



TASK 48

Quality assurance and support measures for Solar Cooling



Annex

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With the support of

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0. *Preamble*

Solar Thermally Driven Heating and Cooling systems (STDHC systems) are belonging to the IEA SHC Strategic Plan Key Technologies because they have the potential to cover much of the rising demand for air conditioning by solar energy.

Achieved and previous IEA SHC Tasks related to Solar Air conditioning (Task 25 and Task 38) have permitted to make a considerable collaborative and international work to develop this technology from pure R&D to first market introduction.

IEA SHC Task 25 (from 1999 to 2004) mainly created an outlook of the technology and initiate industrial and mature developments. During Task 38 (2006-2010), IEA experts created tools and methods to help the market introduction of the emerging technology and analyse the efficiency and reliability of the new generation of solar cooling systems now available for demonstration and pilot installations as well as first commercial market deployment.

Beside, an important work of collection on new developments has been achieved. Results have shown that under certain conditions and with a considerable effort during design, installation, commissioning and operation the technology is reliable, promising and competitive in terms of energy, environmental impact and – sometimes – even cost whereas some of the installations realised since 1999 could not yet be considered as reliable and cost competitive.

In 2010, Solar Air Conditioning is more than ever representing a huge potential of development for solar energy (within 2030 the expected growth of energy demand in buildings especially in developed countries is far bigger on the cooling side than on the heating side) but this promising technology is facing two main issues: (1) general lack of economic competitiveness – as it is still the case for many renewable energies unless incentives are in place – and (2) secure long term energy performance and reliability.

The proposed Task addresses in these obstacles: main goals are (1) to develop and provide various measures which lead to highly reliable, durable, efficient and robust solar cooling (and heating) systems and (2) to contribute to further cost reduction on all levels of the chain and identify most promising market areas in terms of cost competitiveness.

This new Annex is deeply aimed as well to enlarge the actual very European centred view and work to countries out of Europe (most of them are member of IEA SHC) such as China, India, Singapore, USA, Canada, South Africa and Australia where Solar Thermally Driven Heating and Cooling technology is really dynamic and represent a much bigger market potential (because of the climates, the energy structure, peak demand, etc.). Actions to stimulate participation to these countries will be implemented.

1. Description of Technical Sector

Solar cooling systems provide cooling services for the residential, commercial and industrial sectors. The energy sources to drive the processes consist of a mixture of solar energy and an auxiliary energy sources (i.e., fossil, electricity). The solar contribution (solar fraction) for cooling may vary between a few per cent and complete coverage of the energy provision. In general solar cooling systems or at least the solar sub-systems are often used for heat production too (e.g., in residential sector for heating and domestic hot water production).

In principle, solar cooling systems may be operated by solar thermal collectors connected to thermal driven cooling devices, solar-to-electric converters (photovoltaics) combined with compression chillers or by solar to mechanic energy converters (e.g., solar collector driven Rankine machines) combined with compression chillers. This Annex focuses quasi only on the first category of systems even if the photovoltaic technology will be observed as well, especially on a regular update on the technology status.

This type of solar cooling systems consists of three main sub-systems: (1) the solar plant which consists of solar collectors and may include a heat buffer storage and auxiliary heat source(s), (2) a thermally driven cooling machinery including the heat rejection device and possibly auxiliary cooling sources and (3) the cold and heat distribution subsystem including the converters on the load side.

