

TC/TG/TRG MINUTES COVER SHEET

(Minutes of all TC/TG/TRG Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG NO.: T.C. 6.7 DATE: April 25, 2005

TC/TG/TRG TITLE: Solar Energy Utilization

DATE OF MEETING: Feb. 8, 2005 LOCATION: Orlando, FL

MEMBERS PRESENT	YEAR APPTD*	MEMBERS ABSENT	YEAR APPTD*	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Svein Morner (Chair)	01	D. Menicucci	02	Jeffrey Miller (G)
Tim Merrigan (VC/Research)	02	A. Helmy Malek (Int'l)	CM	Marc Sibia (G)
Mark Hertel (Handbook)	03	Tony Pierce	CM	Roger Lichtenwald (G)
Cenk Yavuzturk (Program)	03	R. Aresty	CM	Dena Richardson (G)
John Brown	04	E. Bales	CM	
Brian Dougherty (Std)	CM	J. Bender	CM	
Jim Huggins	CM	B. Black	CM	
Harvey Stenger	CM	N. Buckley	CM	
Marija Todorovic (Int'l)	CM	M. Butler	CM	
Janice Means	CM	A. Chalifoux	CM	
Andy Lowenstein	CM	C. Cromer	CM	
Christian Vachon	CM	Kevin Cross	CM	
Peter Ellis	CM	W. Fleming	CM	
David Gerlach	CM	R. Foster	CM	
Henry Healey (ALI)	CM	D. Goswami	CM	
Bion Howard	CM	R. Hayter	CM	
Sanford Klein	CM	H. Henderson	CM	
Andrew Chiasson (Sec)	CM	L. Lister	CM	
		F. Mahjouri	CM	
		S. Mumma	CM	
		R. O'Neil	CM	
		E. Olsen	CM	
		H. Peebles	CM	
		A. Price	CM	
		E. Rush	CM	
		D. Schieman	CM	
		E. Seiler	CM	
		D. Tompkins	CM	
		R. Turner	CM	
		M. Wildin	CM	
		B. Wood	CM	
		P. Zeigler	CM	

*Starting month as a voting member is July of the year shown.

DISTRIBUTION

ALL MEMBERS OF TC/TG/TRG

TAC CHAIR: W. Bahnfleth

TAC SECTION HEAD: B. I. Kilkis

LIAISONS:

Program: _____ F. W. Betz _____ ALI: _____ S. A. Mumma

Handbook: _____ R. L. Davis _____ RAC: _____ L. Markel

Standards: _____ D. E. Knebel _____ TEGA: _____ J. W. Gartner

Special Pubs: _____ M. A. Listvan

MANAGER OF TECHNICAL SERVICES: M. R. Vaughn

MANAGER OF RESEARCH: _____ M. R. Vaughn

MANAGER OF STANDARDS: _____ C. B. Ramspeck



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MEETING MINUTES ASHRAE TC 6.7 – SOLAR ENERGY UTILIZATION Annual Winter Meeting – February 8, 2005 Orlando, Florida

I. CALL TO ORDER, MEETING AGENDA, AND MEETING MINUTES

Meeting called to order at 12:35 by Chair Morner. A quorum was achieved with six of seven voting members in attendance. International member Marija Todorovic was in attendance. Other voting members present were Svein Morner, Mark Hertel, Tim Merrigan, Cenk Yavuzturk, and John Brown. Dave Menicucci was absent. (See Sections 2.2.3 and 5.1 of the *ASHRAE Manual of Procedures for Technical Committees, Task Groups, and Technical Resource Groups* for quorum requirements.)

Mark Hertel moved and Tim Merrigan seconded to accept the minutes from June 2004 summer meeting in Nashville, TN. Motion passed 6-0-0.

II. LIAISON REPORTS FROM OTHER COMMITTEES

ALI (Henry Healey): Henry Healey reported that ALI is now overseen by (or has been absorbed into) the Professional Development Committee. The solar short course entitled “*Cost Effective Commercial and Industrial Solar Applications*” given at the Orlando meeting was relatively full and it was estimated that there were more than 30 attendees, most of which were engineers. Cenk Yavuzturk inquired about student discounts for short courses, particularly for the upcoming Denver meeting, and Bion Howard pointed out that about 5 major universities are within driving distance from Denver. Henry Healey offered to give the course again, pending ASHRAE approval, because the course is normally given every two years at the winter meeting. Tanya Fisher at ALI should be contacted to pursue logistics of offering the course at the Denver meeting.

