



R.E.S.I.

RENEWABLE ENERGY SCENARIOS IN ISLANDS

Sustainable Energy 2013 / The ISE Annual Conference

21 March 2013, **Dolmen Hotel, Qawra**, Malta

Institute for Sustainable Energy

University of Malta

Prof. Manfred Weissenbacher



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PROJECT AIM:

The aim of the R.E.S.I. project is to promote and increase the uptake of Renewable Energy, and especially Solar Energy, in Sicily and Malta.



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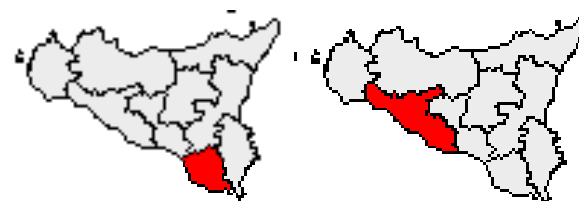
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PROJECT PARTNERS:

- Province of Ragusa (Sicily)
- Province of Agrigento (Sicily)
- Malta Resources Authority: MRA (Malta)
- Institute for Sustainable Energy: ISE (Malta)



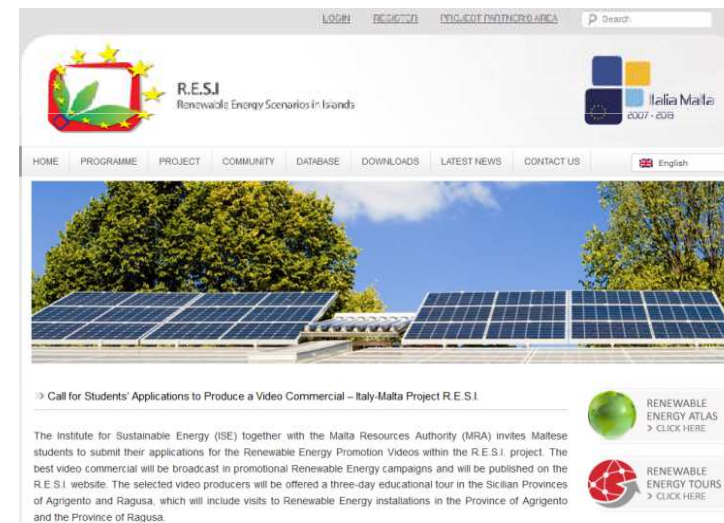
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Project website: www.resiproject.eu





ONLINE COMMUNITY/FORUM

- accessible on the R.E.S.I. project website (www.resiproject.eu)
- discussion of renewable energy issues



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RENEWABLE ENERGY DATA BASE

- accessible on the R.E.S.I. project website (www.resiproject.eu)
- presents information about environmental, energy, social and economic indicators in Malta and Sicily.



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RENEWABLE ENERGY POINTS

- Promote openness to the public for the promotion of renewable energy use.
- Three Renewable Energy Points created:
 - Renewable Energy Point No.1 - Province of Ragusa
 - Renewable Energy Point No.2 - Province of Agrigento
 - Renewable Energy Point No.3 - Institute for Sustainable Energy (ISE) at the University of Malta



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LOCAL ACTION PLAN / RENEWABLE ENERGY

- defined for Malta and Sicily through local *European Awareness Scenario Workshops (EASW)*
- Action plan will be published on the RESI project website: www.resiproject.eu/site/





INTERNSHIPS (MALTA AND SICILY)



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SCIENTIFIC EQUIPMENT

- *Tracking system with GPS control*
- *monitor direct radiation in Malta*



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RENEWABLE ENERGY TOURS

Two Renewable Energy Tours have been organized, one in Malta, one in Sicily, to provide stakeholders with the opportunity to experience RE installations firsthand.





RENEWABLE ENERGY ATLAS

Printed and digital Renewable Energy Atlas showing the location and properties of Renewable Energy installations:

- Ten (10 in No.) installations in Malta
- Ten (10 in No.) installations in the Province of Ragusa
- Ten (10 in No.) installations in the Province of Agrigento

Will be accessible on the RESI website www.resiproject.eu



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RENEWABLE ENERGY ATLAS



9
SANT'ANTON WASTEWATER TREATMENT PLANT AT WASTESERV MALTA LTD.
Marsaxlokk - Malta



10
SEA-WATER AIR-CONDITIONING SYSTEM AT FORT CAMBRIDGE DEVELOPMENT RESIDENTIAL COMPLEX.
Fort Cambridge Development Residential Complex, Tigne, Sliema - Malta

"DISTRIBUTED CHP GENERATION FROM SMALL SIZE CONCENTRATED SOLAR POWER" (DIGESPO) AT ARROW PHARM LTD.

