

EUREKA PROJECT E!2698 - EUROCARE MULTISOLAR ROOFTILE

1. General description

Project	E! 2698 - EUROCARE MULTISOLAR ROOFTILE	Status	Announced - 28-JUN-2002
Title	Building-Integrated Multi Pv/T/A Solar System For Improved Energy Performance		
Class	Sub-Umbrella	Technological area	Energy technology
Start date	01-DEC-2001	End date	01-DEC-2004
Duration	36 months	Total cost	3.5 Meuro
Partner sought	No		
Summary	Develop A New Generation Of Solar Panels That Combine The Pv Energy Production And Production Of Hot Air/Hot Water Through The Habitual Collector, Integrating The Panels In The Structure Of The Building, Roof And Facades.		

Budget and duration

Phase	Budget(Meuro)	Duration (Months)
Definition phase	1	12
Implementation phase	2.5	24
Total	3.5	36

Member contribution

Member	Contribution	Position	Since
Spain	20.00%	Contact Member	18-MAR-2002
Greece	12.00%	Participating Member	28-JUN-2002
Israel	40.00%	Participating Member	28-JUN-2002
Denmark	10.00%	Interested	26-SEP-2001
Turkey	18.00%	Interested	26-SEP-2001

Participants

Company	Country	Type	Role
Necso Entrecanales Cubiertas S.A.	Spain	Large company	Main
Iberdrola Ingenieria Y Consultoria S.A. (Iberinco)	Spain	Large company	Partner
Tou-Millenium Electric Inc.	Israel	Large company	Partner
Center For Renewable Energy Sources (Cres)	Greece	Research Institute	Partner
Atersa - Aplicaciones Tecnicas De La Energi, S.L.	Spain	Large company	Partner

2. Project outline

Project description

This proposed project derives from the same core unit of the multi-solar system, but it is proposed to develop not just a flat plate combined solar collector like they have in mass use in ISRAEL but to develop a multi-solar roof tile facade module that will be integrated onto building roof and facade. The rationale for such a development is both economic and aesthetic. There is a window of opportunity for such development according to the 5 million rooftop programmes all over the world.

Waste heat is generated when PV cells are producing electricity but it decreases its efficiency dramatically. Cooling the cells improves their efficiency while the heat generated can be stored and used as hot water/air system. The main economic rationale for this product is that if you calculate the payback time of a standard PV only system in the field, the payback is about 16-18 years. If you do a rooftop integrated PV only system, the payback time drops down to 12 years. If you add one more function to the above integrated rooftop facade system, like introducing hot air for space heating of the house, the payback time drops to 7 years. And if you add hot water production for the same integrated system, the payback time drops to 3 years; which is an economic figure of 7 cents per Kwh per energy unit cost.

The objectives of this demonstration project is to build a prototype with the integrated multi-solar PV/T hybrid roof tiles and facade modules to prove the viability and the real energy cost.

The main steps in the project will be:

1. Review of the system concept. Design.
2. Energy and architectural analysis. Roof and facade.
3. Design and component testing
4. Design integration of the multi-solar PV/T hybrid system on roof tile and facade modules.
5. Manufacturing and implementation
6. Approval and patent
7. Prototype manufacturing
8. Prototype manufacturing and commissioning
9. Prototype testing
10. Design assessment - design feedback
11. Standardization, certification and industrial implementation
12. Exploitation plan and dissemination.

Keywords: solar energy panels, PV roof tile, building integrated.

Technological development envisaged

Photovoltaic electricity has proven viable and longevity characteristics, practically maintenance free and could be coupled with quality flat-plate collectors to give over 20 years of trouble free operation providing electricity and hot water and hot air for domestic application. This multi solar system could save both standalone and grid connected application at 7 cents/Kwh, or less, energy cost. Substantial savings can be achieved in mass production

manufacturing and in multi-module centralised installation. With the anticipation of further reduction in PV cost, the multi-solar system can become even more cost effective in world markets with technology transfer possibilities to less developed regions in the Mediterranean, Middle East, Asia and Africa.

Markets application and exploitation

The market for the multisolar roof/facade tiles is based on the 'million rooftop programmes' all over the world as follows:

Europe: 600,000 rooftops by the year 2010

USA 1,000,000 by the year 2010

JAPAN 400,000 by the year 2010

INDIA 1,000,000 by the year 2010.

