

Official Transcript of Proceedings

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Section 5(b) - Reconsidering the NRC's
Radiation Protection Framework

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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 PUBLIC MEETING ON EXECUTIVE ORDER 14300 SECTION

5 5(B) - RECONSIDERING THE NRC'S RADIATION

6 PROTECTION FRAMEWORK

7 + + + + +

8 WEDNESDAY,

9 JULY 16, 2025

10 + + + + +

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

14 PRESENT:

15 ED MILLER, NRR/DORL/LPL2-1

16 TERRY BROCK, RES/DSA/RPB

17 MAUREEN CONLEY, OPA

18 MIKE FRANOVICH, NRR

19 DAVID GARMON, NRR/DRA/ARCB

20 KEVIN HSUEH, NRR/DRA/ARCB

21 MEENA KHANNA, NRR/DRA

22 BILL RAUTZEN, NRR/DRA/ARCB

23 CARLA ROQUE-CRUZ, NRR/DORL/LPMB

24 SHILP VASAVADA, NRR/DRA

25 KEVIN WILLIAMS, NSIR

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1 ALSO PRESENT:
2 AMIR BAHADORI
3 DAVID J. BRENNER
4 PETER CRANE
5 ALAN FELLMAN
6 KATHRYN HIGLEY
7 DANIEL HIRSCH
8 MIKE LEWANDOWSKI
9 EDWIN LYMAN
10 CYNTHIA H. MCCOLLOUGH
11 DAVID RICHARDSON
12 MICHEAL SMITH
13 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

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1 from external organizations.

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

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

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

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

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

1 notice.

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

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

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

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

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

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

25 This is a widely attended meeting, so

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

25 MR. HSUEH: Kevin Hsueh, Radiation

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1 Protection and Consequence Branch at NRC.

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

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

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

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

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

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

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1 radiological effluents, occupational exposures, and
2 accident risks.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

25 Obviously, we're having regular

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

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

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

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

25 The staff is in receipt of a letter from

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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1 reasonably achievable, ALARA.

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

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

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

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

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

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

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

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

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

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

25 Later, when we review the topics for

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

3 To wrap up the last few terms, long ago
4 the International Commission on Radiation Protection,
5 or ICRP, introduced justification, optimization, and
6 limitation and three basic components of radiation
7 protection. In the proposed rule for the current Part
8 20 that's in place now, the NRC defined justification
9 as no practice for operation involving radiation
10 should be adopted unless it introduces a net benefit.

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

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

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

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

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

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

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

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

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

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

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

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

17 Slide. This picture here is an excerpt
18 from the biological effects of I-19 radiation, or the
19 BEIR VII report of 2006. In this picture, the authors
20 illustrate that out of 100 people in the U.S., about
21 42 will be diagnosed with cancer in their lifetime.
22 That's represented by the black dots.

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

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

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

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

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

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

25 Next slide. This one's a little hard to

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

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

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

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

1 review in the next two slides.

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

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

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

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

25 Incidentally, when we consider all the

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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1 any detail.

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

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

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

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

1 We have 12 presenters that will be allowed
2 10 minutes. We also have some padding for technical
3 difficulties, so you can see we're a little ahead on
4 the agenda.

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

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

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

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

25 Regarding conduct during this period, we

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

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

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

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

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

16 (Pause.)

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

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

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

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

5 Next slide, please.

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

8 DR. STEIN: Okay.

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

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

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

15 MR. MILLER: That still better?

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

18 MR. MILLER: Yeah.

19 (Simultaneous speaking.)

20 DR. STEIN: Technical issues are no big
21 deal.

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

1 are grounded in empirical and cutting-edge research.

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

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

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

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

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

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

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

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

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1 power operation, or other alternative energy sources.

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

6 The Clean Air Act -- specifically, the
7 1990 amendments to the Clean Air Act -- Congress
8 defined values of what it deemed acceptable risk.
9 These values relate to nuclear power and many other
10 hazards, provides level of acceptable risk and ample
11 margin safety below, which further regulation is not
12 necessary. Next slide, please.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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1 technologies relative to the risks. Next slide,
2 please.

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

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

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

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

14 (Off-mike comments.)

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

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

19 MR. HIRSCH: Ed, you can hear me?

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

22 MR. HIRSCH: Okay, thank you.

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

25 MR. HIRSCH: Thanks so much. My name is

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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1 for public exposure to nuclear fuel cycle facilities.

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

4 1.17 times ten to minus three cancers per
5 person rem, at what are considered low doses. This
6 comes from the National Academy of Sciences BEIR VII
7 report that was commissioned by NRC, EPA, and DOE.

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

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

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

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

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

7 In finalizing the current regulations in
8 1991, the NRC noted that BEIR V had come out after the
9 proposed rule, and has substantially increased
10 radiation risks per unit dose. But NRC declined to
11 tighten the permissible exposures accordingly.

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

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

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

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

6 This is grossly non-protective.

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

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

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

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

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

1 abandoned?

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

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

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

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

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

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

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

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

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

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

18 DR. BAHADORI: Okay.

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

20 MR. RAUTZEN: Yep.

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

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

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1 dose values. Next slide, please.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 above an annual limit those exposures are prohibited.

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

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

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

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

25 They also recommend a process to define a

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

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

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

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

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

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

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

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

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

16 Other values that I used in this example,
17 we considered a hundred percent probability of
18 exposures. So, these exposures will occur to this
19 hypothetical modeled group as individuals, and to link
20 dose to risk, I used a value of .05 deaths per person
21 sievert, which is from the ETA Bluebook published in
22 2011. This is applicable to a general public
23 population, and a chronic low-level exposure. Next
24 slide.

25 So, because we have these two objectives

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

4 But for population sizes less than a
5 hundred thousand people, in this example the limit on
6 the average excess risk to the individual is what
7 determines the de minimis effective dose. And we
8 arrive at a number of .2 millisievert per year, or
9 20 millirem per year.

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

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

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

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

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

3 MR. GARMON: Thirty seconds.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 Our membership is vast and spans across
2 power reactors, advanced reactor developers, other
3 nuclear technology developers, suppliers, academic
4 institutions, etc. Next slide, please.

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

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

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

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

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

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

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

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

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

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

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1 consistency across the regulatory framework.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

25 These targeted changes include

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

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

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

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

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

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

1 understanding with the EPA that are related to this
2 topic.

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

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

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

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

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

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

1 greater flexibility in how radiation protection
2 programs are implemented.

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

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

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

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

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

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

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

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

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

25 MR. GARMON: Thank you, Mr. Smith.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 radiation through the 20th century.

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

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

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

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

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

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1 radiation protection guidelines.

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

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

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

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

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

25 The MPS is also notable for its

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

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

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

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

25 (Audio interference.)

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

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

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

10 DR. HIGLEY: Can you hear me now?

11 MR. GARMON: We can. Perfect.

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

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

25 This means we continually review and

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

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

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

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

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

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1 approach for radiation protection.

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

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

19 MR. GARMON: Thirty seconds, Doctor.

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

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

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

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

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

8 All right, Mr. Lewandowski.

9 (Simultaneous speaking.)

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

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

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

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1 Columbia.

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

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

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

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1 today. Next slide, please.

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

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

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

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

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

1 different.

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

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

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

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

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

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1 occupational and environmental levels. Next slide,
2 please.

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

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

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

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

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

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

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

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

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

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

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

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1 sources combined will be met.

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

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

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

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

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

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

1 in the United States.

2 The HPS position on harmonized regulations
3 is as follows.

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

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

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

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

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1 obtain stakeholder input.

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

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

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

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

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

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

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

1 opportunity to present The Case Against the LNT.

