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Non-Power Production and Utilization Facilities

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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NON-POWER PRODUCTION AND UTILIZATION FACILITIES

SUBCOMMITTEE

+ + + + +

WEDNESDAY

FEBRUARY 16, 2022

+ + + + +

The Subcommittee met via Teleconference,  
at 9:30 a.m. EST, Ronald G. Ballinger, Chairman,  
presiding.

COMMITTEE MEMBERS:

RONALD G. BALLINGER, Chairman

VICKI M. BIER, Member

CHARLES H. BROWN, JR. Member

VESNA B. DIMITRIJEVIC, Member

GREGORY H. HALNON, Member

WALTER L. KIRCHNER, Member

JOSE MARCH-LEUBA, Chairman

DAVID A. PETTI, Member

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JOY L. REMPE, Member

MATTHEW W. SUNSERI, Member

ACRS CONSULTANTS :

MYRON HECHT

STEPHEN SCHULTZ

DENNIS BLEY

DESIGNATED FEDERAL OFFICIAL :

CHRISTOPHER BROWN

C O N T E N T S

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

9:30 a.m.

CHAIRMAN BALLINGER: Good morning, folks. It's now 9:30. The meeting will now come to order. This is a meeting of the NPUF Subcommittee of the Advisory Committee on Reactor Safeguards. I'm Ron Ballinger, chairman of today's subcommittee meeting.

ACRS members present are Charlie Brown, Dave Petti, Dennis Bley, our consultant; Greg Halnon, Jose March-Leuba, Walt Kirchner, Joy Rempe, Stephen Schultz, our consultant. Let's see, who else have I -- Vesna Dimitrijevic was here, but I don't see her now. Maybe she's going to call back in.

MEMBER DIMITRIJEVIC: No, I'm here. I'm here.

CHAIRMAN BALLINGER: Very good. Thank you. If I have missed somebody --

MEMBER SUNSERI: Hey, Ron, this is Matt --

CHAIRMAN BALLINGER: I'm sure I'll get reminded. Oh, okay. Matt Sunseri.

Okay, now that that's done. Chris Brown of the ACRS staff is the Designated Federal Official for this meeting. So if anything goes well, blame him. If anything goes wrong, blame me.

During today's meeting, the subcommittee

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1 will receive an overview of the SHINE Medical Isotope  
2 Production Facility.

3 In addition, we will hear about the phased  
4 approach to initial operation which is new.

5 Given the fact that several members on the  
6 committee are new since the construction permit  
7 application, we felt that it would be appropriate to  
8 have an update so that everybody would have a chance,  
9 all members would have a chance to learn as much as  
10 possible before we start the formal review of  
11 individual chapters which will begin in the March  
12 subcommittee.

13 The subcommittee will also hear, we'll  
14 hear presentations and hold discussions with the NRC  
15 staff and SHINE representatives and other interested  
16 people regarding this matter.

17 Part of the presentation by the applicant  
18 and the NRC staff may be closed in order to discuss  
19 information that is proprietary to the licensee and  
20 its contractors. I might add an additional comment  
21 that we would hope that when we start the review, as  
22 much as possible, of the presentations that are made,  
23 would be non-proprietary. We're trying to be as  
24 transparent as possible in this. We understand that  
25 a lot of the procedures and things are proprietary,

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1 but we should try to be transparent.

2 Attendance at the meeting that deals with  
3 such information will be limited to the NRC staff and  
4 its consultants. SHINE and those individuals and  
5 organizations who have entered into an appropriate  
6 confidentiality agreement, consequently, we will need  
7 to confirm that we have only eligible observers and  
8 participants in the closed part of the meeting.

9 The rules for participation in all ACRS  
10 meetings including today's were announced in the  
11 Federal Register on June 13th, 2019. Oh, I don't  
12 think it was that. Anyway, it was announced earlier.

13 The ACRS section of the U.S. NRC public  
14 website provides our charter, bylaws, agendas, and  
15 letter reports, and full transcripts of all full and  
16 subcommittee meetings, including slides presented  
17 here. The meeting notice and agenda for this meeting  
18 were posted there.

19 We have received no written statements or  
20 requests to make oral statements from the public. The  
21 subcommittee will gather information, analyze relevant  
22 issues and facts, and formulate proposed positions and  
23 actions, as appropriate, for deliberation by the full  
24 committee.

25 The rules for participation in today's

1 meeting have been announced as part of the notice for  
2 this meeting previously published in the Federal  
3 Register.

4 Today's meeting will be held over  
5 Microsoft Teams which includes a telephone bridge line  
6 along participants of the public over their computer  
7 using Teams or by phone. I might add that when we get  
8 through with this introduction, I'm going to turn the  
9 meeting over to Larry Burkhart for a comment on  
10 changes related to the Teams part.

