



StoRES

Promotion of higher penetration of Distributed PV through storage for all

Priority Axis 2: Fostering low-carbon strategies and energy efficiency in specific MED territories: cities, islands and remote areas

2.2: To increase the share of renewable local energy sources in energy mix strategies and plans in specific MED territories

Deliverable n°: **4.5.3**

Deliverable Name: **Training report (Spain)**

Disclaimer: This document reflects only the authors' view and the ERDF is not responsible for its contents or any use or exploitation of the information it contains

1 Document Info

Project Name	Promotion of higher penetration of Distributed PV through storage for all (StoRES)
Funding Scheme	ERDF
Work Package Number	WP4
Name of Work Package	Transferring
Number	D4.5.3
Title	Training report (Spain)
Dissemination Level	PU
Date	11.11.2019
Authors	Simona Ruggeri, Javier Sancho
Contributors / Reviewers	Angelos Nousedilis Nikolas Chatzigeorgiou
Status	Final

2 Document History

Date	Author	Action	Status
10.07.2019	Simona Ruggeri	1 st draft report	Draft
26.08.2019	Simona Ruggeri	2 nd draft report	Draft
13.10.2019	Simona Ruggeri	Finalization	Draft
23.10.2019	Javier Sancho	Finalization	Draft
11.11.2019	Javier Sancho	Finalization	Final

3 Contents

1	Document Info	2
2	Document History	2
3	Contents.....	3
4	Project summary.....	4
5	Introduction.....	5
6	Report on the training course in Spain	5
6.1	General purpose	5
6.2	Target audience.....	5
6.3	Consultants.....	6
6.4	Main contents of the course.....	6
6.5	Agenda.....	7
6.6	Final questionnaire/answers	7
6.7	Photos	7
6.8	Material	9
7	Conclusions.....	9

4 Project summary

The project addresses the development of an optimal policy for the effective integration of Renewable Energy Sources (RES) and Energy Storage Systems (ESS). The primary challenge is to achieve increased penetration of RES and predominantly photovoltaics (PV), in the energy mix of islands and rural areas in the Mediterranean (MED) region without compromising grid stability. The main objective of StoRES is to boost self-consumption in the MED region with the integration of optimal storage solutions. Testing coupled PV-ESS solutions in different pilot sites and taking into account local particularities for optimization, current barriers concerning grid reliability with higher RES deployment will be eliminated. In addition to this, the development and integration of the proposed solution at both residential and community levels and applying different policy scenarios will lift the barriers related to the grid integration of ESS and extend the practical knowledge about this technology. It is expected that all the shortcomings regarding the intermittent nature of PV energy for increased penetration into the energy mix will be addressed whilst maintaining smooth operation of the grid.

The project started on 1st of November 2016 and is expected to be completed within 36 months.

5 Introduction

With the aim of sharing the experience acquired during the project, each participating country organises training courses in which the results, the knowledge acquired, together with some study cases are presented.

Using a common format, one report is constructed per country. In particular, the contents of the training (with the national perspective), the summary and an evaluation of the results in terms an evaluation survey are described.

In the document, the training course held in Zaragoza, Spain on Monday, 16th September 2019 in Hotel Iberus and was organised by Sarga.

6 Report on the training course in Spain

The training course in Spain was delivered on Monday, 16th September 2019, organised by Sarga in Hotel Iberus. It was entitled "Use of battery-based storage in photovoltaic self-consumption facilities. Lessons learned in pilot installations". The event was free of charge and it lasted approximately 3 hours.

6.1 General purpose

The main objective of the training course was to disseminate the results of the StoRES project, including the developed tools (*StoRES Living Lab* and *StoRES Online PV and Storage Optimization Tool*), the lessons learnt from the pilot installations and other results, as well as to present the state of the art, the effectiveness of ESS coupled with PV systems and potential future opportunities in this field.

6.2 Target audience

The target audience of the training was general public, energy consultants, small solar power plant owners, decision makers and Distribution System Operators (DSOs). The training was attended by 14 stakeholders, as it can be seen in Figure 1.

Workshop
16 Sep 2019, Zaragoza, Spain

NAME	ORGANIZATION	EMAIL	SIGN
ALBERTO PASCO	TOISI	alberto@toisi.es	
CARMEN RIOS	CERUEZAS BORDA	carmen.rios@ceruezasborda.es	
CANCHA MOLINA	DE MOLINA	encarnadosmolina@hotmail.com	
ELIANA CORTES	DEPARTAMENT D'ENERGIA	eliana@departamentdenergia.com	
JOSE A. LÓPEZ	EUM	jlopez@eumaducaciones.com	
MARCOS RUPERET	EUM	mruperez@eumaducaciones.com	
RUTH AGUIRRE	SARGA	raguirre@arga.es	
JUAN MOYANO	GOBIERNO ARAGON	JUAN.MOYANO@GMAEL.COM	
F. JAVIER ZARZAGA	UNIZAR	JAVY@UNIZAR.ES	
RICARDO CORTES	DPZ	rcortes@dpz.es	
JUAN CARLOS GARCIA	BGL	C.garcia@BGLAudioblog.com	
JULIAN MARTINEZ	C. ROJA	jmartinez@coyos.es	
CARLOS RUIZ	FRUITAL	carlos@fruital.com	
SARA JUSTE	FRUITAL	sara@fruital.com	

Figure 1: Signed list of participants.

6.3 Consultants

The training was delivered by Octavio Cabello, expert engineer in renewable energy and responsible for the pilot actions and Javier Sancho Sarga

6.4 Main contents of the course

The training course presented the current situation of PV deployment in Spain with special emphasis on the new regulatory framework that has been generated recently. The activities of the StoRES project were presented, with emphasis on the pilot installations and above all on the administrative barriers that we have encountered in its implementation.

6.5 Agenda

The training course was held from 4:00 pm to 7:00 pm. The programme of the event was as follows:

- Current situation of PVs in Spain. Self-consumption. New legislative framework.
- StoRes Project, objectives and work developed.
- Coffee break, networking.
- Pilot installations, summary of the first results. Technical considerations.
- Administrative barriers, proposals for improvement.

6.6 Final questionnaire/answers

After the training course the participants were asked to fill out the questionnaire about their satisfaction with the training. The results are presented in Figure 2.

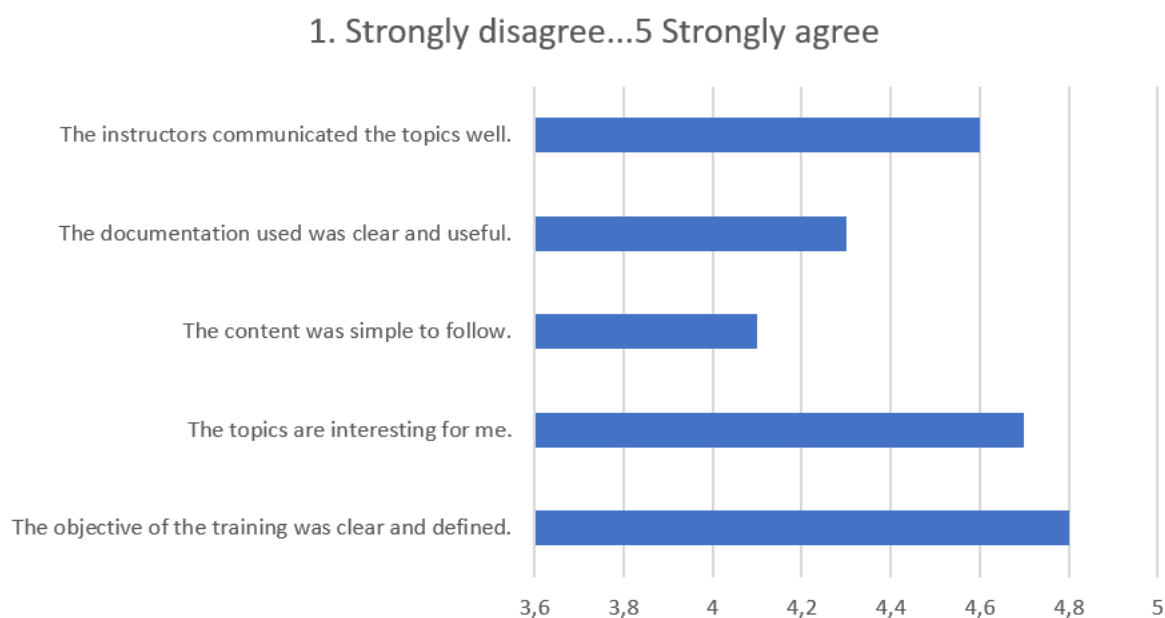


Figure 2: Evaluation survey results.

As it can be seen from the results, the level of satisfaction regarding the training was very high. All participants gave high marks in each of the questions raised.

6.7 Photos

Figures 3 and 4 present photos taken from the training course in Spain



Figure 3: Photo taken during the event.

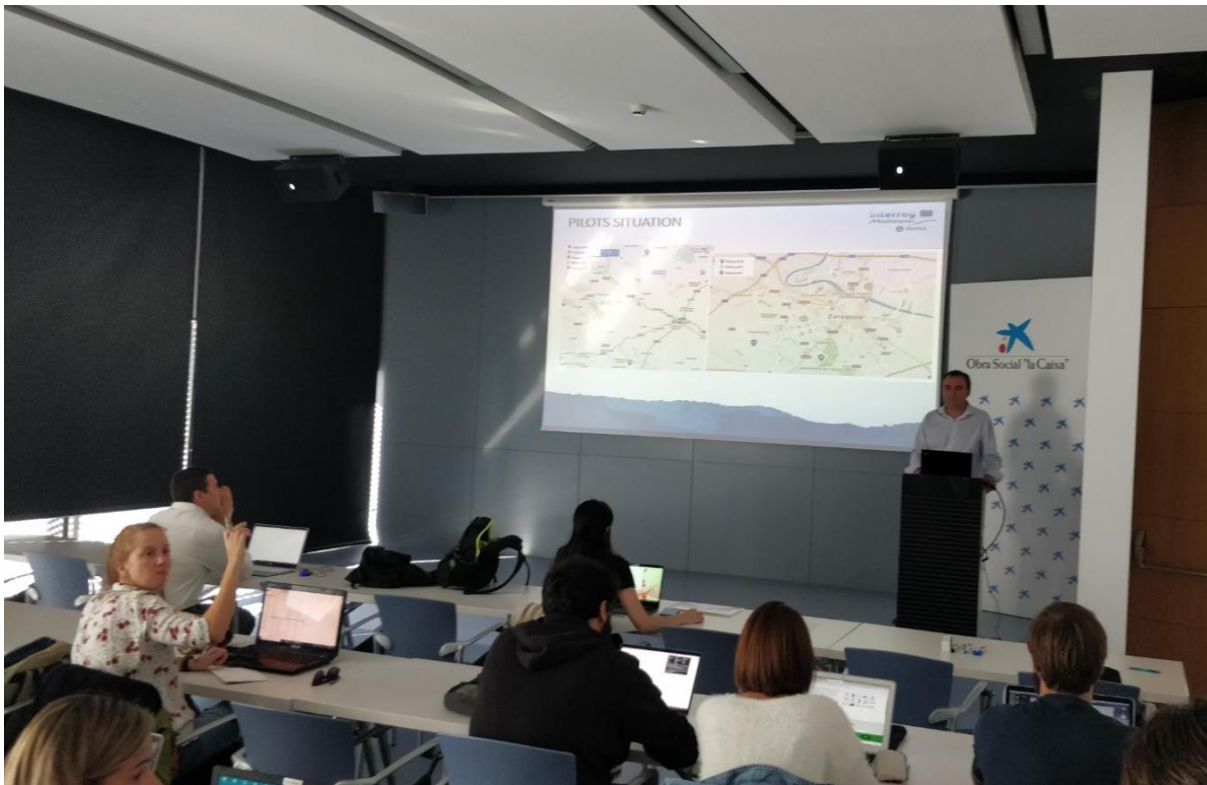


Figure 4: Photo taken during the event.

6.8 Material

Powerpoint presentations of the training material were prepared. At the end of the event a copy was emailed to all participants. No printed documentation was provided.

