

**THE INTERNATIONAL ASSOCIATION
FOR THE PROPERTIES OF
WATER AND STEAM**

MEMBERS

Britain and Ireland

Canada

Czech Republic

Germany

Japan

Russia

Scandinavia (Denmark, Finland, Norway, Sweden)

United States of America

ASSOCIATE MEMBERS

Argentina and Brazil

Australia

France

Greece

Italy

New Zealand

Switzerland

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Minutes

of the

General Meeting

of the

International Association for the Properties of

Water and Steam

Greenwich, London, UK

3rd September 2013

Prepared by: Barry Dooley



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**Minutes of the
General Meeting
of the
International Association for the Properties of
Water and Steam**
Greenwich, London, UK
3rd September 2008

Tuesday, 3rd September 2013. 4:54pm

IAPWS President Petrova opened the General Meeting and welcomed the 45 people in attendance. She explained the background to the General Meeting of IAPWS in that it has always been recognized that it is an opportunity for people attending the ICPWS to observe the workings of the IAPWS organization.

1. Adoption of Agenda

A preliminary agenda had been circulated to all IAPWS members and had been placed on the IAPWS website by the Executive Secretary in May 2013. Copies of this agenda were also available for everybody at the meeting within the booklet of IAPWS activities. There were no suggested changes to the agenda and thus the President requested that it be adopted. It forms Attachment 1 of these minutes.

2. President's Report on Activities of IAPWS 2008-2013

President Petrova next provided her report on IAPWS and EC activities since the last General Meeting in Berlin, Germany in 2008:

2.1 Membership. IAPWS now has 8 Members and 7 Associate Members. Australia and New Zealand both became associate members in 2011.

2.2 Working Group (WG) Activities. The President introduced the chair people of the four IAPWS Working Groups and Seawater Sub Committee. A short description of the activities of this group was included within the booklet of IAPWS activities and is included as Attachment 2.

2.3 Annual Meetings. Attachment 3 delineates the locations of the annual meetings of the EC and the past presidents.

2.4 IAPWS Awards. The fourth IAPWS Gibbs Award was presented to Professor Digby Macdonald at the current ICPWS. The following people had been made IAPWS Honorary Fellows since the last General Meeting: Bignold (2010), Mares (2011), and Friend and Kretzschmar (2012). The following people had received the Helmholtz Award: Myszczyzyn (2010), Adidharma (2011), Fedorov (2012), and Ashbaugh (2013). A full listing of all IAPWS awardees is provided in Attachment 4.

2.5 IAPWS Products. The President next delineated the Releases, Supplementary Releases, Guidelines, Advisory Notes, ICRNs and Technical Guidance Documents that were currently in existence and made note of those issued since the last General Meeting. These are provided in Attachments 5 - 10. She also indicated that these products are listed on the IAPWS Web site (www.IAPWS.org). The President particularly made mention of the new Technical Guidance Documents for power plant chemistry.

2.6 Collaborations with Other Organizations. The President mentioned the very fruitful collaboration with the Scientific Committee on Oceanic Research (SCOR) and the International Association for the Physical Sciences of the Oceans (IAPSO). Recently the IAPWS SCSW has joined with SCOR and IAPSO to jointly sponsor a Joint Committee on the Properties of Seawater (JCS) which meets for the first time at the 16th ICPWS.

3. Executive Secretary's Report on Activities of IAPWS 2008-2013

The Executive Secretary provided information on the IAPWS financial situation. The record of the IAPWS Bank Account was presented.

The Executive Secretary also indicated that the IAPWS Financial records had been audited and approved each year by VDI in Germany and Professor Safarik in Czech Republic.

The IAPWS Dues Structure had remained the same.

