Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
eVINCI Subcommittee

Docket Number: N/A

Location: teleconference

Date: 08-21-24

Work Order No.: NRC-0016 Pages 1-50

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1716 14th Street, N.W.
Washington, D.C. 20009
(202) 234-4433

DISCLAIMER

UNITED STATES NUCLEAR REGULATORY COMMISSION'S ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, as reported herein, is a record of the discussions recorded at the meeting.

This transcript has not been reviewed, corrected, and edited, and it may contain inaccuracies.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

eVINCI SUBCOMMITTEE

+ + + + +

WEDNESDAY

AUGUST 21, 2024

+ + + + +

The Subcommittee met via Teleconference, at 1:00 p.m. EDT, Thomas E. Roberts, Chair, presiding.

COMMITTEE MEMBERS:

THOMAS E. ROBERTS, Chair

RONALD G. BALLINGER, Member

VICKI M. BIER, Member

VESNA B. DIMITRIJEVIC, Member

CRAIG A. HARRINGTON, Member

GREGORY H. HALNON, Member

WALTER L. KIRCHNER, Member

ROBERT P. MARTIN, Member

SCOTT P. PALMTAG, Member

MATTHEW W. SUNSERI, Member

ACRS CONSULTANTS:

DENNIS BLEY

STEPHEN SCHULTZ

DESIGNATED FEDERAL OFFICIAL:

WEIDONG WANG

CONTENTS

P R O C E E D I N G S

(1:00 p.m.)

CHAIR ROBERTS: It is now 1:00 o'clock and this meeting is called to order.

This is a meeting of the eVinci Subcommittee of the Advisory Committee on Reactor Safeguards.

I am Tom Roberts, Chair of today's Subcommittee meeting.

ACRS members in attendance in person are myself, Vicki Bier, Bob Martin, Ron Ballinger, and Craig Harrington. Online, we have Greg Halnon, I can see, and everybody else is off the screen.

So, if you could just identify the members, or the members can identify themselves. That's probably the way to do this.

MEMBER SUNSERI: Matt Sunseri is online. Matt.

CHAIR ROBERTS: Matt Sunseri?

MEMBER SUNSERI: Yes.

MEMBER KIRCHNER: Walt Kirchner online.

MEMBER DIMITRIJEVIC: Vesna Dimitrijevic is online.

CHAIR ROBERTS: Okay. Thank you, guys.

MEMBER HALNON: Greg Halnon is online.

CHAIR ROBERTS: Okay.

And our consultants in the room are Steve Schultz and Dennis. I see Dennis is online, Dennis Bley.

So, if there is anybody who is either a member or a consultant that I didn't introduce, please speak up now.

(No response.)

Okay. Great.

Mr. Weidong Wang of the ACRS staff is the Designated Federal Officer for today's meeting.

And no member conflicts of interest were identified for today's meeting.

During today's meeting, the Subcommittee will be doing a briefing on the Topical Report and the staff's Draft Safety Evaluation for the Westinghouse Principal Design Criteria, or PDC, Topical Report for the eVinci Microreactor.

The PDCs are integral to the review of the unique aspects of a nuclear power plant design. PDCs aid in the NRC staff's evaluation of applicable regulations that allow the NRC staff to assess with reasonable assurance that advanced reactor technology will be conform to the proposed design bases with adequate margins of safety.

We're reviewing this report today because it serves as a foundation for the safety design approach of the eVinci Microreactor. And I'll add that this is the first, as far as I could tell, of the microreactor or small reactor advanced reactor designs. It's not a gas reactor or a sodium fast reactor. So, it probably will be mentioned in this hearing how you adapt it to what's written for those different reactor technologies to what is really a very different reactor technology.

And so, we're going to hear presentations by the NRC staff and Westinghouse regarding this matter.

A portion of the presentations by the Applicant and the NRC staff may be closed to discuss information that is proprietary to the Licensee and contractors, pursuant to 5 U.S. Code 552b(c)(4).

Attendance at the meeting that deals with such information will limited to the NRC staff and its consultants, Westinghouse, and those individuals and organizations who have entered into an appropriate confidentiality agreement with them. Consequently, we will then confirm that we have only eligible observers and participants in the closed portion of the meeting.

So, per the schedule, we actually go into

closed session in about an hour. So, at that point, we'll take about a 15-minute break and the staff will switch over the presentation to the closed presentation and recognize folks, and we'll validate everybody who is in is authorized to be in.

Okay. The ACRS was established by statute and is governed by the Federal Advisory Committee Act, FACA. The NRC implements FACA in accordance with regulations found in Title 10 of the Code of Federal Regulations, Part 7.

Per these regulations and the Committee's Bylaws, the ACRS speaks only through its published Letter Reports. We hold subcommittee meetings to gather information for preparatory work as a part of deliberations and final decisions on whether to issue a Letter Report at a full Committee meeting. All member comments should be regarded as the individual opinion of that member only, not a Committee position.

The rules of participation in all ACRS meetings, including today's, were announced in a June 13th, 2019, Federal Register Notice.

The ACRS section of the U.S. NRC public website provides our Charter, Bylaws, member guidance, subcommittee structure, agenda, Letter Reports, and full transcripts of all full and subcommittee

meetings, including the slides presented.

The meeting notice and agenda for this meeting were published there and can easily be found by typing "about us ACRS" in the search field of the upper right corner of the website.

The ACRS, consistent with the agency's value of public transparency in regulation of nuclear facilities, provides opportunity for public input and comment during these proceedings. We receive written statements and requests to make an oral statement from the public, and we have set aside time on the agenda at the end of the meeting -- and that will be at the end if the public part of the meeting -- for any comments from members and the public listening into this meeting. The Subcommittee will consider all public comments, as appropriate.

A transcript of the meeting is being kept and will be made available.

Today's meeting is being held in-person and over Microsoft Teams for the ACRS staff, the members, the NRC staff, Applicant, and members of the public. The Teams link information with the telephone bridge was placed on the agenda on the ACRS's public website.

When addressing the Subcommittee,

participants should first identify themselves, and then, speak with sufficient clarity and volume, so that they can readily be heard. When not speaking, we request that participants mute your computer microphone on Teams or the phone, if you're on the bridge line, by pressing *6.

Please do not use any virtual meeting chat features to conduct sidebar discussions related to the presentations. Rather, limit use of the meeting chat function to report IT problems, such as an inability to hear speakers or see presentations.

Also, for everyone in the room, please put all your electronic devices in silent mode, including muting your speakers and microphone on your laptops.

In addition, please keep sidebar discussions in the room to a minimum since the microphones in the ceiling are live.

Finally, for the presenters, the microphones at your tables are unidirectional. So, you'll have to speak into the front of the microphone in order to be heard online.

We're now proceeding with the meeting. Does someone from the staff management want to start off the meeting?

MR. PHILPOTT: Thank you. Yes.

Good afternoon. My name is Steve Philpott. I'm the Acting Chief of one of the Advanced Reactor Licensing Branches in the Office of Nuclear Reactor Regulation.

As Member Roberts mentioned, the purpose of this Subcommittee meeting is to discuss Westinghouse's Principal Design Criteria, or PDC, Topical Report for the eVinci design. The PDC Topical Report describes Westinghouse's development of the Principal Design Criteria for the eVinci Microreactor. Westinghouse developed these PDCs using the guidance from Reg Guide 1.232, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors," which we often refer to as the Advanced Reactor Design Criteria.

Westinghouse is implementing the Licensing Modernization Project, or LMP, methodology in their licensing approach and they use the LMP process and the technology-inclusive content of the application project guidance to risk-inform their PDCs.

Westinghouse has indicated that they intend to apply this PDC Topical Report in support of future Standard Design Certification applications and potentially other licensing applications for the eVinci Microreactor.

We would like to express our thanks to the ACRS, the Subcommittee, for taking the time and your interest in reviewing this important topic.

I also want to thank the staff, NRC staff and Westinghouse, for your time preparing for this meeting and the presentations that the ACRS is going to hear today.

I did want to add one additional note. Our primary reviewer from the NRC staff is not feeling well today. So, when we get to the NRC presentations, we may need to adjust somewhat or we'll take it as it comes.

Yes, so we look forward to the conversation today. And if there are no other questions, I'll turn it over to Westinghouse.

CHAIR ROBERTS: This would be a good demonstration of defense-in-depth of the staff.

(Laughter.)

Can we turn it over to Westinghouse?

MR. SCHOEDEL: Yes, thank you, Member Roberts.

My name is Anthony Schoedel, the Advanced Reactor Licensing Manager at Westinghouse, supporting eVinci Microreactor design licensing.

Thank you all for the time here today,

yourself, Member Roberts, and the other Subcommittee Members.

And thank you to the NRC participants for the technical review today and support, and getting ready for all these conversations.

You see a few of my colleagues here with me. I'll let them introduce themselves as they share the speaking presentation responsibilities throughout the course of the dialog today.

First, you're going to hear from Meredith Heh, at the end of the table. She's going to lead the presentation/discussion for this open portion. I'll be presenting the slides here on Teams.

And, Meredith, without any further ado, once I get them up, I think the floor is yours.

MS. HEH: Thank you, Anthony.

As Anthony said, my name is Meredith Heh. I'm Advanced Reactors Licensing Engineer for the eVinci Microreactor project, and I'll be your lead going through the open session today.

Great. So today, I will begin with a design overview, and then, I will go through our deployment model overview. Then, I will speak on our NRC pre-application engagement to date, and then, follow with an overview of the PDC Topical Report.

And then, we can go to any questions that people may have.

So here on this slide, you can see a good overview of our eVinci Microreactor design. This introduces safety through passive heat pipe technology, and this enables a very low pressure reactor.

So, you can see some of our key components: the shutdown rods and control drums, which provide diverse means for shutdown in the reactor; the graphite core block, which is our moderator. And the power of the reactor is a 15-megawatt thermal with a fuel cycle of eight years, and that fuel we'd be using is TRISO.

Our primary coolant is our heat pipes, which is our new technology that you will hear more about later today, as well as we will be using an open-air Brayton cycle for power conversion. And you can see the primary heat exchanger as another key component in the diagram there.

Here on this slide, you can see an eVinci Microreactor site layout. One key component we want to address is that all buildings and systems are aboveground. This means not a lot of excavation is needed for our design.

