



Intelligent Energy  **Europe**

Educa-RUE project
www.educarue.eu
Energy efficiency paths in educational
buildings

NEWSLETTER
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1. Introduction

This is the fifth and last newsletter of the EducaRUE project (Energy Efficiency Paths in Educational Buildings). EducaRUE is an European Commission co-financed project, in the framework of the Energy Intelligent Europe programme. It aims at improving energy performance in the building sector at local level and with particular attention to educational buildings. Its specific aim is to speed up the implementation of the European Directive on Energy Efficiency in Buildings in the Member States and at local government level, by promoting the ability of local players to guide and orient initiatives designed to encourage energy saving through the implementation of specific measures and integrated tools. The use of planning and programming tools, as well as reward and support schemes, will be harmonized via a process of cooperation and coordination involving local government players.

Achieved results:

- development of actions for encouraging the use of sustainable energy through the development of Local Energy Plans, based on environmentally friendly criteria;
- definition of a model of environmentally friendly energy management for public buildings;
- strengthened the role of local authorities in the implementation of European and National legislation;
- strengthening the awareness of local players and public institutions in regards to the use of sustainable energy as a result of both strong project actions (technical interventions), and “soft” actions through communication and dissemination activities;
- increased adoption of environmentally friendly behaviour by developing and updating technical expertise of operators within the energy management sector, through the involvement of all partners in joint actions that include the organization of training courses developed by the project at local level.

2. Update on activities

2.1. EducaRUE Final International Event

The final International event of the EducaRUE project was held in Potenza, on the 4th of June 2010. The event saw the participation of different representatives of schools (teachers, school managers, students), of professionals, associations, municipalities and Energy Agencies, besides the project partners. After the welcoming speech of the two councillors of the Province of Potenza Rosaria Vicino and Francesco Pietrantuono, the project manager Enrico Spera presented the EducaRUE method implemented in schools, by showing in a detailed way the path (identification of the building, training courses, energy audit, energy efficiency project) that EducaRUE has put in place in partners' territory. In particular, the EducaRUE methodology was positively received by the seminar participants and will be replicated in other schools within the partner territories.



Fig. 1 – the Auditorium

The seminar continued with project partners' interventions (Provinces of Perugia, Rieti, Palermo and Potenza, Energy Solutions, Climate Energy and Municipality of Prenzlau) that briefly showed the major results of EducaRUE in their territories.

In the discussion amongst politicians, the President of the Province of Palermo (Giovanni Avanti), the Vice President of the European Parliament, Gianni Pittella, the Italian member of Parliament Filippo Bubbico, the scholar building Councillor of the Province of Perugia, Piero Magning and the President of the Province of Potenza, Piero Lacorazza all made valuable contributions.



Fig. 2 – The political round table

At the end of the seminar, partners signed an Agreement to create a cooperation framework on energy issues in their territory and in future activities, by promoting an exchange of information related to energy efficiency initiatives. Partners have committed themselves to continue their cooperation after the end of the project.



Figg.3 and 4 – Partners and institutional representatives during the signature of the agreement

2.2. Update on project activities

Hereafter the contributions and Energy efficiency project descriptions identified in the selected partners' schools:

Province of Potenza

Energy efficiency improvement intervention in the school building

After the identification of inefficiencies in the school “Technical Institute Ernesto Battaglini” following an initial audit technicians identified possible energy saving measures, by taking into account the objectives of environmental comfort to be achieved.

The evaluation on the intervention possibilities was partly oriented towards low costs solutions and higher energy performance in terms of energy consumption reduction and environmental comfort.

The identified Energy efficiency intervention strategies on the building were as follows:

- Renewable sources: integrated shaded system + solar energy + green areas located in the south-east and south-west of the building
- energy efficiency improvement on the vertical STRUCTURAL Envelope
- energy efficiency interventions on the horizontal STRUCTURAL Envelope
- energy efficiency interventions To GLAZING
- energy efficiency interventions TO the plant
- energy management improvements

Taking into account that the identified school is composed of different building fabrics, the bio climatic analysis has been carried out at a higher level than with a single building fabric, but on the scale of the building complex. For this reason, the methodological choice of adopting different strategies not only taking into account the sun exposure of the single building but also the relations that each body of the building has with the other bodies (for example climatic issues like sun

exposure and ventilation). This was done with the aim of combining energy efficiency needs and building thermal comfort of users.