The different market available technologies which are of main interest are described below:

Closed cold water systems – chilled water systems

- Absorption chiller : these machines are commercially worldwide available with cooling capacities above 100 kW from many manufacturers. Until few years ago in principle only one single machine was available with lower capacity (35 kW). This machine (WFC SC10 of Yazaki/Japan) has been dominating in installations using solar driven absorption cooling in the past. Recently new absorption chillers have been developed and are partly available on the market with cooling capacities below 25 kW. Thus they are of interest for the market segment of solar cooling in the small capacity range. Almost all installations so far use single-effect absorption chillers and thus require driving temperatures lower than 100°C using market available solar collectors such as flat plate collectors or evacuated tube collectors.
- Adsorption chiller : machines of two Japanese manufacturers are available with a minimum capacity of 40 kW. Although investment costs for these machines are comparatively high they have been installed in several pilot installations because of the comparatively low driving temperatures (starting at about 60° C) and the wide range of cooling water temperatures. Normally water/silica gel or water/zeolithe is used as material pair. However, the systems achieve lower COP values compared to single effect absorption; typical values are in the range of 0.6. New products in this field are as well aiming on low capacity in the range of 7 to 10 kW.

Desiccant and evaporative cooling assisted air-conditioning

- Solid sorption : the central component of open solar assisted air conditioning systems is the dehumidification unit which is available from several suppliers in form of a desiccant wheel for different air volume flows. Silica gel or lithium chloride are used as sorption material. All the other components of the system are commonly used in standard air-conditioning applications (where an air handling unit is employed), e.g., heat recovery units, heat exchangers, humidifiers etc.. The majority of the solar assisted air-conditioning systems based on thermodynamic open cycles uses this technology. The heat required for the regeneration of the sorption wheel can be provided at low temperature level (in the range of 45-90°C); therefore air collectors are in principle also applicable.
- Liquid sorption : first prototypes which use this technology have recently been put in operation. The input air is dehumidified by contact with a salt solution, e.g., water/lithium chloride. The diluted solution is re-concentrated using low temperature heat e.g., from solar thermal collectors. The advantage of the method is the loss-free storage ability of the concentrated and diluted salt solution which facilitate energy storage at high energy density. The required regeneration temperature is similarly low as in the case of the solid sorption.

2. *Objective and Scope*

The main objective of this Task is to assist in a strong and sustainable market development of solar cooling systems. This Task is focusing to systems including any solar thermal cooling systems (no power limitation or solar collector field area) which can be used in heating mode. To avoid overlapping risks with ongoing IEA SHC Task45 on Large Systems, Task 45 is mainly focusing (not only but majoritarily) to district heating systems (possibly including cooling)

The proposed project is intended therefore to create a logical follow up of the IEA SHC work already achieved by trying to find solutions to make the solar thermally driven heating and cooling systems at the same time efficient, reliable and cost competitive. This 3 major targets should be reached thanks to 4 levels of R&D:

- 1) Development of tools and procedure to make the characterization of the main components of SAC systems
- 2) Creation of a practical and unified procedure, adapted to specific best technical configurations.
- 3) Development of three quality requirements targets :
 - prescriptive “deemed performance” approach (<20kW): Manufacturers who offer a standard packaged solution declare the performance level of the package under certain rating constraints. This rated performance can then be used in a variety of policy interventions (eg : award of certificates, restriction on sale of low performance products, thresholds for subsidies etc).

- prescriptive “deemed to satisfy engineered” approach (>20 kW) : Where customised solutions are more appropriate, prescribed engineering design and implementation requirements can be specified to ensure the quality of the systems from components to operation (system, installation, etc..). The ability to “qualify” and label installations can be used in a variety of policy interventions (eg : minimum requirement for subsidies, overcoming information barriers, award of points in building rating schemes etc)
 - performance-based approach (>20 kW): While the prescriptive methods described above will be useful within their field of relevance, installers/providers of Solar Thermally Driven Heating and Cooling solutions must also have the ability to innovate and offer tailored solutions outside the direct scope of the prescribed approaches. This can be achieved by allowing direct metering and verification of performance. The ability to benchmark actual performance against alternative solutions can be used in a variety of policy interventions (eg : promotion of energy performance contracting, award of certificates etc)
- 4) Production of tools to promote Solar Thermally Driven Cooling and Heating systems

To develop the 4 strategic axis, 4 subtasks are implemented.

3. Activities

The Participants shall share the coordinated work necessary to carry out this Task.

