



POLYCITY Hochschule für Technik Stuttgart, Germany, Italy, Spain

Summary

The POLYCITY project focuses on the sustainable development of three large urban areas in Germany (Ostfildern), Spain (Barcelona/Cerdanyola) and Italy (Turin) in the field of energy optimisation and the use of renewable energies. In real urban developments the rate of fossil fuels is reduced in favour of sustainable energy supply from biomass, solar and geothermal. The research teams work on the optimisation of design and operation of eco-buildings, optimisation of innovative supply systems, integration of supply and demand with the development and implementation of a communal energy management system, socio-economic analyses. Special issues are low temperature heating/cooling systems. The project is coordinated by the Centre of Applied Research Sustainable Energy Technology at the Stuttgart University of Applied Sciences (HfT). POLYCITY is part of the European CONCERTO initiative, co-funded by the European Commission.



End-user area

- New buildings
- Refurbishment of buildings
- Transport and mobility
- Financial instruments
- Industry
- Legal initiatives (regulations, directives, etc)
- Planning issues
- Sustainable communities
- User behaviour
- Education
- Other

Target Audience

- Citizens
- Households
- Property owners
- Schools and universities
- Decision makers
- Local and regional authorities
- Transport companies
- Utilities
- ESCOs
- Architects and engineers
- Financial institutions
- Other

Technical

- Energy efficiency
- Heating
- Cooling
- Appliances
- Lighting
- CHP
- District Heating
- Solar energy
- Biomass
- Wind
- Geothermal
- Hydro power
- Other

Context

The project delivers high quality urban development examples, which cover a range of typical urban conversion situations and which will provide excellent examples for replication within the European Union. The project aims to solve urgent societal problems concerning land use management in inner cities and CO₂ and other emission levels especially in urban areas.



Objectives

- **Energy savings:**
 - Cerdanyola (340ha/10.000 inhabitants): 55 %,
 - Ostfildern (150 ha/10.000 inhabitants): 30 %
 - Turin (87.500m²/2.500 inhabitants): 46 %
- **Use of renewable energies:**
 - Cerdanyola, 33%,
 - Ostfildern, 80%,
 - Turin, 5%
- **Implementation of communal energy management systems + online simulation in all 3 project sites**

Process

The general objective of the POLYCITY research is to analyse different and complementary innovative applications of integrated energy systems, to study and optimise different alternatives of system control and finally to compare the achieved benefits with the expected performance.

Research and technology development in the POLYCITY proposal will focus on four main issues:

Optimising design and operation of eco-buildings. The main challenge in eco-building design consists in the integration of a complex matrix of issues such as building envelope design, hybrid ventilation strategies, solar gains optimisation versus solar shading, passive cooling through night ventilation, low temperature distribution systems etc. The research work is mainly concerned with the optimisation of large building complexes, as residential construction has already reached very high standards and know-how is widely available.

Optimisation of innovative supply systems: polygeneration technologies provide the main technological challenge in the POLYCITY project. Research will be carried out on clean biomass combustion in large co-generation plants within the urban development sites (in the MW power range). Innovative plant technologies such as organic rankine cycles will be analysed and optimised and local emissions closely monitored. System technology research is needed to integrate different thermal cooling technologies within the heat networks fed by co-generation units or large solar thermal systems.

Integration of supply and demand is only possible with the development and implementation of a communal energy management system. Conventional facility management systems do not provide the features for active control and management of supply and demand sites. To develop and implement the necessary software algorithms and interfaces to existing tools is a major research activity of the project.

The socio-economic research analyses the implementation process of the large urban developments, identifies barriers to change and supports the improvement of the participation processes and quality of life in the quarters.

Financial resources and partners

The project is funded by the European Commission with about 8 M€. The total investment costs are 17 M€.

At each project site are involved:

- ESCOs
- municipalities
- house building companies
- urban development companies
- urban planners + architects
- research centres/universities



Only in a common effort these 19 consortium members can realise sustainable energy concepts for large urban development areas. The involvement of commercial investors guarantees that only cost-effective applications are made. Feasibility studies

