

NEED4B – NEW ENERGY EFFICIENT DEMONSTRATION FOR BUILDINGS

Newsletter 02 July 2014

Editorial

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Project Coordinator
CIRCE – Elena Calvo
need4b@fcirce.es
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Welcome to the second issue of NEED4B Newsletter.

We are excited to present our second Newsletter to inform you about updates and events related to the NEED4B project community. It has been an interesting and dynamic 2,5 years for the 16 partners of NEED4B project to develop and implement the new understanding and the methodology for construction, design and operation of new energy efficient buildings. Within that time 2 sites have finalized their construction and started 3 years long monitoring and evaluation program as part of the operation phase. Technical and social scientific measurements during monitoring will show the actual results of energy performance, energy expenditure costs, and behaviors of end-users as well as environmental impacts of energy efficient new buildings.

This year, fundings under the Energy-Efficiency call of Horizon 2020 provides support for research and demonstration of energy-efficient technologies and solutions. In the energy field, Horizon 2020 Energy Challenge is intended to encourage the transition to a secure, clean and efficient energy system for Europe and the first Work Programme for 'Secure, clean and efficient energy' is divided into three main areas: Energy-efficiency, Low carbon technologies and Smart Cities & Communities. For the following two years, total budget for the Energy Efficiency call amount to nearly 200 M€. This indicates how the concept of energy efficiency in new buildings and also in renovation of existing buildings ranks in priority in the building sector on a global level. Research and implementation of innovative ideas and technologies on energy efficient buildings and forming a methodology as a roadmap for the stakeholders of high-tech building industry already corresponds with NEED4B's main efforts. Accordingly, NEED4B shared its experiences in sustainable buildings in various platforms including EU's Sustainable Energy Week. NEED4B was one of the four leading demonstration projects of EU which organized the EUSEW conference. It is always significant to show the success of demonstration projects and how it is possible to achieve sustainability and efficiency in new buildings.

In this issue of NEED4B Newsletter, you will find new stories from five Project partners highlighting different topics related to their demo sites and progress of their buildings. In the Interview section, you will meet with Dr. Ir. Stephane Pierret from Vue Sur Mons (BE) and you will find out more on what's happening in the NEED4B project.

Enjoy your reading.



Demo Sites

Quaregnon, BELGIUM (5.000 m²) – VSM Quaregnon Phase 1



Test of a Wireless Sensor Network for Environmental Monitoring in a Passive House in Mons

A wireless sensor network designed with ZigBee radios and microcontrollers programmed with the Arduino environment is being tested in a passive solar house in Mons, Belgium (See Figure 1).

Each sensor node is used to measure temperature and relative humidity. The temperature and relative humidity sensors are digital and high resolution. The reporting interval for each sensor node has been set to 3.3 min. There are many practical advantages for installation of a wireless monitoring system. For example: a) the quick installation and/removal of the sensors, b) the easy expansion/reduction of number of nodes, c) the system is less intrusive than a wired monitoring solution in an inhabited space, d) battery operated sensors are ideal in a setting where the inhabitants could potentially disconnect a wired sensor from the power supply, e) the system could potentially be programmed to measure any environmental variable (light, CO₂, solar radiation etc.). The wireless sensor network is tested to identify any malfunction in the sensor nodes and understand their transmission range.

System operation: The data transmitted by the radios is stored in a micro SD card in a base station connected to the house router (See Figure 2). The data is easily downloadable with any internet browser for further processing and analysis.