In the design, you can see our two-reactor-bay system with the power conversion module in the center of the two bays. And I will describe how this system works on the next slide.

Out-front, you can also see three containers. These will be for our I&C modules and our battery module.

And another aspect I wanted to highlight is our equipment is relatively small with less than three quarters overall and the building footprint being just a half an acre.

So, after, firstly, getting our test reactor demonstrated for safety future performance, this will help our licensing approval, and then, we can deploy our reactor, as you can see on this screen.

We will start by assembling in a factory, and then, we can transport disassembled to the site. We will install and operate at the site, and this is where the two reactor bays come in. You can install and operate, and then, as that reactor is operating, it will operate for eight years. And when that one is no longer able to be operated, you can bring in the second reactor, place it into the second reactor bay, and allow for a plug-and-play situation, where you remove one, and then, upload and start the next.

Then, you can allow for that other first reactor to cool down, and then, once it is cooled, transport it away from the site. You can refuel and refurbish that reactor, or if it has reached its end of life, send it to decommissioning and the fuel to a fuel storage facility.

This pre-application will be --

CHAIR ROBERTS: Meredith, I just have two quick questions on radiation levels. It's not clear from the figure in that slide how much shielding there is in that blue building to keep the personnel safe in this reactor.

It's also not clear on the next slide, transport away from site, what kind of delays you need before you can transport safely on the road.

Can you give us a little perspective on that, on both of them?

MR. SMITH: This is Matt Smith from Westinghouse.

So, in terms of shielding, there's actually two structures shown there. There is a concrete structure that provides the majority of the shielding there, yes.

MS. SPALDING: I can talk about transportation.

MR. SMITH: Yes. Yes, I'll turn it over to Amanda.

MS. SPALDING: Hi. This is Amanda Spalding, also a part of the eVinci Microreactor licensing team.

So, the question on transportation, we will be certifying a reactor transportation cask for the reactor module, both to ship onsite with the fresh fuel and ship away with the spent fuel. And we will make sure that it meets the Part 71 regulations for fissile packages.

So, that cool-down period, while we're still developing what that would actually look like, it will be to ensure that we do meet the Part 71 regulations to ship it offsite.

CHAIR ROBERTS: Okay. Thank you.

MS. HEH: Thank you, Matt and Amanda.

There is some pre-application engagement to date. Westinghouse has submitted 31 white papers on various topics, including the second white paper submitted being on the Principal Design Criteria topic. And we have used this white paper to allow for feedback and implementation into our Topical Report.

Speaking of Topical Reports, shown here are the Topical Reports planned for submittal to the

NRC, with a third -- six being submittal and a third being the Principal Design Criteria Topical Report, which was submitted in June of 2023.

So now, I'm going to go over our Topical Report overview and going through the sections.

So, as I stated, the white paper feedback on the PDC (audio interference) white paper was heavily considered in our Topical Report development.

Section 1 of the Topical Report, the purpose, states that it will cover the eVinci Microreactor PDC and the basis for their selection. This PDC includes safety-related and non-safety-related with special treatment design criteria.

The derivation of the eVinci Microreactor PDC were based on the following applicable regulations and regulatory guidance:

The guidance for this design criteria provided in Reg Guide 1.232.

The GDC and Title 10 of the CFR Part 50, Appendix A.

And also, we incorporated the safety case for the eVinci Microreactor developed based on NEI 18-04 and NEI 21-07 guidance, which are endorsed by the NRC in Reg Guide 1.233 and 1.253.

And then, at the end of this Section 1,

Westinghouse requested NRC review and approval of the set of PDCs for the eVinci Microreactor. This included the list and justification for the GDC identified as not applicable to the eVinci Microreactor.

Okay. And then, Section 2 of the report, there is a summary of the eVinci Microreactor design and facility description, which is, basically, the summary provided on slides 3 and 4 today.

Section 3 of the report, a PDC development summary. The PDCs were derived based on the Design Criteria Reg Guide 1.232 and GDC and 10 CFR Part 50, Appendix A.

Each GDC and DC contained in Reg Guide 1.232 were reviewed for applicability to our design, and they were either kept as is; they were edited, or they were determined to not be applicable in entirety.

One additional PDC was developed not based GDC or Reg Guide 1.232.

And the eVinci Microreactor PDCs are function-based. They are not structure-, system-, or component-specific. Therefore, there's no differentiation or report between PDC required function design criteria and PDC complementary design criteria, which is described in NEI 21-07. And in a

few slides, you'll be able to see the crosswalk of how we either kept the PDC as is, edited, or determined to not be applicable.

And continuing in Section 3, we discuss how NEI 18-04 and NEI 21-07 were used to risk-inform the PDCs and confirm the PDCs for the eVinci Microreactor safety functions and confirm that they were appropriately included.

Examples of the ways PDCs have been improvised from NEI 18-04 and NEI 21-07. Some examples here were:

We used quality assurance PDC tests from NEI 21-07.

We allowed for the defense-in-depth process to drive the need for multiple barriers.

"Important to safety" text was revised to "safety-significant."

And "postulated accident" text was revised to "licensing basis events" or "design-basis accidents," as applicable.

Table 3.3-1 in the Topical Report is shown here, which is our PDC crosswalk. You can see the list of applicable GDCs and whether they were pulled from which appendices in Reg Guide 1.232, and whether they were modified, identical, or not applicable to

the eVinci design.

This brings us to Section 4 of the report, which is the eVinci Microreactor PDC list. As stated right before the tables, each table consists of a title, which is the number and title of PDC, and which of those cases comes from the 10 CFR Part 50, Appendix A, or Reg Guide 1.232. And the event you can see is provided, the actual wording of the text.

Then, our position, which provides the determination of whether a given ARDC, SFRDC, or MHTGR-DC from Reg Guide 1.232 is adopted with or without changes.

Modifications to the text are made in red with strikeout or blue with underline for added text.

And then, a basis is provided which provides justification and rationale for why certain design criteria were determined to be applicable, and also, justifies and describes changes to the text. And finally, the source is provided.

So, we have a few examples. The first is an example of one PDC that was modified from the ARDC language with changes consistent to what is in NEI 21-07. And this is our first PDC quality standard.

Our second example is our one and only

newly-developed PDC for monitoring and testing. And this combined multiple PDCs into a single PDC for these functions.

Another example here is an example PDC which is identical to Reg Guide 1.232. This is PDC 14 for reactor helium pressure boundary.

And finally, an example of the PDC which is not applicable. The objective of PDC 27, combined reactivity control system capability, as satisfied by PDC 26 for reactivity control.

CHAIR ROBERTS: I guess I have two questions, and if you want to defer them to the closed session, let me know. We can do that.

But it's a little surprising, given that this is a heat pipe reactor, which is not what was really considered when either Appendix B or C of the Reg Guide were written. I guess Appendix A was intended to be generic.

You have a lot of you picked from this Appendix and picked from that Appendix. But Design Criteria 6, which is really a combination of a bunch of others; it's not really unique to the heat pipe reactor. There's nothing in here that seems to be unique to a heat pipe reactor.

And part of the Reg Guide requirements are

to address unique features of your design and determine whether or not there are design criteria that are warranted based on that design.

So, I was wondering your perspective on, you know, why is it that all of the criteria that apply to a heat pipe reactor are radically covered by a document that really wasn't written for a heat pipe reactor?

MS. SPALDING: Yes. So, this is Amanda Spalding again.

And I think we'll go into this a little bit more in the closed session. But what I can share here, as Meredith mentioned earlier in her presentation, we developed our PDC to be based on function and not specific SSCs. And so, as we went through the criteria in Reg Guide 1.232 and the GDC, we didn't identify any additional functions or safety functions for our reactor that were not already covered. And while there may be different components or different systems that will perform those functions, there were no additional functions.

So, I think that's maybe where the difference is. You know, we did look at our design, but we really looked at it as, what are the safety functions being performed and are those covered by the

intent of the design criteria?

We can discuss that more in the closed session, but I think, for this portion, that's what we would like to say now.

CHAIR ROBERTS: Okay. Thanks. That sounds good

MS. SPALDING: Yes.

CHAIR ROBERTS: There probably will be more questions in the closed session.

And then, the second question I had -- and again, if you want to comment in your closed session, that's fine -- but there were several design criteria that have specific requirements for redundancy, defense-in-depth, diversity, those types of things. And you pretty universally change those to follow the LMP core process. That will tell you whether or not you need such diversity.

I was wondering just in general, are you convinced that the LMP really covers all that or is there some qualitative aspect of the LMP you're counting on to identify things that may not be fully modeled by the PRA?

MS. SPALDING: Yes, that's another great question. And I think, again, we'll cover it a little bit more in the closed portion; specifically, when

Matt covers some discussion design overview.

But our goal was to not have prescriptive requirements through the PDC and allow the LMP process to drive what's really necessary. So, I think, to answer your question, no, we don't necessarily anticipate that there are things that the PRA won't identify, where the LMP process will not identify true defense-in-depth adequacy, where we would need redundancy or diversity. So, we're allowing that process to drive the specific SSCs that will perform the functions.

But again, we can discuss that more in the closed session.

CHAIR ROBERTS: Okay. Good. Thanks.

Any other questions from members or consultants before we go to the staff open session?

(No response.)

Okay. Hearing none, let's go ahead and change out to the staff. You can go to the presentation.

Your choice, you can stay back there or move up to the table.

If you like, you can sit in the audience until we start the closed session.

MS. SPALDING: We won't be in the hot seat

anymore.

CHAIR ROBERTS: Are you ready? Okay, go ahead.

MR. BOYLE: Okay. Great. Thank you.

Good afternoon. I'm Patrick Boyle, Licensing Project Manager at the NRC assigned to the Westinghouse Electric Company eVinci project. I'm the lead Project Manager for the review that Westinghouse has for the Design Criteria Topical Report.

So today, we had Dan Beacon scheduled. He is, unfortunately, unable to join us. So, Greg Oberson is his Branch Chief and will be taking us through the technical details of the discussion.

We did review our slides and determine that we may require additional time in the open session because in this area we can cover, and then, we will be able to save that time in the closed session.

This slide describes the agenda for the NRC staff's presentation today:

Review the chronology of the staff's review.

The purpose of the staff's review.

The staff's strategy on the Topical Report.

We will provide an overview of the contents of the Safety Evaluation Report.