7 Conclusions

In the report, the description of the training course held in Zaragoza Spain is provided. The main objective of the training was to disseminate the results of the StoRES project and present the state of the art of ESS coupled with PV systems.

Post-training surveys showed that participants appreciated the content of the training course and it was interesting for them.



StoRES

Promotion of higher penetration of Distributed PV through storage for all

Priority Axis 2: Fostering low-carbon strategies and energy efficiency in specific MED territories: cities, islands and remote areas

2.2: To increase the share of renewable local energy sources in energy mix strategies and plans in specific MED territories

Deliverable n°: **4.5.3**

Deliverable Name: **Training report (France)**

Disclaimer: This document reflects only the authors' view and the ERDF is not responsible for its contents or any use or exploitation of the information it contains

1 Document Info

Project Name	Promotion of higher penetration of Distributed PV through storage for all (StoRES)
Funding Scheme	ERDF
Work Package Number	WP4
Name of Work Package	Transferring
Number	D4.5.3
Title	Training report (France)
Dissemination Level	PU
Date	11.11.2019
Authors	Noémie POIZE
Contributors / Reviewers	Aggelos Nousedilis Nikolas Chatzigeorgiou
Status	Final

1 Document History

Date	Author	Action	Status
10.07.2019	Simona Ruggeri	1 st draft report	Draft
26.08.2019	Simona Ruggeri	2 nd draft report	Draft
11.10.2019	Noémie POIZE	Finalization	Draft
11.11.2019	Noémie POIZE	Finalization	final

2 Contents

1	Document Info	2
1	Document History	2
2	Contents.....	3
3	Project summary.....	4
4	Introduction.....	5
5	Report on the training course in France	5
5.1	General purpose	5
5.2	Target audience.....	5
5.3	Consultants.....	5
5.4	Main contents of the course.....	5
5.5	Agenda.....	6
5.6	Final questionnaire /answers	7
5.7	Photos	8
5.8	Material	8
6	Conclusions.....	8

3 Project summary

The project addresses the development of an optimal policy for the effective integration of Renewable Energy Sources (RES) and Energy Storage Systems (ESS). The primary challenge is to achieve increased penetration of RES and predominantly photovoltaics (PV), in the energy mix of islands and rural areas in the Mediterranean (MED) region without compromising grid stability. The main objective of StoRES is to boost self-consumption in the MED region with the integration of optimal storage solutions. Testing coupled PV-ESS solutions in different pilot sites and taking into account local particularities for optimization, current barriers concerning grid reliability with higher RES deployment will be eliminated. In addition to this, the development and integration of the proposed solution at both residential and community levels and applying different policy scenarios will lift the barriers related to the grid integration of ESS and extend the practical knowledge about this technology. It is expected that all the shortcomings regarding the intermittent nature of PV energy for increased penetration into the energy mix will be addressed whilst maintaining smooth operation of the grid.

The project started on 1st of November 2016 and is expected to be completed within 36 months.

4 Introduction

With the aim of sharing the experience acquired during the project, each participating country organises training courses, in which the results, the knowledge acquired, together with some study cases are presented.

Using a common format, one report is constructed per country. In particular, the contents of the training (with the national perspective), the summary and an evaluation of the results in terms of an evaluation survey are described.

In the document, the training course held in Auvergne-Rhône-Alpes (France) on the 10th October 2019 is reported.

5 Report on the training course in France

The training took place on the 10th October 2019 in Saint-Pierre-en-Faucigny (Haute-Savoie, premises of Innovales). It lasted half a day. The training was organized by AURA-EE in partnership with Innovales, which is a local structure acting on energy transition and social economy in Haute-Savoie.

5.1 General purpose

The main objective was to bring knowledge on residential storage for the main regional stakeholders. The approach was mostly technical since the market is not developed yet in France because of the lack of viable economic models.

5.2 Target audience

The audience was mainly consisting of installers, engineering companies and municipalities already involved in PV projects.

About 30 people attended the event.

5.3 Consultants

The speakers were:

- Morgane GOSSELIN (CITEOS), engineer working in a private company belonging to the regional union of the PV sector.
- Tony DELAPLAGNE, researcher for INES (National Institute for Solar Energy)
- Noémie POIZE, engineer, AURA-EE, partner of the StoRES project
- Jean-Philippe LANSARD, installer in Haute-Savoie
- Philippe DALLA NORA, installer in Haute-Savoie

5.4 Main contents of the course

First the national context on PV self-consumption was presented, together with the main stakes of energy storage. Then some use cases were detailed to illustrate

the diversity of storage solutions and the cases where it is more adapted and suitable.

Then, INES presented into detail the technologies, the operation of PV systems without and with storage systems. Some technical information was given on the system performances, the ageing of the battery and the best way the storage systems should be operated. Finally, the issues related to ancillary services for the grid were presented.

Noémie POIZE presented the results of the data analysis in the context of the StoRES, as well as the developed tools, i.e. *StoRES Living Lab* and *StoRES Online PV and Storage Optimization Tool* (online demo).

The two installers finally shared their own experience, presenting two local PV plants with storage in residential houses, explaining the impact of people's behaviour on the storage operation and giving their feedback on the market development.

5.5 Agenda

Table 1 introduces the agenda of the event.

14h – 14h30 : CONTEXTE et ENJEUX

- Presentation of AURA Digital Solaire (AURA-EE)
- Main aspects on the development of self-consumption in France
- Use cases of storage: when is it suitable?
 - Morgane GOSSELIN, CITEOS Lyon

14h30 – 15h15 : TECHNICAL INSIGHT

- Technologies for storage: existing market, assets and shortcomings
- Management of self-consumption without and with storage
 - Tony DELAPLAGNE (INES)

15h15 – 16h : EUROPEAN FEEDBACKS

- Presentation of the results from STORES
- Data analysis from 35 pilot plants
 - Noémie POIZE (AURA-EE)

16h – 17h : DEMONSTRATIONS DE SITES FRANCAIS

- Testimonies from local installers on existing plants
 - Jean-Philippe LANSARD, SOLARAVIS
 - Philippe Dalla-Nora, HABITAT Belle Planète

5.6 Final questionnaire /answers

Numerous oral exchanges took place, mostly on technologies, battery ageing, environmental impacts of the Lithium-ion solutions and relation with electric vehicles.

Moreover, an evaluation form was sent by email after the training to assess the quality of the event. The answers are presented in Figure 1.

1) Global appreciation

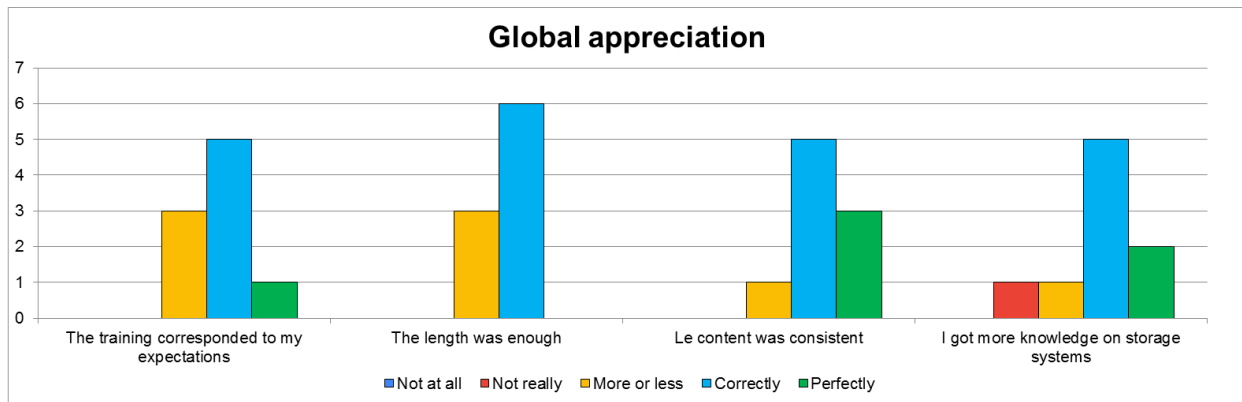


Figure 1: Evaluation results

2) What did the participants like most?

The technical presentation of INES was very interesting and would have needed more time (the reason why the appreciation on length is not so positive). More globally, all the technical inputs were really appreciated.

The presentations of the installers were also very appreciated since they were based on ground experience. The examples which were presented were very concrete.

3) What did the participants like least?

The first presentation was a bit too generic.

Not enough information was provided on the costs and the economic aspects.

The length was too short.

4) What should be improved?

The technical presentations should be longer.

More solutions of storage, apart from batteries, should be presented.

5) Other comments

The diversity of the speakers was really interesting.

This kind of event should be replicated.

The organization was very good.

5.7 Photos

Figures 2 present some photos during the event.



Figure 2: Pictures of the event.

5.8 Material

The project flyer was provided to all participants.

The event schedule and the presentations of each speaker were not printed but sent by email to the participants.

6 Conclusions

The training course was a success, the participants appreciated to learn more about storage, which is not developed in France and thus, hardly promoted. Everybody shared the idea that it was necessary to start developing more projects, so as to get more experience on storage sizing, storage technologies, etc. The tools developed within the context of the StoRES project (StoRES *Living Lab* and StoRES *Online PV and Storage Optimisation Tool*) caught the attention since they really answer to the present needs of the stakeholders.



StoRES

Promotion of higher penetration of Distributed PV through storage for all

Priority Axis 2: Fostering low-carbon strategies and energy efficiency in specific MED territories: cities, islands and remote areas

2.2: To increase the share of renewable local energy sources in energy mix strategies and plans in specific MED territories

Deliverable n°: **4.5.3**

Deliverable Name: **Training reports (Greece)**

Disclaimer: This document reflects only the authors' view and the ERDF is not responsible for its contents or any use or exploitation of the information it contains

1 Document Info

Project Name	Promotion of higher penetration of Distributed PV through storage for all (StoRES)
Funding Scheme	ERDF
Work Package Number	WP4
Name of Work Package	Transferring
Number	D4.5.3
Title	Training report (Greece)
Dissemination Level	PU
Date	22.10.2019
Authors	Simona Ruggeri
Contributors / Reviewers	Angelos Nousedilis Nikolas Chatzigeorgiou
Status	Final

2 Document History

Date	Author	Action	Status
10.07.2019	Simona Ruggeri	1 st draft report	Draft
26.08.2019	Simona Ruggeri	2 nd draft report	Draft
18.10.2019	Angelos Nousedilis	Revised draft 1	Draft
22.10.2019	Simona Ruggeri	Finalization of report	Final

3 Contents

1	Document Info	2
2	Document History	2
3	Contents.....	3
4	Project summary.....	4
5	Introduction.....	5
6	Report on the training course in Greece.....	6
6.1	General purpose	6
6.2	Target audience.....	6
6.3	Consultants.....	6
6.4	Main contents of the course.....	6
6.5	Agenda.....	7
6.6	Final questionnaire/answers	8
6.7	Photos	10
6.8	Printed material	11
7	Conclusions.....	13

4 Project summary

The project addresses the development of an optimal policy for the effective integration of Renewable Energy Sources (RES) and Energy Storage Systems (ESS). The primary challenge is to achieve increased penetration of RES and predominantly photovoltaics (PV), in the energy mix of islands and rural areas in the Mediterranean (MED) region without compromising grid stability. The main objective of StoRES is to boost self-consumption in the MED region with the integration of optimal storage solutions. Testing coupled PV-ESS solutions in different pilot sites and taking into account local particularities for optimization, current barriers concerning grid reliability with higher RES deployment will be eliminated. In addition to this, the development and integration of the proposed solution at both residential and community levels and applying different policy scenarios will lift the barriers related to the grid integration of ESS and extend the practical knowledge about this technology. It is expected that all the shortcomings regarding the intermittent nature of PV energy for increased penetration into the energy mix will be addressed whilst maintaining smooth operation of the grid.

The project started on 1st of November 2016 and is expected to be completed within 36 months.

5 Introduction

With the aim of sharing the experience acquired during the project, each participating country organises training courses, in which the results, the knowledge acquired, together with some study cases are presented.

In the document, a report is offered for the workshop held in Thessaloniki, Greece, on the 10th of June 2019, organised by the Aristotle University of Thessaloniki (AUTH).

6 Report on the training course in Greece

A workshop and a training session for stakeholders and policy makers took place in Thessaloniki, Greece on the 10th of June 2019.

