



RES Integration



Sustainable Development of European Rural Regions through RES-Integration



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WIP

Sylvensteinstraße 2, 81369 Munich, Germany

Tel: + 49-89-720 1235

Fax: + 49-89-720 1291

by Dr. Christian Epp and Martha Bissmann, WIP-Renewable Energies

christian.epp@wip-munich.de

martha.bissmann@wip-munich.de

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AUA – Agricultural University of Athens, Greece, coordinates this pilot demonstration network



SIXTH FRAMEWORK PROGRAMME



The project's full title is:

Rural sustainable development through integration of Renewable Energy Technologies in poor European regions - Specific support actions (SSA) for Western Balkan Countries.

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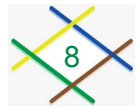
DOIRES, the Software for defining the optimum combination of Integrated Renewable Energy Systems (IRES)



German Target Region and IRES Scheme



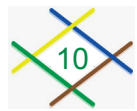
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RES-Integration Project Consortium

RES - INTEGRATION

Project Description

Objectives

The EU funded project RES-INTEGRATION strives to implement innovative and low cost **Renewable Energy Systems (RES) and Energy Saving Technologies** for sustainable development of selected disadvantaged rural regions of Europe.

To significantly increase there the share of renewable energy sources, will have mutual beneficial effects for job creation, CO₂ mitigation and others.

The focus lies on locally available resources, such as **biomass, wind, hydro, photovoltaic, solar thermal or geothermal energy**. Furthermore, the region's own resources in respect of know-how, financial power and labour force should be used. The overall goal is to cover 100 % of the regions' energy demand by renewable and locally available sources.

Through the project, specific **Integrated Renewable Energy Systems (IRES)** will be proposed for sustainable development of each region. The term IRES describes an energy system with a full energetic autocracy and if possible, energy exports. Energy production and consumption at the region shall be sustainable and based on renewable energy sources.

Project Results

- a) A common methodology for the integrated investigation of the regions' energy demands.
- b) **DOIRES Software Model** for defining the optimum local combination of RE technologies according to the specific conditions, needs and particularities of the selected regions. (see next page)
- c) Analyses of the socio-economic and environmental impacts of the defined IRES for each region.
- d) Integration of project results into existing and planned international aid and development schemes for each region.

RES-Integration Target Regions

All regions are located in rural, remote and disadvantaged areas. They were selected for their large development potentials concerning innovative RE actions. Each project partner selected one region which is given in the following:



Greece:

Milos Island, Cyclades Islands



Germany/ Austria:

Achental, Bavaria/ Leukental, Tyrol



Italy:

Mountain Community of Limina, Calabria



Serbia and Montenegro:

Kragujevac-Knic Region



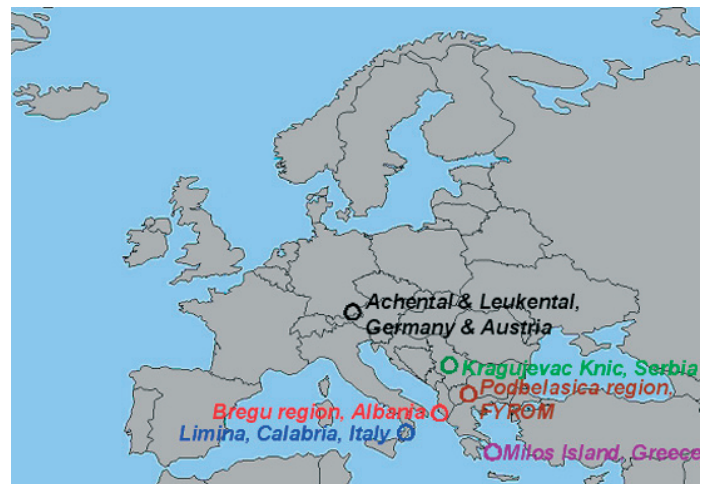
FY Republic of Macedonia:

Podbelasica Region



Albania:

Bregu Region



RES-Integration Target Regions

More information can be found at:

www.res-integration.com

www.renewables.aua.gr

German Target Region Description

The Alp valley **Achental** is a rural region with a total population of 40.000 inhabitants. The area has a size of 30.000 ha. The communities in the region are relatively small. There are no major urban centres. Agriculture, tourism and small industries are the economic backbone of the region. Agricultural activities focus mainly on cattle rising with extensive grassland cultivation and large mountain pastures. Small industries in the region are predominantly wood processing and construction business.