Figure 1 - The passive house in Mons share many of the construction features of the future NEED4B Belgian demonstration sites

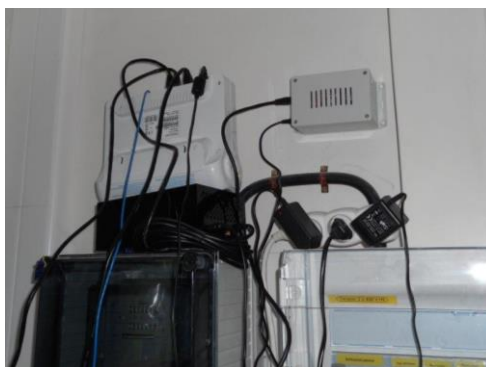


Figure 2 - Base station Connected to the home internet modem/router

Demo Sites

Zaragoza, SPAIN (2.712 m²) – CIRCE II Building



The design of CIRCE II building is presented to the Construction sector

The design project of the CIRCE II building, Spanish demonstration site in NEED4B, has been presented in Congress “Edificios Energía Casi Nula” for near-zero energy buildings held last 6-7 May 2014, in Madrid.

A communication paper was submitted by CIRCE, University of Zaragoza and IDOM who are NEED4B project coordinator, building owner and architects, respectively, and presented to more than 330 professionals from the building sector.

NEED4B was presented as a leading European project in the demonstration of energy efficiency in buildings; CIRCE II building was introduced as a case-study in the field.



Congress “Edificios Energía Casi Nula” May, 6-7 2014 in Madrid. Source: www.construible.es

The energy efficiency solutions selected for this NEED4B demo site allow achieving A very low energy consumption in the building according to the latest simulations performed, estimated at 29 kWh/m² year (primary energy). These energy savings are achieved through a set of technically and economically feasible measures divided into three key main strategies:

- Firstly, the optimization of the thermal envelope which has been done by means of detailed sunlight and wind studies and the design of a double skin façade, a green rooftop and solar protections which allow solar gains in winter and shade in summer.
- Secondly, high energy efficiency facilities; heating and cooling will be provided by a Thermally Activated Building System TABS (an HVAC system based on hydraulic tubes embedded in the concrete slab) connected to a geothermal facility. For ventilation, a free cooling system has been foreseen supported by Canadian wells and a Trombe wall system.
- Finally, the integration of renewable energy systems; the building will have a photovoltaic system with a peak power of 18kW providing 24MWh/year annual production and a small wind installation on deck.

Demo Sites

Istanbul, TURKEY (17.756 m²) – SCOLA Building



Information Kiosks and Large Screen Display for SCOLA

Display of information in public gathering places provide an effective way of delivering energy efficiency measures we have implemented at the SCOLA Building to students, building occupants visitors and to general audiences.

We have envisioned that delivering the detailed information on advanced engineering and architecture details of a modern ambitious building to everybody would enhance understanding of such efforts and encourage students and others to imagine similar concepts in the future. For this we use large screen displays in a number of different places, such as different academic buildings, in front of cafeteria and the main entrance hall of the student center and SCOLA Building Displays cycle through a sequence of alternating information of general interest to a diverse audience. They include the calendar for campus events, daily weather forecasts, etc. and aggregate data associated with the consumption and generation of monitored facilities, like electricity, gas and water consumption, electricity generation through PV panels, carbon footprint of the campus, to highlight commitments to environmental stewardship.

Although the majority of individuals seeing these public displays may not live or work in the SCOLA building, we expect that exposure to typical patterns of consumption by others may stimulate everybody to consider their own consumption choices more carefully. The touch screen kiosks and screen display provide further interactivity through a number of competitions, like Greenquiz I, consisting of questions referring to the whole campus, and Greenquiz II, consisting of questions referring specifically to the SCOLA Building.



Figure 1: Kiosk at the Engineering Building

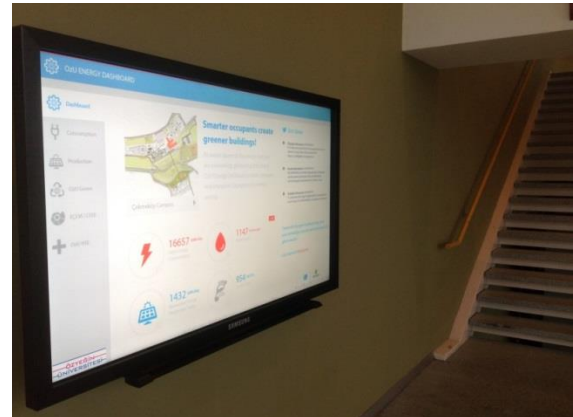


Figure 2: Screen Display at the SCOLA Building

Demo Sites

Borås and Varberg, SWEDEN (276 m²) – NEED4B House 35 (Borås)