6.1 General purpose

The event was organized by the AUTH, so as to discuss the advantages and the challenges of ESS integration along with PVs, based on the outputs of the project activities and the experience gained so far through the StoRES project.

6.2 Target audience

The workshop under the title "Towards energy systems of tomorrow and the role of electrical energy storage" included presentations by the AUTH and other invited speakers. Invited speakers included representatives from the Greek Distribution System Operator (DSO), policy makers, academia, researchers and engineers, along with representatives from private companies and electricity providers. It should be mentioned that more than 40 people attended the workshop and the training session, whereas the outputs of the workshop were announced by the local and national press and television.

6.3 Consultants

The names of the consultants of the training are mentioned below.

- Grigoris K. Papagiannis, Professor, AUTH, Greece.
- Georgios C. Christoforidis, Professor, University of Western Macedonia (UoWM), Kozani, Greece
- Angelos I. Nousedilis, Researcher – PhD Candidate, AUTH, Thessaloniki, Greece.
- Georgios A. Barzegkar-Ntovom, Researcher – PhD Candidate, Democritus University of Thrace, Xanthi, Greece.

Specifically, Professor Papagiannis and Professor Christoforidis provided a brief description of the StoRES project, described the effectiveness of the use of ESSs alongside PVs and stimulated a discussion about the barriers of ESS integration. In addition, researchers from AUTH, Mr. Nousedilis and Mr. Barzegkar-Ntovom conducted the training session and demonstrated the "*Online storage optimization tool*", that was developed in the framework of the StoRES project tasks. Both researchers have contributed to the development of the tool.

6.4 Main contents of the course

Initially, as mentioned above, partners from AUTH and the UoWM presented the scope of the StoRES project, including information regarding challenges of ESS integration with PVs, representative outputs and results from the project's pilot

activities, as well as the scope of the project. In addition, during the first session of the workshop a representative of the Greek DSO presented the technical specifications for the installation of ESS for prosumers that produce electricity using either renewable energy sources or high efficiency combined heat and power plants. Furthermore, the project PEGASUS which promotes the efficient generation and the sustainable use of electricity by applying microgrids was introduced. Finally, plans and actions, which could be adopted by municipalities and could lead to an increase in energy savings and exploitation of renewables, were presented. After the presentations part, the attendants had the opportunity to participate in a round table to stimulate discussion regarding all the above-mentioned issues.

At the second part of the workshop, a training session for all workshop's attendees was conducted, including hands-on experience on the use of the "PV and storage optimization tool" through an interactive lab, which has been developed within the framework of the StoRES project. The tool aims to provide relevant information to interested stakeholders, investors and researchers regarding the optimal sizing of a hybrid PV and storage system in terms of the net present value of the investment. During the training session, various results were presented to the participants, taking into consideration actual techno-economic parameters of Greece, as well as considering different options of policy schemes.

6.5 Agenda

The training course's programme is presented below.

10:00-10:30	<i>Arrival of the Participants - Registration</i>
10:30-10:50 <i>(Session 1)</i>	Promotion of higher penetration of Distributed PV through storage for all. StoRES project. Professor, Grigoris Papagiannis, Aristotle University of Thessaloniki, StoRES Partner.
10:50-11:10	Technical specifications for the installation of electrical energy storage systems for prosumers using either renewable energy sources or high efficiency combined heat and power plants. Dimitra Telaki, Fotis Gakis Division of Regulatory Affairs, Greek Distribution System Operator.
11:10-11:30	Promotion of efficient generation and sustainable use of electricity by applying microgrids – PEGASUS project. Eftichia Mavrou – Centre for Renewable Energy Sources and Saving.

11:30-11:50	Plans and actions to promote energy savings and exploitation of renewables in municipalities.	
	Kostas Konstantinou – PhD, Mechanical Engineer, Development Agency of Eastern Thessaloniki’s Local Authorities.	
11:50-12:10	Evaluating outputs and results of StoRES pilot activities.	
	Associate Professor, Georgios Christoforidis, University of Western Macedonia, Kozani, Greece.	
12:10-12:30	Question time and concluding remarks/Discussion	
12:30-13:30	Lunch Break	
13:30-14:30 (<i>ession 2</i>)	Hall 1 <ul style="list-style-type: none"> Discussion (round table): <u>Topic:</u> Prospects and challenges for the penetration of ESS in Greece.	Hall 2 <ul style="list-style-type: none"> Training session for stakeholders on the use of the “PV and storage optimization tool”, which aims to provide relevant information regarding the optimal sizing of a hybrid PV and storage system. Presentation of indicative results taking into consideration technical and financial parameters of Greece.
14:30-15:00	Coffee break	
15:00-16:00		Hall 2 <ul style="list-style-type: none"> Hands-on experience on the use of the “PV and storage optimization tool” Question time and concluding remarks

6.6 Final questionnaire/answers

As can be seen in Fig. 1, at the end of the workshop a questionnaire was also provided to the attendees. The attendees were also asked to comment on possible improvements for subsequent training sessions.

	Strongly agree	Aggree	Neutral	Disagree	Strongly disagree
The workshop satisfied my expectations	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
The duration of the workshop was sufficient	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
The organization of the workshop was satisfactory	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
The contents of the presentations were interesting	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
My knowledge on electrical storage systems have been improved after the workshop	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
The training session on the <i>“PV and Storage Optimization Tool”</i> was satisfactory	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

Fig. 1. Final questionnaire.

From the survey analysis it was evident that participants assessed the event activities with the highest score available in the event evaluation forms. Furthermore, the technologies employed during the training session have been of a great success, since most of the attendees were more than satisfied with the content of the presentations presented, but also with the interactive session where the *“PV and Storage Optimization tool”* was demonstrated. Moreover, it should be mentioned that some participants indicated that their knowledge on the challenges of ESSs integration, have been improved after the end of the workshop.

Finally, several improvements for subsequent workshops have emerged throughout the satisfaction surveys. For example, it was emphasized that more details could be provided on technical issues, such as battery energy storage systems’ sizing. In addition, it was clarified that possible market modifications or other incentives that could promote storage integration in nearly zero-energy buildings should be discussed extensively.

6.7 Photos

Below some photos of the training session are provided. In the following figures, the first session of the workshop which included the presentations of StoRES partners and invited speakers, as well as the second session, i.e. presentation of the *"PV and storage optimization tool"*, are depicted.



Fig. 2. First session – speakers' presentations.



Fig. 3. Attendees of the training session.



Fig. 4. Demonstration of the "PV and Storage Optimization Tool".

6.8 Printed material

To all the participants a folder was given, containing the training session's agenda, the questionnaire, which was provided to the attendees at the end of the workshop, and a brochure (Fig. 5) which included information regarding StoRES primary goals and the main lessons learnt so far, throughout the project.

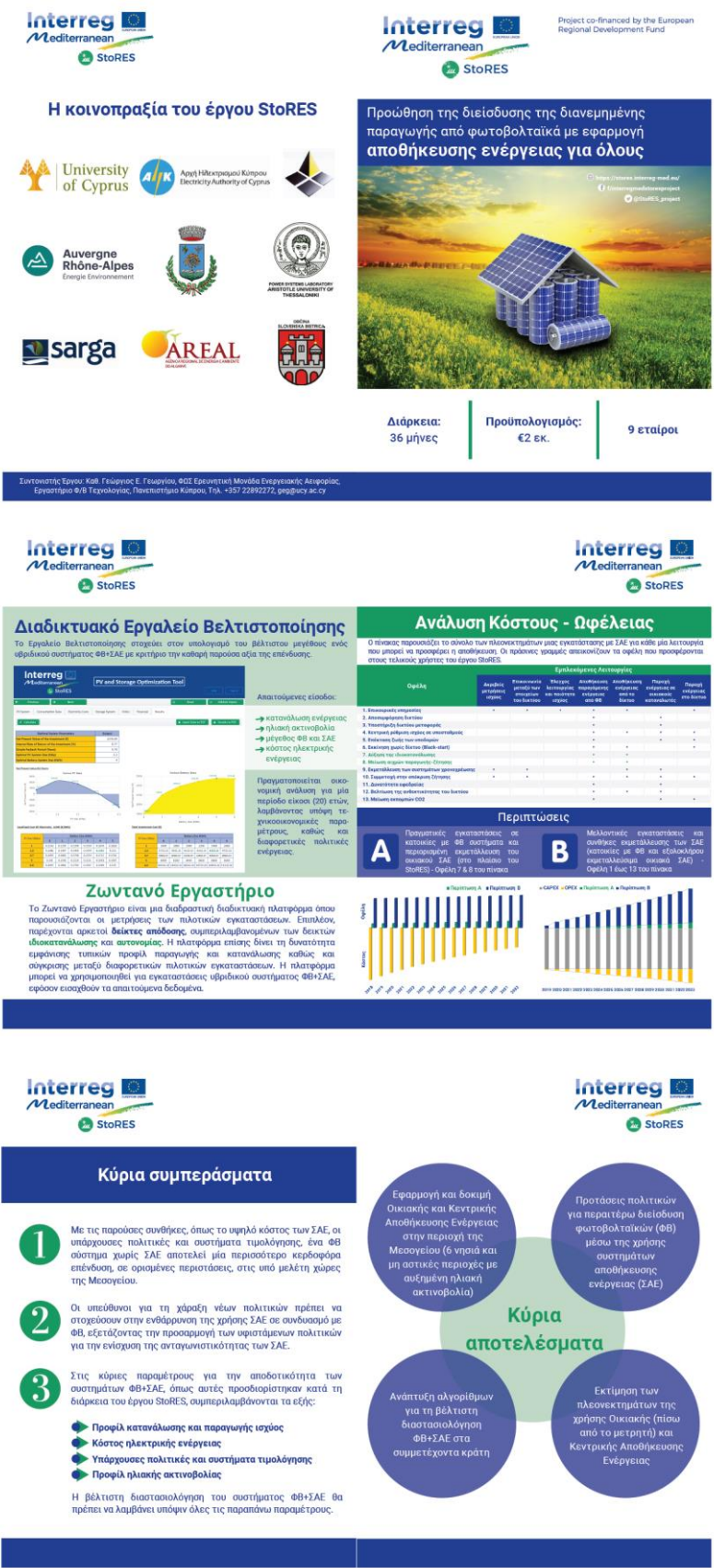


Fig. 5. Brochure

7 Conclusions

In the report, the workshop held in Thessaloniki is described. The aim of the workshop was to disseminate among the participants (Greek DSO, policy makers, academia, researchers, representatives from electricity providers) the outputs of the project activities and the experience gained so far through StoRES, as well as to discuss the advantages and the challenges of ESS integration along with PVs.

The analysis of the final questionnaire showed that the participants were more than satisfied with the workshop and the living-lab, where the *"PV and Storage Optimization Tool"* was presented. Finally, it is of great interest that many participants indicated that their knowledge on the challenges of ESSs integration, have been improved after the end of the training course.



