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NUCLEAR REGULATORY COMMISSION

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PUBLIC MEETING ON EXECUTIVE ORDER 14300 SECTION 5(B) - RECONSIDERING THE NRC'S RADIATION PROTECTION FRAMEWORK

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WEDNESDAY,

JULY 16, 2025

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The meeting was convened via Video-Teleconference, at 1:00 p.m. EDT, Ed Miller, Project Manager, NRR, presiding.

PRESENT:

ED MILLER, NRR/DORL/LPL2-1

TERRY BROCK, RES/DSA/RPB

MAUREEN CONLEY, OPA

MIKE FRANOVICH, NRR

DAVID GARMON, NRR/DRA/ARCB

KEVIN HSUEH, NRR/DRA/ARCB

MEENA KHANNA, NRR/DRA

BILL RAUTZEN, NRR/DRA/ARCB

CARLA ROQUE-CRUZ, NRR/DORL/LPMB

SHILP VASAVADA, NRR/DRA

KEVIN WILLIAMS, NSIR

ALSO PRESENT:

AMIR BAHADORI

DAVID J. BRENNER

PETER CRANE

ALAN FELLMAN

KATHRYN HIGLEY

DANIEL HIRSCH

MIKE LEWANDOWSKI

EDWIN LYMAN

CYNTHIA H. MCCOLLOUGH

DAVID RICHARDSON

MICHEAL SMITH

ADAM STEIN

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P-R-O-C-E-E-D-I-N-G-S

(1:00 p.m.)

MR. MILLER: Hello and good afternoon to everybody. My name is Ed Miller. I'm a project manager in Operating Reactor Licensing.

Today's meeting is a public comment gathering meeting to solicit input from stakeholders on how the NRC implements Executive Order 14300.

Specifically, today's meeting is regarding Section 5(b) of the Executive Order, which directs the NRC to reconsider reliance on the linear no-threshold model radiation exposure the "as low as reasonably achievable" standard.

The meeting today is being transcribed and recorded. Those records will be made publicly available following the meeting today, and links to those will be added to the meeting notice page, in reference to the meeting summary.

Speakers, if they wish to be identified, should do so as part of their comments today.

As with any NRC public meeting, no regulatory decision will be made at this meeting today. Today's meeting will consist of a short presentation by the NRC staff, then we will have a number of presentations by identified stakeholders

from external organizations.

Following those presentations, we will provide two-minute opportunities to attendees at this meeting to make comments to or ask questions of the NRC staff. Commenters during this portion of the meeting will be invited by the order in which they identify themselves by raising their hand in Teams.

Comment times will be limited to two minutes. However, individuals may re-enter the queue and, time permitting, may be provided another two-minute comment period after others have had their time.

Any regulatory changes pursued by the NRC following this meeting will be noticed in accordance with the specific process associated with those changes, and may include formal public comment periods.

The presentation materials for the meeting today are provided as internet links on the webpage where you found the initial notice for the meeting today. Additionally, a list of presenters is linked on the same page.

As indicated in the meeting notice, comments may also be submitted to Dave and myself at our email addresses, which are listed in the meeting

notice.

While this is not a formal comment gathering process with a fixed end date, we would ask that interested parties try to submit comments by next Friday, July 25, to thus ensure that we include them in our considerations moving forward.

With that, I would like to turn opening remarks over to Mike Franovich. He's the Deputy Director of the Office of Nuclear Reactor Regulation. Mike?

MR. FRANOVICH: Just a quick check. I see several hands are already raised, so I want to make sure from an audio standpoint, can you all hear us online?

We're getting thumbs up, that sounds good, okay.

MR. GARMON: Don't forget the next slide. So let's go through introductions first for the folks in the room, if you don't mind. Actually, if you go back one to review the agenda.

MR. FRANOVICH: Okay, let's just take a pause here and review the agenda. We're going to have -- we're going to do some introductions to the NRC staff that are in the room.

This is a widely attended meeting, so

we're not going to ask folks to introduce themselves when they are participating online. However, we'd like to request that when you are addressing the NRC, if you're so inclined, please identify yourself.

This meeting is being recorded and transcribed, so it helps if you especially speak clearly when you're stating your name so that way, we can transcribe it appropriately.

After a brief introductions, we'll turn it over to Mike Franovich, the Deputy Office Director for Engineering of the Office of Nuclear Reactor Regulation.

We'll have a presentation by NRC staff, and the we have a slate of 12 presenters who will, who have provided the NRC staff with presentations, and presentation proposals.

So we'll give them the opportunity to run through their slide material.

Then, we will shift over to public comments, which as Ed mentioned, will be limited to 2 minutes. And, we'll review some ground rules as we approach that time.

So ,with that, the next slide. So if we can go around the room and introduce ourselves, maybe Maureen you can start off, if you don't mind.

MS. CONLEY: Sure. Maureen Conley, NRC Office of Public Affairs.

MR. FRANOVICH: I'm Mike Franovich. I'm the Deputy Office Director for the Office of Nuclear Reactor Regulation, and I have the Engineering and Technical (audio interference).

MS. ROQUE-CRUZ: Carla Roque-Cruz. I'm a PM in NRR, and I will be facilitating the meeting today.

MR. RAUTZEN: Bill Rautzen, Health Physicist in the Division of Risk Assessment at NRR.

MR. BROCK: Terry Brock. I'm a Senior Health Physicist at NRC's Research Office.

MR. WILLIAMS: Kevin Williams. I'm the Acting Deputy Office Director for the Office of Nuclear Security and Incident Response.

MS. KHANNA: Meena Khanna, the Acting Director in the Division of Risk Assessment, in the Office of Nuclear Reactor Regulation.

MR. MILLER: Ed Miller, Project Manager, Operating and Branch Licensing.

MR. VASAVADA: Shilp Vasavada, Acting Deputy Director, Division of Risk Assessment, Office of Nuclear Reactor Regulation.

MR. HSUEH: Kevin Hsueh, Radiation

Protection and Consequence Branch at NRC.

MR. GARMON: And I'm Dave Garmon. I'm Health Physicist, works for Kevin.

With that, you can turn it over to Mike for some opening remarks. Next slide.

MR. FRANOVICH: Thanks, Dave. Good afternoon and thank you for joining us today at today's event. I am Mike Franovich. I am a Senior Executive sponsor for today's topic, co-leading along with my colleague Kevin Williams.

We have a full agenda today and are near in capacity, actually, for our webinar platform. And it actually is an encouraging sign of the strong interest in improving the radiation protection framework at the NRC.

Electricity demand in the U.S. is increasing, and nuclear power is essential for reliable energy, including deployment of advanced reactors. The Executive Order 14300 allow the NRC to reinforce its role as the nation's nuclear regulator and ensure regulatory activities are aligned with national energy goals.

Over 50 years of experience, the NRC has made significant strides in regulating nuclear technologies. Key achievements include reducing

radiological effluents, occupational exposures, and accident risks.

Since the inception of the reactor oversight process in the year 2000, plant performance and safety have notably improved. That said, our experience has also shown that some regulatory requirements have been misinterpreted or misapplied in ways that do not align with actual radiological risks or with the original intent of the regulations.

Executive Order 14300 calls on the NRC to consider a more risk-informed, flexible, and effective approach to radiation protection, one that better reflects scientific advancements, with appropriate protection for both workers and the public.

This directive demands our prompt action. My team is working to identify both short-term and long-term reforms based on gold standard science. While the NRC is not taking positions on this Executive Order section yet, we are seeking stakeholder input and consulting with federal partners to develop balanced options for Commission consideration.

The pace of our actions must increase, without compromising safety, while focusing on better tools, data, and decision-making. The public deserves

a nuclear regulatory framework that is credible, responsive, and fit-for-purpose.

I also want to echo the remarks shared by our Commissioners earlier this week. The NRC is in a truly unprecedented position at this time. The direction provided by the President through the executive orders, and along with the mandates of Congress and last year's ADVANCE Act, has charted a bold course for regulatory transformation.

We remain steadfast in our safety and security mission, while also moving with urgency and agility to enable the safe deployment of nuclear technologies for the benefit of society. We look forward to working together with urgency and unity and purpose to meet this moment. Your feedback today is essential in helping us shape effective proposals that will advance the expectations of the executive order.

Turning now to today's agenda, we are pleased to welcome a variety of speakers. Due to strong interest, we've actually expanded the program to include 12 presenters in a moderated, time-controlled public comment period.

We kindly ask all speakers and commenters to be clear and specific when referencing dose levels or exposure ranges.

David and Carla will now go over the meeting protocols. Please keep these in mind as you engage with our team. Radiation protection is a fundamental responsibility of the NRC, and we treat it with the utmost gravity. We appreciate your participation and look forward to a productive and respectful discussion.

With that, I'll turn the meeting back over to Dave Garmon.

MR. GARMON: Thank you, Mike, for that introduction. A last minute change, we're going to go over the meeting protocol after the NRC presentation. It's better and it will be closer to when the presenters are speaking.

So, with that, if I can get the next slide, please. Before I start, I'd like to recognize all of my colleagues that have supported this effort. These meetings are funny because you typically hear from one or a few NRC staff members, but please note that many people have contributed to this material. I'm just the lucky person that gets to speak to it.

Executive Order 14300, titled Ordering the Reform of the Nuclear Regulatory Commission, was issued in May, on May 23, 2025. The Executive Order contains directives that seek to improve broad areas

of the NRC's work. Today we will be focusing on Section 5(b) of the EO.

In this section, the NRC is directed to reconsider reliance on the linear no-threshold, or LNT, model for radiation exposure and the "as low as reasonably achievable," or ALARA, standard.

The NRC is also directed to consider the implementation of determinant dose limits and to consult the Departments of Defense and Energy and the Environmental Protection Agency.

Next slide. The NRC staff's approach to responding to the EO starts with our mission statement. The NRC protects public health and safety and advances the nation's common defense and security by enabling the safe and secure use and deployment of nuclear energy technologies and radioactive materials. We accomplish this through efficient and reliable licensing, oversight, and regulation for the benefit of society and the environment.

As Mike said, the EO provides a backdrop of an urgent need for an efficient and effective regulator to enable modern nuclear technology.

In the context of this urgent need and other EOs, for example Executive Order 14303, which provides direction for federal decision-making using

gold standard science, EO 14300 directs the NRC to reconsider our radiation protection framework.

The staff appreciates this opportunity. I'm pretty sure that every health physicist I know thinks we can do radiation protection better than we have been. And seizing this opportunity, we intend to apply three decades of experience with the current framework and five decades of overall regulatory experience as an agency.

Much of how staff works this assignment will be familiar to those that know NRC processes. I say familiar because we will be working faster and more efficiently. However, we will be developing proposals for our Commission to consider, and we will await Commission decisions through staff requirements, as usual.

In a minute, I will review the schedule for this activity. Lastly, the mission statement reminds staff of why we do what we do, and while this activity will be challenging, my colleagues are anxious to meet the moment.

Next slide. Here we have a little bit more detail on how the staff is approaching the development of our proposals.

Obviously, we're having regular

interactions within our staff working group that includes two of the most capable and experienced health physicists in the agency.

We're eager to hear your viewpoints today, and to review the written input that we will receive during this initial public engagement period. We think there are safe, immediate, and impactful changes for our applicants and licensees that we can recommend in the near term. And we recognize that there may be some longer term items that are important to the EO response, but require more time to develop.

The EO directs the NRC staff to consult with the DoD, EOE, and EPA. And the staff and NRC staff has taken initial steps to establish lines of communication with points of contact in those organizations.

Additionally, the staff will leverage existing relationships such as the Inner Agency Steering Committee on Radiation Standards, or ISCORS, and the Organization of Agreement States, or OAS, to engage with our government partners to the extent that we can. Our goal is to provide the Commission with proposals late this fall to meet the schedule mandated by the EO.

The staff is in receipt of a letter from

the Health Physicist Society to the Commissioners expressing concern about the scheduling of this meeting.

In viewing the schedule, I hope it is now clear why the staff elected to proceed without delay. And we wish you a great meeting in Madison nevertheless.

Next slide. The NRC mission statement I just reviewed includes key functions of regulation, licensing, and oversight. The staff will ensure that proposals for the Commission's consideration improve NRC activities within each of these functions.

We will look to improve regulations such that they provide adequate protection while ensuring the proposed framework can accommodate the innovation in nuclear technology we can clearly see coming before the agency.

We will provide methods of making licensing of nuclear and materials technology more efficient, and focused on items that of clear significance to public health and safety.

And, finally, we will ensure that the NRC's oversight resources are focused appropriately, and we will seek to improve clarity on performance expectations as it relates to radiological exposures.

Next slide. We have a large audience in this meeting and I'm sure we have attendees that run the full spectrum of understanding, regarding the NRC's radiation protection framework.

So, the next few slides will seek to establish the common understanding of the subject matter in hopes that the remainder of the meeting will be clear to all participants.

One of my colleagues like to say that the NRC would not exist if it were not for radiological hazards. In many ways, he is right. Our radiation protection framework covers broad areas like occupational exposures, exposure to members of the public, and environmental impacts of radiological release.

It spans materials, users, operating nuclear power plants, medical applications, transportation of radioactive material, and decommissioning facilities.

While radiation protection requirements permeate essentially all that we do, we can simplify them into three areas: limitations on dose, limitations on radioactivity released, and precautions as stated in the guidance and regulations.

Next slide. Now I'm going to try to walk

through some key terms and concepts that you'll hear throughout this meeting. I'm under no misconception that I will do these terms justice in the limited time we have, but please avail yourself of the many resources online, including the NRC's website to learn more.

A dose response curve is the holy grail of radiation protection research. Here on the left is a simplified example of a dose response curve. The idea is to map a health effect to a given dose. On the Y-axis of many of these curves, you may see the number of cancers, percent health effects, X's relative risks, or odds ratio.

Here you see number of cancers. On the X-axis, you typically see the dose. You can see there is a line that starts at zero and moves upwards to the right. This line represents the linear no-threshold model of dose response upon which radiation protection framework is based, and which Executive Order 14300, Section 5(b) directs the NRC to reconsider.

This model assumes that the occurrence of health effects varies proportionately with dose. The fact that there is no threshold below which health effects are not observed, leads to the radiation protection practice of maintaining doses as low as

reasonably achievable, ALARA.

The idea is that the lower the dose, the lower the risk. But is there a point where dose reduction or the cost of dose reduction, outweighs the benefit of the risk reduction? Especially when we consider there is a significant amount of uncertainty in our understanding at the lower doses. And we have improved knowledge of how our bodies react to radiation exposure at low doses.

As you can see, there are other models that some researchers may have observed in their analyses. The supra-linear response indicates that health effects are more sensitive to changes in dose than the linear approach, especially at lower doses in this diagram.

A sub-linear response indicates that health effects are less sensitive, or that more dose is needed to see a given amount of health effect at lower doses.

Lastly, some research indicates that at low doses there is actually a human health benefit to radiation exposure, which would be demonstrated by the hormesis curve on this diagram.

So far, I've focused on what we call stochastic effects. These are effects whose chance of

occurrence varies with dose. For example, based on our current understanding at very high doses, there would be an increased chance an individual would develop cancer from radiation exposure.

However, there is such a thing as a deterministic effect. This type of effect will not occur unless the dose exceeds a certain threshold. So if the dose is maintained below that threshold, you should not see the health effect.

The occupational dose limit for the lens of the eye is an example of a deterministic limit. The deterministic effect we're trying to avoid is cataracts in this case.

Obviously, we include a safety factor as part of our limit. But the thinking there is that if a dose to the lens of the eye is maintained below the limit, you should not see radiation induced cataracts in the occupationally exposed individuals.

The EO directs staff to consider determinant limits for radiation protection. To expand on that concept that the EO is directing staff to consider whether the limits that protect against stochastic effects should be a single number, exclusive of ALARA considerations.

Later, when we review the topics for

stakeholder consideration for this meeting, we will return to this idea of an end point for ALARA.

To wrap up the last few terms, long ago the International Commission on Radiation Protection, or ICRP, introduced justification, optimization, and limitation and three basic components of radiation protection. In the proposed rule for the current Part 20 that's in place now, the NRC defined justification as no practice for operation involving radiation should be adopted unless it introduces a net benefit.

With respect to optimization, all exposures shall be kept as low as reasonably achievable. Technological, economical, and societal factors taken into account. Oftentimes, those three items that follow are often forgotten when we speak of ALARA. And doses shall not exceed limits selected for the appropriate circumstances.

And, finally, access relative risk refers to the increase in risk associated with a given exposure, compared to the risk of the health effect with that exposure. Without the exposure, excuse me.

Returning to the dose response diagram on the right, you can see that at lower doses, there would be a low risk of cancer above what you would otherwise expect because the excess relative risk is

small in that region. We will come back to this idea in a little while.

Next slide. I'm a visual learner, and I find that creating analogies helps me to visualize complicated ideas.

Recognizing that all analogies limp, I hope this diagram helps put some values we will be discussing into perspective. What I've done is essentially normalize the 10,000 millirem dose to the height of the world's tallest building, Burj Khalifa in Dubai.

With that in mind, the Empire State Building will represent 5,000 millirem, or the occupational dose limit. Washington Monument doesn't quite fit this model, but it's one of my favorite architectural features of the D.C. area, so we'll use half way up the Washington Monument to represent 1,000 millirem.

A typical two-story house would represent the public dose limit of 100 millirem. The door of that house would represent 25 millirem, which matches our EPA partner's fuel cycle limit.

Finally, the flower pots and the bumble bee represent nuclear power plant effluent guidelines and average calculated effluent levels, respectively.

Again, this is for perspective as we move along in this presentation.

It's important to note that the Burj Khalifa level of dose is considered low dose in many studies. Accident doses and doses where we have significant dose response data would be on the order of a favorite mountain if we continue with this analogy.

Lastly, I also want to point out most of the doses from NRC licensed activities are on the order of the house, the door, and the bee. And, unfortunately, the health effects from exposures at these levels are assumed to follow the behavior of doses on the order of mountains and skyscrapers, because of limitations in statistical power of studies.

Slide. This picture here is an excerpt from the biological effects of I-19 radiation, or the BEIR VII report of 2006. In this picture, the authors illustrate that out of 100 people in the U.S., about 42 will be diagnosed with cancer in their lifetime. That's represented by the black dots.

The findings in the report suggest that one cancer, the star, could result from 100 people who are exposed to a single Burj Khalifa level of

radiation, or 10,000 millirem. We go down to Washington Monument levels of radiation, or 1,000 millirem. The risk becomes 1 cancer per 1,000 people. But remember that 420 of these people are going to get cancer just by living.

Based on a linear dose response, we can continue to the public dose level, where a dose of 100 millirem results in 1 cancer per 10,000 people with a background cancer value of 4,200.

As with any scientific study, there is uncertainty. But the impact of this uncertainty is very small at dose levels observed from my NRC licensed activities.

Next slide. Here's another perspective of radiation exposure. I'd like to give credit to my colleague, Vince, for developing this graphic.

This is a fact of life. Just by being alive in the U.S. you will receive about 300 millirem of dose from natural sources. That is average based on -- that is based on average U.S. data. While many are below this, many are above it as well. Some of us get an extra 200 millirem of dose from medical treatments and diagnostics, for a total of about 540 millirem for the average American.

Next slide. This one's a little hard to

see on my slide, but I love this diagram from our partners in the EPA, so I included it here. The link is at the bottom so you can see the higher resolution original version from the EPA website.

I like this diagram because it does a great job at showing relative sources of radiation. For example, if you look at living near a power plant and compare it to the radon in the average U.S. home, you can see how insignificant the power plant's contribution is to public dose.

