

# NEUCHÂTEL

Even before the HOLISTIC project, the city of Neuchâtel was already a pioneer of low energy policies. In 1995, Neuchâtel received the label "Cité de l'Energie" and in 2006 the European label "European Energy Award GOLD". To continue this energy agenda, in 2007, Neuchâtel became involved in the HOLISTIC project. Over the course of six and a half years, several large demonstration projects have been undertaken in addition to Research and Development such as the development of a software for thermal modeling of buildings called Citysim, a new

underfloor heating control with presence sensor and aerial thermography of the city of Neuchâtel.

According to the energy delegate of the city of Neuchâtel, Mr. Christian Trachsel, the HOLISTIC project is a success and has had a real impact on the city of Neuchâtel and also on the energy policy of the city. The HOLISTIC project has demonstrated in Neuchâtel that it is possible to reduce energy demand not only in individual projects, but across a large area.



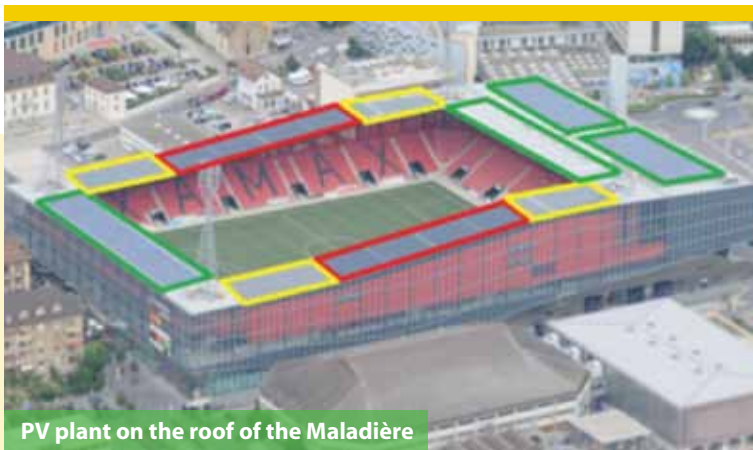
## HOLISTIC area in Neuchâtel

- Approx. 1.5 km<sup>2</sup>
- 33,000 inhabitants
- Works completed during the HOLISTIC project:
  - 6 buildings refurbished
  - 10 new eco-buildings
  - Installation of 8 PV Plants with 1085 kWp total area 8,205m<sup>2</sup>
  - Retrofitting of a large district heating system and installation of an innovative freecooling project
  - 11 Building optimisations

## Next steps

The HOLISTIC objective in Neuchâtel was fully achieved with a 3.15 GWh/yr saving in electricity and heating, more than the target of 10% reduction in energy consumption. Now the objective is to extend the HOLISTIC area across the whole city. The city has already undertaken significant work on two rental buildings based on the example of the retrofitted building "Saars 95" with expected energy savings of 65%. The works include insulating the walls, roof and floor of buildings, and replacing the windows. Thermal and photovoltaic solar installations will also be built and the heat production source will be replaced. Projected further spin-offs in 2014 as a result of the HOLISTIC project are : a new wood boiler of 2MW, hydropower of 170 kW and an extension of the freecooling network.

## Demonstration projects – Renewables



PV plant on the roof of the Maladière

One of 8 PV projects in Neuchâtel, PV plant in the roof of the Maladière stadium was installed in three stages: In red: 60 kW of amorphous technology; In yellow: 130 kW of monocrystalline technology; In green: 323 kW of polycrystalline technology. In addition to producing 485 MWh/yr, (2% more than the design calculations), the three different technologies were compared to determine which best suited the local climatic conditions.

In term of energy saving, these PV plants have produced about 1.1 GWh/yr. This production corresponds to the consumption of approximately 320 Swiss households.



