

**Minutes: Properties Subcommittee,  
ASME Research & Technology Committee on Water and Steam in Thermal Systems  
NIST Headquarters, Gaithersburg, MD, April 19, 2017**

Attendance:

Richard Harwood, Siemens Energy (Chair)  
Jim Bellows, James Bellows & Associates  
Michal Duška, University of Maryland  
Dan Friend, NIST (U.S. IAPWS Delegate)  
John Gallagher, NIST  
Allan Harvey, NIST (Secretary)  
Anneke Levelt Sengers, NIST  
Jay Patel, General Electric  
Jan Sengers, University of Maryland  
Dan Cornell, General Electric (by phone)  
Anurag Singh, General Electric (by phone)

[NOTE: Items numbered as on Preliminary Agenda, which is attached.]

1-2. Approval of Agenda and Review of Action Items

A preliminary agenda was distributed and approved. Minutes of the Fall 2016 meeting had been approved by email. Progress on action items was briefly reviewed. Pending **Action** items are mentioned under related agenda items below.

3. ASME Steam Tables Books

The Third Edition of the book became available for sale in mid-2014. Total sales of the Third Edition so far are 238 copies (about 70 sales in the past 12 months).

The Compact Steam Tables booklet has sold over 12,890 copies, with approximately 650 in the past 12 months; this is a slight decrease compared to the previous few years.

4. ASME Software for IAPWS-IF97

Two copies of the old “Professional” version were sold in the past year (634 over lifetime of product). No new support requests had been received.

For the new DLL software, Jay Patel has inherited the main responsibility at GE, and he has fixed several identified problems and added necessary limit checking. There is still testing needed, and also work on the manual. We have the following **Action** items for moving forward:

- Patel set up ability to share the software for testing, create install, and distribute version for testing by May 1.
- Patel and Singh get draft manual to group for next round of checking by May 1.
- Bellows send Patel his Mollier chart spreadsheet for inclusion as an example.
- All: Test next version and give any feedback by June 1.
- Singh: Continue to work with GE and ASME legal to renegotiate the steam property license for GE (probably as a modification of the 2003 agreement) and also establish that those on the Committee that helped with testing, etc. can get individual copies.
- Patel: Resolve issues identified in testing by July 1, with goal of sending completed version to ASME Press by July 15
- Harvey: discuss pricing with ASME Press (see Fall 2014 Minutes in which we decided to suggest \$200 for the basic Add-in and \$400 with source code included) after above items are complete.

Incorporation of splines for fast calculation (according to the new IAPWS Guideline) and thermodynamic derivatives (IAPWS Advisory Note) for our software in the future are deferred until after this first version of the software is issued.

#### 5. U.S. Implementation of Formulation for General and Scientific Use

Sales of Version 3.0 of the NIST software were 13 in FY 2016, and 11 in the first 6 months of FY 2017. A minor update may be made in late 2017 to include some mixture-related properties accidentally left out of the interface in Version 3.0. The Subcommittee expressed no preference on the question that had been brought up within NIST about possibly making this software free.

#### 6. IAPWS Issues

Dan Friend reported that a Helmholtz award winner had been selected, and the Subcommittee had no objections to the candidate. We discussed candidates for the IAPWS Gibbs award, given to a senior researcher, which will be awarded in 2018. A candidate was agreed upon.

**[Action:** Harvey put together Gibbs Award nomination, consulting others as appropriate, and submit by May 31.]

The US IAPWS delegate mentioned that Italy and China had both recently been approved as new Associate Members.

Michal Duška briefly summarized his IAPWS project results on modeling supercooled heavy water, which shows some interesting differences from ordinary water. There were additional discussions regarding other ongoing IAPWS projects.

**[Actions:** Harvey inquire about status of project for new EOS of D<sub>2</sub>O. Friend inquire about status of paper documenting IAPWS Spline-Based Table Lookup method.]

The 2017 IAPWS meeting will be in Kyoto, Japan, Aug. 27 to Sept. 1. Information is available via the Meetings section of the IAPWS website.

There was discussion of possible areas for sessions at the next ICPWS in Prague in September 2018, where Allan Harvey is on the program committee. Ideas included: use of film-forming amines, seawater-related corrosion (where Prof. Al-Sheikhly from the U. of Maryland could be invited to speak), nature of future industrial formulations, molecular simulation, desalination, and issues with geothermal water or water from fracking.

**[Actions:** Patel inquire about current interest in desalination at GE. All send any further topic ideas to Harvey prior to the 2017 IAPWS meeting.]

