Cité de l'Environnement

by Maeva Tholance / 2014-07-25 00:00:00 / France / 5045 / FR

Primary energy need :

-53.8 kWhep/m².an

(Calculation method : RT 2005)

ENERGY CONSUMPTION

Economical building *Building*

- *< 50* A
- *51 à 90* B
- *91 à 150* C
- *151 à 230* D
- *231 à 330* E
- *331 à 450* F
- *> 450* G

Energy-intensive building

Building Type : Office building < 28m
Construction Year : 2009
Delivery year : 2009
Address 1 - street : 355, allée Jacques Monod 69800 SAINT-PRIEST, France
Climate zone :

Net Floor Area : 4 499 m²
Construction/refurbishment cost : 10 122 750 €
Number of Work station : 156 Work station
Cost/m2 : 2250 €/m²

Proposed by :

ADEME
Agence de l'Environnement et de la Maîtrise de l'Energie

General information

- Positive energy building BEPOS
- Demonstration building PREBAT

Cité de l'environnement is a tertiary building whose **electricity generation by photovoltaic panels** is higher than its energy consumption (all purposes). This performance relies mostly on a drastic reduction of specific uses of electricity and not by the "elimination" of heating which becomes a minority share.

However the optimization of these uses is not entirely within the designer's sphere of control which can only recommend practical and efficient equipment. Indeed, the choice of computers and lamps as well as the proper management of shading devices will ultimately be the responsibility of the occupant or manager. The particularity of this building is **designers have become occupants** and also, via the building management system (BMS), the first operator.

Sustainable development approach of the project owner

- Positive energy building BEPOS
- Demonstration building PREBAT

“The crucial point of positive energy buildings is the specific uses of electricity. The equipment manufacturers must provide us with more efficient material; this is the way we limit the consumption of energy and heat production, which can be very problematic in this type of building in summer. The European directives have an important role to play in this direction. (...).Then one could consider to integrate conventional consumption values of electricity specific uses in the regulatory calculation, as has been done for hot water consumption”.

Regarding user involvement: 'We have unfortunately not managed to come round everyone to our approach. Some people continue to come wearing T-Shirt in winter ... “.

Regarding the grey energy: “Calculations made with CSTB and the Ecole des Mines on the 3 buildings realized for the PREBAT (1 concrete, 1 wood, 1 brick) showed that the steel quantities contained in ventilation networks and copper quantities of electrical networks could represent up to 25% of the overall balance of gray energy; but this information is rarely taken into account. (...) The construction manager does not have all the course of action to reduce the grey energy of building ... materials such as concrete that allow inertia, are also expensive in terms of grey energy ... It is also the job of manufacturers leading us forward”. Enertech, July 2010

Comfort:
Summer comfort objective (Tic): 23.3°C
Objective used by the engineering office: the indoor temperature should not exceed 28°C during 40 hours during summer. The engineering office uses TRNSYS for dynamic thermal simulations.

Comfort (summer and winter) evaluation and quality of use
WINTER: The temperature setpoint in winter is set to 19°C. However, due to the enhancement of internal gains thanks to the very insulated envelope of the building, the occupancy temperature frequently exceeds this requirement. The average temperature in winter during hours of occupancy is 20.5°C in the first year and 20.3°C in the second year. It exceeds 19°C 90% of the time.
SUMMER: The average temperatures are calculated in the same way as for the winter. Data from the period of vacancy (identified through the analysis of the overall electricity consumption) are removed. The average temperature in period of occupancy is 25.3°C and below 26°C over 80% of the time. She never exceeds 29°C. This exceeding temperature is linked to the use of inefficient electrical equipment, a mismanagement of solar shadings and the absence of nocturnal cooling. The gap is small between periods of occupancy and vacancy showing once again the high inertia of the building and the lack of devices (or their implementation) of passive cooling such as overnight windows openings.

Reflection and consideration on the specific uses of electricity outside the regulatory framework
Details on sources of energy consumption included
Lighting: the engineering office encourages the systematic use of portable; an assumption of 30 watts has been maden for portable. The engineering office has taken its practical experience as the basis for its calculation of consumption related to specific uses of electricity. The assumptions made about the facilities are those made for “standard” facilities.

Method and calculation tools: The engineering office calculates two values of electricity consumption: a high hypothesis (21 kWhel/m2utiles.an for office) and a low hypothesis (8 kWhel/m2utiles.an for office) to take into account the choice of equipment and performance differences.