(a) Main activities

The objectives shall be achieved by the participants in the following Subtasks:

- ..Subtask A: Quality procedure on component level
- ..Subtask B: Quality procedure on system level
- ..Subtask C: Market support measures
- ..Subtask D: Dissemination and policy advice

The tasks of dissemination of results and market support are included in the Operating Agent’s general task.

In the following the specific objectives, activities and deliverables of the subtasks are described in more detail.

Subtask A: Quality procedure on component level

The general objectives of Subtask A are to:

- * to better know and characterize the most important components of the solar heating and cooling systems

- * to develop tools and deliverables permitting to show the level of quality of the most critical components of the solar cooling and heating system.
- * to prepare the work to be carried out on the characterization at the system level

The specific objectives of Subtask A are to:

- * to focus on chiller characterization and define the quality level of the chillers
- ..* to further develop the LCA approach to Solar Cooling systems initiated by IEA Task 38 at the component level
- * to select the best technologies and characterize other very important components for solar cooling : pumps, heat rejection systems and solar collectors

The activities to reach these objectives are defined below.

A1: Chiller characterization

A2: Life cycle analysis at component level

A3: Heat rejection

A4: Pumps efficiency and adaptability

A5: Conventional solar collection

A6: State of the art on new collector & characterization

Subtask B: Quality procedure on system level

The general objectives of Subtask B are to develop tools and deliverables permitting to show the level of quality of the solar cooling and heating systems. In order to achieve this goal, a procedure has to be developed which extends the quality characteristics on component level to a system level. In a second step an extension of the procedure from single stationary states to a performance prediction over a whole year need to be developed. Thus subtask B is closely linked to subtask A and its results.

The specific objectives of Subtask B are to:

- * to focus on system characterization and assess field performance
- * to increase the know how for DEC design and installation
- ..* to create a Life Cycle Analysis tool for Solar Cooling systems
- ..* to create a Simplified design tool for Solar Cooling systems
- * to create a quality procedure and a self detection on monitoring procedure
- * to make an assessment on Quantitative quality and cost competitiveness criteria for systems
- * to validate preselected best practice examples with the developed quality procedure

The activities to reach these objectives are defined below.

B1: System/Subsystem characterization & field performance assessment

B2: Good practice for DEC design and installation

B3: Life cycle analysis at system level

B4: Simplified design tool used as a reference calculation tool : design facilitator

- B5: Quality procedure document/check lists*
- B6: Self detection on monitoring procedure*
- B7: Quantitative quality and cost competitiveness criteria for systems*
- B8: Application for validation of preselected best practice examples*

Subtask C: Market support measures

The general objectives of Subtask C are to create a panel of measures to support the market.

These measures will use the results of Subtasks A and B and will above all explore the possibilities to identify, rate and verify the quality and performance of solar cooling solutions.

The resulting tools are intended to provide a framework that will enable policy makers to craft suitable interventions (eg certificates, label and contracting etc) that will support solar cooling on a level playing field with other renewable energy technologies. Even if the completion of these tools will not be achieved rapidly, the subtask should permit to initiate all and maybe conclude some of them.

The specific objectives of Subtask C are to:

- * to better know the relevant international standards rating and incentive schemes
- * to build a methodology for performance assessment, rating and benchmarking
- * to select and standardize the best practice solutions identified in Subtask B
- * to develop procedures to measure and check performances
- * to investigate on labelling process for solar cooling
- * to collect and adapt for solar cooling contracting models
- * to define the process for small system certification

The activities to reach these objectives are defined below.

- C1: Review of relevant international standards rating and incentive schemes*
- C2: Methodology for performance assessment, rating and benchmarking*
- C3: Selection and standardisation of best practice solutions*
- C4: Measurement and verification procedures*
- C5: Labelling possibilities investigation*
- C6: Collaboration with T45 for contracting models*
- C7: Certification process definition for small systems*

Subtask D: Dissemination and policy advice

The work in this subtask covers horizontal activities related to subtasks A, B, and C. The general objectives of Subtask D are the implementation of targeted promotion activities based on the collective work results; production of dissemination material for external communication; the implementation of knowledge transfer measures towards the technical

stakeholders; the development of instruments and their provision for policy makers and the creation and promotion of certification and standardisation schemes.