11 A transcript of today's meeting is being  
12 kept. Therefore, we request that meeting participants  
13 on Teams and on the Teams call-in line identify  
14 themselves when they speak and to speak with  
15 sufficient clarity and volume so they can be readily  
16 heard. Likewise, we request that meeting participants  
17 keep their computer and/or telephone lines on mute  
18 when not speaking to minimize disruptions. The chat  
19 features on Teams should not be used for any technical  
20 exchanges.

21 At this time, I ask the Teams attendees to  
22 make sure they're muted and so before we turn it over  
23 to Shaun Anderson of the staff for opening comments,  
24 I'll turn the meeting over to Larry Burkhart and then  
25 Chairman Rempe for another comment.

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1                   So Larry?

2                   MR. BURKHART:     Yes.     Thanks, Member  
3 Ballinger.     So yes, this announcement is just for  
4 those folks who are tying in via the phone line and  
5 really for the members and other folks, too.

6                   Based on some feedback that we recently  
7 received, we're trying to enhance the experience with  
8 the meeting, so if there is anyone who is on the phone  
9 line who would like the MS Teams link and that's what  
10 we're doing to try to enhance the meeting is to share  
11 that link with all members of the public so they can  
12 see the slides as they go.     But if anyone is  
13 interested in having MS Teams link who doesn't already  
14 have it, please email me at [lawrence.burkhart@nrc.gov](mailto:lawrence.burkhart@nrc.gov).  
15 That's it.

16                   CHAIRMAN BALLINGER:   Okay.   Joy.

17                   MEMBER REMPE:   Thanks, Ron.   This is for  
18 the members and I just wanted to draw their attention  
19 to an invite that Scott sent to us.   It's for an  
20 administrative session on personnel matters.   It's a  
21 closed meeting and it will -- the invite is starting  
22 at 12:15, but I think your agenda, Ron, says we're  
23 going to stop at 12:30, but it may be a little early  
24 in case you get done.   It's going to be a very short  
25 meeting, so before you go to lunch, please login to

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1 that and I'll remind you again when we break for  
2 lunch. But I just wanted you to be aware of it and to  
3 be thinking about that. Okay? Thanks.

4 CHAIRMAN BALLINGER: Okay, so if there  
5 aren't any more comments I'd like to turn it over to  
6 Shaun Anderson from NRR for opening comments.

7 Shaun, I think I can see you.

8 MR. ANDERSON: Hopefully you can hear me.  
9 Can you hear me?

10 CHAIRMAN BALLINGER: I can hear you.

11 MR. ANDERSON: Thank you. Good morning,  
12 Professor Ballinger and fellow ACRS members. My name  
13 is Shaun Anderson. I'm an acting Deputy Director in  
14 the Division of Events Reactors and Non-Power  
15 Protection Utilization Facilities. I'm glad to be  
16 here today and give you an overview of SHINE's  
17 proposed Medical Technology Isotope Facility.

18 Today, SHINE will provide an overview of  
19 their facility followed by the NRC staff's technical  
20 review strategy.

21 It's important to mention, considering the  
22 size and rest of the facility, that this is a risk-  
23 informed review. The staff will cover this topic and  
24 our approach during the accident analysis  
25 presentation. In addition, we'll also highlight

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1 another primary area such as Digital I&C, given its  
2 importance of the facility's design.

3 We look forward to ACRS' feedback in going  
4 through the presentation. We'll do our best to  
5 respond to the questions today and if you have any  
6 follow ups, we'll make sure we get that information to  
7 you. As we have the plan file, during ACRS meetings  
8 more focused on in-depth aspects of the facility's  
9 design.

10 We appreciate ACRS' on-going support, the  
11 scheduling, and flexibility in the review of the  
12 application and as you mentioned, in addition to the  
13 facility overview and staff's approach, we are going  
14 to discuss the phased approach and operation. A  
15 supplement to that was recently submitted by SHINE.  
16 Their phased approach will allow SHINE to begin  
17 initial production of medical isotopes while bringing  
18 the full facility production capabilities online.

19 And upon the staff's initial review of the  
20 phased approach, while this review is still in -- the  
21 design is still in review, it does appear that it's  
22 not as significant as originally thought.

23 The staff will continue to accommodate --  
24 well, the staff believes that we can accommodate the  
25 phased approach review into the current review

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1 schedule. It definitely will continue communication  
2 and support from SHINE. But it's also important to  
3 mention and assure you that while the staff is driving  
4 towards an aggressive review schedule, we will not  
5 make a final decision unless we have the information  
6 that we need to come to a reasonable assurance about  
7 the protection of public health and safety findings.

8 I just want to give a special thanks to  
9 the staff and continue in their support for their  
10 review of this application. And with that, I'll pass  
11 it on to Tracy.

12 CHAIRMAN BALLINGER: Okay, thank you very  
13 much. One additional comment. While we have  
14 attempted to construct the agenda and include  
15 important, what we think are important topics to be  
16 discussed, we can't discuss everything. We ought to  
17 be clear that as is want our reputation from past  
18 discussions, any topic that the members feel is  
19 important should be also brought up if need be. So  
20 it's kind of a little bit of an open, free-form  
21 discussion, but we want to be sure that the members,  
22 especially members who were not on the committee  
23 before for the SHINE construction application, get any  
24 questions that they need to be answered, answered.

