CONUSAF

(to be established at TAMU – College Station – Texas – USA)

UNIPI STARTING REFERENCE DB

F. D'Auria

Founding Meeting of CONUSAF:

CONSORTIUM OF USERS OF THERMAL-HYDRAULICS COMPUTATIONAL TOOLS FOR NUCLEAR REACTOR SAFETY AND DESIGN

University of Pisa – Aula Magna Scuola di Ingegneria, July 26-27, 2018

LIST OF CONTENT &

"CONNECTING PRESENTATIONS"

1) MOTIVATIONS FOR CONUSAF (at that time FONESYS-UG)
given at related Meeting held on March 2, 2018 in College Station, Texas

2) IDEAS FOR THE CONDUCT OF CONUSAF ACTIVITIES
also discussed in College Station

3) SAMPLE-STARTING TOPICS FROM UNIPI

IDEAS FOR THE CONDUCT OF CONUSAF ACTIVITIES

STARTING CLASSICAL/ESTABLISHED RESEARCH ***(including revisiting old issues with recent tools and knowledge) &*** **NEW-FRONTIER RESEARCH** ***(or addressing new needs and meeting new requirements)***

CONSTITUTING A DB OF REFERENCE MATERIAL* BY CONUSAF FOUNDING INSTITUTIONS; ***CONUSAF members are expected to benefit and questioning***

**** Openly available literature (power point and text documents).***

SAMPLE STARTING TOPICS FROM UNIPI

1) **BEPU (established and new frontier)**
2) **V&V&C (new frontier)**
3) **SCALING (established)**

in addition:

4) THERMAL-HYDRAULIC BOOK (established and new frontier)

5) 116 PHENOMENA (established and new frontier)

SAMPLE STARTING TOPICS FROM UNIPI 1 of 5

University of Pisa
DESTEC-GRNSPG
Nuclear Research Group in San Piero a Grado (Pisa) - Italy

BEPU STATUS AND PERSPECTIVES

F. D'Auria+

+acknowledged (next slide)

MAY 13-18, 2018, LUCCA, ITALY
BEPU 2018
BEST ESTIMATE PLUS UNCERTAINTY INTERNATIONAL CONFERENCE
Multi-Physics Multi-Scale Simulations with Uncertainty

SAMPLE STARTING TOPICS FROM UNIPI 2 of 5

University of Pisa
DESTEC-GRNSPG
Nuclear Research Group in San Piero a Grado (Pisa)- Italy

INTRODUCING V&V&C

IN NUCLEAR THERMAL-HYDRAULICS

F. D'Auria

M. Lanfredini

ASME Verification and Validation Symposium (V &V 2018)

Hyatt Regency
Minneapolis, (MN, US) · May 16-18, 2018

SAMPLE STARTING TOPICS FROM UNIPI 3 of 5

University of Pisa
DESTEC-GRNSPG
Nuclear Research Group in San Piero a Grado (Pisa) - Italy

SCALING IN SYSTEM THERMAL-HYDRAULICS APPLICATIONS TO NUCLEAR REACTOR SAFETY AND DESIGN:

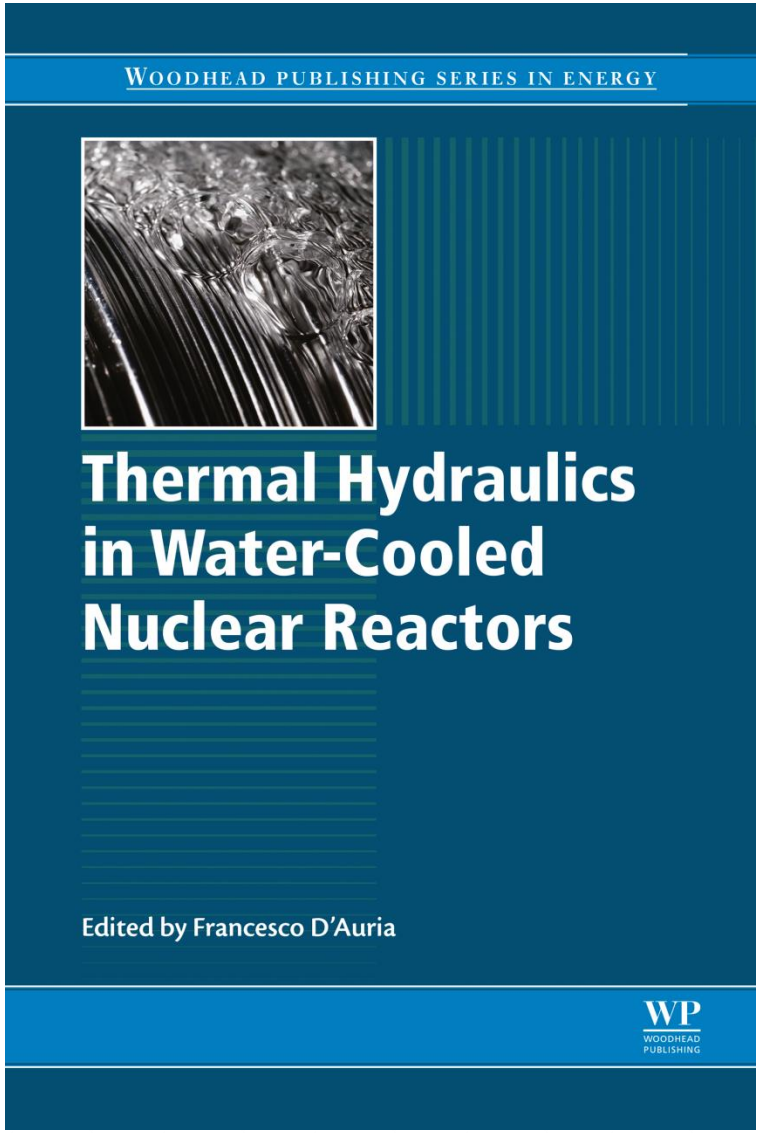
A STATE OF THE ART REPORT (OECD/NEA/CSNI S-SOAR)

