

Official Transcript of Proceedings
NUCLEAR REGULATORY COMMISSION

Title: Proposed Rule: Regulatory Framework
for Fusion Systems

Docket Number: (n/a)

Location: teleconference

Date: Wednesday, January 17, 2024

Work Order No.: NRC-2677

Pages 1-119

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U.S. NUCLEAR REGULATORY COMMISSION

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PUBLIC MEETING

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PROPOSED RULE: REGULATORY FRAMEWORK FOR
FUSION SYSTEMS

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WEDNESDAY

JANUARY 17, 2024

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The public meeting met via Video-
Teleconference, at 2:00 p.m. EST, Dennis Andrukats,
Facilitator, presiding.

NRC STAFF PRESENT

DENNIS ANDRUKAT, NMSS, Facilitator

RATEB "BOBY" ABU-EID, NMSS

ALLYCE BOLGER, NMSS

THERESA CLARK, NMSS

CATY NOLAN, NSIR

DONALD PALMROSE, NMSS

CHRISTIANNE RIDGE, NMSS

CINDY ROSALES-COOPER, NSIR

DUNCAN WHITE, NMSS

1 PUBLIC PARTICIPANTS

2 LAILA EL-GUEBALY

3 TYLER ELLIS

4 ROBERT FLORIAN

5 DON GREGOIRE

6 ANDREW HOLLAND

7 MATTHEW LIPKA

8 JEFFREY MERRIFIELD

9 MIKE O'NEILL

10 ANDREW PROFFITT

11 PATRICK WHITE

12 SAI ZHANG

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

2:01 p.m.

MR. ANDRUKAT: All right. Good afternoon. Hopefully, everyone can hear me. And I want to welcome you and thank you for participating in today's NRC public meeting to discuss the NRC's rulemaking to develop a regulatory framework for fusion systems.

Please note that this public meeting will have a transcript. Thus, we will ask that this meeting, the chat window should not be used to ask questions or make comments as items in the chat window do not get reflected in the transcription. However, it can be used to notify the staff that you have a question or comment or any technical difficulties. Okay. And I have posted some information in the chat as well including links to the presentation, links to today's handout as well as the meeting notice that many of you have probably already seen.

Moving on, I'll go ahead and turn my camera on here. So my name is Dennis Andrukat. I am with the NRC's Office of Nuclear Material Safeguards and Security, and I am the Rulemaking Project Manager for this rulemaking, and I will be serving as today's facilitator.

This is a comment-gathering meeting with

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1 a question and answer/feedback session. And that
2 session will happen at the end of today's meeting.
3 The purpose of the meeting is for the NRC staff to
4 meet directly with individuals to receive feedback
5 comments from the participants on the specific
6 decisions and actions to ensure that the NRC staff
7 understands their views and concerns. Attendees will
8 have an opportunity to ask questions and provide
9 feedback to the staff about the topics discussed in
10 the presentations today.

11 Please note -- and I kind of want to make
12 this clear -- we've had a couple of questions on this,
13 so for today's public meeting, no formal responses
14 from the NRC will be issued for any of the questions,
15 or comment, or feedback received during today's public
16 meeting. As well as this meeting does not replace nor
17 is an extension of any official public comment period
18 associated with the publication of any proposed rule.
19 The publication for the proposed rule for this has not
20 happened yet. Of course, we are still developing it
21 so at this point, we are in development stage, but we
22 want to hear from our stakeholders and get some early
23 feedback as well.

24 We are using Microsoft Teams for this
25 public meeting and again, to minimize distractions

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1 during the meeting, we do ask that everyone please
2 mute themselves when they are not speaking, and to try
3 to do our best not to speak over each other. And to
4 help facilitate the discussion, we request that you
5 utilize the raise hand feature. That's the little
6 hand-shaped icon at the top of the window. And then
7 that will alert us to who has some questions and as
8 well as the order that they raised their hand. Then
9 we will call on you when it is time for you to speak,
10 whether you have a question, comment, feedback.

11 Okay. And again, you can use the chat
12 window to alert us. Now some folks have been -- in
13 previous public meetings, have been typing in their
14 questions in the chat, but because the chat window is
15 not going to be part of the transcript, if anyone were
16 to do that when we get to the Q and A session, we will
17 ask either you or myself to read the question out so
18 that it makes it to the transcript. And for those
19 that have joined Teams via the Teams bridge line and
20 would like to ask a question, you can hit star 6.
21 That's the two keys to enter to mute and unmute
22 yourself.

23 And again, once you're done speaking, you
24 know, hit star 6 again to put yourself on mute. Also
25 very important is to make sure that you identify

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1 yourself and your affiliation. Again, this is very
2 important for the transcript.

3 Okay. Moving on. So we have the agenda
4 here. So for today's meeting, the staff would like to
5 share with the public the latest progress on the
6 development of the proposed rule including the
7 preliminary draft guidance which will become NUREG-
8 1556, Volume 22.

9 In addition and in response to private
10 feedback from our stakeholders, and that's to hold a
11 venue to allow stakeholders to present feedback. So
12 we will also hear presentations from three of our
13 stakeholders followed by the question and answer
14 session as you can see here.

15 We are running until 5:00. As soon as we
16 get through all the presentations -- and we do ask to
17 hold any questions, comments, feedback until the Q and
18 A session at the end.

19 Okay. I also want to mention at the
20 bottom, we have a little footnote there. These times
21 are estimated and depending on the participation level
22 and the speed, the meeting could adjourn earlier than
23 scheduled. If there's a concern with that, then, you
24 know, please feel free to reach out to me. My contact
25 info is in the meeting notice.

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1 Moving on. And you can see on the agenda
2 we have several presenters today. Today's presenters
3 from the NRC include Duncan White from the NRC's
4 Office of Nuclear Materials Safety and Safeguards. He
5 is our lead technical person for this project. Cindy
6 Rosales-Cooper from the NRC's Office of Nuclear
7 Security and Incident Response, she's going to be our
8 emergency preparedness/emergency plans person for this
9 project. Christianne Ridge from the NRC's Office of
10 Materials Safety and Safeguards is our waste
11 management expert followed by three of our external
12 stakeholder. So we have Andrew Holland from the
13 Fusion Industry Association followed by Andrew
14 Proffitt from Helion, and finally, Tyler Ellis from
15 Commonwealth Fusion Systems.

16 With that, I will -- well, excuse me,
17 before we go to the presentations, what we'll do is
18 I'd like to have Theresa Clark offer up some opening
19 remarks. So Theresa is the Deputy Division Director
20 for the Division leading this rulemaking effort, and
21 that's the Division of Materials Safety, Security,
22 State and Travel Programs. Kind of a mouthful there.
23 So with that, Theresa, I'll hand it over to you.

24 MS. CLARK: Hi, everyone. Nice to see you
25 all again or at least see your icons. And thanks,

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1 Dennis, for getting through what has to be one of the
2 longest titles in the agency, but they don't pay me by
3 the letter.

4 So nice to see everyone to talk about
5 what's one of my favorite projects here where we're
6 really putting something together that's at an
7 exciting early stage of an industry. You know, you'll
8 hear a lot about developing a framework, and I think
9 about it in two ways. You know, we're creating
10 something together that allows us to be ready for this
11 industry when there's a regulatory approach needed,
12 and we're optimizing something together because
13 there's been fusion licensing in this country already
14 at a research scale. There's been materials licensing
15 in this country already for decades. And so we know
16 a lot. And so part of the effort that we're doing in
17 this rulemaking and guidance effort is saying, what do
18 we already know, how can we leverage that, and what do
19 we need to tailor for this specific nature of fusion,
20 whether it's a particular hazard, a particular
21 material, new terminology and that sort of thing.

22 So this thought process is right in line
23 with the Commission's mandate to us, to use the
24 byproduct material framework, to regulate near-term
25 fusion designs, and we're doing that by producing the

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1 materials that you're hearing about today.

2 The other thing that, you know, Dennis
3 mentioned, our desire to get feedback from the public.
4 A rulemaking process officially includes, you know, a
5 proposed rule and final rule, and there's a comment
6 period in between the two. We want there to be a lot
7 more opportunity for engagement on this rulemaking as
8 we do in lots of other rulemakings, and so that's why
9 we're having these conversations early on. We're
10 sharing some of our initial thinking. We're asking
11 you all questions. We're trying to get insights and
12 feedback. And then we take that and, you know, work
13 it into the process as we go.

14 And so, you know, Dennis might say we're
15 not formally giving responses to comments here.
16 That's true. But we are thinking hard about
17 everything that we get. Whether we get a letter,
18 whether we get someone making a statement in a meeting
19 like this, that all goes into the thought process.
20 And so that's a really important part of our decision
21 making. So, you know, we might float something, hear
22 some feedback, totally change direction. We might
23 float something, hear some feedback and say yeah, I
24 think we're still in the right place. And that's a
25 really good and healthy part of this.

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1 We also are going to have several formal
2 opportunities; one for the agreement states who are
3 our partners in this regulatory process and then at a
4 later date, the official formal public comment after
5 the Commission has had a chance to see this. So lots
6 of opportunities for injects from the public, and it
7 really is important and it matters. So, you know,
8 don't think that we're just here to present our thing
9 and then shut down the window. We want to hear what
10 you have to say.

11 So that's what I have and I think I'll
12 turn it over to Duncan.

13 MR. WHITE: Thank you very much, Theresa.
14 And what I wanted to go over with everyone in the next
15 two minutes is to talk about where we are with the
16 rulemaking and with the guidance. So again, Dennis
17 introduced me. I'm Duncan White I'm the technical
18 lead for this rulemaking effort. So we'll go to the
19 next slide, Dennis.

20 Back in October, we provided -- we had a
21 meeting to talk about the proposed draft rulemaking
22 language. And in that draft rulemaking language, we
23 provided a definition for fusion system. This is --
24 we did make a little tweak to this definition. We
25 replaced nuclear fusion with fusion reactions. This

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1 is the only change of any of the rulemaking language
2 that we did make. And again, this is a relatively
3 minor change but again, everything that we -- and the
4 other change that we did do from October to November,
5 there were some additional changes to the waste
6 management language. That was discussed during the
7 November meetings and when Christine went through
8 those changes and talked about the tweaking of that
9 language.

10 So that's the only thing we have changed
11 in the proposed draft regulation language. So with
12 that, we'll go on to the guidance. Next slide.

13 Right now we are -- we have most of the
14 licensing guidance. We're reviewing it right now. We
15 have both assembled. We're waiting for a few more
16 pieces, and we expect to have a draft of this
17 licensing guidance done by the end of this month. We
18 also hope that, as Theresa was saying before, we want
19 to get early feedback on this. So we hope to share at
20 a future meeting that draft version of the guidance at
21 a future meeting, well before it's published in the
22 Federal Register, after the Commission sees it, you
23 know, later this year, early next year. We want to do
24 that way before that. So we'll get a chance for
25 people to look at that.

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1 The other thing just again as a reminder,
2 and we've been saying this all along, is again, as we
3 go through the and prepare the guidance, we may
4 identify other additional areas that require our
5 review and may even tweak the regulation -- the draft
6 regulations as we go through. But again, as of right
7 now, we have not made any additional changes with
8 that. Go to the next slide, Dennis.

9 We -- in the handout that's included with
10 this meeting, we put in some of the draft language we
11 had for the guidance. The sections are listed up
12 there. Again, this is, again, where we are right now
13 with these particular areas. Again, this is, you
14 know, the first draft of this, the first round of this
15 and, you know, there may be additional changes as we
16 go along. But we provided a variety of different
17 areas that we've been, you know -- that we have, that
18 are applied fusion systems here. So again, you know,
19 we welcome you to take a look at those and, you know,
20 as said, if you have any comments on that, we
21 certainly appreciate that.

22 So with that, that's all I wanted to cover
23 with this particular area. So what I'll do now is
24 I'll turn it over to Cindy who will talk in a little
25 bit more detail about emergency preparedness. So I'll

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1 turn it over to you, Cindy.

2 MS. ROSALES-COOPER: Thank you, Duncan,
3 and Happy New Year to everyone. My slide is up,
4 Dennis? Thank you. There we go.

5 MR. ANDRUKAT: Yes. Sorry about that.

6 MS. ROSALES-COOPER: Thanks. So as a
7 result of the NRC staff's evaluation of the EP
8 requirements for fusion systems, the NRC will not be
9 pursuing any changes to 10 CFR Part 30 regulations at
10 this time. The staff will, therefore, address EP
11 considerations and guidance modeled after or
12 comparable with Part 30 applicant guidance in NUREG-
13 1556, namely Volumes 12 and 21.

14 The staff is developing guidance for
15 performing the dose evaluations required under the
16 existing Part 30.32(i)(1)(I) for possession of
17 radioactive material in excess of existing 3072
18 Schedule C quantities.

19 We're also developing guidance for the
20 written procedures needed to handle events that may
21 require intervention by emergency personnel. These
22 procedures will need to identify roles and
23 responsibilities; identify appropriate response
24 equipment; have instructions for the required
25 notification and reporting; have the contact

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1 information for the RSO and other response personnel;
2 and identify agreements with offsite response
3 organizations such as local fire and EMS services.

4 The staff welcomes your feedback once the
5 draft guidance has been released to the public. Thank
6 you. That's all I have for EP at this time.

7 MR. ANDRUKAT: All right. Thank you,
8 Cindy. And with that, next, let's turn the
9 presentation over to Dr. Christianne Ridge of the
10 Office of Nuclear Materials Safety and Safeguards, And
11 she will discuss the waste management. Dr. Ridge?

12 DR. RIDGE: Yes. Thank you. Thank you
13 very much and thank you for your attention this
14 afternoon. I'm going to be speaking for just a few
15 minutes about waste management from the waste
16 management guidance. Some of you might remember that
17 I spoke in November about waste management and the
18 proposed rule changes.

19 Just to recap that, we're not planning on
20 any changes to our low-level waste regulations, but a
21 small change to 10 CFR Part 20 that addresses
22 specifically accelerator waste and under that
23 provision would address near-term fusion waste
24 systems. So I'll talk more about that today, just a
25 recap from November.

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1 So waste management needs to be addressed
2 for all byproduct licensees under the radiation
3 protection program that's required under 10 CFR Part
4 20 and that's true for all byproduct licensees. And
5 that program must address waste minimization,
6 characterization, handling, secure storage, and
7 disposal. Most of this is going to be the same for
8 fusion systems, you know, the same regulations. We're
9 not changing anything. That's true for other
10 byproduct licensees.

11 I am going to speak today -- I'm going to
12 focus on disposal and the little bit of a change we're
13 proposing to make there. So they have several
14 authorized disposal mechanisms discussed in our
15 regulations. Among them are decay in storage, release
16 within effluent limits. Other methods that are
17 authorized in -- I have the regulation numbers there
18 -- in Part 20 include compaction, incineration, those
19 types of disposal methods. And all of those, the
20 guidance is going to be -- we've really not proposed
21 any changes to that guidance.

