MACEDONIAN GEOTHERMAL ASSOCIATION

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RURAL SUSTAINABLE DEVELOPMENT THROUGH INTEGRATION OF RENEWABLE ENERGY TECHNOLOGIES IN POOR EUROPEAN REGIONS - EDMARIN PROJECT

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REVIEW OF THE RENEWABLE ENERGIES USE IN MACEDONIA

Skopje, September 2005

R.E.S. INTEGRATION

RURAL SUSTAINABLE DEVELOPMENT THROUGH INTEGRATION OF RENEWABLE ENERGY TECHNOLOGIES IN POOR EUROPEAN REGIONS

Specific Targeted Research Project (FP6-509204)

WORK PACKAGE 2: Review of the Naitional Situation - Macedonia

Project Acronym	R.E.S. INTEGRATION	
Project Full Title	Rural sustainable development through integration of renewable energy technologies in poor European regions	
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Type of action	Specific Targeted Research Project	
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Document's title	WORK PACKAGE 2: Identify schemes for IRES implementation	
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Content	List of project proposals	

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Sixth Framework Programme

Specific measures in support of
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http://www.cordis.lu/fp6/inco.htm

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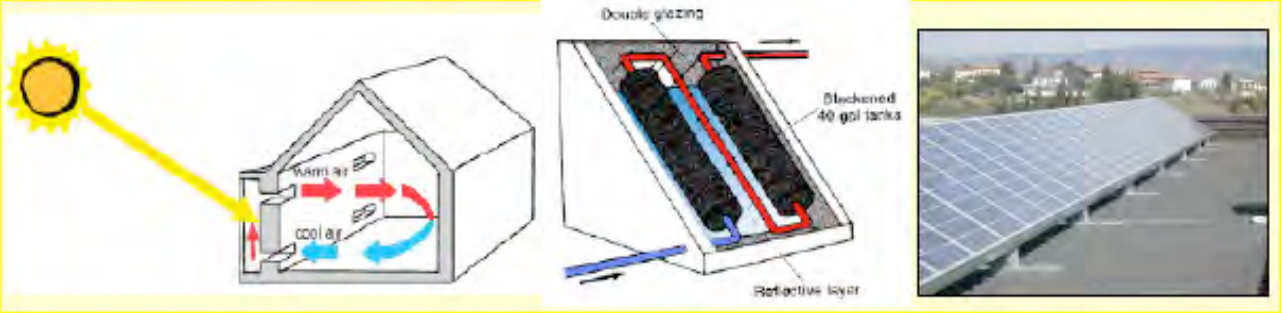
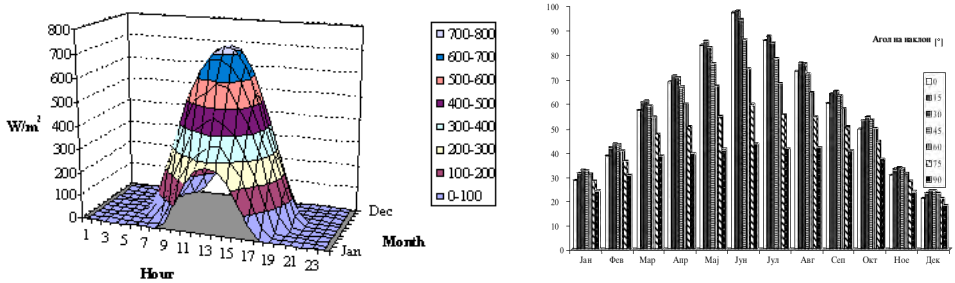
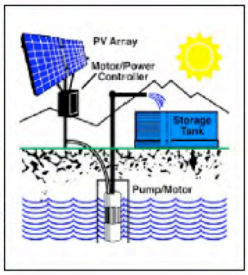
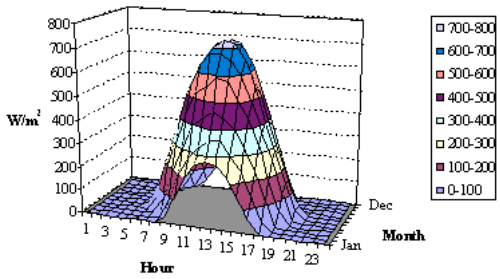
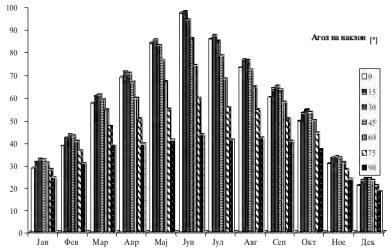