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

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

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

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

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

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

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1 incurred all at the same time.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

25 Do we assess the risk of drinking an

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

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

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

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

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

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

25 And if you look critically at the -- at

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

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

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

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

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

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

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

1 LNT.

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

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

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

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

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

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

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

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

7 So, these all come into play.

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

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

17 Next slide.

18 (Simultaneous speaking.)

19 DR. FELLMAN: What's that?

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

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

23 MR. GARMON: Thank you for your
24 presentation.

25 Dr. Brenner, are you ready to present?

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

2 MR. GARMON: I can hear you fine.

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

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

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

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

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

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

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

24 Next slide, please?

25 Okay, so, am I to argue that what really

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

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

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

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

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

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

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

25 Anyway, so, since these earlier analyses,

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1 I want to talk about two key developments.

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

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

15 I'll talk about both of these right now.

16 So, next slide, please?

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

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

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

1 individuals.

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

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

7 Next slide, please?

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

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

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

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

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

24 And again, with reliable, individualized
25 radiation dosimetry.

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

4 Next slide, please?

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

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

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

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

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

25 The traditional analysis methodologies

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

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

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

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

15 So, next slide, please?

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

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

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

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

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

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

11 And the next slide, please?

12 MR. GARMON: One minute, 45 seconds.

13 DR. BRENNER: Oh, goodness.

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

16 Next slide, please?

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

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

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

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1 So, next slide, please?

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

7 And the last slide, I think?

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

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

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

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

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

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

10 And now I'll stop --

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

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

16 DR. LYMAN: Yes, how do I sound?

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

19 DR. LYMAN: Thank you.

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

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

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

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

8 May I have the next slide, please?

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

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

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

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

25 And aside from Dr. Brenner's very

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

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

8 Next slide, please?

9 All right, I'm not going to read the NRC's
10 words back to you, but this just emphasizes that it
11 was a fairly strong statement that was made in the
12 2021 petition denial, both on the use of LNT and the
13 role of ALARA.

14 Next slide, please?

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

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

25 And so, I think it's misleading to say

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

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

9 Next slide, please?

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

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

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

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

25 For instance, they typically don't even --

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

4 Next slide, please?

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

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

16 Next slide, please?

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

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1 achievable.

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

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

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

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

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

20 Next slide, please?

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

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1 already well below this de minimis dose.

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

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

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

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

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

25 And again, we are concerned that any

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

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

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

17 Thank you.

18 MR. GARMON: Thirty seconds.

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

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

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

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

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

12 MR. GARMON: Thank you, Dr. Lyman.

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

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

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

19 The floor is yours, thank you.

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

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

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1 We were founded in 1958 and have over
2 10,000 medical physicists as members.

3 Next slide, please?

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

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

11 Next slide, please?

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

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

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

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

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1 scans, for example.

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

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

8 Next slide, please?

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

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

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

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

24 Next slide, please?

25 -- two lesions show up that were, in

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

3 Next slide, please?

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

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

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

17 Next slide, please?

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

22 Next slide, please?

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

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

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

6 Next slide, please?

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

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

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

20 Next slide, please?

21 The NRC occupational dose limits differ
22 from the ICRP recommendations.

23 Next slide, please?

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

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

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

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

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

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

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

21 Next slide, please?

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

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1 multiple times this afternoon.

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

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

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

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

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

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1 exposures with meaningful risk and reduces unnecessary
2 regulatory burden.

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

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

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

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

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

20 MR. GARMON: Thank you, Dr. McCollough.

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

23 DR. RICHARDSON: Hello, can you hear me?

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

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

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

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

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

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

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

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

25 I have served on several committees of the

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

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

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

12 Next slide, please?

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

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

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

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

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

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

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

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

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

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

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1 of radiation protection.

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

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

10 Next slide. One example of such
11 international collaboration is INWORKS. For the past
12 15 years, partners from the United States, France, and
13 the United Kingdom have participated in a
14 collaborative study called the International Nuclear
15 Workers Study, INWORKS, where data were obtained from
16 major French employers in the nuclear industry, from
17 the UK national registry for radiation workers, and
18 from the U.S. Department of Energy sites and
19 Portsmouth Naval Shipyard.

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

25 INWORKS encompasses 10.7 million person

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

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

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

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

17 And as was described correctly earlier,
18 the excess relative rate is expressed as a
19 proportionate increase in the rate over baseline per
20 unit dose.

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

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

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1 a simple summarization of the data.

2 The estimates of association remains
3 significant below a 100 milligray, and in fact, below
4 50 milligray. Note that, shown in the figure as well
5 as an estimate of a trend, is a summarization,
6 category specific estimates. Those are points with
7 whiskers that are offering a nonparametric
8 summarization of the data.

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

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

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

25 I should also note that in INWORKS,

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

19 That conclusion holds today with greater
20 reinforcement of epidemiological evidence.

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

24 MR. GARMON: -- seconds.

25 DR. RICHARDSON: -- of statistically

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

3 And to date, there's no reason to
4 conclude, as was noted by Sir Richard Doll more than
5 20 years ago that, as we continue to observe a linear
6 relationship with cancer at lower and lower dose
7 values, that a linear dose response would suddenly
8 dive to zero immediately below whatever level at the
9 time was the lowest level at which a statistically
10 significant excess is observed.

11 MR. GARMON: Thank you, Dr. Richardson.

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

14 MR. GARMON: Thank you.

15 Our last speaker is Mr. Crane.

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

18 MR. CRANE: We good?

19 MR. GARMON: Now we hear you.

20 MR. CRANE: Okay.

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

24 MR. CRANE: Thank you.

25 My name's Peter Crane. I want to thank

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 indefensible.

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

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

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

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

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

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

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

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

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

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

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

25 That eliminates the need for an NRC. You

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

4 MR. GARMON: Forty-five seconds.

5 MR. CRANE: Pardon me?

6 MR. GARMON: Forty-five seconds.

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

13 Thank you very much.

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

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

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

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1 agenda. Thank you.

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

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

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

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

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

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

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1 are representing an organization.

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

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

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

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

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

25 So, with that, we are going to take a

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

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

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

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

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

15 MR. MILLER: We can.

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

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

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

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

11 MR. GARMON: Our next commenter is Bart
12 Ziegler.

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

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

17 MR. ZIEGLER: Hello.

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

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

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

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

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

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

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

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1 AI to look at more research is essential.

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

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

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

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

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

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

19 MR. GARMON: Please proceed with your
20 comment.

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

25 I grew up in Southern California on the

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

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

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

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

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

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1 2024.

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

6 There is no scientific reason the NRC
7 should weaken its existing low dose radiation
8 standards and every reason to fortify them. The
9 health and safety of Americans depends on it.

10 Thank you. And that concludes my
11 comments.

12 MR. GARMON: Thank you, Julie. Calling in
13 our next commenter will be Matt Wait. Matt Wait, do
14 you want to -- Matt, are you able to hear me and
15 you're able to see the time?

16 MR. WAIT: I'm able to hear you see the
17 time.

18 MR. GARMON: Great. Then start with your
19 remarks when you are ready.

20 MR. WAIT: My name is Matt Wait. I am a
21 practicing diagnostic medical physicist for 10 years,
22 and I sit on the Government Regulatory Affairs
23 Committee of the American Association of Physics and
24 Medicine. But I speak for only myself here as you
25 will hear.

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1 I understand critiques of these concepts,
2 the effects of reconsidering LNT and ALARA extend well
3 beyond nuclear power and into medicine. NRC
4 regulations drive radiation use even beyond
5 radioactive materials as a primary regulator of
6 ionization more broadly with respect to occupational
7 radiation exposure.

8 To start with, I want to note that I think
9 this effort is fundamentally misguided. The throttle
10 to innovation in nuclear power is not LNT or ALARA
11 but difficulties securing locations for radioactive
12 waste and bureaucratic inefficiency.