Next slide. In the statements of consideration for the NRC's radiation protection standards, you can find references to our willingness to modify the radiation protection standards based on the development of knowledge, in the event of significant increases in average exposures to U.S. population, and based on further experience in the administration of the Commission's regulatory program. An example of this language is at the bottom of 51 of the Federal Register, at page 1093.

The EO gives us an opportunity to evaluate these factors once again. Specifically, we can consider updating computing techniques to take a second look at our data, and we can certainly consider the outcomes of our regulatory program, which we will

review in the next two slides.

On the left you can see a snapshot of the occupational exposure information since 1994. On the top left, you can see the collective dose per reactor, that has steadily gone down. While the inset of that picture shows the number of workers has essentially stayed the same, or slightly decreased.

The bottom shows the average measurable dose at a reactor, along with our trusty visualization aid. Workers are receiving occupational exposures on the order of the public dose limit when their limit is at the top of the Empire State Building.

But that's not the full story. It's actually a little misleading because the diagram only includes measurable doses. What if I told you that most nuclear power plants that are monitored for occupational exposure receive no measurable dose at all?

In fact, the same NUREG illustrates that out of about 120,000 power reactor workers that were monitored, only 51,000 received a measurable dose. In other words, close to 60 percent of radiation workers at power plants receive occupational doses too small to measure.

Incidentally, when we consider all the

licensees that are required to report occupational exposures to the NRC per Part 20, the percentage is roughly the same, about 60 percent.

Now onto the public exposure example. Here we have doses that result from gaseous and liquid effluents at power plants. You can see that we're deep into bumble bee territory here. Let me go back to our analogy.

What's interesting about these numbers is that these are doses to what we call the maximally exposed individual, which is a conservative analytical tool we ask our licensees to use to calculate a bounding dose that would result from their effluents. It's very conservative because it requires licensees to use limiting inputs and fairly conservative assumptions.

Even with those provisions, you can see that a dose that's from radiological effluents are essentially zero.

Next slide. This next slide is just to show that our power plants are getting safer. I'd like to give credit to my colleague, Elijah, for compiling this dataset I used to make this diagram.

The light green represents '80s vintage plant risk data. The dark green shows how that data

has changed with contemporary risk analysis of plant risk. As you can see, over time, there is decreasing accident risk.

So, to summarize, our regulatory experience tells us that nuclear power plant licensees are demonstrating sustained reductions in dose, and improvements in nuclear safety. And many of these observations can extend to other areas the NRC regulates.

Next slide. With that background, I hope you have a better understanding of where the staff is coming from with respect to the stakeholder discussion topics. We are very much interested in research that would inform our reconsideration of LNT and the potential establishment of determinant dose limits.

We're interested in hearing about our licensees' experience with ALARA, the good, the bad, and the ugly. We'd like to hear about recommended ALARA end points as a basis for proposals, and the basis for their proposals.

With the understanding that stochastic occupational dose limit is intended to manage lifetime exposure and does not represent a demarcation of safety, we're interested in hearing the benefits or drawbacks of making regulatory changes that would add

flexibility into how these dose limits are implemented. For example, over multiple years.

We've had discussions about the potential for adjusting cost benefit, dollar per person rem, guidance to acknowledge that lower risk at a lower doses, and would be interested in hearing the participants' views on that, as well.

And, finally, we're open to any recommendations to the NRC's radiation protection framework, and would welcome any remarks that are within the scope of this meeting.

Thank you for the attention and that concludes my presentation. And we'll move on to a discussion of the meeting rules here shortly.

Next slide. Okay, now I'll review some of the meeting rules before we transition to the presenter portion of this meeting.

As has been mentioned, this is a comment gathering public meeting. The intention is for the public to provide their viewpoints on the subject matter, which the staff will use for developing recommendations for our Commission's consideration.

We are not making decisions today, and we're not even at the point in the process where we can even discuss what the staff is considering with

any detail.

So if you ask a question of the stuff, it's likely we will defer it to another public engagement down the road.

Please note that views expressed by non-NRC staff during presentations and during the public comment period, reflect those of the speaker and do not necessarily reflect the official views of the NRC or the federal government.

Nuclear safety is the public's business and we should not conduct the public -- we should conduct the public's business with appropriate decorum. However, our great country recognizes our right to free speech. Therefore, only conduct that is disruptive to the meeting itself will be prohibited during this meeting. For the purposes of this meeting, that includes discussing matters not relevant to the directives to the NRC in Executive Order 14300, Section 5(b) and inappropriate remarks as described on this slide.

In order to ensure that as many participants' viewpoints can be heard, balance with providing appropriate time for participants to express their viewpoints, we will be observing strict time controls during this meeting.

We have 12 presenters that will be allowed 10 minutes. We also have some padding for technical difficulties, so you can see we're a little ahead on the agenda.

Then we will have a two-minute public comment period. Please ensure your comments are relevant to this meeting's subject matter. We will mute your microphone once your time has expired. Please watch the time that one of my colleagues will display through the meeting video so that you are not cut off.

Unfortunately, we have to maintain this strict policy to be fair to all speakers, so we will cut you off. Please do not make us do so.

We will select public commenters based on the raised hand queue. When we commence the public comment period, we will reset all raised hands at which point then you can raise your hand if you want to make a comment and you will be queued in the order that you raise your hand.

If time permits, you can re-enter the queue after you make your comments, when you will be, once you are selected again, you will be afforded another opportunity for comment, and so forth.

Regarding conduct during this period, we

will enforce a warning policy where we will mute your microphone the first time inappropriate remarks are made as defined on the previous slide. And then, we will invite you to make written remarks on the second warning.

All of the meeting materials are available for your review and for your reference during this meeting, with the public meeting notice.

And with that, I'd like to ask if we'll take a minute to switch over to the presenter slides, and I'd like to ask if Dr. Stein is ready to present, or if you need a few minutes to prepare.

DR. STEIN: Oh, thank you. Yes, I'm ready to present.

MR. GARMON: Okay. Let's get you set up.

(Pause.)

DR. STEIN: If the slides are up, I cannot see them, so --

MR. GARMON: There is a slight two-second delay on the transition of slides, Dr. Stein, so just give us a second.

DR. STEIN: Yes, I can see it. Excellent, thank you. My name's Dr. Adam Stein from the Breakthrough Institute. I appreciate the opportunity to speak today related to this topic.

I'll also note at the beginning of my presentation that we submitted a white paper to the NRC on this topic, which is available on the meeting page.

Next slide, please.

MR. GARMON: Hang on Dr. Stein, we're having a little bit of trouble.

DR. STEIN: Okay.

(Whereupon, the above-entitled matter went off the record at 1:36 p.m. and resumed at 1:40 p.m.)

MR. MILLER: Dr. Stein, can you confirm if I'm displaying your slides now?

DR. STEIN: Yes, we can see the slides again in a pdf viewer window.

MR. MILLER: That still better?

DR. STEIN: There we go. Now it's full-screen. Thank you.

MR. MILLER: Yeah.

(Simultaneous speaking.)

DR. STEIN: Technical issues are no big deal.

Breakthrough Institute is a nonprofit organization, a global research center, focused on pro-growth, pro-technology, and pro-development. We're non-partisan. We advance durable solutions that

are grounded in empirical and cutting-edge research.

Importantly, the Breakthrough Institute does not receive any funding from industry. And our team, in particular, attends the vast majority of all NRC meetings and publishes positions on policy and regulation regularly. So we are hugely engaged in this process. Next slide, please.

For context that is hopefully relevant to all the presenters that follow me, a lot has changed and very little has changed. There have been multiple recent executive orders, including Executive Order 14300, as the NRC mentioned initially with this presentation, and the ADVANCE Act that was signed into law last year, which included an update to the NRC's mission statement to reflect the initial intent of the Atomic Energy Act and the Energy Reorganization Act.

That regulation must be conducted in a manner that is efficient and does not unnecessarily limit civilian use of radioactive materials and nuclear energy, and does not unnecessarily limit benefits of civilian use to society.

There is still, however, significant uncertainty when it comes to very low-dose radiation effects. This has barely improved since Part 20 has been established, despite a large, vast amount of

high-quality data. The uncertainty is not going to be resolved by collecting more data. The uncertainty and variance is in the data.

The NRC acknowledged this and denied petition for rulemaking several years ago, that there is significant uncertainty related to the linear no-threshold model, and there is a scientific consensus that LNT is unprovable. The NRC actually cited the IAEA that said LNT is unprovable, or probably unprovable, I should say. Next slide, please.

For further context, the Atomic Energy Act requires the NRC to protect the public -- provide adequate protection to the public. Adequate protection is not specifically defined in regulation. It is assumed that the amalgamation of existing regulations results in adequate protection at a minimum. Both the Commission and courts have affirmed that adequate protection is not absolute protection or zero risk.

The NRC has safety goals, which are goals, not requirements. These goals are intended to compare risks in the way of bad fits, but the derived value is the quantitative health objectives, or QHOs, are based on cancer prevalence in the population, and disconnected from anything directly related to nuclear

power operation, or other alternative energy sources.

The Commission did affirm that the QHOs, plus other regulations, achieve adequate protection. That indicates that risks below the QHOs are more than adequate.

The Clean Air Act -- specifically, the 1990 amendments to the Clean Air Act -- Congress defined values of what it deemed acceptable risk. These values relate to nuclear power and many other hazards, provides level of acceptable risk and ample margin safety below, which further regulation is not necessary. Next slide, please.

As an overview of the Breakthrough Institute's position, no other model is more certain than LNT, due to the high variance of data at very low thresholds. Or very low values, I should say. The underlying assumptions about LNT prudence should be reconsidered, however. There are three specific assumptions that LNT is based off of, that I will discuss a little bit more later.

The NRC should adopt similar risk warnings to EPA, based on the 1990 Clean Air Act amendments that do relate to nuclear power, as acceptable risk and ample margin of safety have a quantitative value. NRC should initiate rulemaking to adjust those limits

that will be safe and provide for the flexibility. Most importantly, a de minimis, or clearance dose should be set.

The NRC should continue to work to communicate nuclear risk effectively, and include the tradeoffs of utilizing other forms of energy.

NRC should lead a reevaluation of radiation protection with partner agencies, to harmonize these standards, which are currently very disparate. Next slide, please.

The NRC needs a dose response model. It is not a feasible option to say that NRC should remove LNT without an alternative. Something has to be used. Low-dose data for radiation risk is still sufficiently uncertain, despite decades of research. As I mentioned, this is inherent in the variability of the data.

Research is dominantly based in correlation, not causation, with extremely large error or confidence intervals. All models are within the uncertainty range of this variable data at very low doses. LNT has the most direct assumptions to make it viable, though.

But because of the variability of the data, LNT is still science-based to the extent of

available evidence. This warrants changing the risk paradigm, not necessarily the risk model. Next slide, please.

There are other alternatives to inform the use of dose threshold models, such as DDREFs, which modifies the expected harm of chronic low-dose exposures. We suggest continuing to maintain large study populations, to the extent that it is feasible, that that work will likely take decades more.

There should be established a clear understanding that this is an imperfect model, but it is sufficient, since regulation makes up the gaps. The LNT dose response model is not the same as the regulatory application of the model, or associated assumptions thereof.

Consider means such as dose limit changes, include balancing the possibility of risk or the uncertainty could mean it's possibly safe.

This brings up the question, is precaution necessarily a virtue? The answer is, no, precaution can unnecessarily limit, and inspire concern despite relevant benefits. Next slide, please.

Regulation needs to be taken in context. It is on part of a spectrum between empirical evidence of science and subjective policy. Arguments about LNT

often miss that it is part of the gradient of decision-making. Science should inform regulation, and regulation can also shape science.

Adequate protection needs to have a quantitative measure -- most likely, dose -- but a level of acceptable risk from dose is a value judgment.

Legislation is the most concrete tool for translating these societal values of acceptable risk, and has already been done through the Clean Air Act. Next slide, please.

In context of doses to the public, consideration must be made of existing natural doses and medical doses, both of which the NRC staff hopefully illuminated earlier.

Studies have shown that variation of background doses, which can happen just moving from one home to another, or one elevation to another, do not show statistically significant increase in cancer risk.

To provide some context, I overlaid the one millisievert, or 100 millirem, current NRC public dose limit onto this chart. You can see that that is easily confined within the variation of background dose amongst the public. The .03 millisievert

effluent risk that was also mentioned by the NRC helpfully earlier is two orders of magnitude smaller still.

Other regulators, such as the FAA, do not regulate very small doses, which can dwarf the affluent release, three millirem, or .03 millisievert, dose limit, with a single flight.

Options do exist for a five millisievert dose from the NRC regulations, for doses to individuals that are interacting with individuals with medical treatments.

This is also important because if a person receives that larger dose from being near somebody that received a medical treatment, they receive no benefits from that medical treatment directly, unlike nuclear power, which provides larger benefits to society. Next slide, please.

NRC should change ALARA principles to dose optimization, which would be a little bit more internationally aligned, and the implication is not to minimize dose, but to generally optimize exposure.

ALARA makes a strong assumption, or two strong assumptions, that must be reconsidered. It assumes that reducing any dose increases safety. That's a policy choice, not a scientific fact. As I

discussed earlier, due to uncertainty, that's not provable, especially at the very bottom of a very low-dose scale.

This assumes a wholesale dose reduction benefits society, without eliminating other benefits. The dollar per-person gram cost justification is on its licensees. It does not consider cost, or unnecessarily limiting benefits to society currently.

ALARA dose cutoff is more reasonable than no cutoff in this context. Diminishing returns of action at very low levels, this is a clear example of diminishing returns.

Continuing to apply the new mission statements in response to the ADVANCE Act requires the NRC to consider that this might unnecessarily limit benefits to society. Next slide, please.

The intention of the Executive Order of the NRC is for the NRC to reevaluate LNT. It should consult with other agencies, and the NRC has recently demonstrated capacity and energy for change. NRC should, therefore, lead the efforts to harmonize regulation of radiation risk with these other contingencies.

Additional executive clarification should be sought to avoid EPA/NRC conflict, as in the past,

and a potential joint issue of the new presidential guise on the issue, would help to achieve alignment. Next slide, please. However, keeping LNT does necessitate change. Radiation protection needs streamlining and stronger communication.

The NRC can drive industry change. INPO, for instance, is unlikely to change ALARA comparisons where industry groups try to achieve lower dose values without NRC input. This is unintentionally inciting unintentional outcomes that are outside of the regulatory paradigm, but are addressable in the regulatory paradigm.

Evidence exists they adjust by reconsidering the assumptions behind LNT. One of the main assumptions is that potential health risks are proportional to dose received, and that there is an incremental health risk associated with even small doses. And the severity of this stochastic fact is independent of the amount of radiation dose received.

These two assumptions, resulting in increased health risk but not in a health consequence, implies that all of the effects of increased risk are due to higher probability of stochastic effects.

That is not necessarily shown in the data of background radiation studies, where stochastic

effects would be every interaction that the person had with radiation, should increase the probability of cancer outcomes.

But even with the larger variability in background radiation that we receive relative to nuclear power, that is not observed.

This lack of observed outcomes challenges that it is a purely stochastic risk, and that is one of the main necessary assumptions to justify LNT as-is. Next slide, please.

We propose does limits on a multi-tier system. Below, one millisievert should be exempt as a clearance dose, or a de minimis dose.

This is based off of the values that are already observed as having no statistical justification in most studies.

Tier 2 is a public option limit from one millisievert to ten millisievert. This would be similar to the existing radiation paradigm.

Tier 3 is occupation dose limits. And we recommend maintaining an overall dose limit around fifty millisievert.

These recommendations are just as safe, work with the current scope of limits, and provide the ability to balance the benefits of the use of nuclear

technologies relative to the risks. Next slide, please.

MR. GARMON: Dr. Stein, we're up on time.

DR. STEIN: All right, that's fine. I appreciate the opportunity to speak today.

MR. GARMON: Thank you, Dr. Stein. All right, our next speaker is Mr. Daniel Hirsch. Mr. Hirsch, I'm going to make you a presenter here and give you the opportunity to check your sound and your camera.

Mr. Hirsch, you should be able to control your microphone and your camera. You have to unmute yourself to speak.

(Off-mike comments.)

MR. HIRSCH: I am grayed out. Can you hear me?

MR. GARMON: We can hear you now and we can see you now.

MR. HIRSCH: Ed, you can hear me?

MR. GARMON: We can hear you fine and we can see you, and your title slide is showing.

MR. HIRSCH: Okay, thank you.

MR. GARMON: Go ahead and start your presentation when you're ready.

MR. HIRSCH: Thanks so much. My name is

Daniel Hirsch. I'm a retired director of the program on environmental and nuclear policy at the University of California-Santa Cruz, and president of the Committee to Bridge the Gap.

So, I'm going to disclose the dirty little secret at the heart of the nuclear executive order. It could result in allowing radiation exposures to the public 100 to 1,000 times higher than permitted today. Radiation at those levels is estimated to cause cancer in about four out of five people exposed.

The Executive Order states, and I quote, the NRC utilizes safety models that posit there is no safe threshold of radiation exposure, and that harm is directly proportional to the amount of exposure.

And that's true. It goes on to say those models lack sound scientific basis and produce irrational results, such as requiring that nuclear plants protect against radiation below naturally occurring levels.

And that's not true. The EO thus flies in the face of more than half a century of findings of the National Academy of Sciences, and virtually all other international scientific bodies. Indeed, radiation risk estimates per unit dose have generally increased over time.

The National Academy's BEIR V study had risk estimates that were three to eighteen times higher than BEIR III, and the BEIR VII excess cancer risk estimate is a further thirty-five percent larger than BEIR V.

As recently as four years ago, the NRC itself, citing the scientific consensus, strongly rejected petitions for rulemaking to reject LNT. And here we are again basically being told to reverse.

Recent high-quality studies, such as the International Worker Study and FECT, have further reinforced LNT, confirm cancer risk in the low-dose range, and in fact found low-dose cancer risk greater than one would presume from extrapolating from A-bomb survivors who were exposed to higher doses.

The In-Works research, for example, found excess relative rates for solid cancer mortality at low doses "larger than estimates currently informing radiation protection." In other words, standards are not strong enough.

Furthermore, NRC regulations, of course, do not require exposures be below background, as claimed by the EO. The NRC regulations require that the dose be kept to .1 rem in a year, exclusive of the dose contributions from background radiation.

And background radiation is, of course, far from harmless. The National Academy's risk factors indicate that about ten million of the current U.S. population will get cancer from background radiation. Adding to that exposure adds to the risks.

So, what would be the public health impact if the regulations based on the linear no-threshold model were overturned?

The LNT petition for rulemaking that the NRC rejected in 2021, proposed increasing permissible worker doses to ten rem per year, and increasing public exposures to the same amount. Anti-LNT addicts generally claim a low-dose threshold of ten rem.

So, what does that mean in terms the public can understand? If dose limits for the public were increased to ten rem a year, that would be the equivalent of five thousand chest x-rays each year, from conception to death.

That would one hundred to one thousand times higher than current permissible limits. Ten rem a year would be a hundred times higher than the current NRC limit of 100 millirem a year, it would be about a thousand times higher than the current EPA limit through clean-up of contaminated sites, and about a thousand times the current EPA and NRC limits

for public exposure to nuclear fuel cycle facilities.

So, here's the key risk for addressing the adequacy of radiation protection limits.

1.17 times ten to minus three cancers per person rem, at what are considered low doses. This comes from the National Academy of Sciences BEIR VII report that was commissioned by NRC, EPA, and DOE.

The official figure from EPA is essentially the same number, 1.16 times ten to minus three. So, in plain language, there's a little bit more than one cancer produced per thousand people exposed to one rem.

Ten rem per year over a lifetime would thus result in an excess cancer -- put your seatbelts on -- in more than eighty percent of the people exposed.