The specific objectives of Subtask D are to:

- * to disseminate the Task results on national and international level
- * to provide efficient communication tools such as brochures and guidelines
- ..* to update specific training material and promote seminars on Quality procedure
- ..* to collect and structure evidence for policy actions
- * to create guidelines for road mapping solar cooling at national levels and at international one if possible

The activities to reach these objectives are defined below.

D1: Web site

D2: Best Practices brochure

D3: Simplified short brochure

D4: Guidelines for Roadmaps on Solar cooling

D5: Updated specific training seminars adapted to the Quality procedure

D6: Outreach report

(b) Workshops and seminars

National experience exchange groups (participant to be chosen from each country) Establish/participate in national experience exchange groups. The groups should meet e.g. twice a year and exchange experience from operation of systems and discuss new ideas.

Experts could be invited for special issues. Participants could be:

- ..Plant operators
- ..Planners / consultants
- ..Suppliers
- ..Researchers

National workshops

The task participants will organise half a day national workshops dedicated to the industrial players involved in the sector (solar thermal manufacturers and installers, thermally driven cooling industry, planners). This will happen preferably once a year and before fixed experts meeting to as to test and make a feedback on the last developments achieved inside the Task. Thanks to these events, a full retrofit process will be achieved and this will permit to make participate industry interested bodies without implicating them directly and deeply inside the Task R&D work. Short report will have to be done for each event.

International workshops

The task participants will organise at least once per year and in margin of one of the Expert meetings an international workshop dedicated to the policy makers and potential customers. This action will be organised during international conferences (INTERSOLAR in Munich or Sustainable Energy Week in Brussels for example) so as to touch important decision makers on solar cooling (investors, distributors, ESCO's, etc..). The workshops will present the results of the work done in the Task and try to constitute an important lobbying and promotion action. A mix and marriage of R&D institutes and industry partners will make presentations. The organisation of such workshops will be prepared by building inside this activity sets of presentations on solar cooling available for organisers. A list of contact in partnership with National Professional associations (solar, chiller, air conditioning, ..) will be built as well to create a useful database for organisers.

(c) Publications/newsletters

The target groups for Task information include:

- ..Utilities/heating companies/ESCos
- ..Planners/Engineering companies
- ..Installers & Operators (O&M companies)
- ..Technical Schools and Universities
- ..Producers of relevant components (chillers, solar collectors, system manufacturers),
Policy makers and public authorities,
Professional associations

Best Practices brochure

High quality brochure presenting the selected reduced number of Best practices. The length of the document should be nearly of 30 pages. Firstly in pdf format, this brochure will be printed out on demand of the participating countries as well as translated into national languages.

It main focus will be to constitute a media support to disseminate on the success stories available on solar cooling through several fundamental criteria: reliability, efficiency/performance, cost competitiveness.

Simplified short brochure

This brochure will have maximum 4 to 6 pages and should underline what was the methodology used to progress on the development of Quality procedures for solar cooling and what could be the results on creation of tools for certification, labelling and policy support. This brochure will be edited jointly by the Subtask Leader (Greenchiller) and IEA SHC program.

Guidelines for Roadmaps on Solar cooling

A list of recommendations for policy options to develop the industry will be published. This list will be structured so as to become guidelines for roadmaps on solar cooling.

So as to organise it as well as possible, a review of existing roadmaps on Solar Thermal technology will be done (Austria for example) taking inspiration of their own methodology and approach but updating it with Activities results and outputs. Beside, a review of the impact of existing incentive schemes will be carried out. This review will be closely linked to C1 activity but focussing on the efficiency of the schemes for the development of the local market (increase of turnover, improvement on quality of installations,..).

