

COST Action

Final Achievement Report

TU1205: Building Integration of Solar Thermal Systems (BISTS)

(05/04/2013 to 04/04/2017)

The Action was approved by the Committee of Senior Officials (CSO) on 21-11-2012 and has the MoU reference COST TU1205-MoU.

This report was submitted on 04-05-2017 by the Action Chair on behalf of the Management Committee in fulfilment of the requirements of the rules for COST Action Management, Monitoring and Final Assessment.

Action leadership and participants

Leadership positions

Position	Name	Contact details	Country of work affiliation
Chair	Prof Soteris Kalogirou	Soteris.Kalogirou@cut.ac.cy +357-2500-2621	Cyprus

Position	Name	Contact details	Country of Nomination
Vice Chair	Dr Mervyn Smyth	m.smyth1@ulster.ac.uk 02890368119	United Kingdom

Working groups

#	WG Title	# of participants	WG Leader	Country of nomination
1	Development and characterisation of new BISTS	25	Prof Aleksandra Krstic-Furundzic akrstic@arh.bg.ac.rs	Serbia
2	Modelling and Simulation	25	Dr Daniel Chemisana daniel.chemisana@macs.udl.cat	Spain
3	Investigation of new applications for innovative BISTS	25	Dr Aggelos Zacharopoulos a.zacharopoulos@ulster.ac.uk	United Kingdom

Other key leadership positions

Position	Name	Contact details	Country of work affiliation
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Participants

COST members having accepted the MoU

AT	14/07/2013	BE	17/01/2013	BG	10/06/2013	CY	30/11/2012	DK	01/02/2013
FR	23/01/2013	DE	17/01/2013	EL	04/02/2013	HU	25/02/2016	IE	14/12/2012
IL	29/10/2013	IT	29/08/2013	LT	03/07/2013	MT	05/04/2013	NL	18/02/2013
PL	03/01/2013	PT	11/01/2013	RO	25/02/2016	RS	20/12/2012	ES	07/12/2012
TR	10/04/2013	UK	29/11/2012						

Other participants

Institution Name	Country
Appalachian State University	United States
Concordia University	Canada

Summary

Main aim/ objective

The main objective of the Action is to develop new novel solar thermal systems solutions suitable for building integration, definition of key parameters for their characterisation, modelling, simulation, demonstration and dissemination activities.

The Action addressed this as described below

Overall the Action succeeded in establishing a collaborative effort to join forces in order to find solutions for this new type of solar thermal systems application, by integrating them onto the building structure either as facade or roof element. This is a win-win situation as the building is further protected from thermal losses, as all thermal collectors are insulated, the collectors replace a normal building component and also the new element produced substantial quantities of thermal energy.

Most of the participants in this Action showed personal interest to participate in the events organised, like submitting chapters for the books published, teach at the training schools and perform research from own funding to set up pilot units.

It should be noted that a large number of papers were published by members of this Action in peer reviewed journals, but due to their large number these were not included in the Action Publications area of this report.

The success of this Action would not be so much if there was no funding from the COST.

Action website

<http://www.tu1205-bists.eu/>

Achievement of MoU objectives, deliverables and additional outputs/ achievements

MoU objectives

The Action had the following specific objectives:

MoU objective	Level of achievement	Further information (hyperlink or other)
creating a platform from which a working environment is developed that generates methods to further the integration of STS in buildings	76 - 100%	This is proved by the fact that in the Action people from 22 countries actively participated. The number of people are shown in the Action Website on http://www.tu1205-bists.eu/ . All objectives and deliverables were carried out as planned.
Development of new novel STS solutions suitable for building integration across the three generic European regions considered. o The developed STS will be based on both market available systems (which will be modified for building integration) and new innovative systems. The collective expertise of the Action consortium in STS development will be utilised. o Structural/material developments relating to the thermal resistance of the building element, integrity of the element to the weather impact and fire and noise protection will be reviewed.	76 - 100%	New BISTS were developed in Cyprus (South EU), Romania (Central EU) and Northern Ireland (North EU). Both new systems and systems based on modifications of existing systems were developed and adapted for building integrations. As all systems include thermal insulation the thermal resistance of the building element is enhanced. All systems are glazed which means that they offer resistance to the weather impacts and the air gap created creates a barrier to noise propagation. No high temperatures were recorded during the testing of the systems at stagnation conditions, which means that there is no fire risk.
Definition of a set of key parameters for the BISTS characterization, taking into consideration the thermal performance, building functionality and aesthetic aspects.	76 - 100%	BISTS characterisation techniques are described in deliverable D.1.4. This includes both thermal performance testing as well as architectural aspects, like building functionality and aesthetics. The deliverable is available at the downloads area of the Action Website at: http://www.tu1205-bists.eu/
Development of standardised range of methodologies for evaluating BISTS. Comparison of facade and roof integration for different climates and applications (heating, cooling and domestic hot water).	76 - 100%	This is also described in Deliverable D.1.4 already presented in Objective 3. All systems developed produce thermal energy which can be used for heating, cooling and hot water production. The deliverable can be found on Action's website at the downloads area at http://www.tu1205-bists.eu/
Modelling and simulation of STS including optical and thermal modelling for different building integration scenarios and new models of the developed solutions.	51 - 75%	A review of the BISTS models and simulation is given in Deliverable D2.4. Additional models of some of the new system developed were produced. The fabrication of the models can also be seen in D.3.4. All are available on the project website: http://www.tu1205-bists.eu/
Application of developed STS solutions for building integration including fabrication, characterisation and demonstration of prototypes.	76 - 100%	The application of the developed BISTS including the fabrication, characterisation and demonstration of the new prototypes are presented in Deliverable D.3.4. This can be seen in http://www.tu1205-bists.eu/
Dissemination of Action activities and findings in website and various publications. Booklets will be published as part of this Action and will be disseminated in training schools. The findings will also be presented in conference and journal publications, where applicable and a handbook	76 - 100%	Dissemination of the Action findings was done as planned with a number of publications, which are shown in other parts of this report. All publications appear on the Action website: http://www.tu1205-bists.eu/