It's a hugely unacceptable risk. The EPA acceptable cancer risk range for exposure to carcinogens is one in a million, to one in ten thousand. If linear no-threshold model and the regulations based thereon are thrown out and replaced with a so-called low-dose threshold of ten rem per year, the risk to members of the public at such exposures would be nearly ten thousand to one million times higher than the acceptable risk range.

So, NRC radiation regulations should be changed, but they should be markedly tightened.

Current public limits are thirty-five years old, and worker limits are two-thirds, or a century old, established in 1960, not modernized since.

In finalizing the current regulations in 1991, the NRC noted that BEIR V had come out after the proposed rule, and has substantially increased radiation risks per unit dose. But NRC declined to tighten the permissible exposures accordingly.

Even decades ago, the NRC conceded its radiation limits produced risks higher than standard allowable risks, and the situation's only gotten worse since then.

The National Academy and EPA cancer risk estimates for the current worker dose limits that the NRC has -- NDOE -- is that one in five workers would get cancer at the exposures allowed under the regulations. That's five thousand millirem a year, equivalent to ten chest x-rays every day you work.

Over a working life from age eighteen to sixty-five, that would yield a risk of excess cancer of approximately one in five, according to BEIR VII and EPA.

In other words, if a hundred workers began nuclear employment and received the radiation each year at the permissible level, twenty of them would be predicted to get cancer from their occupational exposure.

This is grossly non-protective.

NRC radiation limits for the public are far outside the acceptable risk limits for any other percentage.

The BEIR VII and EPA risk coefficients indicate that the current regulatory permissible dose for the public of a hundred millirem per year, received over a lifetime, result in a cancer in approximately one out of every hundred people exposed.

That's a hundred to ten thousand times outside the standard acceptable risk range for all carcinogens.

The EPA famously put it a few years ago, "to put it bluntly, radiation should not be treated as a privileged pollutant. You and I should not be exposed to higher risk from radiation sites than we should be from sites which contained any other environmental pollutant."

So, what would be the real-world effects if LNT and the regulations derived therefrom were

abandoned?

Cleanup of contaminated sites around the country would almost completely stop. Cleanup would be abandoned at numerous highly contaminated superfund sites that are part of the Department of Energy's nuclear weapons complex.

For example, Hanford, Los Alamos, and Oak Ridge cleanup obligations would be voided for abandoned uranium mines and tribal lands, such as Navajo Nation.

Former Manhattan project contaminations, such as the Westlake facility in Missouri, would never be cleaned up, and decommissioned nuclear plants would be able to leave much of their radioactive contamination and just walk away.

Additionally, such a change would allow massively increased radioactive releases from nuclear power plants, which eliminate most controls for radioactive releases into air, rivers, lakes, and oceans, would authorize high-level waste repositories, even if projected doses from leakage far exceed current limits.

So, the Executive Order to gut radiation protection, should cause great concern for both critics and supporters of nuclear power.

Critics should worry about the harm that would result from extreme increases of permissible radiation exposures to the public, and supporters of nuclear expansion should worry that massive weakening radiation protection standards will damage prospects for public support, since it demonstrates that nuclear plants can't operate unless allowed to expose the public to unacceptable radiation levels.

Conclusion. Radiation protection standards should be markedly strengthened, not gutted. Thank you.

MR. GARMON: Thank you, Mr. Hirsch. Dr. Bahadori, are you ready for your presentation?

DR. BAHADORI: Yes, I'm ready to present.

MR. GARMON: Okay, we're switching off here for a second. Just a minute. We'll get to your title slide when we're ready to go.

DR. BAHADORI: Okay.

MR. GARMON: Are you ready to go, Bill?

MR. RAUTZEN: Yep.

MR. GARMON: The floor is yours, Dr. Bahadori.

DR. BAHADORI: Okay, I wanted to thank you for the opportunity to present today. I'll be talking about a proposed process to define optimization-exempt

dose values. Next slide, please.

So, I wanted to begin with some disclosures, several that I think are pertinent to this presentation and the potential for at least the appearance of a conflict of interest.

If you're interested in reading more about my background and other activities in order to interpret the presentation today, please feel free to access my faculty profile at the provided QR Code. Next slide, please.

I want to emphasize, in addition to the disclaimer that the NRC provided that the views and opinions expressed are my own and have not been reviewed or approved by my employer or any other organization. So, I'm representing my own viewpoint with this presentation. Next, please.

And then I want to clarify the scope of this presentation is restricted to stakeholder discussion topic three, which states that the NRC is interested in insights on finding dose values below which ALARA efforts would not be required by regulation. Next slide, please.

So, in order to set the stage, I wanted to revisit a topic that's known as the "Regulators Dilemma." This was coined by Weinberg in 1985.

The regulator is oftentimes faced with having very little information on the risks of small exposures, or uncertain information on these.

And that's the case here with radiation exposures. However, we still need some type of a regulatory structure in order to address these exposures, even if that means defining levels that may be exempt from regulation.

Society also has finite resources. So, as we all know, we can't spend just insane amounts of money reducing very small radiation doses. There has to be an optimization of these resources, since they are limited.

And so, optimization should be the focus of this principle of radiation protection. I agree that we really need to be talking about optimization, as opposed to ALARA, which kind of had the connotation of reducing doses as far as you can, even though the word "reasonable" is in that acronym.

ALARA, as currently implemented, can result in great cost with little benefit, reaching that level of diminishing returns that has been mentioned before as well. Next slide, please.

So, in order to kind of alleviate this problem, we have the possibility of defining what's

called a "de minimis dose," or a dose that is so low that it is essentially trivial.

The goal here is to establish an optimization lower bound, a dose below which optimization would not be required.

There's various methods that are available in order to do this. Some of these are discussed in the book "De Minimis Risk," which was edited by Chris Whipple, published in 1987, QR Code here for that book.

And a few that I want to mention are, you could take the smallest measurable value, which I'm not a proponent of, because we're so effective at measuring radiation and radiation doses, it seem like it wouldn't really be practical to define the de minimis dose that low.

You can look at natural background variability, but then you have the inevitable question of what an appropriate fraction or multiple of natural background should be for the de minimis dose. Or you can look at modeled risks, which is the approach that I am proposing to take here.

So, really, what we want to do is we want to take the paradigm from what's shown here at this figure at the bottom of this slide, where we have

above an annual limit those exposures are prohibited.

Between natural background and annual limit, we have optimization, and then natural background of course would be exempt, as was previously mentioned. Next slide.

And we want to change this to a situation where we are exempting natural background plus a de minimis dose. Again, an additional dose on top of background that is so low that the corresponding risk is essentially trivial. Next slide.

So, I think it's important to point out that in the area of radiation protection, we really rely heavily on consensus recommendations that are made by various bodies -- in particular, the NCRP National Council on Radiation Protection Measurements here in the United States -- and internationally, we have the ICRP, or the International Commission on Radiological Protection.

Both of these organizations recommend the use of a de minimis approach in some way. There's the negligible individual dose concept, which the NCRP has espoused in reports 116 and 180, and as a universal smallest value for the de minimis dose, they recommend a millirem, .01 millisievert.

They also recommend a process to define a

de minimis dose that may be in excess of this level. That shows up in NCRP Report No. 121, and also in ICRP Publication 103, which is the governing document for the system of radiological protection internationally, that is currently recommended, but is undergoing revision right now by the ICRP. Next slide, please.

So, the process that I'm proposing is related to the process that is recommended by both the NCRP and the ICRP. Again, we want to define this optimization-exempt dose above background.

And so, in order to do this from a risk perspective, we have to look at what quantities we need to limit on an annual basis.

I want to emphasize that these quantities are modeled, they are statistical. They are not actual numbers of deaths, or actual excess individualized time risk. We want to limit the modeled excess number of deaths and the modeled average excess individual lifetime risk.

In order to do this and relate a dose, we have to have some assumptions, or knowledge, to do that, and that includes probability of exposure, and also a dose-risk model.

Finally, the variables that these levels can be dependent on, we're trying to get to an

effective dose or a similar quantity effective dose equivalent, to define that dose level, and population size is important. It comes into play in this calculation as well. Next slide.

So, for this exercise, the values that I chose -- and I want to emphasize that these should be subject to stakeholder input and debate prior to an ultimate decision by the Nuclear Regulatory Commission.

But the excess modeled number of deaths is one here, and that's recommended in ICRP Publication 103, and the maximum, or the excess individual lifetime risk, ten to the minus five, one in a hundred thousand, falls into that range, which is typically considered to be very small.

Other values that I used in this example, we considered a hundred percent probability of exposures. So, these exposures will occur to this hypothetical modeled group as individuals, and to link dose to risk, I used a value of .05 deaths per person sievert, which is from the ETA Bluebook published in 2011. This is applicable to a general public population, and a chronic low-level exposure. Next slide.

So, because we have these two objectives

limiting both the excess number of deaths and the average excess risk per individual, the population size comes into play at a certain point.

But for population sizes less than a hundred thousand people, in this example the limit on the average excess risk to the individual is what determines the de minimis effective dose. And we arrive at a number of .2 millisievert per year, or 20 millirem per year.

Now, obviously, we don't want to just blindly rely on a model to calculate this value. It's important to do a reasonableness check as well, to stick to that R in ALARA.

And so, the first question is, is this measurable? Yes, we can measure twenty millirem over the course of a year, in order to validate our calculations.

Is it a reasonable fraction of annual natural background exposure? In my view, yes, it's on the order of ten, twenty percent of at least the average annual natural background exposure in the United States.

And is it consistent with other unregulated chemical exposures? Currently, this is TBD. But as the NRC was going through the BRC

practice forty years ago, the answer at that time was yes. Next slide.

MR. GARMON: Thirty seconds.

DR. BAHADORI: So, there are some criticisms of this approach and I've got some responses here. First, could we consider an increase in that risk for individuals? Maybe, but it's important for us to understand that licensees are regulated, not exposed individuals. We have the possibility of a different de minimis for public versus workers.

I did assume LNT, but that's just because I need some way to connect dose to risk here. And we're looking for a reasonable lower bound for implementation.

And as I mentioned, the NRC did try this before with BRC, which obviously is not implemented. I acknowledge that.

I think we need to learn from it, try again, and include extensive stakeholder participation early and often.

And this is the conclusion of my presentation. Next slide has some references. And I thank you for your time.

MR. GARMON: Thank you, Dr. Bahadori. And

next, we have Micheal Smith from the Nuclear Energy Institute. Mr. Smith, would you like to check your audio and video?

MR. SMITH: Can you hear me all right and see me?

MR. GARMON: We can hear you fine, and it looks like your video's coming up. You ready yet?

MR. SMITH: Yeah, we're good to go? You can see me now?

MR. GARMON: Whenever you're ready, Mr. Smith.

MR. SMITH: All right, very good. So, good afternoon everyone. I'm Micheal Smith, the Senior Project Manager for Radiation Protection at the Nuclear Energy Institute, and I thank you for your opportunity to share the industry's preliminary perspectives today.

We appreciate the NRC's efforts to engage stakeholders, and we look forward to and support this constructive dialogue on how to best modernize the radiation protection framework. Next slide, please.

For those unfamiliar with the Nuclear Energy Institute, NEI is the policy organization for the nuclear industry, and has been for over thirty years.

Our membership if vast and spans across power reactors, advanced reactor developers, other nuclear technology developers, suppliers, academic institutions, etc. Next slide, please.

And our mission is to promote the use and growth of nuclear energy through efficient operations and effective policy. And we accomplish that by providing a unified voice for the nuclear industry. Next slide, please.

As this effort unfolds, it is important to reflect on the broader goals and the opportunity in front of us to modernize this framework in a way that continues to provide reasonable assurance of adequate protection, but also supports the nation's energy and national security goals.

The executive orders that were issued in May have provided directives to accelerate NRC licensing, significantly expand deployment opportunities for reactors, strengthen our nuclear industrial base, and ensure nuclear energy is central to energy security and national security.

These executive orders highlight nuclear energy's broad value, and emphasize the need of a sound radiation protection framework that continues to ensure safety, while enabling full realization of

nuclear energy's benefit to cross-sectors. Next slide, please.

The reconsideration of the radiation protection framework offers a pivotal opportunity to bring the image on this slide to reality, where we can utilize the full benefits of nuclear energy and its versatility.

From providing electricity to homes, business, and data centers, to production of medical isotopes, to hydrogen production, to processed heat, nuclear makes it happen. Next slide, please.

The reconsideration of the radiation protection framework offers a critical opportunity for the United States. This is a chance to ensure the NRC framework continues to protect the public, workers, and the environment, but is reasonable and incorporates everything we have learned since Part 20 was last update over thirty-five years ago.

This is also a chance to ensure the NRC framework is consistent with our current scientific understanding and our understanding of radiation risk.

At the same time, this initiative allowed the review of related areas, including emergency preparedness, accident analysis, acceptance criteria, transportation and legacy guidance, to promote

consistency across the regulatory framework.

Development of a policy should be considered to help communicate the intent of the updated framework, to ensure there is clarity going forward for NRC staff, licensees, applicants, workers, and the public. Next slide, please.

So, addressing ALARA and reasonableness. One of the clearest challenges we've battled with for decades, is the level of effort and resources focused on the lower end of the dose spectrum, where we know radiation risks are indistinguishable from background.

With that said, implementation of ALARA in the existing regulatory framework has been overly conservative.

Radiation protection remains essential for the use of nuclear technologies. However, the way ALARA has been applied as a regulatory requirement has led to licensing inefficiencies, constrained facility designs, and unnecessary complexity and regulatory decision-making, without improving safety.

So, there's a real need for a more graded risk-informed framework that provides clearer direction and improves regulatory efficiency.

It is also important to note that for the public and occupational doses, industry continues to

operate far below the dose limits. And important contributors to that are industry operating practices, and greater improvements in equipment and fuel reliability, which are important for safety and maintaining high operating capacities.

While considering the NRC's stakeholder discussion topics for this meeting and the directives of the recent executive order, our preliminary recommendation regarding ALARA is to remove ALARA and minimization as regulatory requirements, and establish a practical threshold and guidance, our policy statement below, which further efforts to reduce doses are not expected.

A threshold to consider is two rem a year for occupational doses, since this lines up well with the industry's already-established administrative dose limit, and also somewhat similar to how international recommendations approach occupational doses some others have mentioned earlier. Next slide, please.

Considering the other stakeholder discussion topics, the broader question is, what else should a modernized regulatory framework consider?

The updated frameworks should reduce unnecessary conservatism, while continuing to ensure protection of the public and workers, and facilitate

optimized licensing and design reviews that focus on risk-significant exposures. This should apply to oversight as well.

The industry is fine with maintaining established deterministic dose limits, but note that updated international recommendations do not necessarily have explicit organ-specific dose limits like Part 20 currently does. So, that may be something to consider changing.

And we would like to better understanding the idea of transitioning away from annual dose limits to a limit based on longer periods.

Our initial thoughts are we're not sure what the benefit of this may be, and that it could complicate modern unit workers.

Also, reexamining cost benefit metrics with the more graded approach that considers our understanding of radiation risk at low doses, would be beneficial. Next slide, please.

To provide some other initial preliminary insights for your last stakeholders discussion topic number six, we believe there are other targeted regulatory changes that could be beneficial, and align with the goals of the executive orders.

These targeted changes include

coordinating within EPA to eliminate outdated or duplicative rules, like 40 C.F.R. 190, so we can just focus on the public dose limit, instead of having competing limits or criteria.

In addition, with the idea of removing ALARA's regulatory requirement, that should also involve removing Appendix I to Part 50. The thresholds are overly conservative, and based on outdated dose methodologies.

Providing clear monitoring and reporting thresholds would also be beneficial. The current implementation of 20.1502 requires licensees to develop and document prospective dose evaluations, to unnecessarily justify not having to record and report every single millirem of exposure.

A specific minimum recordable dose threshold could also provide a lot of value and eliminate the need for these unnecessary evaluations.

In addition, consider changing the unrestricted use criteria for license termination, from twenty-five millirem a year, to a hundred. This would align with the existing dose limit, noting that anything below that level is okay.

But industry acknowledges that this may also require NRC to reevaluate other memorandums of

understanding with the EPA that are related to this topic.

Allowing the voluntary use of modern dose models, such as those from ICRP or NCRP, without requiring NRC prior approval, would also be beneficial.

Currently, licensees and applicants need prior approval to use methodologies that are not aligned with the dose methodologies in which Part 20 are based on.

So, making Part 20 agnostic to a specific dose model and not requiring these prior approvals, would be an efficiency gain for the NRC, operating facilities, and for licensing and design efforts.

As part of modernizing the regulatory framework, it's essential to also update the supporting guidance documents to reflect current thinking and illuminate the inefficiencies in licensing and oversight.

This includes revising standard review plans to remove outdated or overly-prescriptive content that can cause delays or confusion during licensing.

Regulatory guidance should also be updated to align with risk-informed practices, to provide

greater flexibility in how radiation protection programs are implemented.

For example, Reg. Guide 8.38, which addresses access control to high-radiation areas, could be revised to provide clear expectations and allow for a broader range of compliant alternative access control methods.

It's equally important to review and revise the inspection manual chapters and associated inspection procedures, to ensure consistency with the revised framework and with our current understanding of radiological risk.

Any updates to guidance should aim to improve clarity and flexibility, eliminate inconsistencies that contribute to inefficiencies, and promote predictable, risk-informed licensing and oversight. These improvements are particularly timely, as the agency prepares for a wave of licensing activity. Next slide, please.

Our position is clear. Safety and public trust must remain at the forefront. But we support the modernization of the framework to ensure that it keeps up with our scientific understanding, supports innovation, and enables the deployment of nuclear technology for the benefit of society.

This effort is foundational to that. It's not just about regulatory requirements and guidance, but it's also about creating an environment and understanding where nuclear investment, deployment, and public confidence, can grow together.

As we look forward, this effort would shape the direction of nuclear energy for decades to come, and the potential's enormous.

Like I mentioned earlier, we're talking three hundred gigawatts of new capacity, modernized fuel cycles, global leadership of nuclear energy, and nuclear's pivotal role in defense of security.

A modern risk-informed radiation protection framework based on sound science is a cornerstone to making that future a reality.

Thank you for your time today. We appreciate the NRC's effort to modernize the radiation protection framework and holding this public webinar, and we look forward to future opportunities to provide feedback, as we work as a country to build a regulatory framework that's protective, practical, and prepared for the future of nuclear energy in the United States. And that's the end of my presentation. Thank you.

MR. GARMON: Thank you, Mr. Smith.

Dr. Higley, do you want to check your audio and your video? Make sure you're good to go?

DR. HIGLEY: I can see my slides. Can you hear me?

MR. GARMON: We can hear you fine. Whenever you're ready to start.

DR. HIGLEY: Okay. Well, the NCRP welcomes the opportunity to provide comments relative to this Executive Order and the NRC. Next slide, please.

So, the origins of NCRP goes back to 1929, when the Advisory Committee on X-Ray and Radium Protection was formed as an informal committee.

And this was necessitated by the increasing use of x-rays and radium in medicine and industry, and the corresponding need to understand and mitigate those health risks.

As radiation applications expanded, the committee evolved, and in 1946 we were renamed the National Committee on Radiation Protection and Measurements, and this change reflected our broader mission.

Following the Second World War, the advent of nuclear technology, and the widespread of radiation in all these industries, underscored the need for a

centralized authoritative body to produce scientifically grounded guidance on radiation protection.

In response, Congress passed Public Law 88376 on July 14, 1964, formally incorporating the NCRP as a non-profit organization with a congressional charter.