13 This will not be fixed by modifying either
14 LNT or ALARA. Regardless of dosimeters or ALARA,
15 communities still need to buy into radioactive waste
16 storage. And the NRC needs to have efficient
17 processes for approving new plants.

18 In the field of medical physics, it has
19 long been understood that radiation poses both
20 stochastic and deterministic risks for patients, but
21 that they also provide great benefit. However, the
22 benefit can be provided while also minimizing risks.

23 This is one of the fundamental tasks of
24 the medical physicists and is core to the practice of
25 medicine, first do no harm. In particular, the sub-

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1 discipline of diagnostic medical physicists,
2 representing roughly 2,000 high skilled American
3 workers is concerned primarily with doses less than
4 100 millisieverts to individual patients. We are also
5 tasked with advising radiation protection of
6 diagnostic imaging staff.

7 First, regarding the science of the NRC
8 proposals, I disagree with the speakers asserting that
9 LNT does not take into effect repair of radiation
10 damage. I would also notice that medical imaging and
11 therapy utilized very high dose rates compared to
12 background.

13 There are studies on effects of radiation
14 on patients, longitudinal with risks to cancer. And
15 regarding a determinant dose limit, it has long been
16 understood in medicine that there is no limits to the
17 amount a patient may receive if the exam is
18 appropriate. However, I am concerned that the --

19 MR. GARMON: Mr. Wait, I'm sorry. I had
20 to cut you off. But please consider rejoining the
21 queue so we can listen to the rest of your comments.

22 The next commenter is Sally G.

23 MS. GELLERT: Yeah, hi, this is Sally
24 Gellert, co-host of Eco-Logic, which I note the irony
25 of this hearing today because this morning we had some

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1 folks on to discuss the two anniversaries today of the
2 Trinity test site in 1945 and the Church Rock Puerco
3 River dam break 34 years later in 1979.

4 Science shows that different people are in
5 fact affected differently. And, yes, cells may repair
6 but cumulative damage is still cumulative. And
7 background radiation has to be considered in any
8 standard.

9 I was appalled to hear how many Americans
10 will be diagnosed with cancer. And, you know, any
11 increase in radiation is going to increase that
12 number. And I want my government to protect my
13 health, not to say, well, you know, the licensees need
14 a little bit more, you know, ability to do things a
15 little bit cheaper or a little bit easier. No, sorry.
16 Safety first, always.

17 Women and children are affected way more
18 than the referenced men. I see Mary Olson here. You
19 know, she can tell you all about the effects of
20 radiation, how it's different based on gender and body
21 size and age.

22 You know, if we lower standards, how many
23 lives will be harmed with various diseases, be it
24 cardiovascular, thyroid, respiratory cancer?

25 As low as reasonably achievable. The word

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1 reasonably is in there. So let's stick to it and keep
2 our standards high. End of statement. Thank you.

3 MR. GARMON: Thank you, Sally. Our next
4 commenter is Robert Gould. Robert, we are going to
5 enable your mic. You can speak whenever you can
6 unmute yourself.

7 DR. GOULD: Can you hear me now?

8 MR. GARMON: Yes, we can hear you. Can
9 you see the screen and the time?

10 DR. GOULD: Yes, I can. Thank you. I am
11 Dr. Robert Gould, a retired Kaiser pathologist and now
12 a professor at the UCSF School of Medicine.

13 I am speaking today as president of San
14 Francisco Bay Physicians for Social Responsibility,
15 representing hundreds of health professionals who,
16 guided by the expertise of medicine and public health,
17 from a public policy to protect human health.

18 As such, we strongly oppose the NRC's
19 reconsideration of its use of the linear now threshold
20 model and keep radiation exposures as low as is
21 reasonably achievable.

22 Risk assessment for all environmental
23 carcinogens is predicated on the scientific
24 understanding that there is no safe level of exposure
25 below which there is no harm.

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1 NRC's proposal would exclude ionizing
2 radiation from this fundamental, scientific tenet
3 supported by virtually all international scientific
4 institutions.

5 NRC's decision would produce orders of
6 magnitude, more cancers among workers and community
7 members. The NRC's reconsideration would further
8 upend two fundamental principles underlying radiation
9 protection. The needs justify why exposure should be
10 permitted and keeping doses as low as possible.

11 There is no justification for increasing
12 population exposure to ionizing radiation to
13 facilitate uptake of nuclear power, which is a false
14 solution to our climate crisis. It's long-lived toxic
15 waste stream alone should disqualify it as an energy
16 source.

17 It is not cost effective and is
18 demonstrably linked to the dangerous proliferation of
19 new weapons. Keeping exposures as low as possible is
20 essential to accounting for the increased
21 vulnerability of pregnant women and children.

22 In addition to ionizing radiation, people
23 are simultaneous exposed to a multitude of toxic
24 chemicals, many of which also contribute to cancer.
25 And we need to consider additional pathways of cancer-

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1 causing exposure, including background radiation and
2 medical diagnostics.

3 We urge the NRC to not abrogate the
4 responsibility to protect people and the environment
5 by further diminishing already inadequate radiation
6 protection standards and set these standards.

7 MR. GARMON: Thank you, Robert Gould. We
8 had to cut you off. Your time expired. Please
9 consider joining the queue again.

10 The next speaker is Mary Olson. Mary, we
11 have enabled your mic, and you can unmute yourself
12 when you are ready. We will do a sound check with you
13 before you start.

14 Mary, are you able to unmute yourself?

15 MS. OLSON: I am now. It might people to
16 know it's up above, not down below.

17 MR. GARMON: So I'm going to make it
18 really fine. Can you see the screen and the time.

19 MS. OLSON: Thank you. I'm ready.

20 MR. GARMON: Okay. You can start when you
21 are ready.

22 MS. OLSON: My name is Mary Olson. I am
23 the founder of Generational Radiation Impact Project.
24 You can find us at radiationproject.org.

25 Dan Hirsch is right. NRC needs to tighten

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1 its standards, not reduce them. I am going to
2 specifically address the below regulatory concern
3 and/or de minimis concept. No one wants nuclear waste
4 in their stainless steel water bottle or their baby's
5 crib or their -- you know, any personal use object.
6 And yet that is what deregulation on a threshold basis
7 would allow.

8 NRC itself published a risk assessment of
9 100 millirems per year for 70 years. And it was
10 published in 1990. And it showed 3.5 fatal cancers,
11 not cancer incidents, fatal cancers per 1,000 people
12 exposed to 100 millirems a year for 70 years. That's
13 1 in 286. I never met a suit or a tie or anyone who
14 would defend 1 in 286 as an acceptable risk level for
15 the public. And guess what? That is not the public.
16 They are all reference men, every single last one of
17 them.

18 I really appreciate speakers for noting
19 that the outcome of radiation exposure does depend on
20 both the age and biological sex and many other
21 factors. We don't yet understand it all. But if we
22 are going to protect not just some idea of
23 conservativeness but rather our species ability to
24 continue through time as a life cycle, I suggest we
25 retire reference man. We thank him for his service.

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1 We give him a gold watch, and you figure out -- I'll
2 help -- how to have a reference girl. Because, you
3 know, that is where the highest damage occurs in the
4 lifespan study data upon which the public health
5 standards have been based.

6 Thank you for this opportunity to speak.
7 I think you guys are sadly Humpty Dumpty, and I am
8 looking forward to the scrambled eggs.

9 MR. GARMON: Thank you for your statement,
10 Mary. Our next speaker will be Thomas Webler.
11 Thomas, we are going to enable your mic. And if you
12 could unmute yourself and do a sound check, then you
13 can start with your comment. Thomas Webler, you
14 should be able to unmute yourself.

15 Okay. We'll go on to Haakon Williams.
16 And we will leave Thomas Webler up. Maybe for the
17 next comment, we can go back to Thomas.