4. Statutes and By-Law Changes

The President requested that the chairman of the committee formed in Plzen provide a status report. Harvey first reminded the EC that currently the Statutes can only be changed at a General Meeting by a two-thirds vote of the EC Members present at the meeting in association with each ICPWS. He indicated that the committee (Svoboda and Watanabe) had developed a draft to include the items raised at the Boulder meetings and a few other items that had been raised by the committee. This version was sent to the National Committees of IAPWS for review. A few minor changes had been received and a final version sent to the EC for consideration at the Greenwich EC meeting on 1st September 2013 to ensure consensus before presenting this version to the General Meeting. The main changes to the Statutes and By-Laws include:

- Information on the IAPWS Technical Guidance Documents was added as a major activity and objective of IAPWS.
- The IAPWS Bank Account will be kept in a currency of convenience to the Executive Secretary. In future the IAPWS dues for a year will be in that currency converted from Swiss Francs on 1st January of that year.

- Two procedures have been included to address associate members: those coming in to IAPWS and those former Members moving away.
- The procedure for changing the statutes only at ICPWS is difficult to manage. The suggested change is that approval of ¾ of the EC at annual meetings will be required to approve changes.
- ICRNs will move to a five year cycle.
- It is suggested to eliminate the Executive Secretariat and to have the Executive Secretary appointed by the EC.

The President asked the General Meeting if there were any other comments or objections to these changes. There were no comments and no objections, so she proposed that the revisions be approved.

The EC Members in the General Meeting Approved the IAPWS Statutes and By-Laws changes unanimously

5. Selection of Host Country for the 17th ICPWS

The President next raised the issue of the location for the next ICPWS. The Executive Secretary indicated that the next country in line to host the 17th ICPWS is the Czech Republic followed by the US, and requested that the head of the Czech Republic National Committee, Hruby, provide the results of discussions with his colleagues during the week. Hruby indicated that there was enthusiasm to hold the next ICPWS and that he would provide an official answer to the Executive Secretary by the end of 2013. The head of the US National Committee indicated that the US would stand in reserve if something precluded the Czech Republic from holding the conference.

6. New Business

The President requested if there were any items of new business. None were raised.

8. Adjournment

The General Meeting adjourned at 5:26pm.

**AGENDA
for the
GENERAL Meeting
of
IAPWS**

Greenwich, London, UK. 3rd September 2013

Tuesday, 3rd September 2013. 4:30pm

- Opening Remarks and Welcome by IAPWS President, Professor Tamara Petrova
1. Adoption of Agenda
 2. President's Report on Activities of IAPWS 2008-2013
 - 2.1 Membership
 - 2.2 Working Group Activities
 - 2.3 Annual Meetings
 - 2.4 IAPWS Awards (Gibbs, Helmholtz and Honorary Fellow)
 - 2.5 IAPWS Products (Releases, Guidelines, Advisory Notes, ICRNs and Technical Guidance Documents)
 - 2.6 Collaboration with Other Organizations
 - 2.7 Other
 3. Executive Secretary's Report on Activities of IAPWS 2008-2013
 - 3.1 Financial, Auditors and Dues
 4. Statutes and By-Laws Changes
 5. Selection of Host Country and Year for the 17th ICPWS
 6. Proposed Activities during Period to Next ICPWS
 7. New Business
 8. Adjournment

Barry Dooley
21st August 2013



**IAPWS WORKING GROUP AND SUB-COMMITTEE MAIN ACTIVITIES
SINCE THE 15TH ICPWS IN BERLIN IN 2008 (September 2013)**

WORKING GROUP - THERMOPHYSICAL PROPERTIES OF WATER AND STEAM (TPWS)

Chairman: Allan Harvey, Vice Chairman: Jan Hruby

The Working Group on Thermophysical Properties of Water and Steam has completed major efforts on the transport properties of water and steam, producing new standard correlations for the viscosity and the thermal conductivity. The new correlations cover a larger range of conditions and improve the accuracy of knowledge of these properties. By careful combination of the existing IAPWS formulations for the thermodynamic properties of ice and of fluid water, new, more accurate reference correlations were created for the melting and sublimation curves of ice. Other projects included a set of simple correlations for properties of liquid water near atmospheric pressure, a simplified formulation for the thermodynamics of liquid water for use in oceanography, and a revision of the guideline for the critical locus of the sodium chloride – water mixture.

