CreAte Acceptance

Work package 2- Historical and recent attitude of stakeholders

Case 17:
PV Accept solar project

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*C*ultural Influences on *R*enewable *E*nergy *A*cceptance and *T*ools for the development of communication strategies to promot*E* ACCEPTANCE among key actor groups

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1. Introduction

This paper looks at the recent experience about photovoltaic system in two European areas: Germany and Italy.

PVACCEPT/IPS-2000-0090 is a project funded by the EC within the 5th Framework Programme and the special programme 'Promotion of innovation and encouragement of SME participation'.

It started officially on the 1st of July 2001 after almost one years and a half of preparation and with a planned duration of 36 months.

During this period research, demonstration, and dissemination activities was realised. The project was extended by six months until the 31st of December 2004 due to an earlier change in the consortium composition and to the delays in decision-making processes on the side of involved municipality partners.

2. Country overview

In Italy, to date, there are 20 MW 'solar' plants and only half is functioning.

The recent development in this field is regulated particularly by the decree n. 181 (28.07.2005), which points criteria to provide incentives to the production of energy by conversion to photovoltaic on solar source.

The decree stimulated the installation of 100 MW photovoltaic (pv) plants and sets the aim to reach the installation of other 300 MW pv plants by 2015.

The scheme of incentives is very different from the present one: the incentives will be granted to the plant owners on account energy, i.e. on each kW surplus of the produced energy, which can be sold to the electricity suppliers.

In this way, electricity suppliers would buy the energy at lower than market prices.

In the past Italy experienced other initiatives devoted to local authorities, with an incentives system that was based on financing the pv plants.

The decree n. 181, encourages using photovoltaic energy not only by public but also by households, house condominium and privates, which will install plants with simpler procedures.

This decree implies incentives related to tariffs, linked to the nominal power of the systems, distinguishing between smaller or greater than 20 MW power.

Another distinction was made regarding the date of presentation of application for obtaining access to the incentives.

In May 2005, the Main National Electricity Supplier (GME) and the National Authority for Electricity and Gas have established the rules for *'the white certificates market operation (TEE)'*.

Electricity and Gas Suppliers who are obliged to energy saving by he electricity and gas Authority, can chose between buying TEE certificates on the market from energy services companies, certifying the obtained savings or, alternatively, can directly develop projects of energy savings.

3. Summary

The project was focussed on the acceptance and dissemination of solar energy conversion by photovoltaic (PV) systems.

The experiences of the past showed that PV systems and modules have been designed predominantly by technical criteria, with a primary focus on performance, such as high efficiency and low cost, and little regard was dedicated to their aesthetic aspects. The consequence was that often no real architectural integration occurred when they were applied to buildings, and investors abandoned the idea of installing a PV system due to their aesthetic appearance. 'Good' application of the commercially available PV modules was thus limited mainly to new modern buildings.

This is probably the reason for the low acceptance of PV and therefore for its low market diffusion.

To enable wider application of this environmentally friendly energy generation, the project aimed therefore at designing and developing marketable photovoltaic modules, whose design enables a low striking integration into old buildings, historical sites, and (protected) landscapes. Since tourism in such sensitive areas was regarded as a vehicle for information transfer to foster further dissemination of (innovative) PV, corresponding sites for demonstration plants with application of the innovative modules were to be chosen.

4. STEP ONE: Possible futures?

The aims of the project can be summarised as follows:

- Broader implementation of photovoltaics will contribute to the reduction of environment-damaging emissions.
- There are non-technical (respectively non-economic) barriers for the acceptability of photovoltaics.
- Design is an important and so far underestimated acceptability factor. Improved design can improve the acceptability of PV technology.
- If innovative PV design stands the integration test in highly sensitive areas under landscape and monument protection, it can be applied everywhere.
- Tourism in sensitive areas can be considered a specific market for PV technology and a possible tool for information transfer and marketing.
- A comparison of North and South European countries with differences in climate, architecture, and landscapes offers a wide range of PV application scenarios.

The realisation of four demonstration objects, equipped with the innovative modules, was achieved in agreement with municipality in Liguria/Italy and the South of Germany in 2004:

a. A solar information plate with oversized printed modules at *Castello San Giorgio*, a protected monument, which houses a museum, in La Spezia/Italy.
b. A solar Schiller-quotation plate at the (protected) historic city wall in Marbach am Neckar/ Germany, also using oversized printed modules.
c. The installation of 18 self-lighted 'solar flags' in the courtyard of the protected monument *Castello Doria* in Porto Venere/Italy.

d. Three solar pergolas with semitransparent modules in special size at a river promenade in Bocca di Magra/Ameglia.