These guidelines will include proposal for policy measures and how to make their promotion towards the local and national policy makers. If this activity leads to converging and coherent international policy measures, there could be an interest to create a final common worldwide roadmap for solar cooling, creating an added value to these guidelines.

Industry newsletters

For further dissemination of the achieved results of the R&D activities a semi-annual electronic newsletter for the industrial players will be published.

Updated specific training seminars adapted to the Quality procedure

An update of the existing training material for installers and planners, already built during IEA SHC Task 38 will be carried out. This update will be on the technical side (available products, new components, etc..) but as well on the adaptation of the content to the Quality procedure concept. The overall set of training material will be divided into different specific sets: one set for engineering companies, one for installers and one for building owner/contractor/utility/decision maker. The training material will permit then to organise seminars for each targeted public in the interested participating countries.

Lobbying actions

Organisation of evidence for policy / lobbying actions to promote solar cooling : preparation of specific documents (after identifying an or several efficient funding mechanism(s), an existing scenario analysis tool provided by CSIRO could be used to identify and optimise impact of evidence for policy actions), networking, preparation of press release, creation of articles relating the Task activity. Organisation of meetings with policy makers at national levels.

4. Expected Results/Deliverables

The products of work performed in this Annex are designed for the solar industry (manufacturers of components and systems; system sales companies), for the air conditioning industry (manufacturers of components and systems) and for professionals such as HVAC engineers, civil engineers and planners, and architects.

Subtask A - Deliverables

- D-A1: Technical report on the characterization method(s) which are adopted and selected for chillers in cooperation with other activities on the topic. The deliverable will contain as well a database including the ongoing characterisation values from existing and tested chillers
- D-A2: Data base of life cycle inventories for components for LCA method tool (see D-B2)
- D-A3: Technical report on heat rejection including sections related to market available products census, including costs, efficiency criteria ranking and performance characterisation.
- D-A4: Technical report on best practices for pumping systems: including both efficiency and adaptability in solar cooling systems
- D-A5: Report on best practices on solar collection components for quality, reliability and cost effectiveness
- D-A6: State of the art of commercial product database build up and periodic update (1 per year) for concentrating solar collectors and including certification process status

Subtask B - Deliverables

- * D-B1: Report on system/subsystem characterization & field performance assessment
 - * D-B2: Collection of good practice for DEC design and installation,
 - * D-B3: LCA method tool (which should contain at the same time a significant database adapted to the most popular solar cooling system components and an user friendly interface permitting to rapidly make an assessment of the main LC criteria : energetic payback, avoided CO2 potential)
 - * D-B4: Software tool for the fast pre-design and performance estimation of best practice projects
 - * D-B5: Quality procedure document/check lists guidelines,
 - * D-B6: Self detection on monitoring procedure
 - * D-B7: Collection of criteria to qualify the quality and cost competitiveness of solar cooling systems
 - * D-B8: Report on validation of preselected best practice examples

Subtask C - Deliverables

- * D-C1: Report and database of international standards, rating and incentive systems relevant to Solar Cooling

- * D-C2: Rating framework developed with benchmarks for qualifying solar cooling performance and quality
- * D-C3: Selection and description of best practices into standardised engineering requirements,
- * D-C4: Minimum procedures developed for measurement and verification
- * D-C5: Report on labelling investigations,
- * D-C6: Models of contracting for solar cooling projects,
- * D-C7: Report about the certification process for small systems in Australia including generalization of the methodology to potential other interested countries and cooling power range.

