STRATEGIC PLAN FOR THE IEA SOLAR HEATING & COOLING PROGRAMME 2004 - 2008

Introduction & Background

The purpose of the Strategic Plan is to provide direction and focus for the activities of the Solar Heating and Cooling Implementing Agreement over the next five-year term. It was developed through an interactive process with the Executive Committee and represents its views.

Solar energy technologies and designs that include active solar heating and cooling, photovoltaics, passive solar building designs including daylighting, are essential components of a sustainable energy future. In this Plan, solar heating and cooling designs and technologies refer to all of these, including photovoltaic/thermal technologies, but excludes photovoltaics. They are growing in importance as governments and private industry continue to recognize the need to diversify energy supplies and to develop new energy technologies that are secure, can sustain growth, and have a minimal impact on the environment.

Solar energy can replace fossil fuels in many applications. Key applications for solar technologies are those that require low temperature heat, such as domestic hot water heating, space heating, drying processes, water processes for industrial heating and swimming pools. Solar energy can also meet cooling needs, where often the supply and demand are well matched.

Current Status of Solar Heating and Cooling

The match between solar energy technologies and designs and the energy needs of the building sector is in many cases excellent. Solar technologies can supply energy for all building applications—heating, cooling, hot water, light and electricity—without the harmful effects of greenhouse gas emissions created by conventional energy sources. Solar technologies also are appropriate for all building types—single-family homes, multi-family residences, office and industrial buildings, schools, hospitals, and other public buildings as well as being applicable anywhere in the world. Active solar technologies can also be used for agricultural and industrial process heat applications.

Market

Since the beginning of the 1990s, the solar thermal market has undergone favorable development. At the end of 2001, a total of 100 million square meters of collector area were installed in the 26 recorded countries. These 26 countries represent 3.3 billion people, about 50% of the world's population. The collector area installed in these countries represents 85-90% of the solar thermal market worldwide.

Of the 100 million square meters of installed collector area:

- 71.3 million square meters are flat-plate and evacuated tube collectors, which are used primarily to prepare hot water and for space heating.
- 27.7 million square meters are unglazed plastic collectors, which are used primarily to heat swimming pools.
- 1.6 million square meters are air collectors for drying agricultural products and space heating of production halls and homes.

The market for hot water and space heating using flat plate and evacuated tube collectors grew a remarkable 26% from 2000 to 2001. The most dynamic markets worldwide are in China and Europe. In 2001, the installed flat-plate and evacuated tube collectors per 1000 inhabitants was 6.4 m² in China and 3.9 m² in Europe.

The market of unglazed collectors for swimming pool heating also recorded an increase of 23%. The markets that underwent the greatest growth in this sector between 2000 and 2001 included the USA, Spain and France.

Impact on Energy Supply

Based on the data collected, the annual collector yield of all solar thermal systems (1) installed by the end of 2001 in the 26 recorded countries is 42 TWh (more than 151 PJ). This corresponds to an oil equivalent of 6.7 billion liter and an annual avoidance of 18.2 million tons of CO_2.

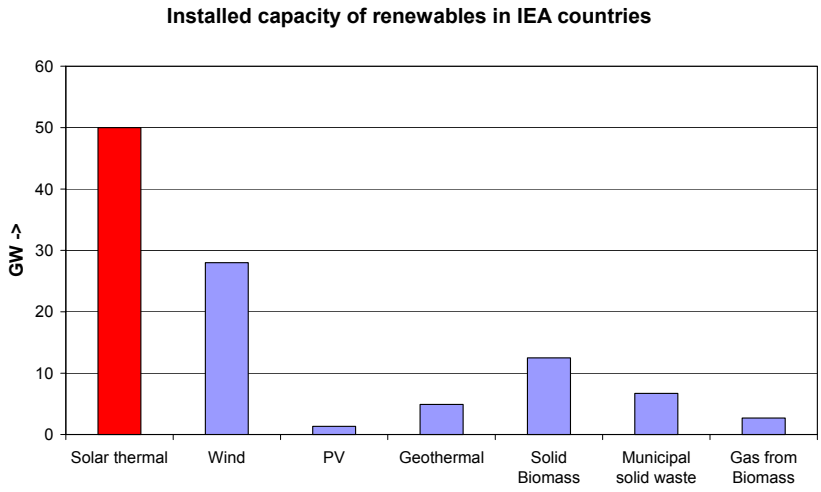
Converting Statistic Metrics – m^2 to kW