Two years ago, SP and the manufacturer of wooden houses, Derome, started a cooperation that will make it possible for more to build energy economically while meeting increasingly stringent energy requirements. There will be two low-energy wooden houses that becomes demonstration. Minister of housing, Stefan Attefall encourages initiative and provides the simulation family a helping hand when it is now time for occupancy in the first house.



The Minister of housing, Stefan Attefall helps the simulation family to move in.



Peter Mossbrant (CEO of Derome), Stefan Attefall (the Minister of Housing) and Maria Khorsand (CEO of SP Technical Research Institute of Sweden) together with family Granqvist (paper figures).

The newly built wooden house located at the area of SP Technical Research Institute of Sweden's area in Borås and will serve as a research center for future housing. The house has been supplied by Derome Group under the brand A-House and is built with the latest energy efficient and building solutions. The initiative is a part of the EU funded project NEED4B that is going on for six years. Today (February 24, 2014) the simulation family Granqvist moving into the house and will over two years to be monitored, measured and analyzed. The family represents a typical Swedish family with representative habits and activities.

"With the project we want to show how a family, living in an energy-efficient wooden house, can affect the energy consumption and the environment," says Maria Khorsand, CEO of SP Technical Research Institute of Sweden. "The house has been equipped with instruments which will help us to follow all activities of the family's everyday life, from the very first day in their new house. The Granqvist family will be Sweden's most watched family and the results will enable us to learn lessons that can help make the construction of new buildings more energy efficient".

The house is built with the same standards of quality, comfort and design as an ordinary house. It is equipped with electrically efficient appliances, an excellent building envelope and high-efficiency ventilation recovery that utilizes the energy from the family and the machines in the house. The solar energy is converted into electricity used to operate and household, including a heat pump that supplies the house with heat and hot water – which makes the house almost self-sufficient in energy. In addition to an environmentally conscious lifestyle, those who choose to live like this can look forward to smart energy management and low operating costs.

To encourage the construction of energy efficient houses emphasizes Peter Mossbrant, CEO of Derome House, that a new approach to financing of energy-efficient new buildings is needed: "Banks in Sweden today do not value the investment made to build an energy efficient house. Mortgage calculations need to be adapted based on the low running costs that low-energy houses actually have. Moreover, we would get more people to actively choose to build their own climate-friendly accommodation on a targeted environment premium was instituted. "

When moving into the house the Minister of Housing (KD) Stefan Attefall were there, who emphasize the importance of demonstrating that climate smart living is a durable solution for the future society: "We need intelligent and resource-efficient solutions for houses if we are to achieve the nearly zero emission building requirement that EU has decided before 2020. The challenge is to develop technologies that lead to the goals without the housing costs increases. It will be interesting to follow the experience gained from this project in the future. Later this spring the shovel will be put in the ground for the other climate-smart house that will be built in Varberg. The next year, a family from Varberg will move into the house, which will be further refined based on the measurements reported from the house in Borås and allows another step forward for climate-smart houses.

Demo Sites

Lecce, ITALY – CAIAFFA Building



The Italian demo site, Caiaffa building, is located in a central part of Lecce city, in Viale de Pietro. It consists in a mixed use building composed by four floors over ground and one floor underground: the first floor underground and the ground floor are addressed to shops; the first, the second and the third floors over ground are for offices. The installed technologies for the building energy efficiency are:

- Thermal insulated external doors and windows;
- External walls with double insulation layer: the internal one is made of two plasterboard panels and one polyurethane panel in the middle; the external layer is composed of a local stone called Leccese stone with a thickness of 25 cm;
- Highly efficient heat pump (COP 4 for heating and COP 3.5 for cooling);
- Photovoltaic plant of total power of 83.09 kWp mounted on the roof.