Achental Region in Bavaria, Germany



In 1999, the eight municipalities of **Achental** have founded the Ökomodell Achental, a strong collaboration scheme to promote sustainable development of the region. Ökomodell Achental facilitates inter-

municipal and cross-border cooperation with the involvement of all social groups. The work of Ökomodell covers environmental protection, tourism, agriculture and the promotion of renewable energy sources in the region.

German IRES Presentation

The energy vision for Achental sets the target to reach self-sufficiency by 2020. This aim will be accomplished by a combined set of measures comprising energy efficiency and the extended use of regional renewable energy resources:

Electricity production:	Potential	Annual production
Hydro Power	4,2 MW	26.634 MWh
PV	2 MW	1.738 MWh
Biogas	2,412 MW	13.860 MWh
Wood gasification	5,35 MW	42.800 MWh
EE measures		61.000 MWh
Total:		146.032 MWh

Heat production	Annual production	
Wood heating	204.650 MWh	
Biogas	10.100 MWh	
Geothermal	10.000 MWh	
Solar Thermal	15.606 MWh	
EE measures	240.877 MWh	
Total:		481.233 MWh



The first step towards the realization of Achental's energy vision was to found the public project development organisation.

Another important step was the commissioning of the Biomass Centre

Achental in September 2007. The municipal Biomass Centre, as service provider for energy woods, will fulfil the following functions:

- Purchase, production and distribution of biomass wood chips and wood pellets,
- Long-term supply of private and municipal biomass boilers in the region,
- Public relations and information.



Biomass Centre Achental

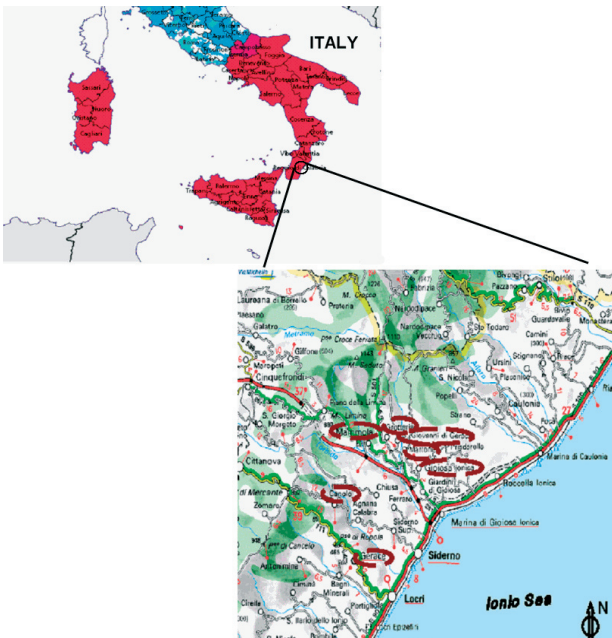
More information can be found at:
www.biomassehof-achental.de

Italian Target Region Description

The **Mountain Community of Limina** is a part of Locride. The area of Locride extends along the Ionian sea in the Province of Reggio Calabria.

The surface of Limina covers 232,73 km² (7,3% of the Province surface and almost 1,6% the entire Region of Calabria) and includes a population of 19.180 inhabitants (3,4% of the population of the province and 1,0% of the inhabitants of the Region). The municipalities that form the Mountain Community of Limina are: Canolo, Gerace, Gioiosa Jonica, Grotteria, Mammola, Martone, San Giovanni di Gerace.

The area is characterized by a rather rugged, mountainous countryside, with typical traits of southern Italy. Population density is low compared to northern Italy, and agriculture plays an important role throughout the countryside. Industrial activity is minimal. The presence of the Ionian sea nearby though has also enabled an economy based on beach-holiday related tourism.



Map of Limina Region, Calabria, Italy



Limina urban area in Calabria, Italy

Italian IRES Presentation

The resources of Limina region were analyzed, and the socio-economic constraints as well as existing energy developments, were investigated. The Italian IRES scheme comprises of the following elements:

1. Central PV Systems: Limina is blessed with a high solar irradiance, at 1.860 kWh/m²/year. Combining the very low environmental impact associated with photovoltaics, along with the generous government economic incentives, PV systems become the ideal way to exploit the resources of the sun. Three 1MW_{peak} PV plants have been proposed on unused land in the area. The energy production for the 3 plants would be approx. 4.500 MWh/year in total, which corresponds to an income of almost 2 million Euro.