Subtask D - Deliverables

- D-D1: Website dedicated to the Task
- D-D2: Best practices high quality brochure,
- D-D3: Simplified short brochure,
- D-D4: Guidelines for Roadmaps on Solar cooling,
- D-D5: Training activity:
 - D5.1: Sets of training material package
 - D5.2: Training seminars feedback and description report
- D-D6: Outreach report
 - D6.1: Customer and policy maker workshops,
 - D6.2: Organising national industry workshops, industry workshops in national languages in participating countries addressing target groups (related to Experts meetings)
 - D6.3: Publishing a semi-annual e-newsletter for the industry
 - D6.4 Report on lobbying actions describing all the actions and their impacts

5. Rights and Obligations of Participants

(a) In addition to the obligations enumerated in Article 7 of this Agreement

1. Each Participant shall commit himself in actively working in the Task and provide Operating Agent with detailed reports on the results of the work carried out in each Subtask.

2. Each Participant shall collect, assess and report to the Operating Agent data on solar heat + heat pumps systems.
3. Each Participant shall participate in the editing and reviewing of draft reports of the Task and Subtasks
4. Each Participant shall participate in the editing and reviewing of the final design book of Task 45 “Large solar thermal systems”.

(b) Individual Financial Obligations.

Each country will bear the costs of its own participation in the Task, including reporting and necessary travel costs

(c) Task-Sharing Requirements.

The Participants agree on the following funding commitment: Each Participant (country) will contribute to this Task **a minimum of 0.3 person year per year of the Task**, i.e. a total of at least 1 person year over the period (of 3,5 years);

Participation in the Task requires participation in at least one of the Subtasks A, B, C, D.

The Operating Agent will contribute with **a minimum of 0.5 person year per year to the Task**.

Participation may partly involve funding already allocated to a national (or international) activity, which is substantially in agreement with the scope of work outlined in this Annex.

Aside from providing the resources required for performing the work of the Subtasks in which they are participating, all Participants are required to commit the resources necessary for activities which are specifically collaborative in nature and which would not be part of activities funded by national or international sources. Examples include the preparation for and participation in Task meetings, co-ordination with Subtask Participants, contribution to the documentation and dissemination work and Task related R&D work which exceeds the R&D work carried out in the framework of the national (or international) activity.

6. Management

(a) ADEME, acting through Daniel Mugnier of TECSOL, is the Operating Agent.

(b) In addition to the obligations enumerated in Articles 4 and 7 of this Agreement, the Operating Agent shall:

- (1) Prepare and distribute the results described above;

- (2) Prepare joint assessments of research development and demonstration priorities for system using solar heat and heat pumps;
- (3) At the request of the Executive Committee organize workshops, seminars, conferences and other meetings;
- (4) Prepare the detailed Programme of Work for the Task in consultation with the Subtask Leaders and the Participants and submit the Programme of Work for approval to the Executive Committee;
- (5) Provide, at least semi-annually, periodic reports to the Executive Committee on the progress and the results of the work performed under the Programme of Work;
- (6) Provide to the Executive Committee, within six months after completion of all work under the Task, a final management report for its approval and transmittal to the Agency;
- (7) In co-ordination with the Participants, use its best efforts to avoid duplication with activities of other related programmes and projects implemented by or under the auspices of the Agency or by other competent bodies;
- (8) Provide the Participants with the necessary guidelines for the work they carry out with minimum duplication;
- (9) Perform such additional services and actions as may be decided by the Executive Committee, acting by unanimity.

(c) Subtask Leaders

A Subtask Leader for each of the foregoing Subtasks will:

- (1) Co-ordinate the work performed under that Subtask;
- (2) Assist the Operating Agent in preparing the detailed Programme of Work;
- (3) Direct technical workshops and provide the Operating Agent with written summaries of workshops results and
- (4) Edit technical reports resulting from the Subtask and organise their publication.
- (5) Subtask leaders may arrange meetings in between or in association with Experts meetings of the Task.

The Subtask Leader shall be a Participant which provides to the Subtask a high level of expertise and undertakes substantial research and development in the field of the Subtask. The Subtask Leaders shall be proposed by the Operating Agent and designated by the Executive Committee, acting by unanimity of the Participants. Changes in the Subtask Leaders may be agreed to by the Executive Committee, acting by unanimity of the Participants.

(d) Experts Meetings.

