Auvergne
Rhône-Alpes
Énergie - Environnement

Renewable energies

Project sheet StoRES :
Promotion of Higher Penetration of Distributed PV through Storage for all

Interreg Mediterranean StoRES

PROJECT OVERVIEW

The StoRES project aimed to increase the use of storage solutions for residential photovoltaic (PV) in rural and island areas, in order to improve the autonomy of producers and to reduce the impact of installations on electric networks. It has analysed the operation of 35 storage facilities coupled to small PV installations in 7 European countries and has drawn the lessons, both on the implementation conditions and on performance.

Tools to facilitate the sizing of the installation were developed. At macro level, a cost-benefit analysis was carried out and recommendations for support measures were formulated. Co-financed by the European Regional Development Fund and the Auvergne-Rhône-Alpes Region, the project was managed in the region by Auvergne-Rhône-Alpes Énergie Environnement.

GOALS AND MAIN STEPS

- Installation and instrumentation of 33 storage facilities for more than a year.
- Analysis of the installations' performance.
- Development of an economic simulation tool.
- Proposals for support measures.
- Training actions and technical workshops on storage coupled with PV.

TARGETS

Actors of the photovoltaic sector and residential producers, with a project approach more oriented towards research than field work.

INVOLVED ACTORS IN AUVERGNE-RHÔNE-ALPES

- Auvergne-Rhône-Alpes Énergie Environnement
- Cythelia Energy (data analysis)
- Innovales (training)
- Solarwatt (manufacturer) and Immo Belle Planete (installer, providing data on 2 French sites)

TOTAL BUDGET

€2M

out of which €1.7 M from the ERDF, allocated to the different partners

DURATION

November 2016 – October 2019

EUROPEAN PARTNERS

9 partners from 7 European countries: Cyprus, France, Greece, Italy, Portugal, Slovenia and Spain.

ACTIVITIES CARRIED OUT

Technical analysis

Instrumentation of the 35 pilot sites

The first phase of the project consisted in equipping 33 existing photovoltaic installations with storage batteries in 6 of the 7 partner countries. In France, there was no pilot site, but 2 existing installations could be identified and their monitoring data (collected over the same period of time) were included in the study. The analysed installations represent various technologies (Lithium-ion, Lead-acid) and also different configurations (AC or DC-coupled).

Map of the pilot sites studied



Photos of the pilot sites

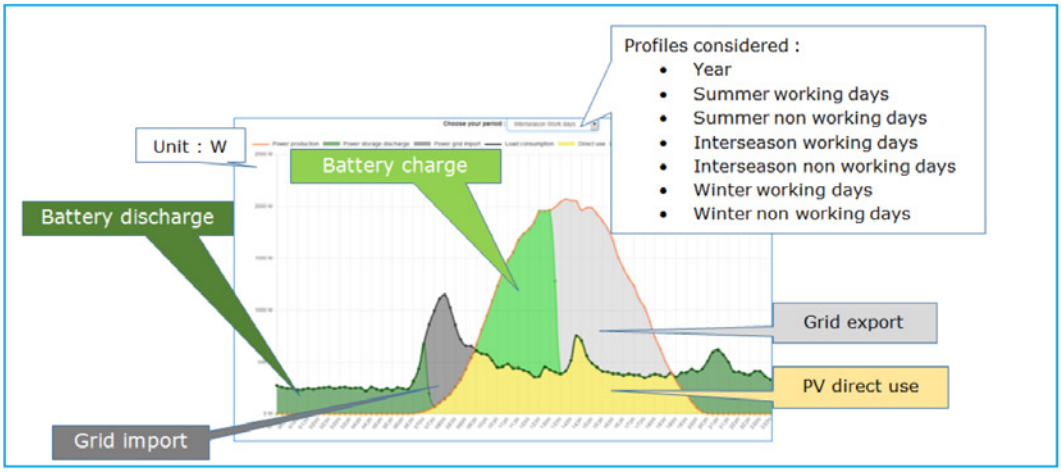
The main difficulties encountered during the installation were the following:

- The administrative procedures related to procurement and to network connection, as well as the insurance of the installations.
- The sizing, as consumer load profiles were not always available.
- The implementation of a monitoring system, adapted to the project (a defined list of parameters).

