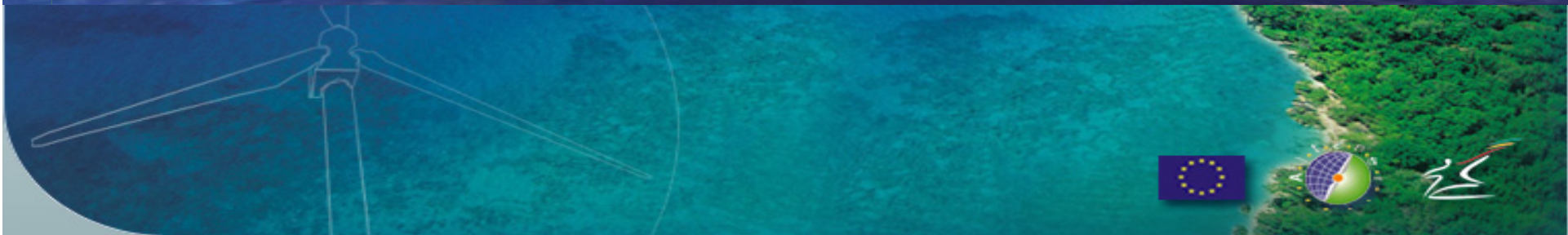




# European RE - islands

RES

Renewable Energies in Sardinia



## Regional Context

Sardinia island is an Italian region with a special autonomy in the national system, close to Corsica French island, between Italian peninsula and Spain.

Island main data	24.090	km2
	1.648.000	inhabitants
	376	Towns
	335	with less than 3.000 inhabitants

which, for their dimension and for their distribution in the territory, highlight the historical and cultural basic structure of the island.

It preserve an environmental patrimony in the internal and seaboard areas of very high quality. Average 15.000 € inhab/ year, but lucky for the good climate and a rather good quality of life.





Not so lucky about energy autonomy, and that can be a problem for the future.

- Nationals and transactional gas and electric grids connection: the island is not connected.
- Energy dependence
  - OIL 94% from abroad
  - RES 2% local
  - Solid fuel 4% local

Actual Power Installed 3000 MW

Urgent a new approach in the energy management system, a special opportunity for the island to improve

- A direct role (not only external enterprise)
- Direction of technology
- Local resource development
- Energy Security supply
- Lower Costs of local productions





A new role for the island in the framework of the actual transformations in the sector:

- energy sources diversifications
- market liberalisation
- energy saving
- energy efficiency
- renewable energies applications development.

This is the new phase Sardinia island is beginning to look for.

RE Islands project co-financed by the Commission have been a useful tool to sensitize institutions and local enterprises on situations and perspectives of renewable energies in Sardinia.



## Wind Energy on-shore

Wind energy development in Sardinia is very recent, as well as the others sources of renewable energy, except for hydroelectric. Sardinia can be considered a favoured isle for wind energy development and has big potentialities. Actually wind plants working are:

- Wind parks	n°	15
- Installed power	MW	272
- Electric energy produced (average per year)	MW/h	686.157

with an installed power for single plant which varies from 0,75 MW to 1,5 MW.

For the next future and for the prospective the interest of the industry is very high, and that is confirmed from installation requests arrived at single communities and at the Sardinia Regional office.

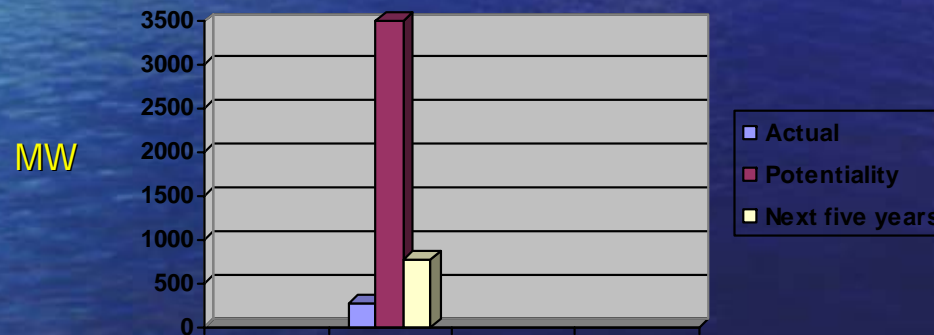




Wind parks requests arrived

MW 3.500

In fact in next five years will be concretely possible to realise about 500 MW, considering the necessity to realise the environmental evaluation and the industrial plans. This data shows the Industrial importance and the economic value of business and investments in the sector.



