Minutes of the IAPWS working group IRS, Moscow, 23 - 26 June 2014
(Numbering of topics follows TPWS agenda)

1. Ingo Weber opened the session for IRS at about 11 am, 23. June 2014. The agenda was adopted unchanged.
2. Rainer Pawellek was appointed clerk of minutes.
3. Covered in TPWS minutes.
4. Covered in TPWS minutes.
5. Covered in TPWS minutes.
6. Revised Supplementary Releases on Backward equations for IAPWS-IF97
    6.1. Report of the proposers
        H.-J. Kretzschmar explained that K. Orlov discovered a sentence in the description for the determination of the region that could be misinterpreted. This in total affects 4 advisory notes (S-01, S-03rev, S-04 and S-05). D. Friend asked for details of this change. Prof. Kretzschmar explained the change in one of the documents (a simple elimination of the problematic sentence). Additionally a few references were updated.
    6.2. Formal consideration of the Revised Supplementary Releases by the Working Group
        I. Weber pointed out that all comments to the revision were included and asked for the approval by the Working Group. The result was: all votes in favor, no against, no abstentions.
        I. Weber explained that – since the revised documents were not yet circulated to the National Committees - the EC will be asked for a Postal Ballot for adoption of these Revised Supplementary Releases.
7. Proposal for an IAPWS Guideline on the Fast Calculation of Steam and Water Properties Using Spline Interpolation (SBTL)
    7.1. Presentation of the Draft Guideline by the proposers
        First, H.-J. Kretzschmar introduced the changed abbreviation SBTL – "Spline-based table lookup" – for this method. He illustrated the background, went through the chapters of the document and explained the highlights. He also explained the evaluation process: there were four packages delivered by M. Kunick to the evaluation group, with C++ source code for the SBTL functions (88 functions) and FORTRAN source code for the test programs and the IAPWS-IF97 packages from Bochum. He explained that the preparation of these program packages was a full time job for M. Kunick for 10 months. Therefore, an explicit reprogramming of the SBTL cannot be done in an evaluation task group. He emphasized the parallelism to the TTSE guideline in 2003 where IAPWS for the first time issued a numerical method as a guideline. After the presentation, D. Friend asked questions about
        *   the boundaries. H.-J. Kretzschmar explained that the regions for SBTL are different from the regions of IAPWS-IF97, but the user does not have to care about the boundaries
        *   time comparisons with TTSE. H.-J. Kretzschmar explained that they compared a couple of functions
        *   a potential withdrawal of TTSE. I. Weber remembered that this issue already had been discussed last year and it was decided to keep both methods. J. Cooper remarked that Advisory Note #2 needed an update whenever SBTL was released as a Guideline. It was discussed that Advisory Note #2 then should contain a recommendation when to use which method.

- a comparison with CFD calculation times based on ideal gas behavior that were performed during the evaluation. H.-J. Kretzschmar explained that this was considered only for the steam phase for steam turbine calculations in TRACE.

7.2. Report of Evaluation Task Group

A. Novy presented the report of the evaluation task group that was distributed to the WG members. The task group consisted of A. Novy (chair), I. Weber, K. Miyagawa, R. Pawellek, F. Blangetti and A. Singh. The SBTL functions were tested only for the IAPWS-IF97 functions. A. Novy explained which functions were available and which tests were performed by whom. Subjects of the tests were the accuracy as well as the gain in calculation speed. K. Miyagawa evaluated the results given in the document. F. di Mare, A. Novy, R. Pawellek and I. Weber integrated the SBTL library in their company calculation tools. E.W. Lemmon performed a review of the method and compared the source code with the method. A. Novy closed his presentation with the question which product should be published: the SBTL method itself or its application (spline coefficient tables) for IAPWS-IF97 and IAPWS-95, respectively. It is the recommendation of the evaluation task group that the draft should be accepted.

7.3. Formal consideration of Guideline

There was an elaborated discussion among the WG members.

For the scope of the questions by A. Novy, I. Weber pointed to the discussion for TTSE. J. Hruby noted that for TTSE, it is easier to determine the coefficients and suggested to publish the tables of coefficients for SBTL. K. Orlov asked how many papers would be required for these tables. A. Novy explained that these tables can be published only electronically as the SBTL library has a size of 120 MB (compared to 0.5 MB of the Skoda library). H.-J. Kretzschmar added that the tables alone would not help without the software. I. Weber explained that it is not necessary to publish the tables because the SBTL is not the standard but an approximate method for the standard. IAPWS-IF97 is the standard, and it is up to the user what approximate method he uses.

