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IN EDUCATIONAL AND CULTURAL FACILITIES”**

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FINAL TECHNICAL REPORT

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1. Universol Executive Publishable Summary

At the end of the Universol contract it is of interest to note the positive and the negative facts concerning the whole work accomplished by the participants.

On the positive side, the two main goals of the project have been more than achieved. Firstly, in spite of many difficulties which are detailed in the present final report, 839 kWp was installed in buildings within the project compared to the contract stated objective of 707 kWp. Secondly, important dissemination results and effects have been achieved. Thousands of students, teachers, decision makers, professionals and general public can now see PV installations in the different European educational centres and observe the actual performances of the solar generators via interpretation panels or on-line information systems.

Comparing with the situation, 3 years ago when the Universol project started, it is clear that there has been a change of opinion regarding PV energy reflected by the increase of PV installations in public and private centres. There is also a recognisable replication effect of the project demonstrated by the interest expressed by other educational centres in installing similar PV systems in their buildings. The Universol project demonstrates the way ahead for Green Campuses and Green Municipalities in all participating countries. Of course these dissemination effects were amplified by a number of activities as conferences, workshops, web sites, publications, courses, new papers notes, TV presentations etc. that are documented in the final report.

To add to the positive side of the balance, it must be said that the project has succeeded in overcoming considerable and numerous difficulties that appeared during the course of the project. These difficulties were related to technical and economic aspects, the financial ones being the most significant of the two aspects.

In the technical task of installing PV systems there have been no important problems worthy of note. The performance of the PV generators has been satisfactory in terms of current commercial and technological expectations. All the cost conditions of PV modules specified in the contract have been respected.

The only negative point that could be significant appeared in the two PV systems studied by the utilities involved in the project (EDF and IBERDROLA). These studies revealed that the presence of harmonic effects can not always be considered as completely solved. This important point, and in general the need to solve negative effects on the electrical grid, suggests that more studies have to be done in order to increase the quality and performances of each type of inverter. As the PV installations are in Universities, this kind of study by power electronic research technical teams in each installation is possible. Several of the Universol project universities have expressed interest in undertaking research in this field with the collaboration of post graduated students.

Economic problems have been very important throughout Universol. All the participants of Universol have been obliged of making important efforts to finish the

construction of their PV installations (and it is well known that universities and other cultural centres are not exactly rich!).

This situation is illustrated by the withdrawal of some of participants after the first year of contract due to financing difficulties and reductions in the PV power peak installed in other participating buildings. The withdrawal of partners led to the need to sign an amendment to the contract, with consequent delays and reduced time scales for new participants. As a result, some participants did not finished their PV installations until the end of the project. These difficulties partly explain why some participants do not yet have a full year's monitoring results.

Unfortunately the worst economic problems relate to political decisions that follow national, regional or municipal elections or changes in the direction of participating entities. 3 French participants (18 UBOURG, 23 EETA, and 27 RIA) have not been able to install the contracted PV system due to this type of problem.

As a conclusion on the financial difficulties it has to be noted that, in spite of the efforts to develop the PV in Europe, even when the support of DG TREN is included, the conditions for a PV take-off can not be considered as having yet been reached the countries involved in the project (France, Spain, the Netherlands and the U.K.).

Another point concerns the behaviour of the electrical utilities. The electrical utilities have collaborated in the Universol PV connections in all but a few installations where the problem is not yet definitively solved. One of the conflicts regards the University Rovira i Virgili of Tarragona (E) where administrative problems between the University, the Municipality, and the utility (ENDESA), are so complicated that the grid connection has not yet be done, although the PV system was installed over one year ago.

Finally, on the negative side of the balance, it has to be noted that the technical and financial coordination has not been easy due to the high number of participants (32), the necessity to prepare an amendment and the necessary precautions in the payments in order to pursue rigorous management. Relations within the consortium have been good despite occasional delays in obtaining reports and monitoring data from the participants.

In conclusion, Universol has exceeded its stated objectives in terms of installed PV capacity in high profile educational centres. This has been achieved despite setbacks and problems some of which may be inevitable in such large and ambitious demonstration project and others due to factors beyond the control of the project and the consortium. This success is due to the determination and collaboration of all the participants involved in the project including DG TREN of the European Commission.