Forecast for the year 2010 Installable building rooftop facade PV:

Region Installable PV/T Wp per inhabitant

Electricity output TWh

Europe 618 GWp 1584 494

USA 757 GWp 2344 903

JAPAN 174 GWp 1385 159

Rest of OECD 211 GWp 1564 230

Priority Markets for PV/t/a In Europe

Application Area Potential (MWp) Cumulative Target MWp2010

PV roofs 620,000 900,000

PV facades on commercial include

and industrial buildings in above 400,000

other grid connected 400,000 400,000

isolated buildings and

island and communities 150,000 100,000

Project codes

BSI

RNC energy supply systems (buildings)

RNG building systems

NACE

40 Electricity, gas, steam and hot water supply

4010 Production and distribution of electricity

40101 Electricity generation

452 Building of complete constructions or parts thereof; civil engineering

3. Main participant

Company	Necso Entrecanales Cubiertas S.A. Parque Empresarial La Moraleja Avenida De Europa, 18 28108 Alcobendas Spain Tel +34 91 663 3160 Fax +34 91 663 3160 www.necso.es
Contact	Mr. Juan Manuel Mieres Head Of Research And Development Department Tel Fax +34 91 663 2830 jmieres@necso.es
Organisation type	Large company
Participant role	Main

Contribution to project

Design the mechanical structure of the panels being part of the building structure, determine where in S. Europe solar panels should be installed, provide results on energetic needs of the buildings where panels will be installed.

Expertise

Expertise: This company is the result of the merger on April 28, 1997 of two large Spanish construction companies: ENTRECANALES Y TAVORA S.A. and CUBIERTAS Y MZOV S.A., respectively established on March 11, 1931 and October 2, 1978. The steady growth of the merged companies made NECSO one of the leading companies in the construction sector in SPAIN, adding an outstanding presence in the international field, with achievements today in over 30 countries. The activities of NECSO extended to all areas and specialised fields in construction, both in project engineering and works execution. In the civil works area, they have built roads, urban developments, airports, harbours, beach regeneration, dams, water piping, tunnels, gas pipes, water purifiers, metropolitan railways and railroads. With regard to the building subsector, they have executed thousand of works in all specialisation areas: industrial, services, maintenance, rehabilitation and housing. The international activity of NECSO represents half a century of experience with continuous presence in those markets, with multiple and outstanding achievements in several continents, some of them deserving world-wide recognition. Although at the beginning of their international endeavour they operated in developing countries in Africa and South America, we have started our activities in Southeast Asia in the last decade, as well as in Europe, parallel to the consolidation of the European Union (GERMANY, ITALY, FRANCE, etc.). Currently NECSO's annual turnover is 2,200 Million Euro. The R&D Department was established in 1991 and its purpose is to achieve a competitive advantage for NECSO through know-how and the development of new technologies in the field of construction methods and materials, as well as setting these up within the organization. In an increasingly competitive environment with marled international globalization and scant economic resources, it becomes necessary to have an innovative form of operation and solid technology allowing them to increase the productivity of our organization through the development of new materials more adequate to the terms, quality and environment required by construction work. Such a development of materials engender new construction methods that improve productivity. NECSO's I&D Department currently has 21 employees, of whom 12 have superior degrees. It also benefits from the collaboration of 400 Engineers and Architects in the areas of Production,

Engineering and Design. International Projects (Fifth Framework Programme of the EUROPEAN COMMISSION): - SAFEFLOOR - Low Risk and totally recyclable structural buildings 2001-2003 - MEGAWIND - Development of to MW scale wind turbine for high wind complex terrain sites.' 2001-2003 EUREKA: - COMREHAB EUROCARE E! 140-'Rehabilitation and protection of historical-artistic buildings with low interference fibre LTM composites'.1998-2001 Contribution: - Install and integrate solar panels in real buildings - Check and to obtain practical data of the real behaviour of the panels and compare between the practical results and theoretical estimation. - End User.

4. Partner

Company **Iberdrola Ingenieria Y Consultoria S.A. (Iberinco)**
Avenida De Burgos, Ed. Genesis, 8
28036 Madrid
Spain

Tel +34 91 383 3180
Fax +34 91 302 1040

www.iberdrolaingenieria.es

Contact **Mr. Jose Antonio Mieres Royo**
Environmental Department Director

Tel
Fax +34 91 383 3311

jmr@iberdrolaingenieria.es

Organisation type Large company
Participant role Partner

Contribution to project

The main objective is to consider all the environmental aspects related to the use of building integrated PV facades and roofs with incorporated cooling features. A Life Cycle Analysis (LCA) will be considered. LCA offers a holistic methodology for analysing the environmental burdens of each option considered over its entire lifetime from the individual components to installation, use and final disposal. This represents a more beyond traditional cost-benefit analysis into a full exploration of life cycle consequences involved in the choice of systems to meet energy service requirements.