Today, the contribution of solar heating is larger than what is accounted for in many national and international energy statistics because these statistics focus primarily on electricity. If the total heat demand were included in the energy balance, solar heating would come out as one of the major renewable energy sources.

To ensure that solar thermal data are accounted for in official energy statistics, the SHC Programme and several major solar thermal trade associations will begin to present the installed capacity of solar collectors in GW_{th}. By making this conversion, it will be possible to compare the installed capacity of solar thermal collectors with other renewable sources.

The definition to be used is similar to that for photovoltaic modules. The conversion factor is nearly the same for all collector types—0.7 kW_{th} per m^2 of solar collector. Based on this conversion factor, the installed capacity of renewables sources was calculated for the IEA countries, based on the IEA Statistics 2004 for renewables and data from the SHC Programme.

1 All water based systems excluding air based systems. Since the database of the applications of air collectors is insufficient, the contribution of air collectors to the energy supply and CO_2 reduction was not calculated.



Vision

The vision for the Programme for the period 2004-2008 is:

The greater use of solar designs and technologies in the built environment, and for agricultural and industrial process heat.

In the future, as a result of their steadily improving cost and performance, and the growing acceptance of their economic, environmental and social benefits, the currently separate solar technologies, such as passive solar design, active solar, high temperature solar and photovoltaics, will be integrated into increasingly competitive systems. Therefore Programme activities need to address this technological evolution. The Programme will develop and integrate advanced solar energy technologies and design strategies for the built environment and for agricultural and industrial process heat applications. In achieving this vision, the Programme will continue to address the issue of how to get solar products and designs used to a much larger extent around the world, given that the Programme's customers are not the end-users. The Programme's customers are the design community, the solar manufacturer, the energy supply and service industries that serve the end-users and building owners, and therefore the Programme must strengthen its links to these intermediary businesses.

Mission

The mission for the Programme for the period 2004-2008 is:

To continue to be the preeminent international collaborative programme in solar heating and cooling technologies and designs.

Based on this mission, the Programme will continue to take a whole buildings perspective, and success is to be measured by how well the Programme facilitates the greater use of solar design and technologies.

Programme Strengths, Limitations, & Opportunities

In pursuing its Mission, the Programme will focus its efforts on activities where it can use its strengths to take advantage of major market opportunities. Likewise, the Programme will avoid initiating work where its weaknesses will impact the success of such work or where market barriers may prove difficult to overcome.

Programme Strengths

The majority of the Solar Heating and Cooling Programme's strengths are derived from its current members, which represent government departments or agents responsible for national R&D programmes, and Task experts. The key strengths of the Programme are:

- Ability to conduct collaborative and innovative R&D
- Ability to assemble excellent technical R&D teams due to strong network of research, industry and policy experts
- Ability to perform high-quality pre-normative phase work
- Work is relevant to many market and political forces, such as green, low energy, and sustainable buildings
- Programme and experts well respected
- Programme has strong credibility in the research community
- Programme is increasing the use of the Internet to deliver information

Programme Weaknesses

The weaknesses of the Programme are either related to funding, securing the right experts to do the task work or procedural.

- Lack of marketing and industry expertise
- Growing emphasis in European participating countries on securing EU funding
- National funding requirements are more complicated today. Cost sharing with industry is often a requirement (e.g., requirement for 50% of funding to come from industry).
- Governments and industry do not seem to understand the benefits of SHC Tasks and work and the added value of international cooperation

- Confidentiality issues can prohibit certain work
- Seldom perform market analysis-return on investment, cost analysis, etc. because participating experts are not economists
- Executive Committee members have limited time to focus on IEA work.