2. UnivERsol detailed report related to overall project duration

2.1- Background

Key barriers to PV market uptake in the EU include: costs, lack of understanding and/or knowledge and consequent low acceptability. Building integrated PV offers a promising solution, where architects, engineers, energy managers and planners play a key role. For PV to become a desired building material, these professions must be aware of the many benefits accruing from the technology. A convincing argument can be offered only if high standards of system efficiency and technical excellence are demonstrated, together with high quality architectural integration.

Educational and cultural organisations are not only a source of knowledge but also a source of thought. It is clear that fossil fuels must be gradually replaced by more environmentally friendly resources. UnivERsol has played a key role in contributing to this process by installing high visibility, renewable energy systems and by raising public awareness of them through the involvement of educational and cultural centres.

The UnivERsol project was undertaken to promote the integration of PV systems into Universities and Educational and Cultural centres in Europe through a series of technically and architecturally targeted demonstration buildings. UnivERsol arose from a strong interest and determination from the participating Universities, Municipalities, Regions and Cultural communities to apply the concept of the “green campus” and “green municipalities” in high quality and high profile case study applications that would encourage others to emulate them.

As a result of the quality architectural integration and technical design of the schemes, and the carefully designed monitoring and dissemination programmes, the project demonstrably contributed to improving the acceptance of renewable energy sources among local professionals, and the general public alike. In particular, the project focused on influencing the next generation of decision makers, and designers, through the education of students in the demonstration universities on issues of how PV systems looked and performed, confirming for many the possibilities and the feasibility of using PV as an important energy source for the future.

In conclusion, UnivERsol exceeded its stated objectives in terms of installed PV capacity in high profile educational centres. This was achieved despite setbacks and problems some of which may be inevitable in such large and ambitious demonstration project and others due to factors beyond the control of the project and the consortium. This success is due to the determination and collaboration of all the participants involved in the project including DG TREN of the European Commission

2.2- Scientific/technological and socio-economic objectives

The main objective of the project was to actively participate in the Take-Off campaign aiming at doubling the share of RES in the European mix by 2010, by installing a significant number of medium-large grid-connected PV systems in educational and cultural facilities in four State-members (Spain, France, UK and the Netherlands).

Wishing to establish the foundations on which the Green Campuses and Green Municipalities of the future can be built, the participants (universities, technical training organisations, regional Governments and Municipalities, cultural centres, utilities and enterprises) also aimed at raising social awareness on energy issues and actual possibilities of PV technology.

The influence of the project was enhanced by combining their strategic location on educational and municipal buildings with campaigns aimed at raising social awareness on energy issues and the possibilities and potential of using PV technology to address those issues.

Specifically, 707 kWp of PV were to be installed in universities and cultural establishments across four European countries. Despite problems and difficulties this objective was finally exceeded (839 kWp installed in buildings with Universol project support). The projects were to act as a test bed for a number of different PV technologies and in particular of innovative architectural integration options. Bulk purchasing of PV across four different countries were to reduce system cost below the EC stated target of <7 Euros/Wp for total installed PV system cost.

The results of the projects have been disseminated widely, in particular to students. Students represent the future decision makers and leaders of Europe and such early education about PV and renewables will contribute to the increased uptake of renewables over the coming generations.

The project has achieved all these results and made a clear contribution to improving the acceptance of renewable energy sources among all concerned professionals, and the general public. At the same time problems were encountered and resolved that offered valuable experience and lessons that were learned and reported as part of the project.

2.3- Applied Methodology, scientific achievements and main deliverables

To date the project has achieved the installation of 8539kWp of Grid connected PV in 24 distinct installations in four European countries (France, The Netherlands, Spain and the United Kingdom).

UNIVERSOL has produced significant results in terms of lessons learnt and knowledge gained in addition to its most obvious benefit of producing clean, electrical energy. A large number of students, staff, visitors or simply passers-by have been brought into direct contact with the photovoltaic facilities through this project, either casually, or more formally through their role as a pedagogical, training or research tool. UnivERsol has shown that educational and cultural organisations are not only repositories of knowledge, but also creators of it. In this way, the output of the project has an ongoing use within the organisations involved and elsewhere.

