: www.storestool.eu

PV System | Consumption Data | Electricity Costs | Storage System | Policy | Financial


PV Production Profile

I want to use my measurements
 No file chosen
 To save your measurements click
 To show your saved measurements click
 Installed PV capacity [kWp]

OR

I want to indicate PV System position

Latitude Longitude
 Address



Single Slope (deg) [0 - 90]
 Azimuth (deg) [-180 - 180]

PV System Characteristics

Degradation (%) [0 - 20]
 Inverter efficiency (%) [80 - 100]

Type of Analysis

Single PV size [1 - 500]
 Parametric - various PV sizes [1 - 500]
 [1 - 500]

Interreg Mediterranean PV and Storage Optimization Tool

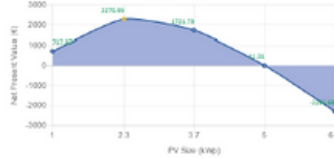
StoRES

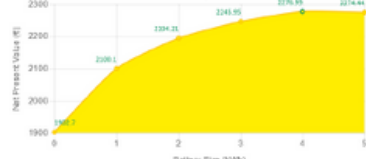
← Previous → Next

PV System | Consumption Data | Electricity Costs | Storage System | Policy | Financial | Results

Optimal System Parameters	Output
Net Present Value of the Investment (€)	2276.99
Internal Rate of Return of the Investment (%)	8.77
Simple Payback Period (Years)	9.74
Optimal PV System Size (kWp)	2.3
Optimal Battery System Size (kWh)	4

Net Present Value (€) Charts

Various PV Sizes: 

Various Battery Sizes: 

Levelized Cost of Electricity - LCOE (€/kWh)

PV Size (kWp)	Battery Size (kWh)					
	0	1	2	3	4	5
1	0.1143	0.1259	0.1399	0.1539	0.1678	0.1818
2.3	0.1486	0.1467	0.1469	0.1479	0.1492	0.151
3.7	0.1955	0.1863	0.1708	0.1754	0.1723	0.1701
5	0.249	0.2345	0.2224	0.2123	0.2058	0.1997
6.3	0.3047	0.2861	0.2703	0.2567	0.2448	0.235

Total Investment Cost (€)

PV Size (kWp)	Battery Size (kWh)					
	0	1	2	3	4	5
1	1600	1800	2000	2200	2400	2600
2.3	3733.33	3933.33	4133.33	4333.33	4533.33	4733.33
3.7	5866.67	6066.67	6266.67	6466.67	6666.67	6866.67
5	8000	8200	8400	8600	8800	9000
6.3	10133.33	10333.33	10533.33	10733.33	10933.33	11133.33

- 1 With the prices of storage still relatively high, a PV system without storage is more profitable to an investor under most circumstances in the studied MED countries.
- 2 Currently the MED countries do not have policies that favor the installation of storage alongside PV systems. Even in the cases where higher self-consumption is encouraged (e.g. the Net-Billing of Cyprus or the partial Net-Metering scheme in Greece), the resulting incentive is not adequate to make a hybrid PV+storage system more profitable (with the current storage system prices).
- 3 The profitability of a PV+storage system depends upon several parameters and, hence, requires careful planning. The parameters include a) consumption profile, b) electricity costs, c) existing policy/scheme, d) solar irradiance and temperature profile of the installation location, e) technical related data of PV and storage. The optimal sizing of the hybrid system should take into account all the above parameters.
- 4 Policy makers that want to encourage the use of storage systems alongside PV's, should consider the adaptation of existing schemes in order to make systems with storage more profitable than those without. Small tweaks upon existing schemes in the MED region may be enough to achieve that.
- 5 The inclusion of storage systems should not be considered in cases where the load consumption is very high compared to PV installed capacity. In that case, the storage system will rarely be charged by the PV excess energy and this will lead to either its fast degradation, or to charging from the grid for maintenance reasons (keep SoC within operational limits).
- 6 The technology of the battery system should be carefully chosen. Lead-acid batteries may be economically preferable than Lithium-ion ones, but one should consider that they exploit a lower level of their nominal capacity (lower usable kWh/nominal kWh rate) and they present higher self-discharge rates.
- 7 The choice of AC-coupled systems is the most preferable one for existing PV installations, since it can be sized independently and with more technical available choices.
- 8 The choice of DC-coupled systems may be preferable for new systems, as the cost is kept low compared to AC-coupled ones, while losses may be limited.
- 9 The distribution system operators in MED region should adapt their regulations in order to facilitate the widespread of PV+storage hybrid systems as soon as possible. Clear guidelines should be given to prospective investors in concise and simple way.

