Renewable Energies in Italian Touristic Islands

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AzzeroCO2
il clima nelle nostre mani

AZZEROCO$_2$

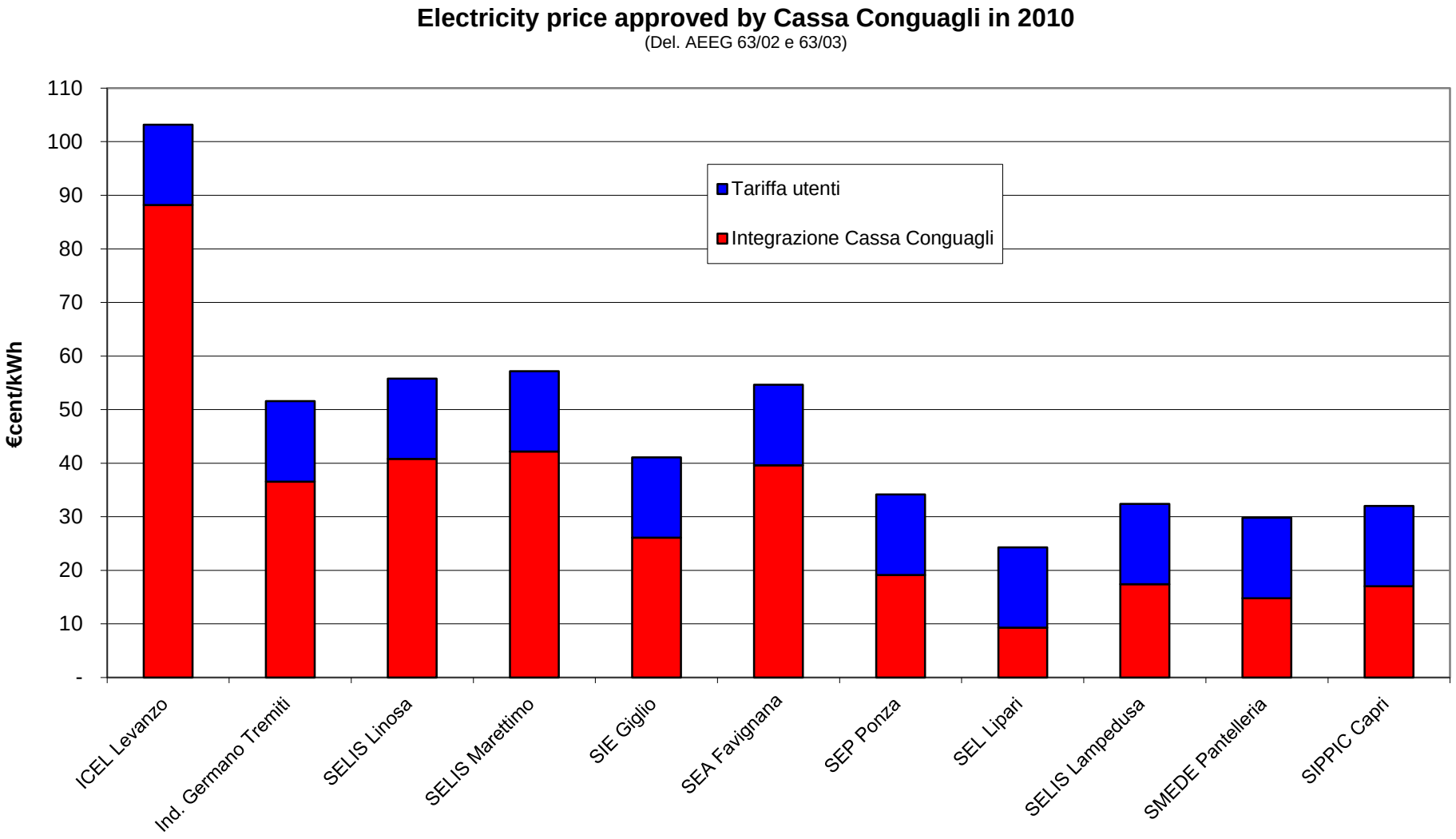
AzzeroCO$_2$ is a private company ltd created by Legambiente and Kyoto Club NGOs involved in the struggle against climate change: AzzeroCO$_2$ in Europe help companies, local administration and citizens in order to calculate, reduce and off-set greenhouse gas emissions.