22 The one place where we are proposing a
23 change is in transfer to an authorized recipient. So
24 that part with the arrow here, that's the part I'm
25 going to talk about more today. If we could go to the

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1 next slide?

2 So in our existing regulations under Part
3 20, and I specifically note in the slide 20.2008, that
4 allows accelerator waste to be disposed of with low-
5 level waste. Now technically speaking, accelerator
6 waste is specifically excluded from the definition of
7 low-level waste, but that's -- you know, that's not an
8 impediment here because 20.2008 allows accelerator
9 waste to be disposed of with low-level waste under our
10 regulations for that, that's 10 CFR Part 61. And
11 near-term fusion systems are going to fall under that
12 provision.

13 And so that regulatory framework includes
14 protection of people during operations. It includes
15 protection of someone offsite from releases of
16 radioactivity. And all of that is going to be the
17 same for fusion as it is for all other low-level
18 waste.

19 The one place where we're proposing a
20 change -- and this is what we talked about in November
21 -- was that the waste classification system, that's if
22 it's low-level waste, Class A, a Class B, Class C,
23 that's part of protecting someone from inadvertently
24 intruding into the waste. So that's if, for some
25 reason, knowledge of the waste site had been lost and

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1 someone intrudes into the waste, digs it up, comes
2 into contact with it. Part of protecting that
3 hypothetical individual is the waste classification
4 system. And when the NRC developed those regulations,
5 we looked specifically at what waste we expected, and
6 so a lot of that, that included a lot of things, you
7 know, medical waste, industrial waste but of course,
8 a lot of that was driven by what we expected from
9 fusion reactors.

10 And so there was a concern that that
11 system, that waste classification system would not
12 cover fusion systems as well. Now for someone, you
13 know, offsite, we're saying that the protection is
14 already there, because our regulations to protect
15 someone from releases of radioactivity offsite already
16 require the waste characterization. They require you
17 to do a dose assessment that looks at all the
18 characteristics of the waste. And that's going to
19 apply equally well to fusion as to other systems.

20 But back in November, we talked about this
21 change proposing under 20.2008 a new paragraph (c)
22 that would require for fusion systems that if they
23 contained novel physical, chemical, or radiological
24 characteristics, the waste disposal site would need to
25 do an inadvertent intrusion assessment to show that

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1 that waste is going to be saved from the point of view
2 of protecting someone who might inadvertently intrude
3 into that waste.

4 Now in this third box down here, I point
5 out that requirement actually is going to apply to the
6 disposal site, not directly to the fusion licensee.
7 So the way that would work is that in developing a
8 waste disposal plan, the fusion site licensee would
9 need to look at whether or not the waste disposal site
10 had done that assessment for the types of waste they
11 have. There would probably need to be some
12 cooperation there, you know, telling the waste
13 disposal site about the characteristics of the waste.
14 And then the waste disposal site would take on that
15 inadvertent intrusion analysis to show that their site
16 could safely contain that waste.

17 Now I use this term novel physical,
18 chemical, or radiological characteristics, and of
19 course, that seems like it would be up to
20 interpretation, right? So the proposed guidance that
21 we're talking about today would provide guidance in
22 identifying what is a novel physical, chemical, or
23 radiological characteristic for this waste. And the
24 waste management proposed guidance is one of the
25 sections that's in the handout for today. So you have

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1 available to you the draft version of this guidance
2 that talks about that, and I'm going to give a brief
3 overview in the next couple of slides.

4 So if you could go to the next slide,
5 Dennis? So the main idea, the overriding idea of what
6 is a novel characteristic is that it's something that
7 the NRC did not consider originally when we developed
8 our low-level waste regulations. And so there is a
9 draft and final environmental impact statement for the
10 development of Part 61 back in the early 1980's that
11 describes in detail the physical and chemical and
12 radiological characteristics that the NRC considered
13 at the time. And everything that we considered then
14 is what we consider to be really like the safety
15 envelope of waste that's not new to us. You know, we
16 thought about it at the time when we were writing the
17 regulation. The regulation, as it stands, was
18 informed by those considerations.

19 And so we previously considered, anything
20 we previously considered importantly would not be
21 considered and would not trigger this need for an
22 inadvertent intruder analysis. And so what are those
23 things? Examples of waste pipes, you know, activated
24 metal, not new; ion-exchange resins, not new;
25 solidified liquids, contaminated soils, contaminated

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1 equipment, building rubble, incinerator ash, there are
2 other ones discussed in the guidance and, in fact, a
3 licensee who is attempting to demonstrate that the
4 waste did not have new physical or chemical
5 characteristics could go into the draft or final
6 environmental impact statement itself and, you know,
7 show that their waste has similar characteristics to
8 something we considered when we were developing the
9 rule.

10 Now similarly, for previously-considered
11 radionuclides, obviously anything that's in those
12 waste classification tables -- and I know that, you
13 know, many people who are listening today are very
14 familiar with those -- but those would be things like
15 Niobium, cesium. Importantly, tritium is in the waste
16 classification tables already. Those are things the
17 NRC staff obviously already considered. They're in
18 the regulation now.

19 Now at the time we developed the
20 regulation, we also considered other radionuclides and
21 determined levels that hypothetically could have been
22 Class A, B, and C at the time. And we determined it
23 was not necessary to include in the rule itself but
24 nonetheless, we considered them in that safety
25 envelope. So those are also not new. Those are

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1 things like chlorine-36, cesium-135, europium-152 and
2 154; you know, obviously, important activation
3 products in concrete, some uranium isotopes. And so
4 in the draft guidance that you have available to you,
5 we include those concentrations of those radionuclides
6 that we considered at the time.

7 And so radionuclides that are not on that
8 list were radionuclides that are in higher
9 concentrations than, are on that lists, those would be
10 something that would trigger this need for an
11 inadvertent intruder analysis. Now if you could go to
12 your next slide, please?

13 Now -- you know, I just -- there's a
14 little nuance here, because I just said radionuclides
15 that are not on that list but are in the waste. And
16 so there needs to be some guidance on how hard do you
17 look to determine if something -- if a radionuclide is
18 in the waste or not. And we're not developing new
19 guidance there.

20 We're proposing to use the same guidance
21 that the NRC has already issued for filling out the
22 uniform waste manifest, and that is used by any
23 licensee who is disposing of low-level waste. They
24 would need to fill out this uniform waste manifest.
25 There's guidance on it in NUREG/BR-0204. And so these

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1 are just the criteria that are in that NUREG that are
2 common for anyone disposing of low-level waste. And
3 this is when you need to list a waste on that
4 manifest.

5 And so the guidance we're proposing is
6 that if it meets any of these criteria for when you
7 would need to specifically list it on the uniform
8 waste manifest. Then we're saying yes, we would
9 consider something that's present in the waste. And
10 so those are things like if it's above -- if it's one
11 percent or more of the waste acceptance criteria for
12 the disposal site, you're going to. That would
13 trigger it. If it's not in the waste classification
14 tables or the disposal site's waste acceptance
15 criteria but it has a concentration of more than .26
16 megabecquerel per cubic centimeter; similarly, if it's
17 a reportable quantity under U.S. Department of
18 Transportation regulations, or if it makes it more
19 than one percent of the total activity within a
20 disposal container, those would all be things where
21 you would need to list it on the uniform waste
22 manifest. Again, that's existing guidance but for our
23 purposes, we're saying that's when you would consider
24 it present in the waste, and you would compare it to
25 the list of radionuclides that the NRC had previously

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1 considered to determine if it was something new.

2 And so I think I've come to my last slide,
3 on the next slide, and that's just some guidance. The
4 guidance also includes what we would expect for the
5 contents of an application. Again, we would expect an
6 outline of the procedures for some of the items I
7 listed on my first slide. That would be waste
8 collection, handling, storage, disposal. We
9 understand there wouldn't be fully fleshed out
10 procedures at this point, but we would expect an
11 outline of those procedures.

12 If a facility was looking for
13 authorization for extended interim storage of waste,
14 we would expect to see that request in the
15 application. And then going back to what I've spent
16 most of my time talking about today, if you were
17 transferring waste to an authorized recipient, we
18 would expect to see a description of that waste and an
19 assessment of whether -- how these novel
20 characteristics that was going to trigger the need for
21 an inadvertent intrusion assessment.

22 Finally, we would expect to see in the
23 application a plan for financial assurance for waste
24 disposal during decommissioning. If that's required
25 under the criteria that already exists in 10 CFR 30.35

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1 and importantly, for fusion systems, I would point out
2 that anything over 100 curies of tritium is going to
3 trigger that requirement that's already existing in 10
4 CFR 30.35 for a decommissioning funding plan. And of
5 course, those criteria are applied with the Unity
6 Rule. So it could be over 100 curies of tritium or,
7 you know, applying it with basimal fractions using the
8 Unity Rule, a combination of other radionuclides and
9 those thresholds that are in the regulation.

10 So that's essentially what we would expect
11 to see in the application. And Dennis, that concludes
12 my slides, so I will turn it back over to you. Thank
13 you very much, everyone for your attention today.

14 MR. ANDRUKAT: Awesome, fantastic. Thank
15 you, Dr. Ridge. Let's go ahead and -- so now we're
16 going to switch gears a little bit. We're going to --
17 that's the end of the staff or the internal
18 presentations. Now we'll start with the external
19 stakeholder presentation, the first of which will be
20 the Fusion Industry Association. So with that, I'll
21 turn this over to Andrew Holland of the Fusion
22 Industry Association. And Andrew, if it's okay with
23 you, I can just run the slides just like I did for the
24 others.

25 MR. HOLLAND: Sure thing. Thank you. Go

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1 on to the next slide then if you can. Can you hear
2 me? All right. Thanks, everybody, and thanks to the
3 NRC for hosting this. Looking forward to reading in
4 detail through all of the handouts and everything put
5 forward on this and being able to respond in kind as
6 much as we need.

7 To introduce myself, I am the CEO of the
8 Fusion Industry Association. The FIA is the
9 representative of all of the private fusion companies
10 working to commercialize fusion on a time scale that
11 is relevant. Our companies are moving quickly to
12 build and learn as much about fusion as we can to move
13 towards pilot plants and commercial fusion operations
14 in a decade. Let's go to the next slide.

15 Just to give a brief overview for folks on
16 this call and everything on the state of the fusion
17 industry, as of last year we can verify that there are
18 least 43 private fusion companies around the world,
19 over \$6.2 billion in investment into these companies.
20 There's an accelerating number of new fusion companies
21 coming in, and our companies are optimistic on the
22 time scales. These companies are seeing growing
23 interest from governments both in the United States
24 and around the world in building the public-private
25 partnerships.

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1 These companies are around the world, but
2 we have to be clear in both public and private that
3 significant technical challenges remain. Fusion has
4 not yet demonstrated commercial pilot plants, and we
5 are working to that. And one of the things that the
6 FIA believes is important is our engagement with the
7 NRC and regulators like this to work through this.
8 Next slide, please.

9 Why is this happening now? Well, what's
10 happened is that you take a combination of new
11 scientific and technological breakthroughs from other
12 fields like high speed computing, advanced
13 manufacturing and even business model improvement, and
14 you apply those to the very significant scientific and
15 technological progress towards fusion energy that was
16 finally demonstrated just over a year ago at the
17 National Ignition Facility at Lawrence Livermore when
18 we did get to that breakthrough moment. You can see
19 in this chart here the progress towards break even
20 fusion. This is multiple technological areas.

21 As it climbs towards the top, that is the
22 progress towards the break even fusion conditions, and
23 the different colors are different sort of geometries
24 and approaches towards fusion. So the idea that, you
25 know, we've been just waiting for this binary moment

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1 of fusion will either work or it won't ignores the
2 fact that there has been tremendous progress towards
3 this breakthrough in fusion energy, progress that, in
4 many ways, has been faster than Moore's law progress
5 in semiconductors and microchips.

6 So FIA and our member companies are in
7 that point now where we're moving from the scientific
8 labs into the commercial sector. And that's where the
9 regulatory environment gets important, cause having a
10 predictable and stable regulatory regime for fusion is
11 not just a want but is a need. This is something that
12 is a requirement for a commercial industry to scale
13 up. Next slide, please.

14 And that leads us to our timeline and what
15 we're looking at, and we are right now at this moment
16 when we're going from 60 years of research into the
17 scientific proof of concept. Multiple companies right
18 now are building their machine that will be a
19 scientific proof of concept, that machine that will
20 show that fusion power can go onto the grid. And so
21 then that will show in a commercially relevant way
22 that they can get to the break even fusion power such
23 that by the late 2020's, they're able to design and
24 build pilot plants; and then by the early 2030's or
25 before, operating these pilot plants, making the first

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1 sales.

2 And that makes the 2030's the decade of
3 commercial fusion, rapid scale up and global
4 deployment. This is an aggressive and ambitious
5 timescale, and what I can say is that we know that
6 multiple companies are aiming for this. We also know
7 that the -- that there's multiple technological
8 approaches towards getting there. We have 38 members
9 within the Fusion Industry Association and all have a
10 consistent pathway to get there. They all have a shot
11 on goal.

12 And so the regulatory structure is really
13 important to get this all set up, and it fits into
14 that mid-2020's timeframe. Getting this all set and
15 done in, you know, the next few years is really
16 important. So that's why we've been so engaged in
17 this. Next slide, please.

18 To get into detail here now on where we
19 stand and where everything is, we first want to thank
20 the NRC staff and the Commissioners for their
21 longstanding engagement in this over the last 3-1/2
22 years looking at this, being diligent, spending the
23 time to work on this such -- to the point where we are
24 talking in details about what the regulations are,
25 what the rule changes are, what definitions are, and

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1 what the guidance will be.

2 The FIA sent a letter on December 15th to
3 the NRC giving our perspective, and I'll go through
4 some of this, but I want to highlight to all
5 stakeholders on this call and to everybody that this
6 letter is available, obviously, on the NRC's Adam's
7 site but also on the FIA's website, and we want to be
8 public and open about where we stand. Next slide,
9 please.

10 The Commission's decision in the Spring of
11 last year was clear that the -- that fusion should be
12 regulated in a -- in the byproduct materials
13 regulatory regime, separating regulatory oversight of
14 fusion from the utilization facilities regime. And we
15 really applaud this and think it's the right result.
16 This will give fusion developers the regulatory
17 certainty while also most effectively protecting the
18 safety, security, and health of the public. Next
19 slide.

20 And one of the clear things within that
21 decision was that a limited scope -- this should be a
22 limited scope rulemaking, and a limited scope
23 rulemaking should be as simple as possible. The SRM
24 said, under the limited scope rulemaking approved
25 under Option 2, the staff should take into account the

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1 existence of fusion systems that already have been
2 licensed and are being regulated by the agreement
3 states as well as those that may be licensed prior to
4 the completion of the rulemaking. Next slide.