SOLAR THERMAL		NATIONAL SITUATION
General description of the technology		• Glass shielded plate collectors – basic technology in use • Vacuum collectors – very rare applied • 400-500 kWh/sqm (30-35% efficiency) • Passive solar houses (only several examples)
General information of the resource to be exploited		The country benefits from relevant solar irradiation data, increasing from 3,5 kWh/sqm to 5,5 kWh/sqm North to South (daily irradiation on horizontal plane). Thus solar thermal systems can satisfy up to 60% needs of hot water and 25% of heating At the moment about 5,000 sqm of solar thermal collectors are installed
Possible application and routes	**Estimated power to be installed**	There is no strategy for development and no estimation can be made.
	Estimated energy production	There is no strategy for development and no estimation can be made.
	Estimated energy distribution all year round	 (Table based on monthly irradiation data of South Macedonia)
General data on costs		400-600 €/sqm (turn-key installation)
Energy objectives		No defined energy objectives at the state level.
Environmental & sustainability issues		• Larger implementation in urban and also rural areas • Reduced maintenance costs
Socio-economic		The investments in solar thermal systems can be competitive to the ones in

benefits	energy systems using fossil fuels only for sanitary warm water preparation. Due to current prices of conventional fuels, interesting values of payback time can be reached (4-5 years compared with electric heating; 8-9 years compared with gas)

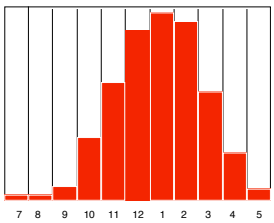




PHOTOVOLTAICS		NATIONAL SITUATION
General description of the technology		• Multicristalline silicon pv modules – 12% efficiency
General information of the resource to be exploited		The country benefits from relevant solar irradiation data, increasing from 3,5 kWh/sqm to 5,5 kWh/sqm North to South (daily irradiation on horizontal plane). Only two demonstration systems installed.
Possible application and routes	**Estimated power to be installed**	There is neither state strategy nor plans for installation of photovoltaic systems in Macedonia.
	Estimated energy production	There is neither state strategy nor plans for installation of photovoltaic systems in Macedonia. Therefore, no estimation can be made.
	Estimated energy distribution all year round	  (Table based on monthly irradiation data of South Macedonia)
General data on costs		No data.
Energy objectives		No energy objectives at the state level.
Environmental & sustainability issues		Possible positive influence in larger urban concentrations. Constraints: • High investment costs • High maintenance costs
Socio-economic benefits		No special attention paid in the country.

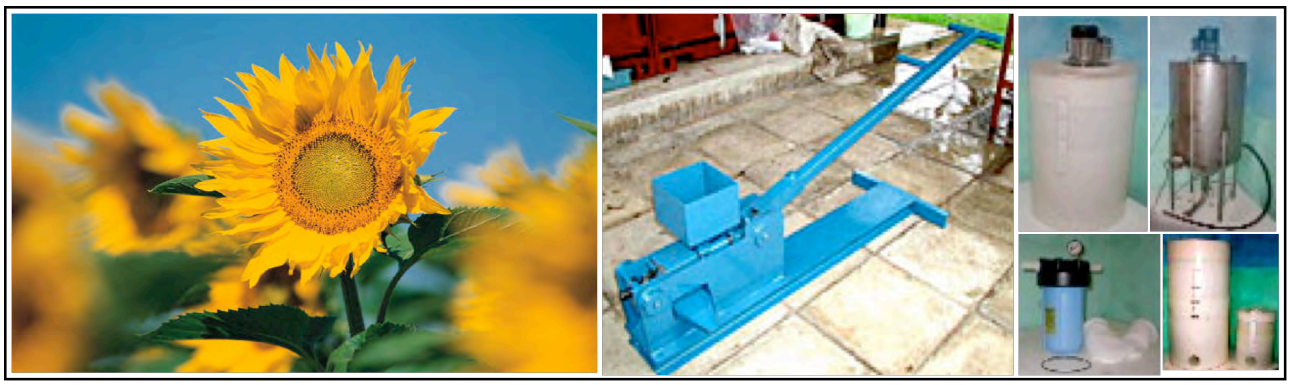
WIND ENERGY		NATIONAL SITUATION
General description of the technology		• Average power of wind generators installed: 10 kW • Three-blade rotor wind turbine
General information of the resource to be exploited		No reliable data about the resource. According to the poor data on disposal, there is no really interesting locations in the country.
Possible application and routes	**Estimated power to be installed**	There is neither strategy of development nor plans for installation of wind energy plants in the country.
	Estimated energy production	No estimation exist in the country.
	Estimated energy distribution all year round	No reliable data on disposal.
General data on costs		No reliable data on disposal.
Energy objectives		No energy objectives at the state level.
Environmental & sustainability issues		Not investigated
Socio-economic benefits		Not investigated.

GEOTHERMAL ENERGY		NATIONAL SITUATION
General description of the technology		• 2 district heating schemes • Heating of greenhouse complexes • Heating of Spa centers
General information of the resource to be exploited		A geothermal belt from Hungary to Turkey is passing the country. Only some shallow boreholes and natural springs have been completed as exploitable energy sources. Presently about 173 MWt are on disposal for low temperature uses. It can be expanded up to 1,000 MWt with additional investigations and completion. About 64 MWt are already engaged with running projects.
Possible application and routes	**Estimated power to be installed**	Estimated expanding to 350 MWt is realistic for a period of about 10-15 years.
	Estimated energy production	• With the existing power on disposal about 250,000 MWh/yr should be reached in a period of 5-10 years. • By developing the resource, up to 2,500,000 MWh/yr can be reached in a period of about 15-20 years.
	Estimated energy distribution all year round	No precise data available, however a 100-150,000 MWh/yr can be a realistic estimation.
General data on costs		Very much differing depending on the source and use in question, i.e. applied technology.
Energy objectives		There is neither strategy on state level nor planning of energy objectives.
Environmental & sustainability issues		• Slight impact during the exploration phase • Additional impact of effluent waters depending on its chemistry and applied technology for disposal • Very good sustainability with other energy resources and different types of uses.
Socio-economic benefits		• The investments in geothermal energy resource and uses development, as the exploitation resulted with very good economy. However, main problem is the high concentration of investments during the exploration and development