StoRES

Promotion of higher penetration of Distributed PV through storage for all

Priority Axis 2: Fostering low-carbon strategies and energy efficiency in specific MED territories: cities, islands and remote areas

2.2: To increase the share of renewable local energy sources in energy mix strategies and plans in specific MED territories

Deliverable n°: **4.5.3**

Deliverable Name: **Training report (Italy)**

Disclaimer: This document reflects only the authors' view and the ERDF is not responsible for its contents or any use or exploitation of the information it contains

1 Document Info

Project Name	Promotion of higher penetration of Distributed PV through storage for all (StoRES)
Funding Scheme	ERDF
Work Package Number	WP4
Name of Work Package	Transferring
Number	D4.5.3
Title	Training report (Italy)
Dissemination Level	PU
Date	11.11.2019
Authors	Simona Ruggeri
Contributors / Reviewers	Angelos Nousdilis Nikolas Chatzigeorgiou
Status	Final

2 Document History

Date	Author	Action	Status
10.07.2019	Simona Ruggeri	1 st draft report	Draft
26.08.2019	Simona Ruggeri	2 nd draft report	Draft
21.10.2019	Susanna Mocci, Simona Ruggeri	Draft	Draft
11.11.2019	Susanna Mocci, Simona Ruggeri	Final	Final

3 Contents

1	Document Info	2
2	Document History	2
3	Contents.....	3
4	Project summary.....	4
5	Introduction.....	5
6	Report on the training course in Italy	6
6.1	General purpose	6
6.2	Target audience.....	6
6.3	Consultants.....	6
6.4	Main contents of the course.....	7
6.5	Agenda.....	8
6.6	Final questionnaire/answers	9
6.7	Photos	9
6.8	Training material	11
7	Conclusions.....	13

4 Project summary

The project addresses the development of an optimal policy for the effective integration of Renewable Energy Sources (RES) and Energy Storage Systems (ESS). The primary challenge is to achieve increased penetration of RES and predominantly photovoltaics (PV), in the energy mix of islands and rural areas in the Mediterranean (MED) region without compromising grid stability. The main objective of StoRES is to boost self-consumption in the MED region with the integration of optimal storage solutions. Testing coupled PV-ESS solutions in different pilot sites and taking into account local particularities for optimization, current barriers concerning grid reliability with higher RES deployment will be eliminated. In addition to this, the development and integration of the proposed solution at both residential and community levels and applying different policy scenarios will lift the barriers related to the grid integration of ESS and extend the practical knowledge about this technology. It is expected that all the shortcomings regarding the intermittent nature of PV energy for increased penetration into the energy mix will be addressed whilst maintaining smooth operation of the grid.

The project started on 1st of November 2016 and is expected to be completed within 36 months.

5 Introduction

With the aim of sharing the experience acquired during the project, each participating country organises training courses, in which the results, the knowledge acquired, together with some study cases are presented.

In the document, a report is offered for the training for stakeholder (combined with the workshop) held in Ussaramanna, Italy, on the 21st of October 2019, organised by the Municipality of Ussaramanna (MOU) together with the University of Cagliari (UNICA).

6 Report on the training course in Italy

The training course for stakeholders and the workshop entitled “StoRES – The role of the energy storage systems towards energy systems of tomorrow” took place in Ussaramanna, Italy, on the 21st of October 2019.

6.1 General purpose

The event was organized by the MOU and the UNICA, with the aim to involve the stakeholders in the advantages and the challenges of ESS combination with PVs, based on the outputs of the project activities and the experience gained through the StoRES project.

6.2 Target audience

Local politicians, members from Academia, researchers, inhabitants of Ussaramanna, installers, local authorities, representatives of the neighbouring municipalities, representatives from industries were invited to attend the training course through emails and the dissemination via social media (Linkedin, Facebook) supported by the Eventbrite platform.

30 people attended the event, and the contents of the workshop were announced by the local press and television, as it can be seen in *Fig. 1*.



Fig. 1. Two frames from the local television.

6.3 Consultants

The speakers of the training/workshop were:

- Marco Sideri (Mayor of Ussaramanna),
- Andrea Rubiu (Engineer, Municipality of Ussaramanna),
- Stefano Piras (Director for Energy Service and Green Economy - Autonomous Region of Sardinia),
- Celestino Pitzalis (President of Union of the Municipalities of Marmilla Area),
- Matteo Atzori (Engineer, Sun2Car),

- Emilo Ghiani (Professor, University of Cagliari),
- Susanna Mocci (Researcher, University of Cagliari),
- Fabrizio Pilo (Professor, University of Cagliari),
- Simona Ruggeri (Researcher, University of Cagliari).

6.4 Main contents of the course

More in detail, Marco Sideri conducted the event welcoming the attendees in his Municipality and introducing the speakers to the audience. After the introducing speech from the local Authorities, the event started with the presentation of Fabrizio Pilo who described the evolution of the Power Systems and the importance of the flexibility provided by the ESS in the future distribution network. Then Emilio Ghiani described the role of Local Energy Communities (LEC), underlying their importance mostly in islands/rural areas and in weak distribution networks. Then the attention was focused on the ongoing projects at regional and national level. Stefano Piras gave an overview on the current projects regarding RES and energy efficiency in Sardinia, describing their topics and the EU funds available. Sequentially, Emilio Ghiani talked about the projects in which UNICA-Department of Electric and Electronical engineering of Cagliari is involved (SEC, Virtual Energy, and POSEIDON). Then Matteo Atzori presented the project Sun2Car, focused on the development of an EV charging station network feed by surplus production of PV systems that will allow the increasing of the interest in commercial activities located in small communities avoiding the range anxiety. Successively, Stefano Caccini gave an overview of CLEAR 2.0 Project (Enabling Consumers to be Engage with and Adopt Renewable energy technologies) that aims at guiding the consumers to the efficient use of domestic renewable and low-carbon energy technologies. In the project, IT_PILOT 1 is also involved with an additional smart meter installed and monitored.

After the coffee break, Andrea Rubiu and Marco Sideri described the positive impact of the StoRES project in their Municipality, focusing the attention on the increase of knowledge among the employees as well as the difficulties faced, the revenue for the owners of the PV+ESS and the visibility obtained by the Municipality. Then Susanna Mocci provided an exhaustive description of the project: she presented the scope of the StoRES project (partners involved, their activity, the main characteristics of the pilots), provided technical information regarding challenges of ESS integration with PVs, illustrated the main results and the outputs from the project's pilot activities. Finally, Simona Ruggeri presented the StoRES Online PV and Storage Optimization Tool and the StoRES Living Lab platforms, showing how to effectively use the tools. During the question time the attendees were invited to answer to the questionnaire (the questions and the results are showed in the next paragraphs).

In the afternoon the owners of the Pilot sites where invited to describe their experience to the audience, giving a very interesting feedback about their involvement.

6.5 Agenda

In Table 1, the agenda of the event is reported.

Table 1- Agenda of the event.

09:00 – 09:30	Registration
09:30 – 09:50	Introduction and welcome to the Participants <ul style="list-style-type: none"> - Marco Sideri (Municipality of Ussaramanna) - Fabrizio Pilo (Director of DIEE - UniCA) - Stefano Piras (Director for Energy Service and Green Economy - Autonomous Region of Sardinia) - Celestino Pitzalis (President of Union of the Municipalities of Marmilla Area)
09:50 – 10:10	Power system evolution: flexibility's role toward the energetic transition - Fabrizio Pilo (UniCA)
10:10 – 10:30	Energy storage systems and innovative technologies for energy communities - Emilio Ghiani (UniCA)
10:30 – 11:00	RES and energy efficiency: strategic project of the Sardinia Region - Stefano Piras (RAS) Related projects (<i>SEC, POSEIDON, Virtual Energy, Clear 2.0, Sun2Car</i>)
11:00 – 11:20	Coffee break
11:20 – 11:50	StoRES – The Municipality of Ussaramanna experience Marco Sideri, Andrea Rubiu
11:50 – 12:10	StoRES – Description of the project and main results - Susanna Mocci (UniCA)
12:10 – 12:30	StoRES tools demonstration - Simona Ruggeri (UniCA) <ul style="list-style-type: none"> • Online storage optimization tool (<i>storestool.eu</i>) • StoRES Living Lab (<i>www.stores-livinglab.eu</i>)
12:30 – 13:00	Question Time
13:00 – 14:30	Lunch
14:30 – 16:30	Prosumers point of view

6.6 Final questionnaire/answers

In Fig. 2, the questions provided to the attendees are presented. Moreover, the attendees were also asked to comment on possible improvements for future training sessions.

Please rate your level of agreement (1=strongly agree, 5=strongly disagree)

	1	2	3	4	5
The training met my expectation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The length of the training was enough	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The training contents was well organised	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presentation were effective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My knowledge on the topic increased as a result of the training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fig. 2. Final questionnaire.

From the survey analysis, it emerges that almost all the participants appreciated the event as well as its organization, stating that it allowed increasing their knowledge on the topic. Several suggestions were provided in the second part of the questionnaire. For instance, it has been required more emphasis on specific critical aspects (e.g. during the installation and the management) and on the incurred costs, and on the use of electric vehicles. The speeches’ concreteness and the presentation of the living lab and the optimization tool were appreciated too.

6.7 Photos

Below some photos depicting the most salient phases of the event are introduced in Figures 3-7. The photos show the attendees and the invited speakers during some sessions, the printed and visual material used to involve them.



Fig. 3. Some of the attendees waiting for the beginning of the event.



Fig. 4. Welcome session.



Fig. 5. Presentation of Sardinian research project on RES.



Fig. 6. Conclusion of the session on the StoRES tool.



Fig. 7. Evening session: a prosumer describes his experience.

6.8 Training material

Regarding the printed material (*Fig. 8*), a folder containing the training session's agenda, the questionnaire and a flyer (*Fig. 9*) which included information regarding StoRES primary goals and the main lessons learnt throughout the project was provided to the attendees. Moreover, a certificated of attendance to the training was given at the end of the event (**Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.**).



Fig. 8. Printed material provided to the attendees

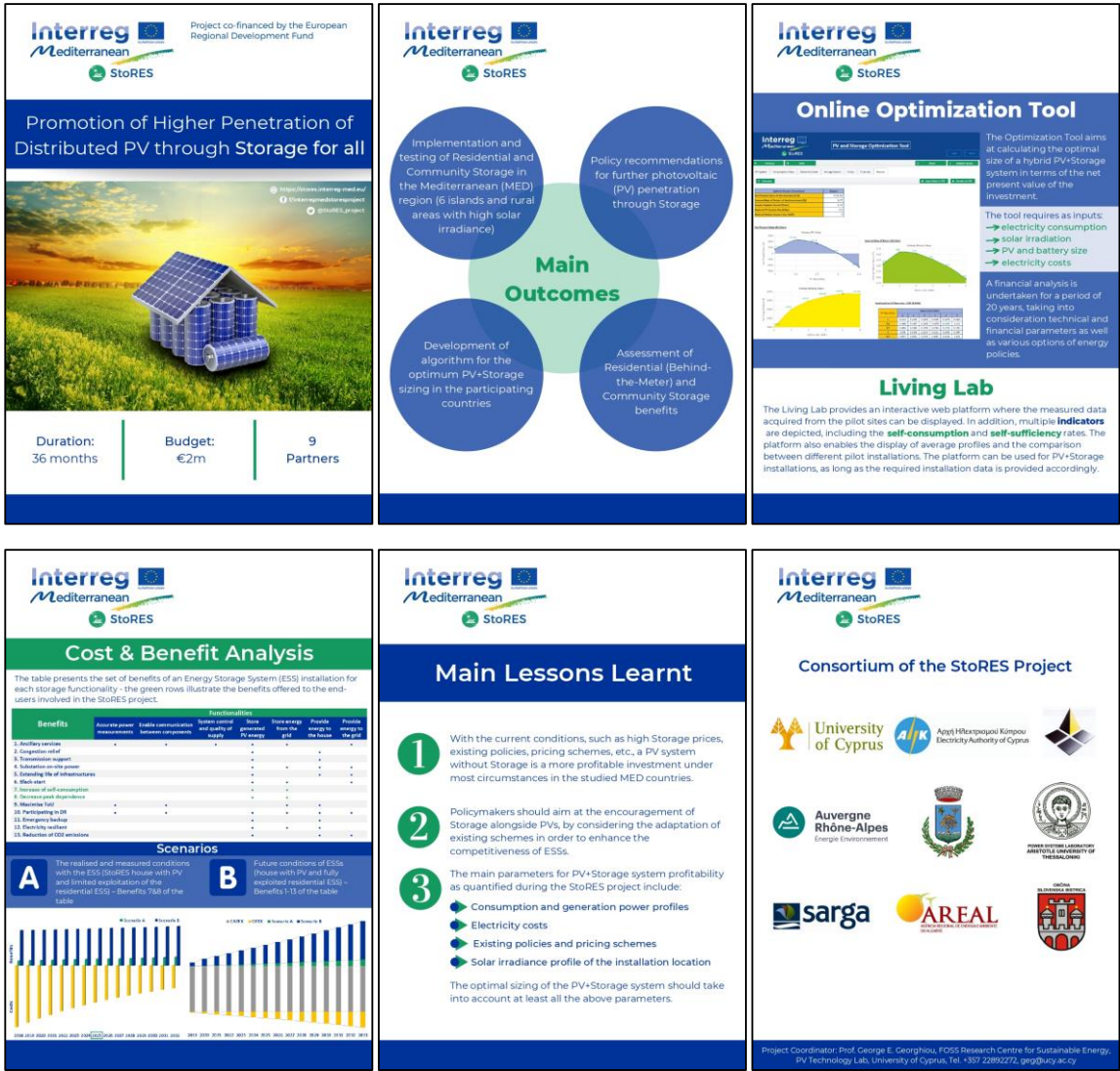


Fig. 9. Detail on the flyer provided to the attendees



Fig. 10. Certificate of attendance.