Reflection and consideration on grey energy
At the time of the design, no reflection has been conducted on the grey energy. Since then, the office has developed a tool in-house to calculate grey energy. This tool could be implemented within the framework of more recent projects (Descartes, St Cirgues).

User involvement in the operation:
Sharing of community facilities (fridge, copying ...) and servers (each company has an independent server in a common room situated in the basement and whose access is secure).
Awareness campaign on good behavior to adopt (several meetings were organized to explain the mode of operation of the building users and the BE plans to make a presentation during the winter of 2010-2011 to submit the right thing and explain the design choices that have been made).
Feedback on consumption is regularly done to occupants.
Information posters on the energy consumption of the building by use are displayed in the atrium.
Users who have participated in the design have rather well received design choices that have been made; other users, however, have difficulties to understand some design choices (eg, the temperature in winter, fixed at 19°C, is considered too low by some). There is a missing link between the supply and the construction phases focused on user awareness and communication

Architectural description

R+2 office building of 4499m²shon
Bioclimatic aspects: The space of the atrium is treated as a buffer space (not heated, it is nevertheless part of the thermal envelope). The thermal inertia is provided by the top and bottom floors. Cooling is partly ensured by a natural-ventilation in summer.
Constructive method: poured concrete

If you had to do it again?

Partial deficiencies of the photovoltaic system have been noted. This system could have been approx. 14% higher. A few recommendations to the users after a measurement campaign should be sufficient to restore the balance consumption / production.

See more details about this project

http://www.enertech.fr/bepos/fiche.php?id=5

Stakeholders

Stakeholders

Function : Contractor

FOR HOME

Function : Designer

Atelier Thierry Roche & associé

http://www.atelierthierryroche.fr/

Function : Other consultancy agency

ENERTECH

http://www.enertech.fr/

Function : Other consultancy agency

TRIBU

http://www.tribu-concevoirdurable.fr/

Function :

BETREC

http://www.betrec.com/

Energy

Energy consumption

Primary energy need : -53,80 kWhep/m^2.an

Primary energy need for standard building : 163,90 kWhep/m^2.an

Calculation method : RT 2005

Breakdown for energy consumption : Electric Production planned: 80.3 kWhEP /m²shon/year
Distribution of primary energy needs based on RT 2005: 44.4 kWhEP/m²shon/year

- Lighting: 8.7
- Ventilation: 12.2
- Heating: 0.2

Envelope performance

More information :
- External walls: External insulation 20cm expanded polystyrene
- Low-floor: underside insulation (17 cm flocking)
- Terrace roofing: 24cm polyurethane
- Glazed walls: Triple glazing with low emissivity surfaces 2 and argon blades on the outer frontage. Wood-aluminium joinery.

Indicator : n50

Air Tightness Value : 0,87

More information

RT uses consumption: 38.7 kWhEP/m²shon/year
- Heating: 9.5 kWhEP/m²shon/year
- Cooling: 3.1 kWhEP/m²shon/year
- ECS: 0.7 kWhEP/m²shon/year
- Lighting: 10 kWhEP/m²shon/year
- Ventilation and auxiliary: 15.4 kWhEP/m²shon/year

Other uses + RT consumption: 99.7 kWhEP/m²shon/year
- 5 RT uses: 38.7 kWhEP/m²shon/year

- Servers + office: 44.1 kWhEP/m²shon/year
- Lighting: 5.6 kWhEP/m²shon/year
- Other: 11.3 kWhEP/m²shon/year

Comment: Average over two years of measurements made with 511 sensors. Measures of the CO2 concentration were also made.
Monitoring cost: Cost of the measurement campaign for the contractor: 40 thousands Euros for two years monitoring.

Renewables & systems

Systems

Heating system :

- Geothermal heat pump
- Low temperature floor heating

Hot water system :

- Individual electric boiler
- Heat pump

Cooling system :

- No cooling system

Ventilation system :

- Natural ventilation
- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Heat pump (geothermal)
- Other, specify

Other information on HVAC :
Heating: water/water (brine) geothermal heat pump
Emission: Floor Heating
Hot water production: air-water extract thermodynamic (for showers), electric storage water heater (2 hot water cylinders localized in cafeteria and utility room)
Ventilation: double flow CMV (heat exchanger)

Photovoltaic panels: 1380m²
Geothermal energy
Aerothermal system
Production of electricity measured: 80 kWhEP/m²shon/year
Comment: Average over two years of production. The building is almost positive all uses.