Central PV system

2. Decentralised PV Systems: The roofs of buildings present an untapped energy "source" for Limina, for which several smaller PV systems are considered to be placed on top, to sum up to an installed capacity of 2.000 kW_{peak}. This would be in the form of several 50 to 200 kW_{peak} plants on larger roofs on municipal/commercial buildings, followed by many smaller systems on residential /commercial buildings between 3 and 20 kW_{peak}. Due to the government PV feed-in tariff, such systems could be a profitable investment even for households. Another way to implement smaller systems should also be through the creation of an enterprise that rents roof space from private households to run the systems.

3. Solar Thermal Water Heaters: Hot water production makes up a significant amount of thermal energy demand in the region, especially so in the lower-altitude sections where heating is used very sparingly. The proposal is to install a wide area of Solar Hot Water (SHW) Systems across the Limina community. It is estimated that 1.000 roof-top systems could be possible installed in the near-term future, which could provide the hot water usage for up to half of the inhabitants. This represents approximately 3.800 kW_{th}. The government supports the installation of SHW systems by being able to reduce income taxes by deducting one-third the installation cost of the system.

FYROM Target Region Description

The project target region **Podbelasica** is located in the Strumica Valley, at the South-Eastern part of the Former Yugoslavian Republic of Macedonia. The region's area covers 18.000 ha and the population is 11.306 inhabitants.



Podbelasica Region in Strumica, FYRO Macedonia

In terms of solar radiation the region is one of the richest in continental Europe, with an annual average of 1.530 kWh/m²/year. Strong winds are very rare. The annual rainfall rate is between 565 and 706 mm. The region has large subsurface water resources, offering good conditions for development of horticulture and agriculture. The mountain part of the area is rich with different fauna and diverse characteristic flora. Agriculture is rather developed in the plains, with characteristic protected plastic greenhouses.



The average economy level of the region is very low, resulting in emigration in foreign countries and stagnation of local population. There is no industry in the region and tourism potential is only exploited in one village in the form of a geothermal spa. Agricultural production is disorganized and in stagnation. The exploitation of forests is organized through a public utility. Electricity supply is accommodated only for small users; water supply is poor, covered mainly from local boreholes. There is no canalization and no regularly organized collection and treatment of waste in the villages. The quality level of house-holds is predominantly at a low level, i.e. without thermal insulation, without good completion and a rather low level of organised social life.

FYROM IRES Presentation

A strategy for the development of the Podbelasica (Strumica) region has been determined, for wider introduction of RES and their use for commercial and home needs. It consists of:

1. Biodiesel production:

Based on the planned production of 663.300 kg/yr soybean and 858.000 kg/yr oil beet, completion of a biodiesel production plant with capacity of 112.800 kg/yr biodiesel is planned.

2. Briquetting the wood residues:

Collection and briquetting of the waste wood from forests on the Belasica Mountain is planned, to supply local and foreign market. The capacity of the briquetting unit in Murtino is 3.100 t/yr raw material and 2.700 t/yr and 1,955 t/yr as final product.

3. Water supply system for 1.320 ha of land in the lower part of the region:

Drilling of 56 boreholes is planned, enabling to cover the area with a regular network for water supply. Initially, the pumps will be driven by diesel or electricity, but substitution by biodiesel is planned.

4. Crop rotation:

Rotation of oil beet, wheat, soy and tomato/pepper are accepted as most suitable in view to the predominant regional framework conditions.

5. Sprinkler and drip irrigation system:

The irrigation system will be accommodated to the requests of the plant rotation. The water will be distributed by pressure pipes. The composition and all the necessary elements of the distribution system and irrigation systems have been determined.



Geothermally heated greenhouse in Bansko (Podbelasica region)

Albania Target Region Description

Bregu Region is situated in the south – western part of Albania and has a size of 345 km². It has a hilly and mountainous surface, confined by the mainly rocky, but very beautiful sea shore of the Ionic Sea in the west and by high mountains in the east. The economic situation of this disadvantaged region is precarious because of limited opportunities for development of agriculture or industry - causing massive emigration of the young population mainly to Greece and Italy.



Map of Bregu Region in Albania

Bregu Region has significant RES potential:

The region is blessed with vast potential for small hydro power (SHP). Almost all Albanian electricity generation is hydro based at present. There are already 83 SHP plants installed with the total capacity of 20 MW. The installed technology is outdated and only 8 plants are still in operation. For many of the 83 SHPP there is the possibility of upgrading them to medium-sized HPP.

The wind intensity differs in the region. The mean wind speed is 6,4 m/sec in 10 m height. Up to date there are no wind power plants installed in Albania. The annual solar radiation amounts to 1.464 kWh/m²/year.

