




Building Integration of Solar Thermal Systems – TU1205 – BISTS




Presentation of the five projects

Future planning



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Agenda

- **Project 1:** Soteris Kalogirou
- **Project 2:** Mervyn Smyth
- **Project 3:** Aggelos Zacharopoulos
- **Project 4:** Brian Norton
- **Project 5:** Guedi Capeluto (by SK)
- 24 minutes each
 - 10-15 min. presentation, rest discussion
 - Further discussion in WGs



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Project #1:

- **Total Construction Integration of Solar Thermal Façade System (TCI-STF)**
- The proposed total construction integration collector façade concept is in line with the Building Energy Performance Directives of the EU.
- These specify that new and renovated buildings should have a minimum heat loss coefficient which can only be achieved with the appropriate thickness of thermal insulation.


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- This insulation is preferable to be installed on the outside surface of the building component in order to avoid thermal bridges.
- Means are usually required to protect the thermal insulation from the weather and the UV radiation of the sun.
- Therefore the concept of this integration is to adapt a flat-plate solar water heater technology with header and riser or serpentine arrangements in front of the insulation and a glazing at the outside protecting all components from the factors already mentioned.

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Figures: Basic idea of TCI-STF Concept

Glazing

Insulation

Plaster

Outside

Inside

Header and riser

Brick

Glazing

Insulation

Air gap


Plaster


Outside

Inside


Header and riser

Brick

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Photos (water and air system)



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Problems to solve

- Bracketing of the solar absorption surface without bridging the thermal insulation and
- Ways to fix the front glazing safely and without interfering with the solar collector operation.
- Possibility of integrating the hot water storage tank will also be investigated.
- Through a detailed design evolution, based on computational and experimental evaluation, fully integrated prototype systems will be developed.

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Continue....

- External field trialling of optimised prototypes under real operating conditions will be used to assess the techno-economic performance of the systems, which will show the commercial potential for the technology.
- A detailed market analysis will identify a clear and concise route to market and will progress the TCI-STF technology from a conceptual idea to a system which demonstrates a significant commercial opportunity.

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The main areas of partnership are:

- The development of a relatively small (minimum 2x1 m) system that can be used to determine the performance of the TCI-STF system for a given range of array, mounting format and geographical location.
- Evaluation of the architectural/structural and mechanical services integration options, including storage, for the various designs and the possibilities for applying colour absorbers.
- External experimental 'field trialling' of TCI-STF prototypes under realistic operating conditions in the three generic EU environments.
- Techno-economic evaluation.

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Project #5:

- **Building integrated solar thermal system- Evacuated Tubes Collectors**
- Demonstrated at the Porter School of Environmental Studies is a new building on the Tel Aviv University campus.
- The use of the building includes classrooms, offices, conference room, atrium, and auditorium with an overall gross area of 3400 sq.m


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- The architectural design features elegant integration of sustainable function; as such, the building is meant to be a showcase of advanced strategies and technologies which achieve sustainable building operation. Among other techniques the building uses solar thermal system as part of its design.
- Three separate arrays of evacuated tube solar-thermal collectors are integrated into the building's envelope, shading the façade and roof, and producing hot water. The hot water also serves to heat the building during the winter and power an absorption cycle chiller to cool the building in summer.

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Design

- A total of 705.4 m² of U-Pipe evacuated solar thermal collector tubes are integrated into the envelope in 3 arrays:
- One array is mounted vertically on the façade, facing south southeast with a total area of 422 m²
- Just above, the second is mounted with a tilt angle of 31 degree, facing the same orientation with a total area of 108 m².
- The third is mounted almost horizontally (with 15 degree tilt) facing south and shades mechanical equipment on the roof. This array, has a total of 175 m².

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Photos

BISTS on south southeast facade

Array on the roof shades mechanical equipment

The vertical array

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Operation

- The three arrays are connected via a pump and a Hx to the Hot Water Storage Tank.
- The Solar Collectors are allowed to operate on a schedule of 6 am to 8 pm in summer and 7 am to 5 pm in winter.
- Control valves keep the output temperature of the array between 75°C and 120°C. A variable speed pump operates the HW loop side of the Hx and modulates between 0 and 100% the flow as the fluid temperature is between 30 and 100°C.

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More photos





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