

United States
Nuclear Waste Technical Review Board (NWTRB)

Transcript

Summer 2023 Board Meeting

Wednesday
August 30, 2023

PUBLIC MEETING
In-Person and Virtual

Idaho Falls, Idaho

NWTRB BOARD MEMBERS IN-PERSON

Nathan Siu, Ph.D., Chair
Ronald Ballinger, Sc.D.
Steven M. Becker, Ph.D.
Allen G. Croff, M.B.A.
Tissa H. Illangasekare, Ph.D., P.E.
Scott Tyler, Deputy Chair, Ph.D.
Brian Woods, Ph.D.

NWTRB BOARD MEMBERS VIRTUAL

Kenneth Lee Peddicord, Ph.D., P.E.
Paul J. Turinsky, Ph.D.

NWTRB EXECUTIVE STAFF MEMBERS IN-PERSON

Daniel Ogg

NWTRB EXECUTIVE STAFF MEMBERS VIRTUAL

Neysa Slater-Chandler

NWTRB PROFESSIONAL STAFF MEMBERS IN-PERSON

Bret Leslie
Chandrika Manepally
Roberto Pabalan
Yoonjo Lee

NWTRB ADMINISTRATION STAFF MEMBERS IN-PERSON

Davonya Barnes

1 SIU: Okay. Good morning. I think it's time to start.
2 Welcome. Good morning, good afternoon, good evening,
3 wherever you are. Welcome to the U.S. Nuclear Waste
4 Technical Review Board's Summer Meeting. I'm Nathan Siu, and
5 I'm Chair of the Board. I'm wearing different glasses today,
6 so I'll read my script better, hopefully.

7

8 Yesterday, we had a workshop focused on the siting of
9 radioactive waste facilities. And we did have some
10 discussion of the U.S. Department of Energy's efforts on
11 consent-based siting. Today's meeting will focus mostly on
12 the U.S. Department of Energy's consent-based siting
13 efforts. And DOE will provide us with updates on its
14 research and development activities related to the
15 management and disposal of high burnup spent nuclear fuel,
16 and the disposition path for future advanced reactor wastes.

17

18 We're holding this meeting in hybrid format, with a
19 combination of both in person and virtual attendance by
20 presenters.

21

22 Okay. Let me introduce the Board members. And then we'll
23 describe briefly what the Board is and what we do. And I
24 apologize to those of you who were here yesterday because
25 you'll hear pretty much the same thing. But I think it's
26 useful because there maybe are some folks attending here
27 that didn't attend our workshop.

28

29 Okay. As I introduce them, I'll ask the Board members to
30 raise their hand so folks can see them. I'm Nathan Siu.
31 Again, I'm the Board Chair. All of the Board members are
32 part-timers, and many of us hold other positions. I'm
33 retired from the U.S. Nuclear Regulatory Commission. I'm a
34 special member of the graduate faculty at the University of
35 Maryland.

36

37 Ron Ballinger. Ron is a Professor Emeritus of Nuclear
38 Science and Engineering and Materials Science and
39 Engineering at Massachusetts Institute of Technology.

40

41 Steve Becker is Professor of Community and Environmental
42 Health in the College of Health Sciences at Old Dominion
43 University in Virginia.

44

45 Allen Croff is a nuclear engineer and an adjunct professor
46 in the Department of Civil and Environmental Engineering at
47 Vanderbilt University.

48

49 Tissa Illangasekare is the Amax Endowed Distinguished Chair
50 of Civil and Environmental Engineering at the Colorado
51 School of Mines. And eventually I'll get there, Tissa.

52

53 Lee Peddicord is not with us here in person. He's attending
54 virtually. And he's Professor Emeritus of Nuclear
55 Engineering at Texas A&M University.

56

57 Scott Tyler, Professor Emeritus in the Department of
58 Geological Sciences and Engineering at the University of
59 Nevada, Reno.

60

61 And Brian Woods is the School Head and Professor in the
62 School of Nuclear Science and Engineering at Oregon State
63 University.

64

65 We do have another Board member who's unable to join us
66 today. That's Dr. Paul Turinsky, who's a Professor Emeritus
67 of Nuclear Engineering in North Carolina State University.

68

69 So, you can see, at present, we have nine board members.
70 That's not our full complement of 11. So, obviously, other
71 positions are vacant, and we are working on filling those
72 positions. Detailed information on our backgrounds can be
73 found on the Board's website.

74

75 Okay. As we heard yesterday, the Board members are lively.
76 They'll provide not only questions, but sometimes
77 suggestions - even things that sound like recommendations. I
78 want to make it clear that the views expressed by Board
79 members during the meeting are their own and not necessarily
80 Board positions. Our official positions can be found in our

81 reports and letters, which are available on the Board's
82 website.