TAC (Birol Kilkis): No report.

RAC (Larry Markel): New submittal cycle of RTARs starts after Denver and will be twice per year. Next submittal time is October. It was suggested to submit RTARs 2 or 3 weeks in advance.

Handbook (Gary Debes, Applications; Doug Fitts, Systems and Equipment): No report.

Other TCs: Mark Hertel reported that Drury Crawley (*4.2 Weather Information*) is interested in incorporating solar irradiance into weather data tables.

LEED Energy and Atmosphere TAG (Bion Howard): Bion Howard provided a working draft of *Renewable Energy Provisions in LEED*. He expressed concerns that the first iteration of the draft guide resulted some misunderstandings on solar energy applications. He suggested the possibility of forming a renewable energy working group of professionals, as USGBC is mostly comprised of corporate members. Some outstanding questions were how to rate daylighting effects on heating and cooling loads when daylighting has significant potential for LEED points in the Energy and Atmosphere section. Bion solicited reviewers for the working draft. These issues will be addressed in the next 18 months.

III. CHAIRMAN’S REPORT

Chairman Svein Morner reported on matters presented at the TC Chairs meeting/breakfast. Chairman Morner announced that ASHRAE is interested in supporting the following conferences: CLIMA 2005 in Lausanne, Switzerland Oct. 9-12, 2005. ASHRAE Research has a strategic plan available on the ASHRAE web site. ASHRAE appears to be encouraging research in areas that are more aligned with TC 6.7. RTARs can now be submitted twice a year. RTARs will be voted on in the Spring and the Fall (October). For RTARs, abstention votes



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must be explained; otherwise, RAC will likely send the RTAR back to the TC. Any electronic files submitted to ASHRAE headquarters should include a "TC67" designation as part of the filename. ASHRAE has expressed interest in addressing 2nd Law/exergy type evaluations in energy conservation program/research/handbook efforts.

Prior to the next edition of the ASHRAE Green Guide, this TC will have an opportunity to comment, especially on the section(s) dealing with solar energy. Chairman Morner offered to send out pages of the Green Guide prior to the Denver meeting. Janice Means will be working on the committee that will revise the Green Guide and they have plans to seek commenters via a notification in the ASHRAE Insights.

ASHRAE is encouraging more nominations for its annual awards. TCs are being encouraged to form an "Award" subcommittee that can be tasked with making nominations. Janice Means agreed to take the lead for the TC. First action item will be to determine what awards are available (i.e. Hightower Award).

Future program deadlines are listed in the below table.

Program Package Deadlines		
Program	Technical Papers Due for Review	Completed Packages Due
Denver, Colorado – Annual 2005	September 24, 2004	February 18, 2005
Chicago, Illinois – Winter 2006	April 1, 2005	August 5, 2005
Quebec City – Annual 2006	September 23, 2005	February 10, 2006

IV. SUBCOMMITTEE REPORTS

A. HANDBOOK SUBCOMMITTEE – MARK HERTEL

TC 6.7 is responsible for two handbook chapters: Chapter 33 of the HVAC Systems and Equipment Handbook, "Solar Energy Equipment," and Chapter 32 of the HVAC Applications Handbook, "Solar Energy Use." The official handbook subcommittee members are Charlie Cromer, Erv Bales, and Bion Howard

The Handbook Subcommittee meeting was held on February 6. Except for Mr. Hertel, no other official members of the subcommittee attended. Chapter 32 of the Applications Handbook will be printed in 2007. Mark Hertel reported that efforts have gone from completely revising the Chapter to focusing on sections. The submittal deadline is April 2006 and the goal is to have it approved by the Chicago meeting (Winter 2006). It was requested to have any proposed revisions submitted to Mark by April 2005. Mark will seek to redistribute any proposed revisions immediately prior to the June meeting in Denver. Final revisions are due by September 2005 to Mark. The final document will then be distributed prior to the January 2006 Chicago meeting. The TC will vote to approve for final submittal in Chicago.

The TC discussed ways of seeking recommended edits via posting on web sites, either ASHRAE's or the TC's. For now, the process will remain the same, which is to go through Mark.