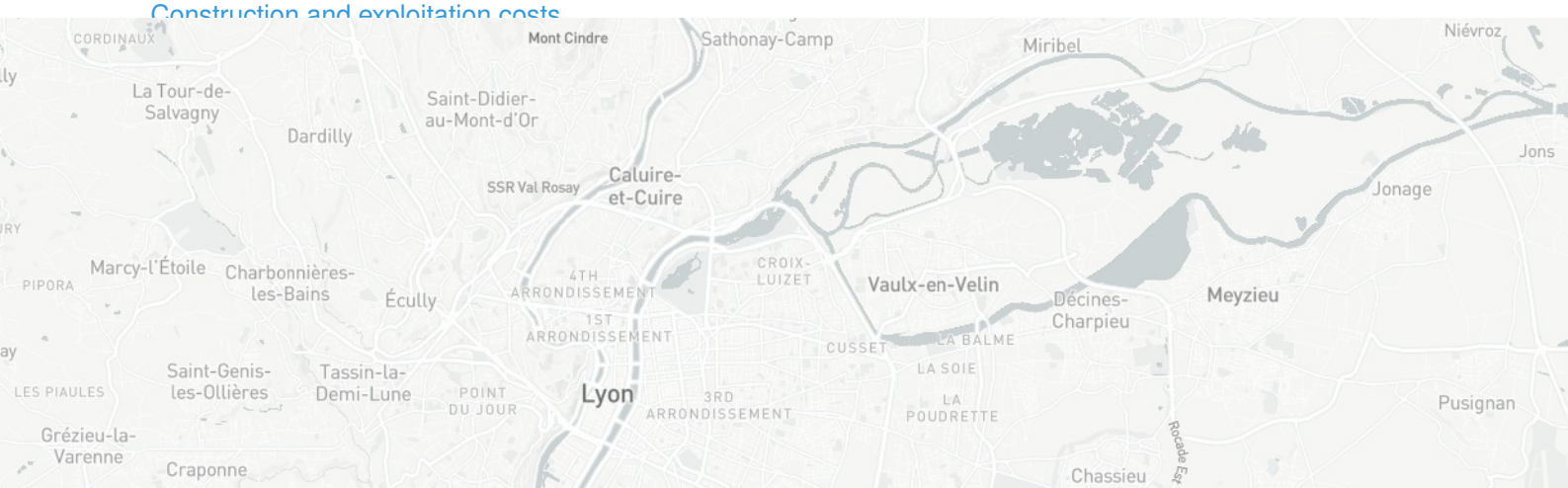
Environment

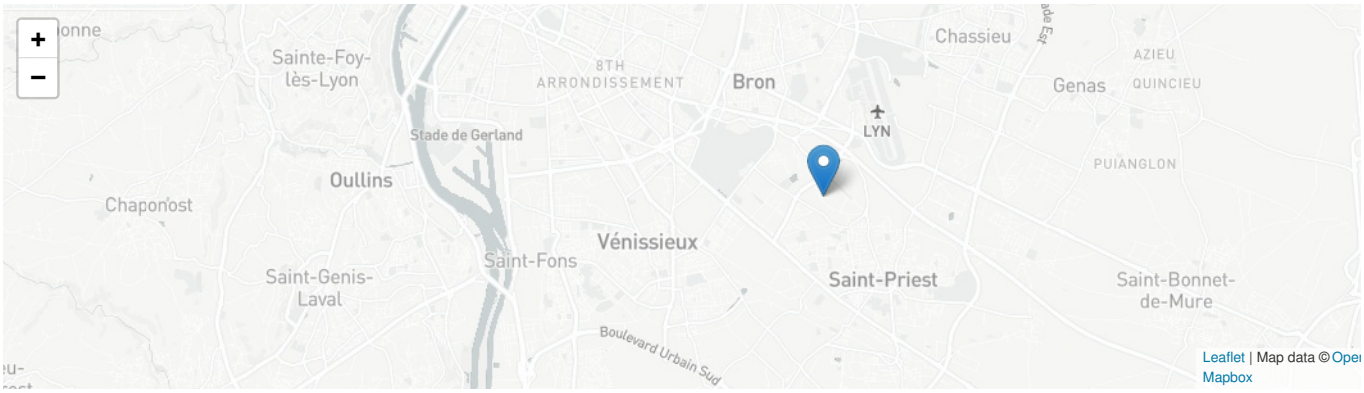
Urban environment

Periurban area

Costs

Construction and exploitation costs





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