LEAD AUTHORS: Bestion D. (CEA, Grenoble, France), D'Auria F. (UNIPI, Pisa, Italy, Editor), Lien P. (NRC, Washington D.C., US), Nakamura H. (JAEA, Tokai-Mura, Japan)

CONTRIBUTORS: Austregesilo H., Skorek T. (GRS, Garching, Germany), Bae B.U., Choi K.Y., Kim K.D., Moon S.K. (KAERI, Daejeon, South Korea), Martinez-Quiroga V., Reventos F. (UPC, Barcelona, Spain), Mascari F. (ENEA, Bologna, Italy), Schollenberger S., Umminger K. (AREVA, Erlangen, Germany), Reyes J.N. (OSU, Corvallis, Or, US), Rohatgi U.S. (BNL, New York, US), Wang W., Zaki T. (NRC, Washington D.C., US)

OECD/NEA/CSNI 19th Plenary Meeting of the Working Group on Analysis and Management of Accidents (WGAMA)
OECD Conference Centre, 2, rue André Pascal, 75016 Paris (F)
September 20-23,2016

SAMPLE STARTING TOPICS FROM UNIPI 4 of 5



SAMPLE STARTING TOPICS FROM UNIPI

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Thermal-hydraulic phenomena for water cooled nuclear reactors

N. Aksan[a], F. D'Auria[b,*], H. Glaeser[c]

[a] Scientific Consultant, Haldenstrasse 35, CH-5415 Nussbaumen, Switzerland
[b] DESTEC/GRNSPG, University of Pisa, Via Livornese 1291, San Piero a Grado, 56100 Pisa, Italy
[c] Consultant, Herbststrasse 9, 85386 Eching, Germany

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ABSTRACT

Nuclear Reactor Safety (NRS), Deterministic Safety Assessment (DSA) and Accident Analysis (AA) constitute the general framework for the topic of the present paper. The class of Water-Cooled Nuclear Reactors (WCNRs) is concerned. This includes most of the nuclear reactors in operation, under construction or in advanced design stage. The required licensing process for those reactors, are further necessary elements to establish the context of the performed activity.

Best Estimate (BE) system thermal-hydraulic codes are adopted to demonstrate the safety of WCNR based on AA, namely focusing on the class of Design Basis Accidents (DBAs). On the one hand, the validation of BE codes is a necessary step to prove their applicability to calculate accident scenarios. On the other hand the knowledge of accident scenarios is a requirement for the design and the operation of WCNR. The validation of BE codes and the knowledge of accident scenarios needs the identification and the characterization of Thermal-hydraulic Phenomena (T-HP).

A list of 116 T-HP is derived in the present paper, based on the documents issued in the last three decades by the Committee on the Safety of Nuclear Installations of Nuclear Energy Agency of The Organization for Economic Cooperation and Development (OECD/NEA/CSNI) and by the International Atomic Energy Agency (IAEA). The T-HP list includes the consideration of Separate Effect Tests (SET) and Integral Effect Tests (IET) relevant in Reactor Coolant System (RCS) and Containment of WCNRs. A dozen WCNR types are considered and include Pressurized Water Reactors (PWRs), Boiling Water Reactors (BWRs), Russian design reactor types (e.g. VVER-440, VVER-1000 and RBMK), pressure tube heavy water reactor designs in Canada (CANDU) and in India (PHWR) and so-called 'advanced' reactors (in the text of this paper, they are sometimes assigned as "New Reactors"), which are also equipped with passive systems (for instance, AP-1000 and APR-1400 designed in US and Korea, respectively).

Each T-HP can be characterized by one or more parameters or variables which are part of numerical models and constitute calculational results from system codes. A cross link process can be established between T-HP, parameters and DBA scenarios. The basis for the process and selected cross-link examples are provided and discussed.

A variety of applications for the T-HP list is envisaged in nuclear thermal-hydraulics. Insights are given in the paper in relation to the use of phenomena: a) to address the scaling issue; b) to distinguish between constitutive equations part of the balance equations and 'special models' in BE system codes; c) to prioritize research in nuclear reactor thermal-hydraulics.