All Italian demonstration objects are stand-alone systems, i.e. the produced energy is stored in batteries, while the object in Marbach am Neckar is grid-connected. All demonstration objects are equipped with data logging systems.

5. STEP TWO: What were the various expectations of the case?

The partners of the project were:

- Designers (UdK Berlin).
- SMEs/PV technology producers: Würth Solar (CuInSe21 thin-film modules), Sunways (crystalline silicon modules).
- PV system installers: BUSI/ANIT.
- Research institutes: Ambiente Italia, IÖW, University of Siena; from Italy and Germany.

The division of labour within the consortium is shown in the following table:

Table 5.1 *Consortium member of the PV ACCEPT project*

Consortium Member	Main tasks
Universität der Künste Berlin (Germany)	Project coordinator Design development/innovative PV modules Design and planning of demonstration objects Execution of SME training units Organisation of workshops and finale conference in Germany Production of dissemination tools: websites, itinerant exhibition, design manual Further dissemination of results
Università degli studi di Siena (Italy)	Life Cycle Assessment of demonstration objects scientific support
Istituto di Ricerche Ambiente Italia (Italy)	Coordination of activities in Italy Acceptability studies Organisation of workshops in Italy Dissemination of results
Institut für ökologische Wirtschaftsforschung (Germany)	Acceptability studies scientific support
Würt Solar (SME) (Germany)	Technology development / innovative PV modules Delivery of modules and carrying structures to the demonstration sites Technical test runs Execution of SME training units
Sunways (SME) (Germany)	Technology development / innovative PV modules Delivery of modules and carrying structures to the demonstration sites Technical test runs Execution of SME training units
BUSI / ANIT(SME) (Italy)	Delivery of additional system components to the demonstration sites Installation of demonstration objects and supervision of data logging Execution of SME training units

The realisation of PVACCEPT project was made in Germany and Italy, which represent two example areas of Northern and Southern Europe.

The reasons for is that the project results should be applicable within other European countries as well. Only a wider dissemination can bring about the aspired ecological advantage on the one hand, and the opening of new markets for the SMEs on the other hand.

The first expectation was taking into consideration relevant aspects of transferability to other European regions.

To monitoring all the relevant aspects of transferability, a group of 'European observers' was integrated into the project. This group was formed not only by academic institutions, but also by research institutes and SMEs.

The qualified observers was chosen from the following four different North and South European countries:

Austria
- RESPECT, Institut für Integrativen Tourismus und Entwicklung, Vienna
- 17&4 Organisationsberatung GmbH, Vienna.

France
- ARMINES / ENSMP, Centre d'Energétique, Ecole des Mines de Paris, Paris
- CSTB, Centre Scientifique et Technique du Bâtiment, Paris.

Holland
- IIUE, The International Institute for the Urban Environment, Delft
- EDC, European Design Centre, Eindhoven.

Spain:
- AGENER, Agencia de Gestión Energética de la Provincia de Jaén, Jaén
- SIARQ, Studio Itinerante de Arquitectura, Barcelona.

The observers played a very important and extremely fruitful function, especially concerning the transferability and dissemination aspects.

Municipality representatives and local key actors in both research regions were involved from the beginning and were essential for the definition of appropriate demonstration objects. Legal contracts were signed to define the obligations of the PVACCEPT consortium as well as of the municipality as the future owners of the photovoltaic plants and to assure the quality and functioning of the demonstration plants for a period of at least ten years. Despite their early involvement, the procedures and negotiations with the municipality authorities turned out to be a much more complex and time-consuming process than expected.

In 2002 the original German consortium member ANTEC Solar, a technology producer, had to leave the consortium due to insolvency. As a consequence the design innovations, which had been developed especially for solar modules and production technologies of ANTEC Solar and in close cooperation of UdK and ANTEC Solar, could not be used further in the project.

In close cooperation between designers and PV technology producers a total of 12 innovative PV cells, modules, and multifunctional objects have been produced, ready for application, following different development lines of innovative aspect :
- colour
- semitransparency

- surface structure
- multifunctionality.

