European Award "Building Integrated Solar Technology 2008"

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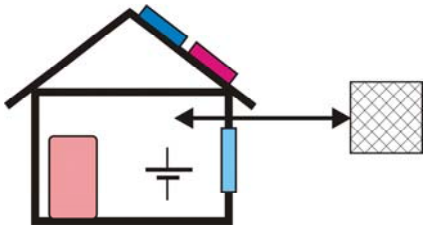
Future Buildings

- ~40 % of the energy consumed worldwide is used in buildings
- Future buildings:
  - Best thermal isolation
  - Solarly optimized windows
  - Heat store
  - Heat pump
  - Building management systems will interact with the grid
- PV system and solar thermal systems → integration into the building envelope → goal of the competition!



Only BIPV?

PV + Solarthermal = **BIST**

BIST: Building Integrated Solar Technology

Structure

1. Why an Award? Criteria for Participation!
2. Viewpoints of Architects and Engineers regarding BIST
3. Projects submitted and assessment criteria
4. Conclusion

Why an Award?

1. We want to encourage architects and engineers, home owners, local authorities etc. to install more solar technology in buildings
2. Find suitable ways to implement solar building technology (not only PV) in design terms
3. Increase acceptance and foster awareness

4. *40 projects entered, 38 projects from 8 countries were assessed by the jury*
5. *Prize money: 15.000 € + 10.000 €*
6. *In total two prizes were awarded, three commendations and ten citations*

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Criteria for Participation

1. Entitled to take part were
   - Architects
   - Owners
   - Operators

   of solar systems in the European Union and Switzerland
2. Solar system must form a substantial component of the building
3. Appropriate solarly produced thermal/electric energy
4. Start of operation: January 2005 – June 2008

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Viewpoints of Architects and Engineers

Projects Submitted (Samples)

Assessment Criteria

1. **Architecture**
   - Integral conceptual design
   - Integration of the solar technology in the building envelope
   - Design quality and functionality
2. **Engineering**
   - Energy yield and energy efficiency
   - Innovativeness in construction and energy
3. **General**
   - Communicating the system to the general public i.e. to catch the attention of the target audience

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First Prize: Office Building in Switzerland

- Marché International Support Office
- Architect: Beat Kämpfen, Büro für Architektur, CH-8094 Zürich
- Thin film modules form the roof:
  - Facing south
  - Tilt angle 12°
  - Nominal power: 44,6 kW
- Architectural
  - Roof and verges are not just unobtrusive in appearance but smart and elegantly detailed
- Engineering
  - Best heat insulation
  - Electric heat pump
  - Glass X Elements using Phase Change Materials PCM
  - Zero energy balance

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Recognition award: opusHouse

- opusHouse – Living and working in the city – Darmstadt/Germany
- Architects: opus Architekten, Darmstadt
- Engineering
  - 8,64 kW monocrystalline PV system (E - W) with two inverters
  - Solar thermal system on a double pitch roof with a tilt angle of 33° (E - W)
- Architectural
  - Collectors and PV modules are colored to blend in with the neighboring roof surfaces
  - The different structural and thermal requirements (PV, thermal) are successfully resolved in the detailing of the eaves and ridge

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Commendation: SIEEB Building Beijing

- „SIEEB Building – Sino-Italian Ecological and Energy Efficient Building“ at Tsinghua University, Beijing/China
- Architect: Mario Cucinella, Bologna
- Architectural
  - Powerful, prominent building with an architecturally unusual and novel composition
  - The cantilevered PV louvres - projecting outwards on each storey - are an important feature in forming the design
  - The design incorporates a diverse range of overlapping and uses and references to traditional Chinese symbolism

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Commendation: Solar Home

- Solar home built to passive home standard
- Architect: Group of students - Prof. Hegger
- Architectural
  - The multifunctional combination of timber with photovoltaics is particularly successful in the façade
  - Amorphous silicon modules are convincingly integrated within the timber louvres. They enable both shadow free tracking and adjustable semi-transparency in the façade
  - The building has won the solar decathlon 2007
- Engineering - Goal “Energy autonomy”
  - Great variety of technologies and concepts:
    - Vacuum insulation
    - Thermo-active components with PCM
    - Heat pump
    - PV with 11,4 kW

Commendation: Solar Building XXI

- Instituto Nacional de Engenheria, Tecnologia e Inovação – INETI, Lisboa/Portugal.
- Architects: Pedro Cabrito & Isabel Diniz
- Architectural
  - The active technology - PV modules in façade - is carefully and unobtrusively integrated
  - The structural design - mullion and transom curtain walling - achieves an attractive and elegantly proportioned solution
- Engineering
  - Direct (PV) and indirect („ground cooling“) systems

Two Citations

- Student Hall of Residence, Bochum/Germany (above)
  - Integration of photovoltaic panels within the facades
  - Yield of the 46,1 kW system is high↑: Outside air is heated up in ventilation shafts behind the PV modules:
    - collected under the roof
    - use within a heat pump system
- Telecom Tower, Khartoum/Sudan (below)
  - Designed by Austrian company Ertex Solar
  - 2000 m² → 104,7 kW
  - World's first building project with amorphous silicon thin-film technology in such a large scale
  - Multiplier for solar technology in Africa
  - PV serves as emergency-power supply

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Two more Citations

- Existing industrial building in Tholey -Theley Germany / above
  - Storey-high façade integrated solar collectors illustrates the potential of solar thermal energy as a design feature
- Plus energy home in Pfarrkirchen Germany / below
  - In conjunction with the wall surfaces and apertures, storey-high flat-plate collectors are harmoniously integrated within the façade - both structurally and design-wise
- Such storey-high PV modules (size) could be advantageously applied

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Conclusion

- Wide range of projects is suited for BIST, e.g.:
  - Commercial buildings
  - Student home
  - Family home
- Common attempts and multiple new solutions
- The architects succeeded in connecting the structural and formal potentials of the solar technical systems with ecological and aesthetic objectives
- Interesting energetic solutions were presented
  - “Zero energy balance” building
  - Ground cooling systems
  - Emergency-power supply
- Architects and engineers together can find excellent solutions