O. Hellmuth asked whether the time ratios are related to the property calls only or the overall calculation time. The factor 6-10 for CFD really affects the whole calculation time, i.e. you need 1 day instead of 1 week for a calculation.

J. Cooper asked whether more functions may be required than the (u,v) and the (p,h) functions, especially for the calculation of steam generators. A. Novy explained that other functions are included, but not available in the interface. I. Weber noted that for the evaluation at Siemens, these functions were sufficient.

W. Wagner noted that it the method should not be limited to just these two sets of variables because the method is much more general. I. Weber points to possible future usages.

As the evaluation was performed for IAPWS-IF97 only, there was a discussion whether an evaluation for IAPWS-95 is required as well. Although the main interest from the industry is on IAPWS-IF97, there are results from IAPWS-95 in the Guideline document. Therefore, it is necessary that these results also have to be evaluated.

A. Novy asked whether an evaluation of the method itself would be possible. A. Harvey asked H.-J. Kretzschmar whether it would be possible at least for IAPWS-95 because this would be easier as problems with the regions do not have to be considered. H.-J. Kretzschmar estimates an effort of $1 - 2$ full time years even for IAPSW-95 due to numerical challenges, coordinate transformations et al. As E. Lemmon compared the source code with the method, the agreement

in the results can be seen as an indication of the correctness of the method.

Finally, A. Harvey proposed that

1. the WG instructs the evaluation task group also to evaluate IAPWS-95 statements contained in the draft document. This proposal was accepted by all WG members without dissents or abstentions. As the work most efficiently could be done by Kiyoshi Miyagawa who is not attending the meeting, the time frame depends on his availability. End of August would be desirable.

2. the guideline will be published without the tables. This proposal was accepted with 2 dissents (from all present WGs) and 0 abstentions.

3. the review of the document by the WG members should be done in parallel to 1.) until end of August. This proposal was accepted by all WG members without dissents or abstentions.

It was determined that after completion of evaluation and review by WG members (latest by end of August 2014), the WG members will be asked to electronically vote for adoption within a time period of one month, i.e. by end of September. In parallel to that the editorial committee would be finalizing the Guideline also by end of September. Following the acceptance by the Working Groups the document will be transferred to EC for Postal Ballot.

Addendum:

Later in the week, prior to adjourning the IRS meeting, I. Weber informed the working group that K. Miyagawa had already performed the SBTL evaluation for IAPWS-95. There are only minor changes, and a new guideline draft is available. There was a discussion whether the time schedule could be accelerated. D. Friend noted that the guideline is quite long and that 6 weeks instead of 1 month would be appropriate to check the document. Ultimately there was an agreement that the time schedule should be left as proposed before. The updated evaluation report and the draft Guideline document will be distributed within one week after the meeting. A. Harvey noted that – if the WG review happens to be faster – the chairs of the WGs could also proceed faster. W. Wagner expressed his thanks to K. Miyagawa, quotation: "Kyoshi is a superman".

8. Covered in TPWS minutes.

9. Covered in TPWS minutes.

11. Industrial Requirements and Solutions for Steam Property Calculations

    11.1.   Report of the New Industrial Requirements Task Group

    I. Weber explained that there is nothing to report from this task group and asked how to continue with this task group. As the task is not concrete enough, he suggested closing this task group. The WG agreed to this suggestion.

    11.2.   Report of the Task Group "Industrial Advisory Note"

    The task of this group is to compile an additional advisory note to have one document that encapsulates all documents relevant for industrial use. There was no progress during the last year, but there is still a document being worked on. I. Weber suggested postponing the task for one year. B. Rukes asked whether M. Hiegemann is still participating in IAPWS. I. Weber will check this. A. Harvey noted that I. Weber is authorized to appoint a new chair of the task group if M. Hiegemann would not be available any more.

20. Other business:

    No International Collaborative Projects were proposed and no ICRNs need the WGs attention

21. Membership:

    No changes in membership are necessary.

22. Contribution to Press release will be done by the WG chair

23. Formal motion to the EC will be prepared by the WG chair
24. Ingo Weber adjourned the meeting at about 11:30am, 26. June 2014