The main results of the project are the 24 installations and the experience gained in their design, installation and grid connection. Supporting results included the monitoring protocols, methodology and experience, the dissemination event and initiatives and the ongoing on-line data and data availability that is now available and contributing to ongoing educational initiatives.

2.4- Conclusions including socio-economic relevance, strategic aspects and policy implications.

General conclusions

The experience of the project confirmed the initial hypothesis: public access, educational and cultural buildings provide good opportunities to learn from innovative PV integration and to provide on-going demonstrative installations for training and awareness raising for present and future decision makers, professionals, technicians and stakeholders.

Architecturally, the best arguments for PV integration (with genuine offset costs) occurred when PV replaced glass in a glazed curtain walling system or was used as an architectural screen to improve the aesthetics of a plant room or metal roof.

Demonstration actions require continuity in terms of political and administrative policy and practice. Changes in policy by agents not directly involved in the project caused difficulties for some installations.

The relationship between the PV industry and construction industry was found to be often immature, resulting in cases of major programming problems with PV installations causing expensive problems in larger construction projects. For example, in one project, the specialist company contracted to make the building integrated PV element did not have the “financial gearing” necessary to supply large the order. This difficulty was only resolved with the collaborative support of the main building contractor and, even so, resulted in several months delay in making the building watertight due to the *integrated* nature of the PV roofing element. The cost of this delay to the larger project was estimated at over 100.000€.

The conclusions to be drawn from this are twofold. Firstly that close collaboration must exist between construction managers and PV installers if installations are to be completed on-time, to budget and with a positive conclusion to the process. Secondly, that PV is not yet a versatile building element. In order for it to be considered a straight forward building element, further work is required to improve the ease of acquisition of PV products including bespoke building integrated PV systems. Currently, designs requiring non-standard module configurations are often costly and subject to unpredictable delays due to variations in supply and demand of components and materials.

Conclusions on monitoring

Time, patience and care is required to successfully specify and commission the monitoring system. In Universol a comprehensive monitoring protocol in accordance with international standards was established by international collaboration and agreed by the project consortium. Information that could be considered “monitoring data” was obtained from virtually all of the PV installations in the project. This information is sufficient to demonstrate that the systems are operational and generating electricity but, in all but a few cases, did not comply with the protocols established in the project.

Investigation of the causes of this curious result enables the following conclusions to be drawn:

- The complexity of collecting and comparing data from differently designed systems should be appreciated. Difficulty was experienced in processing the data files from the different inverters on the project (Sunny Boy, Fronius etc) due to differences between individual systems and the need for specialist knowledge in order to transform the data obtained into a format compatible with international monitoring protocols.
- Some PV owners considered it sufficient to monitor the system output only at the end of the project, without needing to monitor and analyse on a monthly basis, particularly where time constraints existed. In the case of the smaller installations (generally those in Cultural buildings rather than university buildings) this was a practical consideration as there was no one on site with either specific responsibility or sufficient technical knowledge to dedicate the time and attention necessary to extract and check the data regularly.
- Failure of individual components and problems with power conditioning equipment resulted in data gaps from various projects as faults were often not detected for some time. Provision of protocols for either automatic or programmed personal checking of system operability would avoid this loss in future projects.
- Training is needed for Monitoring firms in the effective collection of output data. Contracts could alternatively, specifically and comprehensively, state what is expected in terms of data collection and processing from a particular project.

To summarise these conclusions and the experiences of the project, if detailed monitoring is required then a specific monitoring contract or contract clauses establishing the protocols and responsibilities would help avoid post-installation confusion. As first-time clients cannot be expected to know that this is in their interest, the PV sector should be responsible, in the interest of quality control, for developing such clauses as standard practice.

Socio-economic relevance, strategic aspects and policy implications

The significance of the **social impacts** of the project was increased through the participation of the educational sector. A key ambition of the project was to raise public awareness of PV technology and to modify social attitudes towards them by targeted, intelligent dissemination. New teaching programmes on renewable energies were promoted in the educational centres of the project. Project centres hosted open days and workshops on PV technologies in the collaboration with the teachers, students, decision-makers and the general public in each participating centre. By demonstrating that with PV, one has a 100% clean and safe energy generation technology, the development of the “green campus” and “green municipalities” has become an important stepping-stone to a sustainable energy future. There is no better way to understand the unique

properties of PV, and their quiet, safe, vibration-free, secure smokeless, odourless and non-toxic performance, than to experience them in operation.

