

Presentation of the Action & Working Groups Presentation



Objectives of Action

- **Main objective:** The creation of a platform from which a working environment is developed that generates methods to study the integration of STS in buildings.
- Development of new novel STS solutions suitable for building integration across three generic European regions.
- Definition of a set of key parameters for the BISTS characterization, taking into consideration the thermal performance, building functionality and aesthetic aspects.

Objectives – cont.

- Development of standardised range of methodologies for evaluating BISTS.
- Modelling and simulation of STS (optical and thermal) for different building integration scenarios and for the developed solutions.
- Application of developed STS solutions for building integration including fabrication, characterisation and demonstration of prototypes to the extent that own research funding allows.
- Dissemination of Action activities (symposium, conference, website and various publications).

Motivation

- **Main Motivation:** The collective concentration of resources and the targeted focusing of scientists who are involved in the design, development and evaluation of solar thermal systems.
 - The Action will foster and accelerate long-term (technological) advancement in STS mainly through critical review, experimentation, simulation and demonstration of viable systems for full incorporation and integration into the traditional building envelope.
- The most important benefit of this Action is the increased adoption of RES/STS in buildings.

Types of systems to consider

- The Action will cover many forms of solar collecting methodologies with a particular focus on:
 - thermosiphonic units,
 - integrated collector storage units,
 - forced circulation systems,
 - evacuated tube collector systems and
 - various low concentration compound parabolic & Fresnel units.



Geographic coverage

- Three generic European regions are considered, to fully explore the Pan-European nature of STS integration:
 - Southern Mediterranean,
 - Central Continental and
 - Northern Maritime Europe.
- } These present distinct characteristics with respect to BISTS as all STS are sensitive to incidence angle effects which are strongly related to the latitude.
- The Action consortium presents a critical mass of European knowledge, expertise, resources, skills and R&D in the area of STS, which should support the creation of innovative ideas and concepts.

Potential benefits

- Increased range of potential STS options, greater choice and wider application contributing to the achievement of targets outlined by EU.
- Partnerships fostering a greater level of co-operation and access to specialism related to the Action, providing a platform that will allow the cross fertilisation of new ideas and concepts.
- Dissemination activities such as conferences, symposium and seminars, where all relevant stakeholders will gain an insight into BISTS.
- Aesthetic integration of STS, architectural rhythms and themes.
- 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.
- Social level impact – help reduce fuel poverty and increase energy security.

Target Groups

- Groups interested in the outcomes of this Action:
 - Government officials having the responsibilities for the application of EPBD in Member States,
 - the relevant industry, including solar collector manufacturers, engineers, architects, building developers and consultants,
 - other professionals working in the field, and different federations (like CIBSE, VDI and other Engineering and professional Associations), the industry federation, Energy Agencies, energy producers, energy distribution companies and
 - Municipalities, general community groups and associations across EU with an interest in green energy solutions.

What we mean by Building Integration

- A solar thermal system is considered to be building integrated, if for a building component this is a prerequisite for the integrity of the building's functionality.
- If the building integrated STS is dismantled, dismantling includes or affects the adjacent building component which will have to be replaced partly or totally by a conventional/appropriate building component.
- This applies mostly to the case of structurally bonded modules but applies as well to other cases, like in the case of replacing with BISTS one of the walls in a double wall façade.

Benefits of integration

- **Building envelope** – metal, glass or ceramic used in current BISTS roofing designs can last for more than 50 years.
- **Thermal and optical performances** – different systems can deliver different levels of thermal energy to match the varying needs of building occupants.
- **Costs** – Significant savings occur by replacing two separate systems (e.g. wall and collector) with one system that performs both functions.
- **Aesthetics** – mimic the existing appearance of traditional roofing systems and apply **colour collectors** on façades.

- Therefore BISTS must provide a combination of the following:
 1. Mechanical rigidity and structural integrity.
 2. Weather impact protection from rain, snow, wind and hail.
 3. Energy economy, such as useful thermal energy, but also shading and thermal insulation.
 4. Life expectancy from the various materials involved (at least equal to the life of the building)
 5. Fire protection, Noise protection.
 6. Environmental benefit/influence (LCA, embodied energy, emissions).
- Generally a multidisciplinary area involving engineers (mechanical, materials), physicists, architects, etc.