Experts meetings of the Task will be carried out at intervals of approximately 6 months. Subtask leaders may arrange meetings in between or in association with Experts meetings of the Task. To facilitate the participation of Experts from countries out of Europe, one meeting per year will have to be organized so that a video conference is technically feasible between the Experts so that it is no more mandatory for all the Experts to attend this meeting. Attendance at the Experts meetings of the Task will be mandatory then only once a year (for the second meeting). The cost of organizing meetings will be borne by the host country.

(e) Technical Advisory Committee

The Participants shall establish a Technical Advisory Committee consisting of the Subtask Leaders and the Operating Agent or their respective designees. The Technical Advisory Committee shall assist the Operating Agent in the co-ordination of the Task and advise the Operating Agent on the performance of the task.

7. Admissions, Participation and Withdrawal of Participants

In addition to the specific obligations, the Operating Agent will produce, promote and distribute the results of the Task. The Participants will support these activities by contributing respective papers and by dissemination activities financed by the individual Participants.

8. Information and Intellectual Property

(a) Executive Committee's Powers

The publication, distribution, handling, protection and ownership of information and intellectual property arising from this Task shall be determined by the Executive Committee, acting by unanimity, in conformity with the Agreement.

(b) Right to Publish

Subject only to copyright restrictions, the Participants shall have the right to publish all information provided to or arising from this Task, except proprietary information.

(c) Proprietary Information

The Participants and the Operating Agent shall take all necessary measures in accordance with this paragraph, the laws of their respective countries and international law to protect proprietary information provided to or arising from this Task. For the purposes of this Task, proprietary information shall mean information of a confidential nature such as trade secrets and know-how (for example computer programs, design procedures and techniques, chemical

composition of materials, or manufacturing methods, processes, or treatments) which are appropriately marked, provided such information:

- * Is not generally known or publicly available from other sources.
- * Has not previously been made available by the owner to others without obligation concerning its confidentiality.
- * Is not already in the possession of the recipient Participant without obligation concerning its confidentiality.
- * It shall be the responsibility of each Participant supplying proprietary information and of the Operating Agent for appraising proprietary information, to identify the information as such and to ensure that it is appropriately marked.

Arising Information

All information developed in connection with and during activities carried out under this Task (arising information) shall be provided to each Participant by the Operating Agent, subject only to the need to retain information concerning patentable inventions in confidence until appropriate action can be taken to protect such inventions.

For arising information regarding inventions the following rules shall apply:

- (1) Arising information regarding inventions shall be owned in all countries by the inventing Participant. The inventing Participant shall promptly identify and report to the Executive Committee any such information along with an indication whether and in which countries the inventing Participant intends to file patent applications.
- (2) Information regarding inventions on which the inventing Participant intends to obtain a patent protection shall not be published or publicly disclosed by the Operating Agent or the other Participants until a patent has been filed, provided, however, that this restriction on publication or disclosure shall not extend beyond twelve months from the date of reporting of the invention. It shall be the responsibility of the inventing Participants to appropriately mark Task reports that disclose inventions that have not been appropriately protected by filing a patent application.
- (3) The inventing Participant shall license proprietary information arising from the Task for non-exclusive use to participants in the Task:
 - (a) On the most favorable terms and conditions for use by the Participants in their own country
 - (b) On favorable terms and conditions for the purpose of sub-licensing others for use in their own country.
 - (c) Subject to sub-paragraph (1) above, to each Participant in the Task for use in all countries, on reasonable terms and conditions.
 - (d) To the government of any Agency Member country and nationals designated by it, for use in such country in order to meet its energy needs.

Royalties, if any, under licenses pursuant to this paragraph shall be the property of the inventing Participant.

(d) Production of Relevant Information by Governments

The Operating Agent should encourage the governments of all Agency Participating Countries to make available or to identify to the Operating Agent all published or otherwise freely available information known to them that is relevant to the Task.