Expertise

The Environmental Department of IBERINCO holds a vast experience in the environmental aspects related to energy generation, distribution and use. They have been actively working on the assessment of externalities associated with energy generation using several techniques of environmental economics. They have been involved in the development of several LCA of power generation and development of manufactured products. Recently they carried out several projects aiming at the environmental certification of buildings according to ISO 14.000.

4. Partner

Company **Tou-Millenium Electric Inc.**
Ranana Industrial Zone Hasadna, 7
436 50 Ranana

Israel

Tel +972 9 744 2369
Fax +972 9 740 7511

Contact

Mr. Ami Elazari
General Manager And Chief Executive Officer

Tel
Fax

solor@netvision.net.il

Organisation type
Participant role

Large company
Partner

Contribution to project

Expert and technical knowledge. It designs, develops, installs and provides solar energy-related services. The sophisticated solar energy device developed by SOLAR is an economic, clean and environmentally friendly source of energy, with a wide variety of practical applications in all fields: Isolated and remote houses, rural areas, street lighting, computerized irrigation, communications, etc. SOLAR has implemented a number of projects for private and governmental organizations such as the ENERGY MINISTRY, the Housing Ministry, the DEFENCE MINISTRY and more, and has installed its products abroad, in AUSTRALIA, the Far East, Africa, Europe and the USA. SOLOR, founded in 1992 is a subsidiary of AMITEC INFORMATION INC. and has worked jointly with CHROMAGEN SOLAR ENERGY SYSTEMS. Technology The innovative technology developed by Ami Elazari, the company's founder and CEO, is based on the photovoltaic principle. Solor has developed a special PV glass covering for the photovoltaic cells, preventing the 'escape' of some of the radiation, thus maximising the exploitation of energy. The company has developed and patented a new device, 'multisolar system collectors' introducing the photovoltaic cells into residential solar water collectors. It looks just like a conventional solar thermal collector, but has a layer of photovoltaic cells that is cooled by the water system and air tunnels, thus increasing the PV cells electrical efficiency and collecting the heat for domestic use. The collector generated as much hot water as a standard domestic hot water collector along with 1500 watts of electricity on a sunny day. Overall, it converts some 70% of sunlight into usable energy at 75% of the installed cost of separate thermal and PV systems.

Expertise

Projects - More than 1000 units of street and junction lighting in isolated sites throughout the country. - Electrical power generators in Negev and Galilee settlements. - SOLOR participates in a solar energy experiment currency conducted in SOUTH AFRICA and FRANCE for rural electrification of 30,000 houses. - Aircraft warning lights installed on thousands of antennae and high buildings. - Flashing roadsides lights - Military applications batteries and mobile electricity sources - Installations in ITALY, SOMALIA, NEW YORK POWER AUTHORITY, INDIA and SOUTH AFRICA. Ami Elazari (1950), SOLOR's General Manager is a Lt. Colonel (Res.) who served in the IDF's Intelligence Corps. He holds a B.A. in Psychology and Sociology and an MBA in Senior Business Management from BAR ILAN UNIVERSITY and an Engineering diploma in Energy and Computer System Design. Ami Elazari is an international renowned expert on solar energy with a number of word patents in his name. Between 1990-1995 he managed AMITEC Energy and Computer industries. Since 1995 he has served as Manager of the photovoltaic division of the CHROMAGEN Plant. He is a member of the ISRAEL FINANCIAL FORUM and the CHINA-ISRAEL ASSOCIATION, and Chairman of the Environmental Technology Public Directors Board of the ISRAEL EXPORT INSTITUTE, and has published a number of articles in his field of expertise. Experience: Employer: MINISTRY OF DEFENCE Description: Street lights and Security lights for the Israel border: over 1000 street lights and security lights around the Israel border, with control and military specifications from the MINISTRY OF DEFENCE, Municipality Authorities and the MINISTRY OF TRANSPORT. Employer: UNSOM C/O CLASSICA

INTERNATIONAL Description: Street lighting and office solar systems for the UNSOM Forces in SOMALIA. Employer: ISRAELI MINISTRY OF ENERGY Description: Electrification of a ranch in the Israeli desert: a 40 kwh system for the whole complex. Employer: NEW YORK POWER Description: NEW YORK POWER ELECTRIC AUTHORITY: 3kwp system Employer: Mr Haim Senar Description: electrification of a 31-unit family village including a solar system for each house Description: central solar systems providing hot water for over 50 hotels and public buildings worldwide.