WORKING GROUP - INDUSTRIAL REQUIREMENTS AND SOLUTIONS (IRS)

Chairman: Ingo Weber, Vice Chairman: Nobuo Okita

Mission Statement of IRS is “To identify and prioritize industrial requirements for water, steam, and aqueous system, to work with other IAPWS working groups to deliver solutions and to support implementation of solutions”.

Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam. Minor editorial changes to the IAPWS-IF97-S04 Supplementary Release were accomplished at the 2009 annual meeting. Editorial changes on the revised release on the industrial formulations, IF-97 were discussed and carried out during 2009 and 2010 annual meetings supported by the test report.

New Industrial Requirements Task Group. The need for the industrial requirements for speed, accuracy, and consistency of new fast calculation of steam properties using steam lookup tables applicable to CFD analysis was discussed in 2010, and TG changed its scope in 2011 “to collect new industrial requirements regarding formulations, properties, and fluids” . Some new requirements that cover the needs in areas such as dynamic and transient simulations, plant optimizations & control, in-house or proprietary tool usage were reported in 2012.

Industrial Survey Task Group. The task group for industrial survey was set up at the 2010 annual meeting, and a proposal was presented and discussed at the 2012 annual meeting to define the steps for a questionnaire in order to determine industrial needs and requirements and to develop and send the industrial survey to the identified companies and to the national committees etc.

SUBCOMMITTEE ON SEAWATER (SCSW)

Chairman: Rich Pawlowicz, Vice Chairmen: Michael Hiegemann and Rainer Feistel (past chairman)

The SCSW created a standard for the thermodynamic properties of seawater (IAPWS 2008) ice, and humid air, as an extension of the existing standards for pure water. In cooperation with the Scientific Committee on Oceanic Research (SCOR) and the International Association for the Physical Sciences of the Oceans (IAPSO), who jointly sponsored SCOR/IAPSO working group WG-127 on the Thermophysical Properties of Seawater, a new seawater standard was developed. The Thermodynamic Equation of Seawater 2010 (also known as TEOS-10) has been officially adopted by the Intergovernmental Oceanographic Commission (IOC) and the International Union of Geodesy and Geophysics (IUGG), as well as SCOR and IAPSO, as the standard definition for the salinity concept as it applies to seawater, as well as the thermodynamic properties of seawater of different salinities.

Recently, SCSW has joined with SCOR and IAPSO to jointly sponsor a permanent committee to continue developing standards for seawater. This Joint Committee on the Properties of Seawater (JCS), meeting for the first time at ICPWS16, is holding a series of workshops to further advance oceanographic standards.

WORKING GROUP - PHYSICAL CHEMISTRY OF AQUEOUS SYSTEMS (PCAS)

Chairman: Masaru Nakahara, Vice Chairman: Andrzej Anderko

The PCAS Working Group has discussed about the fundamental thermodynamic and kinetic aspects of aqueous solutions and supercritical water so that it may help an innovative approach to a variety of problems met in the power cycle engineering. In particular, the reactivity of such simple gases as hydrogen, carbon dioxide, and carbon monoxide, simple and complex organics like formic acid etc., and a variety of heavy metal oxides in supercritical water has been presented and discussed in relation to the power cycle chemistry. Attention has been paid to the free energy changes as a measure for the stability of the species involved. Information and opinions have been exchanged also on ionic conductivities and interfacial problems.