Chapter 33 of the Systems and Equipment Handbook is due the following year (2008). The above timeline will, in large part, be repeated, only now 1 year later.

Updates on the electronic version of the handbook chapters (CD-Plus) can be done at any time. The subcommittee is trying to coordinate with other handbook chapters so that material is not repeated (e.g., fenestration). A few members spoke for making the Solar chapter stand-alone to a large degree. Marija Todorovic recommended that the calculations common to solar and fenestrations be pulled into a separate Fundamentals chapter. Mark Hertel expressed interest in updating solar irradiance data since TC 4.02 does NOT include solar irradiance in their most recent update, although it could be updated again. A new map has been developed for Standard 90.1 & 90.2 by PNL. The TC could work with NREL and DOE to incorporate these maps.



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Interested reviewers should go to ASHRAE web site (under publications) for the Author's and Reviser's Guide for handbook materials.

B. RESEARCH SUBCOMMITTEE – TIM MERRIGAN

The Research Subcommittee meeting was held on February 7. Tim Merrigan reported that previous RTARS were not submitted after the last meeting, and therefore old ideas were re-visited and some new ideas were discussed. Possible RTARS suggested were: solar air reheating systems, thermal energy storage (suggested by Cenk Yavuzturk), and solar desiccant regeneration systems (suggested by Andrew Lowenstein). Marija Todorovic reported that TC 4.4 was interested in possibly co-sponsoring two RTARS related to building integrated solar and building integrated storage systems. The TC will have to vote on the two top choices at the next meeting (Denver). Tim Merrigan will check with Solar Design Associates on whether an ASHRAE paper is to be written in order to close out the contract on sponsored research project URP-1109.

C. PROGRAM SUBCOMMITTEE – CENK YAVUZTURK

At the Orlando meeting, TC 6.7 sponsored Seminar 17, “*Solar Systems and Near Zero Energy Homes*”, chaired by Henry Healey. The four seminar speakers were James Huggins, Jeff Christian, Danny Parker, and David Springer. The seminar was very well attended, having approximately 150 people over the course of the seminar.

The Program Subcommittee meeting was held on February 7. For the next meeting in Denver, the TC will seek to organize a seminar that focuses on solar case studies and will be chaired by Tim Merrigan. Cenk Yavuzturk estimated that four speakers would be possible. Henry Healey offered a presentation on solar desiccant regeneration.

For the 2006 Winter Meeting in Chicago, it was hoped that a symposium, chaired by Svein Morner, might be possible. The deadline for symposium papers is April 1, 2005. The proposed theme was along the lines of net zero applications. A seminar featuring the solar decathlon results was also proposed.

For the 2006 Summer Meeting in Quebec City, one seminar was envisioned with the theme of “solar applications in cold climates”, chaired by Christian Vachon. Bion Howard proposed a seminar on LEED certified buildings with possible participation with TC 2.8.

D. STANDARDS SUBCOMMITTEE – BRIAN DOUGHERTY

The standards subcommittee report is provided below. Mark Hertel has volunteered to become a member of the US TAG for ISO TC 180 activities.

E. WEBMASTER – SVEIN MORNER FOR TONY PIERCE

Svein Morner reported that he needs the members' approval to include contact information on the webpage. TC 6.7's web page is now provided on the ASHRAE server. The TC's website is <http://TC67.ashrae.tcs.org>. ASHRAE recommends that the webmaster not be the chair or secretary. Both past and future programs can be posted on the web page. Bion Howard offered to help with maintaining and expanding the TC's existing website, such as by helping with the posting of Power Point presentations.

V. Membership

Chair Morner indicated that the TC needs a new secretary and new chair. Mark Hertel offered to serve at the incoming TC chair. Cenk Yavuzturk moved to have Mark Hertel serve as chair. Andrew Chiasson volunteered to serve as secretary. His appointment was approved by the TC and became effective as of the Orlando meeting. Tim Merrigan will serve as Vice Chair. The three votes were unanimous. Christian Vachon, Andrew Lowenstein, Andrew Chiasson, and Janice Means will be converted to voting members. Bion Howard expressed interest in serving as a voting member but joining in a future year. All of the new members were unanimously approved. Mark Hertel will continue as the Handbook Subcommittee chair for the coming society year.