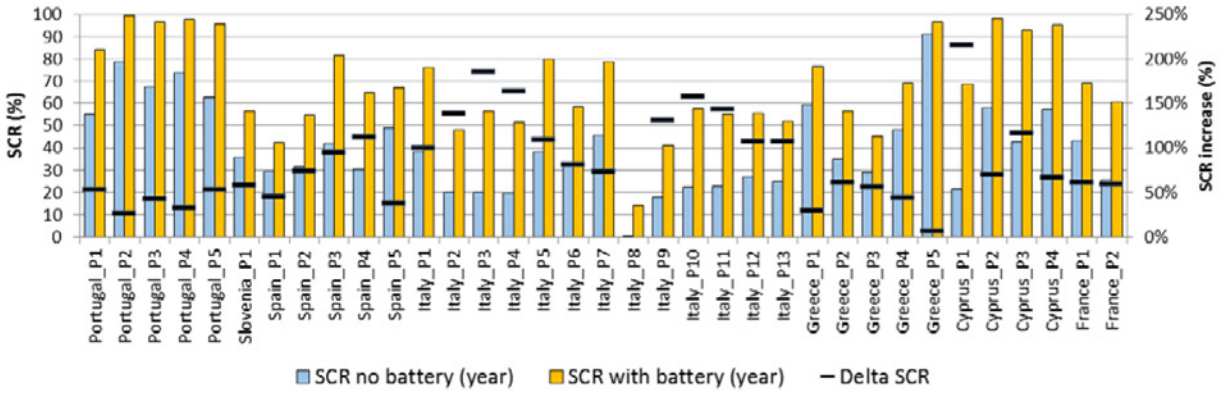
Data analysis

Data collection began during 2018 and continued until the end of the project, in October 2019. The data was acquired mainly at a 10 minutes timestep: power that is produced, consumed, self-consumed, stored, discharged, imported from the network, exported to the network, state of charge. Erroneous data were cleaned and corrected when possible.

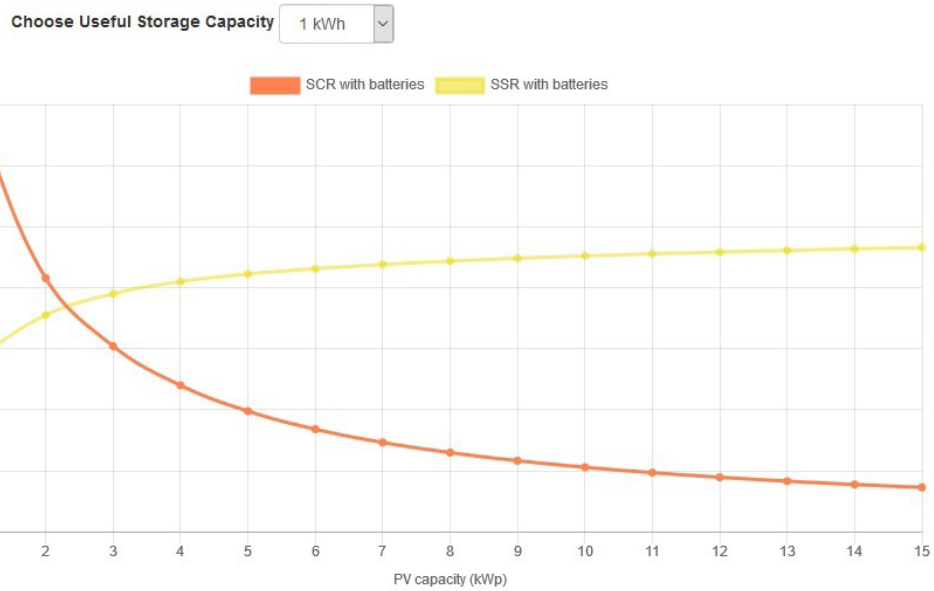
First, seasonal average profiles were studied for each pilot plant. Self-consumption and self-sufficiency rates were calculated with and without storage, in order to assess the impact of batteries on the performance improvement. This analysis was carried out taking into account the differences in the sizing and profiles of the studied sites. Thus, it was observed that the annual rate of self-consumption increases by an average of 85% and the rate of self-sufficiency increases by 62%. In addition, a parametric analysis (recalculation of the rates for different PV and battery sizes) also shows that for a given size of PV (or battery) installation, there is a maximum battery (or PV installation) size beyond which the self-sufficiency rate no longer increases.