25 So with that, I guess we need to turn it

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1 over to the SHINE folks for -- and I think it's --  
2 Tracy, are you going to do the presentation?

3 MR. BARTELME: This is Jeff Bartelme,  
4 SHINE's Director of Licensing. I just want to --  
5 appreciate the opportunity to present the overview of  
6 the SHINE facility to the ACRS members today. I'm  
7 joined in the room not just by Tracy, but also  
8 Catherine Kolb, our Director of Plant Operations.

9 At this time, I'm going to turn it over to  
10 Tracy to give the presentation.

11 MS. RADEL: Thanks, Jeff. I appreciate  
12 the opportunity also to share the design with the  
13 committee. And today, for the open session, we're  
14 going to go through an overview, provide a  
15 construction status, and then go into the process  
16 description, technological approach, and safety  
17 philosophy.

18 So site overview, the site is located in  
19 Janesville, so the southern edge of the Janesville  
20 city limits. You can see it there outlined in red.  
21 The interstate, 39/90, is on the east side, Rock River  
22 on the left side there, and then the Southwest  
23 Regional Airport, and Highway 51 immediately to the  
24 west. Also, our new SHINE headquarters is adjacent to  
25 the site, just north of the site there.

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1 Next slide.

2 This is the site plan, so you can see the  
3 main production facility there in the center. The  
4 N2PS structure in yellow off to the right there, that  
5 is the other safety-related structure on site, the  
6 Research Building, Materials Staging Building, and the  
7 Storage Building.

8 The road going up to the north is to the  
9 SHINE headquarters and you can see the security fence  
10 and site boundary there.

11 MEMBER BROWN: Can I ask a question?

12 MS. RADEL: Sure.

13 MEMBER BROWN: Just to clarify, I presume  
14 since our last discussions on the initial round of  
15 this several years ago, that there has been no change  
16 in the site's outlined boundaries?

17 MS. RADEL: No change in the site  
18 boundaries, no.

19 MEMBER BROWN: Okay, that's all. Thank  
20 you.

21 CHAIRMAN BALLINGER: This is Ron, Ron  
22 Ballinger. But there are many, many, many, many  
23 acronyms that are being used. So I would hope that the  
24 presenters would not make the assumption that the  
25 members have all of these acronyms memorized. I

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1 certainly don't. So we should be careful here.

2 MS. RADEL: That's a very good point.  
3 Just to define that acronym I just used, N2PS is the  
4 nitrogen purge system, so that's the building that  
5 stores nitrogen to support the nitrogen purge system.

6 MEMBER REMPE: So this is Joy and I had a  
7 question along the layout. In our letter last time,  
8 we emphasized the need to have adequate layout --  
9 layup space. And I know that the SHINE folks had  
10 responded that they did think they had enough, but it  
11 was not clear in our minds that that had been  
12 considered.

13 Did additional consideration go into that  
14 request? I think you just said no, we didn't make any  
15 changes to the plans for construction.

16 MS. RADEL: So this is the site plan as we  
17 go into operation. There are laydown areas for  
18 construction that are --

19 MEMBER REMPE: We're talking about -- I  
20 assume you're aware of the letter we wrote. Let's  
21 see, what was the year on it? It was -- it was for  
22 the construction permit back in 2015 and in that, we  
23 emphasized the need to have adequate layup space in  
24 case there was an unplanned component failure. And I  
25 just was wondering if you did the assessments and

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1 decided that you didn't need that space or what  
2 happened?

3 MS. KOLB: Yes, so this is Catherine Kolb,  
4 the Director of Plant Operations. When Tracy was  
5 speaking before, we were referring to changes to the  
6 site boundary so that has not changed, the 91-acre  
7 plot.

8 We have made changes to the structure of  
9 the building. The way that the structure is being  
10 constructed now is described in the FSAR that was  
11 submitted. That is under review. It is not the same  
12 structure as was described in the PSAR for the  
13 construction permit application originally.

14 DR. BLEY: This is Dennis Bley. Maybe I  
15 can clarify Joy's point. When we spoke of layup  
16 capability, we weren't speaking of construction or  
17 laydown. It was within the piping system in case you  
18 have part of the system shut down, we have adequate  
19 capability to store, temporarily or long term,  
20 material that was in process so that you don't get  
21 jammed up later when you try to restart.

22 MS. RADEL: Yes. Thank you for the  
23 clarification there. We did do an evaluation of that  
24 to assess our capability for facility layup if we were  
25 to have to go into an extended shutdown and determined

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1 that the facility design as described in the operating  
2 license can accommodate that situation.

3 DR. BLEY: Okay. Thanks. And this was an  
4 issue, not so much a safety one, but for your own  
5 operational capability so you don't get stuck. There  
6 have been a number of plants around the world that  
7 didn't do this and they're still sitting there and  
8 unused.

