

NURETH-15, Pisa (Italy), May 12-17, 2013 – Summary

Summary information about NURETH-15 Conference is provided in the present document. This intends to cover the conduct of the Conference and to provide highlights about the planning. Insights from the technical-scientific content of the papers and financial report shall be the subject of forthcoming documents. More details can be found on the website www.NURETH15.org.

1. Conference Conduct

The NURETH-15 Conference has been held in Pisa May 12-17, 2013. F. D’Auria (General Chair) opened the Conference. The Welcome Address Session was chaired by M. Cumo (Honorary Chair together with N. Todreas). Key design features of the Conference are listed below:

- The Conference venue included three cities in Tuscany, Florence (‘Corsini Palace’), Lucca (‘Regio Collegio’) and Pisa with four locations (Verdi Theater, Congress Palace, Former Railway Station ‘Leopolda’ and Church ‘Del Carmine’). This needed special logistic arrangements including close attention at each cross-point.
- Specific Conference plans included:
 - Student Sessions.
 - Selection of NURETH Fellows (among around 6000 authors of all NURETH Conferences, since NURETH-1 in 1980, see below).
 - Poster Session.
 - Invited Speakers as distinguished Lecturers and Chairmen introducing the key Plenary Sessions.
 - Pre-Conference and Post-Conference Workshops.
- Committees were formed previous to Conference dates and worked during the Conference:
 - To select the Best Poster papers, Chair Y. Hassan (three awards given, see below).
 - To select the Best Oral papers, Chair N. Aksan (three awards given, see below).
 - To select the Best Student papers, Chair N. Cavlina (three awards given, see below).
 - To plan Technical Journal publication of selected papers, Chair N. Aksan (also expected to work after the Conference).
- A NURETH poster was created including the names of all NURETH authors (from NURETH-1 to NURETH-15, around 6000 scientists as already mentioned) and pictures from each NURETH Conference.

About five hundred scientists, 432 registered participants with payment, NURETH Fellows (the list of those attending is provided below), selected Invited Speakers and undergraduate students from University of Pisa (who also served as stewards in each of the Conference sessions and places), attended the NURETH-15 Conference.

2. Country Statistics

The list of papers based on the Country of the 'presenter' is given in Table 1 (in alphabetic order and including European Commission, EC):

1) Argentine	5
2) Australia	1
3) Belgium	4
4) Brazil	2
5) Bulgaria	1
6) Canada	14 (including 3 invited)
7) China	26 (including 1 invited)
8) Czech Republic	4
9) European Commission	4
10) Finland	4
11) France	39 (including 3 invited)
12) Germany	47 (including 2 invited)
13) Greece	2
14) Hungary	5
15) IAEA	1
16) India	12
17) Italy	22 (including 2 invited)
18) Japan	43 (including 3 invited)
19) Korea (Republic of)	39 (including 1 invited)
20) Lithuania	2
21) Malaysia	1
22) Netherlands	8
23) Poland	3
24) Russia	12 (including 1 invited)
25) Saudi Arabia	2
26) Serbia	2
27) Slovenia	2
28) Spain	13
29) Sweden	16 (including 1 invited)
30) Switzerland	25 (including 2 invited)
31) Taiwan	9
32) Turkey	4
33) United Kingdom	6
34) USA	80 (including 10 invited)
35) Vietnam	1
TOTAL	461 (including 29 Invited Speakers)

Table 1 – Country of origin of main author/presenter of the NURETH-15 Papers.

The following can be noted:

- Presenters of papers are from thirty-three Countries and two International Institutions.
- The number of papers from the Countries, Japan and Germany, mostly hit by the Fukushima event, demonstrates some reaction to the event.
- The number of papers from US is confirmed high notwithstanding contingent budget difficulties.
- Nuclear emerging Countries are not yet appearing with the noticeable exceptions of Poland, Saudi Arabia and (partly) Turkey, Vietnam and Malaysia.
- The contribution to the NURETH by BRICS Countries (Brazil, Russia, India, China and South Africa) is still marginal, though increasing (related to previous NURETH Conferences).
- Republic of Korea confirms its leading role in nuclear thermal-hydraulics.
- The EU Countries together produced more than 300 papers (close to 70% of the total number of papers).
- North America (US and Canada), EU, Korea and Japan contributed to about 84% of the papers.
- Eight no-show authors (2%) were noted.

