UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 17, 2022

MEMORANDUM TO: Christepher A. McKenney, Chief
Risk and Technical Analysis Branch
Division of Decommissioning, Uranium Recovery, and Waste Programs
Office of Nuclear Material Safety and Safeguards

FROM: Cynthia S. Barr, Senior Risk Analyst
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CBarr Signed by Barr, Cynthia on 11/17/22

SUBJECT: SUMMARY OF NOVEMBER 3, 2022, HYBRID PUBLIC WORKSHOP ON DISCRETE RADIOACTIVE PARTICLES

On November 3, 2022, the U.S. Nuclear Regulatory Commission (NRC) held a hybrid public workshop in-person and via Teams on discrete radioactive particles (DRPs) in decommissioning. The meeting was noticed on the NRC's public website at the NRC's Agencywide Documents Access and Management System (ADAMS) at Accession No. ML22306A221. All NRC and contractor presentations and workshop materials can be found at ADAMS Accession No. ML22301A159. The purpose of the public workshop was to discuss the technical basis for development of interim staff guidance or communications related to survey and dose modeling approaches for DRPs to support license termination. This effort focuses on survey design considerations, including calculation of scan minimum detectable activities (MDAs), and data quality objectives; internal dosimetry appropriate for DRPs; and evaluation of exposure scenarios for DRPs. Technical reports and presentations were attached to the meeting notice prior to the workshop. Feedback received during the workshop will be considered in determining the need for (and scope and content of) communications or interim staff guidance in this area. Interim staff guidance would be folded into a future revision of NUREG-1757, Volume 2, of NRC's Consolidated Decommissioning Guidance.

Approximately 125 people participated in the public workshop including industry representatives, state and federal representatives, members of the public, and NRC staff. The meeting began with a welcome by Jane Marshall, Division Director of Decommissioning, Uranium Recovery, and Waste Programs. Jane Marshall discussed NRC efforts to develop guidance or communications on the topics of subsurface investigations and DRPs to supplement guidance in NRC's Consolidated Decommissioning guidance found in NUREG-1757, Volume 2, Rev. 2 which was published in July 2022. Jane stressed the importance of having a good decommissioning program in place to control release of radioactive materials to ensure DRPs are not an issue at the time of final status survey. NRC contracted with Oak Ridge Associated Universities and Renaissance Code Development to look at survey methods and

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scan MDAs as well as internal dosimetry related to DRPs, respectively. NRC has invested significant resources to address comments on gaps in our guidance and will continue to work with our stakeholders to increase transparency and efficiency in the license termination process.

Nuclear Energy Institute (NEI) also gave opening remarks stating that they appreciate the opportunity to participate in the subsurface and DRP workshops. NEI wants to close the gap in the framework to improve efficiency in the license termination process. NEI noted that first alignment on acceptable methods and tools to perform scan and surveys of DRPs is needed. Guidance on appropriate dose scenarios for DRPs and evaluation of their health effects also needs to be developed. Finally, NEI indicated that dose limits for DRP exposure scenarios need to be clarified.

NEI is developing NEI 22-01 which provides guidance to the commercial nuclear industry on the overall license termination process. NEI 22-01 will be submitted to NRC for review in December 2022. NEI indicated that industry is focusing on control of contaminated material to minimize the likelihood of release of DRPs. However, if DRPs are encountered during decommissioning, guidance on how to assess their impact on public health and safety should be available.

NEI indicated that the following questions need to be addressed:

1. How and to what extent should the final status survey (FSS) be aimed at detecting DRPs. What are acceptable survey strategies, tools and techniques for DRPs? What are the criteria for DRP detectability?
2. What are the credible dose pathways for DRPs?
3. What assumptions should be made regarding particle sizes and solubilities of DRPs?
4. What are the dose criteria that must be met?

NEI stated that NRC has put forth a great deal of work in this area. Based on a cursory review of the workshop materials provided a few days before the workshop, some conclusions can be drawn:

- There is at least one dose model of our skin that benchmarks fairly well against established methods.
- There are existing and proven scanning methods that are known to be effective in detecting particles of concern.
- Exposure scenarios and likelihood can be postulated.
- The health effects of DRPs are well established from all this work.