And then, summarize the NRC staff's conclusion regarding the Westinghouse PDC Topical Report.

Regarding the timeline of the review, Westinghouse submitted Revision 0 of the Topical Report in June 2023.

Staff accepted the Topical Report review and began the staff's review in August of 2023.

The staff conducted clarification meetings from September to October 2023.

Following the clarification meetings, the staff issued requests for additional information in November of 2023.

Westinghouse responded to those questions in December.

And then, in May, Westinghouse submitted Revision 1 to the PDC incorporating the RAI responses, as well as the information from the clarification meetings.

The Draft Safety Evaluation for the PDC will be issued in July of 2025.

And now, I'd like to turn this over to Greg Oberson for the technical details of the PDC

review.

MR. OBERSON: All right. So, as mentioned, I'm Greg Oberson. I'm the Branch Chief of Advanced Reactor Technical Branch 1, the Division of Advanced Reactors, Nonpower Production and Utilization Facilities.

So, I just want to, I guess, start by acknowledging or sort of exercising what was aptly mentioned, our defense-in-depth. So, in this case, maybe the capability of the subsequent layers diminish relative to the first layer -- in this case, Dan. So, I'm not going to attempt it. If you could just bear with me and us to appropriately replicate, and Dan would add more to the presentation. So, I'm going to sort of hop scotch through it.

But I think the important things are we want to get the record of the meeting; we want to get any input that you guys have had in response to what you received from Westinghouse or in your prep prior to the meeting. Keep note of that. And what we can address here, we will, and what we can't, we'll get back, and then, work through it that way.

So, in light of that, some things I'll just sort of skip through relatively quickly. Other things which I think I can somewhat capably speak to,

I will. Other things which are sort of beyond me at this moment, I'm going to have to defer. So, as mentioned, I just appreciate your forbearance. We'll do our best to do this.

As is obvious, the purpose of the Topical Report was already well-stated. So, I don't intend to just restate what was already said. But I will speak to our review strategy, which was, generally, to review the conformance with the Regulatory Guide 1.232, which was already mentioned in the prior presentation by Westinghouse.

And notably, evaluate deviations from or changes from Reg Guide 1.232. And in recognition of key eVinci design features, again, as has already been mentioned, this is a difference in the reactor than what was perhaps envisioned when that Regulatory Guide was developed. And therefore, it is necessary and appropriate to look at eVinci in the context of that fact.

And then, sort of correlated to that, consider the applicability of the Appendices and guidance, the novel design features, and where they are appropriate, make note of that, and where there are differences or key differences, make note of that as well.

Go to the next slide.

So, this is just the Safety Evaluation overview. Again, I won't belabor the point here, but what we noted was that the Regulatory Guide, the regulations and guidance that we referenced in making the Safety Evaluation findings.

eVinci did provide design information in the Topical Report, but that was not reviewed by the staff, nor did staff make any findings on the adequacy of the design itself. So, we consider that to be informational in the context of not supporting the more fundamental evaluation of the PDCs.

And then, in light of what I just mentioned, we sort of did the PDCs in terms of the way we wrote the SE, in terms of the ones that were, essentially, in Reg Guide 1.232. That's one category.

Another category would be those that are were influenced by NEI 18-04, terminology and approach, following up on what you heard this morning.

There are some unique ones -- fuel storage, given the design concept, and then, a few odds and ends that we think warrant specific attention that we'll speak to.

And then, we noted again, as was mentioned by Westinghouse staff, where there were design

criteria that were not found to be applicable to the design of those.

And then, we'll speak to the limitations and conditions.

So again, I won't take a lot of time in restating this. I believe the members and the participants in the meeting are aware of the regulations and 10 CFR Parts 50 and 52 that relate to the provision of PDCs, and as well, as noted, in 10 CFR Part 50, Appendix A, as it concerns light water reactors. And again, this having been sort of stated prior, I won't stick on this slide.

So, you can go ahead, Patrick.

And I'll take the same general approach for this one, as these have been previously noted. Of course, we view Reg Guide 1.232 as sort of like, you know, base level of beyond the regulations themselves and based on what we'll reference.

With the PDC reviews, we are sort of overlaid with that. The advanced reactor technology was the risk-informed regulatory guidance that relates to the limitation of the LMP methodology on the technology, the application of methodology, and so forth, as has been previously mentioned by Westinghouse in the context of other PDC reviews that

you guys have done.

So, eVinci did a great job of these in the prior presentation. But, more particularly, once we go to closed session, we will speak to the eVinci design features.

But I did want to make note of a few things here that we think are relevant to the consideration when we think about the applicability of the PDCs to Reg Guide 1.232 to the eVinci design itself. Obviously, the very fact of having TRISO fuel gives it some similarity to those designs referenced in Reg Guide 1.232 that also consider TRISO fuel.

Skipping, I guess, to the fourth bullet, the heat pipe I guess maybe could be considered a different design feature than what was explicitly in Reg Guide 1.232. So, that warrants noting.

Passive heat removal. The reactor heat controls functional (audio interference) is something that we'll speak to, and then, the notion that a lack of electrical power that is necessary to perform the required safety functions, and then, maybe the very last point, the transportable design. Again, there are PDCs related to that, that would have not been explicitly addressed in Reg Guide 1.232. It's warranted to give consideration to those in our

evaluation.

So, as was mentioned -- it sort of came up in that prior discussion by Westinghouse already -- given that the eVinci heat pipe reactor design itself was not one that was explicitly given consideration to in Reg Guide 1.232, it becomes sort of a mix and match of how you sort of translate Reg Guide 1.232 today relative to the eVinci design.

There are some aspects I think that we view as being similar, at least conceptually, to the SFRDCs insofar as it's sodium; it's contained within the heat pipes. There are other aspects that are perhaps akin to the high temperature gas reactor design. You know, we note the fuel functional containment and the materials, graphite, and so forth. There's some similarities there, as was already mentioned. PDC 6 is sort of one that rules and another batch of PDCs or generic PDCs from Reg Guide 1.232.

So, as was mentioned, we sort of did the PDCs into different categories, in part, due to how similar we believe they are to what was in Reg Guide 1.232 -- again, comparing what are the functions or the features of the eVinci design and how those relate to some of the assumptions that are made in the

reactors of this sort that were evaluated in analysis for Reg Guide 1.232.

Listed here on this slide are a number of PDCs which we found to be, essentially, identical to 1.232, where the language is, essentially, well, verbatim the same or perhaps a wording change, as noted there, "systems" to "SSCs," that we believe does not have any meaningful change to the intent of the allocation of the PDCs.

What we confirmed for the PDCs is, again, at least on a functional basis, there was a direct correlation between the eVinci approach and the Reg Guide 1.232 sort of generic evaluation, such that we could say that the bases for determining that the PDCs were adequate as they relate to the designs in the 1.232 continue and apply to the eVinci design itself.

So, a number of PDCs as well concerned the changes, or perhaps supporting changes, related to the implementation of the LMP terminology. And this is very similar to what came up this morning in the discussion with the other vendor about the application of the LMP to their PDCs.

We do note that Reg Guide 1.233, that it states the applicants -- referencing the Reg Guide -- are expected to use the technology of NEI 18-04, and

as such, we see changes -- for instance, from "important to safety" in the Reg Guide to "safety-significant," for instance, in licensing basis events -- so as to align with the language from NEI 18-04.

And consequently, again, the obligation for staff would be to confirm that, notwithstanding the wording changes, the intent of the PDC remains the same from the evaluated wording in Reg Guide 1.232 to the eVinci design. And in the cases referenced, the staff determined that those still didn't apply, and as such, the PDCs can be determined to be acceptable.

So again, and continuing on with the PDCs influenced by the approach, it may be worth noting that Reg Guide 1.25 really was a draft at the time that the Topical Report was drafted. So, the refinement of PDCs into RFDCs and CDCs was not implemented in this report.

The NEI 18-04 approach included an evaluation of defense-in-depth adequacy intended to address concerns related to independent redundancy, diversity, and defense-in-depth, and see the Reg Guide 1.232 language regarding this concepts was, therefore, removed. But we note that it's only acceptable if used with the LMP licensing approach.

And, you know, once we get to the

discussion of the licensing -- sorry -- the limitations and conditions, we can speak more specifically to the intent of the condition as it relates to the implementation of LMP methodology.

Okay. So, as it relates to the design of the microreactor concerning the transportability, I guess, or storage or transportability of the reactor itself, the microreactor, there are a few PDCs -- 61, 62, and 63 -- that modify the language to reflect reactor fuel handling and storage demand for the eVinci design. So, they replace concepts of fuel storage, waste, and handling with the concept of reactor storage, at least as we understand it, to reflect the fueled reactor unit deployment and the handling approach being sought for implementation, or at least being considered in the eVinci deployment model.

It's worth noting -- and just for the record, I believe the Committee is already aware of this -- staff have provided a SECY paper to the Commission that concerns a number of matters related to technical and regulatory dimensions of fueled reactor handling and storage that remain at this point, from our perspective, appropriately the Commission's decisionmaking process. And therefore,

we would condition the PDCs on the outcome of the Commission's policymaking, and then, the demonstration eventually of conformance with whatever that policy happens to be.

So, we're sort of kicking the can here, effectively, until we get further direction from the Commission as far as what this is going to look like for the fueled reactor, like reactor deployment.

So, I think this sort of gets into the few PDCs where just we wanted to bring it back to the Committee's attention to matters where we sort of evaluated, I guess, where there are some unique aspects we wanted to bring the Committee's attention to. They don't fit quite into the other categories that we already mentioned.

So, PDC 12 combines portions of Reg Guide 1.232, Appendix A and C, and this is the suppression of power oscillations. So, this reflects a broader applicability of SSCs than ARDC 12, including the reactor core structures, coolant control and protection system. So, it reflects the use of SARRDLs consistent with DC 12 rather than SAFDLs, in part, because of the similarity of fuel design and radionuclide retention approach for TRISO fuel. And we found that to be applicable to the design and that

the underlying intent of what was evaluated in Reg Guide 1.232 is applicable to the eVinci design.

This one may be best left for the closed discussion of PDC 17. We do the same for this one, microreactor control.