Table 5.2 *Identification of stakeholder and their expectation in an implementation of bioenergy system*

Actor	Expectation	Speaking for 'publics'
Whürt Solar (G)	Product portfolio enlargement of the company by high value products.	Favourable opportunity to open new market niches for PV modules in general and enhance the acceptance of PV installations.
Sunways AG (G)	Knowledge about the demands of the markets, i.e. in the architectural sector, and the development of innovative, multifunctional products are key factors to increase the future competitiveness of Sunways AG.	Niche products can help to enhance the acceptability of PV in general, and the additional functions (i.e. the lighting of the 'solar flag') will raise the value of the PV modules.
BUSI IMPIANTI (I)	Development of new market of this technology.	Not identified
European observers	Transferability to other European Regions	Ecological advantage; Opening of new markets for SME
European Community	Transferability to other European Regions	Reduction of environment-damaging emissions
Partners at Local Level	Knowledge about the project, definition of appropriate demonstration objects	Ecological advantage; Reduction of environment-damaging emissions
Other Partner: ANTEC Solar G)	ANTEC Solar could not stay as a partner in the PVACCEPT project, as it went insolvent in summer 2002	

6. STEP THREE: Understanding 'participatory' decision-making

Negotiating expectations
This project was conducted with a very specific approach that implied a close cooperation between designers and technology producers.

This was a not common cooperation, due to the different expertise of these two groups of partners, that means different languages.

The technology producers had to become more open for design aspects and their importance in general and to discover the marketing potential of design beyond cost considerations; the designers had to learn to deal with the limitations of design ideas, mainly defined by production technologies and processes on the one hand, and development interests of the involved SMEs on the other hand, and to make clear decisions about differing priorities (costs/design) in each individual case.

The actual design and technology development process followed the planned form of the cooperation and decision-making. The output were prototypes, which were tested and further developed, until they were ready for application in the demonstration objects, that were selected and designed in parallel.

The general public management implied an acceptability study that was divided in two parts, carried out respectively before and after the construction of the demonstration objects.

In 2001 it was carried out the first part of the acceptability study based mainly on questionnaires (ex-ante).

It was intended to explore the knowledge on PV of experts and local people and their opinion on aesthetic factors, and their theoretical willingness to accept PV also on old buildings, monuments, and in landscape.

Moreover, direct interviews were conducted with experts and key persons in workshops held in Göhren/Germany in September 2001 and in Porto Venere/Italy in October 2001.

The second part of the acceptability study concentrated on evaluating the effects of the built demonstration objects on acceptability, i.e. on the actual acceptance of the innovative developed PV systems.

This ex post survey was focused on architects, as important intermediary players, on local population and tourists at the demonstration sites.

Additional information from experts and other key persons was gathered at the workshops/SME trainings in Porto Venere/Italy in September 2004 and in Marbach am Neckar/Germany in October 2004.

The results of the ex ante study was confirmed by this second group surveyed, in terms of importance of design and of applicability of PV on protected buildings, if the design is appropriate. An high degree of acceptance of the built demonstration objects emerged from this last part of the study.

Moreover, architects and experts provided valuable information for the applicability and transferability of project results

7. STEP FOUR: From visions to actualities

The reports underlines that the realisation of demonstration objects, that are basic to the project, encountered some barriers that had been underestimated by the project consortium, especially regarding to the time component

The problems and barriers occurred on the following levels:

- *Research, innovation and marketing*
  Lack of knowledge and experience in collaboration within an international research project by the municipalities involved represented a critical factor. Indeed it was necessary a time consuming ‘education’ about the photovoltaic technology and the potential benefits for the municipality partners of the project. The awareness and willingness for innovation in general and the comprehension of its general and touristic marketing value proved to be very low.

- *Complex selection criteria*
  The selection criteria, the interests and needs and the resources were critical factors to achieve decisions concerning the demonstration objects. One main problem here was that the municipality own few buildings themselves, while the selection criteria excluded interested private owners from the project. The selection criteria to be fulfilled by the demonstration objects were:

- municipality property
- touristic function
- visibility
- feasibility
- innovation
- transferability.

- *Bureaucracy and decision-making*
  Other barriers were bureaucratic structures and procedures, due to the time consuming decision-making procedures. Legal contracts were needed to define the tasks of the PVACCEPT consortium as well as those of the municipality as the future owners of the photovoltaic plants, to assure the quality and function of the demonstration plants for a period of at least 10 years. In Italy this process of decision-making involved many levels in the municipality hierarchy. This bureaucratic structure was the main barrier to the realisation of project, in some case influenced by political strategies and changes. The UdK designers were forced to produce new designs for new sites over and over again, that was extremely time consuming.