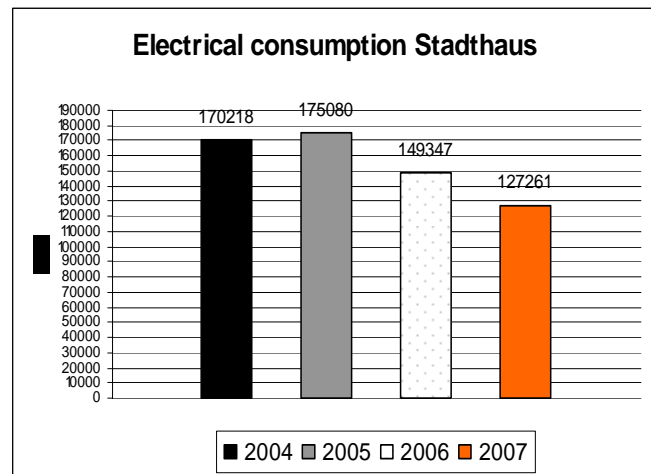
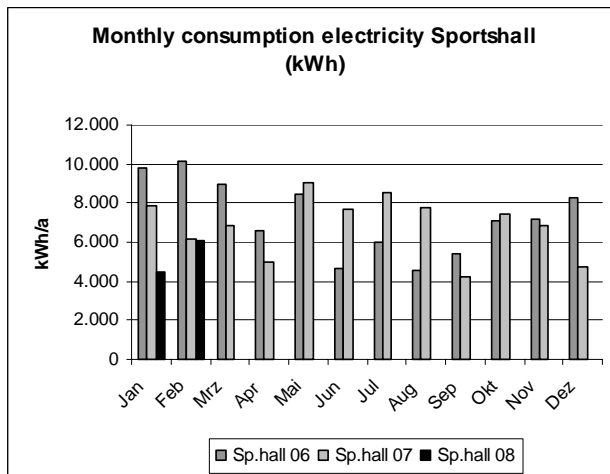
Results

Due to many different sources and the big amount of energy generated in the project (PV, solar thermal, thermal cooling, biomass, geothermal) it's not possible to list the costs in €/kWh. Cost/benefit analyses are still ongoing, in Cerdanyola the construction process of the supply plants has just started.

The construction in Turin is finished, nearly finished in Ostfildern (thermal cooling will start to operate in summer), some PV plants will be installed in 2008/09 and the last construction phase of residential buildings will end in summer 2008. The CEMS in Turin and GIS based CEMS in Ostfildern is about to work.

In Cerdanyola construction has started in summer 2007. A synchrotron demo building and the first power plant are to be finished in spring 2008, several big residential buildings are under construction.

The performance analysis of the demo buildings in Ostfildern and Turin will be finished within the next year. Some examples from Ostfildern/savings in electrical consumption in the demo buildings city hall and school:



Knowledge transfer and replication is one goal of the project. Within the project run-time (5 years), the following main events were organised/are planned (Proceedings and presentations are available on the homepage www.polycity.net):

- Kick-off meeting & public presentation of the project, Stuttgart, May 2005
- Workshop on sustainable town planning and energy benchmarking of buildings, Basel, February 2006
- Workshop on biomass, Gdansk, October, 2006
- Workshop on communal energy management systems, May 2007, Turin
- 1st European Conference on Polygeneration Technologies and Applications, Tarragona, October 2007
- Workshop on low energy buildings/Concerto project presentation, UIA World Congress on Architecture, Turin, June 2008
- International Summer School, Warsaw, July 2009
- International Conference on Sustainable Cities (end conference), Stuttgart, March 2010

Beneath these events, Polycity issues are incorporated in diploma, master and PhD courses in Politecnico di Torino, Universitat Rovira I Virgili Tarragona, Stuttgart University of Applied Sciences and their partner universities and in further education seminars of various institutes. Special meetings, site visits and events were organised for students, professionals and the public. Current project presentations on national and international conferences. Two large networks of associated communities are set up in Eastern Europe and Canada.



Lessons learned and repeatability

Apart from some slight delays in the time schedule, all goals of the project will be realised. A demonstration project of this size underlies some imponderables: legal tender procedures are differing in each country and include the risk that project aims can't be realised (EU funding in some fields is so low that it is no argument).

In Spain the biomass gasification plant and a district heat network will be very innovative measures that attracts a lot of attention. An observer community of about 40 cities in all Europe regularly is informed about the project progress and project events. Technical advice is given. We do encourage the observers to realise their projects and participate in national and European programmes focusing energy efficient urban development.

Rising awareness for ecological issues is not easy. While professionals' interest can be attracted easily, the public – even the residents at the project sites – aren't on the level to explore (complex) technical innovations. Family and childrens' programmes must have a low threshold level, we made good experience with construction of solar toys. Daily newspapers must be provided with plain and intelligible information.

Contact for more information:

Project Web Site: www.polycity.net

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Printed reports or other literature available:

Title: POLYCITY Technik – Energiekonzepte im POLYCITY Projekt Scharnhäuser Park Cost: None

(An English PDF version and a range of reports and presentations is available from the website www.polycity.net)

Proceedings of the 1st European Conference on Polygeneration – Technologies and Applications, October 2007 (available from Prof. Dr. Alberto Coronas, Tel. +34 977 559 665, Fax: -691, alberto.coronas@urv.net)

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