So, PDC 64, we're monitoring radioactive releases. Changes to the Reg Guide reflect the functional containment approach and LMP terminology. So, Revision 0 of the Reg Guide included additional specificity with undefined terminology. We had a public meeting, and then, there was a revision to PDC 64 to more closely align with ARDC 64. And again, we found that the intent and underlying safety basis aligns with the Regulatory Guide.

PDC 71 is adapted from Reg Guide 1.232, Appendix B, in this case, akin to the sodium fast reactor design criteria. So, applicability is to helium cover gas purity of the eVinci reactor canister. So, we removed, in light of eVinci design language referred to the sodium primary coolant, and note that eVinci PDC 73 pertains to the detection of sodium (audio interference) or reactions from sealed heat pipes. So, the PDC on primary cover gas purity and underlying safety basis aligns with Reg Guide 1.232 in the context of eVinci.

PDC 73, sodium detection and reaction prevention and mitigation. This is adapted, again, from one of the SFR design criteria. It expands upon that with the requirement to assure passive heat removal system availability, and the language regarding sodium-concrete interactions is removed. There are multiple non-concrete barriers between the sodium contained in the heat pipes and the concrete structures outside the reactor canister or primary heat exchanger. And as such, again, the intent of the safety basis aligns with Reg Guide 1.232.

So, PDC 74 adopts the applicable portion of Reg Guide 1.232, Appendix B, language regarding steam-water energy conversion systems. These are grouped because eVinci relies on an open-air Brayton conversion system, as was discussed in the Westinghouse portion of the presentation. And again, the underlying safety basis aligns with Reg Guide 1.232 and remains applicable in the context of the design.

Let's see. PDC 78, sodium heat pipe interactions. Again, this is adapted from the SFR design criteria, and changes, as staff noted, reflect that sodium is only contained in pipes and not as a, quote-unquote, "primary coolant." The language is

adapted, again, to reflect the use of the LMP methodology and the defense-in-depth adequacy assessment.

You can go on, Patrick.

So, I think now we'll speak to the PDCs -- I'm sorry -- the PDCS from Reg Guide 1.232 and the design criteria that were not applicable and our reasoning for that.

So, there are a number of PDCs related to the monitoring section that were included in Reg Guide 1.232. And it was already mentioned that these sort of get encompassed or rolled into a higher level.

PDC 6 may be seen as saying they don't apply, but they do apply. But they are sort of rolled together into a single PDC that concerns, again, the capacity and monitoring, inspection and testing. So, the intent in the underlying safety basis for all PDCs were sort of coalesced into PDC 6. Staff assured that those are appropriately addressed.

So, heat transport functions. So, PDCs 30, 31, and 33, these are not directly applicable to the heat design of the eVinci reactor. Specifically, the designers refer to a reactor coolant system, but the staff interpretation of Reg Guide 1.232 is that the eVinci design does not include any forced

convection or primary coolant as what would have been meant in that regulatory guidance.

But, nevertheless, we did want to ensure that the fundamental safety concepts or intent that are meant to be addressed by those design criteria were sufficiently addressed by PDCs. So, for example, the reactor coolant system, we can kind of look at the reactor canister, that helium pressure boundary, and like can conclude for ourselves that the intent of those is addressed by other aspects of the design.

Let's see. Heat removal emergency cooling. So, these focus on adequate heat removal capability to cool the core containment and associated SSCs. I'll be honest, I don't know what was meant by this. So, if there are any questions on that, I'll have to take that back. Apologies for that.

The functional containment. This has already been addressed, and I think Dan had mentioned that this would be appropriate to address in the closed session. So, we'll pick up the conversation from there.

So, as far as limitations and conditions go, you know, there's a couple proposed here, and I won't read those verbatim. You have those at hand for you.

So, a couple of them refer to the implementation of LMP methodology, recognizing, again, as we've already discussed, that these are preliminary designs, and as the LMP process continues to unfold, as necessary, we will ensure that the outcomes of those are iterated back into for the development of the PDCs; and also, that to the degree that sort of language related to implementation of the PDC reflects terminology from the LMP and departures from, for instance, Reg Guide 1.232, that those are acceptable insofar as the user of the Reg Guide -- I'm sorry -- the user of the Topical Report conforms with the LMP process.

Let's see. Then, the third one relates, again, to the matters of reactor fuel storage and transportation --

CHAIR ROBERTS: Excuse me. Could you go back?

MR. OBERSON: Sure.

CHAIR ROBERTS: Yes, there's two questions that may be editorial, maybe not. But the second sentence of the first one says, "design changes and associated policy implementations." And it seems like from the first sentence, it's the LMP implementation of the entire design, not just the changes that are

made to the design, is that right?

MR. OBERSON: Yes.

CHAIR ROBERTS: It seems the word "associated" doesn't belong there.

MR. OBERSON: Yes, we may have to check that wording out. I think the intent of that, fundamentally, is to ensure that, if the LMP had a limitation, it doesn't necessitate a revision to the PDCs in whatever manner. We would have assurance that those would be, like I said, that those would be accounted for. So, yes, we'll take a note, a project to take a look at the wording and see. Thank you for drawing the attention to that.

CHAIR ROBERTS: Yes. And the second one is No. 2, why isn't PDC 16 listed there?

MR. OBERSON: Again, I'll have to take a note of that to follow back up with you on that.

CHAIR ROBERTS: So, that's a functional containment --

MR. OBERSON: Yes.

CHAIR ROBERTS: -- and the words were taken out about how to --

MR. OBERSON: Yes. Dan, again, if you want to join? I apologize, Dan, I'm not doing you justice to what you can do here.

MR. BEACON: Oh, that's no problem. I snuck back into the meeting from my hotel real quick.

So, I think our position is that we do plan to put 16 into that list.

MR. OBERSON: So, as you heard, it was not included. That was an oversight or change in --

CHAIR ROBERTS: Okay. Thanks. So, 16 will be added, too? Okay, great. Thank you.

MR. OBERSON: Thank you, Dan.

Let's see. So, circling back, I mentioned the one on the -- go to the next one, Patrick. Yes, I mentioned the one on the Commission policy on microreactor deployment and the fourth one. That's one, I think, for the closed session.

So, in conclusion, Westinghouse considered each of the design aspects presented in Reg Guide 1.232 and a sufficient set of PDCs for the eVinci design. The core subject is the license limitations and conditions. From the perspective of staff, they established the necessary design testing and performance and provided reasonable assurance that the reactor could be operated without undue risk to the health and safety of the public, and in general, that the TR is suitable for referencing any future license applications.

So again, I do apologize for, like I said, any lack of capacity that I have to address any matters you would have wanted to discuss, but I'm happy to take any questions that I can, and otherwise, pick it up for those matters that are moving to the closed session.

Thanks.

CHAIR ROBERTS: Yes, adding PDC 16 to that policy No. 2 is a good one. We had a pretty extensive discussion this morning on a different PDC review and it was very similar changes made.

MR. OBERSON: Sure.

CHAIR ROBERTS: Then, the question was, why the PDC would be written specifically saying use TRISO fuel, which gives you sufficient, you know, containment --

MR. OBERSON: Sure.

CHAIR ROBERTS: -- versus keeping the functional type of requirement of partial containment that says have multiple barriers and show that. So, maybe you see that as more the generic question for both of these projects --

MR. OBERSON: Sure.

CHAIR ROBERTS: -- when you're rethinking the desirability of having a more detailed design

specification as opposed to at the more functional level.

MR. OBERSON: Yes. Okay.

CHAIR ROBERTS: Okay, great. I guess you know this portion of it?

MR. OBERSON: Yes, I got you. Thanks so much. Yes.

CHAIR ROBERTS: Okay. Any other questions from members or consultants?

MEMBER HALNON: This is Greg. I have one quick one.

MEMBER KIRCHNER: Tom?

MEMBER HALNON: Go ahead, Walt.

MEMBER KIRCHNER: Do you want to go first?

MEMBER HALNON: Well, go ahead, Walt. I'm fine.

MEMBER KIRCHNER: Tom, yes. Thank you. This is Walt Kirchner.

Actually, I wanted to ask the staff about how they were handling -- there's some unique aspects to this design and you addressed one of them earlier. The sodium coolant is really not a primary coolant as we think of it. It's part of a heat pipe system.

But the challenge that I see isn't so much that as the fact that the reactor container does not

completely encapsulate the sodium. So, you have the heat pipes going out from the container to the air Brayton cycle system.

So, then, it raises the question of sodium leakage detection and reaction prevention. Because if you have a failure of one of the heat pipes external to the container, now you have the challenge of consequential failure.

So, what's your position on -- this would be the SFR sodium fast reactor, Design Criteria No. 73 on sodium leakage detection and prevention, and reaction prevention and mitigation. Because it's not just interaction with concrete that's of concern. I would say that's probably of least concerns actually here. It's the air-sodium interaction and the potential additional heat and the loading on the heat pipe itself, and the potential for consequential failure.

So, how are you approaching 73 with regard to air-sodium interactions?

MR. OBERSON: I guess it's a question, do we believe that it applies to air interactions, sodium-air interactions, or what might, I guess --

MEMBER KIRCHNER: Yes. I mean, because it leads to a sodium fire. And traditionally, you know,

for sodium fast reactors, there's been a guard vessel around the sodium systems to prevent that kind of interaction.

MR. OBERSON: Yes, I mean, my understanding of PDC 73 -- and I guess this is a case where I could appeal to even one of the Westinghouse staffers to want to speak to it -- but the intent of PDC 73 as it relates to sodium reaction and reaction prevention mitigation would be addressed by -- the sodium-air interactions would be addressed by that PDC. Does Westinghouse want to speak to that?

MR. SMITH: Yes. This is Matt Smith from Westinghouse.

I wanted to clarify that there is an additional barrier, and we can get into the details of that during the closed session. But there are two barriers between sodium and air. So, that is a design feature that we are considering here. I wanted to make sure that was clear.

MEMBER KIRCHNER: Okay. No. Thank you. I know that. I wanted you to say that for the public.

MR. SMITH: Yes, okay.

(Laughter.)

MR. OBERSON: Noted.

MEMBER HALNON: So, this is Greg. I have

a quick question on some of the language, and you can stay on this slide.

You talk about the PDC intent is met. Back in a previous life, we used to use that language to try to show compliance with a regulation because we didn't like the words that were being used and couldn't quite meet the words of the regulation.