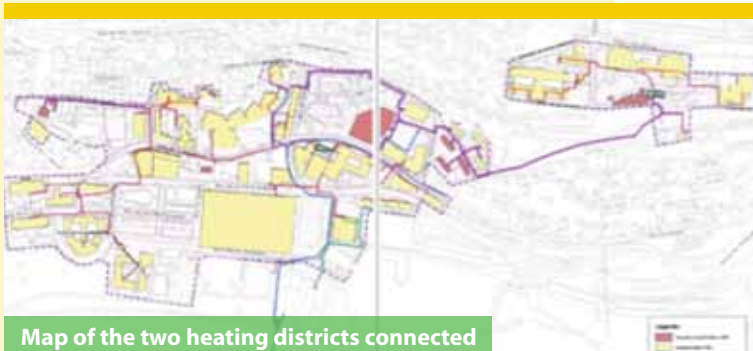
Retrofitting of the large district heating in Neuchâtel

Viteos (Energy distributor of Neuchâtel city) applied a long term and progressive strategy to improve the efficiency of the existing district heating and to extend its capacity as well as the renewable content of the distributed energy.

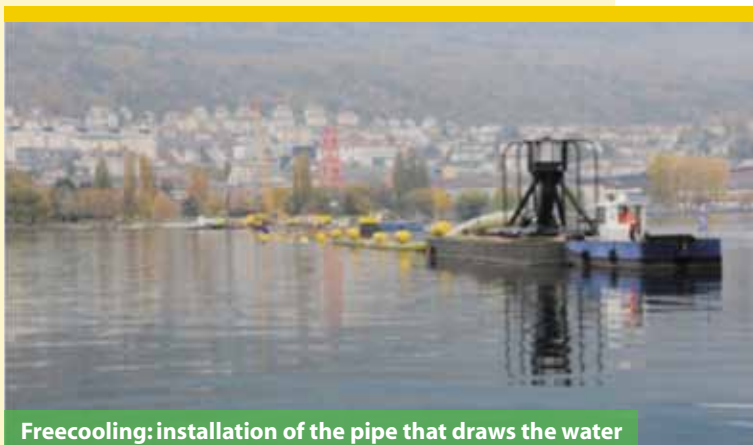
Initially, before replacing the heat production source, the emphasis was to improve the efficiency of the existing infrastructure. The first stage of work was therefore to reduce the losses in the heat production and in the substation. Then in the second stage the works undertaken enabled the valorisation of the wood production and reduction of the gas consumption. The wood power valorised for this second stage is about 1,117 kW and reduction of the energy purchase is 3,209.7 kWh/yr.

The increase in the percentage of energy produced from wood has enabled the two district heating networks of the HOLISTIC area to be connected.

A third stage of work, the installation of a new 2MW wood boiler, will be completed in 2014.



Map of the two heating districts connected



Freecooling: installation of the pipe that draws the water

The objective of this innovative project was to develop a district cooling system based on drawing 'cold enough' water from the lake and distributing it with a network to buildings with high cooling loads.

The total network cooling power capacity is 6.7 MW. Currently, the cold power connection is 3.9 MW and this power requirement will increase as new consumers come on-stream. Compared to the traditional technology of chilled water production, the freecooling project will reduce the electricity consumption in Neuchâtel by about 2.85 GWh/yr.

# Retrofitting Buildings

Six buildings have been retrofitted, three residential, two commercial and one university.



Gibraltar; 3942m<sup>2</sup> total area large residential and administrative buildings. The works undertaken were similar to those of the building in Saars. The roof was insulated with glass wool and the façade with stone wool and polymer. The windows were replaced with triple glazed insulating glass. External insulation was used with the added advantage that residents could stay in their homes during the construction period.

Following retrofitting, the building's heating energy consumption decreased by 45%, beyond the HOLISITIC target. The electricity consumption of the common areas for the buildings decreased by 36%.