Mel-Far Industrial Estate, Birzebbuga - Malta



Location: Arrow Pharm Ltd., Mel-Far, Malta
Proprietor: DIGESPO (subsidiary of Arrow PH)
Expected Total Completion Date: June 2013
Plant Electrical Power: 2 MW (estimated)
Plant Thermal Power: 2 MW (estimated)
Capacity (2012):
 Annual Electricity Output: 3,000 kWh/yr (estimated)
 Annual Thermal Energy (Heat) Output: 3,000 kWh/yr (estimated)
 H.A. Heat output rate is water at 45 - 50 °C. All sanitary use or space heating, but without cooling system.
Annual Steam Production (at 100°C): 3,000 kWh/yr
CO₂ emissions avoided: 5.17 t/year (estimate for experimentation)

Description: This 650 kW installation is located on the roof of a pharmaceutical production company (Arrowpharm (Malta) Ltd., which is part of Watson Group, www.watson.com).

Plant's technical characteristics: The modular micro Combined Heat and Power (m-CHP) installation consists of a small-scale Concentrated Solar Power (CSP) system and a Stirling engine. The plant features a series of parabolic troughs that concentrate solar radiation into an evacuated tube containing a thermal fluid that reaches temperatures of 450-500°C. A Stirling engine that is not yet operational will in turn utilize this energy to co-generate heat and electricity that can typically be used for single and multiple domestic dwellings or small commercial or industrial establishments. The system comprises several innovative elements, including:

- small scale concentrator optics with moving and tracking components using a special flexible glass as reflectant
- specially developed CERMET absorber coatings in the glass outer tube absorbers
- specially developed heat transfer fluid
- a newly-developed Stirling Engine (with a generator) that works at low temperatures
- innovative recuperators based on selective laser welding

Results obtained: Though the Stirling engine has not yet been installed, the system has been operational since the 28th July 2012, and data is being logged and processed, while the system is being improved. The currently measured steam output translates into 5,000 kWh/yr, while 22,000 kWh/yr were expected. The ultimate efficiency goals are as follows:

- thermal efficiency of ca. 30% (thermal fluid vs. direct solar radiation)
- energy efficiency of 18-20% (thermal & electricity output vs. direct solar radiation)
- electricity generation efficiency of 20 % (electricity output vs. direct solar radiation)

The DIGESPO project (www.digespo.eu) is a transnational research effort, partially funded by the European Commission's 7th Framework Programme, involving seven principal partners from five European countries.




Contact: DIGESPO (subsidiary)
Telephone number: +356 2142 8000
E-mail: info@digespo.eu
Website: www.digespo.eu



ATLAS- Photovoltaic Installations

- most prominent technology in this atlas (focus on solar energy)
 - Six PV plants in Ragusa as well as Malta; five in Agrigento.
- Variety within the PV category
 - monocrystalline, polycrystalline and thin film types
 - traditional roof-based installations to double-axis tracked ground-based solar PV farms
 - two different types of concentrated PV installations (lenses in Agrigento, Cassegrain reflectors in Malta)



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ATLAS- Solar Thermal

- Two solar water heating systems installed on hotel roofs
 - The sophistication of the installation in Ragusa rests with the combination of solar-heated water with an innovative boiler and water distribution system
 - The installation in Malta, utilizing vacuum tubes rather than flat-plate collectors, is unusually large and integrated into a system that features pumps, heat exchangers and calorifiers.
- A concentrated solar thermal installation utilizing parabolic troughs
 - R&D installation is a combined heat and power concept that will eventually feature a Stirling engine



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ATLAS- Wind Power

- Four sites of wind turbine installations
 - three in Agrigento and one in Ragusa
 - All are standard wind power installations, but especially relevant in terms of cross-border knowledge exchange.



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ATLAS- Energy from waste/methane gas

- Three energy-from-waste installations, one in each region
 - generate biogas used to fuel internal combustion engines that drive electricity generators
 - installations in Ragusa and Agrigento recover the biogas from landfills, while it is produced in anaerobic digesters at the Maltese facility
- One installation in Ragusa removes carbon dioxide from “waste gas” generated during the extraction of crude oil from wells
 - yields a gas rich enough in methane to fuel an internal combustion engine that drives an electricity generator as well



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ATLAS- Cooling with Water

- Two installations that use water as a medium for cooling purposes.
 - One is a sea-water air-conditioning system within a large apartment complex, featuring an open sea-water loop and a closed internal fresh-water loop that meet at heat exchangers
 - The second is a closed loop geothermal system featuring 22 boreholes that supports cooling at a production plant.



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THANK YOU!



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