

1. Development of a computer application to estimate the solar radiation upon planes located in complex terrains and in urban areas.

• Description:

The general objective of the project is, within short periods of time, to accurately determine the global, diffuse and direct solar radiation that falls upon any plane located in a complex terrain or in an urban area (roofs, flat and terrace roofs or public spaces). The preparation of a computer application will enable different users (municipal and regional energy agency agents, draughtsmen and installers) to assess locations for the active use of solar energy.

The specific objective of the project is to design, develop and create a computer tool that will permit assessing and selecting locations for the active use of solar energy (photovoltaic or thermal installations in urban areas and large generation plants) and to design bioclimatic buildings. The tool to be developed is described briefly below:

The tool must collect available solar radiation data (from weather stations or databases). These data will provide the access to be able to apply an angular solar radiation distribution model that will permit estimating the radiance from the different points of the canopy of heaven. These radiance results obtained will be used to estimate the irradiance on the collector planes of interest according to another geographic model that will bear in mind the nearby obstacles and the materials of such obstacles. The resulting information will be shown on a web page that will offer a report sale module. This web page will comply with a model of user profiles or roles as indicated below:

- It will permit the purchase of reports on the calculation of irradiance on planes for a price per consultation to be defined. This will be the case for sporadic users.

- If the users purchase a large volume of consultations, an application licence may be sold to them at a yearly price.

- The tool may return irradiance values on a plane shown on a geographical map accompanied by a written report.

Other specific objectives of the project, in agreement with the call it is presented to, are:

- Foster C_T_E dialogue through specific project proposals related to ICTs, with a view to combining forces, adding synergies and fostering the growth of the players involved.
- Respond to today's technological needs from a research, development and innovation perspective.
- Foster the scientific and technological capacity of the Regional Community of Navarra, via the joint participation of companies, technological centres and universities.
- Establish a radiance distribution model on the canopy of heaven based on observations of irradiance on the horizontal plane (easily available). Validate and calibrate the aforementioned model. The following objectives are proposed for this:

- Contrast angular distribution measures of solar radiation provided by equipment available at UPNA, in order to make it possible to validate and calibrate the radiance distribution model to be applied.

- Compare the radiance distribution results obtained with different models, for the conditions of the Pamplona sky, with a view to selecting the most appropriate one.

- Develop a geographic model that will make it easier to bear in mind the obstacles and their effects on direct and diffuse radiations that fall upon the collection plane.
- Design, develop and create a computer tool that will permit estimating and assessing locations for the active use of solar energy (photovoltaic or
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thermal systems in urban areas and large plants) and design bioclimatic buildings.

- Supply novel technology that will permit determining the global solar radiation that falls upon the cities, taking into consideration both built-up areas and infrastructures as well as public spaces (squares, park, streets ...).
- Develop technological instruments to estimate the irradiance using information and communication technologies that can be used to design bioclimatic buildings.
- Optimise the energy gains in a building due to the action of solar radiation, with a view to improving the energy efficiency of the building both from the thermal and luminous viewpoint.
- Improve the performance of the technologies related to solar renewable energies which are in turn integrated into buildings, such as thermal solar energy, photovoltaic solar energy and natural lighting.

A clear objective will also be for this tool (by marketing and sale) to reach sectors that work in the field of feasibility analyses and studies of solar energy installations in urban areas as well as in large plants. The main sectors interested are: architects' studios, constructors, developers, energy sector companies, etc.

• **Participants:**

-University Groups: 1. Public University of Navarra (Group of Electrification and Renewable Energies)

-Companies: 4. Trabajos catastrales, S.A., AC Solar XXI, S.L.L., A.H. Asociados, CyC Consultoría y Comunicaciones.

- **Project Time:** 01/10/2007 until 30/10/2009
- **Total Budget:** 389,500 €

2. Development of new domotic systems that integrate innovative sensors for energy management in the construction sector.

- **Description:**

Objective

Develop new domotic systems for energy management in housing, with a high impact on the construction sector. These systems will include innovative sensors in this sector (wireless technologies, optical fibre technology), with a view to offering new information and communication technological tools to improve the energy and environment efficiency of the buildings.

Background

There would be a sectorial impact thanks to the supply of innovative domotic systems for energy management in the construction sector via the incorporation of new sensors, which provide different functional features and enhanced service performance. This would offer new tools to increase the energy efficiency of buildings and to design automatic control systems in the building elements.

From the technical perspective, the incorporation of sensors with a high technological value would open up the door to the development of new domotic systems that will offer advantages, unknown to date, in the building field and thus new products that would have a considerable impact on a European level.