83

84 Okay. Very briefly, about the Board and what we do. We're an
85 independent federal agency in the Executive Branch. We're
86 not part of the Department of Energy and/or of any other
87 federal department or agency.

88

89 The Board was created in 1987 in the Amendments to the
90 Nuclear Waste Policy Act, and our purpose is to perform
91 objective, ongoing evaluations of the technical and
92 scientific validity of DOE activities related to the
93 management and disposal of spent nuclear fuel and high-level
94 radioactive waste.

95

96 Board members are appointed by the President. He's provided
97 with a list of nominees, and that's submitted by the
98 National Academy of Sciences.

99

100 Our purpose, again - we're mandated by statute to report
101 Board findings, conclusions, and recommendations to Congress

102 and to the Secretary of Energy. Meetings like today's are an
103 important part of the Board's review of DOE's activities.

104

105 We provide objective technical and scientific information on
106 a wide range of issues related to the management and
107 disposal of spent nuclear fuel and high-level radioactive
108 waste that will be useful to policymakers in Congress and
109 the Administration.

110

111 For example, we provide technical and scientific comments in
112 letters or reports to DOE following our public meetings -
113 obviously, like this one. All this information can be found
114 on the Board's website, www.nwtrb.gov, along with Board
115 correspondence, reports, testimony, and meeting materials,
116 including archived webcasts of recent public meetings.

117

118 If you'd like to know more about the Board, we do have a
119 two-page document summarizing our mission and presenting a
120 list of the Board members that can be found on the Board's
121 website. We also have copies of the Board's mission and some

122 recent Board reports on the document table outside this
123 room.

124

125 The meeting agenda and presentations have been posted on the
126 Board's website and can be downloaded. I'll note that that
127 agenda does include the names and affiliations of the
128 speakers. And I apologize yesterday if we didn't cover those
129 thoroughly. Today, following public comment that we got, we
130 will have the speaker names and affiliations underneath each
131 slide.

132

133 We'll have two public comments periods today: the first at
134 12:15 Mountain Time; the second at 3:40 PM Mountain Time.
135 Those attending the meeting in person and wanting to provide
136 oral comments are encouraged to sign the public comment
137 register at the check-in table near the entrance to the
138 meeting room.

139

140 Oral commenters will be taken in the order in which they
141 signed in. Depending on the number of those wishing to
142 speak, we might have to have a time limit on the remarks.

143 And I'll note, again, this is something that we are taking
144 comments, but we - this is not a point to engage in question
145 and answer. This is something that we will be putting on our
146 record. And I assure you, the Board members do read those
147 comments, and we'll try to think about what we're going to
148 do with them.

149

150 When making a comment during the public comment period, you
151 please use the microphone right there. And please state your
152 name and affiliation so that you'll be identified correctly
153 in the meeting transcript. I'll remind the DOE staff and
154 National Lab participants in the room, please also use the
155 microphone and identify yourself if you're called upon
156 during the meeting to respond to Board questions.

157

158 Public comments can also be submitted during the meeting via
159 the online meeting viewing platform using the Comment-For-
160 Record form. If you're viewing the presentation in full-
161 screen mode, you can access the Comment-For-Record section
162 by pressing the escape key. A reminder on how to submit
163 comments will be displayed during the breaks. It's tiny

164 little letters, but I think you can pull it up on your
165 screen.

166

167 The Board values these comments and will read them as part
168 of our deliberations on this meeting. Comments submitted
169 online during the meeting will also be posted to the Board
170 website shortly after the meeting adjournment. My
171 understanding from the comments from yesterday, if they're
172 not up already, will be up shortly.

173

174 Written comments and any other written materials may also be
175 submitted later by mail or email to the point of contact
176 noted in the press release for this meeting. That's also
177 posted on our website. These also will become part of the
178 meeting record and will be posted on the Board's website
179 along with the transcript of the meeting and the
180 presentations you'll see today.

181

182 This meeting is being webcast live and is being recorded, so
183 you'll see some cameras around the room. Depending on where

184 you're sitting, you might be a part of the webcast and the
185 recording.

186

187 The archived recording will be available on the Board's
188 website by September 4th, and the transcript will be
189 available by October 30th.

190

191 Okay. So, that's how we're doing things. Let's talk about
192 what we're trying to do today. This meeting is part of the
193 Board's continuing review of DOE activities related to the
194 management and disposal of spent nuclear fuel and high-level
195 radioactive waste.

196

197 DOE's Office of Integrated Waste Management mission is to
198 construct one or more federal interim storage facilities
199 using a consent-based siting process, ready to receive
200 commercial spent nuclear fuel as soon as practicable. Over
201 the past few years, DOE has been ramping up efforts to
202 support integrated waste management activities. And these
203 were the focus of the Board's Spring 2023 meeting, as well
204 as the DOE's consent-based siting activities.