AzzeroCO$_2$ act s as an ESCo (Energy Service Company), promoting the diffusion of renewable energies, sustainable mobility, energy efficiency technologies and policies, waste reduction and management.

ITALIAN SMALL ISLANDS IN NUMBERS

- 42 Small Islands
- 4 connected to the national grid
- 30 out of 42 host protected areas, regional or national protected parks;
- 38 fed by local diesel generators managed by 11 local distribution companies + ENEL;
- Electricity production cost is much higher than national tariff: kWh gross price rise in 2014 at the value of 1,4 €/kWh (ICEL Levanzo);
- This price is partly payed by final users (up to 0,2 €/kWh); for a large part it is payed by a state owned agency named Cassa Conguagli;
- Electricity thanks to the state contribution is farly the cheapest energy vector;
- Island population grows averegely by six –ten times in summer;

ELETRICITY PRICE



EFFECTS

- Energy consumptions, solid waste production and wasted water grow proportionally sometimes threthening the fragile island ecosystem;
- Electrical consumption represent more than 80% of the energy final uses: most of it is consumed in summer when the maximum solar radiation is available;

BARRIERS

- Renewable energies and energy efficiency are not spread at all on islands mainly for three reasons:
  1. The negative attitude of Public Authorities that must evaluate the landscape impact of new technologies;:
  2. The opposition of local energy producers that defend their monopolistic condition although a law of 1999 (dlgs 79/1999) ask them to introduce RES technologies and energy efficiency in the island energy sector;
  3. The low price of electricity for final users in respect with the production cost reduce investors interest in allocating financial resaources.

ITALIAN MINISTRY OF ENVIRONMENT ACTIONS

Several actions have been carried out by the Ministry of Environment in order to remove those barriers that block the island new energy deal.

A public tender was launched in order to select project presented by island local administrations.

Financial resources	**3.490.000 €** 60% dedicated to renewable energies and energy efficiency and 40% to sustainable transport
Duration	5 years 2008- 2013
Local administration	**Local administrations in small island**
Scope	Promotion of renewable energy, energety efficiency and sustainable transport
Contribution	**Up to 80%** of eligible costs

AZZEROCO2 PROPOSAL

The best proposal selected was the project of the Egadi Archipelago developed by AzzeroCO2 involving Favignana, Levanzo and Marettimo in order to foster the Renewable energy and energy efficiency integration in public and private sector through

- Direct intervention of the local administration in the coordination of the project not only for public interventions but for also for private;
- Definition of a guideline for the architectural integration of solar technologies in private sector, pre-approved by the Regional authority;
- Comunication campaign associated to the project involving Legambiente at a local, regional and national level;

Results are presented

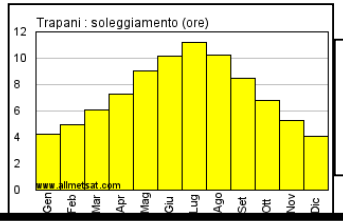
The deployment of the programme is subdivided into three parts:

1. Idea project development
2. Approval of public intervention and construction of guide lines for private
3. Comunication campaing and private interventions

EGADI TODAY

Land and solar availability:

zone EU Directive *Habitat 92/43/CEE*
PTP (piano territoriale paesistico) dal 2004

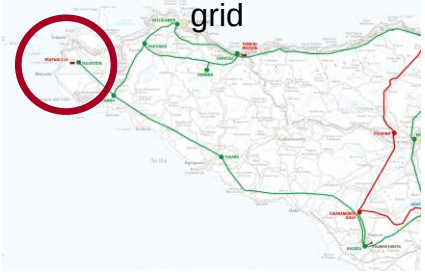


Solar radiation largely available all year: almost 1900 kWh/m2 y

•Small buildings
• Flat roofs and terraces edged by small white bricks fences 50 cm high