WORKING GROUP - POWER CYCLE CHEMISTRY (PCC)

Chairman: Michael Rziha, Vice Chairmen: Karsten Thomsen and Marc DeWispelaere

PCC brings together scientists and engineers from academia and research organizations, power plant operators, equipment manufacturers and other relevant interested parties from around the world. For the benefit of the industry worldwide the main activities and goals in power cycle chemistry are to:

- Collaborate and share results of scientific and engineering research and experience
- Identify gaps in technical information relating to power cycle chemistry
- Seek resolution of these gaps through international cooperative projects and the release of appropriate documents.

Since 2008, PCC has developed four Technical Guidance Documents for the control and operation of cycle chemistry in fossil and combined cycle plants. In 2013 it is anticipated that two others on Steam Purity and Corrosion Products will be authorized.

IAPWS Annual Meetings and ICPWS

<u>Place</u>	<u>Year</u>	<u>ICPWS</u>	<u>President</u>
Giens, France	1974	8th ICPWS	Vodar (France)
Ottawa, Canada	1975		Kestin (USA)
Kyoto, Japan	1976		Kestin (USA)
Moscow, USSR	1977		Bradly (UK)
Washington, USA	1978		Bradly (UK)
Munich, Germany	1979	9th ICPWS	Grigull (Germany)
London, UK	1980		Grigull (Germany)
Prague, Czechoslovakia	1981		Tanashita (Japan)
Ottawa, Canada	1982		Tanashita (Japan)
Tokyo, Japan	1983		Sytchev (USSR)
Moscow, USSR	1984	10th ICPWS	Sytchev (USSR)
Washington, USA	1985		Hill (Canada)
Dusseldorf, Germany	1986		Hill (Canada)
Reading, UK	1987		Grigull (Germany)
Vancouver, Canada	1988		Grigull (Germany)
Prague, Czechoslovakia	1989	11th ICPWS	Pichal (Czechoslovakia)
Buenos Aires, Argentina	1990		Pichal (Czechoslovakia)
Tokyo, Japan	1991		Levelt Sengers (USA)
St. Petersburg, Russia	1992		Levelt Sengers (USA)
Milan, Italy	1993		Cooper (UK)
Orlando, USA	1994	12th ICPWS	Cooper (UK)
Paris, France	1995		Watanabe (Japan)
Fredericia, Denmark	1996		Watanabe (Japan)
Erlangen, Germany	1997		Fernandez-Prini (Argentina)
London, UK	1998		Fernandez-Prini (Argentina)
Toronto, Canada	1999	13th ICPWS	Tremaine (Canada)
Prague, Czech Republic	2000		Tremaine (Canada)
Gaithersburg, USA	2001		Rukes (Germany)
Buenos Aires, Argentina	2002		Rukes (Germany)
Vejle, Denmark	2003		Watanabe (Japan)
Kyoto, Japan	2004	14 th ICPWS	Watanabe (Japan)
Santorini, Greece	2005		Marsik (Czech Republic)
UK	2006		Marsik (Czech Republic)
Switzerland	2007		Cooper (BIAPWS)

<u>Place</u>	<u>Year</u>	<u>ICPWS</u>	<u>President</u>
Germany	2008	15 th ICPWS	Cooper (BIAPWS)
The Netherlands	2009		Friend (USA)
Canada	2010		Friend (USA)
Czech Republic	2011		Daucik (Denmark)
USA	2012		Daucik (Denmark)
UK	2013	16 th ICPWS	Petrova (Russia)
Russia	2014		Petrova (Russia)

IAPWS AWARDS (September 2013)**IAPWS Gibbs Award**

Year	Gibbs Award Winner
1999	Professor E.U. Franck, University of Karlsruhe
2004	Professor R.H. Wood, University of Delaware
2008	Prof. em. Dr.-Ing. W. Wagner, Ruhr-University Bochum
2013	Professor D.D. Macdonald, Berkeley University