205

206 DOE is early into the multi-year consent-based siting
207 enterprise, and we do recognize that. DOE's consent-based
208 siting efforts today include a funding opportunity
209 announcement, hiring new federal staff to work on multi-
210 disciplinary issues such as those that intersect with social
211 and behavioral sciences, and environmental justice, and
212 publishing its consent-based siting process.

213

214 Notably, in June, DOE announced the 13 awardees of a \$26
215 million funding opportunity announcement to support
216 community engagement with DOE's consent-based siting
217 activities.

218

219 For the past several years, DOE's Office of Spent Nuclear
220 Fuel - Spent Fuel and Waste Science and Technology has been
221 conducting R&D activities related to the management and
222 disposal of high burnup spent nuclear fuel.

223

224 In recent years, with the potential near-term development,
225 deployment of commercial small and modular and advanced

226 reactors, such as the high temperature gas-cooled reactor
227 and the sodium-cooled fast reactor, DOE has been making
228 early preparations for the management of spent nuclear fuel
229 and high-level radioactive waste that could result from the
230 operation of advanced reactors. And so, these are other
231 topics that we will be covering in today's meeting.

232

233 So, at this meeting, we'll start the day with presentations
234 from the Office of Integrated Waste Management related to
235 its consent-based siting process. After the lunch break,
236 we'll have two presentations from the Office of Spent Fuel
237 and Waste Science Technology, a presentation on high burnup
238 spent nuclear fuel R&D activities, and then a presentation
239 on the disposition of advanced reactor waste.

240

241 The Board's review will focus on the technical and
242 scientific validity of DOE's consent-based siting
243 activities, DOE's R&D activities related to the management
244 and disposal of high burnup fuel, and DOE's R&D activities
245 related to the disposition of future advanced reactor waste.

246

247 So, our agenda. Today's meeting will start with a
248 presentation from Natalia Saraeva and Juan Uribe, both from
249 the DOE Office of Nuclear Energy. And they'll provide an
250 update on DOE's consent-based siting activities. Following
251 their presentation, and as with all other presentations, the
252 Board members and staff will raise questions and engage in
253 discussion. Public comments will be provided to the Board in
254 reserved time slots, as we talked about earlier.

255

256 Next, Marissa Bell from DOE will provide an overview of
257 environmental justice and DOE's consent-based siting
258 activities. We'll have a 10-minute break 10:15 AM.

259

260 After the break, Marissa and Tran Le, both from DOE, will
261 tell us how DOE plans to incorporate social science in its
262 consent-based siting activities.

263

264 Then Tran and Angelica Gheen, both from DOE, will describe
265 how DOE is developing digital tools for community
266 engagement.

267

268 Then, as I mentioned earlier, we'll have our first public
269 comment period at 12:15 for 15 minutes. Lunch break is at
270 12:30 and will last for one hour and 10 minutes.

271

272 After the lunch break, starting at 1:40 PM, we'll have two
273 presentations from the DOE Office of Spent Fuel and Waste
274 Science and Technology. Ned Larson from DOE, along with two
275 National Laboratory staff, Scott Sanborn and John Bignell,
276 will provide updates on DOE's activities on the management
277 of high burnup spent nuclear fuel.

278

279 And then our final presentation of the meeting, Ned Larson
280 from DOE and Brady Hanson from Pacific Northwest National
281 Laboratory will describe DOE's advanced reactor waste
282 disposition activities.

283

284 We'll have our second public comment period at 3:40 PM
285 Mountain Time, and we'll adjourn the meeting at 3:55 PM
286 Mountain Time.

287

288 Much effort went into planning this meeting and arranging
289 the presentations, so, I want to thank our speakers for
290 making presentations, and especially those, of course, who
291 participated in the Board fact-finding meeting on consent-
292 based siting activities that was held virtually on June 29th,
293 and a fact-finding meeting on the management of high burnup
294 fuel that was held virtually on July 17th of this year.

295

296 Thanks also to Board members Steve Becker, Lee Peddicord,
297 and Scott Tyler, who are the Board leads for consent-based
298 siting; Alan Croff, Lee Peddicord, Paul Turinsky, and Brian
299 Woods, who are the Board leads for high burnup spent nuclear
300 fuel; Ron Ballinger and Lee Peddicord, who are the Board
301 leads for advanced reactor waste disposition.

302

303 These Board members and the Board staff, particularly Bret
304 Leslie, Andy Jung, and Jo Jo Lee, and have been instrumental
305 in putting this meeting together, and our staff are over
306 here. Thank you very much.