5 And so we think that the rulemaking should be
6 limited specifically to these definitions. The
7 decision to place fusion in Part 30 relies on the
8 legal understanding that all fusion machines meet the
9 definition of particle accelerators. And it's
10 important that this definition of particle
11 accelerators is updated. The proposed rule at this
12 point does not explicitly add fusion to the definition
13 of particle accelerator but -- so our proposal is very
14 simple. Simply add fusion machines or, you know,
15 under your current term, whether you call it fusion
16 systems -- we believe machines is the appropriate term
17 -- but add this to the definition of particle
18 accelerator. And you can see the definition here. We
19 have no opposition to the NRC proposal before that
20 said to delete energies usually in excess of 1
21 megaelectron volt. But we think it's really important
22 to add fusion machines and this linkage into there.
23 It takes away a portion of possible regulatory
24 uncertainty. Next slide, please.

25 And then, of course, we think it's

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1 important to define the fusion machine and limit that
2 definition to specific components rather than adopting
3 a facility-wide definition and that the proposed
4 definition in -- as proposed by NRC right now is still
5 overly broad and ambiguous. For example, the phrase
6 associated radiation and radioactive material could be
7 read to describe material such as activated components
8 that are awaiting disposal or spare tritium fuel in
9 storage.

10 And of course we know that a fusion
11 machine license, whether issued by the NRC or by an
12 agreement state, would necessarily include the entire
13 inventory of radioactive materials and associated
14 structures onsite. And we're not talking about the
15 license. We're just saying that it's important for
16 the definition of the fusion machine to be limited to
17 -- and does not need to include all site-wide
18 materials and structures. Simply put, the diversity
19 within the industry means that we should not create
20 some sort of limiting factor and try to write a rule
21 for all of this. Instead just define the fusion
22 center itself. Next slide.

23 I think I went through this but the
24 purpose of this rulemaking is to develop a regulatory
25 definition that narrowly describes fusion machines,

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1 not the whole facility. So, you know, for example,
2 NRC's definitions of particle accelerator, irradiator,
3 and nuclear reactor all focus on the technological
4 device itself, not the overall facility even though,
5 of course, the license is for the facility. So we
6 think just looking at this it's important to make sure
7 it is a limited rulemaking and that the definitions
8 remain limited. Next slide.

9 So we have a suggestion here and we
10 propose actually that this definition follow the
11 definition as proposed in the Fusion Energy Act, H.R.
12 5244, recently added to legislation that has passed
13 the House Energy and Commerce Committee. I won't read
14 it out here but you can specifically see what we
15 propose as the definition here, very simple and very
16 obvious. Next slide.

17 So -- and as we move into the guidance, we
18 really do look forward to and appreciate the
19 publishing of some of the draft guidance here today,
20 and we'll look forward to reading this. We support
21 the creation of this new fusion-specific volume. And,
22 you know, we'd note that the limited direction from
23 the Commission must also apply to the NUREG guidance
24 as well as to rulemaking.

25 We want to emphasize the importance of

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1 maintaining this risk-informed approach in the
2 guidance. You know, of course, the main advantage of
3 the byproduct material framework is the flexibility to
4 the variety of approaches to fusion with the details
5 of the major requirements corresponding to the level
6 of risk. And based on NRC discussion in public
7 meetings to date, we feel it's important to reiterate
8 this value and encourage the Commission to maintain
9 it.

10 Specifics were concerned especially about
11 guidance on emergency preparedness, you know, some of
12 the -- what was said today allays those concerns, so
13 we'll look to see -- to read through the proposed
14 guidance here. And, you know, the key point of the
15 byproduct material framework, like I said, is about
16 flexibility. And so as we look to read more of the
17 guidance, we will have more to say and we may look
18 into future letters or future comments on this as it
19 comes. We do look forward to and thank you for
20 putting out the proposed guidance and look forward to
21 commenting on that in specifics in the future. Next
22 slide.

23 Just to line up, this is our current
24 membership, 38 member companies of which 25 are
25 American. And those that aren't American are also

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1 deeply involved and watching this. This is really
2 important to say that what's hampering here in the NRC
3 in this rulemaking is being followed around the world,
4 and it will provide a model for how this will go
5 around the world. Next slide.

6 This is our affiliate membership, all for
7 the record. Next slide.

8 And so that's it -- to say thank you,
9 thank you for all your work. Thanks to everybody
10 watching for your interest. You can learn more about
11 the Fusion Industry Association on our website here.
12 We are open to affiliate memberships. We All right.
13 Open to keeping engaged with others so please, please
14 reach out to me if you have any questions or comments
15 and look forward to seeing the rest of this and
16 commenting, as appropriate, as we go forward. Thank
17 you, all.

18 MR. ANDRUKAT: Fantastic. Thank you,
19 Andrew. And with that, now let's turn the next
20 presentation over to Helion's Andrew Proffitt. Go
21 ahead, Andrew.

22 MR. PROFFITT: All right. Thank you,
23 Dennis. Can you hear me?

24 MR. ANDRUKAT: Yes, sir.

25 MR. PROFFITT: All right. Great. Good

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1 afternoon, everyone. As Dennis mentioned, I'm Andrew
2 Proffitt with Helion Energy Regulatory Specialists
3 here, and thank you for having me this afternoon. And
4 we'll certainly -- you know, if folks want to raise
5 their hand or engage in any discussion or dialogue or
6 have any questions as I move through, you know, please
7 feel free to ping me and let me know, and I'll try to
8 keep my eye on folks.

9 So just a quick overview on Helion. We're
10 located in Everett, Washington, a bit north of
11 Seattle. We were founded in 2013, now over 230 team
12 members and are rapidly working to commercialize our
13 concept to bring fusion energy to the grid,
14 potentially this decade. We were the first private
15 fusion company to reach 100 million degrees Celsius,
16 an important milestone in fusion, bringing the
17 conditions to where they can -- you can achieve fusion
18 reactions on earth here. That has also allowed us to
19 raise significant capital, being fully funded now
20 through commercialization.

21 We're currently building our seventh
22 generation device now, Polaris, and that's expected to
23 demonstrate net electricity here mid-decade,
24 potentially the end of this year and into next year.

25 We do have a Power Purchase Agreement

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1 signed with Microsoft to start delivering up to 50
2 megawatts of electricity in 2028, 2029 timeframe, and
3 we've announced a collaboration with Nucor Steel to
4 provide 500 megawatts to one of their facilities here
5 in the late 20's or early 2030's.

6 And this picture here is our Polaris
7 junior formation. So the device -- our sixth
8 generation device that reached 100 million degrees
9 Celsius mark was Trenta. That has now been dismantled
10 and we're moving rapidly towards our seventh in
11 Polaris but in the meantime here, we've put this
12 machine together that's a bit scaled up from Trenta
13 closer to Polaris dimensions and will help us practice
14 developing our Field-reversed configurations, which
15 is what's going on. That's that fuchsia-magenta glow
16 going, and that picture there is our first Field-
17 reversed configuration that we formed in that device
18 here over the past couple months and are starting to
19 refine that and move quickly towards Polaris. So next
20 slide, Dennis?

21 So this is an overview of our concept, and
22 I'll get to -- I'll show a quick video as well here in
23 just a moment here, but this is an overview of our
24 concept here. It's a magneto-inertial fusion and a
25 pulse system. So we rapidly will pulse this system in

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1 a commercial device where we're working on making our
2 pulses go faster in our seventh generation device
3 versus our sixth generation device. And part of that
4 pulsing also means that we have a very low inventory
5 of any radioactive materials in the device at any
6 given time. And we also use deuterium/helium-3 fuel
7 which I'll talk to a little bit more in another slide,
8 but those are non-radioactive fuels. And in fact,
9 primary reactions produce stable products as well,
10 though we do have some deuterium reactions that can
11 produce neutrons and tritium.

12 So we inject our fuel into the formation
13 chambers. We form these donuts called Field-reversed
14 configurations, and then through sequencing of
15 magnets, rapidly accelerate them toward the middle
16 from either end, and they combine in the middle.
17 They're further compressed by magnetic fields in the
18 middle of the device there, number 3. And then we can
19 reach fusion conditions there. You start to have
20 fusion. That material begins to expand and release
21 charged particles which push back against the magnetic
22 field, and then that energy is directly re-harvested
23 through the magnetic field and put back onto the
24 capacitor banks which are used to fire the magnets to
25 begin with.

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1 So it's a really cool concept, no steam
2 cycle. We not heating up materials in order to boil
3 water to then go to a steam cycle. So very efficient
4 to 95 percent efficiency of energy recovery from what
5 we put into the system. And then directly capturing
6 that electricity means we can actually -- you know, we
7 don't need to get to ignition. You know, this is
8 actually considered non-ignition fusion where we don't
9 actually have to get to ignition conditions for a long
10 period of time and deal with those difficulties in
11 doing that.

12 So if you don't mind, Dennis, if I can
13 show a slide here that shows that in motion?

14 MR. ANDRUKAT: Sure.

15 MR. PROFFITT: We'll see if I --

16 MR. ANDRUKAT: Do you want --

17 MR. PROFFITT: -- can do that on my own
18 here.

19 MR. ANDRUKAT: There you go.

20 MR. PROFFITT: Is that working?

21 MR. ANDRUKAT: Yes.

22 MR. PROFFITT: Okay. So this is an
23 overview of a commercial concept of Helion's fusion
24 generator. And let's see if it will play here just to
25 show what I explained there in more detail. So we're

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1 forming a Field-reversed configuration like a donut
2 accelerating to the middle. They combine and they'll
3 now be further compressed by magnetic fields there
4 enabling fusion to happen. That begins to expand and
5 push back on the magnetic field, and then our
6 electricity is directly recaptured right back on the
7 capacitor banks as it comes -- I'll just play it one
8 more time just for folks. It is a pretty cool concept
9 here.

10 Accelerate toward the middle, combine,
11 further compressed, get to fusion conditions, this 100
12 million degrees Celsius plus. Do that for long
13 enough, you'll have a fusion, and then you'll directly
14 recapture that through the magnetic fields and then
15 put back onto the capacitor banks. I'll stop and
16 Dennis, you'll probably have to re-share.

17 MR. ANDRUKAT: Hopefully, you should be
18 seeing now.

19 MR. PROFFITT: Yes. I got you. Then you
20 can move to the next slide. So as I mentioned,
21 Helion's fusion generators use non-radioactive fuel,
22 so we have deuterium and helium-3, and that's our
23 primary reaction source. That's what we're going for
24 although we do -- and then our products of that are
25 hydrogen and helium-4, both being stable isotopes of

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1 those elements and, you know, don't produce any
2 radioactive by products or any radiation.

3 However, we do, in fusing -- creating the
4 conditions to fuse deuterium and helium-3, we get
5 deuterium-deuterium fusion. And about half of the
6 time when you have deuterium-deuterium fusion, you can
7 make tritium and hydrogen. And then you can -- half
8 the time, you can make helium-3 and a neutron. So
9 that's where we do produce some radiation through our
10 -- the neutrons and then the byproducts and the
11 tritium.

12 Now these are actually beneficial to us
13 because the one reaction that produces helium-3, which
14 is our fuel, one of our main fuels for the device,
15 while deuterium is very prevalent on earth, helium-3
16 is not. And in fact, you know, there are -- have been
17 concepts through the years of mining helium-3 on the
18 moon. So that would likely be detrimental to our
19 commercial desires. So we can actually create it
20 here, but then we do create neutrons through that
21 reaction and then also the creation of tritium is also
22 not -- for not either as tritium will decay into
23 helium-3. So if we -- we will be very keen to hold
24 any tritium that we do produce such that it will
25 eventually decay into helium-3, and then we can use it

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1 in our fuel cycle. So just an overview of our concept
2 here.

3 So about 5 percent of our -- the energy we
4 produce in these machines, in these generators will
5 come out in the form of neutrons. So there will be a
6 neutron field while the -- these machines are
7 operating and obviously acting those materials, as Dr.
8 Ridge mentioned earlier, the waste produced by these
9 machines so the neutrons will do that. Next slide.

10 This is our building, Ursa, at our
11 headquarters facility in Everett, Washington. This
12 building is going to be the home of our seventh
13 generation device, Polaris, which we do expect to show
14 net electricity here in the year or so. And one
15 takeaway from this picture is really like that these,
16 our seventh generation device and our future power
17 plants, can actually be sited in traditional
18 industrial parks. That is what this facility use to
19 be. As you can see in the background, many other
20 warehouse-type buildings of similar stature.

21 This building is about 30,000 square feet,
22 very low environmental impacts as you would see in
23 other types of power plants that may need a steam
24 cycle and use significant amounts of water or have
25 significant site work or either fuel delivery from

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1 pipelines or even, you know, large tracts of land that
2 are used in the renewable space. So really, a very
3 compact site that has very low environmental impacts.

4 And we also -- you know, another thing to
5 note here is, you know, we expect for Polaris and then
6 also for our potential commercial devices to have very
7 low offsite consequences and potential, you know,
8 credible accident scenarios. So we believe we would
9 stay well below the current 10 CFR Part 30 thresholds
10 for needing -- necessitating offsite emergency
11 planning. We think we can show that quite easily with
12 our design.

13 So we really think this will unlock quite
14 a bit of opportunities for us moving forward, having
15 this compact footprint with low environmental impacts.
16 Next slide, Dennis?

17 So, just to highlight a couple of the key
18 requests here for the staff, and I'll come back to
19 this slide at the end. But really, our keys today,
20 and you know, we'll go through a few other comments
21 that we have in our slides here, but really, our keys
22 is, you know, this as the FIA mentioned, you know, a
23 limited scope rulemaking that's well positioned to
24 provide the clarity and regulatory predictability for
25 the industry and stakeholders that we need here.

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1 And we really appreciate the staff's
2 engagement thus far, and obviously, the Commission
3 decision back in April.

4 A couple of the highlights that we do ask,
5 you know, directly to the staff is, we would like to
6 see that direct tie of fusion generators to particle
7 accelerators.

8 We think that'll be more robust and
9 durable moving forward.

10 And I'll get into more on each of these
11 topics as we move forward.

12 Stakeholder engagement, we've had great
13 engagement, you know, over the past several years on
14 this topic and certainly over the past three months.

15 And we really want to keep that momentum
16 going and not get ourselves in a position where we've
17 gone too long without talking as the staff is moving
18 forward with the rulemaking and the guidance
19 development.

20 And then, lastly, you know, highlight
21 this, you know, the potential future need for a
22 licensing regime that can be more efficient than the
23 site by site licensing that we have today.

24 As I showed on the last slide with these
25 being cited and, you know, traditional industrial

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1 parks maybe already disturbed sites even and having
2 very low potential off site consequences.

3 And also, as I'll discuss a little bit
4 later, you know, the ability for much of the devices
5 or maybe the full devices to be manufactured in a
6 factory of licensing process that isn't inherently
7 site by site and also, potentially, you know, slight
8 differences across the nation as it's implemented by
9 the Agreement States would be very beneficial to
10 helping us achieve our climate and energy security
11 goals.