The utilisation of fuel wood is well known in traditional fireplaces, firewood boilers, wood-burning stoves and similar small heating systems. The use of firewood is declining, both due to substitution by electrical heating devices, and exhaustive use of wood during the transition period. The exploitation of agricultural waste and energy plants for energy production is hindered by small size of holdings, the absence of capital investments, the deficit in agricultural products and the large portion of non cultivated land. There is potential energy from animal residues and energy from solid and urban waste. Its utilisation though has not been initiated yet.

Albania IRES Presentation

Within the Development Strategy of Albania, there has been determined a chapter for the Bregu Region, focused on tourism development and wider introduction of RES. It comprises the following elements:

1. Electricity production from Small Hydro:

Construction of three Small Hydro Power Plants (SHPP) to supply additional electrical energy to all community and improve management of water resources is planned. Total capacity of three SHPP will be more than 1 MW. The annual electricity production will be at least 4.000 MWh/yr.



Small hydro power station

2. Electricity production from Wind Turbines:

Construction of wind turbines in Piluri place for electricity production from. It is planned to place wind turbines with total capacity of 1 MW and an annual electricity production of around 2.000 MWh/yr.

3. Solar - Thermal energy production:

Installation of plate solar collector for warm water preparation is planned. There will be installed 1.000 solar thermal systems with the total capacity of 0.9 MW. The estimated yearly thermal production capacity is 1.100 MWh/yr.



Coastal line of Bregu Region in Albania

Greek Target Region Description

The target region in Greece is **Milos Island**, one of the Cyclades islands, in the middle of Aegean Sea. The surface of Milos Island is 151 km², with a coast line of 126 km. Agriculture at Milos is stably diminishing because of the lack of water and more profitable mining and tourism business.



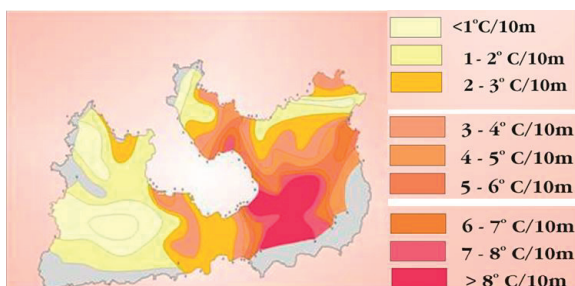
Coastal line of Milos Island

Climatic conditions are characterized by mild winter and moderate temperatures during the summer. Precipitation in the island is limited to 300 mm/year. Permanent inhabitants are 4.771, but during the summer population is 4 times higher.

The RES potential of the island is very rich:
Annual solar radiation: 1.660 kWh/m²,
Average wind velocity: 7.11 m/sec



2,9 MW wind park on Milos Island



Geothermal map of Milos

Greek IRES Presentation

The goal for Milos Island is to exploit all local RES to cover part of the energy needs for tourism, domestic sector and agriculture. Particular attention is paid to the production of fresh water through desalination powered by RE technologies. The selected IRES is summarized as follows:

1. Geothermal Energy:

3 new geothermal boreholes of a total capacity of 1.800 MWh/year to cover the energy requirements for the climatization of 25 small Hotels in Adamas village and Hot water procurement.

2. Wind Energy:

Installation of a 4th wind turbine of 850 kW to cover the electricity needs for the R.O desalination unit of a capacity of 2.000 m³/day. The 4 wind turbines of a total capacity of 2.400 kW will continue to feed the P.P.C network with 8.650 MWh/year electricity for general purposes of the island and the desalination of 2.000 m³/day.



Seawater desalination plant at Milos Island

3. Solar Energy:

a) Solar thermal: Expansion of the 1100 units by 20% to cover all the sanitary water requirements of the houses in the island. **b) Photovoltaics:** 20 stand alone units of 3 kW_{peak} each P.V. Units for electricity for stand alone places, Cafes-bars, restaurants, residences and public lighting in small settlements, our of the P.P.C. networks for lighting, and cooling of water and other products.

4. Desalination:

100 units of 5 m³ fresh water / day Rankine Cycle R.O. units for desalination of water in places out of the water network of the 2 main settlements (Adamas and Plaka). That kind of desalination water will be used also for irrigation of small farms (vegetables arboriculture and animal units).

5. Biomass:

(1) Collection and in the source separation of Municipal Solid Wastes (M.S.W). to be used for recycling (metals, glasses etc.), for compost preparation and R.D.F. for direct combustion. **(2)** Collection and mechanical treatment of used plant oils for the municipal diesel cars (in mixture with diesel from 0% to 20%). **(3)** Aerobical treatment of liquid municipal wastes (under installation) and reuse of effluents for irrigation and the sludges will be mixed with the compost from the M.S.W.