# Companies interested

Wind energy potential in Sardinia provoked the interest of different companies operating in the sector. Some of them have the seat in Italy and in others European countries. Actually there are principally operating in Sardinia n° 4 companies.

It is expected that wind energy development will establish new companies and new organisations. In that sense Re - Islands project can give an important contribute, on the information and dissemination level, and development and organisation as well.






# Wind energy off-shore

Actually in Sardinia does not exist off-shore wind plants. In the recent past have been activated some studies with a preliminary character, with the objective of the potentialities and possibilities evaluation.

For the off-shore wind plants realisation and their visual impact , it must be considered the tourist strong vocation of the island and also the caution of the planning regional legislation. Nevertheless does exist concrete potentialities, both for the wind quality and for water depth, in the west part of the island overall.





## Solar Energy

### Thermal Solar Energy

In the case of Sardinia, which is a Mediterranean country predestined for the use of solar energy, the number of solar water heating systems collectors is lower than the European average. The use of solar collectors increases very slowly. The total amount of solar collectors installed is:

6.600 m<sup>2</sup> and corresponds to 4 m<sup>2</sup> per 1.000 inhabitants

Compared to average figures in the Mediterranean countries and considering the favourable climatic conditions of the islands it demonstrates that the poor market development of solar collectors in Sardinia needs a strong campaign for promotion and diffusion.

A promotional campaign was launched last year, targeted to local communities and authorities.

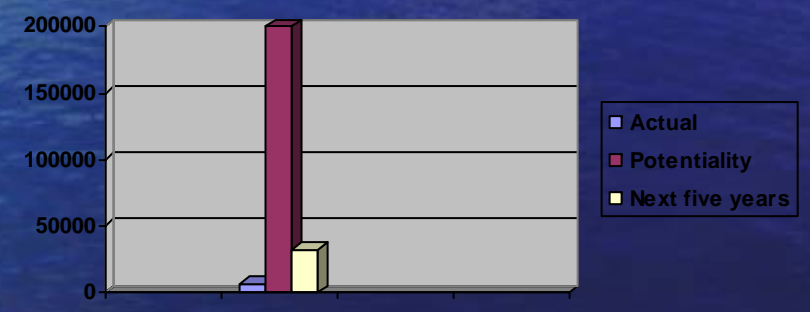
A new campaign will be launched next year addressed to the camping sites.





The aim is to install solar collectors up to 20 m<sup>2</sup> / 1.000 inhabitants (in 2010). This effort permits Sardinia region to reduce the big difference with European and Mediterranean regions. In that new situation an amount of 20,6 GW/h solar energy can be earned and an equivalent electricity production from fossil fuels of 52,8 GW/h, actually used from warm water preparation, can be saved.

m<sup>2</sup>






## Photovoltaic Solar Energy

PV plants installed in Sardinia are very few even though the enormous potentiality of the island. Solar radiation value is average from 1.600 kW/h/m<sup>2</sup> to 1.700 Kw/h/m<sup>2</sup> per year.

PV power installed 1.000 kW

These few plants are prevalently installed in the little island of Carloforte, south-west of Sardinia, 600 kW and the other 400 kW are related to plants installed in Alta Nurra, north-west, 100 kW in scholastic institute and universities.





Considering the extraordinary potentialities related to the favourable climatic conditions almost all over the years, the sector needs a strong impulse through campaign aimed to inform consumers and public institutions on some essential data:

- national, regional and U. E. support for PV plants applications;
- advantage related to electric energy production from PV plants and possibilities of its introduction in electric national grid;
- the opportunity of realisation of PV plants to supply rural farms which can not be connected to the electric grid for economic reason and can not be supplied by other sources.





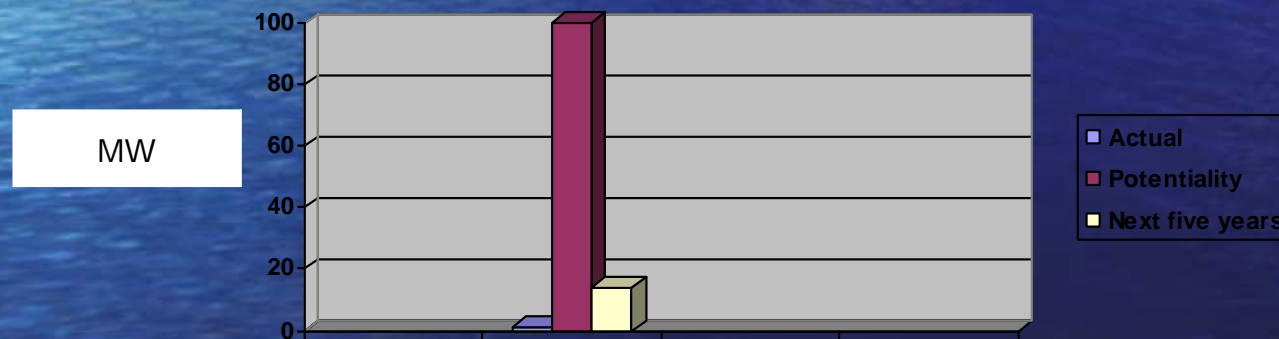
Es.: 3000 rural farms are not connected to regional electric grid. Their operativity is essential for local economy and employment. The average power for each farm will be 4 kW and consequently the minimum power to install is  $P = 12 \text{ MW PV}$

