

Innovative systems for energy efficiency in the Liguria hospital sector

Agenzia Regionale per l'Energia - A.R.E. Liguria S.p.A., Italy

Summary

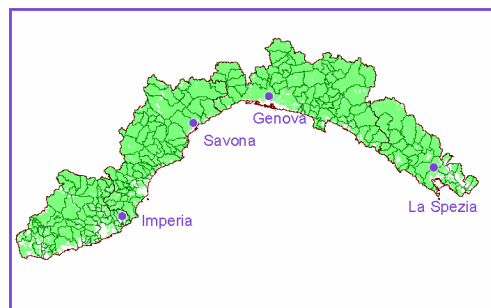
The project “Innovative systems for energy efficiency in the Liguria hospital sector” aims at studying and implementing new forms of management and innovative technologies (thermal insulation, cogeneration, solar roof) that could allow a reduction and a rationalization of the energy consumption in the hospital system of Liguria Region, in Italy. The study is organised into three main phases, which include the drawing up of guidelines for energy efficiency in the hospital sector (adopted by the Regional Administration in date 18/09/2002), a pilot action in a Ligurian ASL (local health enterprise) aimed at carrying out an energy audit of the structure, and the operative plan for the creation of a pilot ESCo and Consortia for electrical energy purchase in the liberalised market. The project, that lasts 18 months (June 2001- February 2003), is financed by the Liguria Region Administration.

End-user area	Target Audience	Technical
<input type="checkbox"/> New buildings	<input type="checkbox"/> Citizens	<input checked="" type="checkbox"/> Energy efficiency
<input checked="" type="checkbox"/> Refurbishment of buildings	<input type="checkbox"/> Households	<input type="checkbox"/> Heating
<input type="checkbox"/> Transport and mobility	<input type="checkbox"/> Property owners	<input type="checkbox"/> Cooling
<input type="checkbox"/> Financial instruments	<input type="checkbox"/> Schools and universities	<input type="checkbox"/> Appliances
<input type="checkbox"/> Industry	<input type="checkbox"/> Decision makers	<input type="checkbox"/> Lighting
<input type="checkbox"/> Legal initiatives (municipal regulations, directives, etc)	<input checked="" type="checkbox"/> Local and regional authorities	<input checked="" type="checkbox"/> CHP
<input type="checkbox"/> Planning issues	<input type="checkbox"/> Transport companies	<input type="checkbox"/> District Heating
<input type="checkbox"/> Sustainable communities	<input type="checkbox"/> Utilities	<input type="checkbox"/> Solar energy
<input type="checkbox"/> User behaviour	<input checked="" type="checkbox"/> ESCOs	<input type="checkbox"/> Biomass
<input type="checkbox"/> Education	<input type="checkbox"/> Architects and engineers	<input type="checkbox"/> Wind
<input type="checkbox"/> Other	<input type="checkbox"/> Financial institutions	<input type="checkbox"/> Geothermal
	<input type="checkbox"/> Other	<input type="checkbox"/> Hydro power
		<input type="checkbox"/> Other

Context

Liguria, the extreme south-western part of Northern Italy, lies on the Ligurian Sea. It is one of the smallest regions of Italy (Surface: 5.416 Km²) but it has one of the highest density of population in Italy (300 inhab/Km²).

The main important cities are four, Genova (the capital), La Spezia, Savona and Imperia. The total population is 1,625,000 inhabitants.



Liguria is a narrow strip of land, enclosed between the sea, the Alps and the Apennines mountains. The southerly exposition of most of the region, the lie of the mountains providing protection against continental influxes from the North and the long stretch of coastline are the principal factors making for the particularly mild climate of Liguria. In Liguria there are 28 hospitals with 8,200 beds. Despite that the number of bed for 1000 inhabitants (5 bed for 1000 inhabitants) is in line with the Italian and European average, a research on energy consumption in the Ligurian hospital sector, carried out by the Regional Agency for Energy - ARE Liguria S.p.A - demonstrated that the energy consumption of Ligurian hospitals is definitely higher (20%) than the national and European average: the Ligurian expenditure for energy amounts to over 23 million euro.

Main problems:

- High consumption of electricity for air-conditioning during summer;
- Poor technological innovation: old thermal plants for heating during winter;
- Low efficiency in buildings: low insulation;
- Not sufficient energy management.

The analysis of these factors indicated that there was a considerable potential for energy saving to be exploited.

"Innovative systems for energy efficiency in the Liguria hospital sector" has the purpose of implementing an innovative approach to solve the energy problem in the hospital system of our Region. In order to reach significant energy saving has been devised a new methodology that tackles the technical, economic and management aspects in an integrated way.

Objectives

Main aim of the project is to optimise the energy system of the Ligurian hospital sector in order to reduce:

- Energy consumption;
- Pollution and CO₂ emissions;
- Energy costs.

The project has the purpose to achieve these goals with an integrated way that deals with technical, economic and management aspects in the same time.