IAPWS Helmholtz Award

Year	Helmholtz Award Winner
2000	Dr. Andrzej Anderko, OLI Systems, Inc.
2001	Dr. Nobuyuki Matubayasi, Kyoto University
2003	Prof. Eric Luijten, University of Illinois
2005	Dr. Valeria Molinero, California Institute of Technology
2006	Dr. Hong-Wei Xiang, Chinese Academy of Sciences
2007	Dr. Karsten Meier, Helmut-Schmidt University
2008	Dr. Noriyuki Yoshii, Himeji Dokkyo University
2010	Ms. Melonie Myszczyzyn, Canadian Natural Resources Limited
2011	Prof. Hertanto Adidharma, University of Wyoming
2012	Prof. Maxim Fedorov, University of Strathclyde
2013	Prof. Henry Ashbaugh, Tulane University

IAPWS Honorary Fellows

Year	Honorary Fellow
1981	Professor S. Beitler Professor H. Hausen Professor J. Juza Professor Sugawara Professor N.B. Vargaftik
1982	Professor B. Vodar
1985	Professor E.J. LeFevre Professor I. Tanishita
1987	Dr. S. Angus

	Professor U. Grigull Professor J. Kestin Mr. R.C. Spencer
1988	K.R. Schmidt Dr. H.J. White
1990	Dr. G. Bohnsack
1991	Professor O.I. Martynova
1992	Professor A.A. Alexandrov Professor E.U. Franck
1993	Dr. E. Whalley
1994	Dr. J.M.H. Levelt Sengers
1996	Dr. A. Bursik
1997	Professor P.G. Hill Professor J. Straub Professor K. Watanabe
1998	Professor W. Wagner
1999	Mr. J.R. Cooper
2000	Professor B. LeNeindre Professor J.V. Sengers
2001	Professor A. Nagashima Dr. O. Šifner
2002	Dr. R. Fernandez-Prini
2003	Mr. K. Daucik
2004	Mr. K. Miyagawa Professor P. Tremaine
2005	Dr. B. Rukes
2006	Dr. J.C. Bellows Dr. R.B. Dooley
2007	Dr. D.A. Palmer
2008	Dr. R. Svoboda
2010	Dr. G. Bignold
2011	Professor R. Mareš
2012	Dr. D.G. Friend Prof. H.-J. Kretzschmar
2013	Dr. R. Feistel

CURRENT IAPWS RELEASES (September 2013)

- Release on the IAPWS Formulation 2011 for the Thermal Conductivity of Ordinary Water Substance (September 2011)
- Revised Release on the Pressure along the Melting and Sublimation Curves of Ordinary Water Substance (September 2011) (This is a minor revision of the 2008 revised release, which replaced the corresponding release of 1993)
- Revised Release on the IAPWS Formulation 1995 for the Thermodynamic Properties of Ordinary Water Substance for General and Scientific Use (September 2009) (This is a minor revision of the 1995 release, which replaced the corresponding release of 1984)
- Revised Release on the Equation of State 2006 for H₂O Ice Ih (September 2009) (This is a minor revision of the 2006 release)
- Release on the IAPWS Formulation 2008 for the Thermodynamic Properties of Seawater (September 2008)
- Release on the IAPWS Formulation 2008 for the Viscosity of Ordinary Water Substance (September 2008)
- Revised Release on the IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam (*The revision only relates to the extension of region 5 to 50 MPa*) (August 2007) (This is a revision of the 1997 release, which replaced the corresponding release of 1967). *NOTE: This release has been supplemented by additional "backward" equations for $p(h,s)$ in Regions 1 and 2, $T(p,h)$, $v(p,h)$, $T(p,s)$, $v(p,s)$ in Region 3, $p(h,s)$ in Region 3 with auxiliary equations for independent variables h and s , and $v(p,T)$ in Region 3.*
- Release on the Ionization Constant of H₂O (August 2007) (This release replaces the corresponding release of 1980)
- Revised Release on Viscosity and Thermal Conductivity of Heavy Water Substance (August 2007) (This is a revision of the 1984 release)
- Revised Release on the IAPWS Formulation 1984 for the Thermodynamic Properties of Heavy Water Substance (July 2005) (This is a revision of the 1984 release)
- Release on the Refractive Index of Ordinary Water Substance as a Function of Wavelength, Temperature and Pressure (September 1997) (This release replaces the corresponding release of 1991)
- Release on the Static Dielectric Constant of Ordinary Water Substance for Temperatures from 238 K to 873 K and Pressures up to 1000 MPa (September 1997) (This release replaces the corresponding release of 1977)
- Release: "Surface Tension of Heavy Water Substance" (September 1994) (This is a revision of the 1985 Release)
- Release: "Surface Tension of Ordinary Water Substance" (September 1994) (This is a revision of the 1976 Release)
- Release: "Values of Temperature, Pressure and Density of Ordinary and Heavy Water Substances at their Respective Critical Points" (September 1992) (This is a revision of the 1983 Release)