And the law outlined the council's primary objectives, which include collecting, analyzing, developing, and disseminating, information and recommendations related to radiation protection and measurements. And it empowered us to collaborate with national and international organizations. Next slide.

This law marked a significant step in institutionalizing radiation safety in the United States. Our congressional charter providers the re-met for NCRP to offer its guidance on the issues of LNT and ALARA.

And it's also important to note that we have a really long history of providing such support to the Nuclear Regulatory Commission, as well as other federal agencies. Next slide.

In the 1980s and 1990s, NCRP worked with the NRC to support change in recording requirements for nuclear workers.

Since 2012, we've supported NRC by analyzing radiation doses to nuclear power plant workers and industrial radiographers, and disseminating the results in the peer-reviewed literature. This effort is also part of the aptly named, "Million Person Study."

We've also issued guidance on radiation dose limits for the lens of the eye. And additionally, the NRC actually supported NCRP as we updated the published or wide-ranging "Radiation Protection Guidance" in our Report 180. Next slide, please.

So, NCRP has provided extensive support to the NRC regarding petitions to change the LNT model that was used for radiation protection, and our work was documented extensively in the Federal Register. And in addition to that support, we formalized the guidance as NCRP commentary number 27. Next slide.

The Million Person Study, which was initiated by us in the early 2000s, is one of the most ambitious and comprehensive efforts to understand the health effects of low-dose, long-term radiation exposure in the United States.

And it focuses on one million American workers and veterans for occupational exposure to

radiation through the 20th century.

The study was designed to address critical gaps in knowledge about the risks associated with chronic low-level radiation exposure, especially in contrast to high-dose, short-term exposure, that have historically informed most radiation protection standards.

The MPS includes diverse cohorts, such as atomic veterans, nuclear power plant workers, medical radiation workers, and employees at facilities like Los Alamos National Lab, Rocketdyne, and the Mound Laboratory. Next slide.

The MPS is expanding our understanding of radiation health effects as it progresses. Historically, most radiation protection standards have been based on cancer risk.

However, emerging evidence suggests that non-cancer outcomes, such as cardiovascular disease, cognitive decline, cataracts, and neurodegenerative disorders, may also be linked to chronic radiation exposure.

Understanding non-cancer risks is essential for refining occupational and public dose limits, especially for populations with prolonged exposure. And this could lead to more comprehensive

radiation protection guidelines.

And while the risk is low, particularly at low doses, it is important to understand and quantify these, so that the broader public is assured that radiation of radioactive materials can be safely and effectively utilized. Next slide.

Because the MPS includes over a million U.S. workers and veterans from various sectors, it provides a rich dataset to examine rare and long latency diseases that smaller studies cannot adequately assess.

And again, it's based on U.S. workers in the modern era. The study uses the retrospect a cohort design, linking occupational records with health outcomes, such as cancer, cardiovascular disease, Parkinson's, and cognitive impairment.

A major strength of it? It's ability to pull data across multiple cohorts, increasing its statistical power, and enabling more precise risk estimates.

The pulling effort referred to as MPS-1, is currently underway, and it aims to harmonize the data across all these groups, and represents the culmination of nearly twenty years of work.

The MPS is also notable for its

methodological innovations, including efforts to account for socioeconomic status, smoking, and other confounding factors, as well as improving the accuracy of internal and external dose assessment. And we use Medicare and Medicaid claims data to track non-cancer morbidity, enabling researchers to examine conditions like dementia, stroke, and chronic respiratory diseases.

As of this month, we have published more than 100 peer-reviewed scientific articles, ensuring timely release of our analysis as they are completed. Our goal is to ensure transparency and accountability of the research and analysis. And a publicly accessible database managed by the U.S. DOE, known as the Comprehensive Epidemiologic Data Resource, will be used to archive the data for future use.

So, our focus on cancer and non-cancer diseases is reshaping our understanding of radiation health risks, and helping ensure that radiation protection policies are grounded in the full spectrum of scientific evidence. Next slide.

In this statement, we have documented how NCRP is tasked by our charter with providing radiation protection --

(Audio interference.)

MR. GARMON: Dr. Higley, we're having technical issues. Could you maybe start your remarks for this slide again?

DR. HIGLEY: (Audio interference) is tasked by our charter -- can you hear me?

MR. GARMON: If you can start your remarks for this slide over, Dr. Higley. We lost you right as you switched to this slide. And maybe consider turning off your video.

DR. HIGLEY: Can you hear me now?

MR. GARMON: We can. Perfect.

DR. HIGLEY: Okay. All right. So, in this statement, we have documented how NCRP is tasked by our charter with providing radiation protection recommendations. And we've given you examples where we specifically assisted the NRC.

We'd like to emphasize that as a scientific body, NCRP provides this guidance through a rigorous, consensus-based process. Our council of a hundred eminent scientists and engineers bring a wealth of experience and backgrounds to this effort, and as a science-driven organization, we are dedicated to understanding and incorporating new knowledge as it is revealed.

This means we continually review and

revise our recommendations in the light of new knowledge, as appropriate.

We've written extensively about ALARA principle, particularly in the context of occupational and medical radiation protection, and we have a very detailed treatment in Report 107.

We also, in Report 180, the ALARA concept was completely revised under the principle of optimization of protection -- you've heard this by other speakers -- and it was noted that the magnitude of the dose to an individual should be kept as low as reasonably achievable, taking into account social, economic, and environmental factors.

Considering the instructions of the Executive Order, it may be time for NCRP to revisit the guidance of Report 180, to ensure that the consideration of these factors, other than dose, are appropriately valued in making such determinations. Next slide.

In regard to LNT, nearly a quarter of a century ago NCRP examined and issued guidance on this model, and, in 2001, we published Report 136. We reviewed the biological and epidemiological evidence and concluded that at that time, LNT model remained the most prudent and scientifically defensible

approach for radiation protection.

As part of our commit to follow the science, nearly twenty years later in 2018, we issued Commentary 27, where we reviewed twenty-nine high-quality epidemiologic studies, published over the previous decade, and following that review in our consensus-based process, we concluded that those studies supported continued use of the LNT model, particularly for low-dose and low-dose-rate exposures. And the report noted that no alternative model offered a more pragmatic or protective basis for safety.

That review was concluded seven years ago. And it's important to reiterate, as new scientific information or operational experiences come forward, we are willing to revisit that guidance, should NRC ask us to do so. We would also consider taking a more timely completion of the MPS-1, so that those results could be folded into the recommendations. Next slide.

MR. GARMON: Thirty seconds, Doctor.

DR. HIGLEY: Okay. So, over the years, we've considered the addition of a dose floor, and we're willing to reconsider a review of this as appropriate.

In conclusion, last slide, the NCRP has a long history of providing scientifically grounded,

consensus-based guidance to the nation, and we're willing to offer such assistance to the NRC in addressing the challenges and opportunities of the EO.

Thank you for the opportunity to provide input on this matter.

MR. GARMON: Thank you for your presentation, Dr. Higley.

All right, Mr. Lewandowski.

(Simultaneous speaking.)

MR. LEWANDOWSKI: Yes, I'm prepared. Thank you. My name is Mike Lewandowski/ I'm the incoming president of Health Physics Society. Next slide, please.

The Health Physics Society appreciates the opportunity to participate in today's stakeholder public meeting. The Health Physics Society was formed in 1956 as a scientific organization of professionals who specialized in radiation safety. Our mission is excellence in the science practice communication, and application of radiation safety and protection.

Our members represent all scientific and technical areas related to radiation safety, including academia, government, medicine, research and development, analytical services, consulting, and industry, in all fifty states and the District of

Columbia.

The HPS is chartered in the United States as an independent, non-profit, scientific organization, and as such, is not affiliated with any government or industrial organization, or private entity. Next slide, please.

The topics discussed today are of great interest to the radiation safety profession. On June 9th and 10th this year, HPS partnered with the National Council on Radiation Protection and Measurements, to hold two open forums, to hear from radiation safety professionals and other interested parties, on the challenges and opportunities posed by the executive orders involving radiation protection, and to hear their ideas on the path forward for radiation safety. Nearly eight hundred people attended the first forum, and nearly six hundred attended the second. The vast majority of attendees were HPS members.

Two professors at the University of Alabama at Birmingham summarized the information gathered during those public forums, in preparing a series of papers for publication in scientific journals. This information may prove to be valuable to NRC, along with the stakeholder comments received

today. Next slide, please.

The Health Physics Society has established formal positions regarding the linear no-threshold model, in several HPS position statements. The following points are taken directly from these published statements.

HPS concurs with the national academies, as documented in the BEIR VII Report, that below levels of about .1 sievert above background from all sources combined, the observed gradation effects in people are not statistically different from zero.

HPS concurs with NCRP's Report No. 136, that because of statistical uncertainties and biological response at or near background levels, the LNT hypothesis cannot provide reliable projections of future cancer incidents from low-level radiation exposures.

Substantial scientific data indicate that the LNT model of radiation effects oversimplifies the relationship between dose and response.

It should also be recognized that credible scientific studies may lead to honest differences in data interpretation, in support of competing theories, and that calculations based on different theories may lead to risk estimates that are significantly

different.

For instance, the radiation protection literature is filled with different views as to shape of the radiation dose response curve at low doses and dose rates.

Some data support a linear no-threshold model, whereas other data support models that predict lower estimates of risk, and perhaps even a threshold below which no detectible radiation health risk exists.

This relationship of increasingly likelihood of disease with increasing dose has only been observed for doses greater than approximately .1 sievert.

The likelihood of radiation-induced disease below this level, if it exists at all, is so small that it is not measurable. It is not a matter of scientific fact, and it can only be estimated using hypothetical mathematical dose response models.

The importance of continued federal support for research into the health effects of low-level radiation exposure, such as is currently being conducted through the Million Persons Study, is critical to enhancing our understanding of the use of various mathematical models for estimating risk at

occupational and environmental levels. Next slide, please.

Intermingled with the current use of the LNT model and regulating radiation exposure, is a concept of maintaining radiation exposures as low as reasonably achievable.

The HPS has also established the following positions on the ALARA principle. Radiation exposures of the public from controllable sources should be maintained as low as reasonably achievable, economic and social factors being taken into account.

However, ALARA should not be quantified with respect to dose goals or monetary cost. For example, dollars per-person sievert.

The most reliable studies of the effects of radiation exposure at the low levels received by occupational workers, have not been able to detect adverse health effects associated with lifetime exposure smaller than approximately .1 sievert.

Even at higher doses, the studies are not all consistent. However, inherent limitations of these studies leave open the possibility there are small undetected risks at the low levels of exposure experienced in the workplace and in the environment. Next slide, please.

The HPS position on occupational and public dose limits is also documented in our position statements.

We conclude the implementation of radiation safety standards and regulations has been responsible and adequate in providing for a safe industry, taking into account changes in occupational work practices over the last fifty years. Next slide, please.

Public radiation safety standards should be based on specified values of dose, rather than hypothetical estimates of risk. These standards should be expressed as an effective dose resulting from all exposure pathways.

The sum of effective doses to individual members of the public from exposure to controllable sources, with the exception of occupational exposure, accidental releases, and indoor radon, normally should be limited to one millisievert in a year.

In special or infrequent circumstances, an effective dose up to five millisievert in a year may be permitted.

Constraint should be applied to each controllable source of public exposure, to ensure that the dose limit for an individual from all controllable

sources combined will be met.

An effective dose of .25 millisievert in any year to individual members of the public, is a suitable source constraint in most cases.

In special circumstances, an effective dose higher than .25 millisievert in a year, may be permitted.

The Health Physics Society supports the establishment of an acceptable dose of radiation of one millisievert per year above the annual natural background radiation.

At this dose, risks of radiation-induced health effects are either non-existent, or too small to be observed.

The Health Physics Society recommends that regulations intended to achieve very low levels of radiation exposure, should take full account of the uncertainties in risk estimates. Otherwise, they may result in enormous expenditure of limited resources, with no demonstrable public health benefits. Next slide, please.

A particular challenge facing the radiation safety profession and other industry and public stakeholders, is related to the various different radiation protection regulations that exist

in the United States.

The HPS position on harmonized regulations is as follows.

The Health Physics Society remains concerned with the inconsistent application of risk assessment in the establishment of radiation protection regulations. These regulations are not well-coordinated among federal agencies, and therefore, create public confusion and concern.

A single independent U.S. federal agency shall have the responsibility and authority to establish all ionizing radiation safety standards for all controllable sources of occupational and public exposures.

An opportunity exists to harmonize radiation protection regulations. While work progresses toward improving the radiation protection regulatory framework, it is the HPS position that radiation safety standards be consistent with the recommendations of the International Commission on Radiological Protection, the National Council on Radiation and Measurements, and scientific consensus standards. Next slide.

On behalf of the Health Physics Society, I thank the NRC for holding this public meeting to

obtain stakeholder input.

Our position statements can be found following this URL. Please contact me if you have any questions regarding the positions of the Health Physics Society, or if the HPS can be of service. Thank you.

MR. GARMON: Thank you for your presentation, Mr. Lewandowski. Now, we're going to break until 3:15 p.m. Eastern Time. So, to keep up with our agenda. So, we will start up, we're going to pause the meeting, we're going to mute all mikes and we will be back on at 3:15. We'll be starting with Dr. Alan Fellman.

(Whereupon, the above-entitled matter went off the record at 2:47 p.m. and resumed at 3:15 p.m.)

MR. GARMON: All right, Dr. Fellman, you're our next presenter, so if you want to adjust your camera or see if your microphone's working properly, then we'll get you started.

DR. FELLMAN: Okay, can you guys hear me?

MR. GARMON: We can hear you fine, and we're on your first slide now, whenever you're ready to start.

DR. FELLMAN: Okay, good afternoon, everybody, and thank you to the NRC for giving me this

opportunity to present The Case Against the LNT.

Next slide. The LNT is based on four assumptions, and they're four false assumptions. False assumption number one is that there's no such thing as repair of radiation damage. The LNT doesn't account for that fact. The reality is that there are over 150 genes involved in DNA repair.

The next bullet on my slide points to something that we all learned probably in a high school biology class, which is that cells adapt and respond to adverse stimuli, such as a dose of radiation.

And by doing so, just the mere fact that they adapt in response to stimuli basically invalidates the LNT mathematically. LNT doesn't allow for these things.

Next slide. False assumption number two, dose rate doesn't matter. LNT is dose-based entirely. It doesn't account for differences in dose rate.

Biologically, dose -- it's all about dose rate. It's really dose rate that's going to determine the outcome much more than dose itself.

We know, for example, that radiation delivered very slowly has -- is much less damaging to a biological system that when the same total dose is

incurred all at the same time.

In fact, radiation oncology departments around the world have been taking advantage of this fact for decades by fractionating doses to patients. Why do they do that? Because they allow for healthy surrounding tissue that gets inadvertently irradiated to undergo repair.

Next slide. This very, very overly simplistic concept that one interaction between radiation and a cell can lead to one DNA mutation which will eventually result in one fatal cancer is what I would call the third false assumption of the LNT.

The fact of the matter is that the induction of cancer is a very complex process involving thousands of mutations. And to quote Nobel Laureate Michael Bishop, a single mutation is not enough to cause cancer. In a lifetime, every gene is likely to under 10E10 mutations on separate occasions.

And finally, the fourth false assumption that being that there are no biological processes existing at low radiation doses and dose rates that do not exist at high doses and at high dose rates.

When, in fact, we know, for example, that repair enzymes, enzymes involved in cellular repair,

DNA repair that we see present following lose dose of radiation are often inhibited from being synthesized at higher doses.

So, we know these are two very distinct different things comparing biological effects at low versus high doses. LNT ignores that.

Next slide. According to the LNT math, LNT math is all based on the collective dose concept. We take a population dose and we multiply it by an LNT driven slope factor such as one in a million per millirem, which comes right out of the BEIR VII report.

We take that slope factor, we multiply it by the person millirem or the person-mrem, person-Sievert, and that gives us the number of cancer cases.

So, what does this mean? It means that the risk to one person receiving a 1,000 rem is the same as the risk to a 1,000 people receiving 1 rem each. Because, in both cases, the population dose is the same.

This is crazy. This is what I call statistics without biology. This is the way, for example, that the EPA tells us that there are 21,000 lung cancer deaths per year caused by residential radon. This is what they were telling in the 1980s.

This is what they're still telling us 40 years later.

How did they get there? You just simply multiply two numbers together.

This is how journalists write articles that tell us about the tens of thousands or hundreds of thousands of people who are going to die from the radiation they receive from CT scans. They simply take the total population dose, multiply it by an LNT derived slope factor, and we have a number.

Now, is there scientific studies that show this? That show that, in these higher residential radon areas there is more lung cancer? That show that patients having received CT scans are subject to more cancer down the road? Of course not. They don't exist. This is simply just bad math.

Next slide. Why do we extrapolate the impact of low dose radiation from high dose effect? Why does -- why should that make sense?

Does it make sense, if we're interested in the toxicity of taking one sleeping pill to start by evaluating, well, what happens if you take a hundred sleeping pills and then, take one one-hundredth of that and assess it, assign it to the risk from the one pill?

Do we assess the risk of drinking an

eight-ounce cup of water by first starting with what's the risk if we drink eight gallons of water?

And you might not know this, but that will kill you from hyper-hydration.

So, do we then take the fraction of the one cup versus the eight gallons and assess a non-zero risk to that activity? Of course we don't do that. That would be ridiculous. And if it's ridiculous for drinking water or taking the sleeping pill, then why is it appropriate for radiation?

Next slide. You may be familiar with the concept of radiation hormesis. It's been mentioned earlier in the webinar. The study that shows that low doses, in fact, can be beneficial to health.

One of the ways is by stimulating, up-regulating enzymes involved in cellular repair. Radiation hormesis is -- the literature is filled with thousands of articles over decades that show hormetic impact in everything from microorganisms all way up to human beings.

And if you look critically at low dose radiation induced cancer in the literature and then, look critically at the literature on low dose radiation induced hormesis, they can't both be true.

And if you look critically at the -- at

what's out there, only one has really been demonstrated to any amount of reasonable certainty, and it's not the low -- that low dose radiation is inducing elevated incidences of cancer.

Next slide. So, you know, I hear people who dismiss hormesis, oh, they're crazy. It's a bunch of lunatic fringe junk scientists. And then, we can just dismiss it and not consider it.

But think about it. All these -- the things you see on this slide, sunlight, water ingested, oxygen inhaled, very toxic, lethal at high doses, beneficial and even essential for life at low doses.

So, if radiation, which we know is a carcinogen at high doses, we know is acutely lethal at very high doses, if it is also hormetic at low doses, does that make it unique? Does that make it crazy?

Not at all. All that means is, it's just one more of many.

Next slide. 2018, NRCP came out with Commentary Number 27 to look at whether it's appropriate to continue to establish radiation protection regulations based on the LNT model.

And of course, the result was that the NCRP recommended to continue to support the use of the

LNT.

They looked at 19 studies very closely. And I find it amazing that 15 of the studies that they evaluated to reach their conclusion did not evaluate study data against the threshold model.

So, on the one hand, they're telling us that they're going to evaluate whether LNT's appropriate, and yet, they're looking at studies that didn't even evaluate alternatives to the LNT which kind of tells me something about, perhaps, they got what they wanted to get by looking at very select data.

Furthermore, since publication of Commentary 27, there have been several papers published in peer reviewed literature that were highly critical of the methodology and the studies cited in Commentary 27.

And to my knowledge, NCRP has never addressed those critiques. They've just simply ignored them in the hope that they would go away.

Next slide. Why do people accept the LNT? Who knows. Certainly, it's what we were all taught back in school. Many people are not aware of all the literature.

You're lazy, you don't want to read all

the literature. We're afraid to change. We're afraid to challenge the status quo.