Scientific Program

- This COST Action will focus on the coordination of current research undertaken through national programmes in three scientific areas:
 - (1) Development of new innovative methods for building integration of STS;
 - (2) Modelling and simulation of new BISTS and their behaviour as a renewable energy system (RES);
 - (3) Investigation of new applications for innovative integration of STS in various application areas like domestic, commercial and industrial buildings.
- Three Working Groups (WG) will be set up to co-ordinate the research within each theme and a fourth one is dedicated to dissemination activities.

Working Groups

- Working Group 1: Development and characterisation of new BISTS
 - WG1 leader presentation by Werner Platzer
- Working Group 2: Modelling and Simulation of BISTS
 - WG2 leader presentation by Daniel Chemisana
- Working Group 3: Investigation of new applications for innovative BISTS
 - WG3 leader presentation by Aggelos Zacharopoulos
- Working Group 4: Dissemination
 - WG4 leader presentation by David Kennedy

WG1. Development and characterisation of new BISTS

- The **objectives** for WG1 are:
 - Perform a literature review to determine the state of the art technological developments published in the area
 - To develop new novel BISTS solutions
 - To develop standardised methodologies to characterise and classify BISTS performance
 - To evaluate methods for improving BISTS performance (overcoming problems such as over temperature, thermal resistance of the building component, rain and fire protection, noise etc.)
- These objectives will be fulfilled through the following tasks:
 - **Task 1.1 Review of the state of the art**
 - **Task 1.2 Development of new BISTS solutions**
 - **Task 1.3 Characterisation of BISTS developed in Task 1.2**

Deliverables and Milestones – WG1

- **Deliverables** include:
 - D.1.1. Review of current STS and identification of problems associate with their building integration. This review will also be submitted as a joint partner publication in a peer reviewed journal (Month 12)
 - D.1.2. Annual STSM on BISTS development and characterisation for PhD students and Early-stage researchers (Month 6, 18, 30, 42)
 - D.1.3. Annual Training School for dissemination of expertise on BISTS development and characterisation techniques and new architectural solutions to PhD students and Early stage researchers (Month 18, 30, 42)
 - D 1.4. Report on the evaluation technologies available for BISTS characterisation (Month 24)
- **Milestones:**
 - 1.1: Development of new and novel BISTS solutions
 - 1.2: Characterisation of new BISTS for use in RES

WG2. Modelling and Simulation

- **Objectives** of WG 2 are:
 - To deliver new mathematical and numerical models to predict the performance of BISTS
 - To validate the models using the experimental data acquired for the BISTS stated and characterised in WG1
 - To explore the validation and implementation of these models in numerical codes
 - To investigate the use of these new numerical codes to design new optimised RES.
- These objectives will be fulfilled through the following tasks:
 - **Task 2.1 Development of new mathematical and numerical models for BISTS**
 - **Task 2.2 Validation and implementation of codes developed in Task 2.1**



Deliverables and Milestones – WG2

- **Deliverables include:**

- D 2.1. Review of current STS modelling techniques. This review will also be submitted as a joint partner publication in a peer reviewed journal (Month 12)
- D.2.2. Annual STSM for PhD students and Early Stage Researchers on theoretical modelling and numerical simulation of thermal behaviour of BISTS (Month 6, 18, 30, 42)
- D.2.3. Annual Training School for dissemination of expertise to PhD students and Early Stage Researchers (Month 18, 30, 42). This will include topics on theoretical modelling and numerical simulation of thermal behaviour of BISTS.
- D 2.4. Report on the validation of developed codes, both thermal and optical (Month 30)
- D 2.5. Report on the new models developed during the project and potential for adaptation for RES (Month 42).
- D.2.6. Report on the development of new models for innovative integrated STS applications (Month 46).