Market Limitations

- Limited impact on the marketplace
- Low and stable price for conventional energy
- Traditional practices in a conservative building industry
- Weak political support
- Externalities are often ignored
- Perceived or actual high initial cost and/or technical risk
- There is a wide variation in markets, policies and technologies among countries
- The building industry is dominated by relatively small businesses and is fragmented
- Some end-users are not professionals and are not well informed

Market Opportunities

- Globalization of markets and technologies
- Job creation
- Growing linkage between solar heating and cooling and $C0_2$ reduction
- Growing demand for credible information on solar heating and cooling technologies and designs.
- Growing importance of certification and a need for tools to proving compliance
- Growing importance of rating schemes which favor sustainability
- Increasing cost of fossil fuel energy due to expected increasing CO_2 tax as a result of the Kyoto mechanism
- Low energy/zero buildings are emerging as a popular building objective

Objectives

The IEA CERT produced a strategic plan in April 2002 that set out four strategic objectives. These objectives outline the overall direction expected from the different Working Parties, including the Renewable Energy Working Party, and the Implementing Agreements reporting to the Working Parties. To link the strategic objectives of the CERT to the work of this Programme over the next five years, the Executive Committee has structured its strategic objectives around those of the CERT. The relationship between the Objectives of the SHC Progamme and those of the CERT are shown in the following table.

CERT OBJECTIVES	CURRENT SHC PROGRAMME OBJECTIVES	PROPOSED NEW SHC PROGRAMME OBJECTIVES
To better identify and promote effective and innovative policies that *stimulate energy technology R&D*.		
To more clearly define and analyze energy technology issues and opportunities, and to enhance *development of analytical tools* that inform and support policy and programme development in member countries.	Quantify and publicize the environmental and climate change benefits of solar design and technologies in meeting environmental targets. Working through relevant international standard organizations, support the development of standards necessary for the widespread use of solar design and technologies in the building, agricultural and industrial sectors.	Be the primary source of high quality **technical information and analysis** on solar heating and cooling technologies, designs and applications. Help achieve a significant increase in the **performance (2)** of solar heating and cooling technologies and designs.
To more vigorously foster *international networking and collaboration* in energy technology R&D.	Continue to develop cost effective designs and technologies in collaboration with appropriate intermediary industries. Work with appropriate intermediary industries and end-users to accelerate the market penetration of solar designs and technologies. Facilitate the greater use of solar designs and technologies in developing countries.	Help industry and government increase the **market share** of solar heating and cooling technologies and designs.
To more effectively *communicate key lessons learned* through the CERT's activities to IEA member country governments and agencies, the research sector and other interested parties.	Assure that information developed in this Programme is available to the target audiences in a useful format.	Help educate decision makers and the public on the **status and value** of solar heating and cooling.

2 Performance is defined as higher efficiency, lower cost, improved reliability and durability, greater user acceptance,

Action Plan for 2004-2008

To fulfill its mission, the SHC Executive Committee has agreed upon the following objectives and associated strategies. As noted in the table above, these objectives complement the objectives of the IEA CERT. Acknowledging the importance of coordinated efforts by IEA Implementing Agreements, the SHC objectives also support those of the IEA Renewable Energy Working Party.

Objective 1

Help achieve a significant increase in the **performance** of solar heating and cooling technologies and designs.

Increase **user acceptance** of solar designs and technologies.

Continue to develop **cost-effective** designs and technologies in collaboration with appropriate intermediary industries.

Identify and prioritize **R&D needs** for solar heating and cooling that will lead to expanded markets

Objective 2

Help industry and government increase the **market share** of solar heating and cooling technologies and designs.

Work with appropriate **intermediary industries** and end users to accelerate the market penetration of solar designs and technologies.

Work with governments to promote and expand **favorable policies** to increase the market share.

Work towards or support the greater use of solar designs and technologies in **developing countries**.

Work to address issues regarding building design, aesthetics and its architectural value.