307

308 Okay. So, if you'll please mute your cell phones, let's
309 begin and start what will probably be a very interesting
310 and productive meeting. So, it's my pleasure to turn it over
311 to Natalia Saraeva, who will get the meeting started. And
312 also Juan Uribe, of course. Thank you.

313

314 SARAeva: Good morning. Thank you, Nathan, for the
315 introduction. My name is Natalia Saraeva. I'm team lead
316 with, on consent-based siting, with U.S. Department of
317 Energy, Office of Nuclear Energy. I'm joined today by my
318 team colleague, Juan Uribe. We'll both be providing you an
319 overview of our consent-based siting and where we are. So,
320 I'll start, and then I'll turn it over to Juan to talk more
321 about the consortia and what we're doing with the consortia.

322

323 As Nathan mentioned, later today, you will hear from our
324 social scientists, Marissa Bell and Tran Le, on what we're
325 doing on environmental justice, social science, integrating
326 social science, and also about the digital tools we're
327 developing for - to help the consent-based siting and
328 communicating about consent-based siting.

329

330 All right. So, just to provide a little bit of background,
331 the Department of Energy and Office of Integrated Waste
332 Management is committed to an integrated approach for the
333 waste management. Integrated approach includes federal
334 interim storage facilities, the transportation needed to
335 move the spent fuel, and the pathway for the disposal. And
336 we're committed to using consent-based siting for siting the
337 - those - the spent nuclear management facilities.

338

339 As many of you may know, the Department of Energy is
340 responsible for managing nation spent nuclear fuel and high-
341 level radioactive waste. And that includes finding sites to
342 store and dispose of spent nuclear fuel. Currently, our
343 focus is on finding sites for federal interim consolidated
344 storage facilities. And it is consistent with the
345 congressional directions that are provided.

346

347 Spent nuclear fuel is currently safely and securely stored
348 across the country and over about 70 sites. However, the
349 communities that were hosting these materials never agreed

350 to do so long term. Moreover, because the department didn't
351 meet its local obligations to start taking fuel back from
352 utilities by 1998, early 1998, this resulted in liabilities
353 that are over \$10 billion, and they will be growing.

354

355 As I mentioned, through the Congressional Appropriation Acts
356 of 2021, 2022, and 2023, Department of Energy was directed
357 to move forward under the existing authority to identify
358 sites for federal consolidated interim storage facilities
359 for spent nuclear fuel using consent-based siting process.

360

361 Interim storage is a very important component of integrated
362 waste management system. It provides flexibility to the
363 system and also allows us to start removing spent nuclear
364 fuel from existing reactor sites. It provides us some useful
365 research opportunities. It will help us to start rebuilding
366 trust and confidence with the public and stakeholders by
367 demonstrating consent-based siting. And as I mentioned, it
368 will help us to start addressing the taxpayers' liability
369 that's been growing.

370

371 So, where we are on consent-based siting right now. So, we -
372 when we restarted the process in 2021, we did not start from
373 scratch, right? So, the - some of you might know who were
374 following us that in 2015, Department of Energy began
375 developing a consent-based siting process for siting the
376 nuclear - spent nuclear fuel facilities. And that was as a
377 result of recommendation of the Blue Ribbon Commission on
378 America's Nuclear Future.

379

380 Department of Energy had an invitation for public comments,
381 and department received over 10,000 public comments. And in
382 addition to that, there were a series of public meetings
383 around the country to solicit feedback. The feedback that we
384 received both in the comments and through the meetings, and
385 also in additional engagements the department held
386 interacting with different stakeholders at conferences and
387 different meetings, all of that feedback resulted in this
388 document, which was draft consent-based siting process.

389

390 It was - in the document was also, of course, incorporated
391 results of previous studies, such as Blue Ribbon Commission
392 on America's Nuclear Future report, National Academy of

393 Sciences, and many more. So, they - the process document was
394 released in January 2017. And there was - put for public
395 comments.

396

397 So, in 2021, again, following the direction from the
398 Congress, Department restarted consent-based siting process.
399 And it issued a Request for Information on using consent-
400 based siting to identify sites for interim storage of spent
401 nuclear fuel.

402

403 So, I am often asked the question, "You already received so
404 many comments before. Why do comments again?" Well, first of
405 all, between 2017 and 2021, a lot has changed, right? So,
406 and the comments were to allow those who did provide comment
407 in the past to let us know if their opinions changed or if
408 they're still the same. And some opinions shifted a little
409 bit, but some of the responders provided the comments that
410 were similar to those.

411

412 It was also an opportunity to hear from those who didn't
413 provide us comments, because we received over 10,000

414 comments for the call for the overall invitation to public
415 comments. But there were only about 30 unique comments for
416 the draft process document itself. So, we strongly felt like
417 we need to provide an opportunity to those we didn't do, so
418 to raise their voice.