12 So, next slide, Dennis?

13 So, this is one, and I'm actually excited,
14 I heard in the staff's presentation, and I think in
15 Theresa's opening remarks, you know, this, you know,
16 fusion isn't something -- while new and does present
17 some novel concepts and potential challenges, you
18 know, the Commission decision, I think, was clear in
19 that, you know, the regulatory treatment of fusion
20 should be consistent with other uses of byproduct
21 material.

22 You know, it's fundamentally a material
23 issue.

24 You know, the Commission decided not to
25 regulate fusion under the utilization facility

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1 framework that has more of a focus on the performance
2 and control of the device.

3 It's in the byproduct material's
4 framework, the safety focus is on the control,
5 confinement, and shielding of that radioactive
6 material.

7 You know, if you look at the staff's paper
8 in SECY-23-0001, the staff looked at the
9 characteristics of near-term fusion systems.

10 Those included things like fissile
11 material not being present, so not having criticality
12 at a chain reaction that requires intervention to
13 stop.

14 The energy and radioactive material
15 production from the device would stop in off-normal
16 events or accident scenarios without any intervention.

17 Active post-shutdown cooling is not
18 required to ensure continued confinement of the
19 radiological -- radioactive material in the device or
20 on the site.

21 Radioactive nuclides present would result
22 in low doses to workers and the present -- and the
23 public during credible accident scenarios.

24 Further, fusion generators actually need
25 active engineered safety features -- not safety

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1 features, active engineered features to continue
2 fusion reactions.

3 You know, very, you know, the opposite of
4 a fission reactor concept where you need active
5 features to be able to stop the reaction as opposed to
6 sustaining it.

7 So, essentially, you know, all these
8 characteristics together, I think, you know, really
9 cement that this is, you know, a truly a material
10 issue and fits well within the byproduct material
11 framework and can build, as was noted earlier, on the
12 decades of experience with byproduct material and also
13 particle accelerators.

14 Next slide, Dennis?

15 All right, so, we think, you know,
16 certainly as mentioned here at the top of this slide,
17 in the rulemaking plan for the SECY-23-0001, it was
18 noted as a major objective of the rulemaking that the
19 staff proposed and was approved by the Commission to
20 include a direct tie of fusion generators to particle
21 accelerator.

22 The Atomic Energy Act does not mention
23 fusion. And also does not define particle
24 accelerators.

25 So, the Congress left it up to the NRC to

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1 promulgate that definition. And they've done so in 10
2 CFR 30.4. And also have the ability to update that
3 definition and clearly tie it in to fusion generators
4 consistent with the Commission direction.

5 And also, you know, as the FIA just
6 mentioned and has mentioned in other public meetings
7 and others, you know, there are all fusion concepts
8 being considered by the commercial industry, can fit
9 the current definition of particle accelerator.

10 But we do think it provides a more robust
11 and durable, lasting impact to go through the
12 rulemaking process and codify the Commission decision
13 through a notice and comment rulemaking procedure
14 which is -- holds quite a bit of deference in the
15 judicial process in this country.

16 So, you know, we think it really lies with
17 the staff to implement this change to the particle
18 accelerator definition, you know, making explicit this
19 tie to fusion generators as we move forward.

20 Next slide?

21 And again, consistent with the FIA's
22 letter and their presentation, we really think the
23 fusion system definition should be narrowed.

24 This would be consistent with past
25 precedent and also the staff's position.

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1 You know, one of the things that we've
2 heard from the staff in these public engagements is
3 there's not the intent to regulate fusion systems,
4 generators, devices, machines, but you know, pick your
5 term there, but not to regulate them from a facility
6 wide perspective and focus on the material.

7 And I think we are aligned with that
8 concept. But the current definition, and I apologize,
9 I ran out of room on this slide to be able to fit it
10 here, but it is very broad and includes many other
11 parts of the facility and systems and shielding and
12 material and, potentially, waste and other things that
13 may be on site that sort of go not in alignment with
14 that velocity that we've heard from the staff.

15 So, this would be more of a longer term
16 potential issue. And as there's, you know, turnover
17 at the agency or, you know, as things are sort of
18 worked down through guidance and legislation that, on
19 the state level, how that's done, you know, that's
20 where things, you know, the sort of original intent of
21 the staff may not be fully fleshed out in
22 implementation in the future.

23 Whereas, as things trickle down to the
24 Agreement States, if this isn't cleared up.

25 And one of the things that I would note is

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1 that it appears that this definition has sort of
2 evolved from the SECY paper, SECY-23-0001, where the
3 staff was assessing fusion facilities and really were
4 looking at the whole site there and the whole facility
5 and what the hazards of it were.

6 Because they were assessing those hazards
7 against the utilization facility criteria which are in
8 the Atomic Energy Act.

9 So, it was appropriate to have a broader
10 definition in that SECY paper when presenting that
11 material to the Commission for a decision to provide
12 them, you know, a complete view, complete picture of
13 the hazards that the facility potentially posed when
14 assessing whether or not they should be regulated as
15 utilization facilities.

16 But now that the Commission has made their
17 decision, I think it makes sense to tailor this
18 definition more tightly.

19 And this would actually even, you know, be
20 consistent with the nuclear reactor definition which,
21 in fact, are regulated more broadly.

22 You know, certainly, facility wide, even
23 that definition, as you can see there, you know,
24 really, one line.

25 And then, the irradiator definition as

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1 well, you know, focused on the actual machine of the
2 device there and not all the ancillary equipment or
3 systems or other pieces of the facility that really
4 aren't part of the definition of the -- or the machine
5 that's actually producing fusion.

6 Next slide, please, Dennis?

7 So, we want to propose here, you know, on
8 our continued engagement, you know, we think it would
9 be really beneficial to have early technically focused
10 workshops on the guidance.

11 And we're very excited to see from the
12 staff that the handout for today.

13 Obviously, we've had very limited time to
14 look through that and aren't really prepared to
15 provide, you know, a whole lot of comment on that
16 material here today.

17 But it's very beneficial to have that
18 material and, hopefully, set us up for potential
19 workshops.

20 You know, the byproduct material framework
21 is high level by design, you know, promoting
22 technology inclusiveness and performance based
23 approaches, it handles the hazards of a lot of
24 different types of material and amounts of material.

25 And so, the guidance is really key in this

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1 framework, you know, more so than maybe other
2 frameworks. Because it actually, you know, dictates
3 sort of the day to day implementation of the framework
4 more so than the ruling which is higher level.

5 So, you know, I think it would be
6 beneficial as we're moving forward where, you know,
7 technically focused individuals from the commercial
8 industry and other stakeholders can come together with
9 the same from the staff and have more in depth
10 technical discussions where the developers can bring
11 in, you know, additional information on their designs
12 and their concepts as we're finalizing our approaches
13 for initial fusion power plants.

14 So, we can provide more detail to the
15 staff than what they have and what they get maybe in
16 these public sessions that are focused more on policy
17 at a very high level.

18 And then, also, we can glean a lot of
19 information from that material and understanding of
20 the staff's concerns.

21 You know, it's always hard to really
22 understand the basis or the impetus for words on
23 paper. There's nothing better than actually getting
24 in a room with somebody and walking through it and
25 talking through it and realizing, you know, you may be

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1 aligned, you may be -- maybe you thought you were
2 aligned and you're miles apart.

3 So, I think it's really helpful to
4 actually get folks together in a room and walk through
5 things.

6 And really, the other, you know, really
7 key point on this regard is, you know, Helion and some
8 of our other colleagues, you know, we're getting to a
9 point where we're finalizing designs for our initial
10 power plants.

11 And as you'll see in my next slide when I
12 get there is, you know, we really want to standardize
13 this design and be able to mass produce it.

14 So, now is really a critical time in our
15 design phase where we're finalizing our proof of
16 concepts and we're starting to pivot towards, you
17 know, designing our fusion power plants.

18 Being able to take into account these
19 staff concerns or, you know, the latest in the
20 guidance or finalizing what the language in the
21 guidance will look like, you know, it's much easier
22 for us right now to be able to implement a design
23 change at this stage in the process.

24 You know, and it may not cost us anything
25 or maybe, you know, it might cost us less to produce

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1 the design that may comply with the NRC's expectations
2 as opposed to what we were thinking.

3 So, whereas, in a year, two years, three
4 years down the road, those retrofits or design changes
5 can be extremely costly or even impractical and
6 create, you know, lots of rework or going back to the
7 drawing board, especially as we're moving towards the
8 potential for mass manufacturing.

9 So, we would propose two workshops in the
10 spring of 2024. I think waste management would be an
11 excellent one. I think we've had a lot -- the
12 discussion has furthered a lot here.

13 I think there are still questions and I
14 think maybe the draft guidance that's out may help
15 answer those.

16 And also, you know, emergency planning has
17 certainly been a topic that, you know, sort of
18 continues to evolve.

19 And I think the discussion today was
20 great.

21 And again, but all these things are really
22 going to come down to, you know, the devil's going to
23 be in the details of the wording on this guidance, is
24 really going to impact the implementation.

25 So, you know, the sooner that we can get,

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1 especially our technical folks, engaged with --
2 directly with the NRC and these targeted areas, I
3 think we can make sure that the staff end up
4 producing, you know, a quality document for the
5 American people here.

6 So, next slide?

7 Thank you, Dennis.

8 Looking toward the future here, so, you'll
9 see on the left here, aircraft manufacturing. The
10 aircraft industry in this country produces one or more
11 new planes every day.

12 And we don't see any reason why that
13 fusion generators couldn't be produced on a similar
14 time scale, being, you know, many components are power
15 electronics and others.

16 And also, the key, really, with fusion
17 generator manufacturing is not needing radioactive
18 material in the product or even initial testing of
19 these generators. We can do that without radioactive
20 materials such that, you know, they truly can be made
21 in a factory.

22 You know, lots of small parts that go
23 together being produced on a factory line, not
24 requiring, you know, forging or fabrication of immense
25 structures.

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1 You saw the building earlier, Ursa, for
2 our seventh generation device.

3 Polaris that, you know, is really similar,
4 a 30,000 square foot building in an industrial park.
5 It would be sufficient for siting a fusion generator.

6 Can really be factory built, transported,
7 and then, quickly installed in these buildings without
8 significant heavy site work there.

9 So, you know, we're working very hard at
10 Helion to prove our concept here in the next year and
11 design our next -- our device for our Microsoft
12 purchase agreement coming in 2028.

13 But you know, quite a bit of focus at our
14 company is also on, okay, how can we make sure that
15 once we do prove this and once we make one of them, we
16 will quickly be able to ramp up and scale to meet the
17 needs of the world from a climate and energy security
18 perspective.

19 So, you know, essentially, the current
20 licensing process, while -- will certainly enable
21 initial deployments of fusion power plants and pilot
22 plants and continued R&D.

23 I think we would all recognize that, you
24 know, if we were -- if Helion was able or any of our
25 colleagues were able to build one or more of these

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1 devices a day, the current framework would certainly
2 be the long pole and tent and really the limiting
3 factors such that we, you know, we would be producing
4 these generators and not be able to site them as
5 quickly as we were deploying them.

6 So, we really think that there's an
7 opportunity here in the fusion -- the longer term
8 fusion regulatory strategy that the staff has
9 discussed in these meetings, and even in this
10 rulemaking, you know, to acknowledge this fact and
11 commit to, you know, as the fusion industry continues
12 to progress and mature, there is a need to look at a
13 more agile, more efficient licensing process to
14 support this potential here.

15 And you know, that could be done, you
16 know, I can see some folks on the line probably
17 presenting some skepticism, but you know, completely
18 understand that there should be some metrics tied to
19 that recognition.

20 You know, I don't want any portion of the
21 government going off and using taxpayer dollars in a
22 way that isn't efficient and going to benefit the
23 American people.

24 So, you know, there could be a need, you
25 know, having a commercial entity show net electricity

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1 from fusion, having a commercial entity have, you
2 know, orders for X number of gigawatts of fusion
3 power, you know, by a certain date.

4 So, you know, I think there's fairly some
5 metrics we could tie to that before the staff went off
6 to generate such a process.

7 But we think now is certainly the time,
8 given the amount of time that, you know, whether it be
9 rulemaking or guidance development or others that
10 would need to be undertaken to develop and implement
11 such a process, you know, that time is really of the
12 essence here as we're rapidly moving towards
13 commercialization and, hopefully, mass manufacturing.

14 So, next slide, Dennis?

15 All right, so just to tie out on the key
16 requests that we had here.

17 Again, the limited scope rulemaking I
18 think is well positioned to provide clarity and
19 regulatory predictability to the industry and other
20 stakeholders.

21 We strongly urge the staff to explicitly
22 address fusion generators in NRC's 10 CFR 30.4
23 definition of particle accelerator given that fusion's
24 not in the Atomic Energy Act and the particle
25 accelerator, the definition of that was left to the

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1 NRC by the Congress.

2 And this is consistent with the staff's
3 rulemaking plan and the Commission's direction
4 provided on SECY-23-0001.

5 And then, you know, as we showed here
6 earlier, you know, in the little clip of Helion's
7 fusion generator and also in FIA's statements, you
8 know, all of these machines that are being considered
9 do fit under the particle accelerator definition.

10 So, it -- we don't see any need for
11 hesitancy for updating that definition, you know,
12 clearly, providing that tie to the byproduct material
13 framework within the NRC's regulations through notice
14 and comment rulemaking.

15 Continue stakeholder engagement, again,
16 we've had quite a bit of momentum here. We really
17 want to continue that.

18 And as I mentioned, you know, now is
19 really a critical moment as we're moving forward with
20 our designs and as the staff is putting pen to paper
21 in the guidance development.

22 We think we can be -- they can be quite
23 mutually beneficial to continue our engagement and,
24 not just continue our engagement, but actually, you
25 know, ramp up and further our engagement more into the

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1 details and have our technical folks, you know,
2 directly in the room with one another to hash out some
3 of these issues and better our understanding.

4 And again, you know, this, you know, being
5 the time that it is, you know, changes -- future
6 changes to our designs will, clearly, you know,
7 potentially set us back in our mass production,
8 desires or, you know, create significant costs as
9 we're further along in those designs.

10 And then, lastly, as I just, you know,
11 ended on the last slide, you know, now is really the
12 time to acknowledge this need for a more efficient
13 process over the current site by site siting process
14 that's done.

15 And so, you know, with that process likely
16 taking, you know, several years to develop and
17 implement, you know, really, now is the time to start
18 thinking about it and what maybe the criteria would be
19 to launch off into that.

20 So, really appreciate the staff's time
21 today and certainly open to any comments or questions
22 as we move forward in the meeting this afternoon.

23 So, thanks.

24 MR. ANDRUKAT: Fantastic, thank you,
25 Andrew.

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1 We can just move on here.

