FHR Integrated Research Project (IRP-2) Workshop 2

FHR Benchmark Workshop

Thermal Hydraulics Working Group Agenda
Clark Kerr Campus – Krutch Theatre
Berkeley, California
April 14-15, 2016

Thermal Hydraulics: The focus of this working group is on benchmarking thermal hydraulic phenomena in FHRs, specifically passive decay heat removal, salt overcooling and freezing, and enhanced heat transfer structures.

Day 1: Thursday, April 14, 2016 (*Krutch Theatre)*

10:40 – 11:00 **Session 1: THWG Scope Definition**
Facilitators: Charalampos Andreades, James Kendrick

Welcome and overview of discussion structure and high level goals/outcomes.

11:00 – 12:00 **Session 2: FHR University Research – Thermal Hydraulics**
Facilitators: One person from following universities: UCB, UNM, UW, OSU
James Kendrick (UCB)
Louis Chapdelaine (UW)
Joel Hughes (UNM)
Quiping Lv (OSU)

Brief overview of the current FHR thermal hydraulics research within both FHR IRPs. This is a good opportunity to discuss current research, gaps in research that can be covered in the future, and to identify research programs that can be utilized in the benchmarking exercises. GT may not have dedicated TH research, but this is a great opportunity to hear a status update on the TH PIRT-Like Workshop planning efforts.

12:00 – 1:15 **Lunch – All WGs**
Lunch Talk: SINAP TMSR program update

1:15 – 2:00 **Session 3: SINAP TH Experiments and Modelling Progress Update**

Updates on SINAP's TH-related research efforts, with particular focus on salt thermophysical properties studies and uncertainties reduction, and work on the TMSR-SF0 simulator facility.

2:00 – 2:45 **Session 4: Separate Effects Test (SET) Research Programs**
Facilitators: Lakshana Huddar, Joel Hughes, Kazi Ahmed

Provide more detail on the SET programs at UCB and UNM, as well as define benchmark needs for this area. Clear research goals will be to provide support for oil-to-salt similitude, clear definition of salt thermophysical properties and their uncertainties, and better understanding of FHR-specific phenomena (heat transfer in low-Pr fluids, salt-to-salt heat exchangers with enhanced heat transfer, salt freezing, etc.).

2:45 – 3:00 **Break**

3:00 – 3:15 **<u>Session 5:</u> TMSR-SF1 Thermal Hydraulics Design**
Presented by Dr. Chong Zhou (SINAP)

3:15 – 4:00 **<u>Session 6:</u> Integral Effects Test (IET) Research Program**
Facilitators: Chris Poresky, James Kendrick

Provide more detail on the CIET program at UCB and benchmarking possibilities. Begin discussion in earnest on how benchmarking using CIET can proceed. CIET will be a natural place to start as it is within the university research of the IRPs, and will be good benchmarking practice for eventual benchmarking of the TMSR-SF0 and TMSR-SF1.

4:00 – 5:00 **<u>Session 7:</u> Additional Concerns**
Facilitators: Chris Poresky, James Kendrick

Discuss important research topics and other FHR TH phenomena that need to be covered. Topics include: Verification, validation, and uncertainty quantification (VVUQ); radiation heat transfer in molten salts; 3D-CFD for complex structures (outlet plena, pebble-beds, etc.); liquid-fueled reactor phenomena; and conjugate heat transfer.

5:00 **Adjourn**

Day 2: Friday, April 15, 2016 (*Krutch Theatre)*

Session 2

9:00 – 9:15 **<u>Session 8:</u> "Overview of T/H Benchmarking and Validation for Industrial Application"**
Presented by Yixing Sun (Westinghouse)

9:15 – 10:00 **<u>Session 9:</u> THWG Structure**
Facilitators: Charalampos Andreades, James Kendrick
Determine the structure of the working group. This includes chairs of the group, discussing important items for the working group charter, who should be members on the working group advisory board, how work will be delegated for optimal performance, and other topics.

10:00– 10:15 **Break**

10:15 – 11:00 **<u>Session 10:</u> THWG Path Forward**
Facilitators: Charalampos Andreades, James Kendrick

Discussion of the practical operation of the working group, assigning work, setting a timeline for the completion of initial benchmarking activities, and deliverables.

Read-ahead Materials
Go through reference material to identify applicable benchmarks, methodology to FHR (e.g., IAEA Tecdoc 1694, VERA-CS, NGNP, NRC ARDC, EBRII)