(e) Production of Available Information by Participants

Each Participant agrees to provide to a Subtask Leader or to the Operating Agent all previously existing information, and information developed independently of the Task, which is needed by a Subtask Leader or by the Operating Agent to carry out its functions under this Task and which is freely at the disposal of the Participant and the transmission of which is not subject to any contractual and/or legal limitations:

If no substantial cost is incurred by the Participant in making such information available, at no charge to the Task.

If substantial costs must be incurred by the Participant to make such information available, at such charges to the Task as shall be agreed between the Operating Agent and the Participant with the approval of the Executive Committee.

(f) Use of Confidential Information

If a Participant has access to confidential information which would be useful to a Subtask Leader or to the Operating Agent in conducting studies, assessments, analyses, or evaluations, such information may be communicated to a Subtask Leader or to the Operating Agent but shall not become part of the reports, handbooks, or other documentation, nor be communicated to the other Participants, except as may be agreed, between the Subtask Leader or the Operating Agent and the Participant.

(g) Reports on Work Performed under the Task

The Operating Agent shall, in accordance with section 6 above, provide reports of all work performed under the Task and the results thereof, including studies, assessments, analyses, evaluations and other documentation, but excluding proprietary information.

(h) Copyright

The Operating Agent may take appropriate measures to protect copyrightable material generated under this Task. Copyrights obtained shall be the property of the IEA SHC IA for the benefit of the Participants provided, however, that the Participants may reproduce and distribute such material, but if it shall be published with a view to profit, permission should be obtained from the Executive Committee.

(i) Authors

Each Participant will, without prejudice to any rights of authors under its national laws, take necessary steps to provide the co-operation from its authors required to carry out the provisions of this paragraph. Each Participant will assume the responsibility to pay awards or compensation required to be paid to its employees according to the laws of its country.

9. Entry in Force, Term and Extension

This Annex shall enter into force 1 October 2011 and shall remain in force for a period of three years until 31 March 2015. At the conclusion of that period, this Annex can be extended by at least two Participants, acting in the Executive Committee, for a period to be determined at that time, provided that in no event shall the Annex continue beyond the current term, or actual termination, of the Implementing Agreement.

10. Participants in this Task (status on 16/10/2011).

Country	Organization	Short name /Abbreviation
Australia	Commonwealth Scientific and Industrial Research Organisation	CSIRO
	SOLEM Consulting	SOLEM
Austria	Austrian Institute of Technology	AIT
	ASIC- Austria Solar Innovation Center	ASIC
	AEE INTEC, AEE - Institute for Sustainable Technologies	AEE INTEC
	University of Innsbruck	UIBK
	Solarinstallation & Design S.O.L.I.D. GmbH, Graz	S.O.L.I.D.
Belgium	University of Liege	ULG
Canada	Thermosol Consulting	THERMOSOL
France	Université de la Réunion	PIMENT
	EDF Optimal Solutions	EDFOS
	TECSOL S.A.	TECSOL
	Institut national d'énergie solaire - CEA	CEA INES
Germany	AETEBA GmbH	AETEBA
	Institut für Luft- und Kältetechnik Gemeinnützige Gesellschaft mbH	ILK Dresden
	Fraunhofer-Institut für Solare Energiesysteme ISE	Fraunhofer ISE
	Bayerisches Zentrum für Angewandte Energieforschung e.V.	ZAE Bayern
	Centre of Applied Research Sustainable Energy Technology Stuttgart University of Applied Sciences	ZAFH.net
	Industrial Solar GmbH / MIRROXX	Industrial Solar
	Green Chiller Association	Green Chiller
Italy	Politecnico di Milano	POLIMI

Country	Organization	Short name /Abbreviation
	EURAC research	EURAC research
	Università degli Studi di Palermo, Dip. Ricerche Energetiche e Ambientali	UNIPA / DREAM
Singapore	Solar Energy Research Institute Sch of Mech. and Aerospace Eng, Nanyang Technological University	SERIS NTU