3. Topics of the Conference

More than seventy (70) technical sessions were held. These deal with eleven (11) broad topics as given in the Table 2, which also includes comparison with paper topic distribution at NURETH-1 Conference (1980). According to this classification one paper may belong to more than one topic, if is identified as appropriate).

TOPIC	NURETH-15 (% of papers)	NURETH-1 (% of papers)
Generic TH (projects overview, safety and licensing philosophies, etc.)	5	4
Basic TH (numerical and analytical derivations & basic modeling)	11	27
NPP application – Design	2	4
NPP application – Safety & licensing including BEPU	12	3
CFD & CMFD	11	-
System TH code development	3	14
System TH code application (including V & V and coupling)	13	2
Basic Experiment	11	12
SET and ITF experiments	9	5
Non-Water cooled reactor application	11	28
Severe Accident	12	1
TOTAL	100	100

Table 2 – Broad technical topics of papers presented at NURETH-15 and comparison with papers presented at NURETH-1.

It can be observed that much less interest in 1980, compared with 2013, was devoted to Severe Accidents (soon after TMI, but before Chernobyl and Fukushima) and to CFD (powerful computers and computational techniques were not available). As expected, less interest in 1980 was devoted to NPP applications. However, there was (in 1980) more interest towards basic modeling. Looking at the total number of papers, the interest towards basic modeling (and numerics) has been kept in 2013. The interest towards basic experimentation has also been kept in 2013.

4. Conference Planning

A nearly three-years endeavor was completed for the organization of the Conference with the maximum effort (coordinated by the by the TPC Chair N. Aksan and by the Organizing Committee Chair A. Petruzzi) in the six months preceding the Conference event. Three aspects are synthesized in the sections 4.1 to 4.3.

4.1 Review process

The review process was conducted in three steps:

- ✓ Review of the Abstracts (about 700 abstracts were submitted)
- ✓ First-round of review process for the draft papers (about 500 draft papers were submitted)
- ✓ Second-round of the review process for the final paper (in case the first round of the review suggested a major revision of the draft paper).

About 200 reviewers, mostly members of the Technical Program Committee, contributed to the review process and to keep high the scientific-technical expectations of NURETH. Relevant contributions to the review process were given by:

- Boiling and Condensation Fundamentals: H. Anglart
- Multi-field Two-Phase Flow Modeling: N. Kolev
- Supercritical Fluids Thermal Hydraulics and Heat Transfer: W. Ambrosini
- Interfacial Area Transport (data base, modeling, measurement techniques): Chul-Hwa Song
- Fluid Flow, Heat Transfer and Micro and Nano-Scale Basic Phenomena: D. Bestion
- Natural Circulation and Passive Safety Systems and Phenomena: W. Marcum
- Sub-channel Fluid Dynamics and Heat Transfer: D. Novog
- Experimental Measurement Techniques and Flow Visualization: K. Umminger
- Computational Fluid Dynamics (DNS, LES, RANS, etc.): D. Lakehal
- Computational Multi-Fluid Dynamics: Y. Bartosiewicz
- Core Thermal-Hydraulics and Sub-channel Analysis: D. Aumiller
- Codes Development: T. Kozlowski
- Steam Generators Thermal-Hydraulics: J. Riznic
- Pressure Surges in Nuclear Power Plants: A. Schaffrath
- Accuracy, Sensitivity and Uncertainties Analysis: H. Glaeser
- Computational Fluid Dynamics V&V (DNS, LES, RANS, etc.): E. Baglietto
- Computational Multi-Fluid Dynamics V&V: V. Sanchez
- Core Thermal-Hydraulics and Sub-channel Analysis V&V: J. M. Le Corre
- Plant System Codes Validation: N. Popov
- Boiling and Condensation Heat Transfer: D. Lucas
- CHF and Post CHF Heat Transfer, Flooding and CCFL: L. Leung
- Containment Analysis: M. Andreani
- Instabilities and Nonlinear Dynamics: J. G. Andersen
- NPP Transients and Accidents Analysis: A. Prosek
- Safety of Sodium Cooled, RBMK and VVER Reactors: M. Bykov
- Integral Testing: A. Del Nevo
- BEPU Analysis and Challenges in Licensing: J. Misak
- Molten Core, Natural Convection and Physic-Chemical Phenomena, Modeling and Experiments: P. Kudinov
- Fuel Coolant Interaction, Modeling and Experiments: C. Vitanza
- Debris Bed Cooling: D. Paladino
- Severe Accident Analytical Activities: M. Naitoh
- Hydrogen and Fission Product Behavior: D. Todd