NEI went on to state that if 25 Gray (Gy) approximates the threshold for deterministic DRP health impacts, DRPs that can produce this dose threshold should be easily detected with existing survey instrumentation. It appears that the regulatory framework around DRPs should be within reach at this point in time. It will be important for NRC to establish a dose limit for skin dose to the public. NEI also commented that NRC should consider allowing the use of more advanced scanning methods in lieu of the favored handheld 2x2 inch sodium iodide (NaI) detectors. There is a significant body of work in handling DRPs at previously decommissioned sites that should be considered. NEI requested a follow-up meeting to allow sufficient time for industry representatives to digest the workshop materials including contractor reports and presentations to facilitate follow-up discussion on the technical issues.

A detailed summary of the workshop presentations and discussion is found in Enclosure 1 below. A list of participants is found in Enclosure 2.

Enclosures:

1. Detailed Summary
2. List of Participants

Enclosure 1 Detailed Summary

NRC opening presentation (Greg Chapman)	• General information was provided about DRPs: what DRPs are, examples of DRP sources, and associated technical issues including the following: o Survey methods for DRPs o Exposure scenarios for DRPs o Dosimetry for DRPs • Information was provided on dose limits specific to decommissioning and general dose requirements found in 10 CFR Part 20 including the public dose limit, and deterministic limits for occupational exposure. • The general characteristics and behavior of DRPs was also discussed: o Particles are relatively insoluble and tend to be more stationary. Therefore, International Commission on Radiation Protection (ICRP) 26/30 biokinetic models do not necessarily represent well DRP behavior in the body. o DRPs are single particles unlike the activity median aerodynamic diameter (or AMAD), which represents a distribution of particles. The size of the discrete particle is important as it determines where the particle will end up in body. o The size of the DRP matters as volume (and therefore activity) increase by a power of three with increases in radius • A statement was made that dose limits for deterministic impacts are applicable to workers but could also potentially be applicable to members of the public because they are protective of deterministic effects. • Renaissance Code Development (RCD) developed dose conversion factors for DRPs. Oak Ridge Institute for Science and Education (ORISE) performed a study to determine scan MDAs for DRPs. • The importance of DRP management from operations to decommissioning, need for controls and need to address DRPs sooner rather than later to prevent transport in the environment was discussed. • A statement was made that if known to be an issue at decommissioning sites, licensees should address DRPs in planning documents, such as the license termination plan, as applicable. Licensees should not wait until the FSS phase to address DRPs. • Past examples of decommissioning sites with DRPs were discussed in general terms. Also, a statement was made that the NRC's Office of General Counsel has advised staff that the Shelwell materials site is not precedent setting. • A statement was made that NRC will be developing guidance or communications related to DRPs in decommissioning in the future.
NEI/industry remarks	• A question was raised about whether interim staff guidance would address the issues discussed in NRC's opening presentation (e.g., discuss dose pathways and dose limits). NRC

(Bruce Montgomery [NEI], Eric Darois [RSCS], and Sarah Roberts [Energy Solutions])	responded that scanning methodologies would likely be discussed in updated guidance; NRC is still deliberating on scope of guidance and/or communications. Interim guidance would be issued prior to the next revision (Revision 3) of NUREG-1757, Volume 2. • A statement was made based on the information provided that surveys performed in the past appear to have been adequate for risk-significant DRPs (e.g., Yankee Rowe used in-situ object counting system, which appears to have been adequate). • A statement was made that Shelwell has similarities to current plants with DRPs even if Shelwell was not a power plant site (e.g., used μR meter to identify DRPs and had relatively insoluble particles). • A question was raised about the applicability of license termination rule dose limits and MARSSIM for DRPs (i.e., 25 mrem/yr or 0.25 mSv/yr total effective dose equivalent [TEDE] is used to derive derived concentration guideline levels (DCGLs) for use with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) to demonstrate compliance with LTR criteria for area sources but does not appear to be applicable to DRPs which represent point sources and not area sources). • A statement was made that clarity on the applicable dose limits for DRPs would be beneficial. • A question was raised about the need to include information on DRPs in license termination plans (e.g., if recognized to be an issue during the historical site assessment). NRC responded that Connecticut Yankee addressed DRPs in planning documents due to knowledge about potential DRPs during operations. Additionally, DRPs may need to be addressed in data quality objectives for FSS, if identified during decommissioning.
Public comments	• The operational history should dictate whether DRPs would be an issue and provide information on the need for surveys to address DRPs and identify potentially problematic areas to focus on. Good documentation and interviews are needed to preserve institutional knowledge about the presence of DRPs that may need to be addressed in the decommissioning phase. • A comment was made that members of the public would not be protected at the worker dose limits (e.g., gender and age are important considerations in protecting members of the public). • Chat comments were made about considering Plutonium (Pu) DRPs. Pu DRPs, which are a global concern, were found at the Rocky Flats site. Although Rocky Flats was not regulated by the NRC, federal agencies should use similar approaches to assessing the risks from DRPs and the site may have relevancy to the current problem. • A member of the public pointed out that there was discussion in the skin dose rulemaking about insignificant stochastic risk at the 50 rad skin dose limit. • Questions were raised about allowable residual radioactivity levels at decommissioning sites particularly buried residual radioactivity in piping, and soils. NRC responded that we have a