18 Is James Welsh first?

19 DR. WELSH: I am here if you are ready.
20 Can anybody hear me?

21 MR. GARMON: Yes.

22 DR. WELSH: Should I proceed?

23 MR. GARMON: Are you able to see the time?

24 DR. WELSH: I am, yes. James Welsh, Dr.
25 James Welsh. I am a past member of the ACMUI Advisory

1 Committee on Medical Uses of Isotopes in the past and
2 a medical advisor on radiation oncology for the NRC.

3 Presently, I am with the Department of
4 Veterans Affairs, but I am speaking today as a private
5 citizen and on behalf of the American College of
6 Radiation Oncology.

7 When I was on the ACMUI, I started to grow
8 skeptical of the LNT, in part because of discussions
9 about NRR possibly coming under the purview of the NRC
10 along with some fruitful conductive discussions with
11 Mr. Peter Crane, who we had heard from earlier today.

12 Thanks to those discussions, I did some
13 homework, and I had come to the conclusion that
14 radiation is not nearly as carcinogenic as I was
15 taught initially for a variety of reasons I won't go
16 into today.

17 But among those reasons, high natural
18 background regions do not have people with higher
19 rates of cancer or shorter life spans. And in some
20 cases, their doses are in excess of 10 rem, which
21 according to one of the presentations we heard today
22 means 80 percent of the population should have cancer.
23 And that is not what I have seen.

24 But most importantly, I have not seen the
25 increased rate of secondary cancers among my patients

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1 after the last 30 years. If we did, we all would have
2 retired decades ago.

3 These doses are on the order of 5 million
4 millirem and 25,000 millirem to the regions. The
5 excessive concerns and exaggerated fears of radiation
6 therapy impede the ideal use of nuclear medicine and
7 radiotherapy. And this is especially important given
8 the use of radiation therapy for benign diseases like
9 osteoarthritis now.

10 So I will stop my presentation at this
11 point and thank you for the chance.

12 MR. GARMON: Thank you, James Walsh for
13 your comment. Our next comments is Haakon Williams.

14 MR. WILLIAMS: Hi, can you hear me?

15 MR. GARMON: I can hear you. Can you see
16 the time.

17 MR. WILLIAMS: Yes, I can.

18 MR. GARMON: Okay. The floor is yours.

19 MR. WILLIAMS: All right. Thank you for
20 the opportunity to speak today. It is not really
21 clear to me why Mr. Welsh was moved up in the queue
22 from number 6. The audience, I think, is just left to
23 conclude that NRC is trying to highlight critics of
24 linear no-threshold even when they are not next in the
25 queue. So that was pretty strange.

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1 I am here today because the NRC is being
2 asked, again, to consider linear no-threshold. Let's
3 be clear. This proposal is not grounded in new
4 science. NRC already reviewed this exact question and
5 reaffirmed LNT as recently as 2021.

6 Since then the science has only grown
7 stronger. More precise studies continue to confirm
8 what LNT has long asserted. That there is no safe
9 threshold for radiation exposure and that risk
10 increases linear lead with dose even at the lowest
11 levels.

12 Leading scientific bodies from the
13 National Academy, the ECA, the United Nations and even
14 this very agency have all repeatedly upheld LNT as the
15 most accurate and protected model we have.

16 Why revisit it now? Well, let's say the
17 quiet part out loud. This isn't about science. It is
18 about politics. The Trump Executive Order pushing
19 this review is a gift to industry. If adopted, it
20 would allow far more radioactive contamination to be
21 left behind at full leaded sites, potentially raising
22 allowable exposure by hundreds or even a thousand
23 times.

24 This would not sicken communities, it
25 would shield the industry from responsibility and

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1 liability, all while cloaking the move in misleading
2 language without safety.

3 Radiation is already permitted at higher
4 risk levels than many other pollutants. Gutting the
5 LNT model would push those risks even higher. Let's
6 not pretend this is in the public interest. This is
7 about profits over people.

8 I urge the NRC to remain independent,
9 grounded in science and protective of public health.
10 Reject a politically motivated attack on the LNT model
11 and by your own prior conclusion.

12 And I would just like to say, as someone
13 who hopes to become a father soon, future generations
14 are looking at you, NRC. Thank you for your time.

15 MR. GARMON: Thank you, Haakon Williams.
16 Our next commenter is Hayden Galvan. We are enabling
17 your mic. You can unmute yourself. Hayden?

18 MS. GALVAN: Hello.

19 MR. GARMON: Hello, Hayden, can you hear
20 us okay?

21 MS. GALVAN: Yes, I can.

22 MR. GARMON: I can hear you fine. And you
23 can see the time. The floor is yours.

24 MS. GALVAN: All right. So today, I am
25 just representing myself. And as a young adult who

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1 will observe and experience the consequences of this
2 Executive Order for years to come, not only in my
3 professional career, but in my personal life, I am
4 gravely concerned about the potential stripping of
5 radiation protection standards.

6 The Executive Order will allow permissible
7 exposures to be at least 100 times higher than the
8 current permissible level, a reality that I fear since
9 it will cause cancer rates in other radiation
10 illnesses to dramatically rise.

11 I cannot support an order that will allow
12 an elevated amount of radiation to be exposed to my
13 community and society as a whole. Not only will those
14 employed in nuclear fields be placed at great risk,
15 but also our family, friends and selves.

16 If this is what it takes to boost nuclear
17 energy production, then the production of nuclear
18 energy is not worth the risk of people in our
19 community developing horrific illnesses as a result of
20 radiation exposure.

21 The weakening of radiation standards is an
22 unsafe decision and will negatively affect everyone.
23 NRC, please do not follow the directive of the
24 Executive Order. If you revisit your radiation
25 standards, it should be in the direction of tightening

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1 those standards to reflect the updated science that
2 has come out in the decades since you last updated
3 your radiation standards. Thank you.

4 MR. GARMON: Thank you for your comment,
5 Hayden. Our next commenter is Dave Collins. Your mic
6 has been enabled. Can you unmute yourself, Dave
7 Collins?

8 DR. COLLINS: Unmuted now. Can you hear
9 me? Can you hear me now?

10 MR. GARMON: We can hear you fine, Dave.
11 Can you see the time?

12 DR. COLLINS: Yes, I can.

13 MR. GARMON: Okay. The floor is yours.

14 DR. COLLINS: Okay. I am Dr. Dave
15 Collins. I am a principal environmental engineer with
16 50 years' experience managing and addressing complex
17 engineering problems and advising governments on
18 practical government policy that should result.

19 This discussion today has focused on
20 radiation and ALARA, largely in isolation to the many
21 other matters that are critical to a balanced
22 discussion of nuclear technologies.

23 To progress this discussion, we must
24 broaden the scope to include other questions. In
25 particular, what are the alternatives and how do the

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1 costs and benefits of those alternatives compare to
2 nuclear technologies?

3 As one example, I will focus on the
4 impacts on environmental and livelihood issues
5 associated with the present government in Australia
6 and also past governments in the United States with
7 relation to climate change.

8 These governments have regarded climate
9 change as an existential crisis, which it may well be.
10 However, they then go on to justify overriding
11 established property rights to put in, for instance,
12 transmission lines and large wind funds. And they
13 also override environmental approvals processes when
14 it comes to the deployment of wind, solar on these
15 same transmission lines.

16 In Australia, for instance, in the State
17 of Queensland, many tens of remnant habitats have been
18 destroyed. These are remnant habitats for koala. And
19 surprisingly, koala is a protected species here in
20 Australia and now in Queensland.

21 And as a consequence, you know, we have
22 lost those habitats because of, as I say, the many of
23 tens of wind farms that have been installed. And
24 there has not been the consideration. There is no
25 environmental follow-up. There is no monitoring

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1 processes. There is no public approval processes of
2 any consequence. And it is leading to decided
3 negative benefits.