Documenting lessons learnt is an integral part of the StoRES project. Lessons learnt is the learning gained from the process of performing the project activities. It captures the challenges faced throughout the project's lifecycle as well as the solutions found to ensure a better execution in the future.

The lessons learnt will be formally communicated with the project partners and used as a foundation for transferring the project results to the relevant project stakeholders.

The Plan for transferring provides a strategy and roadmap for successfully implementing the transfer of the StoRES results. It deals with the formulation of a concrete plan to transfer the lessons learnt from pilot installations, simulation scenarios and other project results to the stakeholders in partners' regions, MED area and beyond. The aim is to transfer results to as many territories as possible and to assure continuity after the project's end.

During the project as well as after its end the partners need to transfer the project's results to a diversified group of representatives. The target groups of the project are:

- citizens/typical consumers
- local/regional authorities
- DSOs/utilities
- Regulators
- energy experts
- government bodies involved in energy policies
- politicians/policy makers
- renewable energy associations
- energy agencies

The StoRES project outputs are listed below:

- webpage
- video
- living lab
- policy recommendations
- publications and articles
- reports from workshops and the international conference
- lessons learnt
- guidelines procedures for optimization of storage (roadmap for a proposed solution)
- flyers, banners and infographic
- newsletters and infographics
- pilots
- online optimisation tool

The objectives of transferring the results are to ensure sustainability of the project results through building a network of contacts and relationships, to achieve adaptation of the results by relevant institutions and to achieve their integration into regional and national plans.

Up to now several activities have been carried out where some of the project results have been transferred to several stakeholders and general population.

With continuation of these actions and implementation of additional ones, building on the connections that have been already established, the Consortium will be able to successfully implement the transfer of the StoRES results from pilot installations and other project outputs to all the partners' regions and the wider MED area.

The goal is, not only to transfer the results at the time of the project implementation, but also to ensure their continuous influence after the project's end.

Project Meetings in Lyon and Cagliari

Two project meetings were successfully held in Lyon, France on the 28-29th November 2018 and in Cagliari, Italy on the 27th of May 2019. The StoRES Consortium met to discuss the project progress to date and plan the next steps.

During the 1st meeting all the partners presented their operational pilots and gave emphasis on the data collection and analysis aspects, while they also discussed in detail the execution of the WP4 transferring activities. They also had the chance to participate in the Pollutec Exhibition, the 28th international trade show for environmental equipment, technologies and services.

During the 2nd meeting, the partners discussed the progress and the encouraging results derived from the activities of the project, including the optimisation tool, the cost-benefit analysis, the lessons learnt and the transferring plan, as well as the outcomes and tools that will become available before the end of the project such as the living lab and the policy recommendations. The StoRES final event was held the next day.

The project partners will meet again in Portugal in September 2019.

Project Meeting, Lyon, France



Pollutec, Lyon, France



Project Meeting, Cagliari, Italy



StoRES Final Event

The StoRES project Consortium, with the support of the Interreg MED Renewable Energy Community, organised its final event entitled “Innovative solutions for fostering low-carbon strategies and increasing renewable energy sources in the energy mix of the MED area” on 28th of May 2019, in Cagliari, Italy.