There's an inherent conflict of interest. Because, let's face it, if we don't have to worry about every last millirem, then maybe our budgets don't need to be as big as they currently are.

So, these all come into play.

Next slide. A quote from President Kennedy, which I think is very relevant here, for the great enemy of the truth is very often not the lie, deliberate, contrived, and dishonest, but the myth, persistent, persuasive, and unrealistic.

Too often, we hold fast to the cliches of our forebears. We subject all facts to a prefabricated set of interpretations. We enjoy the comfort of opinion without the discomfort of thought.

Next slide.

(Simultaneous speaking.)

DR. FELLMAN: What's that?

MR. GARMON: Time's up, Dr. Fellman.

DR. FELLMAN: Okay, thank you very much for the opportunity.

MR. GARMON: Thank you for your presentation.

Dr. Brenner, are you ready to present?

DR. BRENNER: I am, can you hear me?

MR. GARMON: I can hear you fine.

Can you see your slide? We're on the -- your first slide. So, whenever you're ready to start.

DR. BRENNER: I can see it fine, thank you.

Okay, so, good afternoon, everyone, and my own thanks to the NRC for putting this session together.

I'm going to talk about, specifically, about the regulatory dose limits and the significance of new data sets and new analysis techniques in terms of those dose limits.

You can see on this slide, our research team, some of the work, actually, that's been talked about is under peer review at this very moment.

So, I think it's fair to say that the views and opinions that I'm going to express are for myself and my colleague, Dr. Shuryak.

And I should just add that I am the Director of the Center for Radiological Research which has been worrying about these issues since the 1910s. We were founded by a student of Marie Curie.

Next slide, please?

Okay, so, am I to argue that what really

controls radiation protection are the annual dose limits. So, we know about the occupational limit, which is 50 millisieverts a year.

And flowing down from that is the public limit of one millisievert per year.

And flowing down from that are the release requirement limits of -- which are more than in an order of magnitude of less than those.

The 50 millisievert pL limit comes from a series of analyses, '70s, the '90s, and the 2000's, but only of A-bomb survivor data, specifically A-bomb survivor data.

And there's a good reason for that because that was the best data that was available at the time. And but of course, the great majority of the A-bomb exposures took place in a very short period of time, much less than a microsecond.

And of course, we know that, in fact, that dose rate very much affects biological effect is you slowly exposure down, generally, you get less effects.

I would talk about the public limit of one millisievert per year, although, release requirements because they are actually flowing down from the occupational limit.

Anyway, so, since these earlier analyses,

I want to talk about two key developments.

The first is that, now, as well as good quality A-bomb survivor data, we now have large-scale high quality epidata for cohorts exposed to prolonged radiation exposures. And specifically, that's the various nuclear work of cohorts. And David Richardson's going to talk a little bit about more about those as we go along.

But the other aspect I want to talk about is we now have new, advanced data analysis techniques so that we can actually address what we really want to know, which is the causal effects of radiation, independent of any a-priori assumptions about dose-response shapes.

I'll talk about both of these right now.

So, next slide, please?

So, let me start with the epidemiological data and, very briefly, what sorts of data can we use and do we need.

Well, they have to be large data sets and need to incorporate a range of radiation doses, and of course, ages and sexes.

Very much, we need data sets where we have reliable, retrospective dose estimates that are specific for individuals, not just groups of

individuals.

And of course, we need long-term follow up with the individual outcomes.

And as I mentioned before, we have data for short-term exposures, the A-bomb survivors, but we need them also for long-term prolonged exposures.

Next slide, please?

And basically, this is what we have as of now. So, we have the long-term A-bomb survivor data, which is very good. The exposures, as I said, were very brief, largely in less than a microsecond.

All ages, all sexes, very good long-term follow up, very wide dose range. And importantly, credible individualized radiation dosimetry.

And that's what the radiation limits are based on, analysis of the A-bomb survivor data.

But more recently, we now have access to a whole series of nuclear work and data sets which are from prolonged radiation exposure, years, essentially.

Again, with long-term follow up. Again, with a wide dose range, generally not very high doses, but that doesn't matter. We're not interested here in very high doses.

And again, with reliable, individualized radiation dosimetry.

So, we have an extra set of data, the nuclear work of data from what was actually used to generate the occupational doses.

Next slide, please?

So, let me talk about the second aspect of the -- that is new. And that's the methodology of analyzing data.

So, let me start with the traditional analysis methods. And let me just make the statement that what we're looking at, effects of radiation on disease reduction, mortality, a fundamentally causal inference questions.

We want to look for the dose of the radiation that actually cause the end point in question. And of course, traditional analysis methodologies look for correlations, not causes. They look correlation between a dose and the effect of interest.

So, as we all know, the correlations and causations are different things.

And for example, when other -- when you're analyzing some data set, we know the normal radiation features of age, sex, have a strong influence on the outcome.

The traditional analysis methodologies

would not necessarily be able to deal with these appropriately. And the radiation effects may become distorted.

And the final issue with the conventional, traditional analysis methodologies is of necessity. They need to make a-priori assumptions about the shape of the dose effect relationship.

You assume a radium model, for example, or a choreographic model. And obviously, as referred many times today already, the effect -- the shape of that dose effect relationship is uncertain.

So, it would be very good if we didn't have to remake presuppositions about what that shape is in order to analyze that data.

So, next slide, please?

So, in much more recent times, in fact, there has been new technologies developed for actual causal machine learning, which is, at least in this context, a new approach for analyzing low dose epidemiological data.

And as talking about before, it basically assesses causal effects of radiation rather than simply the associations between dose and effect.

And the very nice thing about this sort of approach, this machine learning approach, is you don't

need to make a-priori assumptions about like guarantee or LQ. You can do -- you can just get away from that completely.

And also, nice technical advantages, it's very flexible and, as we know, that per new data sets, for example, with omics data, it can very easily take dosage into account.

And I would argue that it actually does better for the -- for making estimates or the risk estimate uncertainties.

And the next slide, please?

MR. GARMON: One minute, 45 seconds.

DR. BRENNER: Oh, goodness.

Okay, so, those are technicalities or causal machine learning.

Next slide, please?

So, here's some data from the A-bomb survivors analyzed with the causal machine learning approach. And basically, what you see is a causal relationship between dose and risk of high doses, but not low doses.

So, let me go on, next slide, please?

And we do have now a whole pile of data sets for prolonged nuclear worker exposures. And the three that we've analyzed are shown here.

So, next slide, please?

And here is some causal machine learning approaches analyses of relative risks of all doses and also of low doses. And basically, there's no evidence for causal relation between dose and risk at any dose within the cohort.

And the last slide, I think?

So, let me just summarize, so the current dose limits are based on A-bomb survivor data where exposures were essentially instantaneous which is problematic because we know that low doses give you repair.

Current dose limits are based also on old-school data analysis techniques which make assumptions about the shape of the dose/risk relationship.

And what I've talked about is a new approach, causal machine learning, which doesn't have these problems. And the causal machine learning of the A-bomb data does suggest, as I think we know, that's lower doses, there is no evidence for risk and at high doses, you do see a risk.

But when you do the same thing for the nuclear worker data, which is prolonged exposures, you don't see an evidence for causal relationship between dose and risk in any dose in the studied cohorts.

So, what this might conclude -- suggest is that the current occupational dose limits of 50 millisieverts is probably too low for non-instantaneous exposures.

And the important thing here is that conclusion is reached without the need to get immersed in the debates about LNT and ALARA and so on. You can basically draw that conclusion simply based on analysis of the data themselves.

And now I'll stop --

MR. GARMON: That sounded great, Dr. Brenner, thank you so much. Thank you for your presentation.

Dr. Lyman, if you want to test you audio and your video?

DR. LYMAN: Yes, how do I sound?

MR. GARMON: Sounds great and your first slide is showing.

DR. LYMAN: Thank you.

So, on behalf of the Union of Concerned Scientists, I appreciate the opportunity to present our views on this important subject.

I'd like to say that, from my point of view, the most important consideration here is that there is a good, scientific basis for understanding

the health risks and public safety outcomes of the use of nuclear power, both in routine and in routine emissions and accidental exposures.

And without that good understanding of those health risks, it's very hard to really relate the value of nuclear power in the context of other energy sources.

May I have the next slide, please?

So, our position, at this point, is we see no technical or practical basis for changing the NRC's current reliance on the LNT model and ALARA in its radiation protection regulations.

And the principle here is very simple. After six years, the NRC issued a fairly definitive rejection of the petitions that were challenging use of LNT and ALARA.

And there was a pretty definitive literature review as well as risk assessment at the time.

So, if there were to be any changes to those conclusions here in 2024, that really would have to be backed up by additional technical documentation to show why that 2021 decision was no longer appropriate.

And aside from Dr. Brenner's very

interesting research, and I look forward to seeing peer reviewed studies that come out of it, we're not aware of any credible studies since 2021 that would contradict or invalidate the NRC's conclusions in that as posed in the petition.

And in fact, the studies that have come out have essentially reinforced those conclusions.

Next slide, please?

All right, I'm not going to read the NRC's words back to you, but this just emphasizes that it was a fairly strong statement that was made in the 2021 petition denial, both on the use of LNT and the role of ALARA.

Next slide, please?

And again, since 2021, we've already heard that international and national radiation protection organizations are basically reinforced the value of the LNT assumption and ALARA in radiation protection.

And since 2021, every additional statement coming out of bodies like UNSCEAR have reinforced that view. And I would say that they're continually reviewing the entire range of peer reviewed literature including studies that would support or contradict LNT.

And so, I think it's misleading to say

that these bodies are ignoring those studies. They're simply giving them the weight that's appropriate in view of their role in the whole body of literature.

Other studies and reviews -- literature reviews since then, and I give some references here. We've heard, of course, of INWORKS and we'll hear more. But again, these studies all support the continued use of LNT.

Next slide, please?

And most recently, the ICRP, only within the last couple of months, released a draft report trying to assess the range of appropriate values for low dose effectiveness factors and dose rate effectiveness factors.

And we do concede that they do show, or they are consistent with the potential for these low dose effectiveness factors to be larger than one.

But the study concluded looking at a large range of additional studies that the range is likely between one and three. And that does encompass the NRC's use of the DDREF of two.

And I would also note that this is really only appropriate for low-LET radiation, yet in NRC's radiological consequence studies.

For instance, they typically don't even --

they also include high-LET radiation or they apply it to DDREF for radioisotopes associated with high-LET radiation is inappropriate.

Next slide, please?

And as we heard from Dr. Higley, additional studies are -- evidence is emerging of non-cancer endpoints that could lead to significant mortality including cardiovascular disease as well as additional morbidity such as metabolic syndrome or even dementia and other neurological effects.

And to that extent, since these are not encoded or encompassed in the NRC's current risk models, then one has to say that continued conservatism is appropriate until those are better defined quantitatively.

Next slide, please?

And on the concept of ALARA, I find myself in a peculiar position defending it because, you know, my view of ALARA is that it's a way of getting around specific dose limits to protect workers and the public by explicitly injecting the consideration of operational factors, of economics and other so-called optimization factors that's designed to give the industry more flexibility and potentially allow for higher doses than are, you know, absolutely

achievable.

So, I just find it strange that so many are now objecting to ALARA and claiming that it's too restrictive. When in fact, it's -- it was designed to provide more flexibility.

And it's widely accepted. It's common sense and international practice.

I'd also like to point out that it also helps to guide innovation and it's not just it's good industrial hygiene, it's good medical practice to -- and having principle like that, again, helps to guide innovation.

For instance, in being able to do medical diagnostics with a lower dose which, you know, to both the personnel and to the patient, would just seem to be prudent practice.

And so, without that kind of forcing function, there would be no incentive to continue to innovate.

Next slide, please?

The other questions that we were asked to consider, just briefly, we don't see any value in defining a de minimis dose. In fact, it's not clear how it would even have practical impact since we've already heard most routine exposures to the public are

already well below this de minimis dose.

So, it's not clear -- it would probably on have an impact on certain occupational exposures. But still, any specific value, at this point, would be very speculative.

Increasing time periods over which you would assess the stochastic dose limits would potentially involve -- or increase the possibility of allowing higher dose rate exposures in a given period of time, which again, might lead to higher doses than would be expected for based on a low dose rate effectiveness factor.

So, you'd have to take that into account as well.

Cost benefit guidance is something that it took the NRC decades to do to finally revise their own -- these statistics -- value of a statistical life and the dollar per person rem so that it was commensurate with other agencies.

And to go backward at this point, again, you would need to document exactly why since there's an extensive study and the NUREG documenting why it was appropriate to increase that dollar per person rem factor.

And again, we are concerned that any

changes to that would impact the development of reasonable backup safety systems for new reactor designs, for example, that are, again, prudent in a -- for a whole range of reasons in addition to the potential and individual dose limits.

And finally, rather than weakening standards, as Dan Hirsch said, we should be addressing gaps in the current framework that are not protecting subpopulations that are more vulnerable, including children, including sensitive subpopulations, et cetera.

So, all for reviewing and constantly taking into account new scientific data, but again, there's no indication, at this point, that the status quo should be weakened. In fact, it's likely that it needs to be strengthened.

Thank you.

MR. GARMON: Thirty seconds.

DR. LYMAN: And on my last slide, NRC holds itself out as a gold standard nuclear regulator, but you know, other countries are going to see the potential impacts of political influence on NRC's decision making and its use of science.

And we may be fooling ourselves here domestically, but other countries may not be so easily

fooled. And that could well lead to a loss of interest in U.S. nuclear technologies if there's a growing belief among other countries that the U.S. is not adhering to the best scientific practices for radiation protection.

Why would you buy U.S. technologies if you think that they are -- they're not based on the most stringent of the best knowledge of how to protect the public from over exposure radiation.

So, that's -- those are my comments, thank you.

MR. GARMON: Thank you, Dr. Lyman.

Dr. McCollough, would you like to test your audio and your video?

DR. MCCOLLOUGH: I can see my slides now. Can you see me?

MR. GARMON: We can hear you fine and I think your video's coming up. I see you fine now.

The floor is yours, thank you.

DR. MCCOLLOUGH: Thank you for this opportunity to present the position of the American Association of Physicists in Medicine.

The mission of the AAPM is to advance medicine through excellence in science, education, and the professional practice of medical physics.

We were founded in 1958 and have over 10,000 medical physicists as members.

Next slide, please?

And medical physics is an applied branch of physics involving the application of physics concepts and methods to the diagnosis and treatment of human disease.

And so, our comments are going to be in the context of human health and disease and both the diagnosis and treatment of pathology and injury.

Next slide, please?

I've organized my talk in terms of the questions that were asked. I won't repeat the questions.

While most recent studies of low-dose radiation support LNT for the purpose of radiation protection, this model may not accurately reflect biological responses at low doses.

And as such, it is inappropriate to use LNT to estimate health effects from low-level radiation exposures experienced by large populations over extended periods.

These are the kinds of things that result in very sensationalized, alarmist media articles about the number of people that are going to die from CT

scans, for example.

Instead, we should have a determinate dose level below which risk estimates are considered scientifically unreliable and potentially misleading.

We also comment that the NRC currently has lifetime occupational dose limits that have not been burdensome for the majority of medical stakeholders.

Next slide, please?

These are images of the liver and kidneys from a patient in a practice that we cover. And the practitioner was particularly pleased with the low doses and the good image quality that he was achieving.

This patient was being scanned every six months for surveillance and -- of cancer and looking for liver metastasis.

We felt from other data that we have in our practice that these doses were too low. The images look nice because they were run through a processing algorithm that covers up the noise.

When we were able to ask the practitioner, convince him to increase the dose to what we felt was more reasonable --

Next slide, please?

-- two lesions show up that were, in

retrospect, visible on the prior exams. But at the low doses, you lose these low contrast lesions.

Next slide, please?

So, this is an example of the misapplication of the ALARA principle having unintended consequences. The emphasis of ALARA is too often placed on dose minimization which can lead to excessive dose reduction that compromises the diagnostic utility of medical imaging.

The medical community has long endorsed the ICRP and NCRP concepts of justification and optimization for medical imaging and therapy.

And regulatory guidance should reflect this and balance dose reduction with ensuring medical benefit rather than promoting dose reduction as an end in itself.

Next slide, please?

I want to introduce diagnostic reference levels which is the value we choose at the 75th percentile as an investigation level if you have a distribution of doses for the same diagnostic task.

Next slide, please?

The 25th percentile level we propose could be, as an example, a low enough dose level, I don't have an appropriate name for it, where further

reduction in dose may, in fact, cause unintended consequences and loss of diagnostic utility.

And it would be nice if we had a determinate dose level at which ALARA activities need no longer be pursued and, in fact, might be dangerous.

Next slide, please?

So, the application of ALARA in medical imaging can be taken too far. And a more targeted, evidence-based application of optimization, such as the DRLs, would improve regulatory clarity, prevent unnecessary operational burdens, and safeguard the integrity of the medical uses of radiation.

Regulatory agencies should establish clear guidance on the lower boundaries of dose where continued ALARA efforts are no longer required.

And regulators should adapt enforcement to reflect the low risk nature of minimal exposures so that we can focus on protective efforts where the yield will be -- give us the most benefit.

Next slide, please?

The NRC occupational dose limits differ from the ICRP recommendations.

Next slide, please?

And we would comment that transitioning to longer averaging periods may offer greater flexibility

in managing occupational exposures, especially in environments where workloads can vary substantially over time.

However, annual dose limits currently serve as practical triggers for dose investigation and safety review.

And moving to longer term limits could delay the detection of high exposures in shorter time frames, unless some sort of appropriate internal monitoring is maintained.

We recommend that adopting a framework similar to ICRP Publication 103 could align the NRC practice with global norms.

A longer time period for stochastic limits would not necessarily reduce the burden for medical licensees. It would introduce additional record keeping and, perhaps, more complex tracking systems.

And finally, we comment that regulatory guidance that would allow credit for the use of radioprotective lenses would be beneficial.

Next slide, please?

In terms of the dollar per person rem -- next slide, please -- at low doses, which we defined as below approximately 100 millisievert, all estimates become increasingly uncertain. We've heard that

multiple times this afternoon.

And maintaining the current cost per rem values at low doses can impose excessive compliance costs, potentially diverting resources from more effective safety measures or innovation.

Incorporating dose levels below which cost benefit requirements are relaxed or waived, such as one millisievert per year, could significantly streamline regulatory burden.

Guidance should emphasize optimization of radiation protection and medical or societal benefit without incurring disproportionate economic costs, recognizing that zero risk is unattainable and that some low level exposure is unavoidable and acceptable.

Modifications should involve structured decision making that emphasizes stakeholder consultation to understand the economic impacts and maintain public trust while clearly communicating the scientific rationale for adjustments.

And next slide. Recommendations for improvements. Next slide. We would recommend that we align with ICRP recommendations and international standards and establish levels such as below one millisievert per year where additional dose reduction efforts are not required. This focuses resources on

exposures with meaningful risk and reduces unnecessary regulatory burden.

We recommend to streamline regulatory requirements for low level exposures by simplifying reporting and control below optimized clearance or exemption levels.

Adopting diagnostic reference levels in medical imaging to guide dose optimization flexibly, prioritizing clinical utility over any strict, rigid dose limits.

We commend enhancing, as is being done today, stakeholder engagement and communication to ensure that reasonable dose optimization reflects practical and clinical realities, including medical benefit.

And lastly, we would recommend that the NRC adopt SI units.

Next slide. That concludes my comments. Thank you for this opportunity.

MR. GARMON: Thank you, Dr. McCollough.

Dr. Richardson, I think you're next. You want to test your audio and your video?

DR. RICHARDSON: Hello, can you hear me?

MR. GARMON: We can hear you just fine. If I can ask you to hold for one minute.