9 MS. RADEL: Appreciate it. Next slide.

10 This is a site rendering, so you can see  
11 what we expect it to look like when constructed. You  
12 can actually see the new SHINE headquarters off to the  
13 left side there, in the center, then the main  
14 Production Facility Building. And then off to the  
15 right is the Storage Building and in the background  
16 there, the Materials Staging Building.

17 Next slide.

18 These are images of what the construction  
19 site looks like now, or at least a few weeks ago, when  
20 these were taken. So the siding there is being put on,  
21 looking from the south side at the administration  
22 annex.

23 Sorry, was there a question?

24 Okay. On the right there is in the  
25 radioisotope production facility side, the sub-grade

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1 tape and piping trench and then moving to bottom  
2 center an off gas target solution vessel, off gas  
3 system cell where they're doing welding on the liner  
4 plates. And then to the left of that is an electrical  
5 duct bank coming into the facility. And then bottom  
6 left is the quality control and analytical labs.

7 Next slide.

8 So transitioning into the process overview  
9 here, the process release starts with target solution  
10 preparation, so we receive uranium, well enriched  
11 uranium metal from DOE. It is oxidized and then  
12 dissolved in sulfuric acid to generate the target  
13 solution. It's adjusted for uranium concentration and  
14 pH and then put into the process into a subgrade hold  
15 tank. There is one hold tank for each of the eight  
16 irradiation units.

17 We transition it over to the irradiation  
18 facility side by lifting that into the target solution  
19 vessel where it's irradiated for approximately five  
20 and a half days using the neutron driver accelerator  
21 for this critical assembly.

22 Following irradiation is a short decay  
23 period within the IU cell and then it is transferred  
24 over the supercell to the extraction line where the  
25 moly is extracted, purified, checked for quality

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1 control, packaged, and shipped.

2 In the process of extraction and  
3 purification, there are some liquid waste streams  
4 generated. Those are stored and then solidified prior  
5 to storage in the Waste Staging Building.

6 Next slide.

7 MEMBER BROWN: Can I ask a question again?

8 MS. RADEL: Sure.

9 MEMBER BROWN: A learning curve again.  
10 The blue line coming out of the supercell and then  
11 back into the hold tank, you talk only about the waste  
12 periodic disposal part of it. You didn't mention what  
13 stuff goes back into the hold tank, if anything.

14 MS. RADEL: Yes, sorry. So the target  
15 solution passes through the extraction column and  
16 flows then back into the hold tank. So the process  
17 doesn't alter the target solution and so it goes right  
18 back to the hold tank for another irradiation cycle.

19 MEMBER BROWN: Okay. Thank you.

20 CHAIRMAN BALLINGER: This is Ron. Dennis,  
21 do you have your hand raised?

22 DR. BLEY: I did. I forgot to put it  
23 down.

24 CHAIRMAN BALLINGER: Okay.

25 MEMBER PETTI: This is Dave. I have a

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1 question. Go ahead.

2 MEMBER MARCH-LEUBA: I just have a short  
3 question. All the holding tanks, they're really  
4 criticality safe volumes, correct? They're really  
5 annulus because they look like a big 55-gallon drum,  
6 but you only store material under the skin, correct?

7 MS. RADEL: Right, they're annular tanks,  
8 favorable geometry.

9 MEMBER MARCH-LEUBA: So they're able to  
10 hold up to 20 percent and reach uranium on that  
11 criticality by design. Thank you.

12 MEMBER PETTI: I just had a question on  
13 the product relative to the demand for tech-99 in  
14 North America. Is this facility envisioned to provide  
15 half or 75 percent of that or all of the demand,  
16 roughly?

17 MS. KOLB: This is Catherine Kolb. It's  
18 approximately one half of the U.S. demand as the  
19 design.

20 MEMBER PETTI: Okay. Great. Thanks.

21 MEMBER HALNON: This Greg Halnon. A real  
22 quick question. Is the only access to the holdup tank  
23 and the annulus next to the right which is a valve  
24 pit. Is it the missile shield's removal? Is that the  
25 only access to those areas?

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1 MS. RADEL: The only access is through the  
2 cover plugs.

3 MEMBER HALNON: Okay, you call them cover  
4 plugs. I call them missile shields.

5 MS. RADEL: Yes.

6 MEMBER HALNON: Okay. If we needed to do  
7 any valve maintenance or tank maintenance, we would  
8 have to pull that -- those plugs up?

9 MS. RADEL: Yes. We've located the  
10 majority of equipment that we feel we may need access  
11 to in the valve pits adjacent to the hold tanks. And  
12 those plugs are designed for some access areas for  
13 inspection or maintenance and partial plug removal to  
14 gain access, but you would need to lift portions of  
15 the plug out to gain access to that equipment.