The event was held with great success and attracted the interest of more than 50 stakeholders and experts. During the event, the StoRES Consortium presented the achievements and main results of the project and discussions were initiated in regards to complementarities with other MED projects from the renewable energy community of projects.



StoRES Final Event Banner



Project co-financed by the European Regional Development Fund

Promotion of Higher Penetration of Distributed PV through Storage for all



May 28, 2019

9 AM - 3 PM
Cagliari, Italy



Project Partners



Flyer, Infographic & Videos

StoRES Flyer May 2019

Promotion of Higher Penetration of Distributed PV through Storage for all

Main Outcomes:

- Implementation and testing of Residential and Community Storage in the Mediterranean (MED) region (islands and rural areas with high solar irradiance)
- Policy recommendations for further photovoltaic (PV) penetration through Storage
- Development of algorithm for the optimum PV-Storage sizing in the participating countries
- Assessment of Residential (Behind-the-Meter) and Community Storage benefits

Online Optimization Tool

The Online Optimization Tool aims at calculating the optimal size of a hybrid Photovoltaic Storage system in terms of the net present value of the investors. The tool requires as inputs:

- Electricity consumption
- Solar irradiation
- PV and battery cost
- Electricity costs

 A financial analysis is undertaken for a period of 20 years, taking into consideration technical and financial parameters as well as various options of energy policies.

Living Lab

The Living Lab provides an interactive web platform where the measured data acquired from the pilot sites can be displayed. In addition, multiple indicators are displayed, including the self-consumption and self-sufficiency rates. The platform also enables the display of energy profiles and the comparison between different pilot installations. The platform can be used for PV-Storage installations, as long as the required installation data is provided accordingly.

Duration: 36 months | Budget: €2m | 9 Partners

A flyer and an infographic were designed to showcase StoRES project results and outcomes until now and they will be distributed at events and among relevant stakeholders.

StoRES Infographic April 2019

Cost & Benefit Analysis

This table presents the set of benefits of an Energy Storage System (ESS) contribution for each storage functionality. The green rows illustrate the benefits offered to the end users involved in the StoRES project.

Benefits	End-user	Investor	System	Grid	System	Grid
1. Self-consumption	Yes	Yes	Yes	Yes	Yes	Yes
2. Self-sufficiency	Yes	Yes	Yes	Yes	Yes	Yes
3. Energy storage	Yes	Yes	Yes	Yes	Yes	Yes
4. Energy flexibility	Yes	Yes	Yes	Yes	Yes	Yes
5. Energy storage	Yes	Yes	Yes	Yes	Yes	Yes
6. Energy storage	Yes	Yes	Yes	Yes	Yes	Yes
7. Energy storage	Yes	Yes	Yes	Yes	Yes	Yes
8. Energy storage	Yes	Yes	Yes	Yes	Yes	Yes
9. Energy storage	Yes	Yes	Yes	Yes	Yes	Yes
10. Energy storage	Yes	Yes	Yes	Yes	Yes	Yes

Main Lessons Learnt

- With the current conditions, such as high Storage prices, existing policies, pricing schemes, etc., a PV system without Storage is a more profitable investment under most circumstances in the studied MED countries.
- Policy-makers should aim at the encouragement of Storage alongside PV, by considering the adaptation of existing schemes in order to enhance the competitiveness of ESS.
- The main parameters for PV-Storage system profitability as quantified during the StoRES project include:
 - Consumption and generation power profiles
 - Electricity costs
 - Existing policies and pricing schemes
 - Solar irradiance profile of the installation location
 The optimal sizing of the PV-Storage system should take into account at least all the above parameters.

Consortium of the StoRES Project

Promotion of Higher Penetration of Distributed PV through Storage for all

Aim

To increase PV penetration in the energy mix of islands and rural areas in the MED region by integrating PV and energy storage systems. This could be feasible, under an optimal market policy by removing the constraints of grid reliability and RES intermittency.