The staff is noticing that many license -- or many attendees that have their hands raised. It seems like they're queuing up for public comments.

Please note that when we started the meeting, we announced that we would reset hands when we start the public comment period to keep honest with our agenda. So, just keep that in mind.

So, with that, when you're ready, Dr. Richardson, you can start.

DR. RICHARDSON: Thank you for the opportunity to address this meeting.

My name is David Richardson, and let me start with a brief description of my experience as a basis for these comments.

I hold the titles of Professor of Occupational and Environmental Health and Associate Dean for Research at the Wen School of Public Health at the University of California, Irvine.

I serve on Committee I Health Effects of the ICRP. I serve as the lead coordinator for a report on the Epidemiological Studies of Radiation and Cancer for the United Nations Scientific Committee on the Effects of Atomic Radiation, which is called UNSCEAR.

I have served on several committees of the

U.S. National Academies of Science, Engineering and Medicine that focus on radiation, including the recent committee on research directions and human biological effects of low level ionizing radiation.

And so, based on these experiences, my comments today will focus on the epidemiological research related to the low dose exposures in cancer that are most relevant to considerations about ALARA and LNT.

I'll limit my comments today to cancer endpoints, given the short time available.

Next slide, please?

Historically, it was common to illustrate the state of scientific evidence regarding low dose radiation in cancer with a figure like this.

On the X axis is a dose with a dotted line around a 100 millisieverts. On the Y axis, cancer risks. And the dots illustrating epidemiological data points where we have significant evidence and effect.

The figure is meant to convey that, while we have direct evidence of radiation risks at doses in the range above 100 millisieverts, we're obliged to extrapolate risk estimates based on observations at moderate to high doses for estimation of radiation related risks at low doses and dose rates.

This is a perspective that was expressed at the start of this session, in fact, by the NRC and by Mr. Lewandowski's presentation of the Health Physics Society position.

Next slide. Over the last two decades, there's been substantial work done to better inform radiation protection standards in the low dose range.

So, arguably, a better representation of the contemporary state of scientific evidence regarding low dose radiation and cancer is by a figure like this. Again, these are illustrative.

But there are many studies today that provide direct estimates of radiation associated cancer risks in the low dose range.

And there's much more information available for a quantitative summarization of the magnitudes of such risks and bounding on these estimates.

Where does this come from? In large part, it's come from coordinated research programs at the national and international level.

An important example would be, for example, the efforts through the European Union research frameworks like MELODY which directly targeted questions of direct relevance to the system

of radiation protection.

There's also national research programs in North America and in Asia as well as efforts such as the OECD's high level expert group on low dose research.

And there's work that's been supported by multinational coordination, updating and expanding existing cohorts that were judged to be informative for these questions and, yet motivated pooling data.

Next slide. One example of such international collaboration is INWORKS. For the past 15 years, partners from the United States, France, and the United Kingdom have participated in a collaborative study called the International Nuclear Workers Study, INWORKS, where data were obtained from major French employers in the nuclear industry, from the UK national registry for radiation workers, and from the U.S. Department of Energy sites and Portsmouth Naval Shipyard.

So, INWORKS was specifically motivated by the considerations that we've been discussing today regarding the size of the study that would be needed to have sufficient statistical power to directly assess cancer risks in the low dose range.

INWORKS encompasses 10.7 million person

years of follow up. It includes 309,000 workers among whom 103,553 deaths have now been observed, 31,000 of those are deaths due to cancer, and over 28,000 of those are deaths due to solid cancers.

Next slide. INWORKS analyzed the association between cumulative radiation dose, as quantified, using individual personal dosimeters and rates of mortality due to specific causes.

We then estimate the change in the cancer death rate per Gray of external radiation dose under a ten year lag assumption. So, allowing for a latency period between exposure and cancer mortality.

A summary value, like 0.52, is a summarization of the slope of the dose response association. This is the excessive relative rate that is the relative rate minus one per Gray.

And as was described correctly earlier, the excess relative rate is expresses as a proportionate increase in the rate over baseline per unit dose.

So, a value of zero would indicate no radiation associated increase in the mortality rate.

On average, at INWORKS, cancer death rates increase approximately 50 percent per Gray radiation dose. That is, there's a positive association through

a simple summarization of the data.

The estimates of association remains significant below a 100 milligray, and in fact, below 50 milligray. Note that, shown in the figure as well as an estimate of a trend, is a summarization, category specific estimates. Those are points with whiskers that are offering a nonparametric summarization of the data.

Not as asserted earlier, estimated hypothetically, nor estimated with too much statistical uncertainty to rule out competing theories such as null of protective effects.

With regard to causal inference, the analysis is undertaken with background stratification on measure covariates. And so, the identification of a causal effect via directed based like a graph and background stratification is the same identifying conditions that would be used for causal identification of the effects that might be used, for example, with causal machine learning.

And again, the dots and whiskers are essentially nonparametric with regard to the shape and show the identification of excess risks at doses below a 100 milligray is observed in INWORKS.

I should also note that in INWORKS,

evidence of association between dose and leukemia is observed with a steeper slope for the dose response for leukemia than is observed with solid cancers.

So, in terms of conclusions, where does this leave today?

There's clear improvement in the knowledge about cancer risks associated with low doses in the last two decades. There have been new and updated epidemiological investigations that are quantifying radiation risks, not just in occupationally exposed populations, but in populations exposed at low doses and low dose rates in environmental settings as studies of low doses in medical settings.

Recent attempts to summarize the updated evidence include meta-analyses of low dose studies conducted by the ICRP. For example, you can see Shore, et al., 2017 and a monograph organized by the U.S. National Cancer Institute which includes meta-analysis of more than 20 low-dose studies reported by Houtman in 2020.

Another approach is not meta-analysis, but it's pooled analyses. INWORKS is one example of pooled analysis, but certainly not the only one. Pooled analyses of thyroid cancer with reported by Leuba, et al., in 2017, pooled analyses of leukemia

and nine cohorts in children were reported by Little in 2018, pooled analyses of leukemia and other hematological cancers as well as brain cancer in nine cohorts of children exposed to low dose diagnostic exams in 2023, all of which support a conclusion of a significant radiation associated excess cancer risk in the low dose range.

The findings, interestingly, point to variations in cancer risk by cancer site. I mentioned the steeper slope for leukemias, for example, than solid cancers.

The findings examine populations exposed in childhood as well as adulthood and underscore the importance of age at exposure as a source of variation.

And some of the investigations are able to characterize variations by sex.

These latter points I'm emphasizing as important when we get to these considerations about under what conditions could one meaningfully define a threshold which would hold for all endpoints and all ages and all sexes and other factors related to individual variation and risk.

The studies provide significant evidence of radiation associated excess in leukemia in worker

populations, in medically exposed populations, and in environmental settings at the dose range below a 100 milligray.

These results certainly compliment the evidence coming from the life span study of atomic bomb survivors where there is for a long period of time and clear evidence of radiation associated excess leukemia risk.

There is also significant evidence of radiation associated excess solid cancers in occupational cohorts and in environmentally exposed populations and in some medical settings in low dose ranges. That is below a 100 milligray.

Finally, with regards to determinate limits, 20 years ago ICRP 99 noted that epidemiological evidence for a universal threshold, that is, one that would hold across different cancer sites and across individuals is not persuasive.

That conclusion holds today with greater reinforcement of epidemiological evidence.

Risk estimates vary in magnitude with cancer sites. They're varying with age and sex. There's stronger evidence now --

MR. GARMON: -- seconds.

DR. RICHARDSON: -- of statistically

significant excesses of cancer observed at doses below a 100 milligray.

And to date, there's no reason to conclude, as was noted by Sir Richard Doll more than 20 years ago that, as we continue to observe a linear relationship with cancer at lower and lower dose values, that a linear dose response would suddenly dive to zero immediately below whatever level at the time was the lowest level at which a statistically significant excess is observed.

MR. GARMON: Thank you, Dr. Richardson.

DR. RICHARDSON: I'll stop there, thank you.

MR. GARMON: Thank you.

Our last speaker is Mr. Crane.

Mr. Crane, you want to check you audio and your video if you're interested in turning it on?

MR. CRANE: We good?

MR. GARMON: Now we hear you.

MR. CRANE: Okay.

MR. GARMON: Yes, whatever you just did, it worked. Okay, so we hear you well and your video is on, the floor is yours.

MR. CRANE: Thank you.

My name's Peter Crane. I want to thank

Dave Garmon and Ed Miller for the opportunity to be here.

To introduce myself, I'm not a doctor. I'm not a scientist. I'm a lawyer. I joined the NRC slightly more than 50 years ago, retired in '99.

I've been involved in radiation protection issues for more than 40 years. I've taken part in international conferences on the subject in Russia, England, and Germany.

I'm going to -- I appreciate the desire to keep presentations civil, but I've got to be candid at the same time about a course of action that I think presents both substantive and procedural questions that are quite troubling, institutional questions that really go to the heart of why there is a NRC.

There's a theory that everything is now a political issue, can be a political issue and that, even things that seem to be above politics, vaccination, geographic names, what happened on a given day in history is up for grabs.

The May 23rd Executive Order purports to say that to declare without authority given that the LNT and ALARA models lack sound, scientific basis, and produce irrational results.

So, the presentations, so far, I don't

want to duplicate, but have made clear that there is good data at the sub-100 millicuries, 100 millirem or level for causation.

I should also mention, my -- I bring to this the perspective, among other things, as someone who developed thyroid cancer at -- shortly before I joined the NRC as a result of childhood irradiation x-ray for tonsils and adenoids.

I've also been treated with iodine-131 and got familiar with the subject through that.

It doesn't make me phobic about radiation, but it gives me an information base that not everyone has.

I think the -- there has been -- I was pleased that David Richardson just now referred repeatedly to medical exposures. Because often, there seems to be an assumption that what matters is nuclear power, nuclear emissions, and that medical is a different animal of less importance.

There's been discussion of the 100 millirem radiation limit. Well, that's not entirely true. There is a 100 millirem limit for most forms of radiation under Part -- NRC Part 20, but under PART 35 dealing with treatment with radioactive medications, that limit is 500 millirems.

There's no excuse for that. There used to be in the days when radiation I-131 treatments were exclusively inpatient. You could say, well, anybody who's getting exposed to the patient knows that the person is a risk.

And once they leave the hospital and they can take suitable precautions.

That went out the window in 1997 when the NRC deregulated the use of radioisotopes in medicine, relying on the sole authority of a purported export, now dead, who was a major proponent of the doctrine of hormesis, who believed that I-131 was not carcinogenic, and that if there were a major nuclear accident or even the explosion of a dirty bomb, it could have beneficial effects on human health.

This has not got the attention it deserves. But the result has been to make the United States an outlier in the world radiation protection community.

There are people going out the door every day with 200 millicuries and more of radio -- excuse me, radioactive iodine in their systems when this would not be acceptable in Iran or Bangladesh or South Africa, not to mention the countries of Europe.

This is, in my view, impossible. I mean,

indefensible.

The -- how this came about was that -- was through political pressure on the NRC exercised through the Appropriations Committee. You can make the case that they decided we've got to save the reactor program and we'll sacrifice medical. It's just patients.

The reasonably well known by now, that of the 600 millirem average dose, that humans -- Americans get from radiation, half of that is from medical sources.

And the NRC calculated in 2014, the NRC staff calculated that a patient who is released after an outpatient treatment with radioactive iodine-131 of just a 100 millicuries, and it could be much more than that, can, if he or she boards a subway train, deliver a dose of 100 millirems to somebody standing nearby -- standing or sitting nearby in as little as 40 minutes.

If that person is pregnant, that mother and baby can get a significant dose.

Now, the -- but then, there's this institutional question, the NRC made its decision on the LNT several years ago, that included the present Chairman. They are being asked simply to reverse it without even being told why.

The conclusion is stated, they're supposed to fill in the rest.

That risks compromising, if not destroying, the NRC's authority as a reputation, credibility, as an independent regulator.

Certainly, for the 50 years I've known the NRC, it's been axiomatic that it is not just the public that benefits from the existence of a credible nuclear regulator, but the industry itself.

If you sacrifice that, and I didn't get to hear the statement from the Breakthrough Institute, but they have certainly made clear their concern that it's possible to go too far in interfering with the NRC's independence.

And I think that the NRC's leadership owes more to the NRC staff, and here, I speak as a former NRC employee, the leaders who got loyalty from the NRC's employees, we're the ones who showed loyalty to it. And the converse is true.

The people here, here, I speak of the NRC as here, did not go through extensive claiming and years of schooling and years of experience as government employees simply to be told, this is your conclusion, go write it.

That eliminates the need for an NRC. You

can simply leave it to some kid with an autopen to make the decisions, but at least it wouldn't stain the reputation of the NRC as an independent regulator.

MR. GARMON: Forty-five seconds.

MR. CRANE: Pardon me?

MR. GARMON: Forty-five seconds.

MR. CRANE: Okay. Well, I think this is misguided, misguided for the point of view of the health and safety of the public, for the welfare of the NRC and for the long term health of the industries that the NRC regulates. And I hope that the NRC stands up for scientific and institutional integrity.

Thank you very much.

MR. GARMON: Thank you, Mr. Crane, for your remarks. Okay, that concludes our slate of presenters for pre-arranged presentations.

The NRC staff is going to take a break until 4:30 p.m. Eastern Time, at which point we will start -- recommence the meeting and we'll start with the public -- the two minute public comment period.

I want to repeat again for those that have their hands up, you might please consider lowering your hands because we're going to reset the hands when we get back together at 4:30. So that way, we start the public comment period in accordance with our

agenda. Thank you.

(Whereupon, the above-entitled matter went off the record at 4:20 p.m. and resumed at 4:29 p.m.)

MR. GARMON: All right. Welcome back to the NRC's public meeting on Executive Order 14300, Section 5(b). We are now going to commence the two-minute public comment period. Let's see. I would like to review a few of the meeting rules.

Please ensure your comments are relevant to the meeting subject matter. We will mute your microphone once your time has expired. NRC staff is going to make a timer available on the screen here shortly so you can watch your time.

If you do get cut off, you can re-raise your hand and join the queue and attempt to make another comment. And hopefully we will have enough time to accommodate everyone that is interested in making comments.

As I mentioned, when we start the comment period, we will lower all hands. So that way we can re-queue, and, of course, with the meeting agenda.

When you start making a comment, it would be nice if you identified yourself. It is not a requirement, but it would help for our transcription for you to identify yourself and for us to know if you

are representing an organization.

And if you are done with your comment, if you finish before time, it would be helpful to the staff if you state this concludes my comment. Otherwise, we are going to keep the two minutes going because that is what your -- that individual commenter is allowed to have.

For the individuals that are on the phone, you can use star-5 to raise your hand and star 6 to unmute yourself when we call upon you.

The Teams interface displays entire phone numbers, but we are not allowed to state entire phone numbers. So we will identify you by the last four digits of your phone and we will ask to, again, to unmute yourself and to start your comment.

And then, I do have the meeting comment rules displayed again. On Slide 20, we have some inappropriate remarks that we would like to stay away from. So please do not make those.

And then on Slide 18 are the stakeholder meeting topics that we shared with this public meeting notice. If you are interested in making remarks that address those discussion topics, that would be helpful to the staff.

So, with that, we are going to take a

minute to change over to the timer. And then we will reset all hands, all raised hands. And then we can start the public comment period. We will start with the first person in the queue.

We do intend to go for one hour. So we will be adjourning this comment period at 5:32. I am lowering all hands now.

So the first commenter looks like it is James Cook. We will enable your mic.

MR. MILLER: Mr. Cook, even after your mic has been enabled, you may still have to unmute on your end.

MR. COOK: All right. This is James Cook. Can you hear me all right?

MR. MILLER: We can.

MR. COOK: Wonderful. I am the radiation safety officer at University of California, San Francisco. And I understand the LNT was useful as a sort of oversimplification to build regulatory protections on. However, I do feel like it ignores the biological realities of the DNA repair and gene regulation.

And in boots-on-the-ground practice, we find ALARA as an ideal is great. But, in practice, it is too often an unreasonable burden. And we have

sometimes half our radiation safety team dealing with concerns at 1/100th of the occupational limits. And this concern comes from people who see the support of linear no-threshold by the NRC and are concerned about any non-zero exposure.

So I am very happy to see some reassessment of this, and would be very supportive of some of the proposals presented by Health Physic Society and American Board of Medical Physics. And thank you very much. That's the end of my comment.

MR. GARMON: Our next commenter is Bart Ziegler.

MR. MILLER: Again you may have to unmute yourself after I have enabled your microphone.

MR. GARMON: Bart, can you unmute yourself? Bart Ziegler?

MR. ZIEGLER: Hello.

MR. GARMON: We can hear you fine. Can you hear us?

MR. ZIEGLER: Yeah, my name is Bart Ziegler. I have got a doctorate in community environmental medicine. I am the president of a nonprofit foundation that is dedicated to serve the public health and the environment for the risks of nuclear waste and other environmental toxicants.

I am here to strongly oppose the NRC's recommendation on reconsideration of the LNT model as directed by Executive Order 14300. As illustrated by Daniel Hirsch, the principles, the standards the NRC uses are based on outdated, decades old research. The studies have included little data on women, infants, fetuses who have been found to be increasingly susceptible to the health effects of radiation.

Dr. Richardson shared that there are increased peer reviewed data, published data, showing increased concerns for low level, ionized and radiation linked with increased cancer outcomes.

The other outcomes that often are considered a cardiovascular, cognitive and other health issues.

The LNT model is still backed by leading scientific bodies, including International Atomic Agency, the UN scientific community on the effects of atomic radiation and the National Academy of Sciences, Engineering and Medicine. It recognizes that any amount of radiation could pose a risk, and the radiation accumulates over time and exposure.

We have concerns that the standards would be in error without more research. The research in the last 10 or 20 years has been profound and use of

AI to look at more research is essential.

We want to make sure that we don't shift away from safety, et al, costs and the vulnerable sites like San Onofre where nearby communities are already hearing disproportionate environmental burden.

So the proposal needs to be about science. It needs to be about -- and thank you to the NRC for having public comments, by the way. I am really grateful that you are making this thing open to the public.

MR. GARMON: Thank you, Bart. I appreciate your comment. The next comment is Julie King. Julie, do you want to enable your mic. Are you able to speak. Can anybody hear us?

MS. KING: I am here. Can you hear me?

MR. GARMON: We can hear you just fine. Can you see the time?

MS. KING: Yes, I can, thank you.

MR. GARMON: Please proceed with your comment.

MS. KING: My name is Julie King. I am here representing myself. I am in favor of not lowering the acceptable radiation levels below the current LNT standards.

I grew up in Southern California on the

Ventura LA County line, less than five miles, five linear miles, from what was the Santa Susana testing facility and has since been operated by Rocketdyne and Boeing.

There is a statistically significant increase in the number of cancers within the census tract where I grew up. Eight out of ten families on my block experienced cancer. Groundwater contamination was high in our area. And as you likely know, there was a partial nuclear meltdown in that area in 1959.

For me, the result was the diagnosis of bladder cancer at age 30 when my husband and I were trying to get pregnant.

I was also unable to sustain a pregnancy. And with many tests and extensive health histories of our families, no other factors were identified as being responsible for my health situation. Two miscarriages and one ectopic pregnancy later, we stopped trying. No couple should have to deal with this.

Additionally, 36 years after being diagnosed with cancer, I continued to struggle with recurrences. I have had 17 surgeries and numerous rounds of chemo. My most recent surgery was in July

2024.

Weakening radiation safety science will allow our communities to be sickened at vastly higher levels of radioactivity. This is a horrible outcome. I know it. I have lived it.