will be written giving details of all possible solutions.

Deliverables

The Action reported the following deliverables:

Deliverable	Timing of deliverable	Further information (hyperlink or other)
D.1.1., D.2.1, D.3.1: Review of current STS and the suitability of integration onto building structures for domestic, commercial and industrial buildings. Three deliverables combined in one book.		
D.1.2, D.2.2, D.3.2. Annual STSM		
D.1.3, D.2.3, D.3.3. Annual Training School		
D.1.4. Report on the evaluation technologies available for BISTS characterisation		
D.2.4. Report on the validation of developed codes, both thermal and optical		
D.2.5. Report on the new models developed during the project and potential for adaptation for RES		
D.2.6. Report on the development of new models for innovative integrated STS applications.		
D.3.4. Report on fabricated integrated STS prototypes optimised for increased efficiency and low cost.		
D.3.5. Report on the performance of new integrated STS/RES prototypes: A country performance comparison with geographic diversity		
D.3.6. Handbook for architects and building services engineers on the developed BISTS solutions.		

Additional outputs/ achievements

N/A

Projects

N/A

Other outputs / achievements

N/A

Impacts

The Action reported the following impact(s):

Description of the impact, i.e. what will change, and for whom, as a result of what the Action achieved	Type of impact	Timing of impact
<p>The main impact is to suggest a new way of applying solar thermal systems in buildings.</p> <p>Building integration provides a new method which allows the applications of solar thermal systems in an acceptable aesthetic way.</p> <p>In view of the new Energy Performance of Buildings Directive (EPBD) these ways will definitely be available options for applying renewables in buildings.</p>	<ul style="list-style-type: none"> • Scientific / Technological 	<p>Foreseen two-to-five years</p>

Dissemination and exploitation of Action results

Dissemination and exploitation approach of the Action

The Action's dissemination and exploitation approach as well as all activities undertaken to ensure dissemination and exploitation of Action results and the outcomes of these activities are described below.

1. Mid Action Symposium is carried out at in combination with EURE ELECS conference. 2. Final Action Conference is organised in Dublin and called Firt Intrnational Conference on Building Integrate Renewable Energy Systems.

Dissemination meetings funded by the Action

The Action did not fund any Dissemination Meetings

Other dissemination activities

The Action also undertook the following dissemination activities:

Activity	Many of the participants of the Action participated in a wide range of events worldwide such as conferences, forums and symposia. In many of our meetings we also organised special sessions in which people of the local industry were invited. This proved to be a very good way of exchanging views with the people producing these systems and get their opinion on the way we see the market of building integration to develop.
Target	Scientists, PhD students, enginners, economists, decision makers and government employees.
Outcome	Able to disseminate in a bigger audience the outcomes of the Action.
Link	www.ises.org www.wrenuk.co.uk

Exploitation activities

The Action undertook the following activities to ensure exploitation (use, in particular in a commercial context) of the Action's achievements:

Activity	There are plans to repeat the Final Action Conferene every two years. This is because it is expected that the building integration consept is a current research area which attracts many researchers and engineers wordwide as well as companies which find new ways of applying their products.
Target	Researchers, scientists, engineers and renewable energy systems manufacturers.
Outcome	To disseminate the ideas developed in this Action as well as others that may be developed in a wider audience worldwide.

Action Success(es)

The Action's two most significant successes were the following:

- The development of a number (at least 6) different types of new products which demonstrate the building integration of solar thermal collectors.
- The involvement of the relevant industry and decision makers to special sessions of the different meetings in different countries to explain to them what we were doing and get their feedback.

Action Expenditure

The table below shows the budget allocated to the Action for each Grant Period:

#	Grant Period	Start Date	End Date	Budget allocated to Action (EUR)
1	TU1205-20130425	1-6-2013	31-5-2014	134,000.00 (EUR)
2	TU1205-20140509	1-6-2014	31-5-2015	134,000.00 (EUR)
3	CGA-TU1205-3	1-6-2015	30-4-2016	122,046.05 (EUR)
4	AGA-TU1205-4	1-5-2016	4-4-2017	101,749.70 (EUR)