Challenge

To achieve high PV penetration in the energy mix of MED region through solving all market/technical/grid/tariff issues without compromising grid stability or security of supply.

Stakeholders in MED countries

157 Stakeholders identified in 7 Countries

Allocation between Partner Countries

Cyprus	12%
France	14%
Greece	17%
Italy	12%
Portugal	14%
Slovenia	14%
Spain	25%

Average Level of Relationship and Interest

StoRES Project Videos

Renewable Energy Community StoRES Pilot Project

https://www.youtube.com/watch?v=_DRmG7WvF7g

StoRES - Energy Facilities for energy transition

<https://m.youtube.com/watch?feature=youtu.be&v=THhBcclJnJa>

We Think Big, we Start Small!

Residential Pilots Results

Average Self-Consumption Ratio (SCR)

Average Self-Sufficiency Ratio (SSR)

Total Energy Consumption

- Significant increase of self-consumption and self-sufficiency.
- Energy consumption covered mostly by PV and storage for Cyprus, Italy and Spain.
- Energy consumption is significantly covered by PV and storage for Greece and Portugal.
- Reduction of PV export to the grid.

In addition to other communication activities, two videos have been prepared to present StoRES project and its objectives.

StoRES Demonstration sites

Cyprus, Greece, Italy, Portugal, Slovenia, Spain



WORLD CAFE "OVIRE PRI FINANCIRANJU ENERGETSKIH SANACIJ JAVNIH OBJEKTOV" (OBSTACLES CONNECTED WITH FINANCING RENOVATION OF PUBLIC BUILDINGS FOR HIGHER ENERGY EFFICIENCY)

On 17 January 2019, StoRES partners from Municipality of Slovenska Bistrica, LEA Spodnje Podravje attended the event in the municipality of Slovenska Bistrica which attracted a large number of Academics, representatives of public authority, energy agencies, the Slovenian Environmental Public Fund and media.

SyNERGY MED 2019 1st Conference on Energy Transition in the Mediterranean Area



The StoRES Consortium co-organised the 1st Conference on Energy Transition in the Mediterranean Area on 28-30th May 2019, in Cagliari, Italy. This Conference was the starting point of a series of Conferences with the aim of establishing a major energy platform in the region. The Conference attracted the interest of more than 50 stakeholders and provided a forum for discussion among researchers, policy-makers, regional and local authorities, renewable energy clusters and main actors/stakeholders about the energy technology challenges in these regions and solutions for boosting economic and sustainable development. During the 1st day of the Conference, the StoRES partners presented the final project results and outputs.

Energy Day, University of Cyprus

An Energy Day event was organised in the University of Cyprus on the 5th of June 2019 by FOSS Research Centre for Sustainable Energy. The Cypriot partners presented the StoRES project and battery energy storage, web tool demonstration and pilot system demonstration. During the event the flyer and infographic were also disseminated to the 45 professionals (engineers, etc.), academics, utilities, ministries, authorities, policymakers who attended the event.



EUSEW Energy Fair in Brussels

StoRES project was presented during the side event organised by Interreg MED Renewable Energy on the 18th of June 2019 in Brussels, in the context of the EU Sustainable Europe Week organised by the European Commission and energy stakeholders on 17-21st June 2019. During the event an overview of the lessons learnt by recent INTERREG MED renewable energy projects were provided, about how to support the energy transitions of islands and rural areas. This overview was based on project results and regional consultations with stakeholders across the Mediterranean. StoRES also participated at the Energy Fair that was held at the Networking Village on the 19th of June.



