FINAL REPORT

CONTRACT N° : NNE5-2000-397

PROJECT N° : 2000/C 73/10 (Call Identifier)

ACRONYM : PV SOUNDLESS

TITLE : PV Generators Integrated Into Sound Barriers

PROJECT CO-ORDINATOR : ISOFOTON, S.A.

PARTNERS :

Isofoton, S.A. and the mayor subcontractor Freisinger
City of Helmond, Dienst Stadsontwikkeling
City of Leganés
Fraunhofer- Gesellschaft zur Foerderung der Angewandten Forschung E.V.
Biohaus PV Handels GMBH

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1.1 EXECUTIVE PUBLISHABLE SUMMARY

Using Photovoltaic elements in Sound Barriers is a well-known solution in Europe which establishes an excellent method of combining the protection against noise with clean energies power generation, sharing building costs and use efficiency. The PVSOUNDLESS project means to be a step forward in the evolution and proliferation of this solution reducing costs, simplifying installation and increasing efficiency.

The main challenge of the PVSOUNDLESS project was to create a novel sectional construction that unifies the functions of photovoltaic generation and acoustical protection. The photovoltaic cells have been fixed on a ceramic carrier plate and by means of a series-production system standardization, the sound barrier assembly becomes quick and easy.

The electrical and acoustical tests have tried the excellent characteristics of the new ceramic module, and therefore have certified the usefulness of the barrier and its great potential. The new type of PV module is useful not only in sounds barriers but also as sectional construction.

The pursuit of a model project necessarily implied the standardization of both the sound barrier module and the manufacturing process, as well as the installation system, that is to say, the supporting structure. A team of architects and production engineers has worked to achieve this goal. These architects have also developed and carried out the homologation processes of the modules and structure perimeter union joint system.

The project includes the installation of two different sound barrier generators. The first one, which uses conventional photovoltaic modules, pursues the optimization of the method of installation, with a view to his standardization and diffusion of the results among the technical engineering sector. The second barrier combines new ceramic

modules with conventional modules, which allows a comparability research of electrical and mechanical results in the long term.

The sophisticated monitoring of the environmental parameters and electrical generation has played a key position in the project, discovering essential information for the electrical maintenance and optimization of the system. The sizing of the wiring, the anti-vandalism systems and the need of annual cleaning are some examples of the actual training due to failures detected in monitoring. The secondary use of this monitoring is the testing cost-benefit of these systems regarding electricity.

The last step for the attainment of the project target is the development of dissemination activities. Some of these activities have already started, and the high visibility of the barriers has resulted in the arisen of great national and international interest in this solution.

1.2 PUBLISHABLE SYNTHESIS REPORT

Photovoltaic is the technology to convert sunlight into electricity by using solar cells and modules. The technical potential for this environmentally clean and renewable energy resource is immense, yet system costs and sometimes the demand for free space limit the actual application of this mature technology. Using photovoltaic elements in sound barriers establishes an excellent way to combine the noise protection functions with the energy production of the PV modules and to share building costs and use of space.

To mount PV modules on sound barriers is one existing option to use extensive building structures along motorways and railways for building up large grid-connected photovoltaic installations in rural and urban areas. The great potential of this technology in Europe has been recently evaluated in a European THERMIE B Project.

A certain number of PV sound barriers has been installed during the last years. Different mounting technologies have been developed and applied – like top mounting, mounting as

PV shingles, vertical mounting, horizontal zigzag mounting and cassettes type mounting on a concrete wall. The standardization, prefabrication, low cost and reliability of the modules support structures was one of the objectives of the project.

But one step further to lower system costs and increase multifunctional aspects is the creation of a novel sectional construction that unifies the functions of photovoltaic generation and acoustical protection. As one of the main parts of the PVSOUNDLESS project, the R+D department of ISOFOTON has created such a new PV sound barrier element, the I-50 CER, a 50Wp monocrystalline module where the 36 photovoltaic cells have been inserted on a ceramic carrier plate. The new approach to sound barriers solution permeated by the project PVSOUNDLESS has created massive sound barrier elements made of ceramic modules, with the solar cells laminated on the ceramic surface. These ceramic modules can be manufactured and assembled in a central production facility, while mounting on-site the sound barrier becomes quick and easy. The excellent acoustic characteristics of the newly developed photovoltaic module make it ideal for sound barriers at different landscapes, as well as they offer a new constructive solution.

The new module has been submitted to the relevant certification procedures. The electric tests have been carried out by the Solar Energy Institute of Fraunhofer. The acoustic tests have been carried out by the Spanish CSIC – Torres Quevedo Institute. As a result of these tests, the acoustic behaviour of the module itself and of the ensemble of modules has been characterized. These tests have certified the usefulness of the barrier and its great potential.

The pursuit of a model project necessarily implied the standardization of both the sound barrier module and the manufacturing process, as well as the installation system, that is to say, the supporting structure. A team of architects and production engineers has worked to achieve this goal. These architects have also developed and carried out the homologation processes of the modules and structure perimeter union joint system.

Two sound barrier generators have been successfully installed, respectively in Germany and in The Netherlands, and are working properly. A mixture of ceramic and standard modules of different manufacturers has been used, to permit a serious study of the sound barrier usefulness and the new module comparative behaviour, as well as the energy production.

PVSoundless PV Sound barrier at Freising

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The monitoring systems have been implemented by the Fraunhofer Institut Solare Energiesysteme and the STW Freising.

Finally, the first diffusion activities have been carried out; the high visibility of the barriers has resulted in the arisen of great national and international interest in this solution.