

October 2, 2017

MEMORANDUM TO: John P. Segala, Chief
Advanced Reactor and Policy Branch
Division of Safety Systems, Risk Assessment and Advanced
Reactors
Office of New Reactors

FROM: Jan M. Mazza, Project Manager */RA/*
Advanced Reactor and Policy Branch
Division of Safety Systems, Risk Assessment and Advanced
Reactors
Office of New Reactors

SUBJECT: SUMMARY OF AUGUST 24, 2017 PUBLIC MEETING ON
ADVANCED NON-LIGHT WATER REACTOR DESIGN CRITERIA

On August 24, 2017, staff from the U.S. Nuclear Regulatory Commission (NRC) held a category 2 public meeting at the U.S. Nuclear Regulatory Commission, 11555 Rockville Pike, Rockville, Maryland, 20852. The purpose of this meeting was to discuss public comments on specific design criteria in draft regulatory guide (DG)-1330, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors." Agencywide Documents Access and Management System (ADAMS) accession number ML16301A307.

The main objective of the meeting was to discuss comments received on specific design criteria that the staff felt needed more discussion with stakeholders in order to come to a final resolution. After each topic presentation, members of the public had the opportunity to ask questions and provide feedback during an open discussion with the NRC staff. In addition, the staff noted that the next steps were to prepare the final draft of the regulatory guide and to meet with the Advisory Committee on Reactor Safeguards (ACRS) New Plant Subcommittee on February 7, 2018, and with the ACRS Full Committee on February 22, 2018. The staff plans to issue the final regulatory guide in March 2018.

The meeting began with a presentation on comments received on modular high temperature gas-cooled reactor design criterion (MHTGR-DC) 10, Reactor Design. The staff modified specified acceptable **core** radionuclide release design limit to specified acceptable **system** radionuclide release design limit. The U.S. Department of Energy (DOE) Labs were concerned that the term "system" could be interpreted to be overly broad. It was agreed that clarification of "system" would resolve this comment.

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The second topic on the agenda was Containment Design, which includes advanced reactor design criteria (ARDC) 16, sodium-cooled fast reactor (SFR-DC) 16, and MHTGR-DC 16. The DOE report, "Guidance for Developing Principal Design Criteria for Advanced (Non-Light Water) Reactors," (ML14353A224) applied the functional containment concept to ARDC, SFR-DC, and the MHTGR-DC. The NRC staff believes that in the staff requirements memoranda to Office of the Secretary (SECY) 93-092 (ML003760774), and SECY 03-0047 (ML031770124), the Commission approved the functional containment concept, but staff was instructed to develop performance requirements and criteria taking into account such features as core, fuel, and cooling systems design. The staff noted that the Commission may wish to assess the reactor technologies and possible approaches to functional containment that are different from those previously presented for MHTGRs. The staff is preparing a SECY paper for the Commission to discuss functional containment performance requirements, as well as topics integral to functional containment (e.g., specified acceptable system radionuclide release design limit, mechanistic source term, etc.). The staff expects to issue the SECY paper in 2018. The regulatory guide (RG) will be modified to incorporate the Commission's position. There was additional discussion on the pressure retention requirement in SFR-DC 16. It was noted that this requirement may be removed if the SECY paper defines the performance requirements in a way that SFR designers can ensure that the containment can withstand significant energy releases.

The third topic on the agenda was Electric Power ARDC 17. The staff made some modifications to ARDC 17 designed to clarify "systems" in the first sentence, and safety and vital functions in the second sentence of ARDC 17. The discussion indicated that additional clarification is needed on what "additional power system" means. Also, several stakeholders noted that 10 *Code of Federal Regulations* (CFR) 73.2, "Physical Protection of Plants and Materials – Definitions," includes a definition for "vital equipment." In the absence of a clear understanding of vital functions, future users may seek out the definition in 10 CFR 73.2 which is not the intent of ARDC 17. The staff will consider the feedback made during the discussion and determine what if any changes should be made to ARDC 17. Additional public interaction on ARDC 17 may be needed.

