

Draft Summary Report

(Welcome address)

Gim Gulliford, the Head of the Nuclear Science Section, NEA, welcomed the participants of the 14th LFR provisional SSC meeting which was composed of official and substitute members from EU, a Russian substitute member, and a Chinese substitute observer. He mentioned that he had not been directly involved in this part of the GIF before, but the nuclear science programs of the NEA had many activities supporting the development of advanced nuclear systems, and several was associated with the lead-cooled reactor systems. He also stressed that interest in LFR systems might grow in the future because of its potential for inherent safety features to absorb the decay heat following an emergency shutdown, which became of course a topic of increased interest since the Fukushima accident. He expected that although there could be many technical challenges, e.g. corrosion-related issues, these would be overcome particularly through international collaborations such as the GIF.

In the self-introduction that followed the welcome address, Mr. Luca, who temporarily participated as a EU's substitute member, and has also worked for the GIF as a member of the RSWG, mentioned that some budget cuts were expected due to the international economic crisis and JRC has pursued its optimization activities at the moment. He also added that EU hasn't made decision yet to replace the successor of the former EU member, Didier Haas, but the current situation would be hopefully resolved in the following months. Mr. Tao, Chinese substitute observer, expressed that the China intend to join as a member the GIF LFR SSC, and the CAS (Chinese Academy of Science) had already submitted the application to the Ministry of Science and Technology of the China and also the Chinese Atomic Energy Authority to get an approval to sign the LFR MoU within 2013.

Opening remarks and discussion of agenda:

Mr. Alemberti, the Chair, Ansaldo Nucleare, representing EURATOM, thanked the NEA as host of the meeting and gave the opening address by stressing that the main purposes of the meeting were to draft the White Paper on LFR safety as requested by RSWG, and the LFR-SDC as requested by the PG as well as to prepare the final version of the System Research Plan. The draft agenda was adopted with small modifications, because Japanese member,

US and Korean observers couldn't attend the meeting due to budget restraint and date of the meeting conflict. "The Japanese and US statuses on LFR development" have been presented by the chair, whereas "the Korean status on LFR development" has been presented by the TS. The agenda, "White Paper on LFR Safety", was moved to the morning session of the second day and the discussion on the LFR TRU (Technical Road map Update) was added on the same day.

Approval of the last meeting summary report:

The 13th provisional SSC draft summary record, distributed by the TS, was approved with minor corrections. The list of actions was reviewed, and most of the actions had been completed. In this session, it was noted that it was important to see if the development of the LFR SDC has been object of a mandate from the PG or not. The Chair and TS would check this in more detail, including the SDC documentation status of the other GIF SSCs.

(National status on LFR development)

EURATOM: Mr. Alemberti presented the EU's status on LFR development. The LEADER project has just completed its activities on September 30th 2013. Its main objectives were to analyze the previous design generated by the ELSY project in order to reach an improved ELFR (European Lead Fast Reactor) configuration and to perform a conceptual design of scaled down facility with respect to the reference plant, the 300MWth ALFRED (Advanced Lead Fast Reactor European Demonstrator). A new project, called ARCADIA (Assessment of Regional Capabilities for new reactors Development through an Integrated Approach), was newly launched to implement the ALFRED project in Romania. ARCADIA project will last from 2013 to 2016. The first draft of consortium agreement for the ALFRED, CONALF, has been circulated to the EU's LEADER consortium organizations, and its signature would be expected before the end of 2013. Both the LFR roadmap towards industrial deployment and the overall LFR road map by 2050 were developed in the frame of LEADER with the future vision to set up a First-Of-A-Kind (FOAK) commercial 600 MWe ELFR by 2045.

JAPAN: In the absence of the Japanese delegate, Mr. Chair presented the Japanese status on LFR development, which was mainly focused on the recent changes of nuclear energy policy in Japan especially after the accidents of Fukushima Daiichi Nuclear Power Plants. After the Liberal Democratic Party (LDP) won the 46th House of Representatives election in December 2012, Japanese government has reconsidered the Policy of Zero Nuclear Energy by 2030's. The new regulatory requirements for commercial power reactors have got into force on 8th July 2013. The Japan Atomic Energy Agency (JAEA) will be reformed soon to enforce the operation of prototype SFR Monju. The development of the ADS has been considered crucial in back-end of fuel cycle by the government.