- Sodium Cooled Fast Reactors Design and Safety: F. Roelofs
- Advanced PWRs, Advanced BWRs, Advanced CANDU Reactors: P. Saha
- Gas Cooled Fast Reactors and Very High Temperature Reactors : J. P. Simoneau
- Lead and Lead-Bismuth Cooled Reactors: D. Tenchine

4.2 Poster and Student Sessions planning

Importance was given during the Conference preparation and conduct to the Poster and the Student Sessions. The papers (sixty-seven) presented in the poster sessions underwent the same review process as the papers presented in the oral sessions. The following initiatives were taken in order to increase the attention to the poster sessions:

- During the poster session there was no oral sessions taking place.
- The papers in the poster session were organized in 9 sub-sessions (similarly to the oral session) and one chair was assigned to each session. The chair of each poster session discussed (for about 10') the content of poster with each author.
- The following nine chairmen provided support to the poster sub-sessions:
 - S1 - Basic Thermal-hydraulics. Two Phase Flow and Heat Transfer Fundamentals, Including Experimental Thermal-Hydraulics and Instrumentation (1): Y. Hassan
 - S1 - Basic Thermal-hydraulics. Two Phase Flow and Heat Transfer Fundamentals, Including Experimental Thermal-Hydraulics and Instrumentation (2): D. Bestion
 - S2 - Code Development Including Numerics (SYS TH and CFD): H. Ninokata
 - S3 - Code V & V, Design and Operation of SETF Including Instrumentation: R.R. Schultz
 - S4 - Operation & Safety of Existing Reactors Including Code Assessment (final step of Validation) and Application: ITF and BEPU, Including Addressing of the Scaling (1): N. Aksan
 - S4 - Operation & Safety of Existing Reactors Including Code Assessment (final step of Validation) and Application: ITF and BEPU, Including Addressing of the Scaling (2): A. Prosek
 - S5 - Severe Accidents: D. Paladino
 - S6 - Other, Including Gen IV, Waste, Fusion: P. Saha
 - S7 - Student Poster: D. Guillen

Seventy (70) student papers were selected and organized in specific-student sessions. The student sessions were conducted in parallel with the oral sessions. NURETH-15 organizers encouraged the participation of students at the Conference by:

- Applying a reduced fee (see the web-site).
- Proposing specific awards (see below).

4.3 Conference Design

Three preparatory meetings of the Conference Steering Committee were held in Pisa to design and to finalize the NURETH-15 Conference and continuous contacts have been kept between the General Chair of the Conference (F. D'Auria) and the ANS THD Chair (X. Sun). The following scientists attended the preparatory meeting other than the General Chair, the Organizing Committee Chair (A. Petruzzi) and members of the Organizing Committee:

- N. Aksan
- D. Bestion
- J. C. Ferreri
- Y. Hassan
- B. Mavko
- H. Ninokata
- R.R. Schultz

Their contribution for the success of the Conference was decisive.

5. Awards

Twenty-seven (27) scientists were selected among about 6000 authors of NURETH papers and nominated NURETH Fellows. The criteria which were used for the selection of NURETH Fellows have been given in the NURETH-15 website. Those criteria were also agreed and endorsed by the ANS Thermal-Hydraulic Division.

The list of elected NURETH Fellows is provided in Table 3. Three of them (independent of their participation in the Conference) received a 'Special Award' in the occasion of NURETH-15 Conference (see also Table 3) and provided (actually, two of them) invited speeches in the occasion of the official dinner of the Conference (Florence, Palazzo Corsini). The ceremony for the NURETH Fellow awards was chaired by Prof. N. Todreas, Honorary Chair of NURETH-15. All NURETH-15 participants attended the ceremony.