The fourth topic on the agenda was Residual Heat Removal, MHTGR-DC 34. During the discussion related to heat removal it became apparent that the features of MHTGRs, (i.e., passive heat removal from a low power density core with a large height-to diameter ratio, etc.) need to be defined in the RG. In addition the term "time at temperature" needs clarification in the rationale. The staff will consider the feedback made during the discussion and determine what if any changes should be made to MHTGR-DC 34.

The fifth topic on the agenda was Reactivity Control ARDC 26. The staff presented a proposed revised version of this design criteria. There was much discussion about the revised version including: the requirement for more than one reactivity control system, provisions for oscillations during normal operations, whether the shutdown system can be also be used to control reactivity, whether replacing "protecting the specified acceptable fuel design limits" with "design limits for fission product barriers are not exceed" constitutes an expansion of scope. The staff will consider the feedback provided during the discussion and determine what if any changes should be made to ARDC 26. Additional public interaction on ARDC 26 may be needed.

The sixth topic on the agenda was the leak tight requirements for the MHTGR helium pressure boundary (RHPB), leak tight integrity of components, and intermediate cooling system. These subjects encompassed several design criteria. The staff asserted that MHTGR RHPB may be credited as a radiological barrier as part of functional containment. Moreover, a designer can

propose a non-pressure retaining RHBP as part of the principal design criteria and provide justification. The discussion on leak tight integrity of components focused on the definition of leak tightness. Staff noted that leak tight does not necessarily mean zero leakage as noted in the rationale, "A non-leak tight system may be acceptable for some designs..." The DOE/labs noted that an air-cooled reactor cavity cooling system for MHTGRs would be open to the atmosphere. For the discussion on intermediate cooling systems for SFRs, the DOE Labs provided some additional written comments. The staff agreed to consider the comments when finalizing the RG. These questions will be added to the official comments received on DG-1330 (82FR9246).

The seventh topic on the agenda was Cooling Water MHTGR-DC 44, 45, 46. The staff noted that although MHTGRs do not have a cooling water system, the function that the system provides, structural and equipment cooling, may still be needed. MHTGR-DC 44-46 were included in DG-1330 as a reminder for reviewers to verify that this function is accomplished in the design. The staff also noted that the MHTGR-DC stated that, "...systems to transfer heat from structures systems and components to an ultimate heat sink shall be provided, as necessary..." Also the titles of these design criteria focus on the function and do not include the word "water."

The eighth topic on the agenda was Control Room ARDC 19. The staff proposed a modification to ARDC 19 that included a statement, "A control room, that reflects state-of-the-art human factors principles, shall be provided..." The modification refers to the additional Three Mile Island related requirements in 10 CFR 50.34 (f)(2)(iii). While stakeholders did agree that designers must consider human factors principles when designing the control room, what is considered to be, "state-of-the-art" changes over time and including that term in ARDC 19 could have undesirable implications. It was noted that the staff's modification would be more appropriate in the rationale for ARDC 19.

The meeting concluded with a final opportunity for public feedback/questions for the NRC. The meeting agenda and list of attendees are included in Enclosures 1 and 2. The NRC's meeting announcement is available through ADAMS. The ADAMS accession number for the NRC's meeting announcement, presentation slides, and public comment table is ML17226A042 ML117233A213, and 17227A146 respectively.

ADAMS is the system that provides text and image files of NRC's public documents. Documents are available electronically at the NRC's Electronic Reading Room at <http://www.nrc.gov/reading-rm/adams.html>. If you do not have access to ADAMS or have problems accessing the documents located in ADAMS, contact the NRC Public Document Room (PDR) staff at 1-800-397-4209, 301-415-4737, or pdr@nrc.gov.

Please direct any inquiries to me at 301-415-0498, email: Jan.Mazza@nrc.gov, or John Segala at 301-415-1992, email: John.Segala@nrc.gov.