Objective 3

Be the primary source of **technical information and analysis** on solar heating and cooling technologies, designs and applications.

Assure that technical **information** and analysis developed in this programme is available and disseminated to the target audiences in useful formats.

Working through relevant international standards organizations, support the development and harmonization of **standards** necessary for the widespread use of solar designs and

technologies in the building, agricultural and industrial sectors.

Objective 4

Help educate decision makers and the public on the **status and value** of solar heating and cooling

Communicate the value of solar heating and cooling designs and technologies in publications, conferences, workshops and seminars to the public and relevant stakeholders.

Provide **analysis** that links solar heating and cooling designs and technologies to energy security concerns, environmental and economic goals.

Quantify and publicize the environmental, economic and climate change benefits of solar heating and cooling and supporting policy measures solar design and technologies in meeting environmental targets and addressing policies and energy, supply security.

Review our products in relation to our objectives Annual Reports, Solar Update Newsletters, National Programme Review Reports, "*Solar Heating Worldwide: Markets and Contributions to the Energy Supply report."* **Present** the SHC Solar Award annually. **Maintain** the Progamme web site. .

Possible Future Work Topics

The SHC Executive Committee identified the following priority areas for the next five years.

Objective 1: Help achieve a significant increase in the **performance** of solar heating and cooling technologies and designs.

- Sustainable solar buildings (fundamental)
- Retrofit sustainable solar buildings
- Advanced combisystems
- Solar cooling systems
- Thermal storage systems for high solar fraction buildings
- Industrial process heat
- Building integration and solar architecture
- Combined heating and cooling systems
- Simulation tools and validation
- Advanced materials and components
- Solar-assisted district heating with/without seasonal storage
- Daylighting and shading devices
- Solar resource and meteorological assessment
- Advanced control strategies

Objective 2: Help industry and government increase the **market share** of solar heating and cooling technologies and designs.

- Demonstration and monitoring performance documentation of SHC systems - best practices
- Market transformation activities to support industry efforts (e.g., utilities, municipalities)
- Solar heating and cooling projects in developing countries (e.g., solar water heating, drying)

Objective 3: Be the primary source of **technical information and analysis** on solar heating and cooling technologies, designs and applications.

- Review existing studies linking cost effective SHC to environment, economy and energy security (e.g., series of White Papers)
- With industry representatives, review Task results and package select results for specific audiences
- With standards organizations, identify and perform supporting work for standards to expand SHC markets

Objective 4: Help educate decision makers and the public on the **status and value** of solar heating and cooling

- With trade associations, prepare a white paper on the value of SHC
- Quantify the environmental benefits of SHC
- Initiate a policy-related Task
- Conduct meetings with decision makers to present the results of the above activities
- Provide specific Task knowledge upon request

Programme Management

Organization

The Executive Committee is the management body of the IEA Solar Heating and Cooling Programme. It is composed of one representative from each Contracting Party to the Implementing Agreement. Each member country has one vote. The Executive Committee elects a Chairman and up to two Vice-Chairman who serve for a two-year term. The Chairman may serve for a maximum of two consecutive terms.

The management of the individual projects is the responsibility of Operating Agents who are selected by the Executive Committee.

Sponsors

To increase collaboration with industry associations, the SHC Programme has adopted the new

IEA member category of "Sponsors." Based on the IEA's definition, the following guiding principles were adopted by the Executive Committee:

- Admission shall be limited to major international industry associations and international non-profit organizations which are in-line with the SHC Programme's objectives.
- A single company shall not be accepted as a Sponsor.
- The number of Sponsors in the Implementing Agreement shall not be greater than half of the number of Contracting Parties.
- Sponsors are to have voting rights in the Executive Committee except on issues of unanimity.
- Sponsors are to pay half the amount that Contracting Parties pay annually to the Common Fund.
- As stated in the IEA Framework, Sponsors must participate in at least 1 Task.
- Sponsors may propose and initiate new Tasks.
- All Publication Review Committees shall have at least 1 Contracting Party.
- Sponsors are to follow the same procedure, as stated in the SHC Policy & Procedures Handbook, to withdraw from the Implementing Agreement as Contracting Parties.