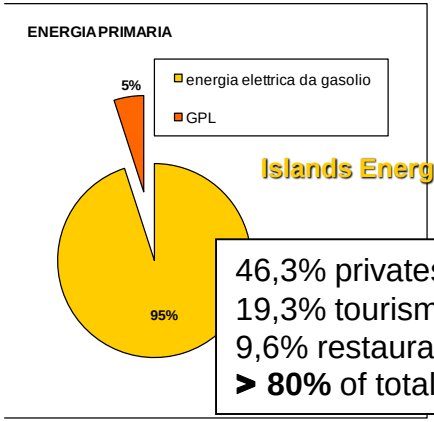
Energy:

Not connected to sicilian grid



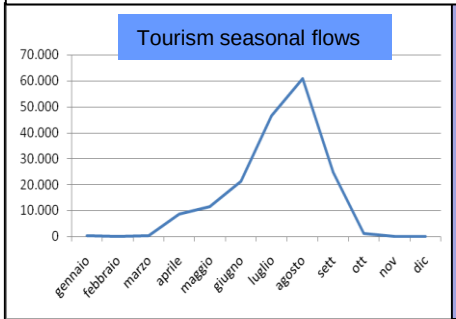
3 diesel generation plants
(oversized to face tourism seasonal flows)

Favignana	13.485.000 kWh/year
Levanzo	686.553 kWh/year
Marettimo	1.896.033 kWh/year
Tot. Emissions	**10.444 tonnCO2 year**



46,3% privates
19,3% tourism operators
9,6% restaurants/bar
> 80% of total cons.

Tourism:



Population rise by 6-10 times in summer entailing a large increase of traffic, electricity consumption, waste and waste water disposal and local pollution

Local transport:

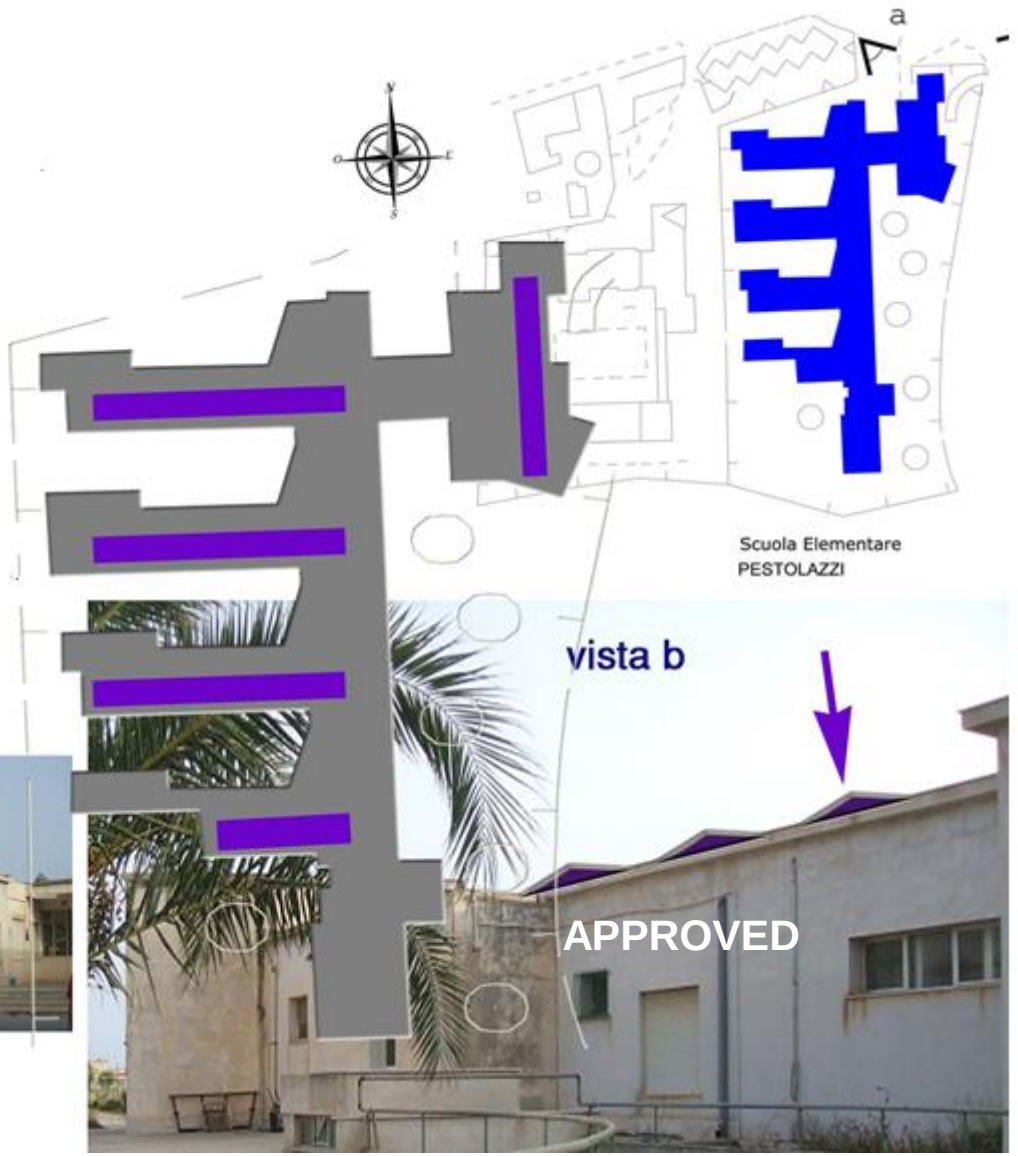
Scooter, cars, busses, quads, small trucks crowds streets in summer time stressing the inadeguate road system of the island.