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VI. OLD BUSINESS:

Bion Howard inquired about working with the American Solar Energy Society (ASES), since there was mention of it in the Nashville minutes, but no action items were identified. A discussion ensued on how to potentially combine ASES and ASHRAE programs, which Henry Healey stated was encouraged to be done in the past. Bion Howard suggested that a poster of ASES activities and mission be posted at ASHRAE meetings, and that he would look into possible partnerships with ASES.

VII. NEW BUSINESS - None

VIII. ADJOURNMENT

The meeting was adjourned at 2:55 PM.



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Standards Subcommittee Report
ASHRAE TC 6.7 Solar Energy Utilization
2005 Annual Meeting – Orlando
Standards Committee Liaison to TC 6.7: David Knebel

Std 93-2003 *MOT to Determine the Thermal Performance of Solar Collectors*

The current standard is a reaffirmation of the 1986 publication. The standard received ANSI approval on April 22, 2003. No action is needed at this time.

Std 95-1987P¹ *MOT to Determine the Thermal Performance of Solar Domestic Water Heating Systems*

SPC Chair: Tim Merrigan

SPC Liaison: Roger Hedrick

Co-cognizant TC: 6.6 (Service Water Heating)

SPC 95P has been in limbo while awaiting the enactment of ANSI-compatible procedures to allow ASHRAE to conduct Identical and Modified adoptions of ISO and IEC Standards. The procedures were adopted and now appear in Appendix C6 of the ASHRAE Standards Committee Manual of Procedures (October 2004 version). The SPC 95 chair was notified via email on October 15, 2004 of the newly adopted procedures. SPC 95 can now act on its August 1995 vote (5-0-1) to recommend that ASHRAE adopt ISO Standard 9459-1: 1993, “Solar heating – Domestic water heating systems – Part 1: Performance rating procedures using indoor test methods” as the replacement for ASHRAE Standard 95. The proposed adoption would be a modified adoption because SPC 95P further recommended that the normative annexes of the ISO standard be changed to informative. (Note: ISO Standard 9459-1:1993 is based on ASHRAE Standard 95-1987.) At the Orlando meeting, Brian Dougherty agreed to assist Tim Merrigan with the adoption process.

Std 96-1980 (RA 89)P¹ *MOT to Determine the Thermal Performance of Unglazed Flat-Plate Liquid-Type Solar Collectors*

SPC Chair: James Huggins

SPC Liaison: Roger Hedrick

SPC 96P plans to consider an identical or modified adoption of ISO Standard 9806-3: 1995, “Test methods for solar collectors -- Part 3: Thermal performance of unglazed liquid heating collectors (sensible heat transfer only) including pressure drop” in lieu of, or in addition to, revising ASHRAE Standard 96. Work to recruit standards project committee members and begin the revision process had been postponed until the recent enactment of new ASHRAE procedures on how to adopt ISO standards (see above remarks given with Std 95). The SPC chair, in an email reply dated 15 October 2004, indicated his intentions to begin recruiting members for the SPC.

Std 109-1986 (RA 03) *MOT to Determine the Thermal Performance of Flat-Plate Solar Collectors Containing a Boiling Liquid*

The current standard is a reaffirmation of the 1986 publication. The standard received ANSI approval on April 22, 2003. No action is needed at this time.

Std 125-1992 (RA 00) *MOT Thermal Energy Meters for Liquid Streams in HVAC Systems*

Cognizant (Lead) TC: 6.1, Hydronic and Steam Heating Equipment and Systems

Co-cognizant TC: 6.7

ANSI approval gained on November 30, 2001. In Nashville, TC 6.1 voted (10-0-0) to recommend that Standard 125 be reaffirmed. The TC’s recommendation will be considered by the Standards Committee during the Orlando meeting.

¹ *NOTE: Standards 95 and 96 are designated as “Proposed” rather than as a “Revision” due to exceeding the maximum time frame in which a standard may retain the ANSI designation. The standard will be sent to ANSI for their approval once its is revised.



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Canvass Ballots - None

ISO Technical Committee 180 (Solar Energy)

Subcommittee 4 (Systems – Thermal Performance, Reliability, and Durability)

ISO TC 180 Secretariat: Australia

ISO TC180/SC4 Secretariat: ASHRAE

ASHRAE is seeking individuals to join the US Technical Advisory Group (TAG) for ISO TC 180. At this stage, any TAG duties would probably be handled via email correspondences. TAG members review, comment, and help form the US position on ISO standards for which TC 180 is cognizant. Mark Thornbloom serves as the chair of the US TAG for ISO TC 180. Brian Dougherty will contact ASHRAE's Doug Tucker to have Mark Hertel and Tim Merrigan added as members to the US TAG.