CURRENT IAPWS SUPPLEMENTARY RELEASES (September 2013)

- Revised Supplementary Release on Properties of Liquid Water at 0.1 MPa (September 2011)
- Supplementary Release on a Computationally Efficient Thermodynamic Formulation for Liquid Water for Oceanographic Use (September 2009)
- Supplementary Release on Backward Equations for Specific Volume as a Function of Pressure and Temperature $v(p,T)$ for Region 3 of the IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam (July 2005)
NOTE: This Supplementary Release provides additional "backward" equations designed to accompany the IAPWS Industrial Formulation 1997
- Supplementary Release on Backward Equations $p(h,s)$ for Region 3, Equations as a Function of h and s for the Region Boundaries, and an Equation $T_{\text{sat}}(h,s)$ for Region 4 of the IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam (September 2004)
NOTE: This Supplementary Release provides additional "backward" equations designed to accompany the IAPWS Industrial Formulation 1997
- Revised Supplementary Release on Backward Equations for the Functions $T(p,h)$, $v(p,h)$, and $T(p,s)$, $v(p,s)$ for Region 3 of the IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam (September 2004) (This is a revision of the 2003 Supplementary Release)
NOTE: This Supplementary Release provides additional "backward" equations designed to accompany the IAPWS Industrial Formulation 1997
- Supplementary Release on Backward Equations for Pressure as a Function of Enthalpy and Entropy $p(h,s)$ to the IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam (September 2001)
NOTE: This Supplementary Release provides additional "backward" equations designed to accompany the IAPWS Industrial Formulation 1997
- Revised Supplementary Release on Saturation Properties of Ordinary Water Substance (September 1992) (This is a revision of the 1986 Release)

CURRENT IAPWS GUIDELINES (September 2013)

- Revised Guideline on the Critical Locus of Aqueous Solutions of Sodium Chloride (October 2012) (This is a revision of the 2000 Guideline)
- Guideline on a Low-Temperature Extension of the IAPWS-95 Formulation for Water Vapor (October 2012)
- Guideline on an Equation of State for Humid Air in Contact with Seawater and Ice, Consistent with the IAPWS Formulation 2008 for the Thermodynamic Properties of Seawater (July 2010)
- Guideline on the Henry's Constant and Vapor-Liquid Distribution Constant for Gases in H₂O and D₂O at High Temperatures (September 2004) (This guideline replaces a gas solubility guideline issued in 1993 and a distribution constant guideline issued in 1998.)
- Guideline on the Tabular Taylor Series Expansion (TTSE) Method for Calculation of Thermodynamic Properties of Water and Steam Applied to IAPWS-95 as an Example (August 2003)
- Guideline on the Use of Fundamental Physical Constants and Basic Constants of Water (September 2001)
NOTE: This Guideline is reviewed annually and updated as necessary. Latest update October 2012.
- Guideline on the IAPWS Formulation 2001 for the Thermodynamic Properties of Ammonia-Water Mixtures (September 2001)
- Guideline: "Solubility of Sodium Sulfate in Aqueous Mixtures of Sodium Chloride and Sulfuric Acid from Water to Concentrated Solutions, from 250°C to 350°C" (September 1994) (This is a revision of the 1990 Guideline)
- Guideline: "Electrolytic Conductivity (Specific Conductance) of Liquid and Dense Supercritical Water from 0°C to 800°C and Pressures up to 1000 MPa" (May 1990)