So, when you say the PDC intent is met, are you, basically, saying this very specific language is equivalent to what the PDC requires or is there something softer there?

MR. OBERSON: I mean, I guess I would say that it's soft in the sense that the presumption is the PDC is intended to provide assurance of, you know, provide a level of assurance of safety, I suppose is how I would say it, and that the same assurance is provided by the wording of the specific eVinci PDC, in this case, the eVinci PDC, as would be provided by the sort of generically-written one, but with the change necessary to sort of translate from one design to the other. So, it's sort of a soft --

MEMBER HALNON: Okay.

MR. OBERSON: Yes, it's sort of a soft intent.

MEMBER HALNON: So, we should not read

into a generic aspect of this, but it's more of a specific eVinci issue?

MR. OBERSON: Yes.

MEMBER HALNON: And then, are we going to assume that was because of the underlying safety basis words, that there's an equivalent level of assurance of safety?

MR. OBERSON: Yes.

MEMBER HALNON: Okay. No, I just wanted to get that cleared up. I wanted to make sure I understood what you were meaning there. Because you use it on several of these.

Thank you.

MR. OBERSON: Yes, I understand. Thank you.

CHAIR ROBERTS: Okay. Any other questions or comments from the members and consultants?

(No response.)

Hearing none, we're going to end the open session.

So, anybody from the public who would like to make a comment? Go ahead and unmute yourself; identify your name and affiliation, if appropriate, and then, state your comment.

(No response.)

Okay. Hearing none, we are now going to close the open session. Okay. So, we're going to close the open session now and, at 2:15 p.m. Eastern, we'll start the closed session.

(Whereupon, at 2:01 p.m. EDT, the open session of the Subcommittee was concluded, to resume at 2:15 p.m. EDT in closed session.)

EVR_LTR_240202
Enclosure 2

WAAP-13023, Revision 0,
"**eVinci™** Microreactor - Principal Design Criteria Topical Report
ACRS Subcommittee Meeting – Open Session"

Westinghouse Electric Company
51 Bridge Street
Pittsburgh, PA 15223

eVinci™ Microreactor

Principal Design Criteria Topical Report ACRS Subcommittee Meeting – Open Session

August 21, 2024

Westinghouse

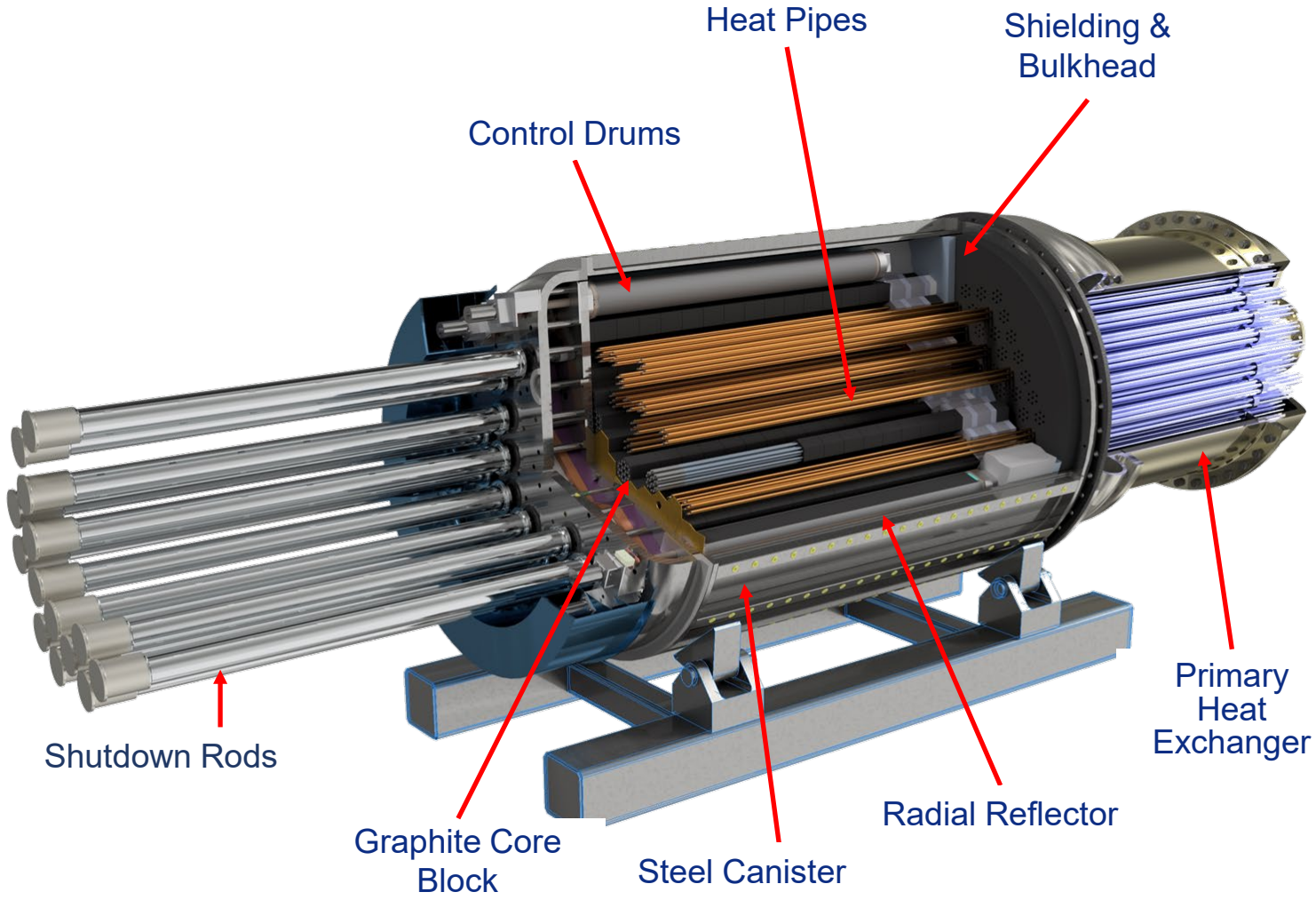
Agenda

- eVinci Microreactor Design Overview
- eVinci Microreactor Deployment Model Overview
- eVinci Microreactor Nuclear Regulatory Commission (NRC) Pre-Application Engagement to Date
- Overview of Principal Design Criteria (PDC) Topical Report (TR)
- Questions

eVinci Microreactor Design

Safety through passive heat pipe technology, enabling a very low-pressure reactor

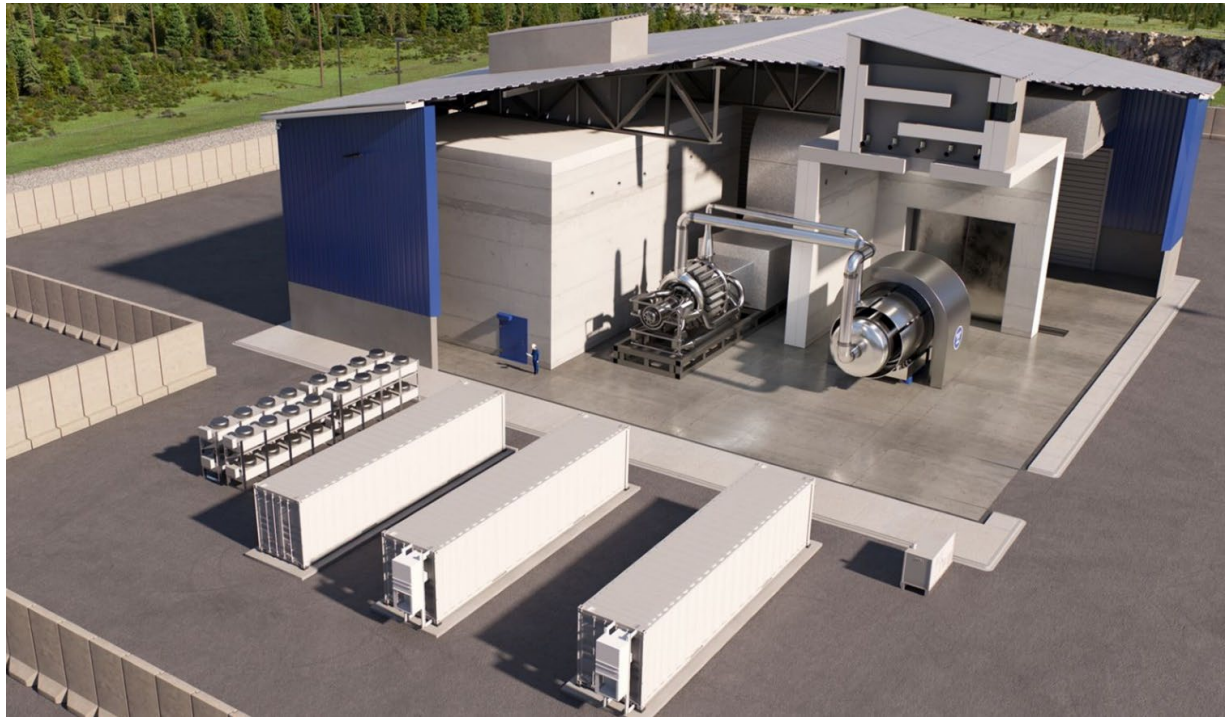
Parameter	eVinci Microreactor
Power	15 MWt
Fuel Cycle	8 years
Fuel (Enrichment)	Tri-structural Isotropic (TRISO) (19.75%)
Coolant	Heat Pipes
Reactor Pressure	~1 atm
Moderator	Graphite
Power Conversion	Open-Air Brayton
Efficiency	34%
Decay Heat Removal	Radial Conduction



eVinci Microreactor Site Layout

Site and facility shown for single unit

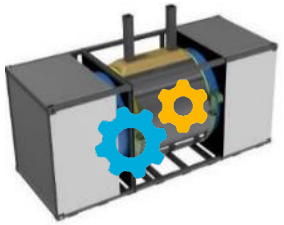
- All buildings and systems: **above ground**
- Reactor site footprint: **< 3 acres**
- Building footprint: <**0.5 acres**



eVinci Microreactor Deployment Model

1 Test reactor for safety feature performance demonstration

Test reactor – testing, data collection and analysis



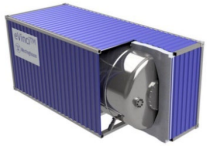
2 eVinci microreactor licensing approval

eVinci Microreactor Deployment

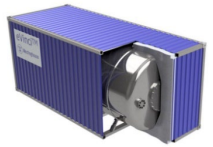
3 Assemble in factory

4 Transport to site

5 Install and operate at site

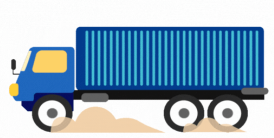


Primary reactor



Replacement reactor

6 Transport away from site



Operated reactor

Remote monitoring station

Limited site staff with remote monitoring

7 Refuel/refurbish or decommission

8 Fuel storage facility

Westinghouse

Pre-Application Engagement – White Papers

Current Status:
https://www.nrc.gov/reactors/new-reactors/advanced/licensing-activities/pre-application-activities/evinci.html