2 Last, but not least, we have Commonwealth
3 Fusion Systems. We're going to have two speakers from
4 them.

5 And with that, I will turn it over to Mike
6 O'Neill.

7 MR. O'NEILL: Great, thanks very much,
8 Dennis.

9 Sound check, can everyone hear me?

10 MR. ANDRUKAT: Yes.

11 MR. O'NEILL: Great, thank you.

12 So, thanks a lot for everyone's time and
13 attention today. We're really excited about all of
14 the effort and enthusiasm and expertise that NRC is
15 bringing to bear on this really critical path issue
16 for CFS and all our peer companies across FIA and the
17 broader fusion ecosystem.

18 We really appreciate the transparency and
19 the efforts to collaborate.

20 And so, you know, our slides kind of
21 reflect some perspectives following the November
22 meeting.

23 Clearly, the conversation has evolved a
24 bit since then on emergency planning and waste and
25 things like that.

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1 So, we'll try to reflect that in somewhat
2 real time recognizing we haven't had a chance to
3 digest the updated materials from the staff.

4 But I think we can still offer some
5 perspectives.

6 By way of background, I am an attorney for
7 CFS. I'm not a technical person, so save those
8 questions for my colleague, Tyler Ellis.

9 And we'll just give a little bit of
10 background on what CFS is up to and then, dig into the
11 rulemaking.

12 So, next slide, please?

13 CFS is a spin out from MIT. I think the
14 takeaway from this slide is, there are about north of
15 600 people working with CFS.

16 And we're tightly focused on
17 commercializing fusion energy with a mission to
18 address climate change.

19 So, our goals are deployment as quickly as
20 -- and efficiently as possible.

21 And to do that, we need a, you know,
22 predictable regulatory environment that's, to echo
23 Andrew Holland's description earlier.

24 Next slide, please?

25 You know, a lot of this material will be

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1 familiar to many of the faces on -- or I should say,
2 the names on the attendee list here.

3 But because we're going to talk a little
4 bit about SPARC versus ARC, I did want to describe a
5 little bit about what we're doing today, whereas --
6 versus what we have planned for our future
7 commercialization efforts.

8 So, SPARC is a fusion demonstration
9 machine that is under construction right now in
10 Devens, Massachusetts, about 45 minutes to an hour
11 northwest of Boston.

12 And that machine will demonstrate net
13 energy from fusion.

14 I've got some pictures further down in the
15 slide deck that show that this machine is under
16 construction today.

17 And I think what's relevant for our
18 conversation is how important the particle accelerator
19 practice and precedent is to efficiently developing
20 the licensing basis and the license application, and
21 we hope, the license itself for SPARC.

22 When, you know, SPARC is an experimental
23 demonstration machine, that will give way and evolve
24 into ARC.

25 ARC will be the commercial power plant

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1 scale fusion machine.

2 We expect to deploy in the early 2030s and
3 will be, you know, grid connected and sell power into
4 the power grid.

5 I think it's relevant for this
6 conversation that we are conducting a global siting
7 search for ARC today. This is not a hypothetical
8 exercise. We are engaged with communities around the
9 world to evaluate sites for possible deployment of
10 ARC.

11 It is an active part of our
12 commercialization plan right now.

13 So, this is a very timely and important
14 discussion for us to give us the certainty to deploy
15 that kind of capital for ARC.

16 Next slide, please?

17 So, we're going to touch mostly on the
18 limited rulemaking considerations. I don't want to
19 belabor these points because Andrew Holland and Andrew
20 Proffitt did a really nice job, you know, outlining
21 some of the key considerations for us around some of
22 the definitional points.

23 But I'll just kind of reiterate them at a
24 high level.

25 Next slide?

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1 So, our main objective in participating in
2 this rulemaking exercise is to ensure that the
3 regulatory program that's developed for fusion really
4 protects public health and safety and hits the right
5 balance for regulatory flexibility and rulemaking
6 durability.

7 You know, as, I think Andrew Proffitt
8 said, we want to ensure that this is a predictable
9 framework that can foster innovation in this new and
10 emerging technical area.

11 And one of the key ways that we think will
12 address that, that will further those goals, is this
13 explicit tie between fusion energy or fusion machine
14 and particle accelerator to give us the firmest
15 statutory basis, tying back to the authorities that
16 NRC has under the AEA from Congress.

17 And really, to give some comfort to the
18 stakeholders that we deal with across the spectrum.

19 That we're going to be able to rely on the
20 practice and precedent that has really helpfully built
21 up around or grown up around particle accelerators and
22 materials licensing basis for particle accelerators
23 over, you know, the past many decades.

24 And as you can see, we've got a photo here
25 of SPARC under construction. That's a pretty recent

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1 picture, I think, to show the demonstration of the
2 commercial fusion energy.

3 Next slide, please?

4 So, I think we really want to emphasize
5 here that we're looking for a really strong statutory
6 basis to implement the Commission's directive to
7 select Option 2 out of the SECY and place commercial
8 fusion energy within the byproduct material framework.

9 You know, some of -- I don't think we need
10 to dwell on the legislative and regulatory history too
11 much here, but you know, Congress brought particle
12 accelerators into the -- or I should say, the
13 byproduct material created by particle accelerators
14 into the NRC's jurisdiction back in 2005.

15 And gave a fair amount of discretion to
16 NRC to describe what types of machines would serve as
17 particle accelerators.

18 And NRC exercised that discretion.
19 They've done it with the definition that's posted here
20 in Parts 20 and 30.

21 And, you know, in our view, we share the
22 view of FIA that we're not aware of any commercial
23 fusion technology that would not fit within this
24 definition, be it, you know, machine topology or fuel
25 cycle, anything else -- anything that any company that

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1 we're aware of that's proposing in the fusion space
2 fits in the particle accelerator definition.

3 Next slide, please?

4 And so, you know, one thing that we were
5 -- we've kind of cottoned on to a little bit in -- is
6 that, you know, our read of the SECY with the SRM is
7 that, really, to the Commissioner's intended to make
8 an explicit tie with -- to particle accelerator.

9 You know, that's within the Commission
10 endorsed rulemaking plan, within the limited
11 rulemaking.

12 They suggested that the definition of
13 particle accelerator ought to be updated to explicitly
14 define radioactive material associated with the
15 operation of a commercial fusion energy device as
16 byproduct material.

17 That's really a very strong sign to us
18 that that's where Commission decision landed. And
19 that that's how they understand the basis for their
20 Part 30 decision for fusion.

21 And that's what we think ought to be
22 implemented via rulemaking here.

23 Next slide, please?

24 You know, and I think we just want to call
25 out that this isn't happening in a vacuum.

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1 You know, Congress is interested in this.
2 I think that's no surprise to anyone on this call.

3 And so, we are just -- we're in alignment
4 with the definition that Congress is developing.

5 I think the point here is that we really
6 just want a tech-neutral, comprehensive fusion machine
7 definition that captures everyone. It creates a level
8 playing field for the entire industry.

9 And then, we can, you know, deploy this
10 technology safely and efficiently across the country.

11 You know, I think that this is just more
12 of a -- our view is, we just want everyone swimming in
13 the same direction.

14 Next slide, please?

15 So, here, we've got a picture of the
16 inside of our Tokamak Hall about as it sits today.

17 You know, I think one thing that we do
18 want to really emphasize is how strongly we agree with
19 the approach that staff has taken on NUREG development
20 based on 1556 Volume 21.

21 We think that that is the right approach.
22 And we strongly agree with that.

23 And the key, for us, is how useful Volume
24 21 has been in developing our licensing strategy for
25 SPARC for dealing with our regulators, for considering

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1 the entire gamut of operations, operational
2 conditions, hazards, things like that.

3 We found Volume 21 to be the indispensable
4 tool to develop a licensing approach for our machine.

5 We think that that is the key that is a
6 critical part of expanding fusion writ large across
7 the country.

8 Next slide, please?

9 So, one thing that we want to flag here
10 from a more kind of practical, boots on the ground,
11 market facing perspective is that, you know, some of
12 the issuances that we've seen either in the
13 definitional space or in prior conversations around,
14 you know, the proposal of 20.2008© or something like
15 that is that there's not a clear intention, at this
16 point, with the rulemaking for fusion intends to
17 really lever the decades of practice and precedent
18 around particle accelerators.

19 You know, where our view is and remains
20 that the material that we will license and our
21 machines should be treated as particle accelerator and
22 particle accelerator produced byproduct material.

23 It fits squarely within the four corners
24 of the Atomic Energy Act, within the existing
25 regulations, and I think, for us, a very clear

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1 statement that this is accurate, that fusion machines
2 are part of the particles accelerator rubric will give
3 us and, frankly, many of our vendors or our -- the
4 folks that we deal with in the marketplace, a lot of
5 comfort and regulatory certainty that this is the
6 case.

7 We want to assure that we are not creating
8 or that NRC is not creating a whole new category of
9 byproduct material here.

10 And what we're actually doing is just
11 building on the decades of accelerator byproduct
12 material framework. That's where CFS is.

13 And where we're concerned is around areas
14 where we're actually increasing the potential for
15 regulatory uncertainty.

16 For instance, you know, there -- it could
17 be argued that 20.2008© isn't totally aligned with the
18 -- with Congress's edicts in the Energy Policy Act of
19 2005.

20 That could create -- if there is, indeed,
21 a conflict there, that creates some significant
22 regulatory uncertainty across the ecosystem.

23 And so, we really want to drill down on
24 that, you know, recognize that the intent from today
25 seems to be that near-term fusion machines really

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1 ought to fall within the existing regulations at
2 20.2008.

3 But I do want to just caution around the
4 potential for a conflict with the statute.

5 And last, but certainly not least, we want
6 to, you know, encourage this regulatory certainty as
7 in line with the agency's own principles of good
8 regulation.

9 You know, we think tying this all back to
10 particle accelerator really implements the
11 Commission's decision neatly in alignment with
12 congressional intent, but under NEIMA and this
13 emerging bipartisan bill in the House, in the
14 Congress.

15 And so, it really is becoming a, you know,
16 collaborative technology-neutral, technology-
17 comprehensive regulatory approach.

18 So, I think that solves -- or that
19 concludes my own slides.

20 If we could transition over to Tyler.

21 MR. ELLIS: I'll take the next slide,
22 please?

23 Hello, everyone. My name is Tyler Ellis.
24 I'm with Commonwealth Fusion Systems.

25 And we just wanted to share some

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1 additional thinking on some of the regulatory guidance
2 concepts and some of the questions that were actually
3 posed at previous meetings just to -- in order to kind
4 of appropriately respond.

5 So, next slide, please?

6 It -- in the previous November meeting,
7 there were actually three different questions that
8 were asked by NRC kind of looking for input and we
9 wanted to be able to share our thoughts on that.

10 So, the first question that was posed was
11 really a question of does it make sense to include
12 some additional terminology such as general emergency
13 or notification of unusual events which is
14 traditionally used in the fission context.

15 We, you know, did some thinking and
16 looking at the current regulations.

17 And I think that what has been proposed,
18 you know, just yesterday when we looked through the
19 material, I think, is very much in line with that.

20 But our read of going through it is that,
21 on both alerts and site area emergencies pretty much
22 cover all of the different situations that we would be
23 talking about kind of both with and without the off
24 site consequences.

25 So, we didn't really see kind of an

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1 obvious need for it.

2 And then, also, just based on the current
3 definition of, you know, general emergency is really
4 referring to a core melt type of a situation.

5 And since fusion power plants are not
6 capable of that kind of a situation, you know, it
7 doesn't make sense necessarily to include that
8 additional terminology.

9 Next slide, please?

10 The second question was focused on, you
11 know, what are the benefits or consequences of
12 requiring all applicants to kind of both submit a
13 maximum dose evaluation as well as a specific
14 emergency response plan kind of independent of looking
15 at the 30.72 Schedule C quantities.

16 And the main conclusion that we kind of
17 came to is it wasn't obvious why fusion would
18 necessarily need to be treated differently than any
19 other 10 CFR 30 licensed, you know, facility.

20 When you kind of look at the evaluation of
21 the maximum dose to an off side individual being under
22 1 REM, you can really reliably do a lot of that with
23 the deterministic analysis tools that we already have
24 just given that we understand the quantities and types
25 of radioactive material that we would be having at

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1 these types of facilities.

2 And the idea of kind of, you know, trying
3 to extend that to potentially include some sort of a
4 probabilistic risk assessment or probabilistic safety
5 assessment, it's challenging to construct those models
6 Because a lot of these are first of a kind components,
7 hence, they don't have the failure rate data that
8 exists in order to create those models.

9 So, therefore, the, you know, the
10 potential that you would -- model that you would
11 generate necessarily wouldn't be as useful information
12 just given that a lot of the key data inputs to
13 construct that model don't really exist now.

14 And then, you know, the final point on
15 this is, if the applicant can, you know, reliably
16 demonstrate that you would remain under 1 REM in an
17 accident scenario during a release of radioactive
18 material, then the -- it did not necessarily seem to
19 be any clear benefit to also require an emergency
20 response plan given that, you know, that is kind of
21 the threshold that is currently written into the Part
22 30 regulations.

23 Next slide, please?

24 And then, the third question that was
25 asked was the potential addition of a requirement for

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1 protecting on site personnel and then, coordinating
2 with fire, medical, local law enforcement.

3 When we went and kind of read through what
4 was covered under site area emergency, we think that
5 this is already covered underneath that section.

6 So, we, you know, didn't necessarily see
7 that there was a need to kind of include it again, you
8 know, at the end of 30.32 section.

9 So, didn't see any obvious benefit on that
10 one.

11 Next slide, please?

12 Then on to the activated material, there
13 was a suggestion kind of brought up in an earlier
14 public meeting that, you know, applicants might list
15 out every single activated isotope separately on a 10
16 CFR 30 license application.

17 But according to the current practice of
18 license applications in Part 30 now, we don't think
19 that's necessarily standard practice.

20 And if you were to kind of list out every
21 single activated isotope, it would bring up some
22 questions such what would the minimum half life be and
23 the justification for those isotopes in there?

24 And if an isotope only exists for a small
25 fraction of a second, does it make sense for it to be

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1 listed on the application given that it would decay
2 away significantly in advance of any waste disposal or
3 material handling type of situations?

4 So, the thing that we recommend is just
5 kind of sticking with what we believe the current best
6 practice is on listing activated materials in license
7 applications, which is in the table in kind of the up
8 front part of the application, you know, just
9 describing when you're talking about activated
10 material is, you know, any radioactive materials,
11 Atomic Numbers 1 through 83, which is either integral
12 to fixed equipment and structures or it's the removed
13 equipment that you would do prior to disposal.

14 Next slide, please?

15 And then, on to the security, I think this
16 also is kind of updated given the documents that the
17 NRC shared today.

18 So, we're very much in full agreement, you
19 know, with the NRC staff that requirements of 10 CFR
20 20, you know, really kind of effectively covered the
21 near-term designs of fusion power plants.