	regulatory framework in place that provides dose-based limits. Guidance is also available that provides information on acceptable methods for consideration of exposure to buried residual radioactivity (e.g., scenarios which may bring the residual radioactivity to the surface where a member of the public could be exposed need to be considered in demonstrating that the dose standard is met and would limit the amount of residual radioactivity remaining at the site including in the subsurface).
Oak Ridge Institute for science and education presentation on scan MDAs (ORISE) (Nick Altic)	• The approach used to develop scan minimum detectable activities (MDAs) using NUREG-1507 methodology to assess the ability to detect hot spots as part of the MARSSIM FSS paradigm was presented. The presenter noted that the assumption regarding constant detector response for a postulated volumetric hot spot is more difficult to apply to DRPs, which act more like point sources. • ORISE developed a method to estimate detector efficiency and response at each detector location along hypothetical surveyor transects (two bounding cases which maximize and minimize the detector response) and to integrate the detector response over a period that corresponds to the audible increase in counts from detection of the DRP to calculate the scan MDA. • ORISE considered Co-60, Cs-137, Th-232, and Am-241; surveyor speeds include 0.25 m/s, 0.5 m/s, 1.0 m/s; distance from detector to ground of 7.5 cm and 10 cm; and DRPs soil depths of 7.5 cm and 15 cm (and 30 cm for Co-60 and Cs-137 only at a distance of detector to ground surface of 7.5 cm) in their analysis. The worst-case and best-case scenarios of maximum offset distance of DRP from detector and detector passing directly over the DRP were considered. • Monte Carlo N-Particle® code (MCNP) was used to calculate detector efficiencies for the various points along the transect. The MCNP results were fit to a log logistic model as a function of offset distance of the DRP to the detector for the various detector to ground surface distances. As expected, with closer distances between the detector and DRP, the stronger the response (i.e., the higher the efficiency). • MCNP results were also compared to experimental results conducted in the lab and compared favorably despite some limitations with the experimental data set. • Next, detector response curves as a function of time were constructed with a single peak representing the detector response for the scenario when the detector passed directly over a DRP, and bi-modal curve representing the response for the scenario when the detector position is at its maximum distance from the DRP (two peaks represent points in the detector path that pass closest to but not directly over the DRP—only the maximum of the two peaks were used to determine the scan MDA).

	• The total integrated response was calculated as the area under the peak (highest of two peaks in scenario where the detector is at its maximum hypothetical distance from the DRP) in the response curves and approximated using the trapezoid method. • Scan MDAs were calculated using a modified version of the scan MDC equation in NUREG-1507. • Generally, results were as expected with higher scan MDAs for greater detector to ground surface distances, greater depth of DRP below ground surface, faster surveyor velocities, and for the more pessimistic scenario where the detector is the furthest distance from the DRP source. Exceptions are that the scan MDAs for ground to detector distance of 10 cm is slightly lower than the 7.5 cm under certain pessimistic scenarios and when the DRPs are below the surface. One possible explanation is that there is higher soil attenuation for the 7.5 cm distance under these scenarios given the angle between the source and detector. • Results are consistent with DRPs identified in the field with activities of a few tenths of a µCi. • Simulations were also run using the MicroShield code. The results are slightly higher and therefore more conservative for most cases, except for the pessimistic case when the DRP is on the surface. MicroShield is considered a reasonable alternative to MCNP for efficiency curve generation. • Future work could investigate impact of a collimated sodium iodide (NaI) detector on the scan MDA.
NRC presentation on Exposure Scenarios (Leah Parks)	• The presentation discussed NRC regulations at 10 CFR 20.1402, which provides 25 mrem per year TEDE dose limit to the average member of the critical group for unrestricted release; and 10 CFR 20.1501, which provides for surveys to comply with regulations in this part (i.e., 10 CFR Part 20). • The average member of the critical group is defined as the group of individuals reasonably accepted to receive the greatest exposures from residual radioactivity under any applicable set of circumstances. • The exposure scenario should consider where the residual radioactivity is present, how it moves through the environment, and how receptors can be exposed. • The contamination source is not an area or volumetric source, but rather a point source and therefore, MARSISM guidance for distributed residual radioactivity does not apply. Following that, typical DCGLs are not appropriate to assess the risk for DRPs. • Exposure scenarios typically include office worker, resident/farmer, recreational, industrial, etc. DRP exposure scenarios may include resident, recreational user, industrial worker, and could even include a child who may spend more time digging in the sand or soil and may inadvertently ingest more sand or soil. If DRPs are near a beach or body of water, other types