PV energy in Sardinia seems to be:

A necessity

An opportunity

- not grid connected entities
- new technologies
- energy saving
- electricity production (0,45 €/kWh x 20 years) support





## Ocean/Wave/Tidal energy

Actions for the utilisation of wave-tidal energy are limited to research activities, because of experimental level of conversion devices and lack of information concerning concrete potentialities of Sardinian sea and possibilities interaction of the utilisation energy plants with coastal areas. It is foreseen to make experimental measurements along the coast to collect data in order to evaluate potentialities and economic enterprises solutions. Priority objective, in the present conditions, it is expected to be the utilisation and development of the others renewable energy sources.





## Biomass

Biomass utilisation for energetic purposes in Sardinia consist essentially of wood and forestall remaining, a little percentage (2%) coming from abroad. Actual consumes are evaluated to be 102 kton/year for 39 ktep/year.

Potential related wood management and existing forests, without considering the possibilities offered by development of energetic cultivation, it is evaluated on existing data, about 668 kton/year for 225,41 ktep/year.

The effective utilisation of those potentialities, or a significant part of them, can constitute an occasion to favour employment in some areas of Sardinia territory which needs activities and human presence. Biomass utilisation should be in the future a consequence of a planning system, possibly integrated for energy production in Sardinia region.

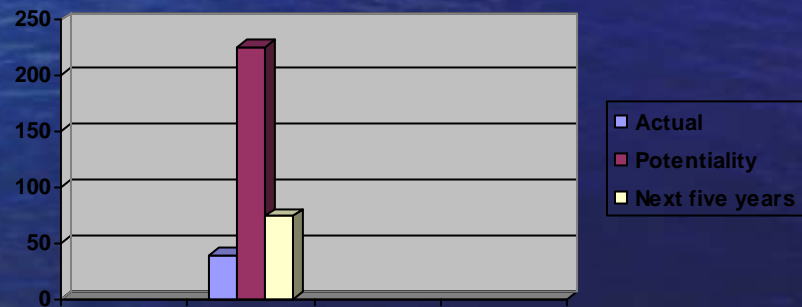




The integrate system for energy production from biomass will foresee, besides wood and forestall remaining, the utilisation of residuals and sub-products coming from agricultural, industrial and commercial activities, in co-firing plants with other sources and MSW as well.

Actually the biomass fraction realistically utilisable for that purpose, constituted just from cereal straw and maize pole, can be estimated about 35 ktep/year, 91 kton/year of dry material. At this quantity can corresponds the installation of 13,75 MWe with different plant engineering solution (co-generation, co-firing, etc.).

ktep





## Geothermal energy

Geothermal energy in Sardinia does not have conditions for electric energy production it will be possible some kind of utilisation at low temperatures. It is necessary to investigate on presence and intensity of geothermal sources to be used for district heating in some urban basins with enough geothermal activity, for example, near the city of Cagliari



## Other RE Sources: Hydro

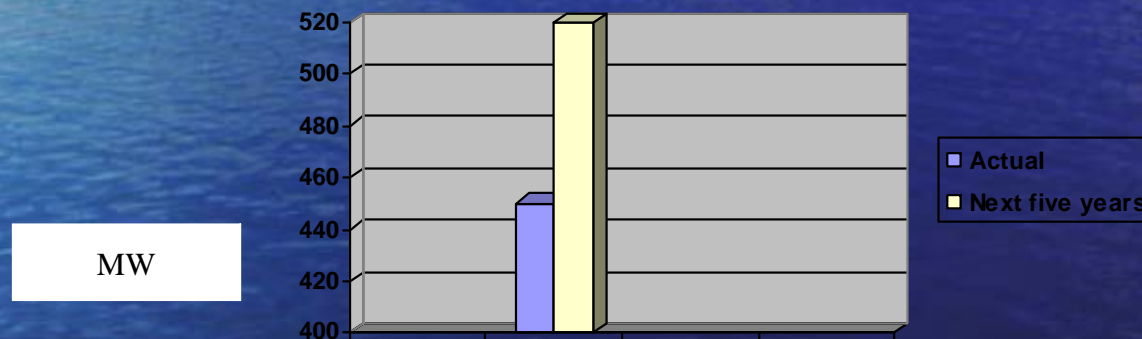
Actually the power installed is 450 MW and there is an electric energy production which is in fact 460 GW/h per year average. It should be possible in next future, that for technical reasons and restructuring activities, the closing of some plants. Nevertheless is possible:

- putting back into service some plants not running for technical reasons;
- realisation of new plants near new storage capacities and also near some old ones where feasibility analysis have indicated possibilities of energetic production for enough time. In few cases the new plants will be "mini" or "micro", but it is possible to contain engineering cost and civil works too.

The new power concretely realisable will be 58 MW with an electric production valuable in about 154,4 GW/h/year (13,1 ktep/year), corresponding to a primary net energy saving of 33,5 ktep/year



Different kinds and number of installations make difficult the exact evaluation of related costs for plants realisation; considering a medium cost of 2.000 €/kW, total investment will be of 116 ML Euro.MW



## Municipal Solid Wastes to Energy

Actually exist and are operating two plants utilising municipal solid waste to produce electric energy. They are located in the south (Cagliari) and in the centre of Sardinia (Macomer).

### WTE to Energy Plants (operating)

<i>Operating Plants</i>	<i>Mis</i>	<i>Tecnocasic (Cagliari)</i>	<i>Tossilo Tecnoservice (Macomer)</i>
Potentiality of the plant	Ton/y	140.000	80.000
Pre treated MSW to combustion	Ton/y	86.600	51.200
Electric energy to national grid	MW/h/y	48.300	27.600
Power installed	MW	10	5

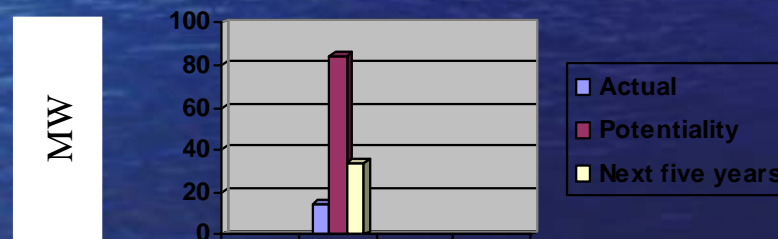


## WTE to Energy Plants (next future)

<i>Operating Plants</i>	<i>Mis</i>	<i>Tecnocasic (Cagliari)</i>	<i>Tossilo Tecnoservice (Macomer)</i>	<i>*Sotacarbo (South Sardinia)</i>
Potentiality of the plant	Ton/y	53.000	23.000	105.550
Pre treated MSW to combustion	Ton/y	33.900	14.700	75.259
New power installed	MW	5	3	11

- Sotacarbo plant will be use co-combustion technology, waste - coal, in an atmospheric internal fluidised bed.

The regional waste management plan foresee the utilisation of Municipal Solid waste with energetic purposes in additional plants for new 50 MW installed in next five years.



## Unsuccessful RE proposals

The reasons of slow development of renewable energy sources in Sardinia it is due to three main factor:

- the scarce sensibility of the political community, often involved in daily problem relate to different sector development;
- the scarce information on opportunities and possibilities linked to RES utilisation and development;
- the limited development of the sector enterprises and of the investors in non traditional sectors of the economy.

Nevertheless actually at regional level there are favourable conditions for RES development:

- laws imposition in order to produce electric energy and energy in general from renewable;
- the increase of sensibility of local and regional communities on energy and environmental problems;
- the companies interested to invest in renewable energy sector and the new attention of consumers for the new opportunities;
- the "discovery" to be an island of renewable energy sources which have a strategic, economic, environmental and economical value.



## Conclusion

Sardinia island is an interesting reality as a model where verify the development of renewable energy sources and their impact under different aspects. Datum where to move from is the presence of the territorial diffusion of RES potentialities which are waiting to be utilised and managed and to give a strategic support for economy and sustainable development of Sardinia.

Sardinia in conclusion lives a phase in which the strong political commitment for quality of life and environmental valorisation can actively support RES development, and then improve

- Energy security supply
- Know how and technologies

In RES island