ACTIVITIES PROGRAMME

Interventions	Favignana	Marettimo	Levanzo
PV System on public buildings	Scuola Media, Scuola Elementare	Scuola Elementare	Edificio Comunale
Solar thermal systems on public buildings	Sport Center (football)		
PV and Solar thermal systems for citizens	Gruppi d'acquisto (300 ST, 130 FV)	Gruppi d'acquisto (50 ST, 70 FV)	Gruppi d'acquisto (40 ST, 15 FV)
PV and Solar thermal systems for tourist sector	11 solar thermal plants 11 PV plants	2 solar thermal plants 2 PV plants	2 solar thermal plants 2 PV plants
Public sustainable transport	3 electric bus 3 PV Pensiline		
Private sustainable transport	60 electric scooter 50 mountain bike	10 electric scooter 10 mountain bike	10 electric scooter 10 mountain bike
Public lighting	600 LED street lighting	150 LED street lighting	75 LED street lighting
Other Renewables: shift to biofuels, miniwind, etc	Cogenaration fed by WCO (400 kW); mini and microwind	Cogenaration fed by WCO (200 kW) mini and microwind	Cogenaration fed by WCO (100 kW); mini and microwind

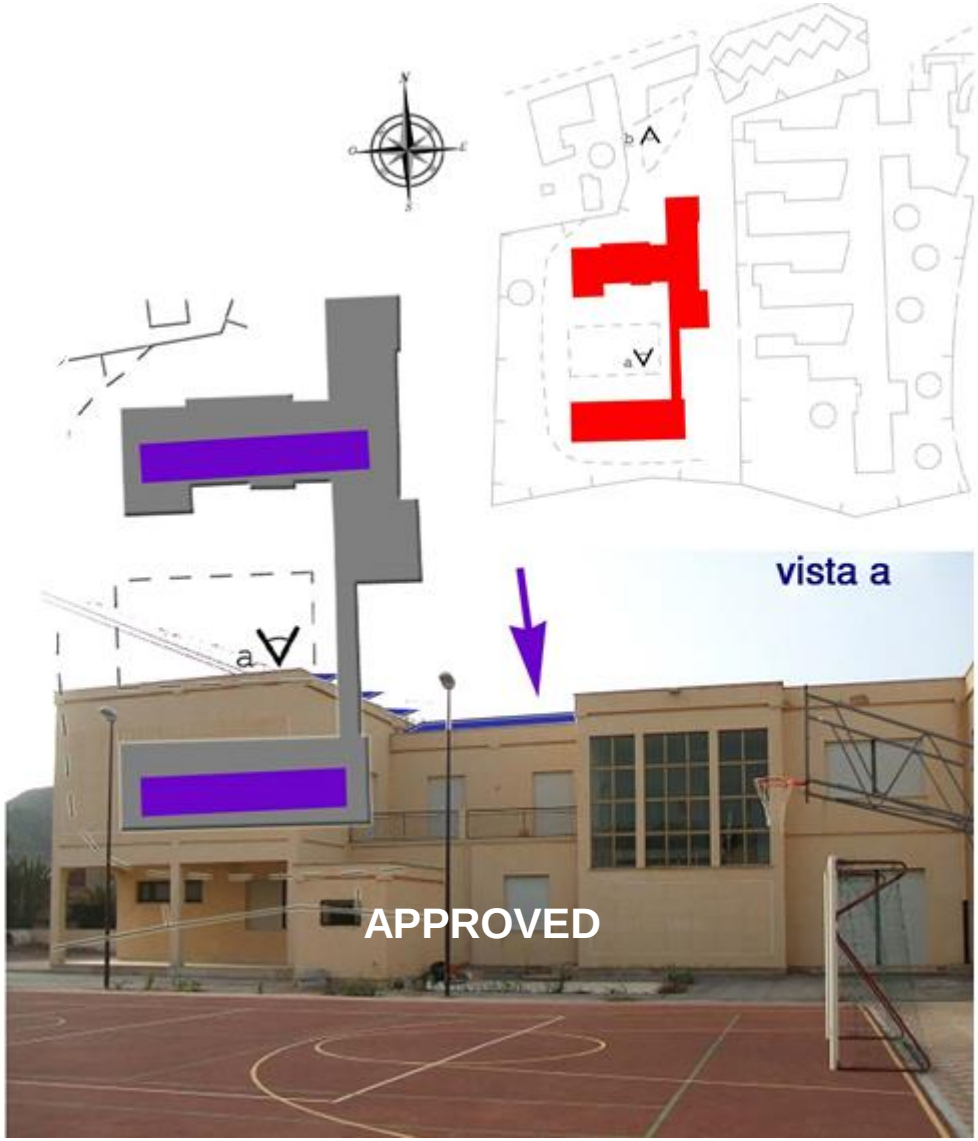
A first hypothesis of PV integration on roof as been developed considering:

- Maximum terrace area employment;
- Attention to maximum height from terrace roof;
- Best orientation of PV modules;



PV INTEGRATION IN THE BUILT ENVIRONMENT (2)

One of the most important costraint was the visual impact and the perspective from the street below. Rendering where performed for each plant in order to guarantee a low visual impact. Results were used for the definition of guide-lines for installation in private sector



A very important first limit for the installation of solar thermal system in the island was the indication that:

- Boiler could not be installed on the roof if any other option was availeable (ground,, technical areas, etc.);
- Solar collectors could not be seen by the street below.

A good equilibrium point was the installation of barriers and green shades covering collectors.

ST

SOLAR THERMAL INTEGRATION IN THE BUILT ENVIRONMENT (2)

Simulation of different kind of solar thermal system were tested incllluding the development of experimental Integrated Collector Storage system particularly suitable to hide the boiler.

ST

ACTIVITIES PROGRAMME

We developed solutions of solar boilers with a structure similar to those vase dedicated to water content. Particularly for those household that could not host any boiler in technical areas.

ST

ACTIVITIES PROGRAMME

A possible area for installation of solar technologies where also the pensiline already scattered on many roofs in Egadi Island. The PV o solar thermal pensiline has the double advantage of generating solar energy and reduce the solar insolation on the roofs entailing better conditions and e lower bill for climatisation.