Process

The duration of the project was from 1st August 2001 to 1st February 2003. There is the intention of extending the project to other ASL, hospitals and even other sectors (residential, public building, tourism, etc.).

The study is organised into three main phases, which include the drawing up of guidelines for energy efficiency in the hospital sector, a pilot action in a Ligurian ASL (local health enterprise) and the operative plan for the creation of a pilot ESCo and Consortia for electrical energy purchase.

The guidelines analyse the building aspects (thermal insulation of building shell, thermal bridges, insulation, natural lighting) and plant aspects (thermal plant, conditioning system, cogeneration plant) that must be considered for the planning of interventions on hospital structures.

The second phase, relative to the pilot action in two hospitals of the ASL 4, is centred on an energy audit of the buildings and the plants of the two structures. In this sense, this tool has been used to analyse the critical issues at plant and building level in such a way as to propose a wide range of improvement interventions.

The third phase, the operative plan, is of a purely management nature, based on the rationalisation of energy management within the structures. It includes, on the basis of the results obtained in the second phase, an analysis of the necessary premises for the setting up of an ESCo, and the foundation of a consortium for the supply of electrical energy in the liberalised market.

Energy plant- proposed interventions:

Use of highly efficient (condensing) boilers;
Use of CHP systems (prime mover = microturbines, or gas engines);
Local temperature sensing/control loops.

Windows and framing - proposed interventions:

Replacement of simple glazing with up-to-date thermally insulated double glazing;
Framing replacement (thermally insulated);
Use of window shading panels in summer;
Replacement of poorly insulated aluminium panels under and between windows.

Building shell insulation - proposed interventions:

Insulation of roof;
Insulation of horizontal and vertical walls.

Other kind of interventions were studied but rejected:

- Trigeneration (electricity + heat + cooling). Considering the current plants and the current gas fee the pay back period is too long, there is no economical return;
- Exhaust heat recovery from chillers. It is not profitable;
- Use of variable frequency drive inverters. This kind of intervention will be implemented when the plant is changed, not before;
- Plant zoning allowing to adapt the distribution of heat and cooling to individual local needs. It will require structural intervention on buildings.

Financial resources and partners

The total costs of the project was 557 k euro financed 100% by the Liguria Region Administration. The partner of the project is the Regional Administration of Liguria Region.

Results

The potential for energy saving obtainable from the correct and systematic application of the guidelines can reach and even pass 15%, thereby bringing a cost saving of over 3.4 million euro.

Recently A.R.E. has set up the Ligurian Energy Consortium, whose current members are public bodies (Regione Liguria, ASL 3 and 4) and a certain number of hospitals, reaching more than up to more than 25 GWh. The saving envisaged for the last three months of 2002 get to more than 50,000€ while the 2003 envisaged saving is 200,000 €. In the following months the consortium will be extended to a provincial and regional level, with a saving on the electricity bill of somewhere around 10%.

The implementation of the proposed interventions in the ASL 4 will lead to a reduction in energy consumption of about 4,638 MWh/year. Energy produced by renewables in ASL 4 is from thermal solar (100 sqm.): 56 MWh/year and from photovoltaic system 20 kW: 78 MW/year. The reduction in CO₂ emissions: 1.300 tons/year.

The economic benefits are 171.220 €/year, and the project itself allowed to increase the personnel of A.R.E. Liguria of 3 people. The correct application of the guidelines and the launch of the ESCo in the ASL 4 should lead to the creation of other work placements (about 10).

A.R.E. made the Regional Administration and hospital managements aware of the critical situation in the health sector. Moreover, it involved 2 Council Departments of the same Administration: Health and Environment. This is a very important achievement.

Work in progress

Regione Liguria and the local health office ASL 4 approved the results of the project and involved ARE Liguria to prepare the technical tender for EPC – Energy Performance Contracts (including legal, technical and management aspects). In the meantime we are meeting companies (Siemens, ABB, Simar, Cophatec, local utilities, etc) to check the real interest in this project; some companies showing a great interest in participating. The call for tenders will start early in 2004, and it will concern:

- ✓ 2 CHP units (100 and 200 kW);
- ✓ monitoring and control system for two hospitals;
- ✓ replacement of existing boilers;
- ✓ management and maintenance for new and existing plants.

The duration of the EPC is evaluated in 8,5 years.

Lessons learned and repeatability

An innovative approach was created whose main characteristics are to face technical, economic and management aspects together and to consider in the same time different fields of application. The main problems encountered were collection and use of data, plants complexity and the low level of liberalization of gas market.

The project was created with the intention of extending the new methodology to other hospitals. For this reason it is easy to adopt the approach individuated in “Innovative systems for energy efficiency in the Liguria hospital sector” in other similar structures in Italy, in Europe and in third countries. Another possibility foreseen in the project consists in the dissemination of this methodology in other sectors (residential, public building, tourism, etc.).

Contact for more information:

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Printed reports or other literature available:

Title: Bollettino Ufficiale della Regione Liguria Anno XXXIII – Numero 38 of 18/09/2002 Cost: 2.07 euro