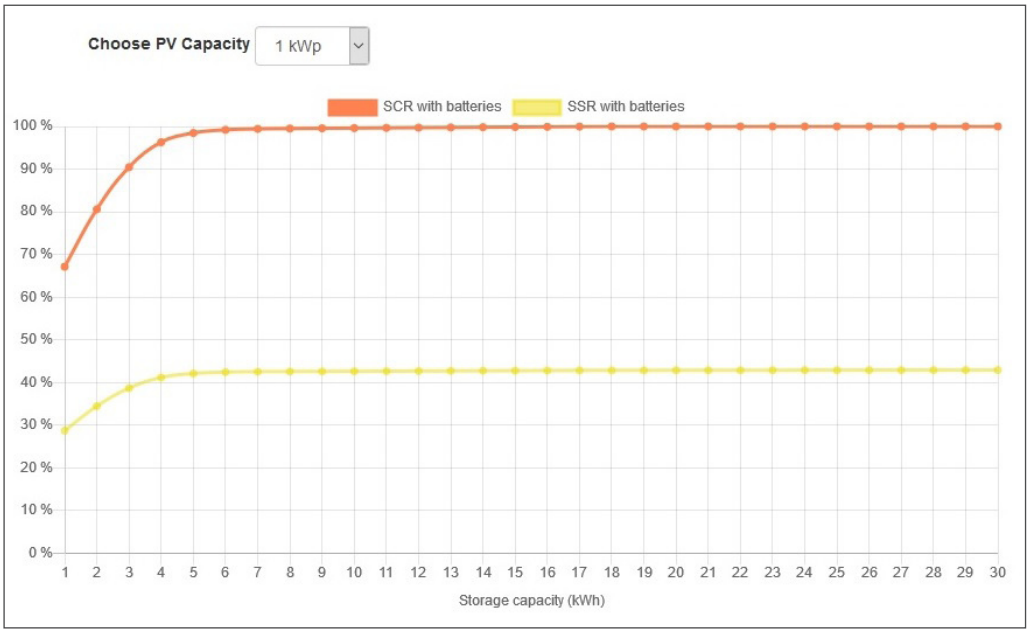


Example of seasonal profile



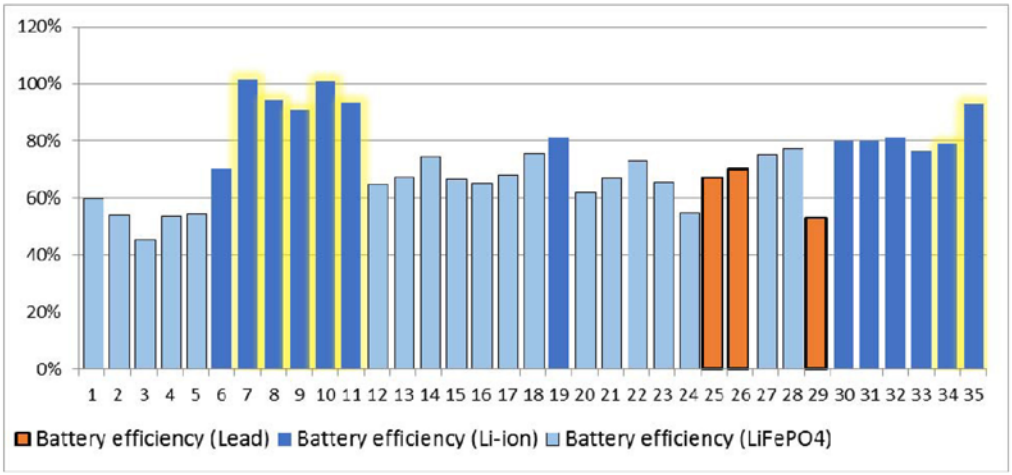
Impact of storage on self-consumption rates





Parametric study (rate of self-consumption and self-sufficiency depending on the system sizing)

Other analyses compared battery performance between different technologies and studied the load cycles.



Observed yields (in yellow, DC-coupled batteries)

