Lawrence Livermore National Laboratory
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SUBJECT: Report of Foreign Travel for the Zero Power Reactor Task Force Meeting and the 2023 Working Party on Nuclear Criticality Safety (WPNCS)

DATE: November 1, 2023

TO: Dr. Angela Chambers, Nuclear Criticality Safety Program Manager, National Nuclear Security Administration / NA-ESH-21

FROM: Catherine Percher (LLNL)

MEETING TITLE: Two meetings were attended during this trip:
1. Zero Power Reactor Task Force Meeting
2. Working Party on Nuclear Criticality Safety, WPNCS 2023

MEETING LOCATION: The meeting locations for the two meetings were:
1. ZPR Task Force: Institut de Radioprotection et de Sûreté Nucléaire (IRSN), 31 Av. de la Division Leclerc, 92260 Fontenay-aux-Roses, France
2. WPNCS: Organization for Economic Cooperation and Development, Nuclear Energy Agency, 46 Quai Alphonse Le Gallo, Boulongne-Billancourt, Paris, France, 92100

MEETING DATES: ZPR Task Force: June 22-23, 2023
WPNCS: June 26-30, 2023

LLNL ATTENDEES ON BEHALF OF NCSP: Catherine Percher

MEETING PURPOSE:

ZPR Task Force: The ZPR Task Force is an official activity of the Organization for Economic Cooperation and Development (OECD) Nuclear Energy Agency (NEA) Nuclear Science Committee (NSC) and was formed in response to the pronounced reduction in zero power reactor (otherwise known as critical and reactor physics experiment) facilities worldwide. The objective of the task force, made up of international specialists, was to review the projected needs for new reactor physics validation data and recommend a consensual course of action for acquiring such data, including minimal functional specifications of the needed facilities and expertise. C. Percher is an invited expert participant on the task force. The workshop brought together representatives from international stakeholder communities, including research, industry, regulators, and government to discuss a recommendations for ZPR facilities and identify needed validation data. In the six months before the meeting, task force members had interviewed ZPR operators, data users, experimentalists, and data evaluators, and the interview key points were presented and discussed. C. Percher gave a presentation regarding criticality safety validation and the usage of the International Criticality Safety Benchmark Evaluation Project (ICSBEP) Handbook and highlighted outstanding integral data needs for the NCS community. The agenda for the meeting is provided in Attachment 1.

WPNCS: C. Percher is one of six official United States Delegates to the WPNCS and is a voting member of the working party. During the week, she attended the subgroup (SG) working groups for SG-10 (Nuclear Data Uncertainties Quantification on Spent Fuel Inventory), SG-11 (Bias and Correlated Data), and SG-12 (Used Nuclear Fuel Decay Heat). She also attended the Technical Review Group for the Spent Fuel Composition (SFCOMPO) project. SG-11 is attempting to quantify the effects that experiment correlations (such as from benchmarks from similar experimental programs at one facility) ultimately have on the calculated k_{eff} code bias determined for a criticality safety validation. The results of this subgroup are highly relevant to the NCSP, both from the benchmark evaluation side and the criticality code and validation side. While the spent fuel-focused subgroups are less directly applicable to NCSP work, many of the discussions held during the subgroups have relevance to integral experiments and benchmarking.

The WPNCS meeting was held on Friday, June 30, and she presented both the ICSBEP report and the US country report on nuclear criticality safety. There is considerable interest from the working party in NCSP activities, particularly critical experiment activities to support NCS. The WPNCS meetings allow for an international forum to share knowledge and resources important to the practice of criticality safety.

MEETING BENEFITS TO THE NCSP:

ZPR Task Force: The ZPR Task Force was created to articulate the international needs (focused on reactor physics) for critical experiments facilities. The NCSP operates two of the last few remaining of these facilities in the world and understanding the international needs (and by extension, the US national needs) will provide justification for experiments and capabilities in the future. One capability that was discussed in detail was a horizontal split table, which is a long-standing technical gap identified by NCSP in its Mission and Vision document.

WPNCS: The WPNCS provides an international forum for cooperation on nuclear criticality safety problems with OECD member countries. The WPNCS is the international organization responsible for the administration of the International Criticality Safety Benchmark Evaluation Project (ICSBEP), which is directly relevant to NCSP IE and IP&D mission as it is the main way integral data generated by NCSP is disseminated to the nuclear criticality safety and nuclear data communities. The WPNCS also establishes subgroups to research problems of relevance to participants from member countries.