22 And then, when I was kind of reading
23 through the draft material that was shared, it said,
24 kind of if the facility has either Category 1 or
25 Category 2 materials, then, you know, you would need

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1 to look to 10 CFR 37.

2 The main point that we really wanted to
3 share on this is, as of the list that's currently in
4 Appendix H Part 37 now, we don't really envision
5 fusion power plants having any of those kind of
6 concentrations of Category 1 or Category 2 material.

7 So, as far as we understand, kind of with
8 our designs and some of the other designs that we've
9 seen, we don't think you would necessarily be
10 broaching that threshold into 10 CFR Part 37.

11 Obviously, tritium is not listed in there
12 either by the NRC or the IAEA.

13 Then, it would kind of look at the total
14 radioactive material hazard, you know, tritium is a
15 much lower energy beta emitter compared to the rest of
16 the list of the Category 1 and Category 2 isotopes
17 that have, you know, a much higher energy and more
18 total dose effective equivalent type of radiation.

19 Then, finally, just given the fact that
20 tritium has really been shipped across the United
21 States, you know, very effectively for a very long
22 period of time in certified containers, both in the
23 United States as well as Canadian certifications.

24 You know, the increased frequency of the
25 shipments that you would need in order to bring the

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1 tritium to a fusion power plant really doesn't kind of
2 change the overall hazard given that these storage and
3 transportation containers have already been certified
4 and used for a very long period of time.

5 Next slide, please?

6 And then, finally, a point on operator
7 training, so, as is kind of already exists in NUREG-
8 1556 Volume 21, which is, you know, the basis for
9 which, you know, Volume 22 is being developed, there
10 already is, you know, a pretty well developed section
11 on training requirements for individuals that are
12 responsible for the radiation and safety program for
13 the facility.

14 Just given the fact that that is one of
15 the main roles that can have an impact on public
16 health and safety and, therefore, having appropriately
17 qualified person and appropriate training and all of
18 the other infrastructure that goes along with that,
19 you know, is really the kind of the major focus of
20 that.

21 And the part that's important to kind of
22 keep in mind for fusion facilities is that the low
23 radiological risk is really kind of, by virtue of the
24 design, as opposed to operator action.

25 You know, this is kind of, again,

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1 different from a fission facility where operator
2 action can have an impact on radiological safety.

3 When you look at the operators for fusion
4 facilities, you know, they're really focused on kind
5 of maintaining, you know, efficient operations.

6 And then, not damaging the plant's
7 equipment, hence, you know, making the company's
8 investment, you know, be worth a lot less.

9 You know, it's really, their role is
10 focused much more on investment protection and
11 efficient operations and not necessarily radiological
12 safety.

13 So, when you kind of look at what is the
14 need from a regulatory standpoint from a, you know, an
15 operator training program, it really, I think, makes
16 more sense to have it be under the licensee's
17 responsibility to ensure their own people are
18 appropriately trained.

19 But since that doesn't play a role in
20 assuring radiological public health and safety,
21 including requirements on operator training programs,
22 you know, probably aren't needed.

23 And according to the table of contents
24 that I think I saw this morning, I don't believe
25 that's in there.

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1 But I just wanted to emphasize that.

2 And with that, I think that is the end of
3 our slides.

4 So, thank you very much for your time.

5 Again, really, really appreciate all of
6 the time and effort and engagement for everyone here
7 in, you know, moving this process forward.

8 MR. ANDRUKAT: All right, fantastic.

9 Thank you, Mike and thank you, Tyler.

10 So, this concludes the presentation
11 portion of today's meeting.

12 You know, speaking for the staff, if I can
13 for a second, I appreciate all of the feedback in the
14 presentations given thus far and especially the time
15 and the effort that went into these.

16 I really do appreciate that it's not just
17 identifying issues of feedback, it's also providing
18 best views and providing basis and examples we have to
19 consider.

20 So, the staff will take these in addition
21 to the feedback we've received to date as we continue
22 to develop our proposed rule package.

23 So, I do appreciate that.

24 So, with that, hopefully, you guys can
25 still hear me, but the -- I think we're going to move

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1 it on to the question and answer session.

2 So, with that, we can do the raise hand
3 feature.

4 For those that are on the bridge line
5 only, it's star six to unmute to let us know that you
6 do have a question.

7 Again, it's a question or comment, excuse
8 me.

9 Again, we do ask for the raised hand, wait
10 for us to call on you. This is just so we can go one
11 by one.

12 In addition, when it is your turn to
13 speak, we do ask that you give your name and your
14 affiliation.

15 And with that, I see that we're already
16 starting to get some hands raised.

17 So, let's see if I can jump over to that
18 here real quick.

19 Okay, so, we have Don, I see he was the
20 first one to raise his hand.

21 Go ahead, Don.

22 MR. GREGOIRE: Hi, yes, this is Don
23 Gregoire from Zap Energy.

24 I had a chance to briefly look at the
25 draft NUREG guidance.

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1 And a couple questions, and I know you
2 didn't really bring it up here, but in the NUREG-1022
3 Volume 22, there's a section 8.5.3 that mentions
4 environmental review.

5 So, very curious about where that's going
6 to and how that's going to be considered?

7 And then, the second question, and I'll
8 leave it with that, is related to the new security
9 section, security program, which is going to be
10 8.10.12.

11 But you also have a section on 8.10.3 for
12 material control and accountability which was where
13 security seemed to be talked about.

14 So, I'm curious as to how those two are
15 going to be separated out differently?

16 And I'll leave it at that.

17 MR. WHITE: Don Palmrose, could you take
18 a shot of answering that question, please?

19 MR. PALMROSE: Yes, this is Don Palmrose.
20 I'm a senior reactor engineer and an environmental
21 COE, also in the Office of NSS.

22 We are currently looking at using NUREG-
23 1748 that we have also used for other material
24 licensing as our guidance for the environmental
25 review.

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1 MR. GREGOIRE: Okay.

2 It just seemed odd that you would add this
3 section to the NUREG-1556 on environmental reviews.

4 MR. PALMROSE: Well, this section has been
5 included in other volumes in NUREG-1556 before.

6 MR. GREGOIRE: Okay.

7 I compared it with the particle
8 accelerator one in volume 21 and I didn't see it in
9 that one, so maybe I missed it.

10 But on the security one, how are you
11 separating out the two concepts there? Material
12 control and accountability and security programs?

13 MR. PALMROSE: I don't know if Duncan or
14 Duane wants to take that one?

15 MR. ANDRUKAT: Duane?

16 MR. WHITE: We're still writing those
17 sections.

18 This is Duncan White.

19 We're still working on those sections but,
20 material accountability, again, is, you know, is how
21 much material you're going to have on site.

22 The way it's written now is those are
23 going to be separated. So, security will be separated
24 from what we're calling material accountability. And
25 we may consider revising the titles of that.

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1 Actually, we had a discussion earlier
2 today, you know, how we're going to handle those write
3 ups in fact.

4 But the way we have it right now is
5 security will be a separate -- a completely separate
6 section from inventory and material accountability.

7 MR. ANDRUKAT: Duane, did you have
8 anything to add to that?

9 MR. WHITE: No, I didn't have anything
10 additional.

11 But generally, we do separate material
12 accountability from security.

13 MR. ANDRUKAT: Fantastic.

14 All right, okay, let's see, let's go back
15 to our next person, is it Laila?

16 MS. EL-GUEBALY: Yes, could you hear me?

17 MR. ANDRUKAT: Yes, ma'am.

18 MS. EL-GUEBALY: Okay.

19 Now, regarding the radioactive waste, you
20 focused on disposal.

21 And if you look at the latest trend in
22 decommissioning, actually, now, people are suggesting
23 the recycling in the clearance of all radioactive
24 materials, whatever the source is, fission or fusion.

25 And so, I have two questions now for the

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1 NRC.

2 Is there any effort to regulate the
3 recycling process of radiated fusion materials?

4 The second one, any plan to develop limits
5 for fusion that employs more than the four alloys
6 evaluated in the 2003 NRC clearance documents?

7 MR. WHITE: I'll take that one. I'll
8 answer part of the question.

9 The waste people who do recycling, you
10 know, we call them waste brokers, they are licensed
11 for that particular activity regardless of where they
12 receive the waste from, you know, commercial,
13 academic, or wherever.

14 So, that -- so, those -- that would be
15 licensed, not specifically for fusion, but it would --
16 they would be licensed for that activity.

17 And that's kind of how we would handle
18 that.

19 Are we going to -- have we done anything
20 specifically to look at that, particularly for fusion
21 waste and recycling?

22 No, we have not done that yet.

23 Christianne, is there anything else you
24 want to add?

25 DR. RIDGE: No, I understand the question,

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1 but as Duncan said, no, we have not looked
2 specifically at recycling yet.

3 And I would just add to what Duncan said
4 about the waste brokers, and Duncan, you're the
5 materials -- the state materials expert here, but my
6 understanding is that is something that is generally
7 licensed by the state -- Agreement State Programs.

8 And that, right now, in the United States,
9 that that's how that is handled, that release of
10 radioactive materials under, you know, what, I guess,
11 release levels are the best way to call those.

12 Those are done under some state programs
13 and there is not a federal program for that.

14 MR. WHITE: Yes, just to -- and again, the
15 Agreement States who do regulate them and there's, you
16 know, for example, there are waste brokers located in
17 Tennessee, Washington, South Carolina, a few other
18 states, of course, too.

19 But they generally follow federal --
20 generally follow NRC guidance and they have similar
21 programs to what NRC has in terms of how they license
22 and inspect them.

23 But they -- but, clearly, those waste
24 broker facility and Agreement States are under, you
25 know, under the Agreement State Program, so they were

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1 -- they would follow what the guidance that we already
2 have in place for that.

3 MS. EL-GUEBALY: Okay.

4 My second question is for the peers.

5 Are there any efforts to update the
6 document that you issued in 2003 to be applicable to
7 fusion?

8 Because in this document that you have,
9 it's just the four alloys. And in fusion, you have
10 two million alloys.

11 MR. ANDRUKAT: Laila, do you mind just for
12 --

13 MR. WHITE: Yes, I think --

14 MR. ANDRUKAT: I don't know if everyone
15 heard the last part of that.

16 MS. EL-GUEBALY: Okay.

17 My original question is that are there any
18 plan by the NRC to develop clearance limits for
19 fusion?

20 Because in fusion, we have more than the
21 four alloys that you have in the 2003 NRC clearance
22 documents.

23 So, we are stuck if we have many alloys in
24 there and we only have four alloys, which is steel,
25 aluminum, copper, and concrete.

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1 We have much more than this in fusion. We
2 don't know which -- if we evaluate the clearance of
3 these materials, if our fusion materials, we have a
4 lot of uncertainty in there.

5 So, for example, the IAEA would have a big
6 table of about 2070 elements that we can use regards
7 they want to divide them into alloys that like the one
8 that you have in the 2003 clearance limits.

9 So, are there any efforts to help the
10 fusion program by getting -- updating your document or
11 getting more like a whole list of elements that we can
12 use and not to divide them into alloys like the one
13 that you had before?

14 DR. RIDGE: Specifically, with respect to
15 clearance levels, there is not an effort at this time
16 as part of this limited rulemaking.

17 MS. EL-GUEBALY: Any plan in the future to
18 do something about it?

19 MR. WHITE: We're not aware of any right
20 -- any plans right now.

21 MS. EL-GUEBALY: Okay.

22 MR. WHITE: But thank you for that.
23 Appreciate that feedback.

24 MR. ANDRUKAT: Okay. I'll go ahead and
25 move on to Matthew. Go ahead and unmute yourself.

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1 MR. LIPKA: Hello, this is Matthew Lipka
2 from TAE. Thanks so much for the presentations today
3 and also the evident willingness to take on board the
4 discussion and feedback in previous sessions.

5 I had a question for Cindy related to your
6 presentation on emergency plan and procedures. I
7 heard you say that there isn't a plan to modify the
8 regulatory text at this time, but there are plans to
9 update the guidance. And I was wondering if you could
10 elaborate a little bit about what the guidance changes
11 might be needed there are, and whether any of them are
12 related to the three questions that you asked last
13 time and that Tyler recapped today. Thank you very
14 much.

15 MS. ROSALES-COOPER: Sure, thanks for the
16 question. So as I mentioned earlier, our guidance is
17 going to be modeled after existing guidance in 1556.
18 I'm not at liberty right now to go into any specifics
19 because as I said it's still under development. And
20 if you refer back to the slide that I have, I cover at
21 a high-level the things we are going to be focused on.

22 The only tie-in I think for the three
23 questions that I asked on November 9th would be where
24 we just restate the things that we will be looking for
25 from those on-site emergency procedures should they be

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1 needed. And that would be it.

2 MR. LIPKA: Thank you.

3 MS. ROSALES-COOPER: Sure.

4 MR. ANDRUKAT: Okay. Let's move onto --
5 is it Sai Zhang? Am I -- I don't know if I'm saying
6 that right.

7 MS. ZHANG: Yes. Can you hear me though?

8 MR. ANDRUKAT: Yes.

9 MS. ZHANG: Oh, this is Sai Zhang from
10 Idaho National Lab. I have a question regarding the
11 licensing basis event selection, so that might be a
12 question for Cindy as it may relate to the maximum
13 dose evaluation. So what are the current thoughts of
14 how to determine the licensing basis events? Like
15 would you encourage a risk-informed approach or it's
16 more like a deterministic -- or you kind of allow the
17 flexibility to the license applicants to determine
18 which method can be used?

19 MR. WHITE: I'll take a first crack and
20 let Cindy weigh in, too.

21 Since we're doing -- writing a guidance
22 document that's really technology-neutral, we --
23 there's going to be different types of designs coming
24 in. Those are all going to have some -- those designs
25 are all going to influence any potential offset

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1 consequences. So we're going to rely on the applicant
2 that -- doing -- looking at what they have and looking
3 at what's realistic and a series of events that would
4 result in some sort of off-site consequences as part
5 of their evaluation. But again, our guidance may have
6 some things to consider.

7 But again, when it comes down to actual
8 doing the evaluation it's going to be very design-
9 specific because again there's different types --
10 there are a number of different technologies out
11 there, different types of -- even within the --
12 similar types of, you know, fusion category. There's
13 different types of designs. And again, how that --
14 off-site consequences will be dependent on that in
15 that particular facility and how it's designed. So
16 that's really what we're looking for.

17 MS. ZHANG: Okay. Yea.

18 MR. ANDRUKAT: Okay. And, Cindy, I don't
19 know if you wanted to add to -- I know Duncan gave a
20 pretty good response there, but --

21 MS. NOLAN: Dennis, so Cindy had to step
22 away for a moment, so I just want to thank Duncan for
23 his response and I'll make sure that Cindy does get
24 the question in case there's any more follow-up at a
25 later time that she could provide. But yes, I just

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1 want to agree with Duncan at this time. Thanks.