AWARD	NAME	COUNTRY	NOTES
NURETH Fellow	D. Groeneveld, J. Riznic	Canada	
	J. M. Delhay	France	
	F. Mayinger, K. Rust ⁺	Germany	⁺ to the memory
	M. Akiyama ⁺ , H. Nariai, H. Ninokata, A. Sakurai [*]	Japan	⁺ to the memory; [*] not present at the award ceremony
	W-P. Baek, S.H. Chang ^{**}	Korea	^{**} not attending the Conference
	P. Kirillov [*]	Russia	[*] not present at the award ceremony
	N. Aksan, G. Yadigaroglu	Switzerland	
	S. Banerjee, S.B. Cheung, M. Corradini, Y. Hassan, L. Hochreiter ⁺ , M. Ishii, Jong Kim [*] , R.T. Lahey Jr. ^{**} , M. Podowski [*] , V.H. Ransom ^{**} , R.B. Sehgal, T. Theofanous ^{**} , N. Todreas	US	⁺ to the memory; [*] not present at the award ceremony; ^{**} not attending the Conference
Special NURETH-15 Fellow			
	F. Mayinger	Germany	
	H. Nariai	Japan	
	R.T. Lahey Jr. ^{**}	US	^{**} not attending the Conference

Table 3 – NURETH Fellows nominated in the occasion of NURETH-15 and Special NURETH-15 Award given to three NURETH Fellows.

The photo at the end of the ceremony, show the Fellows (present at the official Dinner) with the awarded plate, Figs. 1 and 2. Young students were invited to join the Fellow for the photo (Fig. 2).



Fig. 1 – NURETH Fellows present at the NURETH-15 Award Ceremony.



Fig. 2 – NURETH Fellows at the NURETH-15 Award Ceremony together with young students attending the Conference.

Three committees were formed to award the best oral paper, the best poster paper and the best student paper (three members, seven members and eleven members, respectively, please refer to the NURETH-15 website; chairs of the committees are mentioned in section 1 above). Difficult selection processes because of the quality of the papers ended with the awards in Table 4.

AWARD	PRESENTER NAME / PAPER No	COUNTRY	MAIN CRITERION
Best Oral paper			
	Prasser H.M. / 409	Switzerland	One of the best three oral papers in the conference
	Grishchenko D. / 599	Sweden	
	Barth T. / 280	Germany	
Best Poster paper			
	Muñoz-Cobo J. L. / 216	Spain	Scientific quality
	Hosokawa S. / 244	Japan	Visual quality
	Al Issa / 045	Germany	Answering questions
Best Student paper			
	Neiss C. / 085	France	Best paper
	Newlands K. / 165	UK	Oral presentation
	Lee J.H. / 231	Korea	Visual quality

Table 4 – NURETH-15 awards given to the oral, poster and student papers.

6. Invited Speakers and Special Topics Sessions

The apparent success of the Conference was due to a number of factors including the time slot available per each paper (in general 30' including discussion) and the discipline of all participants in satisfying the recommendations of organizers and in providing quality papers. An important role for the success is also due to the Invited Speakers. Two categories of Invited Speakers were proposed:

- Lecturer.
- Chair of selected Key Session.

The lecturers prepared papers which were presented during the Conference and the Chairs of selected Key Sessions prepared 'synopses' which were delivered (5') at the beginning of the Key Sessions. Both Invited Papers and Synopses are part of the Conference Proceedings.

The list of NURETH-15 Invited Speakers is given in Table 5.

INVITED SPEAKER CATEGORY	NAME	COUNTRY	NOTES
LECTURER	Groeneveld D.	Canada	
	Zhou Z.	China	Could not attend. His speech was delivered by a colleague
	Jamet D., Reocreux M.	France	
	Mayinger F.	Germany	Special Fellow Award
	Nariai H.*, Ninokata H.**	Japan	*Special Fellow Award; ** ANS THD, TAA Lecture
	Baek W-P.	Korea	
	Bykov M.	Russia	
	Yadigaroglu G.	Switzerland	
	Sehgal B. R.	Sweden	
	Banerjee S., Bilbao S., Corradini M., Nam Dinh	US	
KEY SESSION CHAIR	Leung L., Riznic J.	Canada	
	Bestion D.	France	
	Schaffrath A.	Germany	
	Cumo M., Petruzzi A.*	Italy	*The Chairs Session meeting at the end of the Conference was not held
	Ninokata H.	Japan	
	Aksan N.	Switzerland	
	Aumiller D., Hassan Y.*, Kim Jong**, Muftuoglu K., Schultz R. R., Todreas N.	US	*Adapted his Invited Lecture to the available time schedule; ** Speech delivered by a colleague

Table 5 – NURETH-15 Invited Speakers.