16 MEMBER HALNON: Got it. Thank you.

17 CHAIRMAN BALLINGER: This is Ron Ballinger  
18 again. I'm assuming and I've looked at the design  
19 pretty carefully that you have no what I would call  
20 black cells involved in the system in the sense that  
21 they would be a single point of so-called -- of  
22 failure if you will, where they couldn't be bypassed  
23 or maintained. Is that correct?

24 MS. RADEL: That's correct.

25 CHAIRMAN BALLINGER: Very good. Thank

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1 you.

2 MS. RADEL: The technological approach  
3 overview, these are small systems, 125 kilowatts for  
4 the license limit. This results in a low source term  
5 overall. The units are independent so there are no  
6 common cause failures that could result in release  
7 from multiple units. The decay heat per system is  
8 less than one kilowatt within five hours of stopping  
9 irradiation. They use the low-enriched uranium  
10 reusable target which greatly reduces waste streams  
11 and eliminates the need for highly enriched uranium.

12 This product, the molybdenum, is  
13 compatible with the current supply chain also. It is  
14 driven by a low energy electrostatic accelerator.  
15 Once the accelerator is turned off, the fission chains  
16 die out shortly and fission terminate.

17 The multiple unit --

18 CHAIRMAN BALLINGER: Are you going to tell  
19 us about what reactivity -- maximum decay effect that  
20 would be in there? We want this to turn off, but as  
21 I remember, when you first came in after the  
22 construction permit, you were running very, very close  
23 to --

24 MS. RADEL: That will be covered in closed  
25 session, yes.

1 CHAIRMAN BALLINGER: Okay.

2 MS. RADEL: The multiple units in multiple  
3 trains of extraction provide operational flexibility  
4 and scalability as we bring the units up.

5 Our safety philosophy, there is minimal  
6 stored energy in the systems due to the low decay  
7 heat, low pressure, low temperature of the system.  
8 They're independent, limiting the source term for  
9 release. Operator action is not required to mitigate  
10 the consequences of any of the accidents, postulated  
11 accidents.

12 In the event of an upset (phonetic)  
13 condition, the TSV reactivity protection system will  
14 initiate a trip. This opens two independent target  
15 solution vessels dump valves at the bottom of the  
16 unit. The target solution gravity drains into the  
17 favorable geometry TSV dump tank.

18 The hydrogen is maintained below the lower  
19 viability limit by offgas system and the nitrogen  
20 purge system. There is an uninterruptable power  
21 supply system with a certain battery run time. After  
22 that, the facility is passively safe.

23 MEMBER BROWN: This is Charlie Brown  
24 again. Can I ask a question? You don't have to  
25 backtrack a slide. You said there were how many --

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1 eventually, to be how many processing units? Did you  
2 say eight?

3 MS. RADEL: There are eight irradiation  
4 units and three processing lines.

5 MEMBER BROWN: Okay, but the eight  
6 irradiation units, that's the TS -- the graphic that  
7 you showed with the TSV and the hold tanks and  
8 everything else, there will be eight of those?

9 THE WITNESS: Correct.

10 MEMBER BROWN: Eight separate units. Is  
11 the intention to have a separate TRPS for every system  
12 or somehow are you integrating?

13 I tried to take a look at that in the FSAR  
14 and I couldn't really get a clear picture of it.

15 MS. RADEL: Correct. There is one TSV  
16 reactivity protection system for irradiation units so  
17 we have eight TRPS units.

18 MEMBER BROWN: Okay. Thank you very much.  
19 Also independent, right?

20 MS. RADEL: Correct.

21 MEMBER BROWN: Eight totally independent,  
22 separate sensors, separate everything.

23 MS. RADEL: Correct.

24 MEMBER BROWN: Okay. Thank you.

25 MS. RADEL: This is our last slide in open

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1 session. So any additional questions here in open  
2 session?

3 MEMBER MARCH-LEUBA: Yes, this is Jose.  
4 Just for my education. The battery with the UPS is  
5 only used for instrumentation or this is running the  
6 active systems?

7 MS. RADEL: It does run the offgas system  
8 blowers for a short period of time prior to the  
9 nitrogen purge system being initiated to handle the  
10 hydrogen generated at the start of the decay.

11 MEMBER MARCH-LEUBA: But you're talking a  
12 few minutes, maybe an hour, not 90 days, correct?

13 MS. RADEL: Correct.

14 MEMBER MARCH-LEUBA: Okay. Thank you.

15 MEMBER BROWN: Yes, Charlie Brown again.  
16 On the UPS battery, is that also one battery per TSV  
17 system or production system, one for each of the eight  
18 systems? Or is it an overall facility battery?

19 MS. RADEL: It's an overall facility  
20 battery. We do have two independent trains of the  
21 uninterruptable power supply systems, so Train A and  
22 Train B.

23 MEMBER BROWN: And when you say following  
24 the run time, the entire plant is passively safe. How  
25 long is that run time? Or is that going to be covered

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1 in a later session?

2 MS. RADEL: In general, it's two hours.  
3 There are a couple of loads on it that remain on it  
4 for six hours. We don't have details on that in the  
5 closed session, but as we get deeper into electrical  
6 systems in future meetings, we'll cover that in more  
7 detail.