Regarding the visual material, the videos produced during the project were showed on the background during the registration. Moreover, also the infographic and the banner were exposed in the room.

7 Conclusions

In the report, the training course organised together with the workshop held in Ussaramanna is described. The aim of the training was to disseminate among the participants (local policy makers, representative from academia, researchers, installers) the outputs of the project activities and the experience gained thanks

to the StoRES project, as well as to discuss the importance of the flexibility and the advantages of ESS integration with PVs.

The analysis of the final questionnaire showed that the objectives have been achieved since the participants indicated that their knowledge on the topic has been improved thanks the training course. Moreover, the questionnaire underlined that people are really interested on the topic and requires more information regarding financial aspects and critical technical issues.



StoRES

Promotion of higher penetration of Distributed PV through storage for all

Priority Axis 2: Fostering low-carbon strategies and energy efficiency in specific MED territories: cities, islands and remote areas

2.2: To increase the share of renewable local energy sources in energy mix strategies and plans in specific MED territories

Deliverable n°: **4.5.3**

Deliverable Name: **Training report (Portugal)**

Disclaimer: This document reflects only the authors' view and the ERDF is not responsible for its contents or any use or exploitation of the information it contains

1 Document Info

Project Name	Promotion of higher penetration of Distributed PV through storage for all (StoRES)
Funding Scheme	ERDF
Work Package Number	WP4
Name of Work Package	Transferring
Number	D4.5.3
Title	Training report (Portugal)
Dissemination Level	PU
Date	30.10.2019
Authors	Simona Ruggeri, Hugo Rodrigues
Contributors / Reviewers	Angelos Nousedilis Nikolas Chatzigeorgiou
Status	Final

2 Document History

Date	Author	Action	Status
10.07.2019	Simona Ruggeri	1 st draft report	Draft
26.08.2019	Simona Ruggeri	2 nd draft report	Draft
30.10.2019	Simona Ruggeri, Hugo Rodrigues	Finalization of report	Final

3 Contents

1	Document Info	2
2	Document History	2
3	Contents.....	3
4	Project summary	4
5	Introduction.....	4
6	Report on the training course in Portugal	4
6.1	General purpose	5
6.2	Target audience	5
6.3	Consultants.....	5
6.4	Main contents of the course.....	5
6.5	Agenda.....	7
6.6	Final questionnaire/answers	8
6.7	Photos	9
6.8	Flyer	11
6.9	Printed material	13
7	Conclusions.....	15

4 Project summary

The project addresses the development of an optimal policy for the effective integration of Renewable Energy Sources (RES) and Energy Storage Systems (ESS). The primary challenge is to achieve increased penetration of RES and predominantly photovoltaics (PV), in the energy mix of islands and rural areas in the Mediterranean (MED) region without compromising grid stability. The main objective of StoRES is to boost self-consumption in the MED region with the integration of optimal storage solutions. Testing coupled PV-ESS solutions in different pilot sites and taking into account local particularities for optimization, current barriers concerning grid reliability with higher RES deployment will be eliminated. In addition to this, the development and integration of the proposed solution at both residential and community levels and applying different policy scenarios will lift the barriers related to the grid integration of ESS and extend the practical knowledge about this technology. It is expected that all the shortcomings regarding the intermittent nature of PV energy for increased penetration into the energy mix will be addressed whilst maintaining smooth operation of the grid.

The project started on 1st of November 2016 and is expected to be completed within 36 months.

5 Introduction

With the aim of sharing the experience acquired during the project, each participating country organises training courses in which the results, the knowledge acquired, together with some study cases are presented.

Using a common format, one report is constructed per country. In particular, the contents of the training (with the national perspective), the summary and an evaluation of the results in terms of Memorandums of Understanding (MoUs) achieved will be described.

In the document, the training course held in Loulé, Portugal on Friday, 18th October 2019 and was organised by the Regional Energy and Environment Agency of Algarve (AREAL) is reported.

6 Report on the training course in Portugal

The training course/workshop in Portugal was delivered on Friday, 18th October 2019, by AREAL. It was entitled "Energy Storage Systems: Innovative Solutions to Promote Low Carbon Strategies and Increase Renewable Energy Sources in the Energy Mix" and took place at the Palácio Gama Lobo, facilities of the Municipality of Loulé in Loulé with a duration of approximately 3.5 hours.

The event was free, open to the general public although an additional effort was made to invite municipal technicians as an essential part of complementing awareness of MoU signing with municipalities. The room capacity was approximately 50 places and 39 participants were present. In the final part, the eight representatives of the municipalities that signed the MoU were present, mostly presidents.

6.1 General purpose

The main context of the training course/workshop was to disseminate the results of the StoRES project, namely the aspects that support the implementation of renewable energy solutions with special focus on photovoltaic technology, with integration of ESS, using the appropriate instruments and services.

To this end, during the training, some experiences that resulted from the StoRES project were shared, namely the results associated with the implemented pilots. In addition, some important tools have been demonstrated and made available, such as the StoRES Living Lab and the StoRES Online Storage Optimization Tool.

In the final part, a MoU Signing Ceremony was held between several municipalities of the Algarve Region. This act aimed to involve local/regional authorities in the creation of a regional cooperation network for the self-consumption of renewable energy and energy communities with the objective of fostering the increased implementation of PV energy solutions and energy storage in the Algarve region.

6.2 Target audience

The target audience of the event was municipalities, municipal companies, public authorities, the scientific community, services providers and the general public. However, the training course was mainly targeting municipalities technical staff as support elements for the initiatives that may result under the signed MoU.

It was also important to note the presence of some regional media, which were particularly interested in covering the timing of the MoU Signing Ceremony.

6.3 Consultants

The training session was delivered by Mr Hugo Rodrigues (AREAL project manager), Eng. Carlos Laia (Managing Director at CEEETA-eco) and Prof. Jânio Monteiro, (Adjunct Professor of the Electrical Engineering Department, Higher Institute of Engineering, University of Algarve).

6.4 Main contents of the course

The training session included four complementary parts:

1. The first part served to frame the StoRES project, presenting the main objectives, results and pilot implementations.

2. The second part presented the context of PV self-consumption from the perspective of residential consumers, addressing technologies and their main benefits and associated average costs.
3. The third part allowed to expose the theme of ESS, analysing the national and international context and its importance in the concept of energy communities. In addition, the potential of the tools developed during the StoRES project (StoRES Living Lab and StoRES Online Storage Optimization Tool) were demonstrated.
4. In the last part, the MoU Signing Ceremony took place.

6.5 Agenda

Figure 1 introduces the agenda of the training course/workshop.



Project co-financed by the European
Regional Development Fund



Sessão de Formação / Workshop

**“Sistemas de Armazenamento de Energia: Soluções inovadoras
para promover estratégias de baixo carbono e aumentar fontes
de energia renováveis no *mix* de energia”**

18 de outubro de 2019

Palácio Gama Lobo, Loulé

Coordenadas GPS: [37°08'29.41 N 8°01'23.67 O](#)


AGENDA

09.15 – 09.30	<i>Receção dos Participantes</i>
09.30 – 09.50	<i>Projeto Europeu StoRES - Promotion of higher penetration of distributed PV through storage for all - AREAL</i> Principais objetivos, resultados Implementação de pilotos: barreiras, soluções adotadas e perspetivas
09.50 – 10.30	<i>Autoconsumo Fotovoltaico na perspetiva de consumidores residenciais – Carlos Laia, CEEETA-eco</i> Tecnologias Principais benefícios e custos associados Exemplos de instalações
10.30 – 10.45	<i>Coffee break</i>
10.45 – 11.45	<i>Sistemas de Armazenamento de Energia – Prof. Jânio Monteiro, UAlg</i> Contexto Internacional e Nacional Redes Energéticas Inteligentes Comunidade Energéticas Armazenamento de energia com ligação à rede Ferramenta de Otimização PV+Storage: StoRes Project
11.45 – 12.15	<i>Debate</i>
12.15 – 12.45	<i>Cerimónia de Assinatura do Memorando de Entendimento - Municípios / Projeto StoRES</i>
12.45	<i>Encerramento</i>


Figure 1: Agenda of the training course in Portugal.

6.6 Final questionnaire/answers


A satisfaction survey/questionnaire, as it can be seen in Figure 2, was provided to the audience to be filled after the end of the training course.



Interreg
Mediterranean



Project co-financed by the European
Regional Development Fund



AREAL
AGÊNCIA REGIONAL DE ENERGIA E AMBIENTE
DO ALGARVE

Inquérito de Avaliação

Sessão de Formação / Workshop

“Sistemas de Armazenamento de Energia: Soluções inovadoras para
promover estratégias de baixo carbono e aumentar fontes de energia
renováveis no *mix* de energia”

18 de outubro de 2019

Por favor complete o inquérito de avaliação relacionado com a Sessão de Formação / Workshop sobre
Sistemas de Armazenamento de Energia. Os seus comentários são importantes para garantir a organização
de sessões de formação eficazes e informativas no futuro. O inquérito é opcional e todos os dados
fornecidos serão tratados de forma anónima.

Nome (opcional): _____

Email (opcional): _____

Área de atividade: _____

Por favor avalie o seu nível de concordância relativamente a cada uma das afirmações abaixo mencionadas
(assinale uma caixa por afirmação)

	Concordo plenamente	Concordo	Não concordo nem discordo	Discordo	Discordo totalmente
A formação correspondeu às minhas expectativas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A duração da formação foi suficiente	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O conteúdo da formação foi bem organizado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
As apresentações foram de interesse e eficazes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Esta formação foi importante para aumentar o meu conhecimento sobre Sistemas de Armazenamento de Energia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

O que mais gostou na sessão de formação / Workshop?

Em que aspetos a sessão de formação / workshop pode ser melhorada?

Outros comentários

Agradecemos o tempo dispensado!!

Figure 2: Satisfaction survey/questionnaire in Portugal.

From the group of 39 participants, 14 answered to the survey, available in the folder provided along with other documents. Most of the participants were technicians/engineers from municipalities or municipal companies, linked to the department of electricity and energy efficiency.

In general, participants expressed their appreciation for the set of parameters/statements mentioned in the survey.

Regarding the open questions, the participants essentially highlighted the presentation of the pilot data, the availability of the StoRES tools and the clarity in the presentation of the contents by the speakers.

6.7 Photos



Figure 3: Presenter during the introduction of the training course in Portugal.



Figure 4: Presenter the StoRES toll during the training course in Portugal.



Figure 5: Presenter during the introduction of the MoU signature in Portugal.



Figure 6: Group of representatives of municipalities that signed the MoU in Portugal.

6.8 Flyer

Figure 7 illustrates the flyer of the project that was disseminated for the purposes of the training course.