Programme Committees

To manage specific Programme activities, the Executive Committee has created the following Committees:

- **Information and Marketing Group** that is to help guide and inform the Programme of opportunities for promoting and disseminating Programme results, to review Task Information Plans, and to develop and improve information guidelines and policies. The group is also responsible for raising the visibility of the Programme. The group consists of 2 Executive Committee members, the OA chair and the Executive Secretary.
- **Trade Association Committee** that is to work with the major solar heating and cooling trade associations to maximize the synergy between their interests and the SHC Programme's activities. The Group consists of 4-5 Executive Committee members.

Information Dissemination

Recognizing the absence of or limited information and statistical data disseminated on solar heating and cooling, daylighting and integrated building technology and design, the Programme will continue to strengthen its dissemination activities through its own platforms (SHC Solar Award, website, newsletter, annual report, Task reports, conference presentations, journal articles) and other channels, such as the IEA (OPEN Bulletin, CADDET newsletter, etc.), conferences/events, trade journals, etc.

Strategy and Performance Review

This strategic plan is a guiding reference document and not a set course of action. The objective of an annual review is to assess if the current strategy should be altered to account for changes in the Agreement or in the field of solar heating and cooling.

Annual Review

The Strategic Plan will be reviewed every year to assess its relevance and progress being made to achieve the Strategic Objectives and annual Action Plan. The Chair and Vice-Chairs will review progress and present their findings to the Executive Committee, who will approved of their report and recommend corrective actions, if required.

National Programme Review

Every 2-3 years the Executive Committee will conduct a national programme review session. At this time, each Executive Committee member will prepare an oral and written paper on the current status of solar in their country. A summary report will be prepared for dissemination on the SHC web site.

Task Evaluations

Mid-term and **final evaluations** of Tasks and Working Groups will be conducted to assess the quality of the technical work, management, products and results. The Programme's Policies and Procedures Handbook contains a description of the evaluation process. These evaluations will be carried out by the Operating Agent or Working Group Leader. The Task subcommittee will review the Task evaluation and provide an independent overview prior to the Operating Agent's presentation at an Executive Committee meeting. Executive Committee is then to vote on its approval or request modifications. In general, the evaluations will be qualitative rather than in-depth, quantitative analysis. Criteria to be applied are:

Mid-term evaluations

- Progress towards meeting Task objectives
- Milestones achieved
- Scientific and technical quality
- Management quality and effectiveness
- Industry involvement
- Adherence to work plan and information plan
- Country adherence to commitments

Final evaluations

Regarding quality:

- Objectives achieved

- Management quality and effectiveness
- Technology outcomes
- Information plan outcomes
- Relevance of results
- Fulfillment of industrial needs
- Adequacy of allocated resources

Regarding impacts:
- Adequacy of SHC and national technology transfer efforts
- Did the activity make a difference? If so, why? If not, why not?
- Economic value to national participants and industries
- Information/technology transfer from the activity
- Application of the Task results
- Educational benefits

Collaboration

Within the IEA

In order to conduct efficient R&D and eliminate duplication of work, it is important to identify common R&D topics, and if appropriate, coordinate activities with the other IEA building-related Implementing Agreements. Other important collaborative activities are the exchange of information, hosting of joint meetings, and development of joint projects in areas of common interest.

It also is important to continue to enhance the dissemination of information through collaborative activities with IEA Headquarters.

Collaborating with other Implementing Agreements is critical. The SHC Agreement currently has collaborative Tasks with the Energy Conservation in Buildings and Community Systems Programme, Energy Storage, Photovoltaic Power Systems and SolarPACES Agreements. The SHC Agreement will continue to develop its current relationships and foster new ones with the Building-Related Implementing Agreements. The SHC Agreement also will actively collaborate with the IEA's Building Coordination Group.