The UnivERsol PV systems were also technically innovative in that they pioneered new protocols for enabling building and campus PV systems to be linked to the low-voltage grid of the local energy utilities, helping to break down both related technical and non-technical barriers in many regions. Much of the success of this aspect of the project, and perhaps its **strategic importance** was achieved with the direct participation of two major European utilities, Iberdrola and Electricité de France. An enormous contribution was made through the development of the UnivERsol PV monitoring system design that enabled such connections to be allowed by Utilities who also learnt much about the integration of PV energy contributions to the local supply grid over the progress of the project. The PV systems, equipped with advanced standard monitoring systems, were also designed to provide educational tools to study the behaviour of a range of different PV technologies in a variety of European climates and conditions.

2.5- Dissemination and exploitation of the results

UnivERSol arose from a strong interest and determination from Universities, Municipalities, Regions and Cultural communities in participating countries. The dissemination of the results of the project therefore contributes to the wide scale development of PV in Europe.

UnivERSol contributes to social, scientific and technical progress by helping teaching institutions, municipalities and cultural centres to acquire PV experience and know-how and by disseminating these widely throughout Europe, in particular to students.

The critical mass achieved by grouping the, more than 20, installations within one project makes a significant contribution to overcoming these knowledge, understanding and awareness barrier.

An indication of the commitment to the achievement of these dissemination aims and goal is indicated by the list of activities and events (below) organised during the project.

UnivERSol Meetings:

- Kick-off meeting, GESP, Parc Científic de Barcelona, 14th January 2002, Spain
- First meeting of WP8 (Dissemination), Barcelona, 14th January 2002, Spain
- Second meeting of WP8 (Dissemination), Oxford Brookes, 28/04/2003, UK
- Mid-term meeting, 23/06/2003, HESPUL'office, Lyon, France
- Mid-term WP8 meeting in HESPUL at Lyon, 23/06/2003

National conferences:

- Press conference, Kick-off meeting, 14th January 2002, Spain
- Conference on Buildings Integrated Photovoltaics: "Intégrer le photovoltaïque au bâtiment", organized by the ADEME and BP Solar, Montpellier, France, 21/02/2002
- "Energia Solar Fotovoltaica" from Universidad Internacional Menéndez Pelayo, Santander, Spain, 20/08/2002
- "La Bibliothèque de Pompeu Fabra de Mataró", organized by les Rencontres du Soleiul, Savoie Technolac, Chambéry, France el 16/09/2002
- Press conference 12/06/2003 from Universitat Autònoma de Barcelona, Spain with collaboration of ICAEN (Institut Català d'Energia)
- Press conference 12/06/2003 from Universitat de Girona, Spain with collaboration of ICAEN (Institut Català d'Energia)
- "Situació de l'Energia solar a Catalunya" organized by ICAEN, Spain

International conferences:

- 18th European PV Solar Energy Conference "WCPEC" Osaka - Japan- 11/05/2002
- The Sixth Sharjah urban planning symposium. "Heating and cooling with solar PV-thermal architectural modules", 02/06/2003
- "Natural Ventilation of multi-functional PV modules and comfort" organized by Oxford Brookes University, Yazd, Iran, September 2002
- One-day conference in French organized by ADEME at the 19th European PV solar Energy Conference and Exhibition, in Paris, 7-11 June 2004, France

Workshops:

- Photovoltaic Technical Workshop: "Séminaire technique de l'ADEME", organized by the ADEME, Sophia Antipolis, France, 17/10/2002
- Université Lyon 1 Claude Bernard, setting up of a lab work based on the PV system installed on the building
- Université Lyon 1 Claude Bernard, Lectures on demand side management, energy efficiency, passive architecture and renewable energies including photovoltaics
- Institut National des Sciences Appliquées (INSA) de Lyon, Two Lectures on building integrated photovoltaic
- Ecole Nationale Supérieure des Mines de Saint-Etienne, Technical support of a group of 2 students working on a feasibility study of a 15 kWp PV system in Saint-Etienne. This technical support is done in partnership with the local association for the promotion of renewable energies (Héliose).
- Université Paul Sabatier, Lecture on building integrated photovoltaic
- Three persons at HESPUL work in schools to teach children about energy and renewable energies. The UNIVERSOL programme made possible the organisation of new activities in relation to building integrated PV like the creation of roof-integrated PV system model, 23 classrooms with 600 children.
- Closing event, Lycée Grésivaudan, next to Grenoble, 14, 15 and 16 October 2004, 2 sessions, a workshop for teachers and directors of schools or university will be organised on Friday 15 October 2004 in the afternoon with several subjects (Organisation of demand side management actions, realisation of pedagogical actions in RES and RUE, installation of a PV system, ..)
- UnivERSol workshop: A seminar was targeted at postgraduate students who were given a certificate of attendance that was valid as a credit towards their studies, Mallorca, Balearics Islands on November 12th 2004
- Technical workshops. Two training sessions were implemented in several institutes of Catalonia with the aim of explaining to school responsible people (professors, teachers and other involved staff) solar energy issues in buildings. There were also organized technical visits with the detailed explanation of solar systems (sometimes photovoltaic and thermal systems), installed in some of those institutes.

Courses:

- Several courses related to building integrated PV systems have been held during the reporting period :
- Friday 9 January 2004 - one day course at the LP STER at the IUT de Tarbes, which is part of the Université Claude Sabatier (n°17)
- Monday 12, Monday 19 January 2004 and Monday 2 February, three day course at the IUT A – Université Lyon 1 Claude Bernard (n°25)
- Friday 23 January 2004 and Monday 9 February 2004, practical work on the 10 kWp PV system at the IUT de Bourg-en-Bresse (n°25)
- Thursday 26 February 2004, one day course at the INSA de Lyon (Civil Engineering department)
- Wednesday 12 and Friday 14 May 2004, 2 day course at the ASDER located at the Maison des Energies in Chambéry (n°31)
- Université Paul Sabatier, Licence professionnelle STER, December 2001, November 2002, January 2004 and January 2005
- Université Claude Bernard Lyon 1, Travaux pratiques à l'IUT de Génie Thermique et Energie, January, February 2004
- Université Claude Bernard Lyon 1, Licence professionnelle conception climatique du bâtiment, January, February 2004
- Ville de Chambéry, stage ASDER, May 2003, May 2004
- Universitat Autònoma de Barcelona, 5th and 6th November 2003, Curses, jornades i seminaris organized by Departament de Medi Ambient de la Generalitat de Catalunya
- ICAEN in Catalonia, Spain, set up a programme to train educational staff of schools, institutes and universities, as well as responsible people of public administration. One of the main achievements of this programme was the creation of the “Solar Schools Network”. Several training tools were implemented, in order to reach the common objective: to promote solar energy in educational centers, in accordance to Universol project. The Education Department of Catalan Government, the professional Association of installers and local actors collaborated in the design and implementation of this programme. Also, they shared their experience in the training sessions.

Pedagogical tools:

During courses on building integrated PV, several simulations of production are usually done in order to make students aware of the influence of orientation and module tilting.

Such simulations are done either by rule-of-thumb (average yield of approx. 1000 kWh/kWp/year), or by the performance-ratio formula, or by a specific software such as Pvsyst, when computers are available.

The performance ratio formula is the method usually used as it is more accurate than the rule-of-thumb and does not required any computers. The difficulty of this method is that the global irradiation must be known for every orientation and tilting.

The solution that has been found is to design and use a solar irradiation disk for the latitude 45°N , which corresponds to the latitude of Lyon : this solar irradiation disk gives an estimation of the global irradiation for every orientation and tilting and thus make possible the estimation of the annual yield of PV systems in various configurations.

2 000 copies of this solar irradiation disk were edited and are given for free to students.

In order to improve the educational benefits of the PV system installed within the UNIVERSOL project, the municipality of Montmélian organised a poster competition for the pupils of the public schools of this municipality. The topic of this competition was to make a drawing to illustrate the link between the PV system installed and the use of electric vehicle, which makes the sun the fuel to power the cars.