	of activities such as sunbathing, beach combing, paddling, or swimming may need to be considered. • DRP exposure pathways may include external dose from standing near DRP(s), getting DRPs on skin or in the eye; internal pathways such as ingestion or inhalation. Cancer risk may not be most limiting and deterministic effects may need to be considered. • Bounding scenarios can be considered, but if realistic exposure scenarios are used to demonstrate compliance, then the licensee should consider less likely but plausible (LLBP) exposure scenarios to risk-inform the decision. Likelihood should be evaluated to support the classification of the exposure scenario as LLBP, but the likelihood of the exposure scenario should not be multiplied by the dose to compare to the dose limit under the LLBP approach.
Renaissance Code Development (RCD) presentation on DRP Dosimetry (David Hamby)	• The focus of the RCD presentation is on recommended ulceration dose threshold for internal DRPs, and development of dose coefficients or dose conversion factors primarily for stationary DRPs for the skin surface, upper respiratory tract, and small and large intestine. • The potential jaggedness and non-uniformity of the particle can cause it to become lodged in the respiratory or gastrointestinal tract. • Dose thresholds for ulceration thresholds were presented from various references and for various risks levels and ranged from 1 to 70 Gray (Gy). RCD recommends a dose threshold of 25 Gy (or 2500 rad) delivered over the averaging area of 1 cm^2 at critical depths of 45 μm for upper respiratory tract, 140 μm for small intestine, and 290 μm for large intestine with a dose averaging area of 1 cm^2. • Dose coefficients were calculated for a DRP on the skin surface including shallow dose equivalent rate, deep dose equivalent (DDE*) rate (*slightly different from typical DDE as this DDE* does not include whole body exposure but a local exposure 1 cm deep), as well as effective dose equivalent (EDE) rate using tissue weighting factors in ICRP 26/30 with the DRP assumed to be located on the torso. PiMAL was coupled with MCNP to calculate the EDE dose coefficients for a DRP on the skin. • Dose coefficient results were presented for the various radionuclide and material type combinations in Sieverts/Becquerel-hour (Sv/Bq-hr). Dose coefficient results were presented for a range of particle diameter sizes from 10 to 1000 μm with some radiation types varying more significantly compared to others due to self-absorption with increasing particle size (e.g., for beta emitters). • The upper respiratory tract dose conversion factors consider the nasopharynx region appropriate for larger 10 to 1000 μm size particles and include the ulceration local dose equivalent (DE) rate, and the EDE rate for a stationary particle. PiMAL was coupled to MCNP to calculate EDE dose coefficients for internal DRPs with the DRP assumed to remain whole and stationary to maximize dose.