Collaboration with other IEA Agreements

To facilitate collaborative activities with other Implementing Agreements, the Executive Committee approved a policy on collaborative Tasks with other IEA Agreements. This policy recognizes that although the IEA SHC Executive Committee believes that, from a management point of view, it is better to formally manage a Task in only one Executive Committee at a time there are Tasks that lend themselves to collaboration. To facilitate this process, the SHC Executive Committee has agreed upon four levels of collaboration.

Minimal At this level, experts selected by ExCo B participate in experts meetings of the Task managed by ExCo A. The administrative burden is minimal. The Task is fully defined and managed by ExCo A with appropriate input from ExCo B.

If greater involvement by ExCo B is necessary to successfully accomplish the work in question, then a still greater degree of collaboration is required.

Moderate At this level, the Task work is jointly defined, that is, ExCo B provides input to the Task Concept Paper and the Task Definition Phase. Once the work is defined, ExCo A will manage the Task. The administrative burden on the OA, ExCo A and ExCo B will be greater than in the case of "Minimal" collaboration.

In the course of such collaboration, ExCos A and B may find that they have differing views on the definition of work. If the two ExCos agree to collaborate at this level, it is assumed that they will make every effort to resolve their differences. Such resolution implies that ExCo A is willing to make changes in the Task Work Plan proposed by ExCo B. However, as Executive Committees are independent and sovereign bodies, it is understood that such decisions remain the sole responsibility of ExCo A. If at any point in the process ExCo A feels that it cannot agree with ExCo B's recommendations, the collaboration should revert back to the "Minimal" level.

If greater involvement by ExCo B is required to successfully accomplish the work in question, then even greater degree of collaboration is required.

Maximum At this level, in addition to jointly defining the Task work, ExCos A and B shall agree on the Task Work Plan and any proposed revisions once the Task is underway. This places additional administrative burden on the OA and both ExCos, but ExCo A is still responsible for the management of the Task.

Due to the increase in the administrative burden, this level of collaboration should be avoided if possible. However, if greater involvement by ExCo B is required to successfully accomplish the work in question, then a Joint Task is required.

Joint Task A Joint Task is a Task that is managed by ExCos A and B acting in unanimity and described by an Annex in both Implementing Agreements. This level of collaboration should be considered if the Maximum level of collaboration is inadequate and joint management and implementation of the work is required. Joint Tasks should be undertaken when it is the only way to successfully accomplish specific collaborative work.

There must be clearly perceived benefits to justify the significant administrative burdens on both ExCos and the OA of the Joint Task.

It must be clear to both ExCos that the work cannot be successfully done by either ExCo alone.

Collaboration Process

It is proposed that whenever one ExCo believes it has a special interest in a new Task that is under consideration by another ExCo, the two ExCo Chairs should review the proposed new Task and determine which level of collaboration is required to assure the successful accomplishment of the new work. Their recommendations should be submitted to both ExCos for their review and decision. It is recommended that a memorandum of understanding be exchanged outlining the agreed upon level of collaboration.

If the two ExCos determine that the "Maximum" level is appropriate and necessary, each ExCo should understand that by selecting this level of collaboration they are agreeing to resolve all differences in the Task Work Plan. If at any point in the process ExCo A feels it cannot agree with ExCo B's recommendations, the collaboration should revert back to the "Moderate" level.

If the two ExCos determine that a "Joint" Task is appropriate and necessary, the ExCos should understand that by selecting this level of collaboration they are agreeing to jointly implement and manage the Task. While two ExCos can provide more resources--both funds and experts-- than a single ExCo can, a Joint Task creates a considerable administrative burden and should be avoided if possible.