PV

ACTIVITIES PROGRAMME

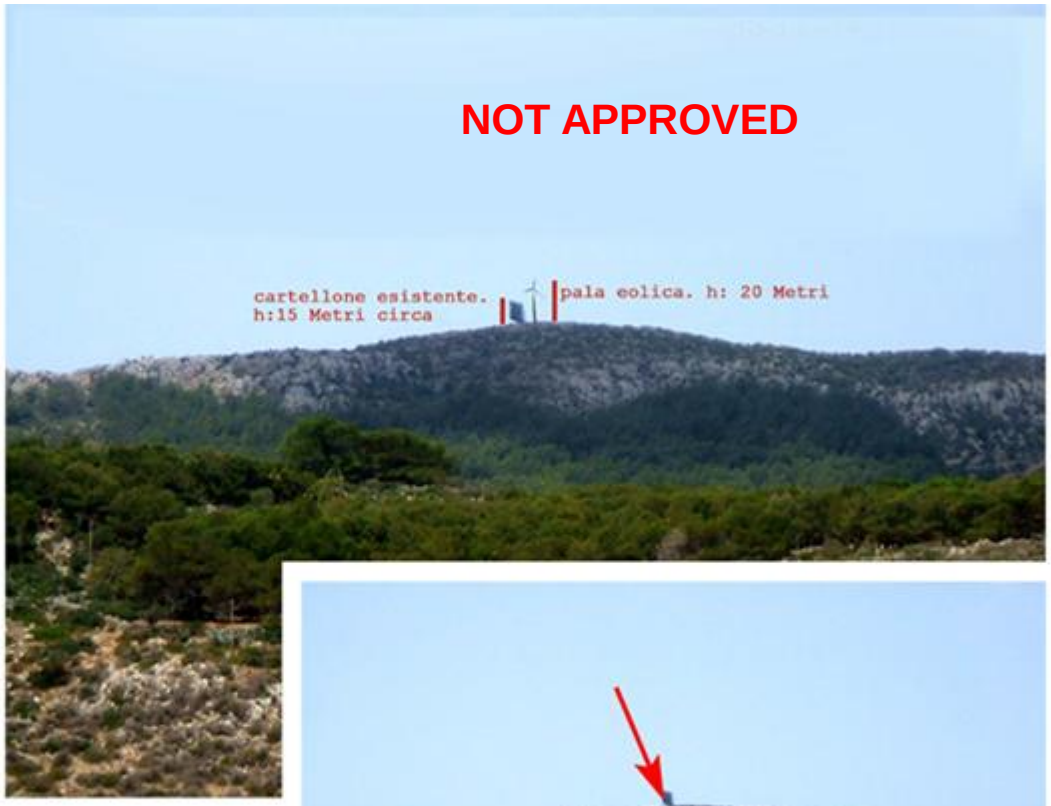
A very light wood pensiline was design and built demstrating the affordability of investment in terms of cost, architectural integration, cost saving related to shodowing effect on terrraces so limiting electricity bill for room climatisation.

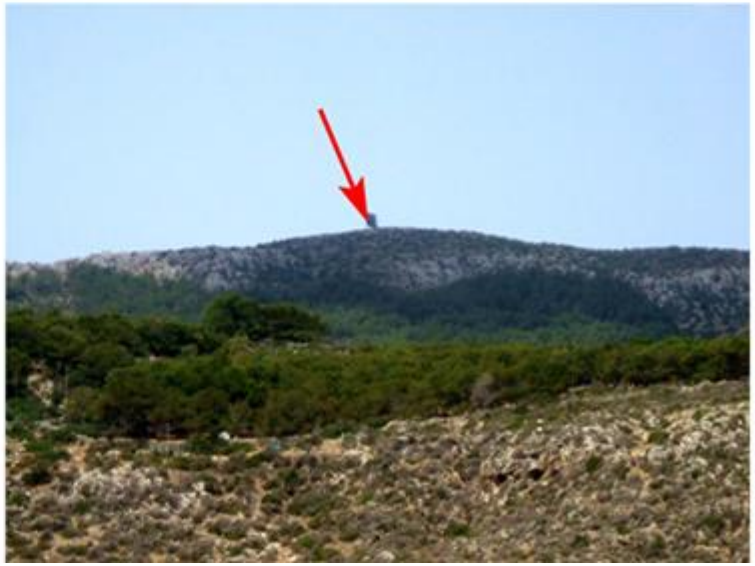
PV

MINIWIND

The integration of miniwind generators 20 meter of height was foreseen on the highest peak of Levanzo. Average Wind speed of 5 m/s would allow an energy production of 40.000 kWh/y contributing significally to the energy balance of the smallest italian island.