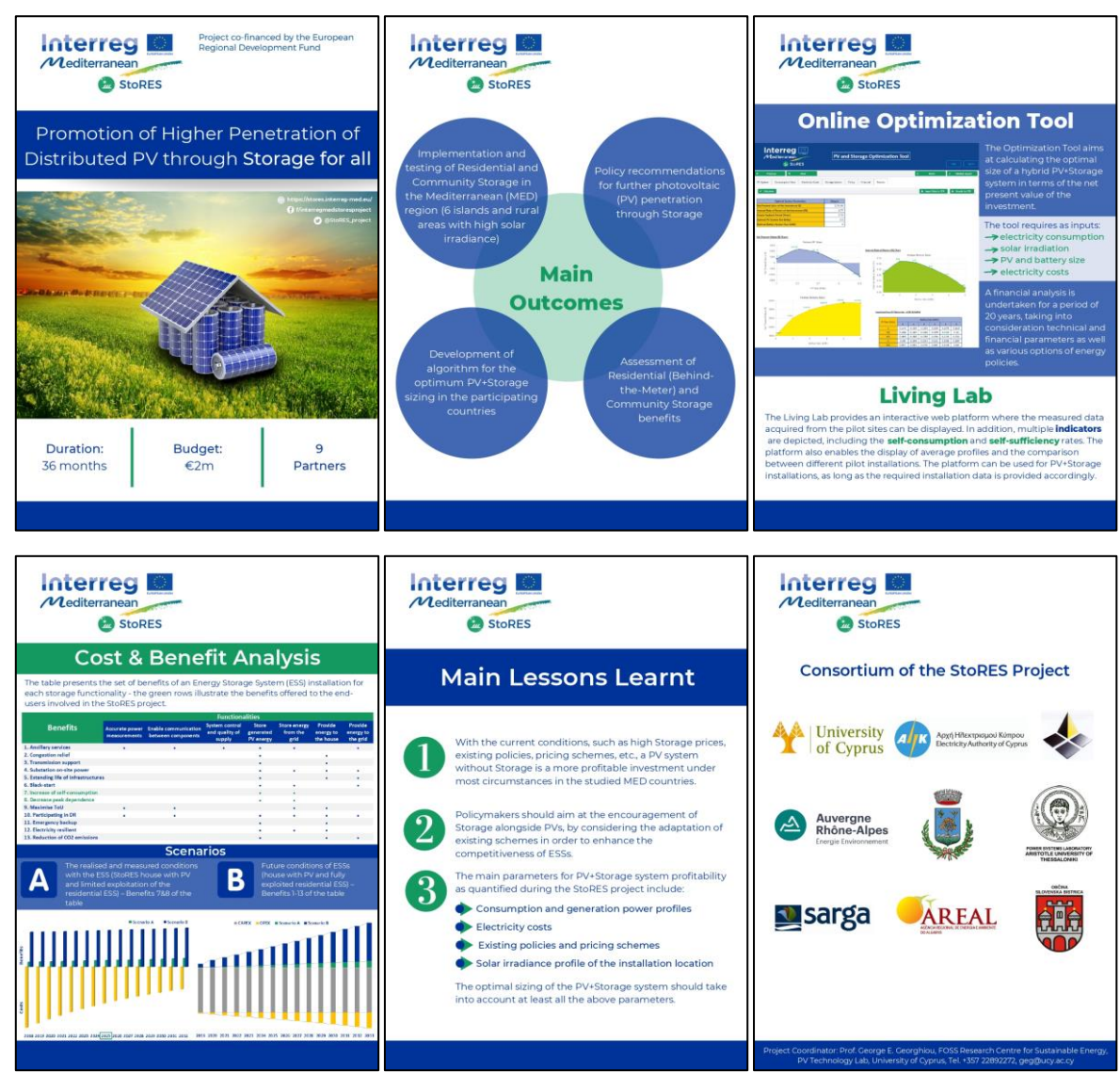


Figure 7: Flyer of the project disseminated during the training course in Portugal.

gra
ou



na

6.9 Printed material

To all the participants was given a kit, containing the flyer of the project, the infographics, the satisfaction survey and program of the training session, as it can be seen in Figure 9. A Certificate of Attendance was provided at the end of the course, as it can be seen in Figure 10.

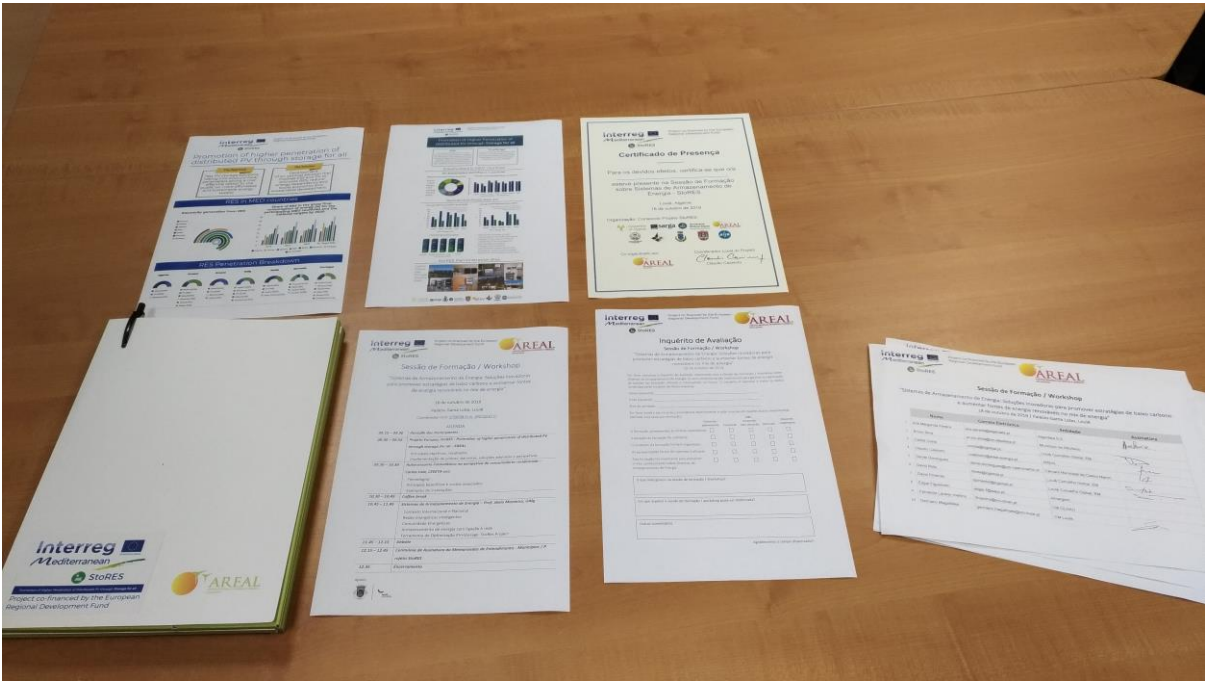


Figure 9: Printed material during the training course in Portugal.



Figure 10: Certificate of Attendance awarded to the participants during the training course in Portugal.

7 Conclusions

This report describes the training course combined with the workshop held in Portugal. The aim of the course was to disseminate among the participants the results obtained and stimulate the local/regional authority to promote wider adoption and replication of the project outcomes.

In the end, all participants demonstrated their satisfaction, which proved the success of the initiative. In general, everyone indicated that they learned more about implementing ESS coupled with PV, indicating the pilot installations and tools developed within the StoRES project (StoRES Living Lab and StoRES Online Storage Optimisation Tool) as an important support for future implementations.

At the same time, the strong adhesion of municipalities interested in signing the MoU confirmed the importance of the project for the Algarve region. After the MoU signing ceremony, other municipalities expressed their interest in signing the MoU. This political intention favours the continued application of project objectives, even after the project is finished.



StoRES

Promotion of higher penetration of Distributed PV through storage for all

Priority Axis 2: Fostering low-carbon strategies and energy efficiency in specific MED territories: cities, islands and remote areas

2.2: To increase the share of renewable local energy sources in energy mix strategies and plans in specific MED territories

Deliverable n°: **4.5.3**

Deliverable Name: **Training report (Slovenia)**

Disclaimer: This document reflects only the authors' view and the ERDF is not responsible for its contents or any use or exploitation of the information it contains

1 Document Info

Project Name	Promotion of higher penetration of Distributed PV through storage for all (StoRES)
Funding Scheme	ERDF
Work Package Number	WP4
Name of Work Package	Transferring
Number	D4.5.3
Title	Training report (Slovenia)
Dissemination Level	PU
Date	11.11.2018
Authors	Simona Ruggeri, Ajda Vernik
Contributors / Reviewers	Angelos Nousedilis Nikolas Chatzigeorgiou
Status	Final

2 Document History

Date	Author	Action	Status
10.07.2019	Simona Ruggeri	1 st draft report	Draft v1
26.08.2019	Simona Ruggeri	2 nd draft report	Draft v2
13.10.2019	Simona Ruggeri	Finalization	Draft v3
15.10.2019	Ajda Vernik	Finalization	Draft v3
11.11.2019	Simona Ruggeri	Finalization	Final

3 Contents

1	Document Info	2
2	Document History	2
3	Contents.....	3
4	Project summary.....	4
5	Introduction.....	5
6	Report on the training course in Slovenia	6
6.1	General purpose	6
6.2	Target audience.....	6
6.3	Consultants.....	6
6.4	Main contents of the course.....	6
6.5	Agenda.....	6
6.6	Final questionnaire/answers	7
6.7	Photos	8
6.8	Flyer	9
6.9	Printed material	9
7	Conclusions.....	10

4 Project summary

The project addresses the development of an optimal policy for the effective integration of Renewable Energy Sources (RES) and Energy Storage Systems (ESS). The primary challenge is to achieve increased penetration of RES and predominantly photovoltaics (PV), in the energy mix of islands and rural areas in the Mediterranean (MED) region without compromising grid stability. The main objective of StoRES is to boost self-consumption in the MED region with the integration of optimal storage solutions. Testing coupled PV-ESS solutions in different pilot sites and taking into account local particularities for optimization, current barriers concerning grid reliability with higher RES deployment will be eliminated. In addition to this, the development and integration of the proposed solution at both residential and community levels and applying different policy scenarios will lift the barriers related to the grid integration of ESS and extend the practical knowledge about this technology. It is expected that all the shortcomings regarding the intermittent nature of PV energy for increased penetration into the energy mix will be addressed whilst maintaining smooth operation of the grid.

The project started on 1st of November 2016 and is expected to be completed within 36 months.

5 Introduction

With the aim of sharing the experience acquired during the project, each participating country organises training courses in which the results, the knowledge acquired, together with some study cases are presented.

Using a common format, one report is constructed per country. In particular, the contents of the training (with the national perspective), the summary and an evaluation of the results in terms of an evaluation survey are described.

In the document, the training course held in Slovenska Bistrica, Slovenia on Wednesday, 9th October 2019, and was organised by the Municipality of Slovenska Bistrica together with Development Information Centre Slovenska Bistrica.

6 Report on the training course in Slovenia

The training course in Slovenia was delivered on Wednesday, 9th October 2019, organised by the Municipality of Slovenska Bistrica. It was entitled "*Opportunities for investment and development in RES and Energy Storage*" and it took place at the Development Information Centre Slovenska Bistrica. The event was free of charge and it lasted approximately 2.5 hours.

6.1 General purpose

The main objective of the training was to disseminate the results of the StoRES project, including the developed tools (StoRES *Living Lab* and StoRES *Online PV and Storage Optimization Tool*), lessons learnt from the pilot installations and other results, as well as to present the state of the art, the effectiveness of ESS coupled with PV systems and potential future opportunities in this field.

6.2 Target audience

The target audience of the training included SMEs, investors, researchers, utilities, general public, energy consultants, small solar power plant owners, decision makers and DSOs. The training was attended by 13 stakeholders, mostly with technical background, such as researchers, investors and SMEs.

6.3 Consultants

The training was delivered by Peter Vrtič PhD, professor at the University of Maribor, Faculty of Energy Technology, who was involved with the project activities as an external expert.

6.4 Main contents of the course

At the training course we presented the current situation in the field of RES in Slovenia, the current legislation, obstacles and future possibilities. We presented the StoRES project activities, with the emphasis on the pilot implementation, the lessons learnt, the StoRES Living Lab with the extension of the *Living Lab* in Slovenia and the StoRES *Online PV and Storage Optimization Tool*.

6.5 Agenda

The training was held from 3:00 pm to 5:30 pm. The programme of the training was as follows:

State of the art	<ul style="list-style-type: none"> - Current situation in the field of RES use in Slovenia and potentials of utilization; - Legislation; - Available RES technologies (photovoltaics) and development trends; - The grid and microproduction - the role of energy storage.
	Coffee break
The StoRES project	<ul style="list-style-type: none"> - Presentation of the StoRES project - Promotion of higher penetration of Distributed PV through storage for all; - Presentation of the pilot installation in Slovenia, with ESS and the living lab; - Presentation of main findings regarding the operation of PV with ESS; - Challenges and solutions;
Opportunities	<ul style="list-style-type: none"> - Opportunities in the field of ESS obtained from RES; - Possibilities for future cooperation; - Discussion.

6.6 Final questionnaire/answers

After the training the participants were asked to fill out the questionnaire about their satisfaction with the training. The results are presented in Table 1.