- *Lack of resources*
  The main problem faced in Germany dealt with the economic aspect. Economic resources of the municipality of the region of Rügen, for financing additional construction works was limited. The failure of several demonstration objects in an already very developed stage of planning was due to the scarceness of financial resources on the municipality side. This unexpected event forced, in agreement with the Commission, to find another region where to realize the demonstration object, since the demonstration aspect was regarded as more important than the regional aspect. The alternative possibilities in the following months led to a cooperation with the Municipality of Marbach am Neckar in the South of Germany. In sum concrete plans and designs were made for 16 possible demonstration sites in Germany, and for 27 sites in Italy between May 2002 and December 2003, each site was discussed with the municipality authorities in several meetings.

  The study underlying that the contacts and discussions with municipality was an element of big instability:

  "Decisions on side of the municipality exceeded the foreseen schedule, in a few cases a negative decision was taken at a stage of planning and discussion, when the project seemed to be only a small step away from realisation. Sometimes even designs for sites and assigned functions, which originally were based on a suggestion of the commune itself, were later rejected by the municipality authorities without giving clear reasons. In consequence, at some points in time 'exit strategies' had to be developed, i.e. the search for appropriate sites started almost from the beginning again. The fact that the search for sites had to concentrate on possible application cases for the innovative PV products, developed by the project in parallel, did not make the task easier".

Table 7.1 *Process of sites choice*

Object / Germany	design start	decision date	comments
Lauterbach / harbour quay	06/02	02/03	given up to the advantage of other, more appropriate sites for the application of the "solar flags"
Putbus / Marstall heating house	06/02	07/03	given up, representative only in combination with neighbouring other demonstration objects, only very small PV areas possible
Putbus / new House of the Guest	06/02	02/03	given up, time plans with preparatory communal and private investment for renovation of the building did not match
Putbus / old House of the Guest	06/02	10/02	given up, not representative enough, very small PV areas possible, selling of house to private owner was planned (selection criteria)
Serams / crossing	06/02	10/02	neglected, commune could not bear costs for necessary accompanying measures, surroundings would have needed considerable improvement to become a "demonstration site"
Göhren / new House of the Guest	07/02	02/03	cancelled by the commune in final stage of planning and application for additional funding, "financial problems" of commune as reasons
Göhren / beach promenade	07/02	02/03	neglected, time plans for accompanying measures of commune (reorganization of the promenade within the frame of a garden exhibition) did not match
Putbus / solar tree in front of Orangerie	06/03	08/03	rejected by commune, communal representatives found the site "too visible", another site (at Marstall, see below) was proposed instead
Putbus / solar tree in castle park near Marstall	08/03	12/03	given up because of lack of necessary private sponsoring for metal structure and additional funding possibilities of commune
Putbus / Marstall	08/03	10/03	rejected by upper level of monument protection authority, while desired by commune and lower level of monument protection authority
Marbach / city wall	08/03	12/03	outside the originally defined research region, "exit strategy" project because of failure of all Rügen projects, accepted in December 2003, solar information plate, will be realized
Tornow / castle terrace	10/03	11/03	"exit strategy" project, outside the originally defined research region, neglected because of restrictions of the monument protection authority, which would have been too costly to realize
Object / Italy	**design start**	**decision date**	**comments**
Porto Venere / Welcome Centre	05/02	01/03	neglected, site not representative enough, expensive building measures would have been necessary, the financial possibilities of the commune remained unclear
Porto Venere / Piazza Spallanzani	05/02	01/03	neglected, would have been temporary installation during the summer season only, no interest of commune
Porto Venere / Pier	05/02	06/02	neglected, risks (protection of modules against salt water as well as vandalism necessary) were regarded as too high
Lerici / Piazza Bacigalupi / new fountain	05/02	01/03	neglected, no interest of commune after election of a new mayor
Lerici / Piazza Bacigalupi / parking	05/02	01/03	neglected, no interest of commune after election of a new mayor
Lerici / Town Hall	05/02	01/03	neglected, no interest of commune, only very small PV area would have been possible
Lerici / School	05/02	01/03	neglected, window shutters could not be further developed within the research project due to the insolvency of a consortium member (= producer)
Lerici / retention wall	06/02	01/03	neglected, suggestion of commune, structurally interesting, but site of very limited visibility alongside highway and near tunnel (selection criteria)