RUSSIAN FEDERATION: Mr. Ulyanov presented the results of the Russian LFR development in the light of approaches for solving problems of lead coolant technology. The first heavy liquid metal (Pb-Bi) coolant test facility has started as early as in 1951, and two nuclear submarines with Pb-Bi coolant were also constructed in 1963 and 1972, respectively. The developments of the first civil nuclear reactors with Pb-Bi and Pb coolants, SVBR-100 and BREST-OD-300, were underway. The first Pb-Bi submarine accident was caused by melt-down of fuel elements in the reactor core due to the heat exchange deterioration by slag deposits. The various research results and provisions from the Russian experiences with the LBE, which included the purification of the coolant and the surfaces of the circuit, the requirements specified for the coolant purification filter, the coolant re-use, etc. were suggested in order to prevent the deposits by hydrogen-containing gaseous mixtures. Maintaining a pre-determined oxygen potential of the coolant was also considered to be important in order to ensure the anti-corrosion and anti-erosion protection of structural materials during the whole operation of a reactor facility.

U.S.A.: In the absence of the US delegate, Mr. Chair also presented the national status of LFR development on USA, consisting of an overview of past efforts related to SSTAR design and ongoing research activities at universities, national laboratories, and industry. The Gen4 Energy, the former Hyperion Power Group (HPG), was recently awarded funding from the US DOE for advanced reactor R&D to conduct the research and development on natural circulation designs for advanced nuclear reactors that utilize a lead bismuth coolant. The project will develop the computer models that will help visualize natural circulation flow and integrate it into safe, reliable reactor designs.

R.O.K.: In the absence of the Korean delegate, the TS presented national status of LFR Development on Korea. In the PEACER fuel cycle, an advanced pyroprocess, called PyroGreen, was adopted for the fuel fabrication and fission product separation, and the high level of the nuclear spent fuel waste could be lowered to low-intermediate level, i.e. WIPP site condition. To validate the operability and safety of PEACER, the HELIOS (Heavy Eutectic liquid metal Loop for the Integral test of Operability and Safety) was constructed in 2005. From its long term (40 days) tests, it was assured that the natural circulation was sustained and a reactor cooled by natural circulation could be built and operated. Korea also suggested the conceptual design of Small Modular Reactor, URANUS, which was characterized by its modularization of each component, 20 years of refueling cycle, and its transportability by a large vehicle. In the discussion that followed the presentation, the verification of MARS-LBE code with NEA LACANES benchmarking program was addressed by the TS, but more detailed information was requested for the alumina containing-corrosion-resistant material development.

China: Mr. ZHOU presented the lead-based fast reactor programs in China by introducing the CLEAR conceptual design and its related R&D activities. The China has long-term national LFR development programs of CLEAR series and a series of experimental support programs, called KYLIN. The preliminary engineering design and safety analysis of the CLEAR-I (Research Reactor) has started in 2013, and KYLIN-III (Reactor Core Integral experimental platform) construction and its components fabrication were underway to develop the LBE technology and support the construction of CLEAR. The detailed design and licensing of the CLEAR-I would be completed around 2015, and its construction would be started around 2016-2017. It was stressed that in the CLEAR reactor design and construction activities, international cooperation on reactor design and technology R&D was welcome.

(Report from GIF PG/EG Meeting in Beijing)

The TS reported on the summary of the PG and EG meeting results in Beijing. It was emphasized that, in preparing an updated technical road map for the next decade as one of the Strategic Planning activities, one of the most hot issues was the timelines of the development for the different systems in particular the viability phase, and the PG asked the TF in charge to consult once more with the Chairs of the SSC to clarify any issues with the development timelines. Concerning the Safety Design Criteria of the SFR, the PG agreed to inform separately MDEP and the NEA CNRA WGRNR of the publication of the SDC “phase 1” report and giving them the possibility to comment.

(White Paper on LFR Safety as requested by RSWG (discussion))

Mr. Ammirabile presented the Risk and Safety White Papers (WPs) with respect to the ISAM methodology for the Gen-IV concepts. The objective of these WPs is to improve the understanding with SSCs so that a common vision about the safety of Gen-IV system could be brought forward to GIF Expert Group. He also stressed that the WPs for each Gen-IV systems would be living documents to be updated regularly and explained every section of the White Paper template.