In relation to the calculation methodology adopted through the EducaRUE project, the building improved by one superior energy class (before the intervention class D, score -5,50, energy class after energy efficiency interventions C, score 49,93) and reduced by at least 20% of the energy performance index of winter conditioning “Epi”, in comparison with reference values before the intervention (Epiesist =60,66KWh/mq and Epiprogr = 39,08 KWh/mq with a percentage reduction equal to Epiprogr= - 21,60% Epiesist).

Province of Rieti

“Project of Energy performance improvement of the Technical institute “U. CIANCARELLI” of Rieti.

The energy efficiency project of the Technical Institute started with the energy audit of the building, carried out through the ENEA (Italian National Agency for New technologies, energy and sustainable economic development) software “Docet” and through the Excel Sheets provided by the Province of Perugia. Once the weakest points (from an energy point of view) of the building were identified, improvements were defined and planned.

The identified solutions concerned:

- reduction of water consumption;
- reduction of the consumption of oil for heating of sanitary water and heating of the rooms;
- reduction of building thermal waste;
- production of energy from renewable sources;

Concerning the reduction of water consumption, reducers of water’ flow in water taps of the school could be installed.

Oil consumption will be limited, by installing a new boiler, with higher performance and by installing thermostat fuses on the radiators.

Oil consumption will be further limited through these actions:

- installation of insulation layers for walls (thermal insulation coating);
- installation of insulation layers for floors and roofs;
- windows substitution

Concerning the production of Energy from renewable Energy sources, a photovoltaic plant on the roof of the building and on shelters built in the square in front of the building will be installed.

The methodology used for improving the energy performance of the building will be implemented also in other school buildings of the Province of Rieti, on the basis of the indications on consumption, scholar population etc, contained in the local plan draft during the project activities.

Province of Perugia

The building selected by the Province of Perugia during the WP 2 activities is the Technical State Institute (ICT) “Vittorio Emanuele II”, located in the centre of Perugia and consisting of a concrete building with a “L” form, on 8 levels, built in the 1970’s.

With the aim to realise a detailed analysis of the current situation and on the possible solutions for energy efficiency, the building has been re- constructed with a simulation with the “MC4 Suite 2009” software and in particular through the module “HvacCad 2009”. These instruments enabled the thermal calculation, the energy audit and the plants planning.

The application of the software to the case study, through the definition of general and climatic data, the reconstruction of some part of the buildings, and the creation of a three-dimensional model has allowed some energy indicators, necessary for the implementation of the methodology

proposed by the Province of Perugia to be obtained. The final score obtained, related to the current situation is 9.42/100.

On the basis of what emerged from the Energy audit and from the Energy/environmental analysis of the School, some Energy efficiency and renewable energy solutions have been selected. These solutions allow savings to be achieved, linked to: reduction of thermal waste of the building; reduction of oil consumption used for heating and sanitary water; production of energy from renewable energy sources; reduction of water consumption. In particular, these interventions have concerned: thermal insulation coating of walls; substitution of the current seals with seals and windows with double windows with energy performance window frame; installation of thermostat fuse; connection to the district heating; solar thermal collectors; improvement of photovoltaic plant; recovery of raining water through a collection and storage tank; and water flow reducers.

The implementation of the methodology in the building after the works, having used the energy efficiency measures mentioned, has allowed a final score of 40,27/100 and a reduction of energy performance for winter heating EPi of 45.6% to be achieved.

The project realised for the selected school will be extended to other schools of the Province of Perugia, thanks to the drawing up of a local plan for educational buildings. The schools of the territory have been classified and characterized on the basis of the intervention priority, defined taking into account two major criteria: average yearly consumption and growth rate of student population. The local plan has been completed with the quantification of costs linked with the interventions, and hypothesis on financing modalities and time for the realisation have been drafted.

Climate Energy Ltd

Using less energy reduces the related emissions of CO² and other combustion products that contribute to global climate change, acid rain and air pollution.

Buildings constructed in line with environmentally conscious principles are good long-term investments, with lower operating costs and a greater ability to meet changing environmental controls and legislation and as part of EDUCA RUE project, the Climate Energy Ltd has selected the Gallions Primary School in the London Borough of Newham to achieve the EDUCA RUE project goals and objectives.

After feasibility study as part of work package 2 and energy building auditing in work package 5, the following barriers were identified:

The building has got passive lighting and ventilation, not only in classrooms but also in unexpected area such hallways except in the main corridor.

The school has no roof insulation.