All drawings were presented at the official inauguration of the PV system and the winning drawing was printed on the electric cars of the municipality, next to the official logo of the municipality and the logo showing the efforts of the Municipality in terms of solar energy.

Open days / visits to PV Systems:

- Région Languedoc-Roussillon - Lycée du Pic Saint-Loup, 6th September 2003, official opening of the building, France
- The 5th November 2003 an Open Day was organized by Fundació Universitat Autònoma de Barcelona (FUAB), Institut de Ciència i Tecnologia Ambientals (ICTA) and Servei de Prevenció i de Medi Ambient (SEPMA) from UAB, with personnel support from ICAEN (Institut Català d'Energia), Spain.

The aim of the meeting was to disseminate the knowledge of PV solar energy in the context of renewable energies and to show some practical examples. The meeting also included a visit to UAB UNIVERSOL PV installation.

- Universitat de Girona, official inauguration, 10/12/2003, in collaboration with Institut Català d'Energia (ICAEN) organized an open day due to the completion of the installation and its connection to the grid the PV installation in the University of Girona. Students, teachers, decision makers from local municipalities and representatives of private companies attended the Open Day. The objective of the action was to disseminate the knowledge of PV solar energy in the context of renewable energies and to show some examples.
- Université Claude Bernard Lyon 1-IUT Bourg-en-Bresse, February 2004, Technical visit of the PV system organised by the local association for the promotion of renewable energies, Hélianthe.
- GEFEN, 1st June 2004, France
- Ville de Chambéry- Maison des Energies, 18th June 2004, Technical visit of the building organised by the local association for the promotion of renewable energies, ASDER, which edited for that event an A3 A3 brochure that describes the features of this eco-building
- Soleil-Marguerite, 12th June 2004, official inauguration, France
- Ville de Montmélian, 22th June 2004, official inauguration, France
- A closing UNIVERSOL event is in preparation in France. It will be a 3 day event (14,15 and 16 October 2004) organised in the Lycée du Grésivandan next to Grenoble and linked with the official inauguration of the 45 kWp PV system installed within the UNIVERSOL project by the Rhone-Alpes Regional Council.

Technical visits of the PV system will be organised for pupils and students of the Lycée du Grésivandan on Thursday 14 October 2004.

The official inauguration of the PV system is expected to be held on Friday 15 October 2004 in the morning

Saturday 16 October 2004 : open day for the public with technical visits of the 45 kWp PV system

- Rhône-Alpes Regional Council, 15th October 2004, France
- Soleil-Marguerite, Friday 21st November : technical visit of the PV system organised by Hespul for the students of the Ecole Nationale Supérieure des Mines de Saint-Etienne and Thursday 27th November : technical visit of the PV system organised by Hespul for the students of the Institut National des Sciences Appliquées (INSA) de Lyon – department Génie Energétique

- Rhone-Alpe Regional Council, 15th october 2005 , official inauguration, France

Web site:

- Web site on line in March 2003 in four languages: Spanish, Catalan, English and French with:

www.universol-europe.org or www.universol.org
direct link with French web-site www.universol-france.org

- Explanation of photovoltaic technology
 - UnivERSol Objectives, list of participants, kWp, etc.
 - Case studies in France, in Spain, in the UK, in the Netherlands
 - Solar News: Relevant information. Events, press, publications, etc.
 - Links: European Commission, partners, manufacturers, subcontractors, etc.
- Internet exchange platform. A specific web site for educational centres was created, in order to disseminate PV solar energy, as well as the achievements of Universol project and information about Universol solar installations in universities and other educational centers in Catalonia (“Solar Schools Network”).
This web site is: www.xesca.net

This is a platform to exchange different experiences, opinions, projects and ideas about the introduction of PV solar energy in schools and universities.