PURPOSE OF TRAVEL:

C. Percher was an invited subject matter expert to the ZPR Task Force meeting and was asked to provide a presentation on criticality safety validation needs and the ICSBEP project. She is also one of six official delegates to the WPNCS and provided a presentation about the status of ICSBEP and gave the US criticality safety-focused country report at the WPNCS meeting.

AUSPICES: This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

ATTACHMENT:
1. Agenda, ZPR Task Force Meeting
2. Agenda, WPNCS Meeting

DISTRIBUTION:

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Attachment 1: ZPR Task Force Meeting Agenda

Thursday, 22 June 2023 – Lessons Learned and Needs			
ID	**Paris Time [CEST]**	**Agenda Item**	**Duration**
I	09:00	Registration on site Option to test Microsoft Teams connection for remote participants	00:15
II	**09:15**	**Welcome**	**00:20**
		- P. Giordano, Nuclear Safety Research Director, Institut de Radioprotection et de Sûreté Nucléaire (IRSN)	
		- T. Ivanova, Head of Division of Nuclear Science and Education, OECD Nuclear Energy Agency (NEA)	
III	**9:35**	**Presentation of NSC/WPRS Task Force on Zero Power Reactors** *R. Jacqmin, CEA (FRA)* *Chair of NSC/WPRS Task Force on Zero Power Reactors*	**00:20**
1	**10:00**	**Session 1: Lessons learned from the operation of ZPRs** *Chair: B. Merk*	
1.1	**10:00**	Summary of Interviews *NEA Secretariat*	00:20
1.2	**10:20**	Presentation User/Research - reactor experiments *D. Bernard, CEA (FRA)*	00:25
1.3	**10:45**	Presentation User/Research – shielding *T. Miller, ORNL (USA)*	00:25
	11:10	*COFFEE BREAK*	*00:20*
1.4	**11:30**	Presentation Operator/Research *"Canada's ZPR Experience: ZED-2", J.E. Atfield, B. Sur and L.R. Yaraskavitch, CNL (CAN)* *"Status of New STACY", G. Satoshi, JAEA (JPN)*	00:25
1.5	**11:55**	Presentation User/Research - criticality safety *C. Percher, LANL (USA)*	00:25
1.6	**12:20**	Invited Presentation Curator - data preservation, benchmarks *P. Blaise, CEA (FRA) and M. DeHart, INL (USA) [REMOTE]*	00:25
	12:45	*LUNCH BREAK*	*01:00*
1.7	**14:00**	Discussion	00:30
1.8	**14:30**	Wrap-Up Session I *R. Jacqmin, CEA (FRA)*	00:20

2	**14:50**	**Session 2: Projected needs related to new reactor physics experimental data and more** *Chair: B. Sur*	
2.1	**14:50**	Summary of Interviews *NEA Secretariat*	00:20
2.2	**15:10**	Invited Presentation - User/Industry *S. Franklin, NIRO (GBR) [REMOTE]* *B. Tomer, INL (USA) [REMOTE]*	00:25
2.3	**15:35**	Presentation - Regulator, TSO *S. Pignet, IRSN (FR)*	00:25
	16:00	*COFFEE BREAK*	*00:20*
2.4	**16:20**	Presentation - Operator/Research *A. Hawari, NCSU (USA) and L. Snoj, IJS (SLO) [REMOTE]*	00:25
2.5	**16:45**	Presentation - User/Research *D. Bernard and P. Leconte, CEA (FRA)* *A. Haghighat, Virginia Tech (USA) [Remote]*	00:25
2.6	**17:10**	Presentation - Education/Research *A. Buijs, McMaster University (CAN)* *V. Lamirand and O. Pakari, EPFL (CHE)*	00:25
2.7	**17:35**	Discussion	00:35
2.8	**18:10**	Wrap-Up Session II *R. Jacqmin, CEA (FRA)*	00:20
IV	**18:30**	**Closing Day 1**	
V	***19:30-22:00***	***Workshop Dinner***	