- **Milestones:**

- 2.1 New validated mathematical and numerical models to predict the BISTS performance
- 2.2 New validated models to optimize BISTS in innovative RES applications



WG3 Investigation of new applications for innovative BISTS

- The **objectives** for WG3 are:
 - To develop innovative BISTS designs for various applications
 - To fabricate BISTS prototype configurations to the extent own funding allows
 - To characterize prototypes of these novel BISTS in indoor and outdoor conditions
- This WG will work on:
 - Domestic, commercial and industrial buildings
 - Full building services integration (e.g. into existing heating, cooling, hot water) or stand-alone operation but integral to the structure
 - Industry applications
 - New prefabricated products
 - In terms of solutions the ultimate objective is to design market ready products
- These will be fulfilled through the following tasks:
 - **Task 3.1 Design of innovative BISTS designs**
 - **Task 3.2 Fabrication of BISTS prototypes**
 - **Task 3.3 Characterisation of novel BISTS indoors and outdoors to assess the actual performance in real conditions**

Deliverables and Milestones – WG3

- **Deliverables include:**

- D.3.1. Review of current STS and the suitability of integration onto building structures for domestic, commercial, institutional and industrial buildings (Month 12).
- D.3.2. Annual STSM for PhD students and Early-stage researchers on design, fabrication and characterisation of innovative integrated STS/ RES (Month 6, 18, 30, 42)
- D.3.3. Annual Training School to disseminate expertise to PhD students and Early Stage Researchers (Month 18, 30, 42). Topics will include design, fabrication and characterisation of innovative integrated STS/ RES.
- D.3.4. Report on fabricated integrated STS prototypes optimised for increased efficiency and low cost. Full building services integration (e.g. into existing heating, cooling, hot water) or stand-alone operation but integral to the structure. This will depend on the extent of own research funding allows (Month 36).
- D.3.5. Report on the performance of new integrated STS/RES prototypes: A country performance comparison with geographic diversity (South, Central and North Europe), (Month 42).
- D.3.6. Handbook for architects and building services engineers on the developed BISTS solutions for the design market ready products. (Month 46)

- **Milestones:**

- 3.1: Fabricated BISTS prototype designs
- 3.2: Handbook to be published BISTS applications: An implementation guide.



WG4 – Dissemination

- Responsibilities of this WG is to organize and manage the Action website, Short Term Scientific Missions (STSM), Training Schools and Symposium (each Early Stage Researcher will present his/her work published as papers in a booklet) and co-ordinate the international conference, publication of journal papers and publication of the handbook on building integration of STS and solutions.
- These responsibilities of WG4 will be achieved through the following tasks:
 - **Task 4.1 – Organisation and coordination of Action events**
 - **Task 4.2 – Coordination of Short Term Scientific Missions (STSMs)**
 - **Task 4.3 – Creation and management of Action website**

Deliverables of WG4

- The deliverables of WG4 are:
 - D.4.1. Organisation of all meetings and related minutes reports
 - D.4.2. Organisation of 3 training schools (1 per year) and related material published
 - D.4.3. Completion of 4 sets of STSMs
 - D.4.4. Organisation of Action Symposium (end of the 2nd year)
 - D.4.5. Organisation of Action Conference (end of the 4th year) and production of proceedings CD.
 - D.4.6. Creation and maintenance of the Action specific website with both secure and public access.
 - D.4.7. Scientific journal and conference and trade publications.



Tasks coordinators



TASKS – WG1:

- D.1.1. Review of current STS and identification of problems associate with their building integration. This review will also be submitted as a joint partner publication in a peer reviewed journal (Month 12): **Werner, Aleksandra**
 - D.1.2. Annual STSM on BISTS development and characterisation (Month 6, 18, 30, 42): **STSM manager**
 - D.1.3. Annual Training School for dissemination of expertise on BISTS development and characterisation techniques and new architectural solutions (Month 18, 30, 42): **SG**
 - D 1.4. Report on the evaluation technologies available for BISTS characterisation (Month 24): **Brian Norton**
- Only those contributing to a publication will have their names on papers (applies to all WGs).