419

420 So, we received 200 - over 220 submissions from a wide
421 variety of commenters. And they included Tribes, state,
422 local governments, nongovernmental organizations, industry,
423 members of academia, and general public. All those comments
424 were carefully reviewed and analyzed. And we have the
425 summary of the analysis that is available on our website.
426 But most importantly, this - the comments informing our
427 steps and actions in the consent-based siting process.

428

429 And even though the comment period is closed, right, we're
430 always open for the feedback and open to the comments that
431 can be sent to us by email.

432

433 So, what is consent-based siting? So, consent-based siting
434 is an approach to finding sites. And it's an approach that

435 we're using to site facilities that focuses on needs and
436 concerns of people and communities. We pay special attention
437 on ensuring issues of equity and environmental justice are
438 built in the process.

439

440 And this is phased, an adaptive approach, and willing and
441 interested communities will be working with the department
442 through those phases collaboratively. And they will be
443 making decisions whether or not hosting a facility is
444 something in their interest and fit their community needs
445 and vision.

446

447 So, this is, as Nathan mentioned, is a long process. And we
448 understand that it's a daunting challenge. But based on
449 experiences both internationally and domestic, we believe
450 that's the right approach to take.

451

452 We often ask, what is the success of consent-based siting
453 process? So, we define success as a negotiated consent
454 agreement between the host community and the Department of
455 Energy, or a determination by the community that it is not

456 in their interest to be a host of such a facility. We're
457 considering both as a success.

458

459 So, in - earlier this year, we released updated revised
460 consent-based siting process document for federal
461 consolidated interim storage of spent nuclear fuel. So,
462 again, our approach prioritizes people in communities. It
463 centers equity and environmental justice. It's
464 collaborative, phased, and adaptive, and its voluntary. So,
465 participation in the process will be voluntary. And we have
466 some copies left in the booth here and also available
467 online. So, if you're interested, please grab a copy.

468

469 So, I wanted to talk a little bit about changes to the - to
470 this document compared to the 2017 draft. So, first of all,
471 this document reflects the current focus on the federal
472 consolidated interim storage facility. And of course, the -
473 when we - the lessons learned from this process will be
474 applied for future siting of facilities to manage spent
475 nuclear fuel. This document includes the incorporation of
476 public feedback, both that were received in 2017 and also in

477 response to 2021 Request for Information. It places greater
478 emphasis on equity and environmental justice.

479

480 We also reflective of the public comments. We expanded the
481 role of potential host communities in the process itself. So
482 for example, in the next phase, we included the opportunity
483 for the potential host communities to develop site -
484 additional site assessment criteria that would be important
485 to them.

486

487 And also, again, responsive to the public feedback, we
488 included broader considerations for providing funding to
489 support the engagement. This comes with a caveat that the
490 funding amounts will be - for us to provide the funding with
491 the, depending on, the congressional provisions that we rely
492 on every year.

493

494 So, this slide is just high-level overview of the three big
495 stages of the process document. Stage one is planning and
496 capacity-building. So, we in this stage right now, and we're
497 not looking for volunteers yet. So, stage two will be site

498 screening and assessment. And that's where we'll be starting
499 looking for willing host communities. And then we will move
500 to stage three, negotiation and implementation. And after
501 we'll negotiate an agreement with willing and informed host
502 communities, we'll be moving into implementation.

503

504 So, this slide also provides some anticipated durations.
505 Again, those are just estimates. And as we've heard from
506 public comments a lot, and as we've heard from - as we know
507 from our experiences, domestic and international consent-
508 based siting or adaptive phase management, as our partners
509 in Canada call it, it takes time, right? And also, we have a
510 really hard work in building trust. So, those durations are
511 anticipated, but we expect that some of the phases might
512 take different timeframes.

513

514 So, again, right now, we are in the first stage. And we are
515 in the phase 1B, building capacity. So, we're not looking
516 for volunteers at this phase. We are - we issued the Funding
517 Opportunity Announcement last year. And as Nathan mentioned,
518 as Juan will talk later about, we recently announced
519 selection of 13 awardees. And those awardees will help us to

520 conduct robust engagement activities and enable mutual
521 learning. So, we expect those activities will be really
522 different and diverse because there are different levels of
523 knowledge across the country about the spent nuclear fuel
524 management. So, we anticipate a wide range of type of
525 learning that will occur. And we expect to learn from the
526 consortia, from the cohorts, and the public. We also expect
527 that members of consortia will learn from each other, and of
528 course, the interested community organizations will learn
529 from us and each other. So that's what we call mutual
530 learning.