The primary heating for gas and electricity in current situation is insufficient with the unit of measurement 168.44% and 311,091 kwh/m².

Main result of EDUCA RUE project in Gallions Primary School is described as below:

The current assessment score is 20.39 with grade D.

The score assessment should be 41.59 to catch the grade C.

The total renovation cost is £ 51,965 and the total tCO₂e will be 173.24 within 3 years, and energy saving 62,218.2 kwh/m² per year

The following suggestions were recommended:

Primary Energy for heating

Installation of CHP Plant

Heat Transmittance of the building envelope

Roof insulation:

The Current total CO₂e is 65 tonnes.

If we insulate the roof it will decrease to 52 tCO₂e.

Therefore, the total insulation cost will be £12,912

Floor Insulation:

The Current total CO²e is 65 tonnes.

Refitting the rest of the floor with wood or parquet with renewable materials will decrease CO² emission to 52 tCO²e

The total insulation cost will be around £12,420

Fitting of 2 new roof lights/skylights: The total cost is £900 each with very Low E Self Cleaning Glass and the U-value is 1.0W/m²K, the payback is 1 year.

Net energy for cooling

Appliances: energy efficient and labeling equipments. The total electricity consumption is 4.56 tonnes. If they use A or A+ grade appliances and follow the low cost no cost behaviour they will reduce their electricity consumption to 3.65 tonnes.

Cooling: It is also naturally ventilated, the building requires an 110kW boiler heating system AND cooling to 20kW.

Water consumption: Installation of rainwater harvesting system will bring the performance scale to 1. That means it will save approximately 29% of this school water consumption.

Conclusion:

The cost involvement:

There is no doubt that the installation of combined heat and power plant and insulation of roofs and floors are expensive and required some investment from external funders. Climate Energy has advised them to take the advantage of the available Carbon trust loans (www.carbontrust.co.uk), enhanced capital allowances, Carbon Reduction Commitment (CRC) targets, and Feed-in Tariff (FIT) system for renewable electricity technologies. The www.decc.gov.uk website was recommended to them as well.

Electrical equipment:

Ensure computers and photocopiers are switched off when not in use for long periods.

Raise staff awareness

A simple awareness programme consisting of no-cost measures can reduce fuel bills by up to 20%. Without staff co-operation and a willingness to change bad habits, savings will be harder to achieve. Use pop-up reminders on monitors to remind staff to switch off PCs and monitors at the end of the working day.

Funding Challenge

It is likely that the Gallions Primary School needs a “patchwork” of funding, which brings their own challenges, but also means that they can build up the budget as funding is agreed. If they can put some savings figures (financial and energy savings) against the proposed project, then they will have a much stronger case and be more likely to be able to demonstrate its economic and environmental sustainability.

Energy Solutions

With the help of building technicians who had undergone the Educa-TEC training scheme aimed at ‘skilling up’ building professionals Harlesden Primary in Brent, NW London was audited and potential building interventions identified. As a late nineteenth century building there were clearly many things that could be done to make a real difference to the energy performance of the site. Because it is so characteristic of much of the primary school building stock found within the borough this provided a great opportunity to develop a best practice methodology for improving the sustainability and energy efficiency of existing educational sites.

From the start it was made very clear that the approach developed would have to fit in with the local authority’s core principals when upgrading existing properties. The emphasis had to be placed

upon developing an intervention that caused minimal disruption to the educational activities held on the site, was cost effective, and could be described as sustainable in the very strictest sense of the word. These last two points were key to determining those interventions deemed suitable in this case. Even prior to the recent moves towards greater budgetary restraint, large scale school refurbishment and significant upgrades to building envelopes were beyond local authorities' abilities unless linked to measures intended to improve public safety or those lucky schools selected through the Primary Capital Programme (PCP) to access central government funding.

A series of measures were introduced to the school's senior management and board of governors. They were extremely impressed with the carbon and financial savings that these suggestions would generate and agreed to start implementing some of them immediately. Amongst the measures were recommendations to install burner controls on existing gas-fired boilers, fitting valve and flange wrap in both boiler houses, the installing of time clocks on local water heaters, and the upgrading of the total lighting provision of the building. Once all the measures are implemented 22.7% emissions savings should be created as a result. If such savings are as easily achieved across the other schools within the borough the local authority will certainly be well on its way to meeting its own tough emission reduction targets.