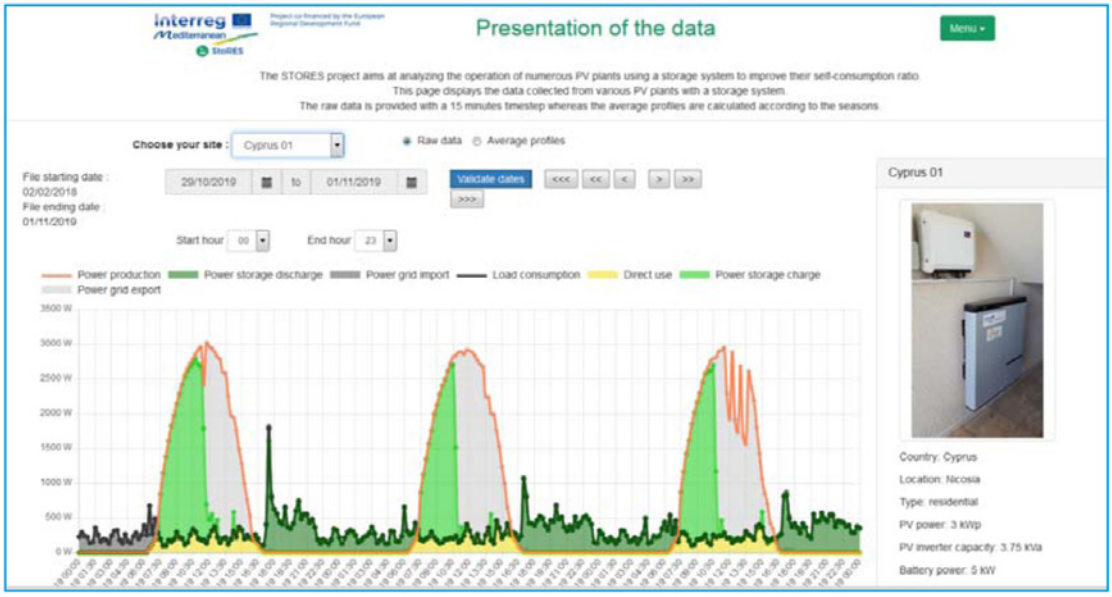
Finally, on a few pilot sites, the operating mode of the batteries was modified during the summer of 2019 to better take into account the impact on the grid. Indeed, a setting exclusively in favour of self-consumption tends not to avoid the meridian injection sites, whereas a time-spread load mode allows to better smooth the injection points.

Living Lab

All the raw and calculated data (average profiles, performance indicators, etc.) were put online on a web platform accessible to all: www.stores-livinglab.eu. This platform was developed by AURA-EE with Cythelia Energy on behalf of all European partners. It allows to:

- View all detailed data over the entire collection period.
- Compare up to 5 installations, including their performance.
- Make a parametric study to evaluate the sizing of the installation, and the evolution of self-consumption and self-sufficiency rates with different sizing.

This platform has been designed to continue collecting data for 3 years after the end of the project and private access has been set up for each partner. Thus, partners can update their data directly on the website.

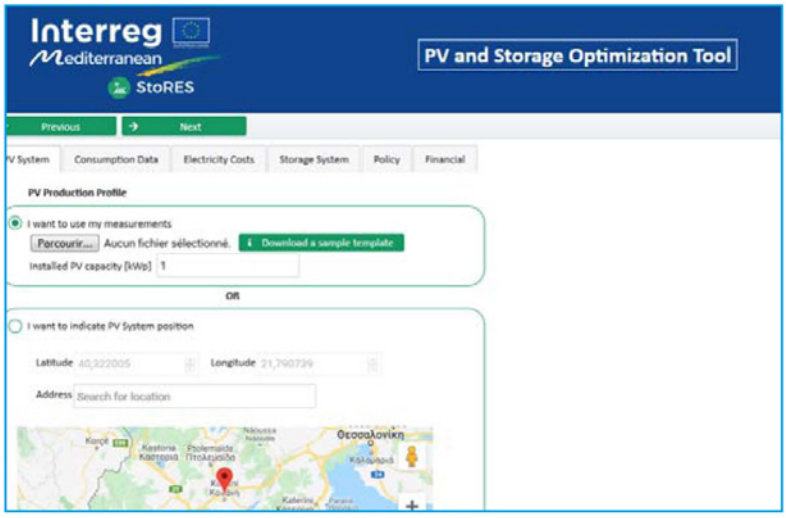


The Living Lab

Economic analysis

Economic simulation tool

An online tool, available at www.storestool.eu, was developed to simulate the economic viability of a PV installation with storage, taking into account different possible settings (electricity price, whether or not to enhance the value of the surplus, technical characteristics of the PV installation and battery, load profiles, etc.).



Economic simulation tool

The simulation results are used to display a Net Present Value (NPV) and a return time. The simulation can also be done parametrically, to define which battery size provides the best economic viability.

Results provided by the economic tool

Using this tool, a more comprehensive analysis was also conducted to estimate a “Standard User Cost” (LCOU – Levelized Cost of Use) of the global PV+Storage system, similar to the Levelized Cost of Energy (LCOE), usually used for photovoltaic. The results help to estimate for each country the current “distance” in relation to grid parity.

Cost-benefit analysis

A cost-benefit analysis has been developed based on the data provided by the pilot sites, but also on more generic hypotheses that use different functionalities offered by the storage. Several scenarios were compared, particularly considering different support policies that were implemented. Indeed, if no PV+Storage system has today a viable economic model, several measures could significantly improve this viability, such as the implementing net billing with adapted pricing, developing system services provided by the storage, or improving the installation sizing.

