IAPWS
Power Cycle Chemistry (PCC) Working Group

Minutes of IAPWS PCC WG Meetings

Location: Moscow, Russia, June 23 - 27, 2014

Acting Chairman: Paul McCann
Members present: See PCC Attachment A

Monday 23rd June 2014

Chairman P. McCann welcomed the participants and working group members and passed on best wishes to M. Rziha for a speedy and full recovery from his current health issues.

Each participant was asked to briefly introduce him- or herself.

1. Agenda

1.1 Amendments / Adoption of Agenda

There were no amendments to the drafted agenda.

1.2 Week program: split up of PCC for joint workshops and task groups.

P. McCann described the proceedings for the WG meetings and summarized the overall schedule. The schedule for the PCC workshop presentations on Tuesday and Thursday was finalized.

A brief discussion was held regarding the distribution of PCC WG presentations following the meeting. It was decided that the OPAL webspace would be used and login credentials would be provided via email following the meeting.

Action: P. McCann to provide login instructions to secure webspace to the PCC members following the meeting.

2. Appointment of Clerk of Minutes

W. Cook was asked and agreed to act as the Clerk of Minutes.

3. Approval of Minutes of PCC WG meeting in Greenwich, UK, 2013

The minutes were approved with a minor correction required in section 7.2 – T. Ichihara should be H. Kido.

4. Progress Reports on PCC Activities 2013 / 2014

4.1 Review of Actions from last PCC WG Meeting

4.2.2 ICRN#17 on Amines: J. Bellows to prepare new ICRN and prepare text to close out ICRN#17 - 15th October 2013
Status: Ongoing.

4.2.3 ICRN on Film Forming Amines: S. Marais (task group leader) and W. Hater to prepare proposal and timeline for new ICRN during ICPWS16.
Status: Ongoing.

4.2.4 ICRN#25 on Impurities: W.Cook to circulate to PCC for approval and M. Rziha to bring to EC for approval.
Status: Complete. Ready for EC approval.

4.2.5 ICRN#22 on PTZ: Expired September 2013. M. Rziha to contact M. Stastny and A. Rudge.

Status: Complete (P. McCann) – Stastny and Rudge indicated ICRN is still relevant and current. It was suggested ICRN #22 be renewed with M. Stastny as the primary contact. There were no objections from the PCC WG. Further discussion included in Section 4.3 below.

4.2.7 ICRN for CP Sampling in cycling plants: P. McCann to lead task group to develop new ICRN.
Status: Ongong - D. Addison mentioned that a year or two of feedback from experience with the current TGD may be useful and customizations for cycling plants may be a good amendment for future. Discussion added as agenda item to new ICRNs.

4.2.8 ICRN#26 on Al in Steam/Water Cycle: Expiring in September 2014. M. Rziha, G. Joy, F.Leidich to evaluate extension.
Status: B. Dooley still sees ICRN as relevant. Recommend extension to EC to September 2019. Further discussion required.

4.5.1 PCC Public Relations: M. Rziha and J. Bellows to assist A. Harvey examining improvements for IAPWS document visibility in search engines.
Status: A. Harvey completed preliminary review of options – presented at EC meeting Monday morning June 23, 2014. Better keywords required on IAPWS webpage, suggested short description of TGD should follow the title/link on the webpage.

4.5.2 PCC meeting highlight for PPChem: M. Rziha to prepare summary of PCC WG meeting for Power Plant Chemistry.
Status: Complete.

4.5.3 Press Release: P. McCann to prepare press release.
Status: Complete.

4.5.4 Indexing files/documents on IAPWS website: J. Bellows to improve searchability of documents on webpage by referencing filenames to authors etc.
Status: Ongoing.

7.2 PCC membership changes: M. Rziha to propose new members to EC.
Status: Complete – note H. Kido should be included in the minutes as a new PCC member, she was incorrectly recorded as T. Ichihara in last year's minutes.

7.3 Contact defunct PCC members: M. Rhiza and P. McCann to contact PCC members who have not been present or active for many years and inquire on their desire to remain on WG.
Status: Ongoing.

4.2 International Collaboration

No international collaborations are currently ongoing. P. McCann asked the PCC WG if there were any proposals for new collaborations, there were none.

4.3 ICRNs – Review and Possible New Additions

Current ICRNs

ICRN#17 on Amines – expired in September 2013. J. Bellows was to write close-out document and prepare new ICRN.

J. Bellows indicated two tasks for new ICRN on Amines: circulate current document through EPRI for comment (J. Matthews – complete); re-write document. B. Dooley suggested having ICRN#17 closing document.

Action: J. Bellows to write closing document for ICRN#17 – provide by end of WG meetings this week.