Dissemination by Internet:

- www.universia.net, www.universia.es, Portal UNIVERSIA, Area de comunicación (Luis Iriarte)
- <http://europa.eu.int/comm/research/headlines.html#01>, European Service Network (JudithGracey), European Research Headlines, 18/01/2002
- <http://www.energias-renovables.com>, Boletín de ENERGIAS RENOVABLES, el 24/01/2002
- <http://www.el-mundo.es/universidad/2003/12/10/actualidad/1071086566.html>

Interviews:

- Telephone interview by the radio programme **ONA CATALANA**. Barcelona, 15/01/2002.
- Participation in the programme “**La República**” presented by Joan Barrils from **COM RADIO**. Barcelona, 16/01/2001.
- Telephone interview by **RADIO 5**. Madrid, 16/01/2002.
- **CATALUNYA RADIO**, campus radio de Barcelona, 16/01/2002.
- Telephone interview by **RADIO ESTEL**, 23/01/2001.
- Personal interview by Rebeca Warden from **TIMES HIGHER**. 23/01/2002.
- Telephone interview by Abelardo Hernandez from **RADIO NACIONAL de ESPAÑA**. 24/01/2002.

- Participation in the programme “**Sorbets de Ciència**” by **CATALUNYA RADIO**. 6/04/2002.
- Press note in the programme “**Lamalla ràdio**” by **COM RADIO**. 22/04/2002.
- Interview by **CATALYNYA RADIO**, 11/10/2002
- Interview by **CATALUNYA RADIO**, 05/05/2003
- Participation in two Catalonia television stations, which broadcasted two programmes, the 14/06/03 on TV3 and the 18/06/03/ on Canal 33 (UAB)
- TV broadcasts, 18th May 2004, "19-20 édition régionale" Lyon, France 3 TV
- TV broadcasts 11th June 2004, "6 minutes édition de Lyon de 20h40", M6 local TV, France
- TV broadcasts 15th June 2004, "Journal de 19h30", TLM TV, France

Posters:

- Poster presentation at 18th European PV Solar Energy Conference "WCPEC" Osaka - Japan- 11/05/2002
- In order to make the students aware on PV solar energy applications, there was planned to create and hang several posters in the walls of the schools and other educational centers by ICAEN, Institut Català d'Energia de la Generalitat de Catalunya. Two posters shown below were created among other dissemination activities and were used at schools, colleges, universities and in the workshops devoted to solar energy. Also there were shown during the open days and the inauguration of the installations.
- Poster of the inauguration of PV system at Sta Coloma de Gramenet, Spain, 28/03/2003
- Poster competitions open to all contractors of the UnivERSol project, the winning team is a group of 3 students from the IUT de Bourg-en-Bresse (université Claude Bernard Lyon 1)
- Poster competition for the pupils of the public schools of the municipality of Montmélian, The topic of this competition was to make a drawing to illustrate the link between the PV system installed and the use of electric vehicle, which makes the sun the fuel to power the cars.
- This poster has been officially awarded in October 2004 during the closing UNIVERSOL event in France (see below).
- Poster for the 19th European PV solar Energy Conference and Exhibition, in Paris, 7-11 June 2004, France On the basis of the paper submitted by the coordinator of the UNIVERSOL project and the graphic style of the French UNIVERSOL web site, a A0 colour poster was designed. This poster gives :
- General information about the UNIVERSOL project
- The full list of contractors and the power of PV systems to be installed by country
- One example of the PV systems installed per country

- Some posters were created and hanged in schools and institutes of Catalonia, in order to acknowledge the pupils about the solar energy issues among other renewable energy sources.

Display:

- Several sites of UnivERSol project have installed an external display to show the daily production of PV installation and its technical characteristics (Universitat Autònoma de Barcelona, Universitat de Barcelona, Montmélian, Association Soleil-Marguerite, etc.)

2.6- Main literature produced

Press Articles:

- **EL PAÍS**, Catalunya, Expansión 15/01/2002
- **LA VANGUARDIA**, Vivir en Barcelona, 15/01/2002
- **El Periódico**, Coses de la vida, 15/01.2002
- **Barcelona ym@s**, 15/01/2002.
- **Diario de Mallorca**, Quadern universitari de l'Universitat de les Illes Balears, 24/01/2002
- **Diari Metro**, Universitat de Barcelona, 31/01/2002
- **Photovoltaics Bulletin**, ISSN 1473-8325, february 2002
- **THE TIMES HIGHER**, 15/02/2002
- **Opto & Laser Europe**, News, February 2002
- **La Universitat**, Revista de la Universitat de Barcelona, march 2002
- **El temps**, L'entrevista, 4-10/06/2002
- **La Vanguardia**, 13/06/2003
- **Diari de Terrassa**, 13/06/2003
- **L'Autònoma**, nº164, July 2003
- **Renewable Energy World**. "The Zicer building, University of East Anglia" by David Howey, UK, Nov-Dec. 2003
- **PRESS Universitat Autònoma de Barcelona**, 3th november 2003
- **Sostenible**, 3th November 2003 Jornada sobre l'energia fotovoltaica al campus de la UAB
- **L'Autonoma**, June, july 2003
- **La Vanguardia**, 03/06/03
- **Diari de Terrassa**, 13/06/03
- **El Punt**, 11/12/2003