Project No. 0814

Enclosure:

1. Agenda
2. List of Attendees

SUBJECT: SUMMARY OF AUGUST 24, 2017 PUBLIC MEETING ON ADVANCED NON-LIGHT WATER REACTOR DESIGN CRITERIA October 2, 2017

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ADAMS ACCESSION NO.:ML17262A894

NRO-002

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|--------|--------------|--------------|
| OFFICE | PM:DSRA/ARPB | BC:DSRA/ARPB |
| NAME | JMazza | JSegala |
| DATE | 09/ 20 /2017 | 10/ 02 /2017 |

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PUBLIC MEETING
ADVANCED NON-LWR REACTOR DESIGN CRITERIA
 Thursday, August 24, 2017
 9:00 a.m. – 4:00 p.m.

| TIME | TOPIC | SPEAKER |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 9:00 AM -9:15 AM | Welcome, Instructions, Introductions | Mazza |
| 9:15 AM – 9:30 AM | Opening Remarks | Mazza/Segala |
| 9:30 AM – 10:00 AM | Reactor Design and use of SARRDL – MHTGR-DC 10* | Schmidt |
| 10:00 AM – 10:30 AM | Containment Design – ARDC 16* | Madni |
| 10:30 AM- 10:45 AM | Break | ALL |
| 10:45 AM - 11:30 AM | Electric Power – ARDC 17* | Fitzpatrick |
| 11:30 AM – 12:00 PM | Residual Heat Removal – MHTGR-DC 34* | Schmidt |
| 12:00 PM - 1:00 PM | Lunch | |
| 1:00 PM -2:00 PM | Reactivity Control – ARDC 26* | Schmidt |
| 2:00 PM- 3:00 PM | Requirements for the MHTGR helium pressure boundary – multiple criteria* Leak tight Integrity of Components – multiple criteria* SFR-DC 75-77* | Yeshnik |
| 3:00 PM – 3:15 PM | Cooling Water Systems – multiple criteria* | Li |
| 3:15 PM – 3:30 PM | ARDC 19 Control Room* | Green |
| 3:30 PM – 3:45 PM | Public Comment | ALL |
| 3:45 PM – 4:00 PM | Closing Remarks | ALL |
| 4:00 PM | Adjourn | ALL |

*Opportunity for public discussion after each topic.

List of Attendees
PUBLIC MEETING REGARDING NON-LIGHT WATER REACTOR DESIGN CRITERIA

| NAME | AFFILIATION |
|-------------------|--------------------|
| Jan Mazza | NRC |
| Bill Reckley | NRC |
| Jim Nestall | MPR/ASME |
| Ed Burns | X-Energy |
| Tom King | INL |
| Kati Austgen | NEI |
| Jim Kinsey | DOE/INL |
| Amir Afzali | SCS |
| Farshid Shahrokhi | AREVA |
| Joe Williams | NRC |
| Jeff Schmidt | NRC |
| Michelle Hart | NRC |
| Bob Fitzpatrick | NRC |
| George Flanagan | ORNL |
| Steven Mirsky | NuScale Power |
| Rod Adams | Atomic Insights |
| David Alberstein | INL |
| Olivia Mikula | NRC |
| Imtiaz Madni | NRC |
| Jim Strnisha | NRC |
| Manas Chakravorty | NRC |
| Chang-Yang Li | NRC |
| Marcia Carpentier | NRC |
| Maxine Segarnick | NRC |
| George Wang | NRC |
| Mike Franovich | NRC |
| John Segala | NRC |
| Michelle Bales | NRC/RES |
| Joe Ashcraft | NRC |
| Pravin Patel | NRC |
| Tim Drzewiecki | NRO |
| B. P. Jain | NRC |
| Amy Cabbage | NRC |
| Rebecca Karas | NRC |
| Diane Jackson | NRC |
| Andrew Yeshnik | NRC |
| Mark Caruso | NRC |
| Stan Gardocki | NRC |
| Jana Bergman | Curtiss-Wright |
| Shiela Ray | NRC |
| John Monninger | NRC |
| Shah Malik | RES/NRC |
| Lauren Kent | NRC/NRO/DCIP/HOIB |
| Kathy Gibson | NRC |

PUBLIC MEETING
ADVANCED NON-LWR REACTOR DESIGN CRITERIA
Thursday, August 24, 2017
9:00 a.m. – 4:00 p.m.

| NAME | AFFILIATION |
|----------------|--------------------|
| Per Peterson | U.C. Berkley |
| Peter Hastings | |
| Fred Silady | INL |
| Pete Gaillard | TerraPower |
| Mark Holbrook | INL |
| Bob Weisman | NRC |