	• The small and large intestine ulceration (local) DE rate, and EDE rate for a stationary particle, and an ingestion committed equivalent dose equivalent (CEDE) are considered. The CEDE dose coefficients were calculated using integrated modules for bioassay analysis. The DRP is assumed to remain whole (i.e., no activity to the bloodstream) and is moving through the body (except for fuel fragments). For fuel fragments an f1 of zero (i.e., no transfer to blood), and FGR 11 (f1 resulting in the highest dose coefficient reported in FGR 11 for the radionuclide in question) are considered to bound the results. • Dose results were presented for various radionuclides and material types (with reasonable assumed particle sizes and expected radionuclide activity). The results show that the local dose equivalent (DE) for the upper respiratory tract may be most limiting. • RCD looked at five DRP materials including stellite, inconel, concrete (regulatory), fuel fragments, and welding rod generated particles. All materials are assumed to remain in-tact except for fuel fragments, which may not stay in-tact and could disassociate (e.g., may be partially soluble). Specific radionuclides were analyzed dependent on material type and included Co-60, Ni-59, Ni-63, Fe-55, Eu-152, Eu-154, Sr-90, Cs-137, Pu-238, Pu-239, Pu-240, Pu-241, Am-241, Cm-244, and Th-232 (Th-232 from a welding rod). • VARSKIN was originally developed to determine dose to skin but was extended to calculate dose coefficients for a DRP to the upper respiratory tract, and in the gastrointestinal (GI) tract. No curvature was assumed for upper respiratory or GI tract, which is reasonable for the small averaging area of the ulceration. • Ulceration dose is age-independent so the dose would be the same for a child as it would be for an adult. Child cell turnover rate is higher and might lead to decreased risk from ulceration compared to an adult at the same exposure, which may be counter-intuitive.
NEI/Industry Comments and Questions	• A question was raised about the assumptions in the scan MDA calculations (integrated detector response). ORAU/ORISE responded that the audio response reflects the peak and that the approach used is similar to the approach used in NUREG-1507. • A comment was made that they appreciated the comment that 0.25 m/s scan speed might be impractical and pointed to the need for evaluation of more modern technologies to survey relatively large areas. • A comment was made that when instruments are deployed in the field, background radiation fields are heterogeneous, which presents challenges in the ability of a surveyor to detect audible changes in background count rates (e.g., particularly when a surveyor is trying to detect a small signal above background). • A comment was raised that a surveyor is listening to the audible signal that is averaging over some period of time. The ORAU/ORISE approach seems to be optimizing the peak, and the commenter was not sure if the approach was correct.

	• A comment was made pointing out that NRC multiplied dose by probability to get expectation dose in the Shelwell case for the compliance demonstration. • A comment was made that ICRP 137 provides information about solubility of DRPs in irradiated fuel for Cs-137 that drops off by a factor of ten compared to FGR-11. Additionally, an article in Environmental Health Perspectives (1995) presents a study that shows that DRPs from irradiated fuel at Chernobyl are inert in the human body. RCD commented they were aware of the studies. RCD indicated that the conditions in the stomach are more acidic compared to the environment. • A comment was made that particles from internal reactor component cutting may be more risk-significant compared to stellite particles during decommissioning. • A comment was made about the assumed exposure times for the local DE calculations based on assumptions regarding stationarity. DRPs would be expected to move in the body with lower exposure times. RCD indicated that there was a documented case that showed that a DRP remained in the same location for 3 weeks. Eric Darois stated that in that case, the individual had been sick prior to the exposure event and had an empty stomach, which led to the prolonged exposure in the single location in the GI tract. The expectation is that this case is rare and should not be a basis for regulatory decision-making. • A question was raised about multiplying the dose by the likelihood. NRC clarified that in the LLBP approach, the likelihood is discussed qualitatively. Shelwell did calculate an estimated dose by multiplying the dose and the likelihood for compliance but that was separate from the LLBP approach outlined in NUREG 1757, Vol 2, Rev 2. NRC further clarified that presenting the information in a disaggregated form allows NRC to use both pieces of information on magnitude and likelihood to risk-inform the decision. • A comment was made that industry is looking at lessons learned related to measures (ventilation, containment, misting) to contain and control DRPs, which will be important during accelerated decommissioning to make these sites available for unrestricted use. • A question was raised regarding the need to include information on DRP surveys, pathways, and dosimetry in the license termination plans, if DRPs are considered a potential issue based on the historical site assessment. • A comment was made that it would be important to know the dose level of concern to inform risk-significant DRP activity levels and required scan MDAs. Based on information collected to date, it appears that current survey methodologies are sufficient to identify risk-significant DRPs. • A comment was made that based on the discussion in the workshop, it seems that we know more than we don't know regarding DRP detectability and health impacts.