StoRES Workshop in Thessaloniki

A workshop and a training session for stakeholders took place in Thessaloniki on the 10th of June 2019, under the title “Towards energy systems of tomorrow and the role of electrical energy storage”. The event was organized by StoRES partner in Greece, Aristotle University of Thessaloniki (AUTH), aiming to discuss the advantages and the challenges of electrical energy storage systems integration with PVs, based on the outputs of the project activities and the experience gained. The workshop included presentations by AUTH and other invited speakers, while the prospects of electrical storage penetration in Greece were discussed in a round table. The training session included hands-on experience by stakeholders on the use of the *StoRES PV and Storage Optimisation Tool* through an interactive lab.

Invited speakers included representatives from the Greek Distribution System Operator (DSO) and other projects related to energy storage. More than 50 people attended to the workshop and the training session, including: DSO representatives, policy makers, academia, researchers and engineers, along with representatives from private companies and electricity providers. The outputs of the workshop were announced by the local and national press and television, while participants assessed the event activities with the highest score available in the event evaluation forms.





University of Cyprus (UCY)

UCY, through its Research Centre for Sustainable Energy (FOSS), plays a key role in research and technological development activities in the field of sustainable energy within Cyprus and at international level with the aim of contributing to the achievement of the relevant energy and environment objectives set out by Europe. In particular, FOSS strives to become a centre of excellence in energy that will act as a structure where world-standard R&D work can be performed, in terms of measurable scientific production (including training) and/or technological innovation.

George E. Georghiou, geg@ucy.ac.cy



Aristotle University of Thessaloniki

The project will be executed by the Power Systems Laboratory (PSL) which is running since 1980 and has been involved in 140+ European, bi-lateral and national projects, related to research and development of power systems, renewable energy sources, electric power and consumption control, environmental impacts from power generation, applications of Information Technologies and energy efficiency (<http://power.ee.auth.gr/>). The PSL and the team members involved in this project have significant experience in all topics related to power systems analysis, operation and control, modelling, power line, communications, distributed generation and smart grids, power electronics, harmonics, power quality, electrical drive systems and renewable energy sources.

Grigoris Papagiannis, grigoris@eng.auth.gr
Giorgos Christoforidis, gchristo@teiw.m.gr



AREAL – Regional Energy and Environment Agency of Algarve

AREAL is a non-profit private Association, whose main goal is to work for the implementation of Regional Energy Politics as a way to contribute for the Algarve Sustainable Development. With international cooperation, AREAL will look for a More Efficient Use of Energy aiming to improve the actual usage of Algarve great potential of renewable Energy Sources. AREAL will benefit from this project by internalizing and disseminate the knowledge that will be acquired from the cooperation between all the partners involved.

Cláudio Casimiro, ccasimiro@areal-energia.pt



SARGA – Government of Aragon

SARGA executes and provides assistance and advice to the Government in the passing of regulations and strategy definition. Through the Aragon Strategy for Climate Change and Clean Energies & Energy Plan for Aragon, it has developed & implemented an energy policy that aims to contribute to the maintenance of energy supply quality and the improvement of energy efficiency. This is in consonance with the priority 4C of Aragon ERDF Operational Plan: O.4.3.1 "Improvement of energy efficiency and emissions reduction in public buildings" & OE.4.3.2 "increase the use of renewable energies for the production of electricity and use of thermal solutions in public buildings and infrastructures, placing specific interest in micro-generation".

Javier Sancho, jsancho@sarga.es



Municipality of Slovenska Bistrica

The Municipality of Slovenska Bistrica is organized under the Local Self-Government Act (Official Gazette of RS, no. 94/07) and is the basic local self-governing community of settlements, which are associated with common needs and interests of their citizens. Municipality is managing 45 public buildings and want to (in the frame of energy management) implement some of the actions from the Local energy concept. For example: extended energetic examination of public buildings, case studies about possibilities for Hydro, Wind, Solar, biomass and Bio gas usage/exploitation, new PV installations on public buildings etc.