4 And in conclusion, given the proven
5 benefits of nuclear energy to reduce greenhouse gas
6 emissions and avoid the existential crisis.

7 MR. GARMON: Okay. Mr. Collins, please
8 consider rejoining our queue. Our next commenter is
9 Bernd Lorenz. We are going to -- I think we have
10 already enabled your mic. Can you unmute yourself and
11 do a sound check with me?

12 DR. LORENZ: Very much. I am Dr. Lorenz
13 from the German-Swiss Society of Radiation Protection.
14 And it was very interesting to see that there have
15 been today also some proposals for a cut-off.

16 The aforementioned study several years
17 ago, and he proposed the same thing to have a cutoff
18 optimization of one millisievert per year for workers
19 and 0.1 for members of the public as a boundary for
20 optimization saying that you are below this one
21 millisievert, you are optimized.

22 The notice and practice that the ALARA
23 principle has low in its words and low means the best
24 radiation protection is when you have lowest dose and
25 the best ever is no dose. This you can counter --

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1 this is, of course, not justified.

2 And I am pleased to see that there are
3 some proposals also in the same area to have a cut-off
4 for optimization, not a cut-off for radiation
5 protection at all not to do so many things unjustified
6 in the low dose region. Thank you.

7 MR. GARMON: Thank you, Dr. Lorenz. Our
8 next commenter in the queue is Mary Beth Brangan.
9 We've enabled your mic if you could do a sound check
10 when you get a chance, Mary Beth.

11 It looks like you have muted yourself,
12 Mary Beth. Can you start speaking so we can hear your
13 voice? Unfortunately, we can't hear you, Mary Beth.

14 On to Patrick Mulligan and then we'll go
15 next to Mary Beth. We will give her another chance.

16 Patrick Mulligan, can you enable your mic
17 or can you unmute?

18 MR. MULLIGAN: I'm good. Can you hear me?

19 MR. GARMON: We can hear you fine. Can
20 you see the screen?

21 MR. MULLIGAN: Yes, I can. Thank you.

22 MR. GARMON: The floor is yours.

23 MR. MULLIGAN: Good afternoon. I am
24 Patrick Mulligan. I am chair of the Conference of
25 Radiation Control Program Directors. CRCPD

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1 collectively represents one of your largest
2 stakeholders, the State Radiation Control Programs,
3 which are responsible for overseeing radiation
4 protection across the country.

5 We recognize and support developing the
6 nation's use of nuclear power. Still, we can't lose
7 sight of the state's responsibility to regulate and
8 ensure the safe use of the wide variety of radiation
9 sources that touch the lives of Americans every day.

10 On behalf of the CRCPD board of directors,
11 I would like to share five key areas we believe should
12 be the focus of any decisions the NRC makes as they
13 move forward in this process.

14 One, harmonization of radiation dose
15 limits across all agencies and stakeholders. Now is
16 the opportunity for the U.S. to adopt a national
17 consensus standard.

18 Two, maintain current dose limits while
19 enhancing practicality. We recognize that industry
20 needs may not align with medical best practices, and
21 we suggest considering the development of a separate
22 threshold for radiation and medicine and industry.

23 Three, establish a de minimis threshold
24 for regulation. The majority of professionals in the
25 radiation protection community agree that there is a

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1 specific dose from all sources where health impacts
2 begin. We suggest reaching consensus on that specific
3 dose to establish a de minimis threshold.

4 Four, use scientific updates to keep
5 regulations current and appropriate. You must use
6 current and use scientific studies without losing
7 sight of the lessons learned from past experience.

8 Five, ensuring independent regulatory
9 authority. We need to maintain a level of commitment
10 and accountability for radiation protection by having
11 an independent regulatory authority.

12 CRCPD looks forward to partnering with NRC
13 to ensure any changes considering developing guides
14 and regulations meet the radiation safety and
15 protection needs of the entire nation.

16 Thank you. End of comments.

17 MR. GARMON: Thank you for those comments,
18 Patrick. We will go back to try Mary Beth one more
19 time. If you could enable Mary Beth's microphone.

20 Mary Beth, your microphone has been
21 enabled, and it looks like you are unmuted. Can you
22 do a sound check with us?

23 Okay. We still can't hear you in the
24 room, Mary Beth. This is the second time we have
25 tried to reach out to you. So we are going to go

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1 ahead and lower your hand and ask you to resolve your
2 technical difficulties and rejoin the queue. We are
3 sorry about that.

4 Our next commenter is Ken Chaplin. And
5 your mic has been enabled. You can unmute yourself
6 and do a sound check with me. Ken Chaplin? We still
7 can't hear you, Ken.

8 Okay. Let's move to -- let's leave Ken's
9 hand up. We'll come back at Nick Karnia. Nick, we
10 are going to enable your mic. Nick Karnia, your mic
11 has been enabled.

12 MR. KARNIA: Can you hear me, sir?

13 MR. GARMON: We can hear you just fine.
14 Can you see the timer?

15 MR. KARNIA: Yes.

16 MR. GARMON: Okay. The floor is yours.

17 MR. KARNIA: Good afternoon, everyone. My
18 name is Nick Karnia, and I am a reporter with the
19 Howard Center for Investigative Journalism at Arizona
20 State University.

21 I recognize that this is a public comment
22 period, but I would be incredibly grateful if any
23 members of the NRC staff could answer just one
24 question for me.

25 I know that several presenters today

1 highlighted peer reviewed evidence supporting
2 continued use of the LNT model and ALARA, and some of
3 the presenters challenged it.

4 Will the NRC include a public summary or
5 formal staff analysis of the scientific evidence
6 presented at this meeting before moving forward with
7 any proposed changes?

8 MR. GARMON: The NRC staff will review all
9 public input. And when we make recommendations to our
10 Commission, we will ensure that they are well founded
11 and supported.

12 We expect that there will be other
13 opportunities for public engagement once we make those
14 recommendations to our commission.

15 MR. KARNIA: Okay. Thank you.

16 MR. GARMON: Does that conclude your
17 remarks?

18 MR. KARNIA: Yes, sir.

19 MR. GARMON: Thank you, Nick. Okay. We
20 are going to go back to Ken Chaplin to enable Ken's
21 mic and see if he can unmute himself and speak.

22 Ken, your mic is enabled. Are you able to
23 unmute yourself? Okay. It appears not. But we will
24 move on to Theodora Tsongas. We will enable your mic
25 and do a mic check with you. And I just want to

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1 inform the commenters that we are about halfway
2 through our public comment period.

3 The staff will also appreciate written
4 comments if you do not have the opportunity to make a
5 verbal comment today.

6 Theodora, it looks like you have unmuted
7 yourself.

8 DR. TSONGAS: Good afternoon. I am Dr.
9 Theodora Tsongas. I am an environmental health scientist
10 with a career in public health.

11 In the short time I have here, I want to
12 urge the NRC in considering its radiation protection
13 framework to continue to use the linear no-threshold
14 model and do everything it can to keep radiation
15 exposures as low as possible because of the growing
16 evidence that risks are high for cancers of many
17 systems at very low doses.

18 That new evidence indicates that
19 cardiovascular disease risk are significantly
20 increased with radiation exposures through occupation
21 and diagnostic procedures and especially evidence that
22 risks of adverse effects of exposure to radiation are
23 increased in the embryo in utero in newborns and
24 infants. The younger, the greater the health risks.
25 And in females, the health risks are greater than in

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1 males.

2 Early exposures can result in adverse
3 health impacts throughout the life of the individual
4 and with the potential for intergenerational effects.