After Mr. Ammirabile’s presentation, the draft version, prepared by Mr. Alemberti, was reviewed at the meeting. As already agreed at the previous meeting, the draft version of the LFR WP has been developed having as a reference ALFRED as an example of the application of the ISAM methodology. However, it was agreed that the present version of the draft is preliminary and an integrated version would be drafted by the Chair. The version would be sent to Mr. Ammirabile as well as the SSC members and observers for review [Action 14.1].

(Review of LFR-SRP)

The draft version of the LFR SRP was reviewed at the meeting. In its final stage of completion, it was agreed that some of the parts still needed to be reinforced. To do this, US, China, Russia, and Korea were requested to submit their meaningful list of references to the TS. Then, the TS, after providing the references for the general GIF documents, will prepare a final version of the SRP to include the possible members, China and Korea, on the first page. The final version of the LFR SRP will be uploaded on the GIF website and managed by the TS [Action 14.2].

(The LFR SDC)

The first draft version of the LFR Safety Design Criteria Report has also been prepared by the Chair, and each part, modified from the SDC of the SFR, was explained in detail at the meeting. However, there were still many questions regarding its mandate from the PG to all Gen-IV systems, the applicability of the SFR SDC to the LFR systems, etc. The Chair and TS will check if the SDC of the SFR can be used as a template and also identify the status of other Gen-IV systems' SDC. After the confirmation, the LFR SDC document will be drafted by the end of December 2013 [Action 14.3].

(Other topics and Business)

The Chair explained the current status of the GIF TRU (Technical Roadmap Update) for the six Gen-IV systems. It was generally felt that the current version of the LFR TRU needs to be updated to reflect the member countries LFR demonstration plan (for example, Russian BREST-300 demonstration reactor operation plan from 2020) as well as the recent advancement of the LFR technology development. The GIF technical Roadmap update for the six systems is expected to be finalized at the next PG meeting in Brussels, Belgium, from November 18 to 22 in 2013.

Concerning the GIF Annual Report preparation, the formal member countries (EU, Japan, and Russia) were requested to submit the summaries of 2012 activities to the Chair and TS in order to integrate the Report. This draft version of LFR Annual Report will be sent to the Technical Director (D.H. Hahn) of the GIF for review [Action 14.4].

The actions, identified during the meeting, were combined with outstanding actions from the last pSSC meeting to form a new list of actions, which was reviewed and adopted by the participants.

Next meeting – Location – Timing

Following an invitation by the Chair, it was agreed that the next provisional SSC meeting will be held at Genova Italy, on the 5th and 6th May 2014. However, if the CAS gets an

approval to be a formal member from its governmental authorities, the next meeting place may be held in China in conjunction with the signature ceremony. The Chinese information on the LFR SSC access will be notified to the Chair and the TS in advance.

Social Event

In the evening of first day of the meeting LFR-SSC members, observer and TS have been invited to a social dinner, kindly hosted by OECD-NEA, at a near-by restaurant. Participants want to express their acknowledgment for the friendly hosting of the meeting in Paris by OECD-NEA.

List of documents presented at the meeting

- 14.1 Agenda of the 14th meeting of the LFR pSSC
- 14.2 List of participants
- 14.3 Summary record of 13th meeting of the LFR pSSC
- 14.4 R&D status EURATOM
- 14.5 R&D status Japan
- 14.6 R&D status RUSSIAN FEDERATION
- 14.7 R&D status U.S.A
- 14.8 R&D status R.O.K
- 14.9 R&D status China
- 14.10 R&D status on China
- 14.10 PG-EG Feedback to LFR pSSC (TS)
- 14.11 Risk & Safety White Papers for Gen_IV concepts (Luca Ammirabile)
- 14.12 RSWG_LFR White Paper Draft 2 1_MF (by Chair)
- 14.13 Revised_LFR-SRP-DRAFT-8-4-2013 - Didier-9-4-2013
- 14.14 LFR-SDC-Draft-01
- 14.15 Generation IV – Overview of Lead-cooled Fast Reactor Activities
(progress in Nuclear Energy paper as requested by GIF chairman)
- 14.16 List of Actions

Attachments; 1. Final Agenda,
 2. List of participants, and
 3. List of actions.