2 MR. ANDRUKAT: Awesome. Okay. Thanks,
3 Caty.

4 Okay. Let's move onto -- looks like we
5 have a Dr. Robert next. And please don't forget to
6 un-mute yourself if you are speaking. And if you're
7 not speaking, please make sure you are muted. Thank
8 you.

9 DR. FLORIAN: All right. Can you hear me?

10 MR. ANDRUKAT: Yes.

11 DR. FLORIAN: Oh, okay. Great. First of
12 all, this has been thoroughly fascinating. I just
13 want to briefly say that I come from having spent 40
14 years in the 10 CFR Part 50 world in commercial PWR
15 nuclear plants, so I want to -- and spent a lot of
16 time in licensing, so I've got a regulatory-related
17 question.

18 Since there are a myriad of designs of
19 fusion machines, as people have been calling them,
20 just like we've got a myriad of small modular reactor
21 designs out there right now and it hasn't condensed
22 down like the Part 50 world had PWRs and BWRs -- so
23 going back to something that Andrew talked about from
24 Helion, for instance. He gave one example of where,
25 okay, if I've got a fusion machine that's based on

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1 deuterium and helium-3 producing stable isotopes with
2 no radioactive byproducts or radiation, then we
3 wouldn't need certain aspects of Part 30, for instance
4 like the emergency plan, et cetera, et cetera.

5 In the Part 50 world one of the things
6 that my experience has been is that every time we had
7 gone into the NRC for an exemption request under Part
8 50.12 -- once a whole string of plants start coming in
9 the NRC says, okay, stop -- getting exemption requests
10 approved and processed is pretty arduous. Let's just
11 go ahead and change the regulation.

12 So with all these different designs where
13 some may produce byproduct material, some many not
14 produce byproduct material, some may produce certain
15 levels of radiation that would be governed under Part
16 20, how does the NRC and the industry, like say the
17 FIA working with the NRC, plan to address the
18 applicability of various aspects of these regulations
19 that may or may not apply to specific designs to avoid
20 having to come in with a whole myriad of exemption
21 requests?

22 Are we forward-looking enough to foresee
23 all these different aspects and try to build specific
24 exceptions into the regulations? I can just foresee
25 what happened when I first started working in the

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1 industry, particularly after TMI, where we were
2 basically designing as we were building and coming in
3 with exemption requests left, right, and center. So
4 I can envision the industry both in the SMR world and
5 the fusion world basically repeating history from 40
6 or 50 years ago. What is the plan to address that
7 time of regulatory environment?

8 MR. WHITE: Yes, I'll answer that
9 question. Thank you for the question. Under the Part
10 30 approach to licensing we -- the requirements that
11 are actually in the regulations are actually fairly
12 high-level, and particularly for fusion the direction
13 from the Commission was to write -- to have
14 requirements that are very technology-neutral and high
15 level. And the way we do license -- and how do we
16 address the differences between one fusion device
17 versus another device if they're Part 30?

18 And our plans are, and it's consistent
19 with how we do it for other types of byproduct uses,
20 is that the guidance document becomes the main vehicle
21 for getting the information that we need to ensure
22 that the licensee will operate their facility and the
23 fusion device in a safe manner and protect public
24 health and safety and the environment.

25 So when we write our guidance document we

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1 may have different sections that frankly may not apply
2 to certain types of devices. And for that reason the
3 applicant wouldn't have to respond to that. But what
4 we do ask the applicant to do for areas that do apply
5 and they do have to provide information -- they make
6 certain commitments and those commitments are
7 incorporated into the license. And by incorporating
8 them into the license we make them legally binding.

9 And of course -- and that's legally -- and
10 the way we work at NRC is anything that's in the
11 license and it's legally binding is as enforceable as
12 if it was in the regulation. So by doing it this way
13 we don't have to have a myriad of regulations and do
14 exemptions that they would -- may have to do under
15 Part 50 and the other nuclear power plant regulations.
16 So that's how our approach is.

17 So if there's a particular section in the
18 guidance that doesn't apply to a particular fusion
19 device that we -- under Volume 22, we don't expect an
20 answer for it. It's that simple. But where do expect
21 answers, that's where we would get the information and
22 the commitment that would be incorporated into the
23 license.

24 DR. FLORIAN: Okay.

25 MR. WHITE: That answer your question?

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1 DR. FLORIAN: Yes. Yes. No, I appreciate
2 that. I just was -- because I had just been through
3 the AP1000 process, too, and I sadly say that we saw
4 history repeat itself. So I was just hoping that with
5 SMRs and fusion that we have learnt from our past.
6 But, no, I appreciate that. Thank you very much.

7 MR. WHITE: Yes. No problems. Yes.

8 DR. FLORIAN: Thank you.

9 MR. ANDRUKAT: And I think -- this is
10 Dennis Andrukatt and I think it is important to note
11 that the Part 30 and the material -- byproduct
12 material framework is definitely quite different than
13 how the NRC -- how we regulate and set up the
14 framework for the nuclear reactors on the fission
15 side, right? So Part 50, Part 52 can be a bit more
16 technology-dedicated and a bit more specific, and thus
17 you get some possibly more exemptions.

18 Part 30, like Duncan said, is a bit more
19 high-level. And I think Duncan did a good job
20 explaining both how we're going to use the guidance,
21 including in the license, which I think is a pretty
22 good important point.

23 MR. WHITE: One of the advantages of Part
24 30, it's a very flexible set of requirements for a
25 very large broad -- a very broad scope of types of

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1 active material uses from very small things up to
2 very, very large amounts of radioactive material. So
3 I think it's -- fusion fits well here.

4 MR. ANDRUKAT: Right. Right. I think it
5 definitely helps for sure.

6 Okay. I guess it looks like we can move
7 on to Bobby. Go ahead, Bobby.

8 MR. ABU-EID: Yes, can you hear me?

9 MR. ANDRUKAT: Yes.

10 MR. ABU-EID: Yes, I would like to respond
11 to Dr. Laila's questions about --

12 MR. ANDRUKAT: Hey, Bobby?

13 MR. ABU-EID: Yes, can you --

14 MR. ANDRUKAT: Oh, Bobby, just don't forget
15 to tell us who you're affiliated with, please.

16 MR. ABU-EID: Can you hear me?

17 MR. ANDRUKAT: Yes.

18 MR. WHITE: Yes.

19 MR. ABU-EID: Okay. I'm trying to respond
20 to Dr. Laila's question about the recycling. I think
21 in our case we declared such things as usable material
22 for unrestricted use. And we are adopting IAEA
23 criteria, which is 10 microsievert, if it is to be
24 used for under no restrictions. And if it is to be
25 disposed in certain areas and landfill it is about 1

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1 to 5 millirems, the criteria. I think your question
2 regarding recycling is to reuse the material for --
3 because it is expensive material that you're talking
4 about. And this is depends on the kind of use and the
5 kind of dose impacts in the recycling of the material.
6 So that's why I'll try to differentiate between
7 clearance and recycling. So it is important, you
8 know?

9 The other thing that -- just I want to
10 mention that when we talk about the fusion system as
11 well as the machine, I think we need to be careful our
12 focus on the rad material and safety rather than the
13 machine because we don't know even up to now the exact
14 design of the machine. How is it going to be
15 designed? So I believe what -- when we talk about the
16 system would cover rad material generated or stored
17 that is associate with the machine. These are the two
18 points I'd like to clarify. Thank you.

19 MR. ANDRUKAT: All right. Thanks, Boby.

20 And just for the record Boby is with the
21 NRC staff.

22 And looks like we have Mr. Don. You've
23 got your hand raised again?

24 MR. GREGOIRE: Okay. Yes, I didn't mean
25 to monopolize the discussion, but --

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1 MR. ANDRUKAT: No that's okay.

2 MR. GREGOIRE: -- just a few more
3 questions on the draft NUREG that caught my eye.

4 One is the Section 872 that was being
5 proposed, Individuals Authorized to Handle Licensed
6 Material. And I see -- and this is just maybe a
7 subtle thing, but emphasis on the verb use as opposed
8 to handle or any of the other verbs that are currently
9 used in Part 30 which include produce, transfer,
10 receive, acquire, own, possess. Whatever. But they
11 talk about in 872 an emphasis on authorized users. I
12 think particle accelerator they actually talk about
13 handling.

14 So anyhow, is there something going on
15 here that is trying to limit this concept as if fusion
16 is only going to involve use of byproduct material as
17 opposed to handle or possess or anything else? Just
18 looking to see if there's any --

19 MR. WHITE: Yes, this is Duncan White
20 again. No, there's not. Use is a common -- we use it
21 often in the Part 30 world of -- to -- with regard to
22 -- we talk about possession and use all the time. So
23 use is just our way of -- in lieu of saying handling
24 we will say use. I mean, that's --

25 MR. GREGOIRE: Yes, the only reason I

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1 brought it up was because Particle Accelerator Volume
2 21 specifically uses the word handle and --

3 MR. WHITE: Yes.

4 MR. GREGOIRE: -- doesn't use the word
5 use. So it just stood out to me as a --

6 MR. WHITE: Yes, it's -- there's no
7 particular -- nothing specific about -- even by staff
8 to focus on anything particular. It was just
9 something -- it's a term that we often use is that
10 term. Appreciate the feedback and the -- pointing
11 that out. Appreciate it.

12 MR. GREGOIRE: And the last question
13 really, it kind of alluded to more -- I'm trying to
14 understand the staff's position up to this point on
15 the definition of fusion system and maybe the
16 disconnect with particle accelerator. Is there
17 something that is problematic with the staff in
18 associating those two concepts together? I'd like to
19 try to understand that a little more.

20 MR. WHITE: I'll start off and then I'll
21 let others jump in. The way we approached it is again
22 the NRC does not regulate the accelerator device
23 itself. We only regulate the rad material that's
24 produced by it. So the definition that we developed
25 was to focus on the radioactive material that was --

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1 it's either -- it's produced or -- and the radiation
2 associated with that. So that was kind of the genesis
3 of that is to use what's in the Atomic Energy Act and
4 say -- which define byproduct material. And 1183
5 talks about its material that's produced. And again,
6 by demonstrating we -- there's -- that we have
7 jurisdiction over that and there's possession of that,
8 then we can go in and start further talking about --
9 and going forward with that. That was kind of the
10 genesis behind that.

11 And again, the definition was designed to
12 say, okay, well, wherever there's -- like an
13 accelerator you're going to have activation of
14 components that you want activated and there's going
15 to be activation of components you don't want
16 activated and they all are impact -- and they all --
17 we have to license them all like we do with -- like we
18 do when they're under a particle accelerator license.
19 We active -- we license obviously the targets and we
20 also license the shielding that's activated. So this
21 is -- so we -- it's kind of the same approach. So we
22 -- the definition was written in that respect that
23 anything that's impacted by it. That's why we wrote
24 it the way we did. So that's kind of the overall
25 general approach to doing that.

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1 Again, because particle accelerator is
2 only defined in the regulations, not defined in the
3 Act. It's only -- with relationship to what we're
4 working here with fusion and fusion devices byproduct
5 material is the only thing that's -- that's the
6 clearest tie we have that's in the Act, not particle
7 accelerator. That's why we focused on that.

8 MR. GREGOIRE: Yes, and that definition in
9 the Atomic Energy Act does point to material produced
10 by particle accelerators.

11 MR. WHITE: It does.

12 MR. GREGOIRE: And so it seems like a
13 natural fit to be able to conclude the same, that a
14 fusion system is essentially a particle accelerator
15 and it's being -- producing byproduct material.

16 MR. WHITE: Yes.

17 MR. GREGOIRE: So again, I think we
18 probably need more discussion on this --

19 MR. WHITE: Yes.

20 MR. GREGOIRE: -- but I didn't want to tie
21 it up.

22 MR. WHITE: That's exactly why we have
23 these meetings is to get people's feedback.

24 I see, Theresa, you raised your hand. You
25 want to add to this?

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1 MS. CLARK: Yes, thanks. And I'm just
2 going to jump ahead of other people. Sorry. Manager
3 prerogative, I guess.

4 So I think these are the conversations
5 that we're having internally on which terms we should
6 define and which terms don't need to be defined and
7 how we can do it the simplest and most elegant.

8 I think one of the things that we are
9 thinking about that some of the fusion companies might
10 be able to have some thoughts on is that our mandate
11 from the Commission is about near-term fusion systems
12 and our regulatory approach for those. And so we are
13 working on this Part 30 rulemaking and guidance
14 approach for the near-term fusion systems and thinking
15 about how those fit into what we've already done for
16 particle accelerators.

17 If we are making a statement that looks
18 like all fusion systems forever fit under a certain
19 definition of particle accelerator, I'm not sure we
20 have the technical evidence for that yet. I'm not
21 saying it's not true. I'm just -- we don't
22 necessarily have that in front of us. And so this is
23 where we have to think through this -- what we're
24 approached with for the near-term designs, what we
25 want to define today, and where we need to take it

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1 from there. So the books aren't shut on this. It's
2 one thing we're actively discussing. And so input
3 like this meeting and like the letter we got is
4 helpful.

5 While I have my yap open I will address --
6 there was a discussion a little bit earlier about
7 environmental reviews and I think in one of our
8 previous public meetings we talked about environmental
9 reports and the need for that. Don Palmrose who spoke
10 up earlier was one of the presenters there, if I
11 remember right.

12 So environmental reviews are part of the
13 Part 30 framework, where appropriate, let's say.
14 There are certain types of activities that have
15 categorical exclusions under our regulations, so when
16 the NRC is doing a review in 10 CFR 51.22 certain
17 types of activities: research and development and
18 education, for example, there's a categorical
19 exclusion there.

20 And so in the past some types of licensees
21 might not have had the environmental report and then
22 either an environment assessment or an environmental
23 impact statement, if they're in those categories, but
24 where those categories don't apply -- for example,
25 well logging is one of those things where there are

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1 environmental reviews called out in NUREG-1556.

2 And so whether you see it or not in
3 Chapter -- Volume 21 related to accelerators doesn't
4 necessarily mean it wouldn't be applicable to a fusion
5 facility, because if you actually look at the front
6 matter of that volume it talks about like the -- I'm
7 editorializing here, but the accelerator itself is
8 just one piece of a facility. There may be other
9 activities licensed, and so it's possible that those
10 other activities would have needed an environmental
11 review. That's sort of hypothetical, but that's how
12 the puzzle pieces fit together.

13 And this is something when we put the
14 whole guidance out and have another meeting in a few
15 months we can talk about even more.

16 MR. GREGOIRE: Thanks for the feedback.
17 Appreciate it.

18 MR. WHITE: Thanks. Andrew, I apologize
19 for calling an audible, so I'm -- jump ahead of you.
20 So I'll turn it over to you now.

21 MR. HOLLAND: Thanks, Duncan. No problem.
22 And I actually think Theresa just mostly answered this
23 in her conversation with Don.