#	Topic	Submittal Wave	#	Topic	Submittal Wave	#	Topic	Submittal Wave
1	Facility Level Design Description	Submitted - 1	13	Advanced Logic System®(ALS) v2	Submitted - 3	25	Inservice Inspection Program/Inservice Testing Program	Submitted – 5
2	Principal Design Criteria	Submitted - 1	14	Component Qualification	Submitted- 3	26	Post-Accident Monitoring System	Submitted – 5
3	Safety and Accident Analysis Methodologies	Submitted - 1	15	Emergency Plan Zone Sizing Methodology	Submitted - 3	27	Equipment Qualification	Submitted – 5
4	Licensing Modernization Project Implementation	Submitted - 1	16	Physical Security	Submitted - 3	28	Probabilistic Risk Assessment and Transportation Risk Assessment	Submitted – 5
5	Regulatory Analysis	Submitted - 2	17	Heat Pipe Design, Qualification, and Testing	Submitted - 3	29	Fire Protection	Submitted – 5
6	Deployment Model	Submitted - 2	18	Nuclear Design	Submitted - 3	30	Cyber Security	Submitted – 5
7	Safeguards Information Plan	Submitted - 2	19	U.S Transportation Strategy	Submitted - 3	31	Radiation Protection and Contamination Methodology	Submitted – 6
8	Test and Analysis Process	Submitted - 2	20	Phenomena Identification and Ranking Table (PIRT)	Submitted - 4			
9	Functional Containment and Mechanistic Source Term	Submitted - 2	21	Integral Effects and Transient Testing	Submitted - 4			
10	Composite Material Qualification and Testing	Submitted - 2	22	Refueling and Decommissioning	Submitted - 4			
11	Fuel Qualification and Testing	Submitted - 3	23	Seismic Methodology	Submitted - 4			
12	Code Qualification	Submitted - 3	24	Operations and Remote Monitoring	Submitted - 4			

Topical Reports

#	Report Title	Submittal Date
1	ALS v2 Platform	Submitted (Dec. 2022)
2	ALS v2 Development Process	Submitted (Dec. 2022)
3	Principal Design Criteria	Submitted (Jun. 2023)
4	ALS v2 Technical Specification Surveillance Requirement Elimination	Submitted (Dec. 2023)
5	Nuclear Design Methodology	Submitted (May 2024)
6	Westinghouse TRISO Fuel Design Methodology	Submitted (Aug. 2024)
7	Composite Materials	
8	Testing Program	
9	Physical Security	
10	Functional Containment and Mechanistic Source Term Methodology	
11	Design Basis Analysis Methodology	
12	Metallic Materials	
13	Graphite Materials	
14	Heat Pipe Qualification Criteria	
15	Component Qualification Methodology	
16	Inservice Inspection	
17	Inservice Testing	

Principal Design Criteria Topical Report Overview

Section 1.0 – Introduction

- NRC white paper feedback (ML22059A460) considered in topical report development
- Purpose
  - eVinci microreactor PDC and the basis for their selection
  - PDC include safety-related (SR) and non-safety-related with special treatment (NSRST) design criteria (DC)
- Derivation of eVinci microreactor PDC based on the following applicable regulations and regulatory guidance:
  - Guidance for DC provided in Regulatory Guide (RG) 1.232
  - General Design Criteria (GDC) in Title 10 of the Code of Federal Regulations (CFR) Part 50 Appendix A
  - Incorporates the safety case for the eVinci microreactor developed based on Nuclear Energy Institute (NEI) 18-04 (endorsed by NRC in RG 1.233) and NEI 21-07 (endorsed by NRC in RG 1.253)
- Westinghouse requests NRC review and approval on the set of PDC for the eVinci microreactor, including the list of and justification for the GDC identified as not applicable to the eVinci microreactor.

Section 2.0 – Summary of the eVinci Microreactor Design and Facility Description

See design summary provided in Slides 3-4

Section 3.0 – PDC Development Summary

- PDC derived based on the design criteria in RG 1.232 and GDC in 10 CFR Part 50 Appendix A
- Each GDC and DC contained in RG 1.232 reviewed for applicability to design and were either kept as-is, edited, or determined to not be applicable in its entirety
- One additional PDC developed not based on GDC or RG 1.232
- eVinci microreactor PDC are function-based and not structure, system, or component (SSC) specific; therefore, there is no differentiation between PDC-Required Functional Design Criteria (RFDC) and PDC-Complementary Design Criteria (CDC) as described in NEI 21-07

eVinci microreactor PDC crosswalk provided on Slide 13.

Section 3.0 – PDC Development Summary

- NEI 18-04 (endorsed by RG 1.233) and NEI 21-07 (endorsed by RG 1.253) were used to risk-inform the PDC and confirm PDC for the eVinci microreactor required safety functions (RSFs) were appropriately included
- Examples of ways PDC have been revised based on NEI 18-04 and NEI 21-07:
  - Use of Quality Assurance PDC text from NEI 21-07
  - Allow for defense-in-depth process to drive need for multiple barriers
  - “Important to safety” revised to “safety significant”
  - “Postulated accidents” revised to “licensing basis events” or “design basis accidents” (as applicable)

Section 3.0 – eVinci Microreactor PDC Crosswalk

10 CFR 50 Appendix A GDC	Applicable RG 1.232 Appendices	eVinci Microreactor PDC Text Compared RG 1.232 PDCs
1	A	Modified from RG
2	A	Modified from RG
3	A	Modified from RG
4	A	Modified from RG
5	A	Modified from RG
N/A (PDC 6 newly defined)	N/A	Reactor-specific PDC
10	C	Modified from RG
11	A	Modified from RG
12	A, C	Modified from RG
13	A	Modified from RG
14	C	Identical to RG
15	C	Modified from RG
16	C	Modified from RG
17	C	Modified from RG
18	N/A	N/A
19	A	Modified from RG
20	C	Modified from RG
21	N/A	N/A
22	A	Modified from RG
23	A	Identical to RG
24	A	Identical to RG
25	C	Identical to RG
26	C	Modified from RG
27	N/A	N/A
28	A	Modified from RG
29	A	Identical to RG
30	N/A	N/A
31	N/A	N/A
32	N/A	N/A
33	N/A	N/A

10 CFR 50 Appendix A GDC	Applicable RG 1.232 Appendices	eVinci Microreactor PDC Text Compared to RG 1.232 PDCs
34	C	Modified from RG
35	N/A	N/A
36	N/A	N/A
37	N/A	N/A
38	N/A	N/A
39	N/A	N/A
40	N/A	N/A
41	N/A	N/A
42	N/A	N/A
43	N/A	N/A
44	N/A	N/A
45	N/A	N/A
46	N/A	N/A
50	N/A	N/A
51	N/A	N/A
52	N/A	N/A
53	N/A	N/A
54	N/A	N/A
55	N/A	N/A
56	N/A	N/A
57	N/A	N/A
60	A	Identical to RG
61	A	Modified from RG
62	A	Modified from RG
63	A	Modified from RG
64	A	Modified from RG
N/A	B (Criterion 71)	Modified from RG
N/A	B (Criterion 73)	Modified from RG
N/A	B (Criterion 74)	Modified from RG
N/A	B (Criterion 78)	Modified from RG

Table 3.3-1 in Topical Report

Westinghouse

Section 4.0 – eVinci Microreactor PDC

- **Title**: Provides number and title of PDC. In most cases, the title is from 10 CFR Part 50 Appendix A and/or RG 1.232; however, in some cases the title has been changed to reflect specific aspects of the eVinci microreactor design.
- **eVinci microreactor PDC**: Provides eVinci microreactor PDC wording.
- **Position**: Provides determination of whether a given Advanced Reactor Design Criteria (ARDC), Sodium-Cooled Fast Reactor (SFR)-DC, or Modular High-Temperature Gas-Cooled Reactor (MHTGR)-DC from RG 1.232 (or other source, as applicable) is adopted with or without changes. Modifications made to the underlying design criteria are shown in red with a strikethrough for removed text and in blue with underline for added text. The source DC is provided adjacent to the modifications for convenience.
- **Basis**: Provides justification and rationale for why a certain design criteria (or portion of a certain design criteria) has been determined to be applicable to the eVinci microreactor design. Also describes and justifies changes in text to develop the eVinci microreactor PDC.
- **Source**: Provides the ARDC, SFR-DC, or MHTGR-DC from RG 1.232 (or other source, as applicable).