TASKS – WG2:

- D 2.1. Review of current STS modelling techniques. This review will also be submitted as a joint partner publication in a peer reviewed journal (Month 12): **Daniel, Alberto**
- D.2.2. Annual STSM for PhD students and Early Stage Researchers on theoretical modelling and numerical simulation of thermal behaviour of BISTS (Month 6, 18, 30, 42): **STSM Manager**
- D.2.3. Annual Training School for dissemination of expertise to PhD students and Early Stage Researchers (Month 18, 30, 42). This will include topics on theoretical modelling and numerical simulation of thermal behaviour of BISTS: **SG**
- D 2.4. Report on the validation of developed codes, both thermal and optical (Month 30): **Manolis**
- D 2.5. Report on the new models developed during the project and potential for adaptation for RES (Month 42): **??**
- D.2.6. Report on the development of new models for innovative integrated STS applications: (Month 46)??

TASKS – WG3:

- D.3.1. Review of current STS and the suitability of integration onto building structures for domestic, commercial and industrial buildings (Month 12): **Aggelos, Manolis**
- D.3.2. Annual STSM for PhD students and Early-stage researchers on design, fabrication and characterisation of innovative integrated STS/ RES (Month 6, 18, 30, 42): **STSM Manager**
- D.3.3. Annual Training School to disseminate expertise to PhD students and Early Stage Researchers (Month 18, 30, 42). Topics will include design, fabrication and characterisation of innovative integrated STS/ RES: **SG**
- D.3.4. Report on fabricated integrated STS prototypes optimised for increased efficiency and low cost. Full building services integration (e.g. into existing heating, cooling, hot water) or stand-alone operation but integral to the structure (Month 36): **Ina, Mervyn**
- D.3.5. Report on the performance of new integrated STS/RES prototypes: A country performance comparison with geographic diversity (South, Central and North Europe), (Month 42): **Yiannis, David, George, Christian**
- D.3.6. Handbook for architects and building services engineers on the developed BISTS solutions for the design market ready products. (Month 46): **Coordinated by WG4** (next slide).

Handbook

- The main publication of the Action – basically include all deliverables from the various WGs.
- Handbook for architects and building services engineers on the developed BISTS solutions for the design market ready products.
- This will include new prefabricated products, a variety of mounting surfaces (vertical, sloped, horizontal) and the use of new materials, like PCM.
- The handbook will also include the development of BISTS through novel modelling techniques, fabrication and assembly of BISTS prototypes specifically tailored to building element integration, performance measurement of novel BISTS and the suggestion of standardised procedures and the determination of a range of applications for BISTS.

TASKS – WG4:

- D.4.1. Organisation of all meetings and related minutes reports: **SG**
- D.4.2. Organisation of 3 training schools (1 per year) and related material published: **SG**
- D.4.3. Completion of 4 STSMs: **STSM Manager**
- D.4.4. Organisation of Action Symposium (end of the 2nd year): **SG**
- D.4.5. Organisation of Action Conference (end of the 4th year) and production proceedings CD: **SG + Conference Organising committee**
- D.4.6. Creation and maintenance of the Action specific website with both secure and public access: **CUT**
- D.4.7. Scientific journal and conference and trade publications: **Editorial Board (part of WG4)**

Publications

- Remember in all publications to acknowledge COST and the Action:
 - The author is grateful to the EU COST Action TU1205: “Building integration of solar thermal systems (BISTS)” for its sponsorship.
- Same on PowerPoint presentations or posters in Conferences.

WG Presentations

- In future meetings each WG to present to all, a scientific subject on their work to initiate discussions and inter-WG collaborations.
 - Can also be in the form of a poster or both.
- Improve the scientific part of the Action meetings- not just managerial matters.
- To be organised by the SG.
- All presentations will be posted on the Action web page and published as additional deliverable.

Templates

- For new designs, models, applications the various WGs to consider the use of templates so as to:
 - Have a uniform way of presentation
 - Ease the collection of information for the various ideas
 - Ease the exchange of information between WGs
 - Have them ready to be used in publications/HB.



Any questions....



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