	period. • Economy of use depends on the quality of the engaged staff for exploitation. • Enable creation of new jobs (in the exploitation of the resource and economic activities of the users. • Offers possibilities for improving the economy of classical district heating systems.

BIOMASS ENERGY		NATIONAL SITUATION
General description of the technology		• Collection and briquetting of forest of agricultural resi-dues • Collection and briquetting of agricultural residues • Collection and gasification of residues of animal production
General information of the resource to be exploited		Veri large and renewable enrgy source in question: • Animal husbandry: up to 965,50 GWh/yr • Agricultural residues: up to 1,900 GWh/yr • Forests: up to 8,000 GWh/yr
Possible application and routes	**Estimated power to be installed**	There is neither strategy nor plan at the state level for planned development of the energy source
	Estimated energy production	Only wood is used for burning and participate with 21.6% in the state energy balance. There are also 3 small briqueting plants, using residues from wood producing units.
	Estimated energy distribution all year round	
General data on costs		Depending on the culture and applied technology: • Forests: rather low costs of exploitation and use • Agricultural residues: rather high costs for collection and pre-treatment, rather low cists for use • Animal husbandry: Rather high costs for collection and exploitation
Energy objectives		Whole production of renewable energy shall reach 20% (now 22%) before 2010
Environmental & sustainability issues		Rational management of forestal and agricultural resources Preservation of hill and mountains regions from hydrogeologic disruption. When improperly used, negative impact to the environment. Constraints: • Difficult balance in biomass demand/offer

	• Difficult coordination of different subjects involved in biomass chain • High transport and manipulation costs
Socio-economic benefits	Cheapest energy resource for mountain and rural population. Possibility to create a local controllable energy resource. Involvement of agricultural subjects in energy market and, in that way increasing the economy of agricultural production. Realization of a new field of business in rural and depressed areas, generating workforce demand



ENERGY OF BIOFUELS		NATIONAL SITUATION
General description of the technology		• Production of crops containing oil • Production of oils and fabrication of biodiesel
General information of the resource to be exploited		Initial studies in flow. Country is importer of eatible oils. However, calculations show a competitive price (0.5-0.6 €/l) for biodiesel produced of oil beet. That can stimulate development of wider production based on guaranteed collection of product.
Possible application and routes	**Estimated power to be installed**	Still no estimations. However. 50-100,000 t/yr diesel oil is possible to be reached in 10 years, with a proper approach and state support.
	Estimated energy production	Still no estimations
	Estimated energy distribution all year round	Still no estimations
General data on costs		Main investments in agricultural fields (proper irrigation systems). Main costs in agricultural production phase and energy in the disel oil production phase. About 0.5-0.6 €/l is the estimation based on the last calculations.
Energy objectives		Still no objectives defined
Environmental & sustainability issues		Rational management of agricultural resources Constraints: • Difficulties with undefined state treatment • Difficult coordination of different subjects involved in production and distribution chain.
Socio-economic benefits		• Excellent possibility for creation of energy independent rural communities. • Guaranteed collection of the production with known prices. • Diversification and development of income resources in agricultural sector

	Realization of a new field of business in rural and depressed areas, generating workforce demand

ENERGY OF URBAN WASTE		NATIONAL SITUATION
General description of the technology		• Collection and grading of town waste • Burning the organic part of town waste • Production of electricity • Production of heat
General information of the resource to be exploited		Urban waste of different resurces can be also an energy resource. According to the estimations of recent studies, about 650-96-50 GWh/yr from the communal waste, 120-180 GWh/yr from the commercial sector, 4.5-6.5 GWh/yr from different hospitals, 14-42 GWh/yr from the civil engineering sector, 52-79 GWh/yr from the industrial sector, or altogether about 870-1,270 GWh/yr can be produced.
Possible application and routes	**Estimated power to be installed**	There is neither strategy nor plan at the state level for planned development of the energy source
	Estimated energy production	There is neither strategy nor plan at the state level for planned development of the energy source
	Estimated energy distribution all year round	There is neither strategy nor plan at the state level for planned development of the energy source
General data on costs		Depending on the technology to be applied. Principally, costs are very high and economy can be found only through the environmental protection.
Energy objectives		There is neither strategy nor plan at the state level for planned development of the energy source
Environmental & sustainability issues		• Absolute positive for the environmental protection • Complicate organization of the waste collection • Complicate exploitation • Expensive energy
Socio-economic benefits		• Absolute need for the larger urban centres; enabling controlled and proper treatment of town waste. • Improved environmental conditions.