Example name: Case study 2 – integration on the facade

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Fig. 7: Operating Control Centre of BRISA, view of the South and East facade (Carcavelos)

For installations

BISTS Location: Carcavelos, Lisboa (38.709° N, 9.336° W)

Climate Type: CSA

Building Use: service – Operational Coordination Centre

Level of BISTS integration:
Reijenga classification: Added to the design

- ● New Build
- O Refurbishment
- O Other: ……………………

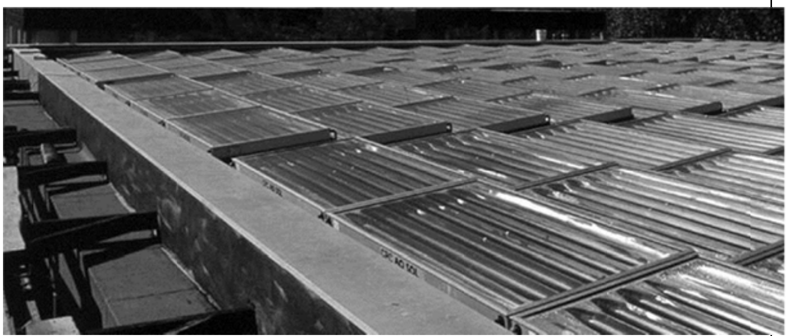

Fig. 8: Aspect of the roof

Type of BISTS:

Active

Function(s):

- O Air heating
- O Water heating
- O Combi-system
- ● Cooling/ventilation/shading
- O PV/T
- O linked to another system (e.g., heat pump)
- O Other: ……………………

Building element:

- ● Facade
- ● Roof
- O Other: ……………………..

Fig. 9: Partial view of the East and North façade

Fig. 10: Close view of the solar thermal panels

BISTS characteristics:

The Solar Thermal Collectors are installed on the roof and on the South, East and West facades. In the facades the STC are also used as the cladding of a ventilated wall. The roof has 144 solar collectors, with a 7º angle towards the South (this angle was due to architectural restrictions), with an area of approximately 400 m^2. The south facade has 100 solar thermal collectors with an area of approximately 200 m^2. In the East and West facades 48 solar thermal collectors are installed, with an approximate area of 96 m^2 (in each façade).

Stage of Development: Installed
Responsible: HVAC: Pen Engenharia **-** Luis Andrade;
Carrilho da Graça, arquitectos

O Idea/Patent …………………………………..
O Prototype …………………………………..
O Demonstration …………………………………..
● Integral building element …………………………………..
O Commercially available …………………………………..

BISTS description and context

The building has an operation room with 450 m^2, and a height of 9 m (occupying the two floors of the building). Adjacent to the operating room, on the lower floor are located the technicians offices, the technical rooms (data servers room) and the archive. In the upper floor are located the offices, an auditorium and a cafeteria. The architecture project was done in a way to integrate a large area of solar collectors, on the roof and on the three facades exposed to radiation, creating an opportunity for the adoption of an efficient cooling solution from the energy and environmental impact point of view. This STC is mainly used for cooling and is a solar absorption cooling system.

System viability

The energy requirements of this building are essentially for cooling, resulting from the heat released from the large amount of equipments. This reality led to the adoption of an absorption cooling cycle solar system. Since the solar radiation is coincident in time of occupation of the building, this system showed to be the most efficient one.

Modelling and simulation tools developed/used

The water circulators, each dedicated to solar orientation, have variable speed according to an algorithm which includes several parameters, especially the temperature of the water out of sewers and water temperatures at the bottom and at the top of the two deposits of hot water. The used modelling and simulation tool was the SolTerm software.

BISTS Performance data

Based on:

- ● Estimation
- O Detailed simulation
- ● Measurement/testing
- O Long-term monitoring

Performance parameters

For integrated systems:

key performance indicators -

South

Solar savings fraction: 93,9%

Esolar:34972 KWh

Leaning radiation: 1094 KWh/m^2

horizontal radiation:

1613 KWh/m^2

East

Solar savings fraction: 77,9%

Esolar:29016 KWh

Leaning radiation: 778 KWh/m^2

horizontal radiation:

1613 KWh/m^2

West

Solar savings fraction: 81,5%

Esolar:30369 KWh

Leaning radiation: 779 KWh/m^2

horizontal radiation:

1613 KWh/m^2

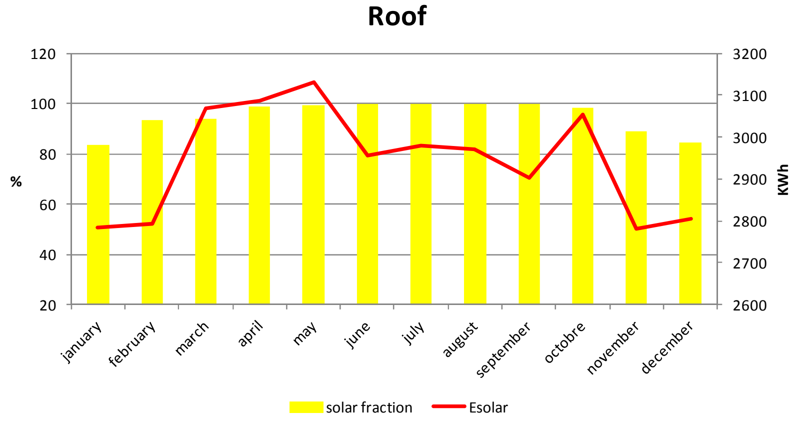

Fig.11: Estimation of the STC (roof) performance during the whole year

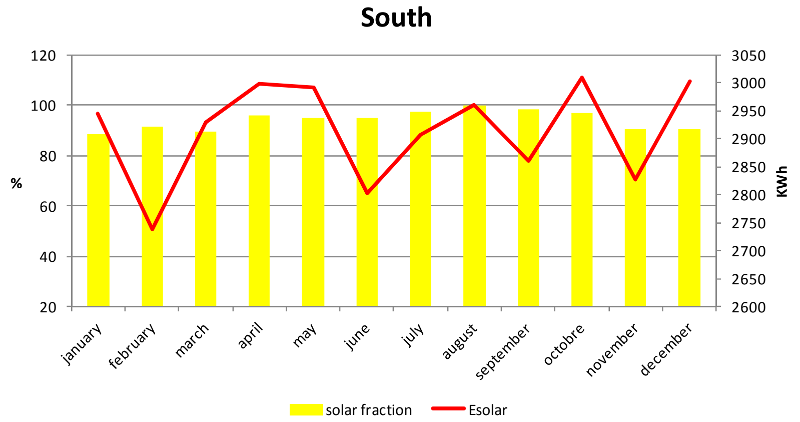

Fig.12: Estimation of the STC (south) performance during the whole year

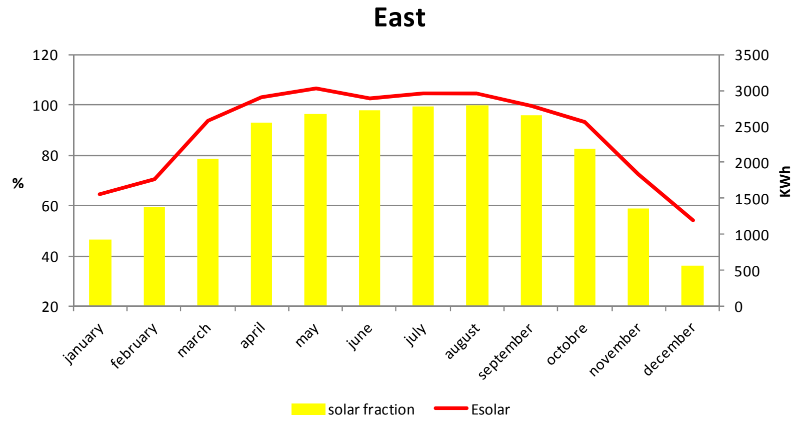

Fig.13: Estimation of the STC (east) performance during the whole year

BISTS Performance data

Roof
Solar savings fraction: 94,8%
Esolar:35312 KWh
Leaning radiation: 1622 KWh/m^2
horizontal radiation:
1613 KWh/m^2

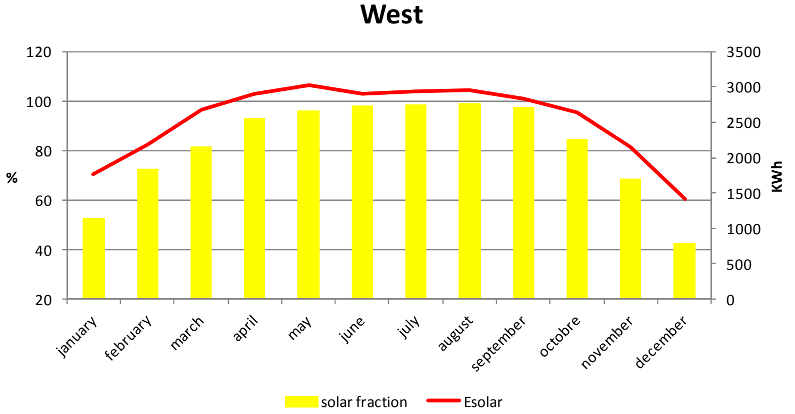

Fig.13: Estimation of the STC (roof) performance during the whole year

Additional information:

The production system and thermal energy storage system consists of the following major components:

- 4 groups of solar thermal collectors (East, South, West and roof);
- One absorption chiller;
- A cooling tower (closed type);
- A chiller / heat pump system backup;
- A primary hot water tank;
- A secondary hot water tank;
- A tank of chilled water.

Sources and references:

http://www.grunfos.dk/web/homept.nsf/webPrintView/78425FD007DFDAF580256F50004CEBE6

http://jlcg.pt/additional_work/brisa