Action: J. Bellows to draft new ICRN on amines, suggested co-authorship with member from PCAS – provide draft ICRN for circulation to PCC by September 30, 2014.

ICRN#20 on Sensors for Elevated Temperatures – expires September 2014. S. Uchida recommends closure of this ICRN as it has helped with FAC sensors and H_2O_2 sensor development.

Action: S. Uchida to prepare closing document for ICRN#20 – provide by December 31, 2014.

ICRN#22 on Chemistry in the PTZ: Expired September 2013.
As above, it was suggested ICRN #22 be renewed for 1-year period with M. Stastny as the primary contact. There were no objections from the PCC WG. Suggested collaborative review of current document with A. Bartos and recommend changes (if any) to PCC for approval at 2015 meeting.

Action: M. Stastny / A. Bartos – provide amended ICRN#22 to PCC chairman by September 30, 2014

Action: P. McCann to recommend extension of ICRN#22 for one year to EC.

ICRN#25 on Impurities: Document complete, approved by Editorial Committee and circulated to NC's for comments. None have been received. Take to EC for approval.

Action: P. McCann to submit ICRN#25 to EC for approval.

ICRN#26 on Al in Steam/Water Cycle: Expiring in September 2014. B. Dooley, M. Rziha, G. Joy and F. Leidich still see ICRN as relevant. Recommend extension to EC to for 5-year period.

Action: P. McCann to request 5-year extension of ICRN#26 to EC.

Future ICRNs

P. McCann reviewed list of potential future PCC activities from the Greenwich meeting. The items selected for further PCC work include:

Film Forming Amines – discussion on the need to examine current literature and prepare a position paper. B. Dooley suggested W. Hater as lead for task group who will examine the relevant issues (effect on polishers, conductivity etc.).

Task group includes: W. Hater (lead), T. Petrova, W. Cook, M. Lendi

Action: task group to prepare white paper on film forming amines for next meeting – provide by April 30, 2015.

Corrosion Product Sampling for Cycling Plants – D. Addison suggested to wait and let comments percolate from current TGD to provide direction for what's needed for cycling plants and potentially include as a revision to current TGD. Suggested that task group struck in Greenwich identify the primary needs/requirements for cycling plants (sampling point locations, instrumentation etc.) and prepare "white paper" for release at next year's meeting.

Task group includes: D. Addison, P. McCann, W. Cook

Action: Task group to prepare white paper on CP sampling in cycling plants for next meeting – provide by April 30, 2015.

Geothermal Power Cycle Chemistry – D. Addison indicated every geothermal reservoir is different in its chemical makeup, likely not possible to provide TGD encompassing all plants. Likely several areas for ICRNs in the future.

Demineralized Make-up Water – discussion around TGD for supply of DM water for plant systems (see below).

Organics Effects and Removal – discussion around need for guidance in the industry, perhaps separate organics removal from their effects in plant systems.

Condensate Polishing for Plants with ACCs – potential white paper on water purification options in units with ACCs where the condensate temperature is greater than 60^{o}C.

Other issues discussed as were suggested from open meeting in Greenwich included outage inspection guidelines for chemists, QA/QC, HRSG sample tubes, plant preservation, training, technical knowledge transfer. No immediate actions from the PCC WG were recommended on these items at this time.

4.4 Activities of Standard Organizations (e.g. VGB, EN 12952, IEC)

P. McCann asked the PCC WG members if there were any updates regarding work ongoing from standards organisations. W. Hater indicated VGB is in process of developing revised standards for plant conservation.

4.5 Technical Guidance Documents

B. Dooley presented background to TGD and how they are equivalent to IAPWS Releases for the TPS WG and are being recognized as the standard documents internationally. Discussion on the status of current TGDs, do they need revision? F. Gabrielli feels TGD on Carryover is fine for the moment. D. Addison mentioned several references that need to be amended in TGD for CP sampling. Discussion on other additions to CP Sampling TGD including modifications for cycling plants (see ICRN section above), adding Aluminium to CP monitoring, HRSG HP evaporator sampling. B. Dooley circulated a document from J. Cooper of some of the changes incorporated into the sampling TGD. Other potential TGDs discussed include Demin. Water quality, Open Gas Turbine water usage, Nuclear Plant Chemistry and Amines.

Action: P. McCann to mention at EC meeting the minor changes to references in TGD on CP Sampling

Demineralized Make-up Water – B. Dooley gave presentation from G. Joy about the need for a TGD on DMW purity monitoring. Proposed TGD on sampling requirements and locations that would overlap and re-iterate key concepts from other TGDs. This TGD would not include details on the normal operation and/or maintenance of water treatment plants. J. Bellows and Kirk Buecher felt document would be useful. P. McCann was concerned about the scope and utility of the proposed document. Task group struck to begin building the document.