There is no scientific reason the NRC should weaken its existing low dose radiation standards and every reason to fortify them. The health and safety of Americans depends on it.

Thank you. And that concludes my comments.

MR. GARMON: Thank you, Julie. Calling in our next commenter will be Matt Wait. Matt Wait, do you want to -- Matt, are you able to hear me and you're able to see the time?

MR. WAIT: I'm able to hear you see the time.

MR. GARMON: Great. Then start with your remarks when you are ready.

MR. WAIT: My name is Matt Wait. I am a practicing diagnostic medical physicist for 10 years, and I sit on the Government Regulatory Affairs Committee of the American Association of Physics and Medicine. But I speak for only myself here as you will hear.

I understand critiques of these concepts, the effects of reconsidering LNT and ALARA extend well beyond nuclear power and into medicine. NRC regulations drive radiation use even beyond radioactive materials as a primary regulator of ionization more broadly with respect to occupational radiation exposure.

To start with, I want to note that I think this effort is fundamentally misguided. The throttle to innovation in nuclear power is not LNT or ALARA but difficulties securing locations for radioactive waste and bureaucratic inefficiency.

This will not be fixed by modifying either LNT or ALARA. Regardless of dosimeters or ALARA, communities still need to buy into radioactive waste storage. And the NRC needs to have efficient processes for approving new plants.

In the field of medical physics, it has long been understood that radiation poses both stochastic and deterministic risks for patients, but that they also provide great benefit. However, the benefit can be provided while also minimizing risks.

This is one of the fundamental tasks of the medical physicists and is core to the practice of medicine, first do no harm. In particular, the sub-

discipline of diagnostic medical physicists, representing roughly 2,000 high skilled American workers is concerned primarily with doses less than 100 millisieverts to individual patients. We are also tasked with advising radiation protection of diagnostic imaging staff.

First, regarding the science of the NRC proposals, I disagree with the speakers asserting that LNT does not take into effect repair of radiation damage. I would also notice that medical imaging and therapy utilized very high dose rates compared to background.

There are studies on effects of radiation on patients, longitudinal with risks to cancer. And regarding a determinant dose limit, it has long been understood in medicine that there is no limits to the amount a patient may receive if the exam is appropriate. However, I am concerned that the --

MR. GARMON: Mr. Wait, I'm sorry. I had to cut you off. But please consider rejoining the queue so we can listen to the rest of your comments.

The next commenter is Sally G.

MS. GELLERT: Yeah, hi, this is Sally Gellert, co-host of Eco-Logic, which I note the irony of this hearing today because this morning we had some

folks on to discuss the two anniversaries today of the Trinity test site in 1945 and the Church Rock Puerco River dam break 34 years later in 1979.

Science shows that different people are in fact affected differently. And, yes, cells may repair but cumulative damage is still cumulative. And background radiation has to be considered in any standard.

I was appalled to hear how many Americans will be diagnosed with cancer. And, you know, any increase in radiation is going to increase that number. And I want my government to protect my health, not to say, well, you know, the licensees need a little bit more, you know, ability to do things a little bit cheaper or a little bit easier. No, sorry. Safety first, always.

Women and children are affected way more than the referenced men. I see Mary Olson here. You know, she can tell you all about the effects of radiation, how it's different based on gender and body size and age.

You know, if we lower standards, how many lives will be harmed with various diseases, be it cardiovascular, thyroid, respiratory cancer?

As low as reasonably achievable. The word

reasonably is in there. So let's stick to it and keep our standards high. End of statement. Thank you.

MR. GARMON: Thank you, Sally. Our next commenter is Robert Gould. Robert, we are going to enable your mic. You can speak whenever you can unmute yourself.

DR. GOULD: Can you hear me now?

MR. GARMON: Yes, we can hear you. Can you see the screen and the time?

DR. GOULD: Yes, I can. Thank you. I am Dr. Robert Gould, a retired Kaiser pathologist and now a professor at the UCSF School of Medicine.

I am speaking today as president of San Francisco Bay Physicians for Social Responsibility, representing hundreds of health professionals who, guided by the expertise of medicine and public health, from a public policy to protect human health.

As such, we strongly oppose the NRC's reconsideration of its use of the linear now threshold model and keep radiation exposures as low as is reasonably achievable.

Risk assessment for all environmental carcinogens is predicated on the scientific understanding that there is no safe level of exposure below which there is no harm.

NRC's proposal would exclude ionizing radiation from this fundamental, scientific tenet supported by virtually all international scientific institutions.

NRC's decision would produce orders of magnitude, more cancers among workers and community members. The NRC's reconsideration would further upend two fundamental principles underlying radiation protection. The needs justify why exposure should be permitted and keeping doses as low as possible.

There is no justification for increasing population exposure to ionizing radiation to facilitate uptake of nuclear power, which is a false solution to our climate crisis. It's long-lived toxic waste stream alone should disqualify it as an energy source.

It is not cost effective and is demonstrably linked to the dangerous proliferation of new weapons. Keeping exposures as low as possible is essential to accounting for the increased vulnerability of pregnant women and children.

In addition to ionizing radiation, people are simultaneous exposed to a multitude of toxic chemicals, many of which also contribute to cancer. And we need to consider additional pathways of cancer-

causing exposure, including background radiation and medical diagnostics.

We urge the NRC to not abrogate the responsibility to protect people and the environment by further diminishing already inadequate radiation protection standards and set these standards.

MR. GARMON: Thank you, Robert Gould. We had to cut you off. Your time expired. Please consider joining the queue again.

The next speaker is Mary Olson. Mary, we have enabled your mic, and you can unmute yourself when you are ready. We will do a sound check with you before you start.

Mary, are you able to unmute yourself?

MS. OLSON: I am now. It might people to know it's up above, not down below.

MR. GARMON: So I'm going to make it really fine. Can you see the screen and the time.

MS. OLSON: Thank you. I'm ready.

MR. GARMON: Okay. You can start when you are ready.

MS. OLSON: My name is Mary Olson. I am the founder of Generational Radiation Impact Project. You can find us at radiationproject.org.

Dan Hirsch is right. NRC needs to tighten

its standards, not reduce them. I am going to specifically address the below regulatory concern and/or de minimis concept. No one wants nuclear waste in their stainless steel water bottle or their baby's crib or their -- you know, any personal use object. And yet that is what deregulation on a threshold basis would allow.

NRC itself published a risk assessment of 100 millirems per year for 70 years. And it was published in 1990. And it showed 3.5 fatal cancers, not cancer incidents, fatal cancers per 1,000 people exposed to 100 millirems a year for 70 years. That's 1 in 286. I never met a suit or a tie or anyone who would defend 1 in 286 as an acceptable risk level for the public. And guess what? That is not the public. They are all reference men, every single last one of them.

I really appreciate speakers for noting that the outcome of radiation exposure does depend on both the age and biological sex and many other factors. We don't yet understand it all. But if we are going to protect not just some idea of conservativeness but rather our species ability to continue through time as a life cycle, I suggest we retire reference man. We thank him for his service.

We give him a gold watch, and you figure out -- I'll help -- how to have a reference girl. Because, you know, that is where the highest damage occurs in the lifespan study data upon which the public health standards have been based.

Thank you for this opportunity to speak. I think you guys are sadly Humpty Dumpty, and I am looking forward to the scrambled eggs.

MR. GARMON: Thank you for your statement, Mary. Our next speaker will be Thomas Webler. Thomas, we are going to enable your mic. And if you could unmute yourself and do a sound check, then you can start with your comment. Thomas Webler, you should be able to unmute yourself.

Okay. We'll go on to Haakon Williams. And we will leave Thomas Webler up. Maybe for the next comment, we can go back to Thomas.

Is James Welsh first?

DR. WELSH: I am here if you are ready. Can anybody hear me?

MR. GARMON: Yes.

DR. WELSH: Should I proceed?

MR. GARMON: Are you able to see the time?

DR. WELSH: I am, yes. James Welsh, Dr. James Welsh. I am a past member of the ACMUI Advisory

Committee on Medical Uses of Isotopes in the past and a medical advisor on radiation oncology for the NRC.

Presently, I am with the Department of Veterans Affairs, but I am speaking today as a private citizen and on behalf of the American College of Radiation Oncology.

When I was on the ACMUI, I started to grow skeptical of the LNT, in part because of discussions about NRR possibly coming under the purview of the NRC along with some fruitful conductive discussions with Mr. Peter Crane, who we had heard from earlier today.

Thanks to those discussions, I did some homework, and I had come to the conclusion that radiation is not nearly as carcinogenic as I was taught initially for a variety of reasons I won't go into today.

But among those reasons, high natural background regions do not have people with higher rates of cancer or shorter life spans. And in some cases, their doses are in excess of 10 rem, which according to one of the presentations we heard today means 80 percent of the population should have cancer. And that is not what I have seen.

But most importantly, I have not seen the increased rate of secondary cancers among my patients

after the last 30 years. If we did, we all would have retired decades ago.

These doses are on the order of 5 million millirem and 25,000 millirem to the regions. The excessive concerns and exaggerated fears of radiation therapy impede the ideal use of nuclear medicine and radiotherapy. And this is especially important given the use of radiation therapy for benign diseases like osteoarthritis now.

So I will stop my presentation at this point and thank you for the chance.

MR. GARMON: Thank you, James Walsh for your comment. Our next comments is Haakon Williams.

MR. WILLIAMS: Hi, can you hear me?

MR. GARMON: I can hear you. Can you see the time.

MR. WILLIAMS: Yes, I can.

MR. GARMON: Okay. The floor is yours.

MR. WILLIAMS: All right. Thank you for the opportunity to speak today. It is not really clear to me why Mr. Welsh was moved up in the queue from number 6. The audience, I think, is just left to conclude that NRC is trying to highlight critics of linear no-threshold even when they are not next in the queue. So that was pretty strange.

I am here today because the NRC is being asked, again, to consider linear no-threshold. Let's be clear. This proposal is not grounded in new science. NRC already reviewed this exact question and reaffirmed LNT as recently as 2021.

Since then the science has only grown stronger. More precise studies continue to confirm what LNT has long asserted. That there is no safe threshold for radiation exposure and that risk increases linear lead with dose even at the lowest levels.

Leading scientific bodies from the National Academy, the ECA, the United Nations and even this very agency have all repeatedly upheld LNT as the most accurate and protected model we have.

Why revisit it now? Well, let's say the quiet part out loud. This isn't about science. It is about politics. The Trump Executive Order pushing this review is a gift to industry. If adopted, it would allow far more radioactive contamination to be left behind at full leaded sites, potentially raising allowable exposure by hundreds or even a thousand times.

This would not sicken communities, it would shield the industry from responsibility and

liability, all while cloaking the move in misleading language without safety.

Radiation is already permitted at higher risk levels than many other pollutants. Gutting the LNT model would push those risks even higher. Let's not pretend this is in the public interest. This is about profits over people.

I urge the NRC to remain independent, grounded in science and protective of public health. Reject a politically motivated attack on the LNT model and by your own prior conclusion.

And I would just like to say, as someone who hopes to become a father soon, future generations are looking at you, NRC. Thank you for your time.

MR. GARMON: Thank you, Haakon Williams. Our next commenter is Hayden Galvan. We are enabling your mic. You can unmute yourself. Hayden?

MS. GALVAN: Hello.

MR. GARMON: Hello, Hayden, can you hear us okay?

MS. GALVAN: Yes, I can.

MR. GARMON: I can hear you fine. And you can see the time. The floor is yours.

MS. GALVAN: All right. So today, I am just representing myself. And as a young adult who

will observe and experience the consequences of this Executive Order for years to come, not only in my professional career, but in my personal life, I am gravely concerned about the potential stripping of radiation protection standards.

The Executive Order will allow permissible exposures to be at least 100 times higher than the current permissible level, a reality that I fear since it will cause cancer rates in other radiation illnesses to dramatically rise.

I cannot support an order that will allow an elevated amount of radiation to be exposed to my community and society as a whole. Not only will those employed in nuclear fields be placed at great risk, but also our family, friends and selves.

If this is what it takes to boost nuclear energy production, then the production of nuclear energy is not worth the risk of people in our community developing horrific illnesses as a result of radiation exposure.

The weakening of radiation standards is an unsafe decision and will negatively affect everyone. NRC, please do not follow the directive of the Executive Order. If you revisit your radiation standards, it should be in the direction of tightening

those standards to reflect the updated science that has come out in the decades since you last updated your radiation standards. Thank you.

MR. GARMON: Thank you for your comment, Hayden. Our next commenter is Dave Collins. Your mic has been enabled. Can you unmute yourself, Dave Collins?

DR. COLLINS: Unmuted now. Can you hear me? Can you hear me now?

MR. GARMON: We can hear you fine, Dave. Can you see the time?

DR. COLLINS: Yes, I can.

MR. GARMON: Okay. The floor is yours.

DR. COLLINS: Okay. I am Dr. Dave Collins. I am a principal environmental engineer with 50 years' experience managing and addressing complex engineering problems and advising governments on practical government policy that should result.

This discussion today has focused on radiation and ALARA, largely in isolation to the many other matters that are critical to a balanced discussion of nuclear technologies.

To progress this discussion, we must broaden the scope to include other questions. In particular, what are the alternatives and how do the

costs and benefits of those alternatives compare to nuclear technologies?

As one example, I will focus on the impacts on environmental and livelihood issues associated with the present government in Australia and also past governments in the United States with relation to climate change.

These governments have regarded climate change as an existential crisis, which it may well be. However, they then go on to justify overriding established property rights to put in, for instance, transmission lines and large wind funds. And they also override environmental approvals processes when it comes to the deployment of wind, solar on these same transmission lines.

In Australia, for instance, in the State of Queensland, many tens of remnant habitats have been destroyed. These are remnant habitats for koala. And surprisingly, koala is a protected species here in Australia and now in Queensland.

And as a consequence, you know, we have lost those habitats because of, as I say, the many of tens of wind farms that have been installed. And there has not been the consideration. There is no environmental follow-up. There is no monitoring

processes. There is no public approval processes of any consequence. And it is leading to decided negative benefits.

And in conclusion, given the proven benefits of nuclear energy to reduce greenhouse gas emissions and avoid the existential crisis.

MR. GARMON: Okay. Mr. Collins, please consider rejoining our queue. Our next commenter is Bernd Lorenz. We are going to -- I think we have already enabled your mic. Can you unmute yourself and do a sound check with me?

DR. LORENZ: Very much. I am Dr. Lorenz from the German-Swiss Society of Radiation Protection. And it was very interesting to see that there have been today also some proposals for a cut-off.

The aforementioned study several years ago, and he proposed the same thing to have a cutoff optimization of one millisievert per year for workers and 0.1 for members of the public as a boundary for optimization saying that you are below this one millisievert, you are optimized.

The notice and practice that the ALARA principle has low in its words and low means the best radiation protection is when you have lowest dose and the best ever is no dose. This you can counter --

this is, of course, not justified.

And I am pleased to see that there are some proposals also in the same area to have a cut-off for optimization, not a cut-off for radiation protection at all not to do so many things unjustified in the low dose region. Thank you.

MR. GARMON: Thank you, Dr. Lorenz. Our next commenter in the queue is Mary Beth Brangan. We've enabled your mic if you could do a sound check when you get a chance, Mary Beth.

It looks like you have muted yourself, Mary Beth. Can you start speaking so we can hear your voice? Unfortunately, we can't hear you, Mary Beth.

On to Patrick Mulligan and then we'll go next to Mary Beth. We will give her another chance.

Patrick Mulligan, can you enable your mic or can you unmute?

MR. MULLIGAN: I'm good. Can you hear me?

MR. GARMON: We can hear you fine. Can you see the screen?

MR. MULLIGAN: Yes, I can. Thank you.

MR. GARMON: The floor is yours.

MR. MULLIGAN: Good afternoon. I am Patrick Mulligan. I am chair of the Conference of Radiation Control Program Directors. CRCPD

collectively represents one of your largest stakeholders, the State Radiation Control Programs, which are responsible for overseeing radiation protection across the country.

We recognize and support developing the nation's use of nuclear power. Still, we can't lose sight of the state's responsibility to regulate and ensure the safe use of the wide variety of radiation sources that touch the lives of Americans every day.

On behalf of the CRCPD board of directors, I would like to share five key areas we believe should be the focus of any decisions the NRC makes as they move forward in this process.

One, harmonization of radiation dose limits across all agencies and stakeholders. Now is the opportunity for the U.S. to adopt a national consensus standard.

Two, maintain current dose limits while enhancing practicality. We recognize that industry needs may not align with medical best practices, and we suggest considering the development of a separate threshold for radiation and medicine and industry.

Three, establish a de minimis threshold for regulation. The majority of professionals in the radiation protection community agree that there is a

specific dose from all sources where health impacts begin. We suggest reaching consensus on that specific dose to establish a de minimis threshold.

Four, use scientific updates to keep regulations current and appropriate. You must use current and use scientific studies without losing sight of the lessons learned from past experience.

Five, ensuring independent regulatory authority. We need to maintain a level of commitment and accountability for radiation protection by having an independent regulatory authority.

CRCPD looks forward to partnering with NRC to ensure any changes considering developing guides and regulations meet the radiation safety and protection needs of the entire nation.

Thank you. End of comments.

MR. GARMON: Thank you for those comments, Patrick. We will go back to try Mary Beth one more time. If you could enable Mary Beth's microphone.

Mary Beth, your microphone has been enabled, and it looks like you are unmuted. Can you do a sound check with us?

Okay. We still can't hear you in the room, Mary Beth. This is the second time we have tried to reach out to you. So we are going to go

ahead and lower your hand and ask you to resolve your technical difficulties and rejoin the queue. We are sorry about that.

Our next commenter is Ken Chaplin. And your mic has been enabled. You can unmute yourself and do a sound check with me. Ken Chaplin? We still can't hear you, Ken.

Okay. Let's move to -- let's leave Ken's hand up. We'll come back at Nick Karnia. Nick, we are going to enable your mic. Nick Karnia, your mic has been enabled.

MR. KARNIA: Can you hear me, sir?

MR. GARMON: We can hear you just fine. Can you see the timer?

MR. KARNIA: Yes.

MR. GARMON: Okay. The floor is yours.

MR. KARNIA: Good afternoon, everyone. My name is Nick Karnia, and I am a reporter with the Howard Center for Investigative Journalism at Arizona State University.

I recognize that this is a public comment period, but I would be incredibly grateful if any members of the NRC staff could answer just one question for me.

I know that several presenters today

highlighted peer reviewed evidence supporting continued use of the LNT model and ALARA, and some of the presenters challenged it.

Will the NRC include a public summary or formal staff analysis of the scientific evidence presented at this meeting before moving forward with any proposed changes?

MR. GARMON: The NRC staff will review all public input. And when we make recommendations to our Commission, we will ensure that they are well founded and supported.

We expect that there will be other opportunities for public engagement once we make those recommendations to our commission.

MR. KARNIA: Okay. Thank you.

MR. GARMON: Does that conclude your remarks?

MR. KARNIA: Yes, sir.

MR. GARMON: Thank you, Nick. Okay. We are going to go back to Ken Chaplin to enable Ken's mic and see if he can unmute himself and speak.

Ken, your mic is enabled. Are you able to unmute yourself? Okay. It appears not. But we will move on to Theodora Tsongas. We will enable your mic and do a mic check with you. And I just want to

inform the commenters that we are about halfway through our public comment period.

The staff will also appreciate written comments if you do not have the opportunity to make a verbal comment today.

Theodora, it looks like you have unmuted yourself.

DR. TSONGAS: Good afternoon. I am Dr. Theodora Tsongas. I an environmental health scientist with a career in public health.