Serbian Target Region Description

The rural target region *Kragujevac-Knić* is located in the Sumadija area, at the central part of Serbia. The region's area covers 118.400 ha and the population is around 50.700 inhabitants.



Kragujevac-Knić Region in Serbia

58 % of the region's area is agricultural land. 22 % is covered by forests, and 15 % are pastures. The mountain part of the area is rich with different fauna and diverse characteristic flora.

The average economy level of the village region is very low, resulting in the situation that elderly people remain in villages and youngsters work in cities and come back only for holidays and weekends. In addition, emigration to foreign countries can be noticed. The region has potential for further development of agriculture and animal husbandry. In addition there is development potential in village tourism and food-processing industry.

The quality level of house-holds is predominantly at a low level, i.e. without thermal insulation and without use of renewable energy except traditional use of firewood for inefficient heating.

Various RES potentialities can be found in the region. In terms of solar radiation the region has an annual average of 1.400 kWh/m² per year. Strong winds are very rare. The annual rainfall rate is around 600 mm. The exploitation of biomass may be organized for fuels, heat and electricity.

Serbian IRES Presentation

1. Production of rapeseed & biodiesel:

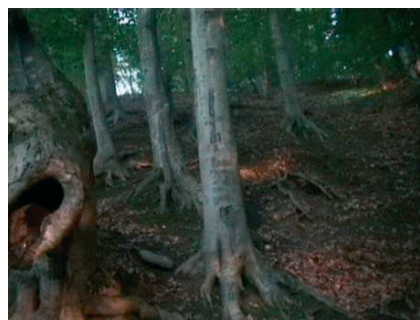
Rapeseed production of 3.000 t/yr would be organized by rotation of rape and wheat using an area of 3.000 ha. The completion of a biodiesel production plant for 450-500 t/yr is envisaged in the region with possibilities to increase its production to 1.000 t/yr.

2. Production of wood chips and pellets:

125.000 t of switchgrass would be obtained per year on 5.000 ha. In addition, forest residues would be collected. 4.800 t of wood chips and pellets would be produced for local and outside markets.

3. Production of heat & electricity by biomass:

Wood chips would be used in the 1 MW biomass power plant to provide consumers with 3.000 MWh/yr of electricity. In addition, one 300 kW boiler would be constructed for fuel mix combustion of 90% coal and 10 % biomass, for expected heat production of 8.640 MWh/yr to serve Kragujevac's expanding district heating network.



Forest in Kragujevac-Knić region

4. Production of electricity by biogas:

An old 200 kW power biogas plant would be reconstructed to produce 2.000 MWh of electricity per year. This power plant is part of the sewage processing plant in the region.

5. Production of electricity by hydro:

To use available water flows, a construction of 10 micro hydro power plants is planned. They would amount to 375 kW of power and produce 2.000 MWh/yr of electricity.

6. Solar energy in the village municipalities:

Application of 2.000 solar water heaters and their installation for sanitary water heating is planned to substitute at present used electricity water heating systems.

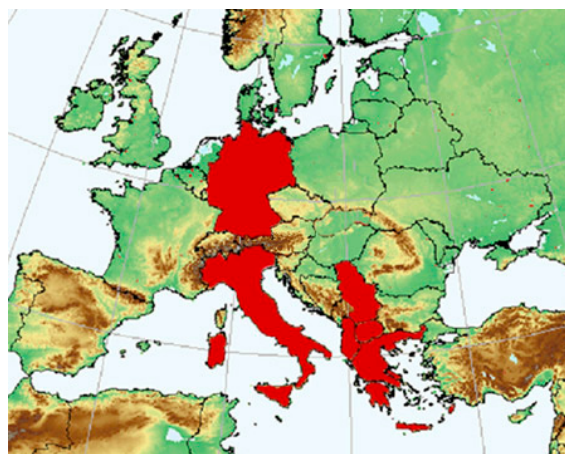


Solar thermal system for hot water heating



RES-Integration Consortium

The RES-Integration partnership consists of companies and institutes with a broad range of competence on RE actions and rural development potentials. The project partners comprise of six key players from six European countries:



AUA - Agricultural University of Athens, Greece

www.aua.gr



WIP-Renewable Energies, Germany

www.wip-munich.de



ETA-Renewable Energies, Italy

www.etaflorence.it



MFKG - Masinski Fakultet – Kragujevac, Serbia and Montenegro

www.mfkg.kg.ac.yu



MAGA - Macedonian Geothermal Association, FYROM

www.iga.igg.cnr.it/index.php



PUT – Polytechnic University of Tirana, Albania

www.unitir.edu.al