531

532 At the end of this phase, which is anticipated to take about
533 two years, we will take all that feedback we received, and
534 we use it to inform our next steps. And if needed, we'll
535 refine our process document. Because our process document is
536 not set in stone. It's adaptive and will be changed as
537 needed.

538

539 So, now I wanted to talk a little bit about the decision-
540 making process, to address one of the questions that the
541 Board had. So, first of all, this step-wise and

542 collaborative decision-making is one of the foundational
543 principles of consent-based siting. And the implementation
544 will be done in consultations with interested communities,
545 stakeholders, Tribes, and states. And decision will be based
546 on social, technical, and scientific consideration, and
547 regulatory requirements. And that's where the nexus of
548 social acceptability and technical acceptability comes into
549 place.

550

551 Right now, we're on the phase of capacity-building and
552 enabling more learning, even though learning will continue
553 throughout the whole process. But so, we're not requesting
554 any volunteers. So, and those who will participate in this
555 mutual learning, it's not a requirement to move to the next
556 phase. That's why the collaborative, more collaborative and
557 place-based activities will take place in the next phase and
558 beyond.

559

560 And we also anticipate that we will be discussing our
561 decision-making process and the basis for the decision
562 process clearly and openly with interested communities
563 throughout the phases. But we also expect that communities

564 may develop and determine the best approaches for their own
565 decision-making process. And those approaches might be
566 different depending on different communities.

567

568 So, this slide is a screenshot of the simplified road map of
569 our consent-based siting process that is available in the
570 document itself. But it's a good illustration of the nexus
571 of technical and social acceptability, right? So, the -
572 especially it's illustrated well here. So, right here. At
573 the end of each phase, qualified and interested communities
574 will decide if to proceed or not to the next phase. And
575 qualified would mean that all the technical, environment,
576 regulatory criterias applicable to that phase are met. And
577 interested would also mean this social acceptability, right?
578 So, this is where they, again, come together.

579

580 So, with that, I'd like to turn to Juan to talk more about
581 our consent-based siting consortia and our plan there.

582

583 URIBE: Good morning. As Natalia mentioned, my name is Juan
584 Uribe. And I also want to thank the Board again for having

585 us here and have discussions about consent-based siting and
586 the consortia.

587

588 So, we're switching gears a little bit now, and we're
589 talking about the consortia. Natalia covered the consent-
590 based siting process and mentioned where our Funding
591 Opportunity Announcement fits in. I do want to start with a
592 couple of reminders. And that's that while the process is
593 certainly not a prescriptive set of requirements, it does
594 serve as a set of guidance or guidelines that we will
595 follow.

596

597 So, consistent with this, the consortia activities that
598 you'll hear about, and central to the funding opportunity
599 that we issued, is to prioritize communities and its
600 members; listen to them - we spent some time yesterday
601 talking about the importance of listening; learn from them;
602 environmental justice as an integral part of all activities.
603 And again, Marissa had some discussion yesterday on
604 environmental justice, and we'll hear more about that today.
605 As an integral part of all activities, consent-based siting
606 will pursue the fair treatment and meaningful involvement of

607 all people and comply with the federal requirements and the
608 guidance available on this particular topic.

609

610 And lastly, understand that this process is meant to be
611 collaborative. And so, as we learn together, we will be
612 adaptive in our learning and take a phased approach toward
613 siting a federal consolidated interim storage facility for
614 commercial spent nuclear fuel.

615

616 So now, switching gears to the consortia. Okay. So, there
617 was a delay in the slide. So, this is just a quick reminder
618 of where we are in the process with the Funding Opportunity
619 Announcement. As a signal of this funding opportunity's
620 relevance and importance, as Nathan mentioned, on June 9th of
621 this year, Secretary Granholm announced the \$26 million
622 Funding Opportunity Announcement awardees at the San Onofre
623 Nuclear Generating Station in California. In her
624 announcement, she was flanked by Republican Mike Levin,
625 Representative Mike Levin, Steve Powell, and Katrina Foley.

626

627 So, one of our early goals that we hoped to accomplish when
628 we set out with this funding opportunity was to have both
629 geographical and also institutional diversity in our
630 awardees and the communities that they engaged. As we all
631 could perhaps agree, diverse perspectives are fundamental to
632 informing our process in a balanced and fair manner.

633

634 So, our Funding Opportunity Announcement, just as a context
635 heading, was issued in September of 2022 and originally had
636 \$16 million allocated to the awards. It was then increased
637 by \$10 million to a total of \$26 million, and the deadline
638 was extended to the end of January of this year.

639

640 And, as Natalia mentioned, it's important to reemphasize
641 that in this part of the process, we are not looking for
642 volunteer host communities. So, the tasks by the consortia
643 are not meant to deliver or have as an output the
644 identification of a site. This is just simply meant to be a
645 stage for capacity-building, learning more, and as we all
646 heard yesterday, it's very similar to the learn more
647 approach that was covered by Lisa Frizzell from NWMO and the
648 Canadian process.