Appendix-1

*14th LFR Prov. SSC Meeting
OECD/NEA Headquarters
Le Seine St-Germain
12, boulevard des Îles
92130 Issy-les-Moulineaux, France
10-11 October, 2013*

Final Agenda

Thursday, 10 October 2013

Conference Room D-Ground Floor

14:00	Welcome address	Mr. Gulliford
	Opening remarks and discussion of agenda	Chair
	Approval of the last meeting summary report	TS
14:15	National status on LFR development:	
	•EURATOM	Mr. Alemberti
	•JAPAN	Mr. Alemberti
	•RUSSIA	Mr. Ulianov
16:00	USA status on LFR development:	Mr. Alemberti
16:30	<i>Coffee break</i>	
17:00	KOREA status on LFR development:	TS
17:30	CHINA status on LFR development	Mr. Zhou
18:00	End of first day meeting	
17:00	<i>Dinner hosted by NEA</i>	

Friday, 11 October 2013

Conference Room D-Ground Floor

09:00	Report from PG Meeting in Beijing	TS
09:30	White Paper on LFR Safety as requested by RSWG (discussion)	All
10:30	<i>Coffee Break</i>	
10:45	Review of LFR-SDC: Working session	All
12:00	<i>Lunch</i>	
14:00	Finalization of LFR-SDC: actions	All
15:00	Finalization of LFR SRP	All
16:00	LFR TRM update	All
16:30	<i>Coffee break</i>	
16:45	GIF-LFR Annual Report 2013 – discussion of the Draft	All
17:00	Additional Items for discussion	
	• Next conferences – meetings etc.	All
	• Interface with PRPP, EMWG and RSWG WGs	All
	• Next meeting – Location – Timing	All
17:30	Draft summary report including action list	TS and All
18:00	End of meeting	

Appendix-2



*14th LFR Prov. SSC Meeting
OECD/NEA Headquarters
Le Seine St-Germain
12, boulevard des Îles
92130 Issy-les-Moulineaux, France
10-11 October, 2013*

**List of LFR Prov. SSC members
(List of participants)**

Name (Name): Absent from the meeting	Organization	Address	E-mail Phone Fax	Category	Signature (Attendance)
Qunying HUANG	Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences (CAS)/ Peoples' Republic of China	No. 350, Shushanhu Road, P.O. Box 1135 HEFEI, 230031, ANHUI, Peoples' Republic of China	qunying.huang@fds.org.cn +86 551 5593681 +86 551 5593681	O	
Ming JIN	Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences (CAS)/ Peoples' Republic of China	No. 350, Shushanhu Road, P.O. Box 1135 HEFEI, 230031, ANHUI, Peoples' Republic of China	ming.jin@fds.org.cn +86 551 5593681 +86 551 5593681	O	
Yican WU	Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences (CAS)/ Peoples' Republic of China	No. 350, Shushanhu Road, P.O. Box 1135 HEFEI, 230031, ANHUI, Peoples' Republic of China a	yican.wu@fds.org.cn +86 551 5593681 +86 551 5593681	O	
Tao ZHOU	Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences (CAS)/ Peoples' Republic of China	No. 350, Shushanhu Road, P.O. Box 1135 HEFEI, 230031, ANHUI, Peoples' Republic of China	tao.zhou@fds.org.cn +86 551 5593681 +86 551 5593681	O	Yes
Alessandro ALEMBERTI	Ansaldo Nucleare/EURATOM	Ansaldo Nucleare S.p.A 16152 Genoa, , Italy	alessandro.alemberti@ann.ansaldo.it +39 010 6558473 +39 010 6558400	R, Chair	Yes
Didier HAAS	JRC/EURATOM	European Commission Joint Research Center Rue de la Loi 130, 1049 Brussels, Belgique	didier.haas@ec.europa.eu +32 2 299 2642	R	
Luca Ammirabile	JRC/EURATOM	European Commission, JRC Institute for Energy and Transport Westerduinweg 3 SeNL-1755 LE Petten	Luca.ammirabile@ec.europa.eu +31 224 56 5064	A	Yes

