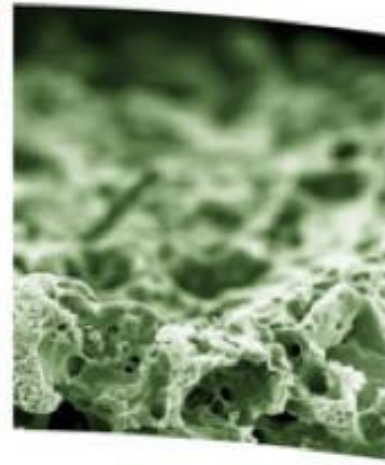


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Institut de Recerca en Energia de Catalunya
Catalonia Institute for Energy Research



On behalf of



The CIRCE building (Zaragoza) Experiences on Net Zero Energy Buildings Barcelona, Oct 3, 2012

Eduard Cubí
Thermal Energy and Building Performance Group - IREC

- Research building (mainly offices) in Zaragoza
- Target: Life cycle zero emissions building
- Operational since 2010
- Net floor area: 1700m²



The CIRCE building – Passive solutions

- Better envelope performance in the walls facing the dominant wind (cierzo)
- Thermal mass
- Sun shading
- Thermal chimney
- Natural / night ventilation
- Green roof
- Greenhouse
- Day lighting



Radiant slab (heating and cooling)

Heating

- Ground source heat pump
- Condensing boiler (NG)
 - To be replaced by a biomass boiler

Cooling

- Ground source heat pump (reversible)

Renewable generation

- PV (5.4 kWp)
- Wind turbine
- ST (vacuum tubes)

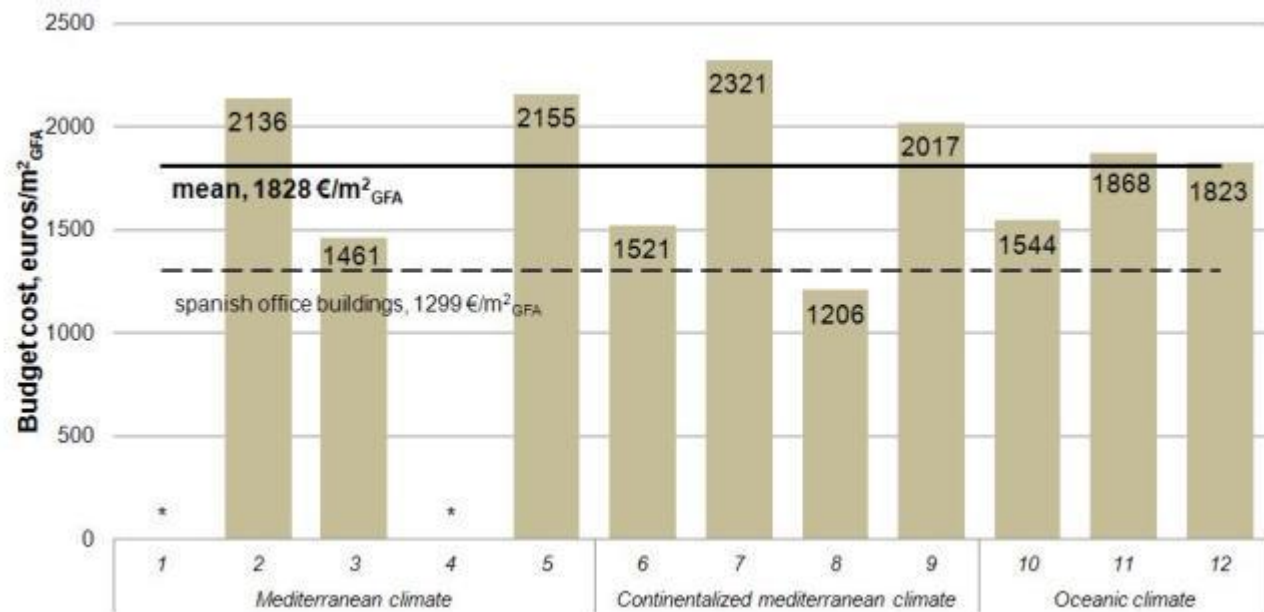


Lessons Learned

- Good performance of the greenhouse space (both in summer and winter)
- Good performance of solar protection and day lighting solutions
- Users appreciate the “home-like” interior design and materials



- Low construction cost compared to other “nNZEBs” (and even the Spanish average of office buildings)



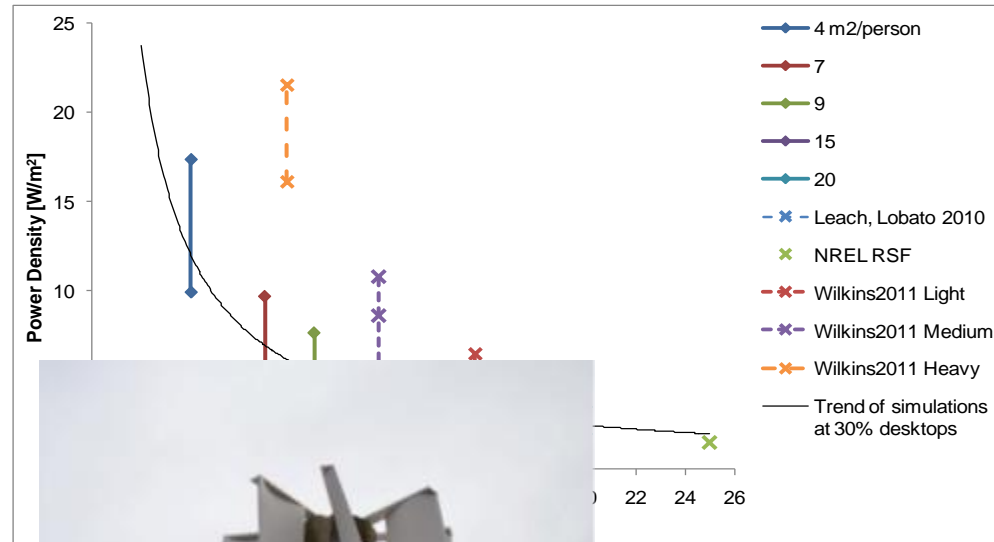
Source: IREC
Sanchez, A. et al (2012)

- Roof tilt: “wind protection” vs. opportunity for solar collectors
- Natural / night ventilation trade-offs:
 - Acoustics / privacy
 - Security
 - Insects
- “Green roofs” in dry places require maintenance (green roofs work well in green places!)



Lessons learned – "Project management" issues

- Actual occupancy density 30% higher than expected
 - Higher electricity use
 - Larger cooling load
- Last items in the project were put on hold due to admin reasons (university) and budget cuts
 - Renewable energy systems (Biomass boiler, wind turbine)
 - Monitoring



Source: IREC
Velez, J. et al (2012)

- Ground heat exchanger too shallow



Little heat exchange with the ground



Poor performance of the GSHP system



Summer discomfort



Thank you for your attention!

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