Section 4.0 – Example PDC (Modified from ARDC)

Title:	1. Quality standards and records	
eVinci microreactor PDC:	Safety significant structures, systems, and components shall be designed, fabricated, erected, and tested to quality standards commensurate with the safety significance of the functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the safety significant function. A quality assurance program shall be established and implemented in order to provide reasonable assurance that these structures, systems, and components will satisfactorily perform their safety significant functions. Appropriate records of the design, fabrication, erection, and testing of safety significant structures, systems, and components shall be maintained by or under the control of the nuclear power unit licensee for an appropriate period of time.	
Position:	PDC 1 for the eVinci microreactor design uses the language in RG 1.232, ARDC 1 with changes to be consistent with the Quality Assurance PDC text in NEI 21-07, Section C, 5.3.1.	
	RG 1.232, Appendix A, Criterion 1	eVinci microreactor PDC 1
	Structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. A quality assurance program shall be established and implemented in order to provide adequate assurance that these structures, systems, and components will satisfactorily perform their safety functions. Appropriate records of the design, fabrication, erection, and testing of structures, systems, and components important to safety shall be maintained by or under the control of the nuclear power unit licensee throughout the life of the unit.	Safety significant structures, systems, and components ~~important to safety~~ shall be designed, fabricated, erected, and tested to quality standards commensurate with the ~~importance~~ safety significance of the ~~safety~~ functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the ~~required~~ safety significant function. A quality assurance program shall be established and implemented in order to provide ~~adequate~~ reasonable assurance that these structures, systems, and components will satisfactorily perform their safety significant functions. Appropriate records of the design, fabrication, erection, and testing of safety significant structures, systems, and components ~~important to safety~~ shall be maintained by or under the control of the nuclear power unit licensee ~~throughout the life~~ for an appropriate period of ~~the unit~~ time.
Basis:	This requirement is applicable, because the eVinci microreactor contains safety significant SSCs that are designed, fabricated, erected, and tested to quality standards that correspond with the importance of the safety functions that need to be performed. The eVinci microreactor will follow the Westinghouse Quality Management System. The phrase “important to safety” is changed to “safety significant” to align with the terminology in the proposed Quality Assurance PDC in NEI 21-07, Section C, 5.3.1. The phrase “throughout the life of the unit” was changed to “for an appropriate period of time” to account for the application of quality assurance special treatments to NSRST SSCs. Again, this aligns the PDC text with NEI 21-07, Section C, 5.3.1.	
Source:	RG 1.232, Appendix A, Criterion 1 and NEI 21-07, Section 5.3.1	

Section 4.0 – Example PDC (Newly Developed)

Title:	6. Monitoring, inspection, and testing	
eVinci microreactor PDC:	Safety significant structures, systems, and components shall be designed to permit monitoring, surveillance, periodic inspection, and/or testing as necessary to ensure functional capability commensurate with the safety significance of the functions to be performed. Functional testing shall ensure the operability and performance of the system components, and the operability of the system as a whole and, under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation, including associated systems, for licensing basis events.	
Position:	PDC 6 of the eVinci microreactor design uses the language from RG 1.232, MHTGR-DCs 18, 21, 32, 36, 37, 39, 40, 45, and 46 into a single PDC for monitoring, inspection, and testing.	
	RG 1.232, Appendix C	eVinci microreactor PDC 6
	No generic monitoring, inspection, and testing PDC in RG 1.232.	Safety significant structures, systems, and components shall be designed to permit monitoring, surveillance, periodic inspection, and/or testing as necessary to ensure functional capability commensurate with the safety significance of the functions to be performed. Functional testing shall ensure the operability and performance of the system components, and the operability of the system as a whole and, under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation, including associated systems, for licensing basis events.
Basis:	Generic wording is used to support a single monitoring, testing, and inspection PDC, which replaces the need for RG 1.232, MHTGR-DCs 18, 21, 32, 36, 37, 39, 40, 45, and 46. Monitoring, surveillance, periodic inspection, and/or testing will be established as special treatments in accordance with the NEI 18-04 integrated decision-making process (IDP) and will meet the performance intent of the eVinci microreactor. Accordingly, the eVinci microreactor inservice inspection and inservice testing programs will be developed to support inspection and testing needs that are identified through the NEI 18-04 process. Additionally, the Inspections, Tests, Analyses, And Acceptance Criteria (ITAAC), to be defined in the DCA will inform what is required in terms of testing and inspection prior to operation. The phrase “safety significant” is used in this PDC to align with the risk-informed, performance-based (RIPB) terminology used in NEI 18-04 and NEI 21-07.	
Source:	RG 1.232, Appendix C, Criteria 18, 21, 32, 36, 37, 39, 40, 45, and 46	

Section 4.0 – Example PDC (Identical to RG 1.232)

Title:	14. Reactor helium pressure boundary	
eVinci microreactor PDC:	The reactor helium pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, of gross rupture, and of unacceptable ingress of moisture, air, secondary coolant, or other fluids.	
Position:	PDC 14 for the eVinci microreactor design uses the language in RG 1.232, MHTGR-DC 14 with no changes.	
	RG 1.232, Appendix C, Criterion 14	eVinci microreactor PDC 14
	The reactor helium pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, of gross rupture, and of unacceptable ingress of moisture, air, secondary coolant, or other fluids.	The reactor helium pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, of gross rupture, and of unacceptable ingress of moisture, air, secondary coolant, or other fluids.
Basis:	This requirement is applicable because the eVinci microreactor has a helium environment in the reactor canister. This PDC addresses the need to consider leakage of contaminants into the helium in the reactor canister.	
Source:	RG 1.232, Appendix C, Criterion 14	

Section 4.0 – Example N/A GDC

Title:	27. Combined reactivity control systems capability
GDC:	The reactivity control systems shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained.
Screening Rationale for GDC Being N/A:	The objective of this requirement is satisfied by PDC 26 for reactivity control.

Questions

Thank You

Westinghouse Electric Company

@WECNuclear

Westinghouse Electric Company

wecchinanuclear

westinghousenuclear.com

Westinghouse

NRC Staff Review of the Westinghouse Principal Design Criteria Topical Report for the eVinci Microreactor Design

Patrick Boyle, Project Manager

Michelle Vega Rodriguez, Associate Project Manager

Dan Beacon, Nuclear Engineer

Office of Nuclear Reactor Regulation

Division of Advanced Reactors and
Non-Power Production and Utilization Facilities

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Agenda

- Review chronology
- Topical report (TR) purpose and review strategy
- Safety evaluation (SE) overview
- Conclusions

Review Chronology

- June 28, 2023: WEC eVinci PDC topical report (TR), Rev. 0 submitted.
- Aug. 15, 2023: TR accepted for review.
- Sept. 15 and Oct. 31, 2023: Clarification meetings held.
- Nov. 16, 2023: Requests for Additional Information (RAIs) issued.
- Dec. 15, 2023: RAI responses submitted by WEC.
- May 15, 2024: WEC eVinci PDC TR, Rev. 1 submitted.
  - Edits to reflect the items discussed during the clarification meeting discussions and RAIs.
- July 26, 2024: NRC Staff's Draft Safety Evaluation Issued (ML24176A132)

TR Purpose and Review Strategy

- Purpose of TR:
  - Provide PDCs to support both the design and licensing process and compliance with pertinent regulatory requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Parts 50 and 52 associated with PDCs.
- Review strategy
  - Review conformance with Regulatory Guide (RG) 1.232
  - Evaluate deviations from RG 1.232 in consideration of the key eVinci design features
  - Consider applicability of RG 1.232 appendices and guidance to novel eVinci design features

Safety Evaluation Overview

- Regulations and guidance
- eVinci design features (informational)
- eVinci PDCs
  - PDCs effectively identical to RG 1.232 Design Criteria (DCs)
  - PDCs influenced by NEI 18-04 terminology and approach
  - PDCs related to fuel storage
  - PDCs with specific considerations
- RG 1.232 DCs and GDCs found not applicable
- Limitations and conditions
- Conclusions

Regulations

- In accordance with the provisions of 10 CFR Parts 50 and 52, applicants for a construction permit (CP), operating license (OL), standard design certification (DC), combined license (COL), standard design approval (SDA), or manufacturing license (ML) must submit PDCs for the proposed facility. Specifically,
  - 10 CFR 50.34(a)(3)(i), which requires, in part, that applications for a CP include PDCs for the facility. An OL would reference a CP, which would include PDCs.
  - 10 CFR 52.47(a)(3)(i), which requires, in part, that applications for a standard DC include PDCs for the facility.
  - 10 CFR 52.79(a)(4)(i), which requires, in part, that applications for a COL include PDCs for the facility.
  - 10 CFR 52.137(a)(3)(i), which requires, in part, that applications for an SDA include PDCs for the facility.
  - 10 CFR 52.157(a), which requires, in part, that applications for a ML include PDCs for the reactor to be manufactured.
- 10 CFR Part 50, Appendix A provides requirements on the scope and content of PDCs for non-light water reactors (non-LWRs):
  - "The principal design criteria establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety; that is, structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public."

Guidance

- RG 1.232, “Guidance for Developing Principal Design Criteria for Non-Light Water Reactors” (ML17325A611)
  - Appendices provide example DCs
- RG 1.233, “Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light Water Reactors” (ML20091L698)
  - Endorses NEI 18-04, “Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development,” Revision 1 (ML19241A472)
- RG 1.253, “Guidance for a Technology-Inclusive Content of Application Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors,” (ML23269A222) was in draft form (DG-1404) at the time of submittal.
  - Endorses NEI 21-07, “Technology Inclusive Guidance for Non-Light Water Reactors – Safety Analysis Report: For Applications Utilizing the NEI 18-04 Methodology,” Revision 1 (ML22060A190).

eVinci Design Features

- High-temperature heat pipe reactor, 15MWth
- Tri-structural isotropic (TRISO) fuel, compacts, high-assay low-enriched uranium (HALEU)
- Horizontal hexagonal graphite blocks, thermal neutron spectrum
- Normal heat removal: Heat pipes to open-air Brayton cycle
- Decay heat removal: Conduction and radiation to environment (passive)
- Reactivity control: Drums, shutdown rods, and inherent feedback
- Functional containment (TRISO layers, Reactor Canister)
- No active electrical power to perform required safety functions
- Transportable

eVinci PDC Overview

- Most PDCs are based on ARDC-DCs (Appendix A of RG 1.232)
- Some PDCs are based on SFR-DCs (Appendix B of RG 1.232)
  - Sodium is contained in the heat pipes as the working fluid
- Some PDCs are based on MHTGR-DCs (Appendix C of RG 1.232)
  - Design similarities: fuel, core, vessel, functional containment and materials
- New PDC 6 proposed
  - Combines multiple monitoring, inspection, and testing related DCs

PDCs effectively identical to RG 1.232 DCs

- Applicable PDCs: 10, 11, 14, 15, 23, 24, 25, 28, 29, and 60
- The above eVinci PDCs were found acceptable on the bases that:
  - The proposed language is effectively identical to the RG 1.232 DCs.
  - Differences in language or terminology, if any, did not change intent of PDC.
    - Ex: PDC 11, Changing “systems” to “structures, systems and components.”
  - Design assumptions for the RG 1.232 DCs are applicable to the eVinci design.
  - The underlying safety basis of RG 1.232 remains applicable for each, as applied to the eVinci design.