In the short time I have here, I want to urge the NRC in considering its radiation protection framework to continue to use the linear no-threshold model and do everything it can to keep radiation exposures as low as possible because of the growing evidence that risks are high for cancers of many systems at very low doses.

That new evidence indicates that cardiovascular disease risk are significantly increased with radiation exposures through occupation and diagnostic procedures and especially evidence that risks of adverse effects of exposure to radiation are increased in the embryo in utero in newborns and infants. The younger, the greater the health risks. And in females, the health risks are greater than in

males.

Early exposures can result in adverse health impacts throughout the life of the individual and with the potential for intergenerational effects.

As evidence accumulates of adverse effects at lower doses in different biological systems and in different segments of the population, determinant radiation dose limits would be quickly out of date and costly to society as well as unprotective of health.

On the basis of the evidence, it is absolutely unthinkable to increase the risks to the working and general population by increasing allowable exposures. The precautionary principle tells us that prevention is the least possible direction to take to prevent unforeseen adverse consequences.

Please keep the linear no-threshold model as the standard for protection, especially as we are finding adverse health impacts at lower and lower levels of exposure.

Thank you for your time and consideration.

MR. GARMON: Thank you for your remark, Theodora.

Our next commenter is Regna Merritt. We have enabled your microphone, Regna. Can you unmute yourself? Regna Merritt, we have enabled your

microphone.

Can you unmute yourself and start your remarks? It appears not.

We will try Julie Korenstein. Ms. Korenstein is next in the queue. We have unmuted your mic, Julie.

MS. KORENSTEIN: Yeah, can you hear me okay?

MR. GARMON: Julie, we can hear you perfectly. Can you see the time?

MS. KORENSTEIN: Yeah, go ahead -- I'll go ahead. Thank you. I am Julie Korenstein. I live in the San Fernando Valley, very close to the Santa Susana Field Lab. I will begin now.

Lowering nuclear radiation standards, how will this affect the cleanup of the Santa Susana Field Lab? In July of 1959, there was a partial meltdown of an experimental nuclear reactor in the Simi Valley. A third of the fuel elements experienced melting, resulting in the release of radiation directly into the environment, into Simi Valley and the San Fernando Valley. We were all affected.

No one knew about this disaster for over 20 years after the meltdowns. So 65 years later, we are still being affected by deadly chemicals and

radionuclear effects on our bodies.

Not only was this an area used for a nuclear reactor, it was also used for rocket testing and processing of spent plutonium rods. The clean-up was supposed to have been completed in 2017, but the agencies involved as well as Boeing have dragged their feet while children are dying.

My greatest concern right now is that my granddaughter and her husband and my great grandson have moved into Simi Valley now. And I am continuously worried about any radiation and/or contamination of water.

What type of guarantees can you give me that their health will not be affected by your lowering the standards for the clean-up? It is your responsibility to protect them as well as other community members.

Please do not change and dilute the comprehensive clean-up of the Santa Susana Field Lab. We depend on your for guaranteeing the health and the safety of our communities. I am continually worried because I think that the decision to reduce the nuclear radiation is --

MR. GARMON: Sorry. We had to cut you off, Julie. Please consider rejoining the queue.

Our next commenter is Michel Lee. We have enabled your mic. Can you unmute yourself? It looks like you have unmuted yourself. Michel Lee or Michel Lee? We cannot hear you.

We will leave Michel Lee at the top, and we will go on Sarah Abramson. Sarah, your mic has been enabled. Can you unmute yourself?

MS. ABRAMSON: Yes, can you hear me?

MR. GARMON: We can hear you just fine. Can you see the time?

MS. ABRAMSON: I can.

MR. GARMON: Yeah, great. Start when you are ready.

MS. ABRAMSON: My name is Sarah Abramson. I am the executive director of the C-10 Research and Education Foundation. We are a public advocacy group serving the nearly 180,000 people living within the 10 mile evacuation emergency planning zone of the Seabrook Station Nuclear Reactor in New Hampshire.

Dr. Lyman from the Union of Concerned Scientists summarized well on another commenter that this topic was just adjudicated and denied in 2021. So I will simply reinforce that Chairman Wright did publish his support of that petition's denial in 2021. And thus the NRC arriving at any different conclusion

can only be interpreted by me and likely many others as being driven by industry and political will not gold standard science.

We cannot with a straight face support that all the presentations and viewpoints today are created equal on a scale of credibility. And I urge the NRC to do what you did well four years ago and that is to make public safety focused decisions based only on credible evidence.

If regulatory changes result in occupational doses not being measured and recorded in certain settings or if there is a lessening of environmental radiological monitoring efforts, as was suggested as reasonable by a couple of today's presenters, how can the NRC possibly continue to have effective analysis of the harm caused by these changes.

I compare it to the probabilistic risk assessment that I optimistically assume you are going to be doing prior to any changes.

Increased rates in cancers will be written off as stochastic, random, bad luck. And do not forget that in 2015, the NRC cancelled a planned National Academies of Science study on cancer incidents in populations residing near nuclear

reactors. And the NAS estimated that would take three years and $8 million. And it was cancelled because it would be too long and too expensive.

If that had been done, we might not find ourselves here today because the NRC would have this NRC funded unbiased data to refer to. And so for those who care about waste, fraud and abuse, take note. That investment could have perhaps avoided this frivolous review.

And we are not properly exploring cancer rates for nuclear host communities, especially in children.

I live in Seacoast, New Hampshire. There is a pediatric cancer cluster here that was studied in 2017 and --

MR. GARMON: I'm sorry, Sarah. We had to cut you off. Your time expired. We will try one more time with Michel Lee or Michelle Lee? We have enabled your mic. Can you speak? Unfortunately, we can't hear you.

We will go on to Leona Morgan. Leona, we have enabled your mic.

MS. MORGAN: Okay.

MR. GARMON: I can hear you fine. Start when you are ready.

MS. MORGAN: (Native language spoken.) Leona Morgan, (Native language spoken). I am Dine and indigenous to this so-called United States.

My people have been living within the Four Secret Mountains since time immemorial. There is uranium beneath us yet we have never experienced the health issues that my people are experiencing now from uranium mining of the Manhattan Project and the Cold War.

There is no such thing as peaceful or peacetime use of nuclear. All nuclear developments cause harm to our communities. I agree with changing the current regulations. However, not to weaken protections but to increase the protections and strengthen for all life our indigenous peoples.

We still have subsistence living. We still hunt and grow our own foods. We must protect our human family but also our plant and animal relatives as well as secret places.

We do not consider our cultures as religion, but the federal government that is the only way to explain that indigenous people have an inalienable right to practice our traditional lifeways. And we must be allowed to do this safety.

Our people are dealing with results in

cancers, autoimmune disease, reproductive health problems and more without proper medical facilities on a reservation.

We are also dealing with the cumulative impacts of uranium mining and being downwind of the Nevada tests.

If we protect more people, this should also lower the cost of the Radiation Exposure Compensation Act for folks who are hurt by such exposures.

Some recommendations for better protections include lowering the allowable limit for water from 30 parts per billion to 20 parts per billion. We need to lower all allowable levels across the board to protect our food and water resources and the air we breathe for our communities, but more importantly for our future generations.

Again, today is July 16, the anniversary of the Trinity tests and the Church Rock spill. Please remember that. Thank you. (Native language spoken.)

MR. GARMON: Thank you for your comment, Leona. As a reminder, we have about 15 minutes of public comment time remaining. Our next commenter is Linda Richards. Your mic has been enabled. You can

unmute yourself. Do a sound check with me. Linda Richards?

Okay. We'll try Roger Johnson and give Linda Richards a second try after Roger. Roger, it looks like your mic has been enabled.

Roger Johnson, are you able to unmute yourself?

Okay. We'll try Madison Schroder. Madison Schroder, are you able to unmute yourself?

MS. SCHRODER: I am, and I can see the timer.

MR. GARMON: Great.

MS. SCHRODER: Okay. Good afternoon. My name is Madison Schroder speaking for Generation Atomic, one of the largest nonprofit organizations advocating for nuclear energy.

We are very grateful for this opportunity to provide public comments today. We will submit detailed written comments following this hearing to include a more in-depth discussion of our full position on the Executive Order.

Today, I will briefly highlight our key perspective based on our expertise in public communication and engagement.

Through our grassroots work, we frequently

encounter widespread public confusion about radiation risks. The current radiation protection framework may undermine the NRC statutory mission to provide reasonable assurance of adequate protection by failing to establish clear, science-based thresholds that the public can understand and trust.

Without meaning thresholds, the NRC cannot demonstrate it has fulfilled its mission of providing adequate protection because there are not defined criteria for what constitutes success in protecting public health.

We strongly support reconsidering the LNT and ALARA frameworks and establishing evidence-based thresholds, below which regulatory action would not be required, such as those proposed by the Breakthrough Institute in the earlier presentation.

This reform would provide regulatory clarity, focused resources where oversight provides genuine safety benefits, and enable the NRC to demonstrate measurable success in protecting public health while building public confidence in nuclear safety.

Such thresholds would also align nuclear regulation with how other federal agencies treat comparable risks.

The nuclear industry has achieved exceptional safety performance that continues operating under regulatory assumptions that don't reflect current scientific understanding.

Establishing rational, science-based thresholds would help the NRC fulfill its mission more effectively while maintaining its rigorous safety standards.

Thank you for your time in considering our perspective.

MR. GARMON: Thank you for your comment, Madison. We will try Linda Richards one more time. Linda, your mic has been enabled. Are you able to unmute yourself and speak?

Unfortunately, we can't hear you, Linda. We'll move on to Roger Johnson. Roger, your mic has been enabled. Are you able to unmute yourself and speak? Roger Johnson? We can't hear you Roger.

Our next commenter is Ace Hoffman. Ace Hoffman, your mic has been enabled. Ace Hoffman. We will go on to Matt Wait.

MR. WAIT: Hi, can you hear me?

MR. GARMON: You're fine.

MR. WAIT: Okay. I will do my best to finish my comments.

Regarding a determinate dose limit has long been understood in medicine that there is no limit to the amount of radiation a patient may receive if the exam is providing a benefit.

However, my concern is that the establishment of such an arbitrary limit by the NRC would add confusion to the appropriateness of an imaging exam.

For example, a 10 millisievert chest X-ray may be considered to be acceptable if it was within the NRC's limit even though a dose of 1/100th of that will create a sort of high quality image.

Such a dose limit and removal of ALARA could unintentionally upend entire careers and livelihoods. Additionally, there is no international recognized scientific consensus for establishing a determinate dose limit let alone what a number like that should be.

In particular, I strongly disagree with the nuclear power industry's request to "delete" 20.30 -- 20.130.01(e) regarding public dose limits. The public dose limit is used to determine everything from the appropriate release of the radioactive patient following a nuclear medicine therapy to the amount of lead in the walls for a linear accelerator CT scanner.

Public health is as legitimate of a consideration as costs and benefits to individual stakeholders and industries. Imagine the response to the patient's family member in the future when they ask why there is no more lead shielding of X-ray rooms if they are told that is because the administration wanted to unleash America's nuclear power.

In conclusion, my request to the NRC is that regulations that are intended to apply to nuclear power should be limited to such without creating unintended consequences for other industries.

And I will use the remainder of my time to just say that I agree with the first presenter that LNT is the most viable model for use, but certainly more can be done to educate the public.

If we overturn international scientific consensus, we risk creating more radiophobic people and creates distrust in our entities and our government and reduce safety.

Thank you.

MR. GARMON: Thank you for your comment, Matt Wait. Our next commenter is Cindy Maughan.

MS. MAUGHAN: Maughan.

MR. GARMON: Maughan. Sorry, Cindy. It sounds like your audio is working fine.

MS. MAUGHAN: Yup.

MR. GARMON: The floor is yours.

MS. MAUGHAN: Thank you. So 80 years ago today, my mother was four years old as she slept right outside Alamogordo, New Mexico. After the blast, my grandmother got cancer as well as my mother had passed those mutations onto myself and my children. And as I sit here and talk to you, I am sitting in a cancer hospital parking structure so that I could participate today.

This has caused intergenerational mutations and problems for me and my family. It denies us generational wealth because we spend all of our money on health. Finally, we will get RECA. But it still has to be approved.

I don't think the NRC should reduce standards at all. All nuclear, whether we are talking about medical, whether we are talking about AI, energy production, any of these different things all have competing interests, but public safety should be number one. There is no safe level.

I strongly oppose lowering any of the standards. We need to really look at the supply chain because what we are doing currently is not safe for any of the communities that these things go through.

I have been monitoring the EPA going through rural counties trying to get interim storage facilities for spent nuclear fuel. There is just so much that goes into these things. And I appreciate what you are doing, but I don't think that we should cave to this Executive Order in any way, shape or form.

I think we should strengthen all protections and public safety measures. And we should make sure public health is imminent and the first and foremost thing and not politics in anybody's mind as we move forward to make these decisions for myself and my community. So I appreciate the ability to speak with you today.

MR. GARMON: Thank you for your comments, Ms. Maughan.

MS. MAUGHAN: You're welcome.

MR. GARMON: The next commenter is Diane D'Arrigo.

MS. D'ARRIGO: This is Diane D'Arrigo. I am with the Nuclear Information and Resource Service. I have been tracking the Nuclear Regulatory Commission, and its 10 CFR 20 standards since the late 70s and fought the changes that took place in 1992, which actually increased allowable radioactivity in

air and water.

I oppose, our organization opposes, and we work with groups around the country and actually around the world. We oppose the end -- the proposal to stop using the LNT model unless you are going to include super linearity at low doses.

There is no safe threshold. This has been scientific consensus. The below regulatory concern policy, which would have set a level below which you don't have to regulate, was overturned by Congress in 1992. That was after 14 states passed laws requiring continued regulatory control over nuclear materials in their states, even if the feds deregulated.

By allowing a clearance or a threshold level, you are writing a blank check to allow unlimited amounts of radioactivity. There is no way to verify or enforce millirems of microsieverts or whatever amounts of dose you are proposing to declare a threshold. So we oppose having such a level.

All manmade radioactivity needs to be regulated.

So back in '92, in '86 and '90, the NRC BRC policies, which were overturned, would have allowed a third to a quarter of the low level radioactive waste from nuclear power to be allowed

into regular commerce and recycling.

If you are going to reassess standards, look at things in addition to cancer, look at all of the health effects.

Thank you.

MR. GARMON: Thank you, Diane D'Arrigo. Our next commenter is Nancy Vann. We are approaching our adjournment of this meeting. We have time for three more comments. Nancy? Nancy Vann, are you able to unmute yourself?

We can't hear you Nancy. We'll try --

MS. VANN: Wait, wait, wait.

MR. GARMON: I can hear you, Nancy. You can go ahead and start, Nancy.

MS. VANN: I thought it was on the little thing at the bottom of my screen.

Okay. As a retired attorney, myself, I want to thank Robert Gold for his comments, his insightful comments.

I would note that radiation exposure limits are premised on site specific exposure. Movement of individuals between locations and occupations and across medical conditions can lead to greater exposure than if a person was only in one location, with one lifetime job and was as young and

healthy as reference man.

For example, I, myself, was in Europe during the Chernobyl meltdown. Then I needed multiple X-rays for ankle replacement surgery and then movements to radiation admitting Indian Point with their reactor before it was closed.

I got cancer a few years later. But which of those exposures was the one that gave it to me? You can't always pinpoint causation. But certainly the correlation that it existed for many, many years is a good indication that there is causation that is happening.

With the current administration and that limitations in citizens' movements and residences such as exist in certain Eastern countries or will they limit a person's occupation based on their radiological imaging requirements.

I hope that those aren't going to be companion proposals or executive orders. But they do seem like they would be necessary if we are actually going to try to limit people's health exposure and protect their safety. Thank you.

MR. GARMON: Thank you for your comment, Nancy. Our next commenter is Anthony Smith.

MR. SMITH: Can you hear me?

MR. GARMON: I can hear you.

MR. SMITH: I can see the time.

MR. GARMON: Go ahead and start.

MR. SMITH: (Native language spoken.) My name is Anthony Smith. I work for the Nez Perce tribe, although I am not speaking on behalf of the tribe. I work in regards to environmental restoration and waste management in regard to the Hanford Nuclear site.

Understandably, this is an NRC conversation. But significantly taken to interests of how this could have ramifications in regard to weaker protections against long-term low level radiation exposure, especially from radioactive materials that filled up in people or in ecosystems over time.

Although there is a lot of debate over, you know, the scientific rigors behind the process, whether it is too old or there are new standards may overlook real and hard to measure health risks, my concern in this is that us, as Nimiipuu of the Nez Perce Nation, in our backyard, we have an existence here and a play space for over 12,000 years. We plan to be here for a very long time.

Lowering these standards and risks concerns us in the sense of not necessarily evaluating

what those risks look like long term. We only can understand what the parameters are in the short term. And we can also see what the benefits are for shaping and making it easier for nuclear mining and waste companies to operate.

(Native language spoken.) Thank you.

MR. GARMON: Thank you for your comment, Anthony Smith.

Our last commenter, being Thomas Webler. Thomas, we have enabled your mic. Are you able to unmute yourself? Thomas Webler?

Okay. Bethany Tyree? Bethany, can you unmute yourself?

Mary Beth Brangan? We've enabled your mic, Mary Beth. Are you able to unmute yourself? Mary Beth Brangan?

Okay. We will try the phone number that ends in 7 -- oh, we lost that. That person put their hand down.

Ken Chaplin? Ken Chaplin, your mic has been enabled.

Okay. Regna Merritt?

Okay. We've reached the end of our public comment period. I am going to disable everyone's mics. We appreciate the comments provided and public

input that was provided.

For those that were not able to make verbal comments to the NRC, please consider submitting written remarks to the email addresses that are on the public meeting notice.

I want to thank you again for your comments and participation. I especially appreciate the civility that was shown in the commentary. It takes courage to participate in these meetings and the staff appreciates and recognizes that. We believe that your input will enable us to give better advice to our Commission through proposals that are informed by the public's viewpoints. So, on behalf of the staff, thank you for your comments.

As I mentioned earlier, the staff is working on an urgent schedule to respond to this Executive Order. So we request that any written comments be submitted to the staff by next Friday, July 25, which, if we receive comments after that date, we can't promise that we will consider them, but we will do our best. We have already received many comments. And we appreciate it.

This meeting was recorded and transcribed. We are looking to make a preliminary copy of this recording available to our social media next week.

And we will refine it and share the final version with the public meeting summary, as we do with all of our public meetings.

If you are interested in providing meeting feedback after this meeting adjourns, you will be able to go to the public meeting site and click on the meeting feedback form and provide feedback to the project manager, Ed Miller, and me.

And now I would like to turn it over to Mike Franovich for closing remarks.

MR. FRANOVICH: Well, I'll be mercifully brief. Thank you very much for your patience. And I would like to especially thank the presenters for making the effort of putting together their thoughtful perspectives and enlighten us on some additional information and maybe perhaps newer work that might be available to us to consider.

There are many perspectives that were shared. I think importantly for us is that it is much broader than just the reactor community.

We heard from more than the fuel cycle community itself, medical community, other radiation type of applications and use of materials, both at the perspectives of the users on the ground. I think that is very important.

But I also want to thank those who provided the comments here late in the afternoon of where you see potential impacts to your communities and your perspectives. I think those insights are also quite helpful for us.

We probably gained much more insight than we anticipated. I think we have exceed the expectations given the amount of information that has been provided.

Stay tuned. There is a lot of work going on as Dave has mentioned. We will keep you informed as best we can on this aggressive schedule that we are working.

So, again, thank you very much for your candor and very respectful commentary during today's meeting.

Okay. We are adjourned. Thank you.

(Whereupon, the above-entitled matter went off the record at 5:37 p.m.)