4. Partner

Company **Center For Renewable Energy Sources (Cres)**
19 Km Marathonos Avenue, 7
19009 Pikermi
Greece

Tel +30 10 603 9900
Fax +30 10 603 9905

www.cres.gr

Contact **Dr. Argiro Dimoudi**

Tel +30 10 603 9900
Fax +30 10 603 9905

adimoudi@cres.gr

Organisation type Research Institute
Participant role Partner

Contribution to project

Energy/architectural analysis, Design/component testing and design integration, Prototype testing of proposed system, On-site measurement/test of the pilot-scale demonstration and design assessment and feedback.

Expertise

Greek national centre for Renewable Energy Sources (RES), Rational Use of Energy (RUE) and Energy Saving (ES). CRES was instituted as the national co-ordination centre in its areas of activity by Law 2244/94 (Production of Electricity from Renewable Energy Sources). CRES was founded in September 1987 by Presidential Decree 375/87. It is a public entity, supervised by the MINISTRY OF DEVELOPMENT, General Secretariat of Research and Technology, and has financial and administrative independence. Its main goal is the promotion of RES/RUE/ES applications at a national and international level, taking into consideration the environmental impact in the production and use of energy. Over the years, CRES has participated in more than 500 European and national projects. These include R & D, demonstration projects, projects dealing with energy information systems, feasibility studies, technical and economic studies, market research, as well as promotional activities for the use of RES/RUE/ES. In carrying out these projects, CRES has co-operated with a large number of public and private organizations, on a national as well as on a European and international level. The Centre is managed by a seven-member Board of Directors, which includes representatives from the General Secretariat of Research and Technology/MINISTRY OF DEVELOPMENT, the PPC (PUBLIC POWER COOPERATION), the ASSOCIATION OF GREEK INDUSTRIES, as well as a representative from the EUROPEAN COMMISSION. CRES has a scientific staff of more than 120 highly experienced and specialized scientists, and engineers. The organizational structure of CRES is composed of the following basic units: * Strategic Planning, Programming and Control Unit * Division of Energy Policy and Planning * Division of Applied Research and Technology Development * Division of Technical Support * Division for

Energy Information Systems, Dissemination & Training * Division of Administrative Support * Quality Assurance Office. Since 1992, CRES has been located on its wholly owned premises at 19th km Marathonos Avenue, Pikermi, Attiki. In addition to over 2000 square meters of main work space, there are also experimental installations, specialized laboratories (biomass, photovoltaics, passive solar systems, wind energy), a mechanical shop and a strong computing infrastructure (a network of computers connected to other Greek and international networks). CRES' laboratories also provide, among others, technical services to third parties, such as measurements, materials and systems testing, certification, etc. CRES' funding is provided mainly by the EUROPEAN UNION, through the Centre's participation in competitive EU programmes, by the Ministry of Development and other Ministries, through CRES' participation in national projects, and, also, from work carried out on behalf of third parties (industry, investors, etc.).

4. Partner

Company **Atersa - Aplicaciones Tecnicas De La Energi, S.L.**
Cami Del Bony, 14
46470 Catarroja
Spain

Tel +34 915 178 580
Fax +34 914 747 467

www.atersa.com

Contact **Ing. Enrique Alcor Cabrerizo**
Director Comercial

Tel
Fax

ealcor@atersa.com

Organisation type Large company
Participant role Partner

Contribution to project

1 - Design of the integration system for the photovoltaic module on the structural module developed by NECSO. 2 - Design of the photovoltaic module cooling system by using a canalized forced ventilation system. 3 - Design of the forced ventilation system integrated into the NECSO structural module. 4 - Design of the special photovoltaic module adapted to the NECSO structural module. 5 - Building of prototypes of all the elements. 6 - Monitoring of the functioning tests and system characterization.

Expertise

The organisation, which has an experience of 25 years in the photovoltaic solar energy sector, develops its activity in these fields: - Solar cells manufacturing. - Design and manufacturing of photovoltaic panels. - Design and manufacturing of regulation, control and power units for solar systems. - Design and installation turnkey projects of photovoltaic solar systems.