ASHRAE holds the secretariat for Subcommittee 4 within TC 180, Systems – Thermal Performance, Reliability and Durability. Jim Huggins serves as the SC 4 chair.

1. ISO Standard 9459-1: 1993, “Solar heating – Domestic water heating systems – Part 1: Performance rating procedures using indoor test methods”
Cognizant SC: 4
ISO document stage code is 90.93 – international standard confirmed.
2. ISO Standard 9459-3: 1997, “Solar heating – Domestic water heating systems – Part 3: Performance tests for solar plus supplementary systems”
Cognizant SC: 4
ISO document stage code is 95.20 – withdrawal ballot initiated.
3. ISO / AWI 9459-4, “Solar heating – Domestic water heating systems – Part 4: System performance characterization by means of component tests and computer simulations”
Cognizant SC: 4
ISO document stage code is 20.00 – new project registered in TC/SC work program.
4. ISO/CD 9459-5, “Solar heating – Domestic water heating systems – Part 5: System performance characterization by means of whole-system tests and computer simulation”
Cognizant SC: 4
Work is to proceed in parallel with CEN TC 312. At the November 2003 meeting of ISO TC 180/SC 4, a decision was made to make minor edits to the current draft in an effort to get it published and then immediately start a new revision process.
ISO document stage code is 30.99 – committee draft (CD) approved for registration as a draft international standard (DIS).
5. ISO/AWI TS 11924, “Solar heating – Domestic water heating systems – Test methods for the assessment of protection from extreme temperatures and pressures”
Cognizant SC: 4
Work is to proceed in parallel with CEN TC 312. At the November 2003 meeting of ISO TC 180/SC4, a decision was made to publish the current version as a Technical Specification (which has occurred) and then revise it with the goal of publishing it as an ISO Standard.
ISO document stage code is 20.00 – new project registered in TC/SC work program.
6. ISO Standard 9806-3: 1995, “Test methods for solar collectors – Part 3: Thermal performance of unglazed liquid heating collectors (sensible heat transfer only) including pressure drop”
Cognizant SC: 5 (Collectors and other components)
At the November 2003 meeting of ISO TC 180, a resolution was passed to request the SC 5 Secretariat to initiate the revision of ISO 9806 series of standards using the current work done by CEN in this area, including the current draft revision of EN 12975 Part 1 and Part 2.
ISO document stage code is 90.93 – international standard confirmed.

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

A N I N T E R N A T I O N A L O R G A N I Z A T I O N



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ASHRAE Code Participation – The International Association of Plumbing and Mechanical Officials (IAPMO) announced the development of BSR/IAPMP USPC-1-200x, Uniform Solar Energy Code, in the December 17, 2004 ANSI Standards Action. The Intersociety Liaison Subcommittee of the ASHRAE Standards Committee wants to know if TC 6.7 would be interested in recommending someone to act as an ASHRAE representative to the IAPMO committee. Jim Huggins offered to serve as the ASHRAE representative.

Report Submitted By: Brian Dougherty

ASHRAE TC/TG/TRG ACTIVITIES SHEET

DATE: April 25, 2005

TC/TG/TRG NO.: 6.7 TC/TG/TRG TITLE: Solar Energy Utilization

CHAIRMAN : S. O. Morner VICE CHAIRMAN: T. J. Merrigan

SECRETARY: A. Chiasson

TC/TG/TRG MEETING SCHEDULE			
Location – Past 36 Months	Date	Location - Next 18 Months	Date
Atlantic City, NJ	02/01	Denver, CO	05/06
Honolulu, HI	02/06	Chicago, IL	06/01
Chicago, IL	03/01	Quebec City, PQ	06/06
Kansas City, MO	03/06		
Anaheim, CA	04/01		
Nashville, TN	04/06		
Orlando, FL	05/02		
TC/TG/TRG SUBCOMMITTEES			
Function	Chairman		
Program Handbook Standards Research	C. Yavuzturk M. A. Hertel B. P. Dougherty T. J. Merrigan		