5 As evidence accumulates of adverse effects
6 at lower doses in different biological systems and in
7 different segments of the population, determinant
8 radiation dose limits would be quickly out of date and
9 costly to society as well as unprotective of health.

10 On the basis of the evidence, it is
11 absolutely unthinkable to increase the risks to the
12 working and general population by increasing allowable
13 exposures. The precautionary principle tells us that
14 prevention is the least possible direction to take to
15 prevent unforeseen adverse consequences.

16 Please keep the linear no-threshold model
17 as the standard for protection, especially as we are
18 finding adverse health impacts at lower and lower
19 levels of exposure.

20 Thank you for your time and consideration.

21 MR. GARMON: Thank you for your remark,
22 Theodora.

23 Our next commenter is Regna Merritt. We
24 have enabled your microphone, Regna. Can you unmute
25 yourself? Regna Merritt, we have enabled your

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1 microphone.

2 Can you unmute yourself and start your
3 remarks? It appears not.

4 We will try Julie Korenstein. Ms.
5 Korenstein is next in the queue. We have unmuted your
6 mic, Julie.

7 MS. KORENSTEIN: Yeah, can you hear me
8 okay?

9 MR. GARMON: Julie, we can hear you
10 perfectly. Can you see the time?

11 MS. KORENSTEIN: Yeah, go ahead -- I'll go
12 ahead. Thank you. I am Julie Korenstein. I live in
13 the San Fernando Valley, very close to the Santa
14 Susana Field Lab. I will begin now.

15 Lowering nuclear radiation standards, how
16 will this affect the cleanup of the Santa Susana Field
17 Lab? In July of 1959, there was a partial meltdown of
18 an experimental nuclear reactor in the Simi Valley.
19 A third of the fuel elements experienced melting,
20 resulting in the release of radiation directly into
21 the environment, into Simi Valley and the San Fernando
22 Valley. We were all affected.

23 No one knew about this disaster for over
24 20 years after the meltdowns. So 65 years later, we
25 are still being affected by deadly chemicals and

1 radionuclear effects on our bodies.

2 Not only was this an area used for a
3 nuclear reactor, it was also used for rocket testing
4 and processing of spent plutonium rods. The clean-up
5 was supposed to have been completed in 2017, but the
6 agencies involved as well as Boeing have dragged their
7 feet while children are dying.

8 My greatest concern right now is that my
9 granddaughter and her husband and my great grandson
10 have moved into Simi Valley now. And I am
11 continuously worried about any radiation and/or
12 contamination of water.

13 What type of guarantees can you give me
14 that their health will not be affected by your
15 lowering the standards for the clean-up? It is your
16 responsibility to protect them as well as other
17 community members.

18 Please do not change and dilute the
19 comprehensive clean-up of the Santa Susana Field Lab.
20 We depend on your for guaranteeing the health and the
21 safety of our communities. I am continually worried
22 because I think that the decision to reduce the
23 nuclear radiation is --

24 MR. GARMON: Sorry. We had to cut you
25 off, Julie. Please consider rejoining the queue.

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1 Our next commenter is Michel Lee. We have
2 enabled your mic. Can you unmute yourself? It looks
3 like you have unmuted yourself. Michel Lee or Michel
4 Lee? We cannot hear you.

5 We will leave Michel Lee at the top, and
6 we will go on Sarah Abramson. Sarah, your mic has
7 been enabled. Can you unmute yourself?

8 MS. ABRAMSON: Yes, can you hear me?

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

11 MS. ABRAMSON: I can.

12 MR. GARMON: Yeah, great. Start when you
13 are ready.

14 MS. ABRAMSON: My name is Sarah Abramson.
15 I am the executive director of the C-10 Research and
16 Education Foundation. We are a public advocacy group
17 serving the nearly 180,000 people living within the 10
18 mile evacuation emergency planning zone of the
19 Seabrook Station Nuclear Reactor in New Hampshire.

20 Dr. Lyman from the Union of Concerned
21 Scientists summarized well on another commenter that
22 this topic was just adjudicated and denied in 2021.
23 So I will simply reinforce that Chairman Wright did
24 publish his support of that petition's denial in 2021.
25 And thus the NRC arriving at any different conclusion

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1 can only be interpreted by me and likely many others
2 as being driven by industry and political will not
3 gold standard science.

4 We cannot with a straight face support
5 that all the presentations and viewpoints today are
6 created equal on a scale of credibility. And I urge
7 the NRC to do what you did well four years ago and
8 that is to make public safety focused decisions based
9 only on credible evidence.

10 If regulatory changes result in
11 occupational doses not being measured and recorded in
12 certain settings or if there is a lessening of
13 environmental radiological monitoring efforts, as was
14 suggested as reasonable by a couple of today's
15 presenters, how can the NRC possibly continue to have
16 effective analysis of the harm caused by these
17 changes.

18 I compare it to the probabilistic risk
19 assessment that I optimistically assume you are going
20 to be doing prior to any changes.

21 Increased rates in cancers will be written
22 off as stochastic, random, bad luck. And do not
23 forget that in 2015, the NRC cancelled a planned
24 National Academies of Science study on cancer
25 incidents in populations residing near nuclear

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1 reactors. And the NAS estimated that would take three
2 years and \$8 million. And it was cancelled because it
3 would be too long and too expensive.

4 If that had been done, we might not find
5 ourselves here today because the NRC would have this
6 NRC funded unbiased data to refer to. And so for
7 those who care about waste, fraud and abuse, take
8 note. That investment could have perhaps avoided this
9 frivolous review.

10 And we are not properly exploring cancer
11 rates for nuclear host communities, especially in
12 children.

13 I live in Seacoast, New Hampshire. There
14 is a pediatric cancer cluster here that was studied in
15 2017 and --

16 MR. GARMON: I'm sorry, Sarah. We had to
17 cut you off. Your time expired. We will try one more
18 time with Michel Lee or Michelle Lee? We have enabled
19 your mic. Can you speak? Unfortunately, we can't
20 hear you.

21 We will go on to Leona Morgan. Leona, we
22 have enabled your mic.

23 MS. MORGAN: Okay.

24 MR. GARMON: I can hear you fine. Start
25 when you are ready.

1 MS. MORGAN: (Native language spoken.)
2 Leona Morgan, (Native language spoken). I am Dine and
3 indigenous to this so-called United States.

4 My people have been living within the Four
5 Secret Mountains since time immemorial. There is
6 uranium beneath us yet we have never experienced the
7 health issues that my people are experiencing now from
8 uranium mining of the Manhattan Project and the Cold
9 War.

10 There is no such thing as peaceful or
11 peacetime use of nuclear. All nuclear developments
12 cause harm to our communities. I agree with changing
13 the current regulations. However, not to weaken
14 protections but to increase the protections and
15 strengthen for all life our indigenous peoples.

16 We still have subsistence living. We
17 still hunt and grow our own foods. We must protect
18 our human family but also our plant and animal
19 relatives as well as secret places.

20 We do not consider our cultures as
21 religion, but the federal government that is the only
22 way to explain that indigenous people have an
23 inalienable right to practice our traditional
24 lifeways. And we must be allowed to do this safely.

25 Our people are dealing with results in

1 cancers, autoimmune disease, reproductive health
2 problems and more without proper medical facilities on
3 a reservation.

4 We are also dealing with the cumulative
5 impacts of uranium mining and being downwind of the
6 Nevada tests.

7 If we protect more people, this should
8 also lower the cost of the Radiation Exposure
9 Compensation Act for folks who are hurt by such
10 exposures.

11 Some recommendations for better
12 protections include lowering the allowable limit for
13 water from 30 parts per billion to 20 parts per
14 billion. We need to lower all allowable levels across
15 the board to protect our food and water resources and
16 the air we breathe for our communities, but more
17 importantly for our future generations.