Table 1: Evaluation survey summary of the training course in Slovenia

5-strongly agree, 4-agree, 3-neither agree, nor disagree, 2-disagree, 1-strongly disagree	Number of responses	Average answer
<i>The objective of the training was well defined.</i>	10	4,9
<i>The topics covered are relevant to me.</i>	10	4,7
<i>The contents was organized and easy to follow.</i>	10	4,9
<i>I am familiar with the topic.</i>	10	4,7
<i>The trainer was well prepared.</i>	10	4,9

As can be seen in Table 1 the participants were generally very satisfied with the training. In addition to the above question the participants had an opportunity to comment on what they liked and/or disliked about the training and what else they would like to know about this (or similar) topic. The comments they provided in the second part of the questionnaire were directed at satisfaction with the presenter and the topicality of information provided.

6.7 Photos

Following are two photos from the training course in Slovenia (Figures 1 and 2).





Figure 1: Training course in Slovenia



Figure 2: Training course in Slovenia

6.8 Flyer

Figure 3 presents the invitation with the agenda sent to the relevant stakeholders.

V sredo, 9. 10. 2019 med 15. in 17. uro, vas vljudno vabimo, da se udeležite izobraževanja

Priložnosti za investicije in razvoj na področju OVE ter skladiščenja energije

ki bo potekalo v sejni sobi Razvojno informacijskega centra Slovenska Bistrica,
Trg svobode 5, 2310 Slovenska Bistrica

VSEBINA

Trenutno stanje na področju obnovljive energije	<ul style="list-style-type: none"> • Trenutno stanje na področju koriščenja OVE v Sloveniji in potenciali koriščenja; • Zakonodaja; • Razpoložljive tehnologije izkoriščanja OVE (fotovoltaika) ter trendi razvoja; • Umeščanje mikroproizvodnje v omrežje in vloga skladiščenja energije.
Odmor	<ul style="list-style-type: none"> • Kava in prigrizek.
Predstavitve projekta StoRES	<ul style="list-style-type: none"> • Predstavitve projekta StoRES – Promocija večje rabe energije iz porazdeljenih fotovoltaičnih sistemov; • Predstavitve pilotne instalacije SE s hranilnikom in živega laboratorija; • Predstavitve ključnih ugotovitev glede delovanja sončnih elektrarn s hranilniki; • Izzivi in rešitve.
Priložnosti in ovire	<ul style="list-style-type: none"> • Poslovne priložnosti na področju skladiščenja energije pridobljene iz OVE; • Možnosti sodelovanja; • Diskusija.

Izobraževanje bo izvajal **izr. prof. dr. Peter Vrtič** iz Fakultete za energetiko, Univerze v Mariboru.

Dogodek je **BREZPLAČEN**. Namenjen je trenutnim in bodočim lastnikom malih sončnih elektrarn, (potencialnim) investitorjem, energetskim svetovalcem, ponudnikom in ostalim, ki jih tematika zanima.

Zaradi omejenega števila mest in lažje organizacije, vas prosimo, da svojo **udeležbo potrdite** na naslov ajda.vernik@slov-bistrica.si, najpozneje **do ponedeljka, 7. 10. 2019**.

Izobraževanje organiziramo v okviru projekta StoRES, Interreg Mediteran, ki je so-financiran s strani Evropskega sklada za regionalni razvoj.

Figure 3: Invitation with the agenda of the training course in Slovenia

6.9 Printed material

To all the participants was given a kit, containing the flyer of the training with the agenda, as well as both flyers of the StoRES project. A Certificate of Attendance was provided at the end of the course (Figure 4).



Figure 4: Certificate of attendance in Slovenia

7 Conclusions

In the report, the description of the training course held in Slovenska Bistrica is provided. The aim of the course was to disseminate the StoRES project results among SMEs, investors, researchers, utilities, general public, energy consultants, small solar power plant owners, decision makers and DSOs.

The analysis of the final questionnaire showed that the participants appreciated the training and are eager to adopt any new knowledge gained and disseminate the information with other relevant stakeholders.



StoRES

Promotion of higher penetration of Distributed PV through storage for all

Priority Axis 2: Fostering low-carbon strategies and energy efficiency in specific MED territories: cities, islands and remote areas

2.2: To increase the share of renewable local energy sources in energy mix strategies and plans in specific MED territories

Deliverable n°: **4.5.3**

Deliverable Name: **Training report (Cyprus)**

Disclaimer: This document reflects only the authors' view and the ERDF is not responsible for its contents or any use or exploitation of the information it contains

1 Document Info

Project Name	Promotion of higher penetration of Distributed PV through storage for all (StoRES)
Funding Scheme	ERDF
Work Package Number	WP4
Name of Work Package	Transferring
Number	D4.5.3
Title	Training report (Cyprus)
Dissemination Level	PU
Date	22.10.2019
Authors	Simona Ruggeri, Nikolas Chatzigeorgiou
Contributors / Reviewers	Simona Ruggeri, Nikolas Chatzigeorgiou, Angelos Nousedilis
Status	Final

2 Document History

Date	Author	Action	Status
10.07.2019	Simona Ruggeri	1 st draft report	Draft
26.08.2019	Simona Ruggeri	2 nd draft report	Draft
11.10.2019	Nikolas Chatzigeorgiou	Draft finalisation	Draft
22.10.2019	Simona Ruggeri	Finalization of report	Final

3 Contents

1	Document Info	2
2	Document History	2
3	Contents.....	3
4	Project summary.....	4
5	Introduction.....	4
6	Report on the training course in Cyprus.....	4
6.1	General purpose	5
6.2	Target audience.....	5
6.3	Consultants.....	5
6.4	Main contents of the course.....	5
6.5	Agenda.....	6
6.6	Final questionnaire/answers	7
6.7	Photos	9
6.8	Flyer	11
6.9	Printed material	13
7	Conclusions.....	15

4 Project summary

The project addresses the development of an optimal policy for the effective integration of Renewable Energy Sources (RES) and Energy Storage Systems (ESS). The primary challenge is to achieve increased penetration of RES and predominantly photovoltaics (PV), in the energy mix of islands and rural areas in the Mediterranean (MED) region without compromising grid stability. The main objective of StoRES is to boost self-consumption in the MED region with the integration of optimal storage solutions. Testing coupled PV-ESS solutions in different pilot sites and taking into account local particularities for optimization, current barriers concerning grid reliability with higher RES deployment will be eliminated. In addition to this, the development and integration of the proposed solution at both residential and community levels and applying different policy scenarios will lift the barriers related to the grid integration of ESS and extend the practical knowledge about this technology. It is expected that all the shortcomings regarding the intermittent nature of PV energy for increased penetration into the energy mix will be addressed whilst maintaining smooth operation of the grid.

The project started on 1st of November 2016 and is expected to be completed within 36 months.

5 Introduction

With the aim of sharing the experience acquired during the project, each participating country organises training courses in which the results, the knowledge acquired, together with some study cases are presented.

Using a common format, one report is constructed per country. In particular, the contents of the training (with the national perspective), the summary and an evaluation of the results in terms of an evaluation survey are described.

In the document, the training course held in Cyprus on Tuesday, 08/10/2019 and organised by the University of Cyprus (UCY) is reported.

6 Report on the training course in Cyprus

The training course in Cyprus was delivered on Tuesday, 8 October 2019, by the FOSS Research Centre for Sustainable Energy of the UCY. It was entitled "Training on Battery Energy Storage Systems coupled with Photovoltaics" and took place at the university's facilities in Nicosia with a duration of approximately 2.5 hours.

The attendance at the event was free, open to the public and initially limited to 15 places, as it was aimed to function mostly as a round-table discussion between interested parties, mainly engineers. However, due to the high amount of people interested in participating, according to the increased number of participation

applications (more than 20 individual applications), it was decided that the event would be open to all people that applied for participation (22 individuals).

6.1 General purpose

The main context of the workshop was to disseminate the results of the StoRES project. Moreover, to describe the effectiveness of the use of ESS coupled with PV systems, underlying the gained know-how and the barriers faced during the project, in order to encourage discussion on the use of storage at the domestic level and facilitate the spread of such technology in Cyprus. Finally, one of the main objectives of the course was to provide hands-on experience regarding the battery storage technology to the participants, as an implemented ESS pilot and the developed tools of the project, i.e. the StoRES *Living Lab* and the StoRES *Online Storage Optimisation Tool*, were demonstrated. Thus, specific emphasis was given to the technical aspects of the project.

6.2 Target audience

The target audience of the event was, among others, the local DSO and TSO, governmental authorities, municipalities, the scientific community, Non-Governmental Organisations (NGOs), other interested parties and the general public. However, the training course was targeting mostly engineers/installers and service providers, as specific emphasis was given to the technical aspects.

6.3 Consultants

The training course was delivered by the Director of the FOSS Research Centre for Sustainable Energy, Prof. George E. Georghiou, Dr Konstantina Panagiotou (post-doctoral researcher, Special Scientist/Electrical Engineer at FOSS) and Mr Nikolas Chatzigeorgiou (doctoral researcher and Special Scientist/Electrical Engineer at FOSS).

6.4 Main contents of the course

The training course was structured as follows:

- **15.00-15.15: Registration**
- **15.15-15.30: Introduction to PV + Battery Energy Storage Systems (BESS)**
Welcome note by the Director of FOSS and introduction to current PV+BESS application.
- **15.30-16.00: Different Configurations and System Implementation**
Presentation of the different topologies of PV+BESS, the implemented systems in Cyprus and their results.
- **16.00-17.00: Demonstration of FOSS PV+BESS Pilot and developed Tools**

Interactive session.

Participants have the opportunity for hands-on experience with the PV+BESS at FOSS.

Demonstration of developed tools (StoRES Living Lab & StoRES Online Storage Optimisation Tool)

- **17.00 – 17.15 Discussion and Closing Remarks**

Discuss the future exploitation of residential PV+BESS




The training course was held in two different places. The first one, where the participants initially arrived and all the oral presentations were performed, was the Conference Room of the PV Technology Laboratory at the New University Campus of the UCY. There, a projector and all necessary equipment were used to present the information (in MS PowerPoint presentations) in a coherent way.

Next, after the end of the presentations, the training course was transferred to the installation location of the PV+BESS pilot at the PV Technology Laboratory, where the pilot system was introduced to the participants and its operation was thoroughly explained.

Finally, the training was concluded at the Conference Room where the online portal for system monitoring and data collection of the Cypriot pilots was presented. In addition, the *StoRES Living Lab* and the *StoRES Online Storage Optimization Tool*, both developed in the context of the project, were demonstrated gaining significant attention among the audience.

6.5 Agenda

Figure 1 introduces the invitation and the agenda of the training course.

Training on Battery Energy Storage Systems coupled with Photovoltaics

08 October 2019
FOSS, Research Centre for Sustainable Energy,
University of Cyprus, Nicosia

Battery Energy Storage Systems (BESS) are expected to have a profound impact in our energy transition worldwide. As we shift to a low-carbon society and our electricity generation from renewable sources accelerates, BESS will have an ever-more important role to play. In Cyprus, for example, we have reliable sunshine making it an ideal location for using Photovoltaics (PV) to generate electricity and therefore management of our own resources is possible for everyone. In the near future, a considerable amount of intermittent solar generators will be connected in the electrical grid posing new challenges, in terms of secure and reliable grid operation. Therefore, it is crucial to boost PV self-consumption through optimal storage solution. This will assist in decentralizing our power supply. The storage system allows users to increase self-consumption from PV generation whilst controlling the amount of PV energy injected into the grid, thus not only avoiding grid congestion but also allowing for more installations. Citizens can turn into active prosumers, enabling the effective use of electricity grids, providing cost-effective options for a more affordable and sustainable energy supply.

Join us for this training to learn more about the latest developments in BESS and to obtain hands on experience. The training session is limited to a small number of people.