PDCs influenced by LMP terminology

- Applicable PDCs: 1, 2, 3, 4, 5, 16, 20, and 22
- The above eVinci PDCs use similar language as RG 1.232 DCs, with key terminology changes to reflect planned LMP implementation.
  - RG 1.233: “Applicants referencing this RG are expected to use the terminology in NEI 18-04”
- Replace “important to safety” and “postulated accident” from RG 1.232 DC with “safety-significant” and “licensing basis event” to align with language from NEI 18-04 (and NEI 21-07).
- Underlying safety basis remains applicable to the eVinci design.

PDCs influenced by the LMP approach

- Applicable PDCs: 6, 17, 26, 34, and 78
- RG 1.253 was in draft (DG-1404), so refinement of the PDCs into RFDCs + CDCs was not implemented in this topical report.
- The NEI 18-04 approach includes an evaluation of defense-in-depth adequacy intended to address concerns related to independence, redundancy, diversity, and defense-in-depth.
  - RG 1.232 DC language regarding these concepts was therefore removed.
- Only acceptable if used with LMP licensing approach
  - Limitation/Condition 2

PDCs related to storage

- eVinci PDCs 61, 62, and 63 modify RG 1.232 DC language to reflect reactor fuel handling and storage plans for the eVinci design.
  - Replace concepts of “fuel storage,” “waste,” and associated “handling” with the concept of “reactor storage” to reflect the fueled-reactor unit deployment and handling approach being sought for implementation.
- Technical and regulatory aspects of fueled-reactor handling and storage were under Commission consideration at the time of review. (SECY 24-0008)
- Condition/Limitation 3: Only acceptable if, in a future licensing submittal, fueled-reactor storage is found to conform with Commission policy

PDC 12 - Suppression of Power Oscillations

- eVinci PDC 12 combined portions of RG 1.232 Appendix A and C.
  - Reflects broader applicability of SSCs than ARDC-12.
    - Reactor core, associated structures, and associated coolant, control, and protection systems
  - Reflects the use of SARRDLs, consistent with MHTGR-DC 12, rather than SAFDLs.
    - Similarity in fuel design and radionuclide retention approach
- Found appropriately applicable to the eVinci design and that RG 1.232 safety basis is maintained.

PDC 17 – Electric power systems

- Incorporates LMP terminology changes: “safety significant,” “required safety function,” and “design basis accidents.”
- **[Discussion deferred to closed session]**
  - Electrical power for RSFs (if needed) is covered by the PDC, regardless.

PDC 19 – Microreactor control

- Adapts ARDC 19 language **[Discussion deferred to closed session]**
- Removed text about shutdown capabilities that is redundant to other PDC requirements (i.e. PDC 26).
- PDC accepted with Limitation/Condition 4:
  - **[Discussion deferred to closed session]**

PDC 64 – Monitoring Radioactive Releases

- Changes to RG language reflect functional containment approach and LMP terminology.
- TR Rev. 0 included additional specificity with undefined terminology.
  - Public meeting held for discussion between NRC and Westinghouse
  - PDC 64 Revised in TR Rev. 1 to more closely align with RG 1.232 ARDC 64.
- PDC intent and underlying safety basis aligns with RG 1.232 and eVinci design.

PDC 71 – Cover gas purity control

- eVinci PDC 71 is adapted from RG 1.232, Appendix B, SFR-DC 71.
- Applicability to helium cover gas purity in the eVinci reactor canister.
- Removed SFR-DC 71 language that referred to sodium primary coolant.
  - eVinci PDC 73 pertains to detection of sodium leakage and/or reactions from hermetically sealed heat pipes.
- PDC intent of maintaining “primary” cover gas purity and underlying safety basis aligns with RG 1.232 and remains applicable in the context of the eVinci design.

PDC 73 – Sodium leakage detection and reaction prevention and mitigation

- eVinci PDC 73 is adapted from RG 1.232, Appendix B, SFR-DC 73.
- The SFR-DC 73 language is expanded with a requirement to ensure passive heat removal system availability.
- Language regarding sodium-concrete interactions is removed.
  - Multiple non-concrete barriers exist between the sodium contained in heat pipes and any concrete structures outside the reactor canister or primary heat exchanger.
- PDC intent and underlying safety basis aligns with RG 1.232 and remains applicable in the context of the eVinci design.

PDC 74 – Sodium/water reaction prevention/mitigation

- eVinci PDC 74 adopts the applicable portion of RG 1.232, Appendix B, SFR-DC 74.
- Language regarding steam-water energy conversion systems is removed because eVinci relies on an open-air Brayton conversion system.
- PDC intent and underlying safety basis aligns with RG 1.232 and remains applicable in the context of the eVinci design.

PDC 78 – Sodium heat pipe interfaces

- eVinci PDC 78 is adapted from RG 1.232, Appendix B, SFR-DC 78.
- Changes reflect that sodium is only contained in heat pipes, and not as a “primary” coolant.
- Language associated with redundancy is removed to reflect the use of LMP and the associated DiD adequacy assessment.
- PDC intent and underlying safety basis aligns with RG 1.232 and remains applicable in the context of the eVinci design.

Safety Evaluation Overview

- Regulations and guidance
- eVinci design features (informational)
- eVinci PDCs
  - PDCs effectively identical to RG 1.232 Design Criteria (DCs)
  - PDCs influenced by NEI 18-04 terminology and approach
  - PDCs related to storage
  - PDCs with specific considerations
- RG 1.232 DCs and GDCs found not applicable
- Limitations and conditions
- Conclusions

PDCs related to monitoring, inspection and testing

- RG 1.232 DCs 18, 21, 32, 36, 37, 39, 40, 45, and 46 pertain to monitoring, inspecting, and testing of various specific SSCs.
  - Similar language used in each.
- eVinci PDC 6 encompasses these criteria into a single PDC.
  - Effectively mirrors the language of the replaced criteria.
  - Applicability encompasses all replaced criteria.
- PDC intent and underlying safety basis aligns with that of the replaced RG 1.232 criteria.

Heat transport functions, Reactor coolant system boundary – DCs 30, 31, and 33

- DCs 30, 31, and 33 are not directly applicable to the unique heat removal design of the eVinci reactor (heat pipes).
  - The DCs refer to a “reactor coolant system”, but the eVinci design does not include any forced convection or primary “coolant” as meant in RG 1.232.
- Review approach: Ensure the fundamental safety concepts intended by DCs 30, 31, and 33 are addressed by PDCs.
  - Concepts: “Reactor coolant system” (reactor canister/HPB, in the eVinci context) integrity, retainment of radioactive materials, appropriate heat removal, and monitoring/prevention of air, moisture, or other fluid ingress.

Heat removal and emergency cooling – DCs 35, 38, and 44

- DCs 35, 38, and 44 objectives focus on adequate heat removal capability to cool the core, containment, and associated SSCs.

Functional Containment – DCs 41, 42, 43, and 50-57

- DCs 41, 41, 43, and 50-57

[Discussion deferred to closed session]

Limitations and Conditions (L&Cs)

1. Westinghouse is requesting approval for the proposed PDCs based on a preliminary design and plans to incorporate the NEI 18-04 and NEI 21-07 processes (subsequently referred to as the licensing modernization project (LMP) in its licensing approach). The eVinci™ design changes and associated LMP implementation could necessitate a revision to the proposed PDCs described in the TR. Therefore, future licensing applicants referencing the TR must confirm that the PDCs in this TR remain appropriate for its design. If additional or revised PDCs are identified that are not within the scope of what is approved in this TR, those PDCs will be subject to further NRC staff review.
2. The eVinci™ PDCs 6, 17, 26, 34, and 78 include language that reflects the implementation of the LMP. Specifically, departures from NRC endorsed PDC development guidance are made, including the removal or replacement of language regarding defense-in-depth, redundancy, independence, and/or diversity. The NRC staff finds the proposed language of these PDCs acceptable based on the assumption that the LMP process will be implemented during licensing and will address the topics of defense- in- depth, redundancy, independence, and/or diversity. As such, the NRC staff finds eVinci™ PDCs 6, 17, 26, 34, and 78 acceptable only when referenced to support the licensing of a design or facility that also includes the implementation of the LMP in its licensing approach.

Limitations and Conditions (L&Cs)

3. The NRC staff acknowledge that PDCs 61, 62 and 63 are developed to support eventual implementation of a fueled microreactor unit deployment strategy. The NRC staff finds the PDCs acceptable on the condition that such an approach will be deemed acceptable in a future licensing action. The NRC staff makes no determination in this SE regarding the acceptability of transporting, manipulating, and/or storing a fueled microreactor unit. Such a determination would be subject to future licensing actions and subject to the requirements deemed applicable to those actions.

4. **[Discussion deferred to closed session]**

Conclusions

- Westinghouse considered each of the design aspects presented in RG 1.232.
- Westinghouse provided a sufficient set of PDCs for the eVinci design, subject to the L&Cs.
- The PDCs (subject to the L&Cs) establish the necessary design, fabrication, construction, testing, and performance DC for safety significant SSCs to provide reasonable assurance that the eVinci reactor could be operated without undue risk to the health and safety of the public.
- The TR is suitable for referencing in future licensing applications for the eVinci reactor.

Abbreviations

ARDC – Advanced reactor design criteria

CDC – Complimentary design criteria

CFR – *Code of Federal Regulations*

CP – Construction permit

DANU - Division of Advanced Reactors and Non-Power Production and Utilization Facilities

DBA – Design basis accident

DC – Design criterion

DG – Draft Guide

DiD – Defense in depth

GDC – General design criterion

HALEU – High-assay low-enriched uranium

L&C – Limitation and/or condition

LMP – Licensing Modernization Project

LWR – Light water reactor

MHTGR – Modular high temperature gas reactor

NEI – Nuclear Energy Institute

NRC – Nuclear Regulatory Commission

NRR - Office of Nuclear Reactor Regulation

PDC – Principal design criterion

RAI – Request for additional information

RFDC – Required functional design criteria

RG – Regulatory guide

RSF – Required safety function

SAFDL – Specified acceptable fuel design limit

SARRDL – Specified acceptable system radionuclide release design limit

SFR – Sodium fast reactor

SSC – Structure, system, or component

SE – Safety evaluation

TR – Topical report

TRISO – Tri-structural Isotropic

WEC – Westinghouse Electric Company