18 Again, today is July 16, the anniversary
19 of the Trinity tests and the Church Rock spill.
20 Please remember that. Thank you. (Native language
21 spoken.)

22 MR. GARMON: Thank you for your comment,
23 Leona. As a reminder, we have about 15 minutes of
24 public comment time remaining. Our next commenter is
25 Linda Richards. Your mic has been enabled. You can

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1 unmute yourself. Do a sound check with me. Linda
2 Richards?

3 Okay. We'll try Roger Johnson and give
4 Linda Richards a second try after Roger. Roger, it
5 looks like your mic has been enabled.

6 Roger Johnson, are you able to unmute
7 yourself?

8 Okay. We'll try Madison Schroder.
9 Madison Schroder, are you able to unmute yourself?

10 MS. SCHRODER: I am, and I can see the
11 timer.

12 MR. GARMON: Great.

13 MS. SCHRODER: Okay. Good afternoon. My
14 name is Madison Schroder speaking for Generation
15 Atomic, one of the largest nonprofit organizations
16 advocating for nuclear energy.

17 We are very grateful for this opportunity
18 to provide public comments today. We will submit
19 detailed written comments following this hearing to
20 include a more in-depth discussion of our full
21 position on the Executive Order.

22 Today, I will briefly highlight our key
23 perspective based on our expertise in public
24 communication and engagement.

25 Through our grassroots work, we frequently

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1 encounter widespread public confusion about radiation
2 risks. The current radiation protection framework may
3 undermine the NRC statutory mission to provide
4 reasonable assurance of adequate protection by failing
5 to establish clear, science-based thresholds that the
6 public can understand and trust.

7 Without meaning thresholds, the NRC cannot
8 demonstrate it has fulfilled its mission of providing
9 adequate protection because there are not defined
10 criteria for what constitutes success in protecting
11 public health.

12 We strongly support reconsidering the LNT
13 and ALARA frameworks and establishing evidence-based
14 thresholds, below which regulatory action would not be
15 required, such as those proposed by the Breakthrough
16 Institute in the earlier presentation.

17 This reform would provide regulatory
18 clarity, focused resources where oversight provides
19 genuine safety benefits, and enable the NRC to
20 demonstrate measurable success in protecting public
21 health while building public confidence in nuclear
22 safety.

23 Such thresholds would also align nuclear
24 regulation with how other federal agencies treat
25 comparable risks.

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1 The nuclear industry has achieved
2 exceptional safety performance that continues
3 operating under regulatory assumptions that don't
4 reflect current scientific understanding.

5 Establishing rational, science-based
6 thresholds would help the NRC fulfill its mission more
7 effectively while maintaining its rigorous safety
8 standards.

9 Thank you for your time in considering our
10 perspective.

11 MR. GARMON: Thank you for your comment,
12 Madison. We will try Linda Richards one more time.
13 Linda, your mic has been enabled. Are you able to
14 unmute yourself and speak?

15 Unfortunately, we can't hear you, Linda.
16 We'll move on to Roger Johnson. Roger, your mic has
17 been enabled. Are you able to unmute yourself and
18 speak? Roger Johnson? We can't hear you Roger.

19 Our next commenter is Ace Hoffman. Ace
20 Hoffman, your mic has been enabled. Ace Hoffman. We
21 will go on to Matt Wait.

22 MR. WAIT: Hi, can you hear me?

23 MR. GARMON: You're fine.

24 MR. WAIT: Okay. I will do my best to
25 finish my comments.

1 Regarding a determinate dose limit has
2 long been understood in medicine that there is no
3 limit to the amount of radiation a patient may receive
4 if the exam is providing a benefit.

5 However, my concern is that the
6 establishment of such an arbitrary limit by the NRC
7 would add confusion to the appropriateness of an
8 imaging exam.

9 For example, a 10 millisievert chest X-ray
10 may be considered to be acceptable if it was within
11 the NRC's limit even though a dose of 1/100th of that
12 will create a sort of high quality image.

13 Such a dose limit and removal of ALARA
14 could unintentionally upend entire careers and
15 livelihoods. Additionally, there is no international
16 recognized scientific consensus for establishing a
17 determinate dose limit let alone what a number like
18 that should be.

19 In particular, I strongly disagree with
20 the nuclear power industry's request to "delete" 20.30
21 -- 20.130.01(e) regarding public dose limits. The
22 public dose limit is used to determine everything from
23 the appropriate release of the radioactive patient
24 following a nuclear medicine therapy to the amount of
25 lead in the walls for a linear accelerator CT scanner.

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1 Public health is as legitimate of a consideration as
2 costs and benefits to individual stakeholders and
3 industries. Imagine the response to the patient's
4 family member in the future when they ask why there is
5 no more lead shielding of X-ray rooms if they are told
6 that is because the administration wanted to unleash
7 America's nuclear power.

8 In conclusion, my request to the NRC is
9 that regulations that are intended to apply to nuclear
10 power should be limited to such without creating
11 unintended consequences for other industries.

12 And I will use the remainder of my time to
13 just say that I agree with the first presenter that
14 LNT is the most viable model for use, but certainly
15 more can be done to educate the public.

16 If we overturn international scientific
17 consensus, we risk creating more radiophobic people
18 and creates distrust in our entities and our
19 government and reduce safety.

20 Thank you.

21 MR. GARMON: Thank you for your comment,
22 Matt Wait. Our next commenter is Cindy Maughan.

23 MS. MAUGHAN: Maughan.

24 MR. GARMON: Maughan. Sorry, Cindy. It
25 sounds like your audio is working fine.

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1 MS. MAUGHAN: Yup.

2 MR. GARMON: The floor is yours.

3 MS. MAUGHAN: Thank you. So 80 years ago
4 today, my mother was four years old as she slept right
5 outside Alamogordo, New Mexico. After the blast, my
6 grandmother got cancer as well as my mother had passed
7 those mutations onto myself and my children. And as
8 I sit here and talk to you, I am sitting in a cancer
9 hospital parking structure so that I could participate
10 today.

11 This has caused intergenerational
12 mutations and problems for me and my family. It
13 denies us generational wealth because we spend all of
14 our money on health. Finally, we will get RECA. But
15 it still has to be approved.

16 I don't think the NRC should reduce
17 standards at all. All nuclear, whether we are talking
18 about medical, whether we are talking about AI, energy
19 production, any of these different things all have
20 competing interests, but public safety should be
21 number one. There is no safe level.

22 I strongly oppose lowering any of the
23 standards. We need to really look at the supply chain
24 because what we are doing currently is not safe for
25 any of the communities that these things go through.

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1 I have been monitoring the EPA going
2 through rural counties trying to get interim storage
3 facilities for spent nuclear fuel. There is just so
4 much that goes into these things. And I appreciate
5 what you are doing, but I don't think that we should
6 cave to this Executive Order in any way, shape or
7 form.

8 I think we should strengthen all
9 protections and public safety measures. And we should
10 make sure public health is imminent and the first and
11 foremost thing and not politics in anybody's mind as
12 we move forward to make these decisions for myself and
13 my community. So I appreciate the ability to speak
14 with you today.

15 MR. GARMON: Thank you for your comments,
16 Ms. Maughan.

17 MS. MAUGHAN: You're welcome.

18 MR. GARMON: The next commenter is Diane
19 D'Arrigo.

20 MS. D'ARRIGO: This is Diane D'Arrigo. I
21 am with the Nuclear Information and Resource Service.
22 I have been tracking the Nuclear Regulatory
23 Commission, and its 10 CFR 20 standards since the late
24 70s and fought the changes that took place in 1992,
25 which actually increased allowable radioactivity in

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1 air and water.

2 I oppose, our organization opposes, and we
3 work with groups around the country and actually
4 around the world. We oppose the end -- the proposal
5 to stop using the LNT model unless you are going to
6 include super linearity at low doses.