CURRENT IAPWS ADVISORY NOTES (September 2013)

- Advisory Note No. 5: Industrial Calculation of the Thermodynamic Properties of Seawater (September 2013)
- Advisory Note No. 4: Roles of IAPWS and CIPM Standards for the Density of Water (September 2009)
- Revised Advisory Note No. 3: Thermodynamic Derivatives from IAPWS Formulations (September 2008) (This is a revision of the 2007 Advisory Note)
- Advisory Note No. 2: Role of Various IAPWS Documents Concerning the Thermodynamic Properties of Ordinary Water Substance (September 2004)
NOTE: This Advisory Note is reviewed annually and updated as necessary. Latest update September 2011.
- Advisory Note No. 1: Uncertainties in Enthalpy for the IAPWS Formulation 1995 for the Thermodynamic Properties of Ordinary Water Substance for General and Scientific Use (IAPWS-95) and the IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam (IAPWS-IF97) (August 2003)

IAPWS CERTIFIED RESEARCH NEEDS (ICRNS) (September 2013)

Active ICRNs

16. Thermophysical Properties of Seawater. Issued August 2007. Revised July 2011. Expires July 2013. IAPWS Contact: R. Feistel.
17. Research on Amines for the Power Industry. Originally issued July 2010. Expires September 2013. To be completely revised by PCC WG (see Chairman M. Rziha)
19. Improved Coolant Sampling and Analysis of Low Concentration Metals (Fe, Cu, Co, etc.). Issued September 2006. Expired September 2009. ICRN extended to 2014. Closing statement to be developed 2013. IAPWS Contact: D. Lister.
20. Sensors for use at Elevated Temperature in the Plant Cycle of the Power Industry. Issued September 2006. Original Expired September 2009. PCC WG revised. Revision Expires September 2014. IAPWS Contacts: S. Uchida and D. Lister.
22. Steam Chemistry in Turbine Phase Transition Zone. Issued July 2010. Expires September 2013. IAPWS Contacts: M. Stastny and A. Rudge.
24. Thermal Conductivity of H₂O at Low Pressures and High Temperatures. Issued February 2010. Expires September 2012. To be revised and extended. IAPWS Contacts: A. Harvey.
25. Corrosion Mechanisms that are Related to the Presence of Contaminants in Steam/Water Circuits Particularly Boiler Water. Discussed in September 2012 by PCC. To be finalized September 2013.
26. Behaviour of Aluminum in the Steam/Water Cycle of Power Plants. Issued September 2011. Expires September 2014. Contacts: R. Svoboda and M. Rziha..
27. Thermodynamic Properties of Humid Gases and CO₂-Rich Mixtures. Issued September 2011. Expires September 2014. IAPWS Contacts: R. Span and A. Harvey
28. Thermophysical Properties of Metastable Steam and Homogeneous Nucleation. Issued September 2011. Expires September 2014. Contact: J. Hruby.

IAPWS CERTIFIED RESEARCH NEEDS (ICRNS) (September 2013) (continued)