Tomaž Pristovnik, tomaz.pristovnik@ric-sb.si



**Auvergne
Rhône-Alpes**
Énergie Environnement

Regional Energy and Environment Agency in RhôneAlpes

The Regional Energy and Environment Agency in Rhône-Alpes is in charge for the development of sustainable energy projects and programs both at regional, but also local levels. The objective of the Regional Energy and Environment Agency in Rhône-Alpes is to mobilize public authorities and other key stakeholders at regional and local levels in order to develop new policies and introduce new instruments having a significant impact on the development of sustainable energy projects within the region.

Noemie Poize, noemie.poize@auvergnerhonealpes-ee.fr



Ministry of Energy, Commerce, Industry and Tourism

The Energy Service has the overall responsibility of Energy in Cyprus, including the promotion and utilization of RES & the formation of the national energy policy for Cyprus. In this capacity the Energy Service is keenly interested in the further development of PV in Cyprus through the adoption of appropriate policy, market rules and supporting technologies. To this effect the proposed project StoRES is aligned with the objectives of the Energy Service and thus the Energy Service is interested to play an active role in completing the planned installations and identifying the benefits of using distributed storage facilities in support of PV sources of energy.

George Partasides, gpartasides@mcit.gov.cy



Municipality of Ussaramanna

The members of municipality of Ussaramanna can share important skills and experiences in European project design as well as in the Sustainable Energy field. They have in particular a good know-how in electrical engineering such as electrical power system, and good knowledge of electrical distribution networks and smart grids. In addition, administrators have several experience and skills in managing European projects. The Municipality of Ussaramanna is already signatory of the Covenant of Mayors and the relevant SEAP implementation is already started and in progress. This SEAP involves local integrating actions of 18 Municipalities, as well as global actions for the whole territory of the “Municipalities Union of Marmilla”.

Marco Sideri, sindaco@comune.ussaramanna.vs.it



Αρχή Ηλεκτρισμού Κύπρου
Electricity Authority of Cyprus

Electricity Authority of Cyprus/Distribution System Operator

The DSO is the organisation responsible for the efficient, reliable and secure operation, maintenance & expansion of the electricity distribution system. The DSO is responsible for the integration of distributed RES in the distribution network of Cyprus. The technical staff have great experience regarding the integration of PVs into the energy mix, identifying possible problems and troubleshooting. Also, it has great experience in designing technical solutions for the integration of domestic PV systems to the electricity grid. The involvement of the DSO of Cyprus in this project is of vital importance.

Tasos Gregoriou, TGregori@eac.com.cy

Associated Partners

Mediterranean Technology Platform for Smart Grids

Venizelos Efthymiou, vefthymiou@hotmail.com

University of Cagliari

Susanna Mocci, susanna.mocci@diee.unica.it

Cyprus Energy Regulatory Authority

Andreas Poullikkas, andreas.poullikkas@cut.ac.cy

Autonomous Region of Sardinia – Regional Planning Centre

Massimo Carboni, mascarboni@regione.sardegna.it

Federacion Aragonesa De Municipios Comarcas Y Provincias

Romina Magni De Antonio, rmagni@famcp.org

Ministry of Environment and Energy/General Secretariat of Energy and Mineral Raw Materials/General Directorate of Energy/Directorate of Renewable Energy Sources and Electricity

Papadogianni Aikaterini, papadogiannia@prv.ypeka.gr

Municipality of Kozani

Despotidis Konstantinos, Programmatismos@kozanh.gr

HEDNO S.A. (Hellenic Electricity Distribution Network Operator S.A.)

Dimitrios K. Lianas, D.Lianas@deddie.gr

Dimitra Telaki, D.Telaki@deddie.gr

EDP Distribuicao Energia S.A.

Antonio Aires Messias, aires.messias@edp.pt

SODO electricity distribution system operator, d. o. o.

Matjaž Vodusek, matjaz.vodusek@sodo.si

Project Coordinator

Prof. George E. Georghiou, FOSS Research Centre for Sustainable Energy, PV Technology Lab, University of Cyprus, Tel. +357 22892272, geg@ucy.ac.cy