Collaboration With Other Institutes

To strengthen dissemination activities and increase the number of individuals using Task results, the Agreement will build upon and expand its existing relationships with institutes outside of the IEA. These institutes include, but are not limited to:

- European Union
- International Solar Energy Society (ISES)
- International standard organizations, e.g., ISO and CEN
- CIB

Appendix 1

Current Tasks of the IEA Solar Heating and Cooling Programme

Task 27: Performance of Solar Facade Components, *Germany*

Task 28/ECBCS Annex 38: Sustainable Solar Housing, *Switzerland*

Task 29: Solar Crop Drying, *Canada*

Task 31: Daylighting Buildings in the 21st Century, *Australia*

Task 32: Advanced Storage Concepts for Solar Buildings, *Switzerland*

Task 33/SolarPACES Annex 4: Solar Heat for Industrial Processes, *Austria*

Task 34/ECBCS Annex 43: Testing and Validation of Building Energy Simulation Tools, *United States*

Task 35: PV/Thermal Systems, *Denmark*

Solar Resource Knowledge Management, *United States (Task Definition Phase)*

Appendix 2

ADDITIONAL TOPICS FOR POSSIBLE NEW WORK

Objective 1: Help achieve a significant increase in the performance of solar heating and cooling technologies and designs

- Develop a design tool for energy and comfort optimization (including adaptive controllers), for building planning
- Develop a design tool to predict the energy impact of different control strategies (containing rating scheme for visually/thermally uncomfortable situations)
- Design tools that include environmental impacts
- Tools to quantify the environmental benefits of solar designs/technologies
- Trade-off analysis of environmental issues and solar building strategies
- Economic analysis and quantification of CO_2 reductions from solar buildings
- Development of life-cycle analysis methodologies (with other organizations)
- Studies of the insurance risk reduction by solar buildings
- Energy and environmental impact study of solar buildings and components

Objective 2: Help industry and government increase the market share of solar heating and cooling technologies and designs

- Design low cost and light integrated solutions for retrofit of big buildings or new and retrofit applications
- Identify what solar shading devices are available, their characteristics and assessing their potential to introduce daylight into buildings
- Case studies where SWH systems were successfully integrated into larger commercial building, particular emphasis on non-technical success factors
- Study of domestic SWH installation requirements – both thermosiphon and split systems and aims to reduce time and cost of installation
- Improved integration techniques/ mounting strategies of products for high quality architecture
- Retrofitting solar for residential heating
- Market studies on buyer behavior and new market niches
- Internal rate of return analysis of solar buildings
- Collaborative alliances with national building and related trade associations
- Creation of buyer groups for solar buildings and/or solar building products
- Thermal comfort, occupancy expectations and productivity measurements

Objective 3: Be the primary source of technical information and analysis on solar heating and cooling technologies, designs and applications

- Integrated PV/thermal/daylight – smart facades
- Solar chimneys for ventilation & cooling
- Development of solar water heating (SWH) systems optimized for winter performance
- High temperature collectors for cooling devices
- Solar cooling using Combined Heat & Power System/thermal collectors
- Develop new generation of control devices for solar shading systems, glare control systems, electric lighting
- Heating ventilation and air conditioning systems for simultaneous optimization of building energy consumption and comfort
- Cost effective storage system for low energy buildings to store heat for two plus months
- Flat plate solar water heating collector improvement
- Incorporation of phase change materials (PCMs) in energy storage–high and low temperature
- Roof integrated solar heating/hot water systems
- Whole building integrated solar systems and designs, including passive and active solar and PV
- Continue work on combined solar water and space heating systems
- Advanced controls and analysis tools to integrate solar technologies
- Application and durability studies of advanced glazings and other components
- Development of standardized SWH systems for commercial and industrial applications
- Develop glare criteria for windows and daylighting sys that can be used for control purposes
- Solar Building Design - impose a standard similar to the "Minergie" standard in Switzerland as the standard for 2005-2015 retrofit and new construction in all signatures of the Kyoto Protocol
- Develop and test control algorithms that allow seamless integration of solar system with conventional domestic hot water systems for commercial applications
- Model performance and universal rating systems
- Pre-normative work on equivalent solar factors and alternate energy ratings

Objective 4: Help educate decision makers and the public on the status and value of solar heating and cooling

- Success stories of solar building design and technology applications with performance data and cost information
- Development of best practices for solar buildings
- Guidelines for builder associations
- Decision guidelines for purchase of solar buildings/products
- Market study of building practices and opportunities in developing countries