## Gibraltar – residential renovation

Area: 3,942m<sup>2</sup>  
 Energy Consumption before: 85 kWh/m<sup>2</sup>/yr  
 Energy Consumption after: 47 kWh/m<sup>2</sup>/yr  
 Energy Saving: 45%



## University – historic building renovation

Area: 7,704m<sup>2</sup>  
 Energy Consumption before: 61 kWh/m<sup>2</sup>/yr  
 Energy Consumption after: 40 kWh/m<sup>2</sup>/yr  
 Energy Saving: 33%  
 Measures included: Roof and wall insulation, new windows, MHRV system, heating upgrades



## Les Saars - residential renovation

Area: 835m<sup>2</sup>  
 Energy Consumption before: 151 kWh/m<sup>2</sup>/yr  
 Energy Consumption after: 45 kWh/m<sup>2</sup>/yr  
 Energy Saving: 70%  
 Measures included: external insulation, roof insulation, new double glazing, solar thermal panels



## Falaises – office renovation

Area: 1,570m<sup>2</sup>  
 Energy Consumption before: 151 kWh/m<sup>2</sup>/yr  
 Energy Consumption after: 45 kWh/m<sup>2</sup>/yr  
 Energy Saving: 70%  
 Measures included: new triple glazing, external and roof insulation, heating system up

**Monitoring** after completion was an essential aspect of the work as very often when buildings are renovated the heating setting parameters are not adapted to the new situation leading to higher consumption than originally planned.

However by monitoring the consumption post-retrofit and with some optimization of heating controls, significant savings were delivered compared to the outcome if the technical installations of the buildings had been left unadjusted.



## New Eco-Buildings

10 new buildings have been built, 7 residential and 3 educational, with one (Microcity) that includes high industrial processes and laboratories. The majority of these buildings will have the Swiss energy label Minergie. Furthermore the Microcity building has been built according to Minergie ECO proving high thermal performance and also that all construction materials are ecological materials. The new ecobuildings save about 970 MWh per year of heating and electricity demand. Including the renewable energy production, the energy saving is 1780 MWh per year.



Microcity (photo by Yves-André)

## Microcity

The design of the Microcity building incorporates the criteria of sustainable development and of the Minergie ECO label. The carbon footprint of the materials required for its construction has been minimized while the building envelope includes an excellent level of thermal insulation, which reduces the heat loss and ensures maximum comfort to the users. The energy performance of this building is 36% better than building regulations.

**Energy consumption norm: 63.5 kWh/m<sup>2</sup>/yr**

**Energy consumption predicted: 44 kWh/m<sup>2</sup>/yr**

The energy requirement of the Microcity building is met by two local energy networks: the heating needs are covered by the district heating project of La Maladière while the cooling needs are covered by the freecooling network. Furthermore, the roof of the Microcity building hosts a PV plant of 213 kW also developed under the HOLISTIC project.

The Microcity building was the last construction completed within the HOLISTIC project. It is also the most advanced in term of efficient energy use and of renewable energy demand and is representative of several exemplary actions and projects of CONCERTO+ and HOLISTIC. It is a cumulation of all possible best energy practices in an urban environment. To complete the energy "mission" of the building it will be partially used for R&D purposes in the energy field.

## Optimisation of Buildings

The objective of this project was to save 10% of the energy consumed in the optimised buildings without large investment. Buildings were selected based on their size, their high energy consumption and their location in the HOLISTIC zone.

Location of buildings included in optimisation program

**No's 1- 7,9 Lyceum and University buildings**

**No 8 - Hospital**

**No 10 - Ice rink**

**No 11 - Waste water treatment plant**

EnergO is an association which is supported by the Federal Office of Energy (OFEN) as part of the SwissEnergy program with an objective to reduce the energy consumption (heat, electricity and water) of buildings by at least 10%, in a five year period, by optimising the use of technical installations. Optimizing

buildings does not require large investments and should not impose restrictions in terms of comfort, safety or health. The help of OFEN enabled the development of monitoring tools and the formation of a solid base from which to make the optimisation. Facility managers responsible for the buildings were also trained in optimisation techniques. This program could be widely applied in other communities.

The type of optimisation works carried out included:

- HVAC: optimising the operating hours, ambient temperature, heat curve, ventilation flow rate and air conditioning
- Changing the lighting and installing presence sensors
- Installing pressure reducers on taps and showers to reduce cold water consumption