News from Europe

The Directive 2010/31/CE will enter into force on the 9th of July 2010 – New zero energy buildings from 2021.

The new 2010/31/CE directive on energy performance of buildings (published in the EU official journal) has been approved for the 18th of May. It will replace the old 2002/91/CE directive that will be abrogated from February 2012. The new directive promotes the improvement of energy performance of buildings, taking into account the local and climatic conditions as well as the prescription related to the internal environments of buildings and from a cost-effective point of view.

The directive defines a general common framework for a methodology for energy performance of buildings calculation. This methodology should be applied by Member States in compliance with the standards listed in Annex I of the Directive. In particular, the calculation methodology should take into account the thermal characteristics of the building and its internal division (thermal capacity, insulation, passive heating, cooling elements...), its heating plants and production of hot water, cooling and ventilation, lighting, position and orientation of the building, of solar passive systems, internal weather conditions etc. Furthermore the calculation of energy performance should be diversified according to the building category (offices, schools, hotels and restaurants, flats, sport plants, shops ecc)

Minimum Energy performance requirements

Member States should adopt all necessary measures and requirements for minimum energy performance (to be revised each 5 years, or before if necessary) for buildings or units within building with the aim of reaching the optimal energy performance level. The minimum requirements could not be applied in protected buildings (for their historical, architectonic or religious value), in industrial sites, buildings used for agriculture not residential; residential buildings used less than 4 months a year.

Calculation of optimal levels

By the 30 June 2011, the European Commission will establish the optimal levels, taking into account cost-effectiveness requirements, energy performance requirements of building elements. The methodological framework will distinguish between new and existing buildings and building typology. Member States will calculate optimal levels, by using the comparative framework and other parameters – weather conditions, energy equipment accessibility – by comparing the results of such calculation with the minimum energy performance requirements in force. By the 30th June

2012, Member States will send to the Commission the first report containing all data and hypothesis used for the calculation, with the related results. If the in force minimum energy requirements would be less efficient than the optimal one, Member States should justify the differences to the EC and reduce the gap.

New and existing buildings

For new buildings, Member States should guarantee that, before the start of the works, the technical, environmental and economic of energy efficient system feasibility should be evaluated, if available among which: decentralised energy providers systems based on renewable energy sources; co-generation, district heating and cooling, heat pumps. For the existing buildings subjected to major renovation works, the energy performance should be improved with the aim of satisfied minimum requirements; furthermore alternative system with high energy performance should be taken into account.

Technical plants for building industry

With the aim of reducing energy consumption, Member States should define minimum requirements for technical systems for the building industry (heating plants and production of hot water, plants for the conditioning of air, big ventilation plants). Furthermore MS should promote the introduction of intelligent measurement systems when a building is subject to major renovation works.

Almost zero Energy efficiency buildings

The 2010/31/CE Directive establishes that MS provide that by 31 December 2020 all new buildings are almost zero energy efficiency buildings, and the remaining low energy needs should be covered by energy from renewable energy sources, produced on site or nearby. New public buildings should be zero energy starting from 31 December 2018. MS should draft National plans aimed at increasing zero Energy buildings by 31st of December 2012 and every three years, the Commission will publish a report on progress realised and draft an action plan.

Incentives

The directive underlines the importance of the availability of adequate financial instruments and incentives for favouring the energy efficiency of buildings and zero energy buildings. For this reason MS should adopt instruments on the basis of national circumstances and should draft by 30 June 2011 a list of measures and existing instruments and proposals.

Energy performance certificate

MS should instigate Energy performance building certificates. The certificates will encompass the building energy performance and the reference values, as the minimum energy performance requirements, with the aim of allowing the owners to evaluate and compare the energy performance. The certificate, valid for a maximum for 10 years, encompasses recommendations for a better and optimal improvement, in function of the costs, of the energy performance and it could contain additional information (yearly energy consumption for non residential buildings and the percentage of energy from renewable energy sources on total energy consumption).

By 2011 the CE will adopt a common voluntary system at EU level for the energy performance certification of non residential buildings.

Certification release

The Energy performance certificate will be released to:

- buildings and unit of building, sold or rented;
- buildings with a total surface over 500 m² and used by public authority. Starting from the 9th of July 2015, the threshold of 500 m² is reduced to 250 m².

The obligation to have a certificate is not necessary in the case where there is already a valid certificate issued in compliance with the 2002/91/CE directive. In the case of construction, selling or renting, the certificate should be showed to the potential new owners or new tenant.

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