The foreseen total energy consumption is above 20 kWh/m² year.

The construction work is almost finished; what misses is the installation of the monitoring system used for the electricity consumption control. Furthermore, all the information gathered during the design, construction and monitoring phases are going to be managed using a BIM tool, such as REVIT.

The 11th of April 2014 a public conference was organized in Lecce in order to present the main results of NEED4B project, and, in particular, the Caiaffa building pilot.

In the spotlight

EUSEW Conference – 23 June 2014 - Brussels

As part of EUSEW 2014, NEED4B and fellow projects BUILDSMART, NEXT-Buildings, and DIRECTION worked together to deliver a conference on nearly-zero energy buildings.

The conference, chaired by DIRECTION coordinator Sergio Sanz from Fundación CARTIF, took place on 23 June 2014 at the Committee of the Regions in Brussels.

The four projects have worked on energy efficiency in buildings, and focus on demonstration of new low energy buildings. They presented highlights of their experiences.

The conference program included a presentation about integration of architecture and engineering to develop sustainable buildings by Professor M. Pinar Mengüç of Özyeğin University, Center for Energy, Environment and Economy (CEEE). He talked about the experiences obtained in Turkey and a short update about the rest of the NEED4B demonstration projects in Spain, Italy, and Belgium.

As well, other topics of the conference dealt with the role of data monitoring to understand user behaviors and equipment control. Another presentation will deal about financing schemes for building low energy buildings. Professor Pinar Menguc was invited to share his thought, during the discussion panel, about the road from demonstration projects to mass deployment of energy efficient buildings and behavior change, and stated “The Technology is there, we know how to combine engineering and architecture to minimize energy loss... We must also now consider social innovation, behavioral and social sciences and communication techniques to ensure lasting change”.

The conferences was aimed primarily to policy makers at regional and local levels, to keep them informed about the projects concerns, findings, and how they can help to ease any barriers in the development of low energy buildings.

Find more on:

www.eusew.eu

www.cor.europa.eu



EUSEW Conference
23 June 2014, Brussels
hosted by

EUROPEAN UNION



Committee of the Regions

Interview

Who is Dr. Ir. Stephane Pierret and why are you involved in the project?



Stephane Pierret is responsible for the European projects in the company Vue-Sur-Mons S.A. (VSM) and also in charge of the technical coordination of the matters related to passive houses. The company was set up in 2010 with the goal of developing new passive houses and to demonstrate the possibility to design, construct and sell such houses at a larger scale. He is Mechanical engineer holding a PhD in applied sciences. For more than 20 years, he has been mostly involved in the field of numerical optimization algorithms based on genetic algorithms and neural networks. He has written more than 20 scientific papers on the subject on the application of numerical optimization techniques. These algorithms have been applied in the field of automotive and aeronautics mainly to optimize the energy performance of new aero-engines deployed in the aeronautic sector.

In 2010, while setting up the company we had the opportunity to join the NEED4B consortium that was under construction. This was a great opportunity for us as the NEED4B objectives were exactly the ones targeted in our own project.

What do you think the positive outputs of the project will be specifically in Quaregnon, Masnuy Saint-Jean and Belgium?

The NEED4B project in Belgium involves the design and construction of houses into 2 separate demo sites both located at about 10 km from the town of Mons. The first one, located in Quaregnon, deals with the construction of 55 passive houses. The project is divided into 2 phases. During the first phase 16 houses will be constructed. The NEED4B project was an opportunity to really focus on the energetic goals while making sure that economically speaking the final design was also attractive for the future owners.