On the other hand, the project represents an opportunity to analyse the

industrial feasibility of new information and communication technologies (ICTs) which will be researched throughout the project.

Expected results

Development of new domotic systems for energy management via innovative sensors, with new service features, high technological impact and broad commercial possibilities.

Integration of sensors with a high technological development level (wireless, optical fibre) in ICTs with applications in housing, which will be used to improve the energy efficiency of buildings.

- **Participants:**

- University Groups: 2. Public University of Navarra (Group of Optical Communications and Electronic Applications and Group of Antenna and Signals.)

- Companies: 5. Natural Climate Systems, S.A. (Miyabi), Ingeniería Domótica. S.L. and A.H. Asociados,

- **Project Time:** 01/10/2007 until 30/09/2010
- **Total Budget:** 797,600 €

3. Bioinformatics Platform Development.

- **Description:**

The objective of this project would be to develop a genomics platform in the community of Navarra. The genomics platform must have three differentiated pillars: (1) large-scale DNA sequencing (complete genomes); (2) design, construction and hybridisation of à la carte arrays; (3) bioinformatics tools to perform the sequence analyses, genomes comparison, oligonucleotide design, etc.

Specific objectives: This project would be dedicated to the development of the third pillar embryo, the development of a bioinformatics station with the capacity to carry out comparisons between genomes, annotation of genomes, design of DNA sequences to construct à la carte arrays, analysis of array hybridisation results, detection of polymorphisms.

Operative objective: The existence in our community of an ICT company specialised in the field of bioinformatics. Initially, the bioinformatics company could use already development programs but in a future it would develop its own bioinformatics tools or adapt existing programs (customise) and existing tools, to optimise their use in specific objectives..

- **Participants:**

- University Groups: 2. Public University of Navarra (Group of Distributed Systems of the Department of Mathematics and Informatics and the Group of Genetics and Microbiology of the Agricultural Production Department.)
- Technological Centres: 1. Agrobiotechnology Institute.
- Companies: 1. Cimanti, S.L.

- **Project Time:** 01/10/2007 until 30/09/2009
- **Total Budget:** 198,800 €

4. Management and transmission of signals produced by nanosensors

- **Description:**

General Objective: To develop a data receipt and wireless communication and collection system for two specific applications: Vine strains and construction elements, using nanotechnology applied to sensors.

Specific objective(s):

As the objective is to work with nanosensors, it is important to point out that the critical parameters of the system to be designed and developed are:

- Reduced size of the signal transmitters/receivers
- Solution of the battery autonomy system (working life of batteries of around 5 years)
- Lower price of transmitter/receiver
- Wireless communications system
- Weather-resistance system
- Antitheft safety system of the systems

The distribution of the Nanosensors on the plantation will be carried out for a homogeneous 10-hectare standard type plantation. The land relief is a critical parameter for the communications system, so the design in the plantation will have nodes, repeaters and concentrators. The sensor concentration may vary depending on the plantation.

The twice-daily data transmission from the sensors to the intermediate node could be considered.

The project must also manage the data collected in a standard.

A standard building will be taken as reference in the case of nanosensors in construction. This building may be for residential or service use. In this case the typology of the building (number of stories, orientation, type of enclosure,...) will be a decisive factor to define the operation and control the parameters of the sensors, as well as where they will be located and the density (e.g. independent sensors distributed throughout the plant, located in the inner partition to cover an area of 10 m²). In this case, the data transmission from the sensors to the intermediate node must be constant and in real time.

Operative objective(s):

On the one hand, achieve a system that will provide the possibility of having 60 sensors per hectare. The data collection and transmission would be discrete and non-continued with an average of two transmissions per day. The optimal data communication would be 20 bytes (10 identification and protocol +10 of data corresponding to about 5 signals) of information per sensor, which represents about 2.5 kb per hectare and day. The cost of the traffic considered could be 0.001 Euros per day. The optimal cost of the entire system, including communications, nodes, repeaters, concentrators and nanosensors could be around 5% or less the exploitation cost of the vineyard (2000 – 2500 € on average per exploitation) (with an amortisation period of about 5 years)

On the other hand, for the construction sector, the sensors to be integrated into buildings. must stand out due to the following characteristics:

- Nanosensor manufacturing feasibility, according to the functional characteristic sought and the application as a construction element
- Aptitude to obtain construction scale elements that can be installed in buildings in order to assess them *in situ* under service conditions.
- Future industrialisation possibility (industrial scale production)

- Adequate service performance during the working life of the elements developed (either on the outside or on the inside of the building), due to the extensive service time (decades).