#### 7. Finances and ASME issues

Our Segregated Account balance is approximately \$49,000 after payment of the 2017 IAPWS dues.

We submitted a request through ASME's GPS system for collecting money from EPRI to be designated specifically to pay IAPWS-related expenses (but not IAPWS dues). This was approved and now ASME and EPRI must work out the legal details.

#### 8. Old Business

In the absence of Chuck Marks, no progress was reported on the possible project for revising and updating the *ASME Handbook on Water Technology for Thermal Power Systems*, so the Action items from our previous Minutes are repeated and suitably modified below.

**[Actions:** Marks prepare proposal for revising Chapter 7 for Fall meeting, potentially to be requested for ASME funding through GPS. Marks and Bellows look through book to make recommendations about what other chapters most need to be updated or rewritten. Harvey contact 2 or 3 people from Water

Technology subcommittee for their recommendations. Friend ask PPEC leadership if they have any recommendations. Marks synthesize all these recommendations to report in November. Friend find appropriate IAPWS channel to suggest Chuck Marks be added to IAPWS Task Group working on guidance for film-forming amines in nuclear plants.]

#### 9. New Business

Our current list of “long-term” topics includes: desalination and seawater; properties for carbon capture and sequestration; properties for concentrating solar power cycles; fast property calculations for CFD; non-Fortran languages (like Java) for our products and apps related to our products; the possibility of having ASME steam-tables calculations on our Subcommittee website; other working fluids such as carbon dioxide for power cycles. We decided to add one item to our long-term list, which is the upcoming (2021) 100-year anniversary of organized ASME steam-tables efforts.

[**Action:** Patel prepare a presentation for our Fall meeting about things we might do with our steam tables software in the future.]

We also discussed the desire of ASME for us to produce videos, webinars, conference programming, etc. Our software is one item we can point to, and we will want to be sure it is publicized when it becomes available. An article and/or conference session for our 100-year anniversary in 2021 would be a good idea. Otherwise, we decided to see how efforts in this direction by the Water Technology Subcommittee were received before making any specific plans.

#### 10. Membership

**It was unanimously approved to add Jay Patel of General Electric to the membership of the Subcommittee.**

#### 11. Next Meetings

Our Fall 2017 meeting will be held on Thursday, November 16 in Orlando, FL. Our preference is to get a meeting room at the hotel where the International Water Conference is located, with the fallback position being meeting at the Siemens facility in Orlando.

[**Action:** Harvey check on availability of meeting room in conjunction with the IWC and related meetings of Main WSTS Committee.]

For Spring 2018, we are scheduled to meet at NIST in Gaithersburg on Wednesday, April 4.

#### 12. Adjournment

The meeting adjourned at approximately 4:40 PM.

## **Preliminary Agenda: ASME Subcommittee on Properties of Water and Steam**

**Location: NIST Admin Bldg, Room B-111, Gaithersburg, MD**

**Time: Wednesday, April 19, 2017, 10:00 to 5:00 [“Main Committee” at 8:30 in Lecture Room B]**

- 1. Approval of Agenda**
- 2. Review of Action Items from Fall 2016 Minutes**
- 3. ASME Steam Tables book and booklet**
  - 3.1. Report on sales Allan Harvey
- 4. ASME Software for IAPWS-IF97**
  - 4.1. Report on sales Allan Harvey
  - 4.2. Technical support, bugs John Gallagher, Harvey
  - 4.3. Code revision and DLL/Excel product Jay Patel
  - 4.4. Plan for completing DLL/Excel product Patel, All
  - 4.5. Future incorporation of splines, derivatives?
- 5. Update on implementation of general/scientific formulation** Allan Harvey
- 6. IAPWS issues**
  - 6.1. IAPWS Awards Dan Friend
  - 6.2. IAPWS documents for consideration Dan Friend
  - 6.3. Preparation for 2017 IAPWS meeting in Kyoto Friend
  - 6.4. Suggestions for 2018 ICPWS in Prague?
- 7. Finances and ASME issues**
  - 7.1. Committee finances Harwood, Friend, Harvey
  - 7.2. Possible EPRI agreement for some IAPWS costs Harvey, Friend
- 8. Old Business**
  - 8.1. US participation in IAPWS PCC activities (EPRI, PPEC)
  - 8.2. Interactions with PPEC Friend
  - 8.3. Revision of ASME Handbook
- 9. New Business**
  - 9.1. Review of “long-term” items All
- 10. Membership**
- 11. Next Meetings** – Fall 2017 (with IWC in Orlando, which is Nov. 12-16?); April 4, 2018 in Gaithersburg.
- 12. Adjournment**