649

650 Many of you may have seen the figure that's being displayed
651 before. But, we as a team are very proud of the wide and far
652 reach that our awardees bring. We do recognize that some of
653 the consortia members, partners, and plans are evolving.
654 Communities are still being decided and some of the details
655 finalized. So, this figure may potentially change over the
656 coming months and will continue to change, and that's okay.
657 But the impact that you see here, the point being that the
658 impact that you see here is tremendous. And with this big
659 impact comes a big responsibility that our awardees and DOE
660 will share together. And so, we'll dive into that in the
661 coming slides.

662

663 So, as mentioned on the prior slide, one of our early goals
664 we hoped to accomplish when we set out with this funding
665 opportunity was to have institutional diversity in our
666 awardees and the communities that they engage. So, many of
667 you may have seen this table before, but we as a team,
668 again, are very proud of the wide and far reach that our
669 awardees bring.

670

671 So, just some quick numbers for you. And seven of the 13
672 awardees are higher - of the primary awardees are higher
673 learning institutions. We also have NGOs, and we also have
674 the private sector, including partners. When you factor the
675 partners in, there's approximately 25 higher learning
676 institutions that are involved. Topnotch academic
677 institutions in the country. Institutional diversity is
678 further reflected by Tribal entities such as the National
679 Tribal Energy Association, the Tribal Consent-Based
680 Coalition, and Sovereign Nations, so the YTT Northern
681 Chumash and the Prairie Island Indian Community are
682 participating in some capacity.

683

684 You also have invaluable insights from key partners, such as
685 the Nuclear Energy Institute, the National Association of
686 Regional Councils, representatives from operating nuclear
687 power plants. And so, when you collect all this together and
688 combine it, the diversity that we have is incredibly
689 valuable.

690

691 So, again, I won't go into specific details of the table.
692 They're all listed in the slides that are available. But

693 just as a very high-level, 13 primary awardees are the
694 American Nuclear Society, Arizona State University, Boise
695 State University, Clemson University, the Energy Communities
696 Alliance, Good Energy Collective, Holtec International, the
697 Keystone Policy Center, Missouri University of Science and
698 Technology, North Carolina State University, Rensselaer
699 Polytechnic Institute, Southwest Research Institute, and
700 Vanderbilt University.

701

702 I do want to mention that the cooperative agreements with
703 these institutions are currently in the process of being
704 finalized. And so, because of that, we are in some capacity
705 still in the procurement and under the auspice of
706 procurement process. And so, we're still somewhat limited in
707 the information and the evolution of the things that we can
708 release until we finalize the cooperative agreement.

709

710 So now, let's talk a little bit about the expectations that
711 we have for the consortia. So first, I want to mention, we
712 met with our consortia members on July 24th and 25th for a
713 kickoff meeting in Washington, DC. And it was a phenomenal
714 meeting. It was full of networking. It was full of

715 informational sessions. We had a message from Secretary
716 Granholm. But most importantly, it served as a platform and
717 a space where collaboration and capacity-building will be
718 developed over the course of 18 to 24 months, which is the
719 period of performance for the cooperative agreement. So, you
720 keep hearing the term about capacity building. And in
721 principle, this is how it starts to look like.

722

723 We reemphasized to the consortia that as they go out and
724 begin to complete the tasks described in the funding
725 opportunity for which they were selected, they are a hub.
726 They are a trusted source for community engagement and
727 information. They are responsible for managing the provision
728 of these resources that we provide to them to the
729 communities. And as you may agree, these resources are
730 critical in allowing interested communities the opportunity
731 to learn more about nuclear waste, the management of
732 commercial spent nuclear fuel, and the role that a
733 consolidated interim storage facility may have in their
734 community.

735

736 We firmly believe that with adequate resources, we have an
737 increased chance of having meaningful involvement and
738 participation. And this is a critical step to reduce the
739 barriers to participation and ensure that the voices that we
740 haven't heard before are accounted for and that we learn
741 from them.

742

743 So, the consortia, which is the composition of the thirteen
744 awardees - each individual awardee is a consortium. So, the
745 consortia has an incredible capacity to increase outreach
746 and expand the discussion around the topic of spent nuclear
747 fuel. And this is where the multiplication factor comes in.
748 When you look at all the outreach and the engagement that
749 our awardees are going to be able to leverage over the
750 course of two years, there is a multiplication factor that
751 the department, if we were to set out and do this ourselves,
752 would not have the resources or the capability to reach. And
753 that's not even considering the issues of trust that have
754 been mentioned over the past couple days.