8 MEMBER BROWN: So once the batteries run  
9 out, you really don't need any electrical power for  
10 the next 90 days. Is that correct?

11 MS. RADEL: Correct.

12 MEMBER BROWN: Okay. Thank you. If I  
13 missed something, other folks who are better at this  
14 than me, please chime in.

15 MS. RADEL: Okay. Would we like to switch  
16 over to closed session?

17 CHAIRMAN BALLINGER: Well, thank you very  
18 much. Before we do that, we need to ask for public  
19 comments before we switch over.

20 So if there are any members of the public  
21 that would like to make a comment, please unmute  
22 yourself and give us your name and your comment.

23 MR. EIDEN: Can we just board it up?

24 CHAIRMAN BALLINGER: Boarding is allowed  
25 as long as we know who you are.

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1 MR. EIDEN: All right, I'll unraise my  
2 hand here. Thomas Eiden, Founder and CEO of Atomic  
3 Alchemy.

4 Yes, we'd be curious for -- I guess more  
5 of a question to the NRC, expecting these last couple  
6 of meetings about the SHINE phased approach. We're  
7 looking more for how SHINE or how the NRC is handling,  
8 more specifically, the NRC from a regulatory  
9 standpoint, is handling construction or implementation  
10 of equipment with operating equipment, nuclear  
11 equipment that's operating.

12 We are doing something kind of similar  
13 with our facility and we've put together White Papers  
14 on construction approaches to mitigate accidents on  
15 operating reactors and other things. Unfortunately,  
16 in these public meetings, we haven't really had any  
17 discussion about how from a regulatory standpoint this  
18 all kind of works.

19 So hoping for a little more of an NRC  
20 treatment from a licensing standpoint, from a safety  
21 standpoint, operating equipment with -- operating a  
22 nuclear facility at the same time.

23 CHAIRMAN BALLINGER: Go ahead, please.

24 MR. BALAZIK: Yes, this is Mike Balazik,  
25 NRC, Project Manager for SHINE.

1 Tom, we recently received this supplement  
2 and right now we are actively reviewing it from a  
3 licensing standpoint. There's the possibility of the  
4 implementation of conditions on the license. Again,  
5 that still hasn't been figured out in exactly which  
6 direction we're going, but I'll just say more to come.  
7 The staff is still evaluating SHINE's supplement at  
8 this point.

9 MR. EIDEN: Okay.

10 CHAIRMAN BALLINGER: This is Ron. Sorry,  
11 to interrupt here. I think that we need to limit  
12 public comments to just comments and not endeavor to  
13 respond to the comments. I think that kind of  
14 conversation can better be had by contacting Chris  
15 Brown and work through him. So we'd like to limit the  
16 public comments to just public comments. Thank you.

17 Are there any additional public comments?

18 MR. GROCHOWSKI: Yes. This is Mike  
19 Grochowski with Atomic Alchemy. So I guess we were  
20 interested to see the safety philosophy of  
21 constructing units while the other units are operating  
22 and I thought that would be in the public.

23 And then similarly, how are they licensing  
24 the multiple units or what is the plan to license the  
25 multiple units? And again, I thought that was going

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1 to be in the public realm.

2 CHAIRMAN BALLINGER: Thank you. Are there  
3 any other comments? Hearing none, okay, what we need  
4 to now do is to exit this portion of the meeting and  
5 let's see, what time is it? 10:05. So we're a  
6 little ahead of schedule which is probably the death  
7 knell of us meeting the schedule, but -- so we would  
8 like to close this part of the meeting and there's  
9 been -- there's an invitation out. Let's give it five  
10 minutes and for members and other presenters to login  
11 to the private meeting. So this part of the meeting  
12 adjourned.

13 (Whereupon, the above-entitled matter went  
14 off the record at 10:06 a.m.)

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# Overview of the SHINE Medical Isotope Production Facility (Open Session)