Special Topic Sessions were proposed and organized by volunteering scientists addressing a call published in the web-site of NURETH-15. The following Special Topics Sessions were implemented (simplified titles are adopted below not in the order of planning):

- 1) Thermal-Hydraulics of SMR (Main Proponent: R. Martin)
- 2) Fukushima Event (Main Proponents: F. Kasahara and A. Hotta)
- 3) Multiphase CFD (Main Proponent: E. Baglietto)
- 4) Multi-scale and Multi-physics (Main Proponent: A. Manera)
- 5) CASL Project (Main Proponent: J. Buongiorno)
- 6) OECD/NEA W-GAMA activities (Main Proponent: T. Nitheanandam)
- 7) Embarking Countries (Main Proponent: M. Modro)
- 8) Natural Circulation (Main Proponent: N. Aksan)
- 9) Supercritical Water-cooled Reactors (Main Proponent: N. Aksan)
- 10) Full Spectrum LOCA Evaluation Model (Main Proponent: C. Frepoli)
- 11) Design of Experimental Matrices (Main Proponent: R. R. Schultz)
- 12) Rod Bundle Flows (Main Proponent: E. Merzari)
- 13) FONESYS Network (Main Proponent: D. Bestion)

The Special Topic Sessions gathered the most engaged scientists in the concerned topics at the NURETH-15 Conference. The Student Session can also be seen as a Special Topic Session. In this case, key responsible for the session organization was J. C. Ferreri.

7. Pre-and Post-Workshops

About twenty pre- and post-Workshops were proposed during the planning of the NURETH-15 Conference. The implementation of the workshops was connected with a minimum number of registered participants at the beginning of the Conference. Owing to reasons that have not been investigated it was possible to hold seven Workshops with an average attendance of 10 participants per Workshop (with the noticeable exception of the first Workshop in the list below only reserved to invited Speakers) :

- 1) Pre-Workshop: Teaching in Thermal-Hydraulics (Main Organizer: Prof. M. Giot).
- 2) Pre-Workshop: Deterministic and Probabilistic Safety (Main Organizer: M. Zimmerman).
- 3) Pre-Workshop: Use of Gothic (Main Organizer: D. Todd).
- 4) Pre-Workshop: CHF (Main Organizer: L. Leung).
- 5) Pre-Workshop: BWR Stability (Main Organizer: J. Vedovi).
- 6) Pre-Workshop: BEPU approach in licensing (Main Organizer: J. Misak).
- 7) Post-Workshop: Scaling (Main Organizer: C. Frepoli).

8. Final Remarks

A complex Conference results from the notes provided in the present document . The engagement and the dedication other than of authors of the about 500 papers, of the TPC members, of reviewers, of Session Chairs, of Invited Speakers, of Awards Committees Members and Chairs, of the Special Session proponents, of the Sponsoring Organizations, of Organizers of Pre- and Post-NURETH-15 Workshops, of the Organizing Committee, made possible the success of the NURETH-15 Conference. The contribution of all of them is gratefully acknowledged.

Follow-up activities to be finalized during the forthcoming months include:

- Journal publication of Special issues from NURETH-15 Conference, to be coordinated by the Publication Committee.
- Invited Speakers contributions with possible publication of a devoted booklet or of a Journal Special Issue.
- Lessons learned and perspectives from the papers published in the Proceedings. To this aim the Session Chairs will be contacted with the request to send their impressions from the chaired session(s).
- Preparation of a NURETH-15 Panel Session at the ANS Winter Meeting 2013.
- Transferring to the ANS THD and to the Organizers of the NURETH-16 Conference, the NURETH-15 material with main reference to the documentation supporting the nomination of NURETH Fellows.