Continuation of table

Object / Italy	design start	decision date	comments
Lerici / camouflage nets	06/02	01/03	neglected, technical production problems would have gone beyond the scope of the project (triangular module shapes necessary)
Lerici / parking / retention walls	06/02	01/03	neglected, preparatory communal construction works were delayed, so that time tables did not match
Porto Venere / bus stop	06/02	01/03	rejected by commune after several presentations without clear arguments
Porto Venere / stone wall Seno dell' Olivo	08/02	01/03	rejected by commune after several presentations without clear arguments
Ameglia / Bocca di Magra / solar pergola	10/02	12/03	accepted, "solar pergola" will be realized in cooperation with the commune (preparatory works for the supporting pergola structure will be financed and built by the commune)
Bolano / retention wall	10/02	01/03	neglected, first discussions and agreements positive, but later no interest of commune in realization
Bolano / entrance ramp	10/02	01/03	neglected, first discussions and agreements positive, but later no interest of commune in realization
La Spezia / Agriturismo pool house	10/02	01/03	neglected, "exit strategy" project, site was privately owned (selection criteria)
La Spezia / castle	10/02	12/03	finally accepted by all authorities (December 2003), solar information plate with lighting at museum's entrance, will be realized
Porto Venere / castle	10/02	10/03	finally accepted by all authorities (October 2003), installation with self-lighted "solar flags" in castle courtyard, will be realized
Sarzana / Piazza San Giorgio	10/02	01/03	neglected, limited interest of commune, very small PV application possible
Sarzana / Piazza Citadella / bike station	10/02	01/03	rejected by commune without clear reasons

Source: PV ACCEPT, Final Report, 2005.

8. Lesson learned

The PV ACCEPT experience underlined three set of issues that must be taking into consideration:

- *Cooperation between SMEs, designers and researchers;*

If there are partners with completely different backgrounds (such as SME interested on technical aspects and researchers interested on sociological aspects), involved in a project, their cooperation requires flexibility on all sides. The basic aim is finding a common language, i.e. to come to understand each other's expectations and limitations. The project coordinator plays an important role in trying to bundle up the different interests, especially when every steps of project are dependent on each other.

- *Involvement of local clients and stakeholders;*

Public bodies and external partners are critical factors to be managed by the project developers. The necessary commitment over a longer period of time than previously foreseen, cannot be taken for granted: it is very important to guarantee intensive contacts between the project management and local authorities, because local political and economic conditions have a strong influence on the project. Legal contracts should be made to define tasks on both sides. Along with project partners, it is crucial the involvement of other relevant stakeholders. It may be very useful to have good links with local population, local professional, cultural, and environmental as-

sociations and get them involved in the decisional steps. That means also a useful tool to communicate with local administrators - always concerned with budget and image problems - and with the general public, sometimes worried by what they perceive as an 'excess' of innovation.

- *Involvement of authorisation bodies.*

The PV ACCEPT project planned demonstration object in protected areas. This implied a strong involvement of authorization bodies in the first design, to allow a better understanding from the early stages of project and to participate in a constructive way to the decision-making process. The early involvement of the monument protection authority, who had a constructive and committed attitude, was a success factor for the realization of the demonstration objects in Liguria. Some remarks must be done about the acceptability of photovoltaic technology. It emerged that there are a high support in favour of PV but, at the same time, a certain degree of confusion and lack of information is observed.

In general, the aesthetics of standard photovoltaic modules is a major obstacle for broader diffusion of the technology. The questioning ex ante of experts and non-experts and the questioning ex post of tourists and local population, confirmed that there are high level of acceptability of PV in monuments and protected buildings, which maintain harmonic integration into the existing architecture. Other relevant factors that emerged by this experience is the attitude of monument protection authorities. They need to be 'educated' about innovative solar technologies, due to the considerable lack of knowledge.

A strong recommendation is made for several activities that are needed to overcome the barriers that the project faced.

The main ones are:
1. transferability of results
2. disseminations
3. training and teaching
4. networking.

Finally, the economic aspect must be regarded as a key factor: this is a concerns for all the stakeholders. From the local authorities point of view, without financial incentives today PV actually would not have much chance. The existing incentives have to be made more efficient with respect to innovation and design; financial support systems should be long-term oriented, in order to decrease risk and attract private investments; an effective incentive scheme should devote part of the financial resources to promotion and information dissemination activities. On the other hand, the interest of SMEs and architects is concentrated on costs and amortization aspects and about how much improved aesthetics can cost more than the standard version.

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