TRACY RADEL, VICE PRESIDENT OF ENGINEERING

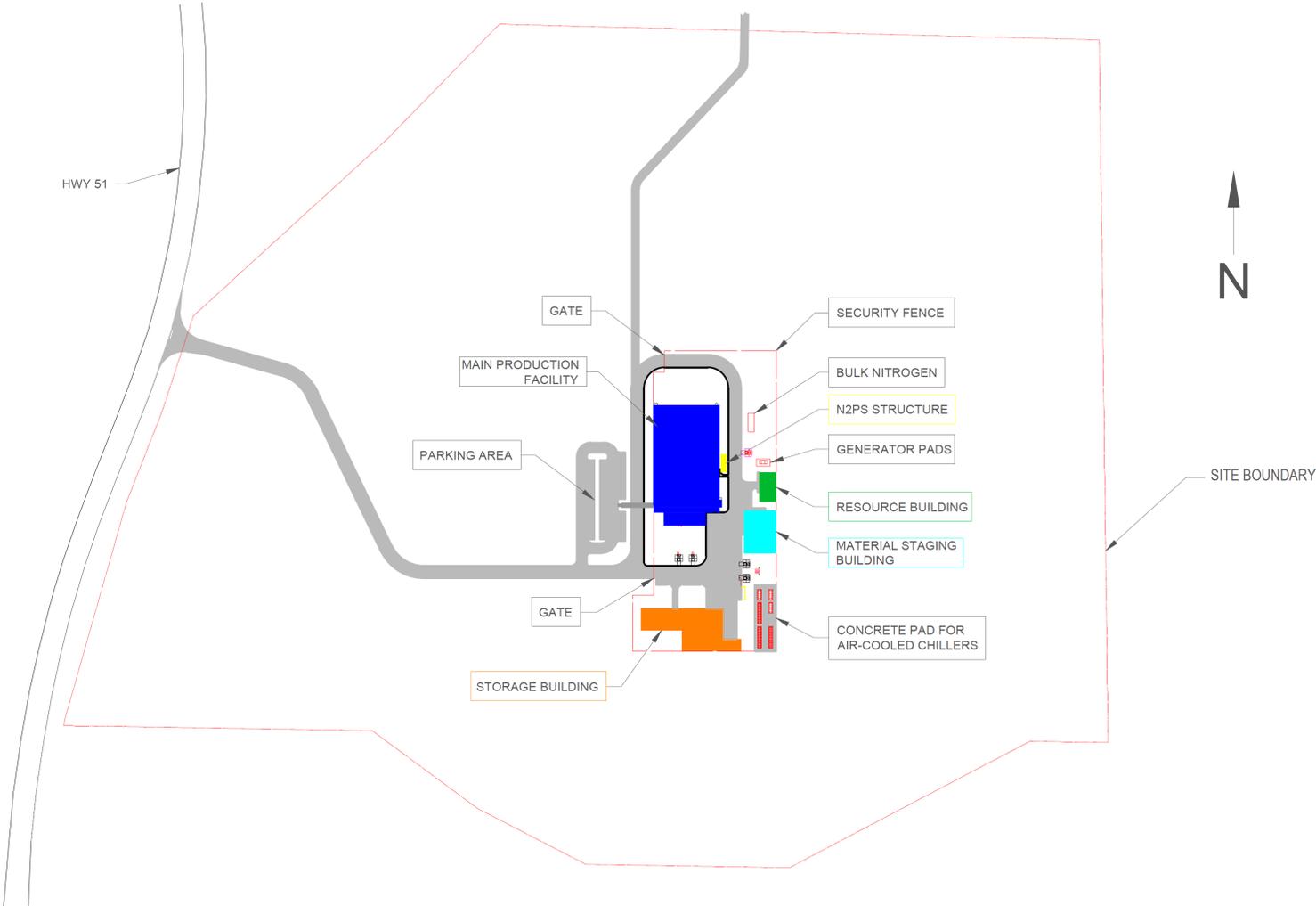
# Outline

- SHINE Site Overview
- Construction Status
- Process Overview
- Technological Approach
- Safety Philosophy