Closed and Expired ICRNs

1. Evaluation of Binary Nucleation Models. Issued September 1993. Closed August 2004. Closing Statement November 2005. IAPWS Contact: F. Sigon.
2. Solubility of Sodium Sulphate in Superheated Steam. Issued September 1993. Expired September 2001. IAPWS Contact: K. Daucik. Closing Statement, October 2001.
3. Solubility of Spinel in the Chemical Conditions of Nuclear Reactors. Issued September 1993. Expired September 1996. Closing statement prepared. IAPWS Contacts: D. You.
4. Interaction Between Sodium Salts (Phosphates, Sulfates, Silicates, Borates) and Transition Metal Oxides. Issued September 1993. Closed September 1996. IAPWS Contact: J. Stodola.
5. Origin, Behaviour, and Fate of Organics in the Power Cycle. Issued September 1993. Closing Statement September 2006. IAPWS Contact: E. Maughan.
6. Thermophysical Properties of Ammonia-Water Mixtures. Issued June 1994. Closed September 2002. IAPWS Contact: W. Parry. Closing Statement, July 2002.
7. Carryover Coefficients of Salts and Metal Contaminants in Boiler Water. Issued June 1994. Expired June 1997. Closed September 1999. IAPWS Contact: P. Tremaine.
8. Development of an Accurate External Reference Electrode for Use in High Temperature and High Pressure Aqueous Solutions. Issued August 1994. Expired August 1997. Closed September 1998. IAPWS Contact: S. Lvov.
9. Thermodynamic Models for Transition-Metal/Water Systems under Steam Generator Conditions. Issued September 1994. Closed September 2000. IAPWS Contact: P. Tremaine
10. pH Measurements and Potentiometric Studies of Supercritical Aqueous Solutions. Issued May 1996. Extended to September 2009. IAPWS Contacts: S. Lvov and D. Palmer. Closed in September 2011 with a Closure Statement.
11. Properties of Salts in Steam. Issued May 1996. Closed September 2001. IAPWS Contacts: D. Palmer and R. Fernandez-Prini. No Closing Statement.
12. Kinetics of the Oxygen and Hydrogen Electrode Reactions in Subcritical and Supercritical Aqueous Systems. Issued September 1998. Closed September 2001. IAPWS Contacts: S. Lvov and D. Macdonald. No Closing Statement.
13. Surface Tension of Aqueous Solutions. Issued September 1998. Extended to September 2009. Closing Statement: September 2009. IAPWS Contacts: T. Nemeč and F. Marsik.
14. Thermophysical Properties of Humid Air and Combustion-Gas Mixtures. Issued July 2002. Extended to September 2011. Closing Statement September 2012. IAPWS Contacts R. Span and M. Hiegemann.

15. Thermodynamic Properties of Metastable Steam. Issued July 2002. Expires September 2011. IAPWS Contact: B. Rukes. July 2010 to be modified by TPWS to include Homogeneous Nucleation by September 2011. Closing Statement September 2011.
18. Decomposition of Ion Exchange Resins. Issued September 2006. Expires September 2009. IAPWS Contact: K. Daucik. Closing Statement 22nd July 2010.
21. Thermophysical Properties Associated with Ultra-supercritical Coal-Fired Steam Generators. Issued September 2009. Expired September 2012. Closing statement October 2012. IAPWS Contact: D. Palmer, B. Dooley and A. Harvey.
23. Dew Point for Flue Gas of Power Plant Exhaust. Issued September 2008. Expires September 2011. Revision September 2011, Expired September 2012. Closing statement October 2012. IAPWS Contact: N. Okita.

CURRENT IAPWS TECHNICAL GUIDANCE DOCUMENTS (September 2013)

- Corrosion Product Sampling and Analysis (November 2013)
- Steam Purity for Turbine Operation (September 2013)
- Instrumentation for Monitoring and Control of Cycle Chemistry for the Steam-Water Circuits of Fossil-Fired and Combined Cycle Power Plants (October 2012) [this is a minor revision of a document first issued in 2009]
- Phosphate and NaOH Treatments for the Steam-Water Circuits of Drum Boilers of Fossil and Combined Cycle/HRSG Power Plants (September 2011)
- Volatile Treatments for the Steam-Water Circuits of Fossil and Combined Cycle/HRSG Power Plants (July 2010)
- Procedures for the Measurement of Carryover of Boiler Water and Steam (September 2008)