(Toru OBARA)	TIT/Japan	Tokyo Institute of Technology 2-12-1 O-okayama, Meguro-ku, Tokyo 152-8550, Japan	tobata@nr.titech.ac.jp +81 3 5734 2380 +81 3 5734 2959	A	
Minoru TAKAHASHI	TIT/Japan	Tokyo Institute of Technology 2-12-1 O-okayama, Meguro-ku, Tokyo 152-8550, Japan	mtakahas@nr.titech.ac.jp +812 5734 2957 +81 3 5734 2959	R	
Il Soon HWANG	Seoul National University /ROK	Seoul National University Shinlim-Dong, Gwanak-Gu, Seoul,151-744, ROK	hisline@snu.ac.kr +8228807215 +8228802688	O	
Myung Hyun KIM	Kyung Hee University / ROK	Kyung Hee University 1732 Deogyong-daero, Giheung-gu, Yongin-si, Gyeonggi-do, 446-701, ROK	mhkim@khu.ac.kr +82 10 5349 7751	O	
(Admir ASKHADULLIN)	IPPE/Russia	State Scientific Center of Russian Federation, IPPE Bondarenko Sq. 1, Kaluga Region, 249033 Obninsk, Russia	memraskh@mail.ru +7 910 9104251	A	
Valery SMIRNOV	NIKIET/Russia	NIKIET P.O.B. 788, Moscow, 101000 Russia	sval@nikiet.ru +7 499 788 20 27 +7 499 788 20 52	R	
Anton UMANSKIY	NIKIET/Russia	NIKIET P.O.B. 788, Moscow, 101000 Russia	umanskiy@nikiet.ru +7 499 263 73 63	O	
V.V. LEMEKHOV	NIKIET/Russia	NIKIET P.O.B. 788, Moscow, 101000 Russia	lemekh@nikiet.ru	O	
Ulianov Vladimir Vladimirovich	IPPE/Russia	State Scientific Center of Russian Federation, IPPE Bondarenko Sq. 1, Kaluga Region, 249033 Obninsk, Russia	vulyanov@ippe.ru +7-903-810-8435	A	Yes
Craig F. SMITH	Naval Postgraduate School/USA	Naval Postgraduate School 1 University Circle, Spanagel Hall, 213 Monterey, CA 93943, USA	cfsmith@nps.edu +1 831 656 2185 +1 831 656 2834	O	
James J. SIENICKI	Argonne National Laboratory	Argonne National Laboratory 9700 South Cass Avenue, Argonne, Illinois 60439	sienicki@anl.gov +1 630 252 4848 +1 630 252 4780	O	
Anton MOISSEYTSEV	Argonne National Laboratory	Argonne National Laboratory 9700 South Cass Avenue, Argonne, Illinois 60439	amoissey@anl.gov +1 630 252 4578	O	
Hong June Park	OECD/NEA	Le Seine St-Germain, 12, Boulevard des Iles, 92130, Issy-les-Moulineau, France	HongJune.PARK@oecd.org +33 1 4524 1067 +33 1 4524 1117	TS	Yes

* R – Representative, A – Alternative Representative, O-Observer, TS – Technical Secretariat.

List of actions agreed at 14th LFR pSSC meeting

No.	Action	Responsible	Deadline	Actions made	Done?
	RSWG White Paper				
14-1a	Prepare an integrated version of White Paper	Chair	End October		
14-1b	Send an integrated draft version to SSC participants and Luca for review	TS	End October		
14-1c	Make comments to the integrated version	All	End November		
	System Research Plan				
14-2a	Modify the current SRP (to include CN and KR in the first page, General GIF Document) and request US, CN, Russia, and KR to submit the meaningful list of references	TS	20th October		
14-2b	Provide meaningful list of references for each country	All	End October		
14-2c	Prepare the complete version of the LFR SRP, and upload the version on the GIF website	TS	End December		
	Safety Design Criteria				
14-3a	Identify the status of the other systems' SDC	TS and Chair	End November		

14-3b	Chair will distribute the new draft version (SDC of SFR as Template)	Chair	End December		
14-3c	Make comments to SDC	All	End March		
	Annual Report				
14-4a	Send summary of the member counties' activities to the Chair and TS	MoU Participants (EU, JP, RU)	27 th October		
14-4b	Send the draft to TD (D.H. Hahn)	Chair	30 th October		
	Prepare the draft summary record	TS	20 th October		
14-5	Comment to draft summary	All	End October		