Friday, 23 June 2023 - Future			
	Paris Time [CET]	**Agenda Item**	**Duration**
VI	**09:00**	**Welcome Day 2 (and Recap Day 1)** *R. Jacqmin, CEA (FRA)*	**00:20**
3	**09:20**	**Session 3: New capabilities and cooperation models** *Chair: T. Miller*	
3.1	**09:20**	Summary of Interviews *NEA Secretariat*	00:20
3.2	**09:40**	Envisioning new experimental capabilities - Part 1 *B. Merk, University of Liverpool (GBR)*	00:30

		"Status of Critical Assembly (KUCA) and Training Reactor (UTR) in Japan", *C. H. Pyeon, Kyoto University (JPN) [REMOTE]*	
3.3	**10:10**	Envisioning new experimental capabilities - Part 2 *J. Wagemans, SCK-CEN (BEL) [REMOTE]* *M. Kostal, CV Rez (CZE) [REMOTE]*	00:30
	10:40	*COFFEE BREAK*	*00:20*
3.4	**11:00**	Organization and cooperation models - Part 1 *K. Tsuji, JAEA (JPN) [REMOTE]*	00:20
3.5	**11:20**	Organization and cooperation models - Part 2 *R. Garbil, European Commission*	00:20
3.6	**11:40**	Organization and cooperation models - Part 3 *G. Bignan, CEA (FRA) [REMOTE]*	00:20
3.6	**12:00**	Discussion	00:30
	12:30	*LUNCH BREAK*	*01:00*
3.7	**13:30**	Wrap-Up Session III *R. Jacqmin, CEA (FRA)*	00:30
VII	**14:00**	**Wrap-Up & Conclusions Workshop Days 1&2** *R. Jacqmin, CEA (FRA)*	**01:00**
VIII	**15:00**	**Closing Day 2**	

Attachment 2: WPNCS Agenda

Friday 30 June – WPNCS Meeting			
Duration	**Time (CEST)**	**Topic**	**Speaker**
Opening session			
	9:00	Welcome, opening remarks	A. Vasiliev (chair)
	9:05	Self-introduction of participants	All
Administrative items			
	9:15	Vice-chair	A. Vasiliev (chair)
	9:20	Adoption of the agenda	J.-F. Martin (NEA Secretariat)
	9:25	Approval of the summary record of previous meeting	J.-F. Martin (NEA Secretariat)
	9:30	Review of actions from the previous meeting	A. Vasiliev (chair)
Update from NSC activities			
	9:35	Update from the Nuclear Science Committee	T. Ivanova, Head of Division, NEA/SCI
	9:55	Update from the Nuclear Science Committee Programme Review Group	C. Valot (NEA)
0:15	**10:25**	**Group picture and Coffee Break**	
Update from WPNCS activities			
	10:40	Subgroup 9: Transport in random geometries	A. Zoia (FR)
	11:00	Subgroup 10: Nuclear data uncertainties quantification on spent fuel inventory	C. Carmouze, R. Ichou (FR)
	11:20	Subgroup 11: Bias and Correlated Data	A. Hoefer (DE)
	11:40	Subgroup 12: used nuclear fuel decay heat	D. Rochman (CH)
01:00	**12:00**	**Lunch break**	
Update from activities (ctd)			
	13:00	Subgroup 13:	A. Vasiliev (chair)
	13:20	SFCOMPOTRG	G. Ilas (US)
	13:40	ICSBEPTRG	C. Percher (US)
New proposals for activities			
	14h00	Presentation of proposals	
	14h30	Mandate	
Workshops, meetings and conferences			
	15:00	ICNC2023	S. Gunji (JP)
	15:10	ICNC2027	G. O'Connor (UK)
00:15	15:20	Coffee Break	
National Reports (~40 minutes)			
	15:35	Country 1	
		Country 2	

		Country 3…..	
	16:15	Update on the activities Working Group on Fuel Cycle Safety	WGFCS Chair, vice-chair, or secretariat (presenter TBC)
	16:35	Update on ANS-8 standards and ISO NCS standards	D. Bowen (USA)
Closing Session			
	17:00	Date and place of next meeting	A. Vasiliev (chair)
	17:10	Any other business	All
	17:20	Review of actions and summary	J.-F. Martin (NEA Secretariat)
	17:30	**Adjourn**	