RESEARCH PROJECTS – CURRENT			
Project Title	Contractor	Monitoring Comm. Chairperson	Report Made At Mtg.
URP-1109 – Optimization of Hybrid PV / Thermal Solar Collector	Solar Design Associates	P. Zeigler	Project complete except for ASHRAE paper

LONG RANGE RESEARCH PLAN				
Rank	/ Title	W/S Written	Approved	To RAC
	Solar air reheating systems	No	Unranked	No
	Thermal energy storage	No	Unranked	No
	Solar desiccant re-generation systems	No	Unranked	No
	Building integrated solar storage systems	No	Unranked	No

HANDBOOK RESPONSIBILITIES					
Year & Volume	Chapter	Title	No.	Deadline	Handbook Liaison
07 HVAC Applications	32	Solar Energy Use		05/02	G. Debes
08 HVAC Systems & Equipment	33	Solar Energy Equipment			

STANDARDS ACTIVITIES - List and Describe Subjects
<p>STD 93-2003 MOT to Determine the Thermal Performance of Solar Collectors. Reaffirmation of the 1986 standard. Approved by ANSI on 03/04/22..</p>
<p>STD 95-1987P* MOT to Determine the Thermal Performance of Solar Domestic Water Heating Systems. SPC 95P recommended adopting ISO Standard 9459-1 (with annexes marked informative rather than normative) as the next revision of Standard 95. Until October 2004, SPC 95P had been in limbo awaiting ANSI-compatible procedures for adopting ISO standards. SPC 95P can now reconvene and act on the revision/replacement of Standard 95. TC 6.6 is co-cognizant; TC 6.7 is the cognizant (lead) technical committee.</p>
<p>STD 96-1980P* MOT to Determine the Thermal Performance of Unglazed Flat-Plate Liquid-Type Solar Collectors. SPC 96P chair Jim Huggins plans to recommend that the SPC review ISO Standard 9806-3 and consider it as a replacement for Standard 96. Until October 2004, SPC 96P had been in limbo awaiting ANSI-compatible procedures for adopting ISO standards. SPC 96P can now more rigorously recruit committee members and then consider the options of an identical or modified adoption of the ISO standard.</p>
<p>STD 109-2003 MOT to Determine the Thermal Performance of Flat-Plate Solar Collectors Containing a Boiling Liquid. Reaffirmation of the 1986 standard. Approved by ANSI on 03/04/22.</p>
<p>STD 125-1992 (RA2000) MOT Thermal Energy Meters for Liquid Streams in HVAC Systems. The cognizant (lead) technical committee is TC 6.1; TC 6.7 is co-cognizant. TC 6.1 voted in Nashville to recommend Standard 125 for reaffirmation (10-0-0).</p>
<p>*NOTE: Standards 95, and 96 are designated as “Proposed” rather than as a “Reaffirmation” or as a “Revision” due to exceeding the maximum time frame in which a standard may retain the ANSI designation. These standards will be sent to ANSI for their approval once they are reaffirmed/revised.</p>

<p>TECHNICAL PAPERS from Sponsored Research – Title, when presented (past 3 yrs. present & planned)</p>
<p>None</p>
<p>TC/TG Sponsored Symposia – Title, when presented (past 3 yrs. present & planned)</p>
<p>1. Renewable Energy Sources, Energy Efficiency and BPS for Sustainable Local and Regional Development, Jan. 2004, Anaheim</p>
<p>TC/TG Sponsored Seminars – Title when presented (past 3 years, present, & planned)</p>
<p>1. <i>Planned Seminar</i>, Jun. 2005, Denver 2. Solar Systems and Near Zero Energy Homes, Feb. 2005, Orlando 3. Leading Edge Solar Energy Technologies, Jun. 2004, Nashville 4. (1) Solar Domestic Hot Water Applications, (2) RES Integrated Sustainable Buildings, Jun. 2003, Kansas City 5. The Solar Decathlon: Results of the 2002 Competition, Jan. 2003, Chicago</p>
<p>TC/TG SPONSORED FORUMS - Title, when presented (past 3 years, present, & planned)</p>
<p>1. What Can ASHRAE and Its Members Do to Increase the Use of Solar Energy?, Jan. 2003, Chicago</p>
<p>JOURNAL PUBLICATIONS, when published (past 3 years, present, & planned)</p>
<p>None</p>

Submitted By: A. Chiasson