AGENDA

15.00 – 15.15	Registration	
15.15 – 15.30	Introduction to PV + Battery Energy Storage Systems (BESS) Welcome note by the director of FOSS, and introduction to current PV+BESS applications.	Prof G.E.Georgiou
15.30 – 16.00	Different Configurations and System Implementation Present the different topologies of PV+BESS. Discuss the different systems implemented in Cyprus.	Mr N. Chatzigeorgiou
16.00 – 16.45	Demonstration of FOSS PV+BESS Pilot and Developed Tools Interactive session. Participants will have the opportunity for hands on experience with the PV+BESS at FOSS. Demonstration of developed tools (StoRES Living Lab & StoRES Online Storage Optimisation Tool)	Mr N. Chatzigeorgiou / Dr K. Panagiotou
16.45 – 17.00	Discussion and Closing Remarks Discuss the future exploitation of residential PV+BESS.	Prof G.E.Georgiou

The event will take place at the FOSS, Photovoltaic Park (number 12 on map attached) and is free and open to public. The event is limited to 20 places.

RSVP by 07 October 2019 via email: lakeridou.michelle@ucy.ac.cy







 www.foos.ucy.ac.cy
 foos@ucy.ac.cy
 +357 22 892 211

Figure 1: Agenda of the training course in Cyprus.

6.6 Final questionnaire/answers

A satisfaction survey/questionnaire, as it can be seen in Figure 2, was provided to the audience to be filled after the end of the training course.

EVALUATION SURVEY

Training on Battery Energy Storage Systems coupled with Photovoltaics

Please complete the evaluation survey for today's training on Battery Energy Storage Systems coupled with Photovoltaics. Your feedback is valuable to us to ensure that we organize trainings that are effective and informative to you. The survey is optional and all data provided will be used anonymously.

Surname, Name (Optional) _____

Contact email (Optional) _____

Occupation _____

Please rate your level of agreement with the statements below (please tick one box per statement):

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
The training met my expectations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Length of the training was sufficient	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The training content was well organized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presentations were effective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My knowledge on Battery Energy Storage Systems coupled with Photovoltaics increased as a result of the training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What did you like most about the training?

What aspects of the training could be improved?

Other comments

Figure 2: Satisfaction survey/questionnaire in Cyprus.

6.6.1 Analysis of participation

The total number of participants was 22, more than it was initially planned. More specifically, 14 individuals were external participants and 8 were FOSS members not related to the project. Most of the participants (15) had a background in Electrical Engineering, as it was the main aim. Furthermore, most of the

participants came from private companies (11) operating in the energy sector of Cyprus. The second most popular organization of participants was the UCY (8).

Figure 3 illustrates the evaluation survey summary. In general, it can be seen that the training course received very good comments regarding all the evaluation parameters below and met the expectation of the audience to the greatest possible extent.

Evaluation Survey Summary

Statements	Number Responses	Mode	Average
The training met my expectations	12	1	1.4
Length of training was sufficient	12	1	1.5
The training content was well organized	12	1	1.1
Presentations were effective	12	1	1.2
My knowledge on Battery Energy Storage System coupled with Photovoltaics increased as a result of the training	12	2	1.6

Figure 3: Evaluation survey summary of the training course in Cyprus.

More specifically, among the aspects that gained the positive opinion of the participants were the effectiveness of transferring the speakers' knowledge to the audience, the well organisation of the training content, as well as the good rhythm and relation of the presented material. Some improvement recommendations from the audience regarded the use of even more technical explanations.

6.7 Photos

Figures 4-6 present some photos during the training course.



Figure 4: Presenter during the introduction of the training course in Cyprus.



Figure 5: Presenter during the training course in Cyprus.



Figure 6: Demonstration of developed tools during the training course in Cyprus.

6.8 Flyer

Figure 7 illustrates the flyer of the project that was disseminated for the purposes of the training course.

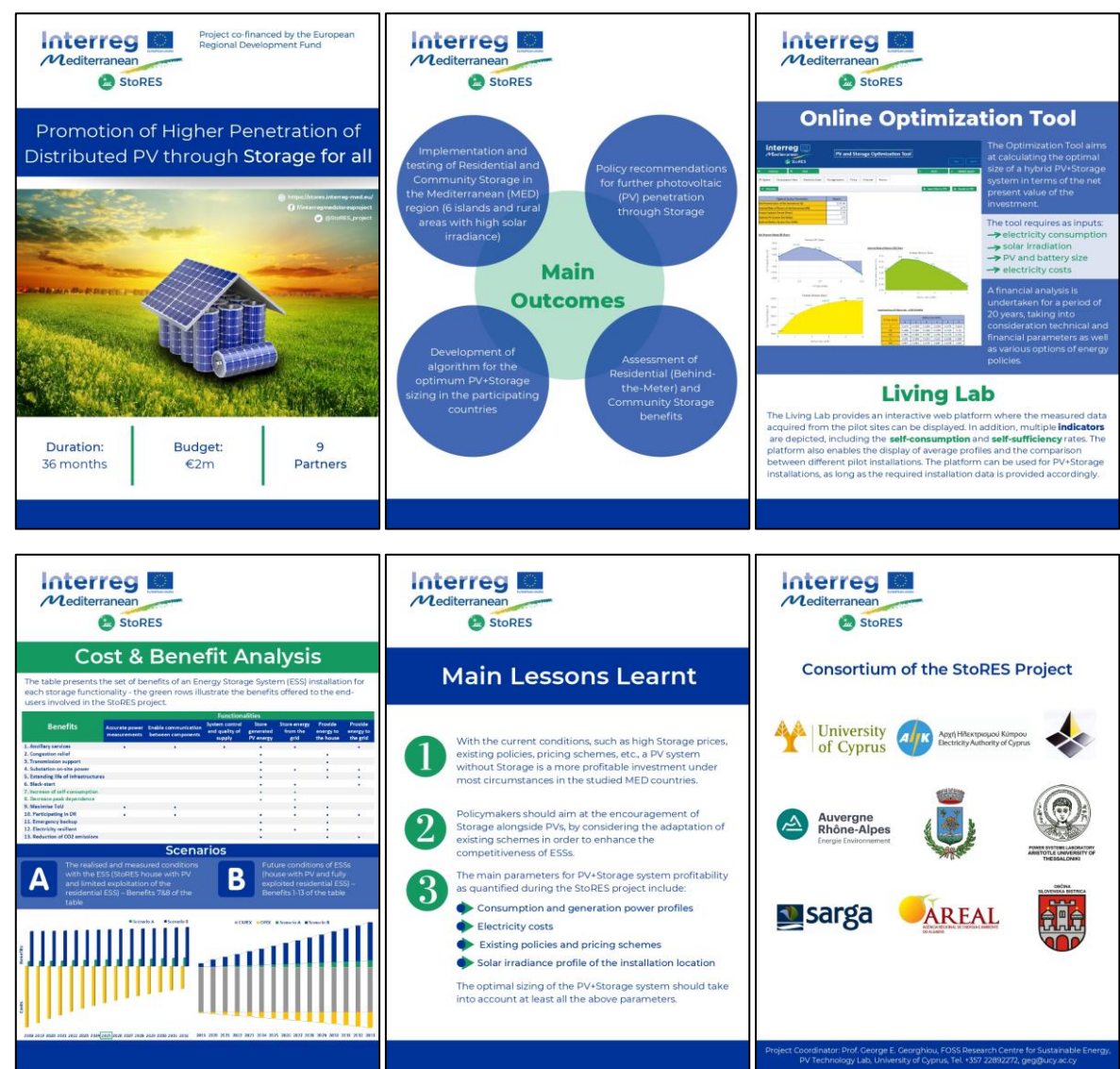


Figure 7: Flyer of the project disseminated during the training course in Cyprus.

Figure 8 demonstrates the project's infographics (issue 1 and 2 respectively) that were disseminated during the training course.

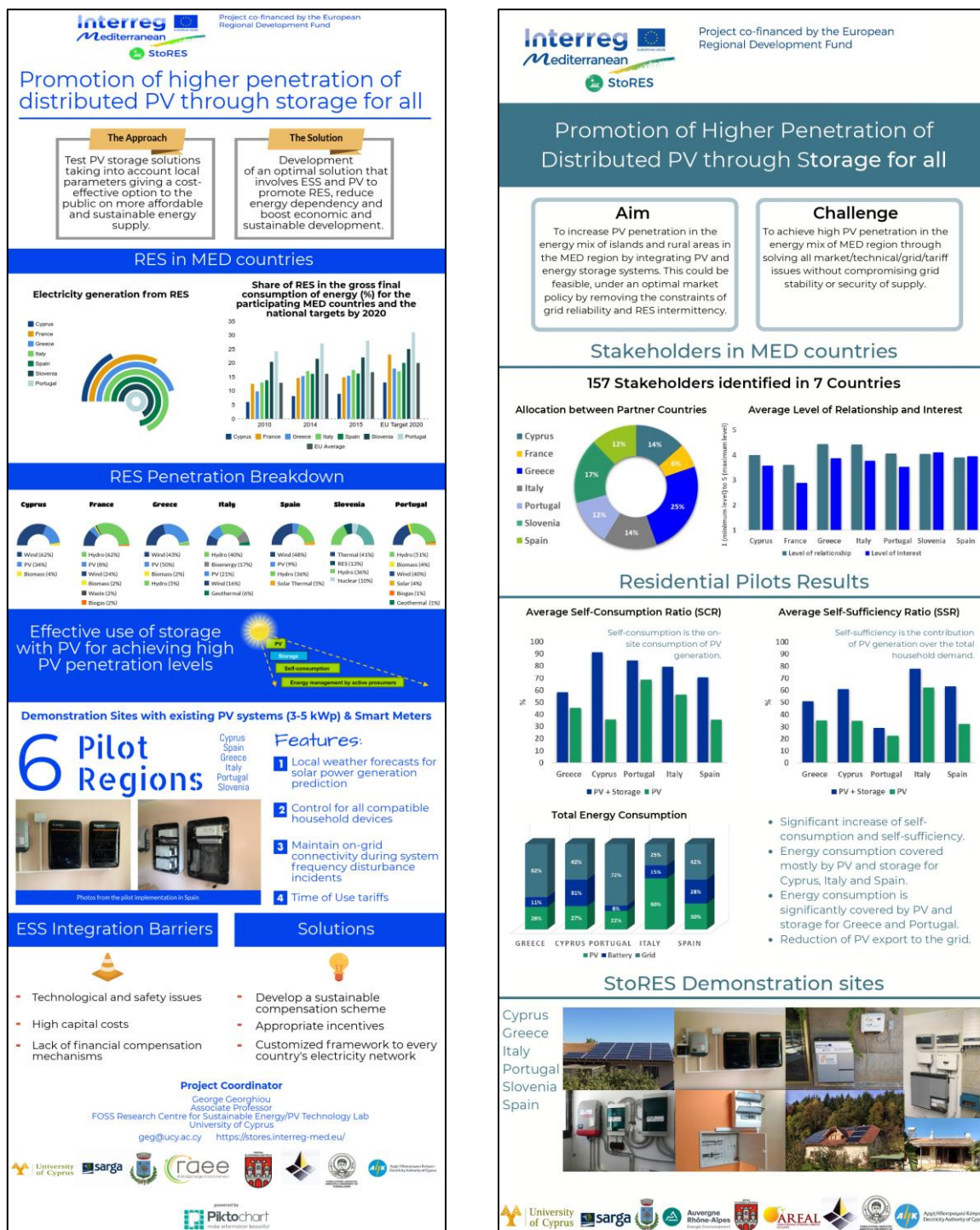


Figure 8: Infographics of the [project disseminated during the training course in Cyprus.

6.9 Printed material

To all the participants was given a kit, containing the flyer of the project, the project leaflet and the agenda of the training course, as it can be seen in Figure 9. A Certificate of Attendance was awarded at the end of the course, as it can be seen in Figure 10.



Figure 9: Printed material during the training course in Cyprus.



Figure 10: Certificate of Attendance awarded to the participants during the training course in Cyprus.

7 Conclusions

In the report, the description of the training course delivered in Cyprus is described. The aim of the course was to disseminate among the participants the project, its results, the lessons learnt and stimulate discussion on BESS coupled with PV at the residential level. Mostly, it was aimed to provide the participants with a hands-on experience of an actual ESS at the facilities of the PV Technology Laboratory of the UCY and disseminate the developed tools.

The analysis of the final questionnaire showed that the participants appreciated the course, which met their expectations to the greatest possible extent. Particular interest was noted about the implemented pilots, the know-how gained, and the barriers faced during the project.