Task Group: G. Joy (lead), P. McCann, K. Buecher, J. Bellows, H. Hirano

Action: Task group to prepare TGD for approval at next meeting – provide by March 31, 2015.

HRSG HP Evaporator sampling – Discussion identified emerging issues in HRSGs around deposition in HP evaporator tubes. Much work has already been published and could be readily turned into a TGD. PCC WG viewed this as important issue and suggested striking a task group to begin development.

Task Group: B. Dooley, P. McCann, D. Addison, T. Petrova, F. Gabrielli.

Action: Task group to prepare TGD for approval at next meeting – provide by March 31, 2015.

4.6 Discussion of Future PCC Activities and Task Groups

The PCC workshop on the morning of Tuesday 24th June 2014 included presentations on:

- Water Use in Gas Turbines – D. Addison
  Discussion centred around the possibility of issuing an IAPWS TGD for water purity required for different applications in the gas turbine operation. F. Gabrielli cautioned about specifying requirements for turbines supplied by OEMs. B. Dooley commented that agreement from OEMs on water specs is not the mandate of IAPWS, also commented that our current knowledge on the topic needs more time to develop to the same level as current TGDs. Proposed drafting a white paper to poll current OEM specs and investigate potential areas for recommendations. Task group formed. Could be included in section of potential TGD on water demineralization (discussed above).

Task group: D. Addison (lead), B. Dooley, B. Svoboda, H. Kido (or rep from Japan)

- Sampling/Analytical Considerations for the Next Generation of Combined Cycle Plants – F. Gabrielli
  Outlined key areas for IAPWS to contribute to cycling plants including recommending sampling locations next to drum, sensors in strategic locations (hot well) and chemistry control during layups and start-ups. B. Dooley commented that shut down chemistry is of prime importance to ensure conditions during quick start up. F. Gabrielli commented that continuous ammonia dosing during start ups would be beneficial to counteract carbonate pH depression from CO_2 ingress during shut down.

  Discussion ensued about the preparation of an Advisory Note or a paper for PPChem. It was then suggested that several TGDs be amended to include guidance for cycling plants including the Instrumentation, AVT and Phosphate TGDs. Task group formed.

  Task group: F.Gabrielli / B. Dooley, M. Hellman, H. Hirano, T. Petrova, K. Buecher

  Action: Task group to draft amendments to these TGDs for PCC review and approval at 2015 meeting – provide drafts to PCC chair by September 30, 2014.

  Action: Task group to draft paper for PPChem describing amendments to TGDs for cycling plants – provide to PPC chair by January 31, 2015.

The joint PCC/PCAS workshop in the afternoon of Tuesday 24th June 2014 included presentations on:

- Water Treatment in Swedish Power Plants – A. Fredrikson

- Film Forming Amines – W. Hater
  The current state of R&D for FFAs was presented. Discussion on the need for reducing agents while using FFAs as well as the effect/benefit of FFAs on the corrosion of aluminium and copper alloys. PCAS members invited on to PCC task group developing white paper on FFAs.

- Research Needs for Amines – J. Bellows
  The importance of sound and accessible database for the chemical properties of alkalizing amines used in power plants was presented. J. Bellows proposed PCAS issues "Guidelines" for the properties of amines for open distribution. Properties should include volatility, dissociation constants, complex stability and equivalent conductance all up to near critical temperature. W. Cook suggested interaction with the EPRI MultiEQ development team, perhaps P. Tremaine. A task group was formed.

  Task group: A. Anderko, J. Bellows

  Action: Task group to identify necessary ICRN(s) (if any) and prepare them for submission and approval at next year's meeting. Goal to have Guideline documents for release in 2015.

- Overview to Geothermal Power Production – D. Addison
  Introduction to the forms and challenges of geothermal production in the world. Scaling in the reinjection wells is one of the primary issues and may require literature search and/or more

experimental data to predict and mitigate. Suggested white paper be drafted examining geothermal issues and how IAPWS interaction and guidance could be of benefit.

Task group: D. Addison, A. Anderko, T. Petrova, M. Nakahara, M. Hellman

Action: Task group to solicit participation and input from experts in their respective countries and draft white paper for circulation to PCC.

The PCC workshop on the morning of Thursday 26th June 2014 included the following presentations:

- Reviewing the Status of the Revision of JIS B 8223 " Water Conditioning for Boiler Feed Water and Boiler Water – H. Hirano
  B. Dooley pleased to see JIS is nearly identical to IAPWS TGDs. Commented to H. Hirano that Na spec. in steam is still too high, perhaps JIS would like to review.

- Advanced management of pipe wall thinning due to flow-accelerated corrosion – S. Uchida

- Turbidity measurement as trend monitor for particulate corrosion products – M. Lendi
  Discussion around the utility of a continuous iron monitor, caution that turbidity is commonly misunderstood and misinterpreted when used in power plant systems. B. Dooley suggested that IAPWS may be able to support an International Collaboration examining turbidity measurements with different iron or copper oxides.