The second demo site is located in Masnuy Saint-Jean. On this demo site an individual passive house has been designed and will be constructed with an even more challenging goal that is to make it net zero or close to net zero energy. This house will also contain a roof completely covered with solar photovoltaïque panels. It will be based on the same constructive principles than the houses in Quaregnon but the house topology is completely different. This will allow us to check the energy consumption of different houses topologies.

These projects will result in demonstrating in the region that it is possible to design, sell and construct such passive individual houses in an economical affordable way. With the help of the NEED4B project, it was possible to allocate more resources to the efficient design of the buildings including investigating several design alternatives in order to optimize the cost of the buildings. These improvements were made possible thanks to a close collaboration between the architects and engineer, university and the company Vue-Sur-Mons. Several computer simulations have been carried out on several design alternatives in order to optimize the energy performance while decreasing the building cost.

How do you evaluate the progress of the project so far? How are the reactions of the stakeholders?

The projects are progressing very well. The optimal design was obtained, the building permits have been obtained and the construction will start soon. Although the building are not constructed yet, the stakeholders involved in the project are very satisfied about the solution obtained and the progress made in the project.

It is a quite challenging task to reach the energy consumption goals while obtaining an economically marketable solution. Moreover, optimal energetic solutions have been found while being integrated into the existing building code which also imposes additional constraints that must be satisfied. These constraints are sometimes in contradiction with the energy performance goals and therefore more ideas and innovations must be found to satisfy them.

These solutions could only be obtained as a result of a team effort and collaboration. In particular, the final design was obtained thanks to the innovative solutions brought by the architects and engineering team (FormatD2) also part of the NEED4B project. This solution was also possible with a large contribution from the University of Mons (UMONS) which performed detailed numerical simulations of the energetic performance of the buildings. These simulations allowed the team to iteratively adapt the best solution in order to improve further the energy consumption and / or improving the cost of the buildings.

The monitoring that will be performed after the building are constructed is also a very important aspect of this project. It will allow us to draw conclusions between the design goals, the simulation results and the real energy performance obtained. These measurements will also allow us to study the influence of different occupant behaviors in the houses and their impact on the overall energy consumption.

Interesting Links

Useful Links

- **European Commission**. E2B Public Partner Partnership: ec.europa.eu/research/industrial_technologies/energy-efficient-buildings_en.html
- **E2BA** – Energy Efficient Buildings Association: www.e2b-ei.eu/default.php
- **Eracobuild** – Strategic Networking of RDI Programmes in Construction and Operation of Buildings www.eracobuild.eu
- **BUILD UP** – European portal for energy efficiency in buildings: www.buildup.eu

Interesting Events

SUSTAINABLE CITY 2014

9th Conference on Urban Regeneration and Sustainability – 23rd to 25th September 2014, Siena

The International Conference on Urban Regeneration and Sustainability addresses all aspects of the urban environment aiming to provide solutions leading towards sustainability. The Conference addresses the multi-disciplinary aspects of urban planning; a result of the increasing size of the cities; the amount of resources and services required and the complexity of modern society.

Web: <http://www.wessex.ac.uk/14-conferences/sustainable-city-2014.html>

Brochure: http://www.wessex.ac.uk/images/stories/pdf_cfps/2014/sustainablecity2014cfp.pdf

BSO2104 BUILDING SIMULATION AND OPTIMIZATION

The Second IBPSA – England Conference took place on the 23-24 of June 2014 at UCL, London

BSO14 provided a forum for the exchange of knowledge on the development and application of building performance simulation to the optimum design and operation of buildings. The conference had four broad themes:

- New performance models and simulation methods
- Procedures for optimizing design and operation
- Real-world case studies
- Visualisation in built environment

The Belgian NEED4B Partners prepared a paper for this conference titled: Building Energy and Light simulations for the design of Passive-apartment buildings in Belgium, about the design of their demonstration buildings. The paper was presented by Dr. Luis Candanedo from University of Mons. The paper showed results about building envelope design optimization using TRNSYS and GenOpt to find the most energy efficient configurations from a given set of parameters.

Web: <http://www.bso14.org>