- **Diari de Girona** 11/12/2003
- **La Vanguardia**, 11/12/2003
- **Elmundo.es** 10/12/2003
- **Diari de Girona** 11/12/2003
- **El Periódico** 11/12/2003
- **Renewable Energy World**. "Sporting spaces", Wageningen, Netherlands. UK Jan-Feb 04
- **Vif-argent**, January 2004, France
- **Systèmes solaires**, March-April 2004, France
- **Hespul Infos**, April 2004, France
- **Silence**, April 2004, France
- **La Maison écologique**, April-May 2004, France,
- **Renewable Energy World**, May-June 2004, France
- **Du Soleil**, May-June, France
- **Plein-Soleil**, June 2004, France
- **Vif-argent**, June 2004, France

Papers:

- "UnivERSol - Integrating grid connected PV systems into educational and cultural facilities in France" for the 18th European PV Solar Energy Conference "WCPEC" Osaka, Japan, 11/05/2002
- "Grid-connected PV systems integrated in 27 universities and cultural facilities" for the 19th European PV solar Energy Conference and Exhibition, in Paris, 7-11 June 2004, France

Brochures:

- In order to present the UNIVERSOL programme during site visits or student course, an A5 brochure has been developed and edited in 10 000 copies. This brochure includes :
 - A short description of the UNIVERSOL programme
 - The aims and objectives of the UNIVERSOL programme
 - Logos of financial supports (European Commission, FP5 and ADEME)
 - The name of French contactors
 - A picture and short description of 2 UNIVERSOL PV systems
 - the contact details of the general coordinator (Gesp) and national coordinator (Hespul)

- the address of the UNIVERSOL web site

Technical visit of the building organised by the local association for the promotion of renewable energies, ASDER, which edited for that event an A3 brochure that describes the features of the eco-building of Maison des Energies, Ville de Chambéry

- A specific closing UNIVERSOL event has been organised in France in order to disseminate achievements and lessons learnt towards several stakeholders. This 3 day event (14,15 and 16 October 2004) was organised in the Lycée du Grésivandan next to Grenoble and linked with the official inauguration of the 45 kWp PV system installed within the UNIVERSOL project by the Rhone-Alpes Regional Council.
- A brochure presenting the event and an official invitation have been design and printed in 4 000 copies. Hespul sent 3 000 of them to primary schools and universities of the Rhone-Alp Region and the Regional Council of Rhone-Alp, that was involved in the organisation of the event, sent 1 000 copies to High Schools.

Booklet:

- Dissemination booklet produced and published by Oxford Brookes University. At the time of writing (February 2005) delivery in Oxford of the printed copies is expected any day. They will be distributed by Oxford Brookes to DG TREN and project participants for dissemination purposes and to other organisations who have expressed interest in the project over the last three years. Also it will be distributed in the next annual European Photovoltaic conference of Barcelona (June 2005).

Handbook:

- Handbook on solar energy promotion. "Coneixer el poder del sol", Manual per al seguiment solar de les instal·lacions fotovoltaïques de la xarxa d'escoles solars de Catalunya, by ICAEN, Institut Català d'Energia de la Generalitat de Catalunya, The idea of this handbook is to summarize all the technical aspects of solar energy systems in a simple way, in order for the students to get familiar with the solar energy.

Leaflets:

- In Spain and in France several sites of UnivERsol project are given to the visitors leaflets of these installation
- Leaflets which contained a brief explanation about the PV installations and Universol project so that students and general public could get a necessary information on the subject were created among other dissemination activities and were used at schools, colleges, universities and in the workshops devoted to solar energy, in Catalonia, Spain.