- Determining water chemistry conditions in nuclear reactor coolants – S. Uchida
  Discussion around how IAPWS can contribute to chemistry control in nuclear power stations. Likely not feasible to issue TGD as each country and utility follows specific guidelines already (EPRI, EDF etc). Perhaps IAPWS could issue state-of-the-art summary or paper providing value to the nuclear industry. Task group to interface with key people involved with guidelines and report back to PCC at next meeting.

  Task group: S. Uchida, D. Lister, W. Cook

- Development of a sensor for in-situ measurement of hydrogen peroxide in irradiation field by using Frequency dependent complex impedance analysis – S. Hanawa

- Development of Water Quality Simulator for Thermal Power Plants – H. Kido

4.7 PCC Public Relations

It is desirable to have IAPWS documents, including the PCC TGDs, be the first hit when people perform web searches on issues related to power cycle chemistry. Discussed again including brief summary of TGD directly on webpage to increase probably and ease of hits from search engines. It was suggested that outside professional help should be solicited to aid in promotion and visibility of IAPWS PCC and the TGDs.

Action: P. McCann to contact authors for the TGD for a brief summary to be included on the website. He will provide to A. Harvey to upload.

Action: P. McCann to write a summary of PCC WG meeting for Power Plant Chemistry. B. Dooley and W. Cook agreed to review.

Other Action List Items

No other items were presented requiring action by PCC WG members.

5. Priority List Review

Discussion proceeded surrounding the utility of maintaining a priority list. Suggestion to amalgamate Priority List with potential/current ICRNs and TGDs listed above.

Action: P. McCann to amalgamate Priority list with ICRN/TGD ideas.

6. Other Business

No other business added.

Thursday afternoon 26th June 2014 – PCC WG business

1. J. Bellows wanted PCC reviewers for ICRN/TGD drafts. The following people were proposed:

   from PCC: D. Moed, W. Hater, H. Hirano
   from PCAS: P. Tremaine & D. Guzonas

2. New Members and Election of PCC Officers
   The following new members were proposed for the PCC WG:

   Olga Yegoshina (MPEI, TWT Dept.) nominated: T. Petrova seconded: P. McCann
   Philipp Dyachenko (Aminotek) nominated: T. Petrova seconded: P. McCann
   Aref Saeidipour (Seimens) nominated: P. McCann seconded: F. Gabrielli
   Satoshi Hanawa (JAEA) nominated: P. McCann seconded: S. Uchida

   PCC unanimously accepted these new members.

   Due to unforeseen circumstances, neither the PCC chair (M. Rziha) nor the two vice chairs (Karsten Thomsen and Marc DeWispelaere) were able to attend the WG meeting this year. P. McCann accepted to act as chair and was thanked for his efforts. It was noted that vice-chair M. DeWispelaere has not been at a WG meeting in several years so it was proposed that he be replaced in this capacity by P. McCann, who accepted the nomination. The PCC was polled and P. McCann's appointment as vice-chair of PCC WG was unanimously accepted.

   Action: P. McCann to advise EC of new PCC members and officers.

3. Technical Guidance Document and IAPWS cover pages
   Suggested removing paragraph of text from IAPWS document cover pages and including this on the second page of the document so every IAPWS cover page looks essentially identical. PCC WG polled and agreed that this is a good approach.

Action: P. McCann to advise EC of PCC's recommendation.

4. Interface with BIPM
   P. McCann explained the interfaces between TPS, particularly the subcommittee on seawater, and the BIPM. PCC members were asked to review the work and website of BIPM and advise at the meeting of potential interactions, if any.

5. Meeting Presentations
   P. McCann indicated that the OPAL webspace would be used to circulate PCC presentations and login credentials would be provided via email following the meeting. P. McCann will investigate options for using OPAL or similar web-based system for use by PCC task groups' working documents.

   Action: P. McCann

6. 2015 Meeting – Stockholm, Sweden
   M. Hellman introduced the location of next year's EC and WG meetings from 28th June – 3rd July 2015.

7. 2016 Meeting – Dresden, Germany
   P. McCann inquired if anyone knew of any conflicting conferences with the proposed dates for the 2016 meeting in Dresden, 11-16th September 2016. There were none at this time.

8. PCC WG Report for EC
   P. McCann asked B. Dooley and W. Cook to review PCC WG report to EC following meeting.

9. Miscellaneous and Adjournment
   P. McCann asked for any further items of discussion, there were none. P. McCann thanked MPEI and the Russian NC for organising an excellent meeting in Moscow and called the meeting closed.

   Adjournment 14:00 hours.