7 There is no safe threshold. This has been
8 scientific consensus. The below regulatory concern
9 policy, which would have set a level below which you
10 don't have to regulate, was overturned by Congress in
11 1992. That was after 14 states passed laws requiring
12 continued regulatory control over nuclear materials in
13 their states, even if the feds deregulated.

14 By allowing a clearance or a threshold
15 level, you are writing a blank check to allow
16 unlimited amounts of radioactivity. There is no way
17 to verify or enforce millirems of microsieverts or
18 whatever amounts of dose you are proposing to declare
19 a threshold. So we oppose having such a level.

20 All manmade radioactivity needs to be
21 regulated.

22 So back in '92, in '86 and '90, the NRC
23 BRC policies, which were overturned, would have
24 allowed a third to a quarter of the low level
25 radioactive waste from nuclear power to be allowed

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1 into regular commerce and recycling.

2 If you are going to reassess standards,
3 look at things in addition to cancer, look at all of
4 the health effects.

5 Thank you.

6 MR. GARMON: Thank you, Diane D'Arrigo.
7 Our next commenter is Nancy Vann. We are approaching
8 our adjournment of this meeting. We have time for
9 three more comments. Nancy? Nancy Vann, are you able
10 to unmute yourself?

11 We can't hear you Nancy. We'll try --

12 MS. VANN: Wait, wait, wait.

13 MR. GARMON: I can hear you, Nancy. You
14 can go ahead and start, Nancy.

15 MS. VANN: I thought it was on the little
16 thing at the bottom of my screen.

17 Okay. As a retired attorney, myself, I
18 want to thank Robert Gold for his comments, his
19 insightful comments.

20 I would note that radiation exposure
21 limits are premised on site specific exposure.
22 Movement of individuals between locations and
23 occupations and across medical conditions can lead to
24 greater exposure than if a person was only in one
25 location, with one lifetime job and was as young and

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1 healthy as reference man.

2 For example, I, myself, was in Europe
3 during the Chernobyl meltdown. Then I needed multiple
4 X-rays for ankle replacement surgery and then
5 movements to radiation admitting Indian Point with
6 their reactor before it was closed.

7 I got cancer a few years later. But which
8 of those exposures was the one that gave it to me?
9 You can't always pinpoint causation. But certainly
10 the correlation that it existed for many, many years
11 is a good indication that there is causation that is
12 happening.

13 With the current administration and that
14 limitations in citizens' movements and residences such
15 as exist in certain Eastern countries or will they
16 limit a person's occupation based on their
17 radiological imaging requirements.

18 I hope that those aren't going to be
19 companion proposals or executive orders. But they do
20 seem like they would be necessary if we are actually
21 going to try to limit people's health exposure and
22 protect their safety. Thank you.

23 MR. GARMON: Thank you for your comment,
24 Nancy. Our next commenter is Anthony Smith.

25 MR. SMITH: Can you hear me?

1 MR. GARMON: I can hear you.

2 MR. SMITH: I can see the time.

3 MR. GARMON: Go ahead and start.

4 MR. SMITH: (Native language spoken.) My
5 name is Anthony Smith. I work for the Nez Perce
6 tribe, although I am not speaking on behalf of the
7 tribe. I work in regards to environmental restoration
8 and waste management in regard to the Hanford Nuclear
9 site.

10 Understandably, this is an NRC
11 conversation. But significantly taken to interests of
12 how this could have ramifications in regard to weaker
13 protections against long-term low level radiation
14 exposure, especially from radioactive materials that
15 filled up in people or in ecosystems over time.

16 Although there is a lot of debate over,
17 you know, the scientific rigors behind the process,
18 whether it is too old or there are new standards may
19 overlook real and hard to measure health risks, my
20 concern in this is that us, as Nimiipuu of the Nez
21 Perce Nation, in our backyard, we have an existence
22 here and a play space for over 12,000 years. We plan
23 to be here for a very long time.

24 Lowering these standards and risks
25 concerns us in the sense of not necessarily evaluating

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1 what those risks look like long term. We only can
2 understand what the parameters are in the short term.
3 And we can also see what the benefits are for shaping
4 and making it easier for nuclear mining and waste
5 companies to operate.

6 (Native language spoken.) Thank you.

7 MR. GARMON: Thank you for your comment,
8 Anthony Smith.

9 Our last commenter, being Thomas Webler.
10 Thomas, we have enabled your mic. Are you able to
11 unmute yourself? Thomas Webler?

12 Okay. Bethany Tyree? Bethany, can you
13 unmute yourself?

14 Mary Beth Brangan? We've enabled your
15 mic, Mary Beth. Are you able to unmute yourself?
16 Mary Beth Brangan?

17 Okay. We will try the phone number that
18 ends in 7 -- oh, we lost that. That person put their
19 hand down.

20 Ken Chaplin? Ken Chaplin, your mic has
21 been enabled.

22 Okay. Regna Merritt?

23 Okay. We've reached the end of our public
24 comment period. I am going to disable everyone's
25 mics. We appreciate the comments provided and public

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1 input that was provided.

2 For those that were not able to make
3 verbal comments to the NRC, please consider submitting
4 written remarks to the email addresses that are on the
5 public meeting notice.

6 I want to thank you again for your
7 comments and participation. I especially appreciate
8 the civility that was shown in the commentary. It
9 takes courage to participate in these meetings and the
10 staff appreciates and recognizes that. We believe
11 that your input will enable us to give better advice
12 to our Commission through proposals that are informed
13 by the public's viewpoints. So, on behalf of the
14 staff, thank you for your comments.

15 As I mentioned earlier, the staff is
16 working on an urgent schedule to respond to this
17 Executive Order. So we request that any written
18 comments be submitted to the staff by next Friday,
19 July 25, which, if we receive comments after that
20 date, we can't promise that we will consider them, but
21 we will do our best. We have already received many
22 comments. And we appreciate it.

23 This meeting was recorded and transcribed.
24 We are looking to make a preliminary copy of this
25 recording available to our social media next week.

1 And we will refine it and share the final version with
2 the public meeting summary, as we do with all of our
3 public meetings.

4 If you are interested in providing meeting
5 feedback after this meeting adjourns, you will be able
6 to go to the public meeting site and click on the
7 meeting feedback form and provide feedback to the
8 project manager, Ed Miller, and me.

9 And now I would like to turn it over to
10 Mike Franovich for closing remarks.

11 MR. FRANOVICH: Well, I'll be mercifully
12 brief. Thank you very much for your patience. And I
13 would like to especially thank the presenters for
14 making the effort of putting together their thoughtful
15 perspectives and enlighten us on some additional
16 information and maybe perhaps newer work that might be
17 available to us to consider.

18 There are many perspectives that were
19 shared. I think importantly for us is that it is much
20 broader than just the reactor community.

21 We heard from more than the fuel cycle
22 community itself, medical community, other radiation
23 type of applications and use of materials, both at the
24 perspectives of the users on the ground. I think that
25 is very important.

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1 But I also want to thank those who
2 provided the comments here late in the afternoon of
3 where you see potential impacts to your communities
4 and your perspectives. I think those insights are
5 also quite helpful for us.

6 We probably gained much more insight than
7 we anticipated. I think we have exceed the
8 expectations given the amount of information that has
9 been provided.

10 Stay tuned. There is a lot of work going
11 on as Dave has mentioned. We will keep you informed
12 as best we can on this aggressive schedule that we are
13 working.

14 So, again, thank you very much for your
15 candor and very respectful commentary during today's
16 meeting.

17 Okay. We are adjourned. Thank you.

18 (Whereupon, the above-entitled matter went
19 off the record at 5:37 p.m.)
20
21
22
23
24
25