Policy recommendations

Regionalised scenarios

Based on the results of the analysis of the pilot sites and the statistical data collected for each pilot region (number of individual houses, average electricity consumption, etc.), a basic estimate of electricity savings was made and this could generate a massive expansion of storage in the residential sector. Taking into account the maximum number of main houses that can be equipped, a saving of 11% could be achieved. This rate rises to 6% if an average rate of equipped households is taken into account (thereby considering the constraints that are usually encountered).

Support measures

The main support measures that can encourage the development of storage systems are the following:

- Implement a net billing system with adapted price ranges;
- Facilitate the market access for service providers;
- Support the energy communities.

PROJECT RESOURCES AVAILABLE

Technical solutions

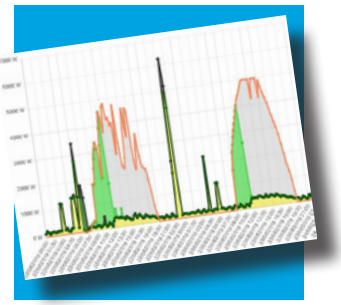
Description of the PV+Storage technical solutions, implemented in the pilot sites.

http://bit.ly/2ORy4i1

Data acquisition

Description of the acquisition and monitoring devices that were set up for data analysis.

http://bit.ly/2vrJRNe



Analysis of collected data

Analysis of the data collected at 15 minutes timestep on the 35 pilot sites (performance indicators, sizing, etc.).

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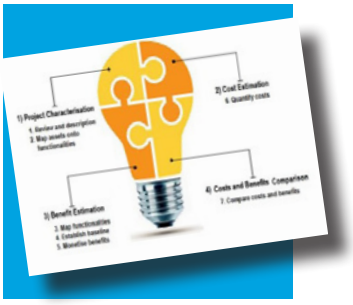


Cost-benefit analysis

An analysis at macro-scale of the costs and benefits related to the PV+Storage systems.

http://bit.ly/2SKukjL

Recommendations

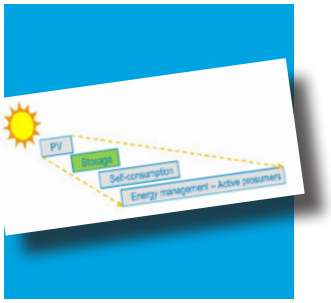
Synthesis of the recommendations proposed at the end of the project, concerning the evolution of tariffs, support policies and market rules.

http://bit.ly/38oY0tf

Economic simulation tool

The online tool, available at www.storestool.eu, can be used to simulate the economic viability of a PV+Storage solution, for different configurations in terms of installation size, electricity price, etc.

http://bit.ly/2w6cK1J



Experience feedback

Synthesis of the feedback from the field, lessons learnt from the pilot installations.

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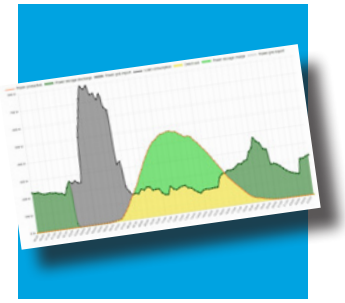

Living Lab

The www.stores-livinglab.eu platform provides the data and calculation of performance indicators, as well as the parametric analysis.

http://bit.ly/2uzlq0q

General recommendations

Synthesis of the project recommendations for members outside the consortium.

http://bit.ly/2SJoWwX

Layman's report

http://bit.ly/37orXZ4

FUTURE PROSPECTS

In the Auvergne-Rhône-Alpes Region, the market for storage coupled with residential photovoltaic is still very poorly developed due to the lack of a business model. However, StoRES has made several advancements: demonstrating in the field the impact of storage on the autonomy of photovoltaic installations; acquiring knowledge on the operation and configuration of systems; and noting that a more global consideration of the services provided to the electricity grid could help improving its economic viability. These elements prepare the development of a market in France, which can also be stimulated in the residential sector by the evolution of electric mobility (as it is already the case in the Auvergne-Rhône-Alpes Region).

TO FIND OUT MORE

- StoRES project website: https://stores.interreg-med.eu
- StoRES presentation leaflet: https://cutt.ly/HgddDG1
- The Living Lab: www.stores-livinglab.eu
- All the project deliverables: hhttps://stores.interreg-med.eu/what-we-achieve/deliverable-library

CONTACT IN AUVERGNE-RHÔNE-ALPES

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