	• NEI would like to continue to work with NRC to keep moving forward on this technical issue, developing guidance, and determining if any policy decisions need to be made to support efficient decommissioning.
Public Comments	• A question was raised about use of 2x2 NaI detectors. ORISE indicated that the project dictates the survey instrument to be used, but that the 2x2 NaI detector is the "go to" instrument for walkover gamma surveys. • A question was raised whether a high scan MDC for DRPs requires additional sampling. NRC indicated that the activity level of concern for the DRP is needed to determine the required scan MDA. The Hematite decommissioning site used a soil segregating and sorting system to identify fuel fragments and other materials that needed to be disposed of off-site as waste. • A member of public stated that Rocky Flats had issues with Pu particles, which could inform the current problem. A recommendation was made that NRC should look at a more stochastic type of criterion for DRPs that may have a risk-significant internal dose. For example, weapons grade Pu may be partially soluble in the body, and consideration of probability distributions would help address the uncertainty in the potential internal dose. • A comment was made about the method of scanning (serpentine motion) and that changes should be made to the scanning direction to increase likelihood of finding DRPs. • A comment was made that alpha and beta radiation types do more biological damage compared to gamma radiation (questioning the use of gamma walkover surveys to identify DRPs). • A question was raised about use of Visual Sample Plan presence/absence sampling design in lieu of typical MARSSIM sampling design approaches? NRC responded that it can be used; however, DRP surveys are site-specific and to ensure data quality objectives are met and adequate surveys are performed, decommissioning licensees should consult with their regulator. • A comment was made that a cost benefit analysis should be made to inform expenditure of limited resources to increase benefit to the community (suggesting that resources spent on detection of DRPs may not be the most beneficial use of limited resources). • A question was made on whether probability of exposure to DRPs on a 100-acre site has been assessed. NRC responded that the Shelwell decommissioning licensee attempted to determine the probability of exposure and that publicly available information on decommissioning of that site is available for public consumption. • A question was raised whether NRC guidance is clear on the extent to which surveys must consider DRPs during surveys if there is no history of DRPs. NRC responded there is no guidance on surveys of DRPs in decommissioning guidance, and it is hoping to develop guidance in this area.

	• A comment was made on the need to determine a non-stochastic dose limit (not currently in 10 CFR Part 20, Subpart E) to determine necessary scan MDAs for DRPs. NRC responded that it is trying to address that question in the DRP workshop, but that it may lead to policy implications, which would require Commission input. • A comment was made on the importance of isolation and controls for DRPs during stockpiling or storage of contaminated materials during decommissioning. • A comment was made on the need to define DRPs of concern for subsurface.

Enclosure 2 List of Participants

Teams Participation

Adam Lee	John Jernigan
Adam Schwartzman	John Tomon
Alyse L Peterson	Karen Pinkston
Anthony Leshinskie	Karen Tuccillo
Arthur L Hammond	Katherine Warner
Bill	Katie Barnes
Bill Lin	Keith A. Consani
Boby Abu-Eid	Kim Conway
Bradley Frank	Kim M. Anthony
Brett Klukan	Kristin Maddalo
Briana DeBoer	Leah Parks
Bruce Watson	Louis Carson
Casper Sun	Madison Schroder
Charlotte Rose	Marc R Pawlowski
Chris Messier	Mark E Morgan
Christianne Ridge	Marlayna Doell
Court Reporter	Matthew Darois
Dale B. Randall	Michael Ginzel
Dan J Shannon	Michael LaFranzo
David Garmon	Micheal Smith
David Hills	Michel Lee
David King	Nate Senn
David S. Villicana	Nathan Fuguet
David Stuenkel	Neil Peterson
David Weisman	Neil Sheehan
Dennis Quinn	Nick Altic
Don Lowman	Oleg Povetko
Don Mayer	Paul Blanch
Douglas Ower	Paul Blanch
Ed Everett	Peter M Vlad
Edwin O'Brien	R. K. Bhat
Eric M Goldin	Ray Fucheck
Gehan Flanders	Rich McGrath
Gerald Wood	Ron
Gerard P. Van Noordennen	Scott G. Zoller
Gordon Madison	Shannon Seneca
Harry Anagnostopoulos	Stephen Giebel
Jack	Stephen Hammann
Jack Parrott	Steven Rademacher
James McCullough	Stewart Bland
James Uhlemeyer	Susan Hoxie-Key
Jan Boudart	Suzanne Dennis
Jana Bergman	Thomas L Jones
Jane Marshall	Timothy Hooker
Janet Schlueter	Tom Magette
Jay Maisler	Tom Schneider
Jennifer Bakker	Wesley O'Brien
Jerry Falo	William Rautzen
Joe	Zach
Joe Lynch	
John Clements	
John Geesman	

Note: Eight phone numbers were also listed in the Teams attendance list.

Enclosure 2 List of Participants

In-Person Participation

NRC	Other Participants
Cynthia Barr Christian Dennes Christepher McKenney David Hamby Ed Harvey Gregory Chapman Jade Adams John Tomon Rigel Flora Sarah Lopaz Shaun Anderson Stephanie Bush-Goddard	Verena Sesin
NEI/Industry	
Bruce Montgomery Eric Darois Sarah Roberts	

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DATE	Nov 8, 2022	Nov 15, 2022	Nov 9, 2022	Nov 16, 2022
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DATE	Nov 17, 2022			

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