On the other end Microwind generators (1-3 kW) were foreseen close to isoleted houses in Favignana





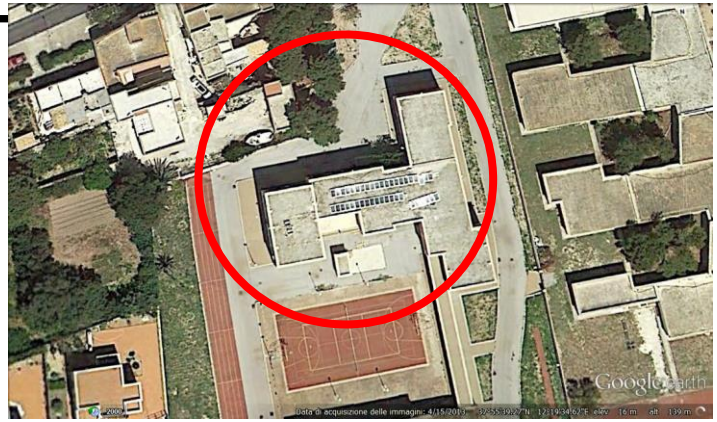
WIND

1 STAGE: LESSON LEARNT

1. Every infrastructure is critical in terms of authorisation;
2. Solar technologies must be installed just on flat roofs without any possible views by the street below;
3. For Natural circulation solar thermal system: Boiler must be hidden inside the buildings or in any case lower than the edge wall of terraces like for example ICS;
4. Solar panels or collectors cannot be installed on tilted roofs;
5. Wind technology is not admitted at all;
6. General opposition to PV installation from the electricity distributor;

RESULTS: PUBLIC SECTOR

PV systems on public building: Schools and Town halls	POWER INSTALLED
PV system “School, via Dante – Favignana”	10 kWp
PV system “School, via Libertà – Favignana”	10 kWp
PV System “Town hall – Favignana”	7 kWp
PV System “Town hall – Levanzo”	5 kWp
PV System “School De Amicis–Marettimo”	5 kWp



RESULTS:

	POWER INSTALLED	ELECTRICITY SAVED	BILL SAVING
TOTAL	**37 kWp**	**52.577kWh/y**	**8.874 €/y**

REQUIREMENTS:

• Every installation is on terrace. Plants have been designed limiting terrace area employed in order to avoid shadowing effects and leaving enougn area for maintenance activities.

•Panels are tilted with an angle that allows PV modules to be hidden by the wall edge of the terrace in order to reduce visual impact;

2 STAGE: PRIVATE INSTALLATIONS

Private Installations have been promoted with the experience made with the public activities. The role of coordination of the public administration with the technical support of AzzeroCO2 was necessary to make the programma feasible under many point of view:

1. **Comunication:** the success of the programme could not be possibile without a comminication campaign coordinated by the local administration with Legambiente;
2. **Authorisation:** Comune identified within the administration a person dedicated to the deployment of the project; particularly usefull the definition of a guideline for technology integration on the built environment;
3. **Contribution:** the collection of Ministry of Environment resources and the organisation of public tenders dedicate to local actors
4. **Connection to the grid:** without the support of the local administration citizens would have been very weak in front of the local distributor, against the connection of small RES plant to the grid;

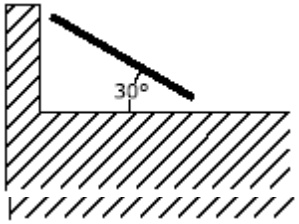
PV AND SOLAR THERMAL SYSTEM

	Local Adminis.	Ministry	Regional authorities	AzzeroCO2
Communication	Organize a public campaign to enlarge participation	Istitutional support; participate to	Istitutional support by Province	Local Support to foster the comm actions of the local administration
Public tender	Manage the public tender	Approval of the public tender	No actions	Support the local administration
Authorisation	Propose guide lines for correct installation	No actions	Pre-approval of a set of integration solutions and authorize single intervention	Support local administration for technical activities
Procurement and installation	Control the installation process	Verifies eligible costs	No actions	Activate local companies for the participation to the tender
Contribution	Control eligibile costs and transfer financial resources to final users	Trasfer financial contribution to local administration	No actions	No actions

PV – Private sector

The tender launched an over all power installed of 429 kW: from 1 ato3 kWp for citizens and from 5 to 20 kWp for tourist sector

POSIZIONAMENTO MODULO FV.
I moduli vengono collocati al di sotto del filo superiore del parapetto, per nasconderne la vista. Tale vincolo estetico è perfettamente compatibile con l'inclinazione ottimale - 30° - con cui vengono posizionati i moduli e pertanto non va a compromettere la produttività del generatore FV.