- **Participants:**

- University Groups: 1. Public University of Navarra (Group of Antennas and Signals)

- Technological Centres: 1. CEMITEC.

- Companies: 4. A.H. Asociados, Cimanti, S.L., Técnicas y procesos agrícolas, S.L., Simes Senco, S.L.

- **Project Time:** 01/10/2007 until 30/09/2010

- **Total Budget:** 1,392,900 €

5. Management and transmission of signals produced by nanosensors

• Description:

- The objective is to construct a computer tool to design thermal solar systems that will also permit the simulation, via virtual reality, of the performance of solar installations under certain conditions of use, with a view to foreseeing any installation problems prior to installation and start-up.

- The aim is for this tool to be useful to train installation designers, installation and maintenance technicians of thermal solar systems (new and “experts”). It will thus be very useful for thermal solar energy training centres. Therefore, the aim is to develop a specific didactic methodology with the development of decent technological simulations.

-Another of the objectives is for the program to be validated for use as a tool acknowledged by the CTE (Technical Construction Code).

Specific objective(s).

- This will be a very helpful instrument to design or re-designing installations.

- It will be an instrument to train technicians in thermal solar installations as well as maintenance technicians to distinguish between different calculation programs and to know and improve the performance of the thermal solar installation and its elements.

- The tool will integrate all the program and algorithm possibilities considered appropriate for each one of the components or elements of a standard thermal solar installation (pipes, accumulators, valves...).

Other specific objectives of the project, depending on the call it is presented to, are:

- To foster the T_E dialogue through this specific project proposal around ICTs, with a view to combining forces, adding synergies and fostering the growth of the partners involved.

- To respond to today's technological needs from a research, development and innovation perspective.

- To foster the technological capacity of the Regional Community of Navarra, via joint participation of companies and training centres

The operative objectives(s):

- This computer tool seeks to provide a comparison between several programs (algorithms) and a visual representation of the performance of each calculation program with respect to time.

- Functionality will be taken into account: this tool will incorporate all the components (elements) and will simulate the performance of each one of them as well as the performance of the complete installation.

- A further objective is to be able to modify the inputs of each one or several of the elements and observe the performance (obtain outputs) of the complete installation. Therefore, the result that this computer tool will provide us will be the performance of the installation and of its components in real time.

It will be a tool that will compare and react. It will also be possible to modify component parameters and even maybe improve the design. Basically, the process of this tool would be comprised of three parts:

- Design of installation of tested elements.

- Incorporate mathematical algorithms (inputs-motor of the assessment)

- Outputs of the algorithms: visualisation, virtual reality and introduction of parameter modifications.

• Participants:

- Technological Centres: 1. CENIFER.

- Companies: 4. Novalia, AC Solar XXI, S.L.L., INASFOR 2, Cima Nuevas tecnologías informáticas.

- **Project Time:** 01/11/2007 until 30/05/2009



- **Total Budget:** 226,900 €

ICT

6. Management and analysis of signals of sensors developed via nanofluid processes

• Description:

This project seeks to develop a test and validation method for the progresses of Milestone 1 of the NANOFLUID Project led by CEMITEC within the EUROINNOVA Project. A sensor will be developed for the car industry market with high durability features via the use of nanotechnologies.

With this project the aim is to guarantee the correct working of these sensors throughout their entire working life. It is, therefore, necessary to continuously analyse the value of one of its significant characteristics, "contact resistance", during the relative mechanical life test.

Specific objective(s):

All the data related to contact resistance, position and temperature must be collected and stored simultaneously during the test, as well as to be able to easily manage all this information in order to develop an analysis after the test.

The aim is to be able to associate the fault produced in the tested parts to the temperature and the position, to thus be able to find a solution to improve the component much more quickly.

Operative objectives(s).

The equipment developed should be able to:

- Perform the control of the mechanical life tooling via the configuration of the basic test parameters: rotation angle, speed...

- Switch over between an analysis of the contact resistance or of the strain curve of the component, to be able to analyse the influence between them.

- Acquire and record the signal of all the samples tested, of the position and of the test temperature

- Manage up to a total of 24 samples to be tested.
- Record the faults that are detected during the test.
- Continuously monitor the signal of all the components tested, as well as a cumulate of faults per sample.
- Monitor a histogram of the fault of the parts related to the temperature or the position.
- Analyse the signals once the test is over.

• **Participants:**

-Technological Centres: 1. L´Urederra Foundation

-Companies: 2. Nacesa, and Elara Ingenieros

• **Project Time:** 01/10/2007 until 30/10/2008

• **Total Budget:** 155,900 €