# Located in Janesville, WI



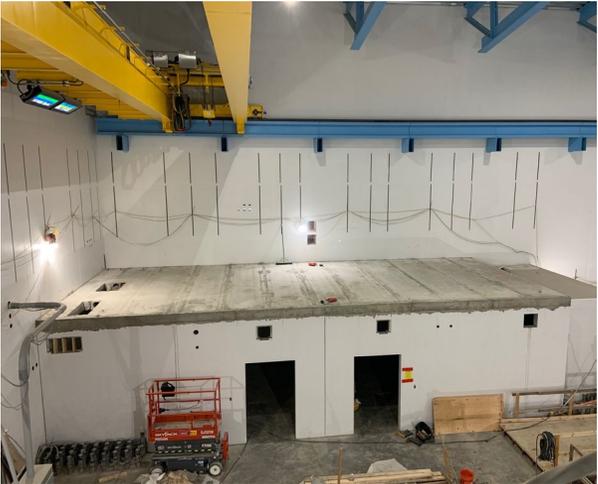
# Site Plan



# Site Rendering

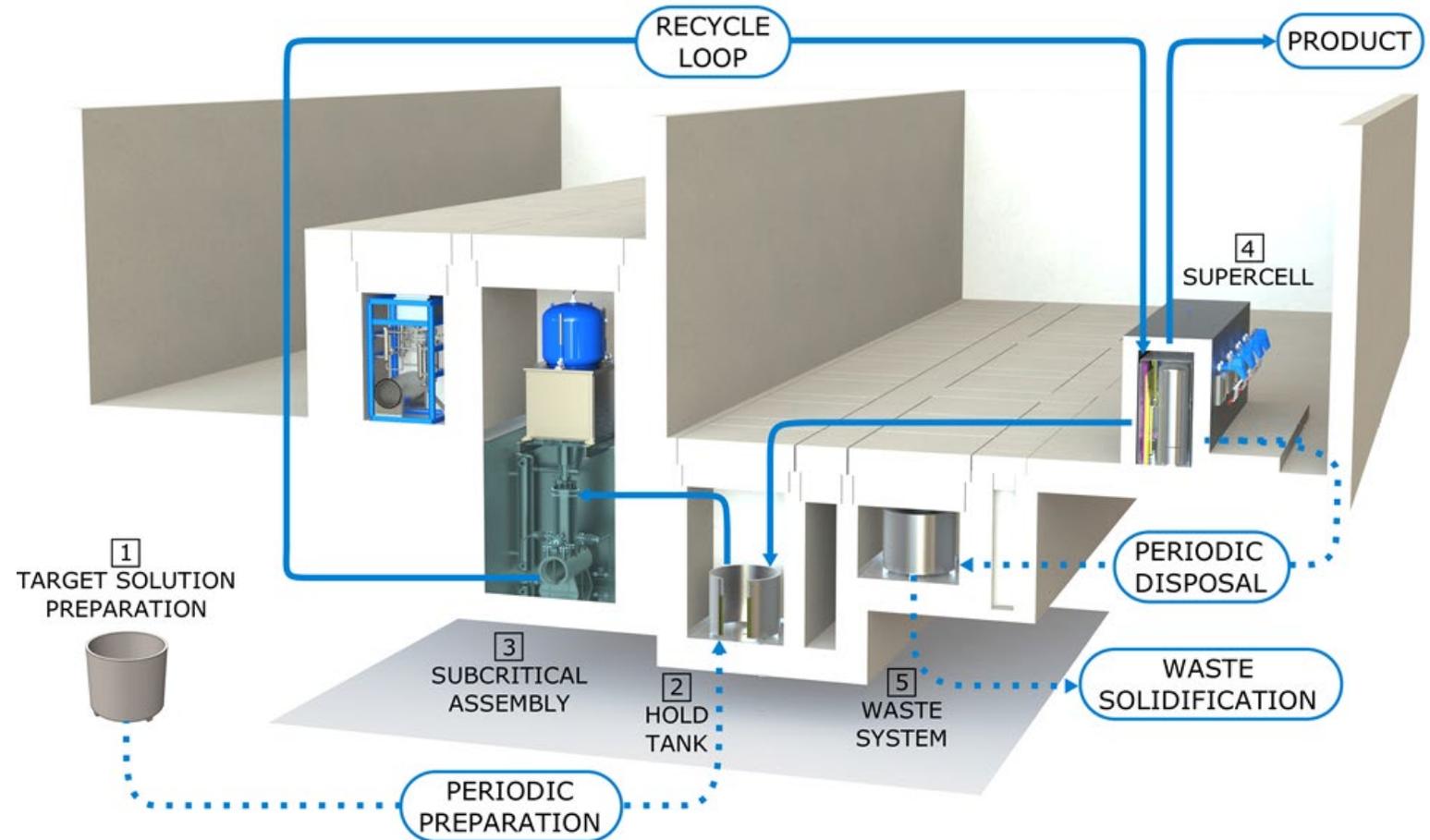


# Construction Status



# Process Overview

- Periodic solution preparation from LEU
- Solution chemistry check and staging
- Irradiation for 5.5 days
- Extraction, purification, QC, and packaging
- Waste handling



# Technological Approach

- Small systems: 125 kW, hundreds of times less power than isotope production reactors being used
  - Low source term—helps ensure safety of public and workforce
  - Decay heat per system < 1 kW within 5 hours
  - Minimizes waste nuclide generation compared to reactors
- Low enriched uranium (LEU) reusable target
  - Reduces waste
  - Product compatible with current supply chain
  - Eliminates need for HEU
- Driven by low-energy electrostatic accelerator
  - Fission essentially terminate shortly after driver turned off
- Multiple units and trains provide operational scalability and flexibility

# Safety Philosophy

- Low decay heat, low pressure, low temperature system
  - Minimal stored energy
- Independent units limit common cause failures
- Operator actions are not required to mitigate the consequences of an accident
- In the event of an upset condition:
  - TSV reactivity protection system (TRPS) initiates trip of system
  - Two completely independent safety-related TSV dump valves open
  - Target solution gravity drains to the TSV dump tank (safe for all uranium concentrations)
  - Hydrogen concentration maintained below lower flammability limit (LFL) by off-gas system blowers
- Following UPS battery run time, entire plant is passively safe
  - 90 days without cooling: pool temperature rise is not more than 13°F
  - Nitrogen purge system for hydrogen control

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Brown, Ch	Joined	2/16/2022, 9:56:52 AM
Widmayer, J	Joined before	2/16/2022, 9:56:52 AM
Antonescu	Joined before	2/16/2022, 9:56:52 AM
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Carte, Norl	Left	2/16/2022, 12:08:33 PM
Dennis Ble	Joined	2/16/2022, 10:06:46 AM
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