24 I did just want to underline again that
25 industry's strong support for linking the definition

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1 of particle accelerators to fusion machines, fusion
2 systems and note that we really haven't seen any
3 opposition to this in any of the public meetings. We
4 first put this forward in July and this was the first
5 time we heard the -- kind of the more fulsome
6 discussion here of why you haven't put anything out on
7 this, that definition.

8 It's helpful to know this, and yes, would look
9 forward to in future meetings going further into this.

10 Obviously we've testified during the
11 public process prior to the decision and since that
12 everything that the -- that FIA members are planning
13 and conceivably could plan we believe fits as an
14 accelerator. And so we think that that definition
15 should work. And we've heard no one -- no intervener
16 say otherwise.

17 But I do have a better understanding now
18 with, Theresa, your discussion there with Don on this.

19 So anyway, thank you for your continued
20 engagement and look forward to continued discussion
21 here of this.

22 MR. ANDRUKAT: Thanks, Andrew.

23 And, Tyler, I see your hand is up, but if
24 I -- maybe both you guys can elaborate. I think some
25 of you guys probably know a bit better than I do, but

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1 the tie of and the want to using particle accelerator
2 as opposed to creating a new definition -- I know you
3 guys talked about some basis and bringing it back to
4 the statute and I didn't know if anyone could provide
5 a little bit more detail for that nexus of bringing it
6 back to the statute there.

7 MR. HOLLAND: Well, we think clarity in
8 regulation is really the most important thing given
9 that today even the Supreme Court is considering the
10 challenge to Chevron deference, that it's really
11 important that regulators make as clear a link as
12 possible to everything they're doing in statute. And
13 so that's one of the reasons the Fusion Energy Act in
14 Congress is progressing as well. And we propose the
15 link, the direct link between the definition for
16 fusion machine here and fusion machine there.

17 In a world where -- that could be coming
18 as soon as June of post-Chevron it's important for all
19 regulators to consider how to explicitly link to these
20 -- to statute.

21 MR. ANDRUKAT: Right. No, and I -- yes,
22 you're right. You're right. And yes, I think -- was
23 it the herring fishermen presenting something with the
24 Supreme Court on the Chevron doctrine?

25 MR. HOLLAND: Yes, yes. Exactly right.

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MR. ANDRUKAT: Right. Yes, that will be interesting.

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So -- and forgive my ignorance here. So aside from the Fusion Energy Act that's still progressing through Congress, if hypothetically -- setting that aside for a second, is there still a clarity issue with tying it to the statutes in place today?

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MR. HOLLAND: No, we're confident that your -- so far as I understand it from our members, we're confident that the direction given by the Commission and the direction that you're going right now provides sufficient clarity. It's what we're looking towards in the future, in a not-too-distant future.

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MR. ANDRUKAT: Okay.

MR. WHITE: I'll offer up something -- there's been obviously a lot of discussion on the fusion machine as particle accelerator. So maybe one thing that we could do is we could provide a discussion in the Federal Register Notice when we -- can we -- we can put a question there and maybe we can ask for it. We will write down where we are and then get some feedback, formal feedback on that. Maybe we

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1 can do that.

2 MR. HOLLAND: Okay. That would be great.

3 MR. WHITE: In addition to continuing
4 discussions at meetings like this. I'm not saying
5 this is the end of the discussion. I'm just saying we
6 could also do that.

7 MR. HOLLAND: Yes. Yes. I know of no
8 opposition to it, but --

9 MR. WHITE: Yes, I just --

10 MR. ANDRUKAT: And, Tyler, appreciate your
11 patience there. Go ahead, sir.

12 MR. ELLIS: Yes, sure. Yes, I agree with
13 what Andrew just shared of the importance of -- really
14 strict to the statutory basis of this is a pretty key
15 important point for connecting particle accelerator to
16 fusion facility.

17 I guess the question that I had is -- kind
18 of, Theresa, when you were describing -- it's kind of
19 you don't know what you don't know. And the industry
20 and a whole bunch of other stakeholders kind of shared
21 descriptions of all the different designs that they're
22 considering. Is it possible for you to describe like
23 what attributes would cause it to not be a particle
24 accelerator?

25 So like as kind of an example, there's

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1 basically four fusion fuel cycles that everyone is
2 looking at: deuterium -- deuterium/tritium,
3 deuterium/deuterium, deuterium/helium 3, proton/boron-
4 11. All of those produce byproduct material. All of
5 them have kind of radioactive material that's produced
6 and activated material. So given all that all four
7 fusion fuel cycles kind of fit neatly in that
8 byproduct material definition and all of the different
9 designs that are kind of proposed and shared now I
10 think would kind of fit within that, like what
11 potential attribute or what potential things are
12 people thinking about that might fall outside of the
13 particle accelerator definition? Because we've not
14 seen anything like that.

15 MS. CLARK: So, and Duncan or other smart
16 people on here can chime in, I think -- but since you
17 called me out first. So I think we're looking at the
18 actual words of particle accelerator in the 30.4
19 definitions and trying to make sure that things fit
20 there, right? And so if it says a machine capable of
21 accelerating electrons, protons, deuterons, et cetera,
22 in a vacuum and discharging the resultant particulate,
23 like that's pretty specific. And whether it should be
24 that specific or not is perhaps a matter up for
25 debate.

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1 But we're looking at designs like the
2 ignition facility at Livermore. Does that meet that
3 definition? I'd maybe need some technical information
4 put in front of me to make sure that that meets it.
5 It might. I'm not saying it doesn't. But we kind of
6 need to bounce those sorts of things off of the
7 particle accelerator definition. And then even so,
8 maybe there's a category of fusion generators, fusion
9 machines, fusion noun that clearly meet the particle
10 accelerator definition. And maybe we can lock that
11 down. But I think you're sensing the uncertainty in
12 categorically saying fusion is a particle accelerator.
13 That's where we're a little bit nervous.

14 MR. WHITE: Yes, I mean, for example, if
15 you look at something like the National Ignition
16 Facility at Lawrence Livermore, which is an inertial
17 fusion device. It looks very much unlike an
18 accelerator. It looks very different. But again, you
19 can -- that's the type of thing we want to make sure
20 that we're covered by that. And again, I think
21 Theresa also pointed out the point is, again, our
22 mandate is termed. So we have to be -- we want to be
23 -- stay true to -- again to what the Commission wants
24 and not try to go too far outside that.

25 MR. ELLIS: Fair enough. Well, thank you.

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1 Yes, that's very helpful. And we're happy to kind of
2 come in and meet and share some additional thoughts of
3 -- even an inertial fusion where you have laser beams
4 that kind of hit a particle, it accelerates that
5 particle in order to create fusion. So I think -- and
6 it does it in a vacuum. So we think that from a
7 technical perspective that -- even the inertial
8 systems would also fit.

9 MR. WHITE: Yes, as I said, it was
10 something we struggled with when we wrote the
11 Commission paper. Is to have it -- is it -- can we --
12 we thought -- as I said, we -- it's just we want to
13 make sure that we capture it correctly because it says
14 it's not -- and explain it clearly to others that --
15 that what that is and sometimes that's hard to do.
16 So, yes, appreciate your additional feedback on that.
17 That would be great.

18 MR. ELLIS: Yes. No. Thank you very
19 much. Appreciate it.

20 MR. ANDRUKAT: All right. I don't see any
21 other hands raised, but I do want to give it just a
22 couple more minutes just in case as we're thinking
23 about it because, I do apologize, I know folks didn't
24 -- the handout for example and the slides are fairly
25 fresh or fairly new. People did not have a chance to

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1 really go through them, so I do want to give it at
2 least a couple of minutes here just in case there's no
3 more questions.

4 MR. WHITE: Looks like we've got some
5 hands up.

6 MR. ANDRUKAT: I see Andrew Proffitt. Go
7 ahead.

8 MR. PROFFITT: Yes, sorry. Just on that
9 note, Dennis, I'll say at Helion we'll be working our
10 way through the draft guidance and certainly look
11 forward to future interactions on that. Hopefully we
12 can -- whether that be workshops or future public
13 meetings. Of if not, we can certainly communicate via
14 letter on that. So look forward to future engagement
15 on that as we get our technical folks and have a
16 chance to look through the material provided. So
17 appreciate it.

18 MR. ANDRUKAT: Fantastic.

19 And let's see, Jeff Merrifield, I think I
20 just jumped over you. Go ahead, sir.

21 MR. MERRIFIELD: Thank you very much. I
22 just wanted to make a comment, and that is I just want
23 to congratulate the NRC staff for the time and effort
24 and thoughtfulness that they've put into this. Can
25 you hear me?

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1 MR. ANDRUKAT: Yes.

2 MR. WHITE: Yes, go ahead.

3 MR. MERRIFIELD: Can you hear me?

4 MS. CLARK: Yes, we're good.

5 MR. WHITE: Yes, go ahead.

6 MR. MERRIFIELD: Okay. I broke up there
7 for a second. Apologies.

8 I was just thanking the NRC staff for the
9 time and thoughtfulness it's put into this effort.
10 Obviously you were given clear instructions from the
11 Commission to try to keep to the Part 30 approach, and
12 I think many of the comments you've made today have
13 indicated the way which you are trying to meet that
14 mandate.

15 I think some of the presentations on the
16 industry side today were done in a spirit of outlining
17 our concerns. And have not had a chance to review the
18 materials you had prepared for this meeting, so I
19 think it's going to give us an opportunity to go back,
20 look at that in a thoughtful way and provide further
21 comments as appropriate.

22 But I just wanted to -- sometimes folks
23 ask a lot of questions and there's a lot of comments
24 and I think it is appropriate to certainly give some
25 credit the NRC staff as -- in the very helpful way

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1 that they've been trying to move this along over the
2 course of the last couple years.

3 So like Andrew, I would say I think the
4 meetings have been useful and continue to be useful
5 and I think this open dialogue is getting hopefully to
6 the right place for all involved. Thank you.

7 MR. ANDRUKAT: All right. Fantastic.
8 Let's see. I don't see any other hands raised.
9 Looking at the chat don't see anything in the chat
10 except for I do see a comment about the meeting
11 summary ADAMS accession number, so very shortly here
12 I will be adding some information to the chat window.
13 But please note that meeting summaries for these tend
14 to come out at about -- or within 30 days of the
15 public meeting. What I tend to do is I will share the
16 ML number, but please note, and I'll share a little
17 asterisk there, that the -- it won't be made public,
18 of course, until finalized. So I think you'll be able
19 to see a bunch of information that just populated into
20 the chat.

21 So, Bob, I think that should answer your
22 question as well.

23 DR. FLORIAN: Yes, thank you.

24 MR. ANDRUKAT: Of course. Doing one last
25 check before I move on.

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1 Let's see. I don't see anything.

2 Okay. Duncan, was there anything else,
3 or, Theresa, that you guys wanted to say before I move
4 on here?

5 MS. CLARK: I'll just say I appreciate the
6 conversation. Like I said at the beginning, this is
7 exactly why we have these meetings. It's better to
8 hear it all now so that we can inform the documents.
9 They're easiest to address while they're being
10 written, which is exactly what we're doing right now.
11 And I think we both -- all -- both is the wrong word
12 -- alluded to a future public meeting around the time
13 that we're ready to put all of the draft guidance
14 together. We're still kind of nailing down the exact
15 timing of that. It would be in the spring sometime
16 probably. And so, whether you call that a meeting or
17 a workshop or whatever, we'll figure that out. But we
18 do intend to have further discussion of this so that
19 the first time you see the whole thing is not when it
20 goes to the Commission. That is not the plan. That's
21 it.

22 MR. ANDRUKAT: And, Duncan, looks like --
23 I don't think -- I think you're good to go?

24 MR. WHITE: I'm good to go. I'll second
25 what Theresa said.

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1 MR. ANDRUKAT: Okay. Fantastic. Speaking
2 of what Theresa just said -- yes, so looking on the
3 next slide here, some upcoming events. Yes, the staff
4 is already talking about another public meeting, so
5 the tentative time frame that we're looking at is --
6 I have early March. It could be at the end of
7 February. That is the time frame that we are looking
8 at. The point of this particular is to share the full
9 preliminary draft version of the guidance.

10 We are also going to try and get that
11 particular handout out with enough time for folks to
12 be able to look at it before the actual meeting
13 itself. So please take a -- be on the look out for
14 another public meeting.

15 As far as the workshops and the requests
16 for the workshops that we heard from some of the
17 presentations, I cannot speak to that. I cannot make
18 any guarantees. The problem that we're going to start
19 running into is trying to get to a place where we can
20 start our internal review and concurrence process.
21 And once that happens it makes it very difficult to --
22 for the staff to make any changes to the packet such
23 that we'll kind of need this in a spot that's kind of
24 done before we start our internal review and
25 concurrence process.

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1 Now, the second item here on this slide.
2 Same as before. This has not changed. Our goal for
3 the proposed rule stage; i.e., the proposed rule
4 packets with the draft guidance to be sent to the
5 Commission. We're looking at September of this year,
6 2024.

7 This slide just has some additional
8 information. Some of this is very similar to what I
9 just put into the chat. So the public meeting
10 information. So we have some ML numbers for you all
11 for today's public meeting as well as the meeting
12 summaries from the -- some recent public meetings. In
13 those meeting summaries you'll see references to the
14 presentations that -- or any handouts associated with
15 those.

16 The second set of blocks there. Public
17 information. This is the standard for our rulemaking
18 project. So we have a public website that does talk
19 about this.

20 We do have the docket. It's NRC-2023-
21 0071. That's on regulations.gov. So you can -- if
22 you're familiar with the NRC's internal ADAMS, you can
23 go there. Otherwise, you can go to this docket folder
24 under regulations.gov.

25 I will like to add that, as always, the

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1 staff does look for feedback from our public meetings.
2 And again, this particular feedback and the feedback
3 form associated with the public meeting notice -- this
4 is not the type -- it's not the feedback that we did
5 during the meeting. This is just more logistical on
6 how the meeting was run, the systems that were used,
7 et cetera.

8 So if you go back to the public meeting
9 announcement/notice, there will be a link to the
10 public feedback form. Feel free to provide us an
11 details on how to run the public meeting, how well it
12 was run, et cetera.

13 Now with that, we have some -- I put my
14 contact info, I put Duncan's contact info if folks
15 have questions on the rulemaking project. Please feel
16 free to reach out to us on that.

17 And I'm just doing one last double-check.
18 Don't see any hands raised, questions. So, many
19 thanks to everyone who attended and for the
20 discussions today. I'd like to thank especially those
21 that participated as well as our presenters. I know
22 that -- and I appreciate the time and the effort that
23 went into making the presentations, so I do appreciate
24 that.

25 And I think we're done. So I hope

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1 everyone has a wonderful evening and this meeting is
2 now closed. Thanks, everyone.

3 (Whereupon, the above-entitled matter went
4 off the record at 4:43 p.m.)

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