RESULTS:

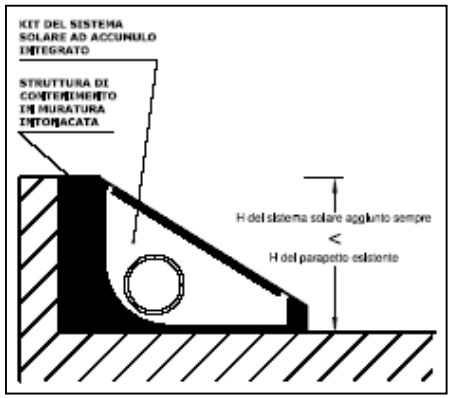
Impianti fotovoltaici per utenze private e del turismo		COSTS	SAVED ENERGY (kWh/year)	AVOIDED EMISSIONS (ton CO2/year)	BILL SAVED (€/year)
TOTALE	**429 kWp**	**3.003.000 €**	**609609**	**395 tonn CO2**	**97.537 €**

The overall power installation has been subdivided as follows:

Favignana	284 kWp
Levanzo	30 kWp
Marettimo	115 kWp

SOLAR THERMAL – Private sector:

The tender launched an over all surface installed of 1.150 mq: from 2 to 4 mq for citizens and from 6 to 20 mq for tourist sector

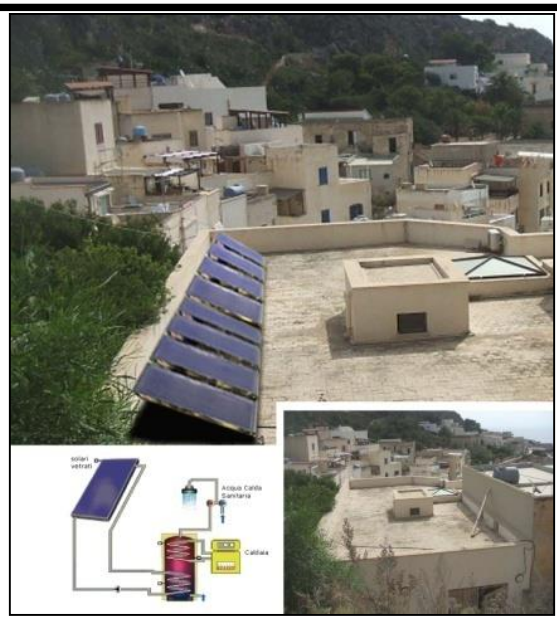


RESULTS:

Solar thermal systems for privates and tourist sector	COSTS	SAVED ENERGY (kWh/year)	AVOIDED EMISSIONS (ton CO2/year)	BILL SAVED (€/year)
TOTAL	**846.000 €**	**869250**	**449 tonn CO2**	**139.080 €**

The overall solar surface installed has been subdivided as follows:

Favignana	900 mq
Levanzo	110 mq
Marettimo	140 mq



CONCLUSIONS

In order let renewables to better penetrate islands energy markets a 360° approach must be adopted:

1. **Technologies:** start from a great diffusion of energy saving in final uses; no barriers detected;
2. **Innovation**: study solution for a better integration of solar and wind technologies in the environment in order to remove non-technical barriers;
3. **Public endorsment:** the role of the local administration is fundamental to adopt good practises and approve guidelines for the integration of solar technologies in the built and natural environment of the Island;
4. **Connection to the grid:** the local energy distributor must drive the change from diesel to RES/energy efficiency;

A research project named «Smart Island» was launched in Italy financed by the Ministry of Reaserch and Innovation in order to demostrate that a new energy model of the island is possible with the distributor as the main actor.

Possible intervention to improve island energy system:

- Renewable energy integration in the built environment in combination with energy efficiency in final uses in public and private sector;
- Improving existing diesel generation efficiency through heat recovery, and distribution network optimisation;
- Diffusion of the ICT technologies and storage systems;
- Limitation of conventional cars into islands and substitution of public transport with electric vehicle;
- Integration of waste, water and energy cycles;
- Study and predict the energy system behaviour through non stationary enegy models(TRNSYS)

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