755

756 So, lastly, during our meeting in July, we emphasized to the
757 consortia the importance of cohort building. DOE will work

758 very hard to ensure that our awardees have a platform to
759 collaborate and engage with each other. But it also depends
760 on each awardee. And we had frank discussions about
761 challenging our awardees to work amongst each other. And it
762 was a really fulfilling thing to see that even from day one,
763 those interactions already started to happen. Meetings were
764 being scheduled, plans were being co-developed. And some of
765 our objectives were already coming to fruition.

766

767 So, as I mentioned, as awardees learn from other awardees
768 and their activities, we challenge them to collaborate and
769 build those long-lasting partnerships. Strengthening that
770 capacity will be key as we enter the next stage of the
771 consent-based siting process and formally start looking for
772 volunteer host communities.

773

774 So, switching gears to the main tasks that the consortia
775 will be conducting and the responsibilities, we can divide
776 them into three major areas. The first one is to organize,
777 lead, and maintain meaningful, inclusive community and
778 stakeholder engagement processes related to nuclear waste
779 management.

780

781 Second is to map public values, interests, concerns, and
782 goals to promote and enable effective collaboration and
783 community-driven feedback. And this mapping of public values
784 is something that is very critical and is something that was
785 mentioned yesterday about understanding the communities, how
786 they differ, what's important to them.

787

788 And third is to develop, implement, and report outcomes and
789 strategies and activities that support mutual learning among
790 the Department of Energy, stakeholders, communities, and
791 experts on nuclear waste-related topics.

792

793 So, throughout the period of performance, we'll be talking
794 about what things are working for each awardee, what things
795 are posing a challenge. We all know the things, or we have
796 an idea of the things that are working for us and the
797 challenges that we have. So, at the end, we'll have a good
798 baseline to learn more and adapt from there.

799

800 And this is key because, as we've mentioned in several
801 different presentations and conferences and even to the
802 consortia, DOE will be a partner throughout the process. We
803 are not in a standby mode. We are a partner, and we'll be
804 working hand-in-hand with the consortia in mutual learning
805 activities.

806

807 And then, one of the questions was how we're going to
808 integrate the consortia activities into our consent-based
809 siting process. So, while it's still very early in the
810 consortia process, the consent-based siting team lead by
811 Natalia is already hard at work and looking at ways to
812 integrate what we learn.

813

814 So, with the aim of refining and improving the consent-based
815 siting process, there are two deliverables that we're
816 planning to issue, and we have a high degree of certainty
817 that we're going to plan and execute them. The first one is
818 a consortia dedicated report that captures and summarizes
819 the learnings over the course of two years. It's going to
820 have a summary section, but also more details about the
821 activities that we did, what we learned, what we heard. And

822 it's going to distill them into succinct and actionable
823 findings.

824

825 So, for those of you that follow the Office of Integrated
826 Waste Management's activities, we had the Request for
827 Information, which Natalia mentioned, received over 225
828 responses. And then following that was a summary report of
829 those comments received, and distilled them into actionable
830 items. So, following that same process, we hope to do
831 something similar with the consortia.

832

833 And then the second, which is reflected here in this slide,
834 is we also envision that all the work being done in the
835 social science area, the work by the consortia, the
836 continuous public feedback, and other key sources of input
837 will all result in valuable updates to the consent-based
838 siting document. So, we think that around this time, it
839 would be prudent to look at refining or updating the
840 consent-based siting process, which we've mentioned is
841 iterative and adaptive.

842

843 And then from there, we're also leaving room to adapt and
844 adjust with the information that we learn along the way from
845 the consortia. So, as we go out and complete the period of
846 performance, when we learn about the effectiveness, for
847 example, of certain engagement strategies versus others, we
848 can also tailor that into our activities. What are the most
849 useful communication strategies? We've heard a lot about
850 social media. We heard a lot about different ways to
851 communicate. It was also mentioned yesterday about sending
852 paper copies because of the challenges of certain
853 communities to - for broadband access. So, optimizing the
854 way that we communicate is certainly something that we're
855 going to keep an eye out on.

856

857 And also, I just wanted to follow up on a question received
858 yesterday, which is, we're already seeing meaningful changes
859 from the consortia work. Lessons learned and activities that
860 the consortia are doing are already being taken back to
861 academic curriculums, and they're already being implemented
862 by some of the professors that are involved, directly or
863 indirectly, in the consortia. You have venues such as the
864 Nuclear Waste Educators Workshop, where they meet, they talk

865 about these topics, and they all take them back to their
866 respective home organizations, and adapt and refine their
867 curriculums.

868

869 So, with that, that is really just a broad overview of the
870 consortia where we are, some of the activities. And I thank
871 you for your time.

872

873 SIU: Thank you, Natalia and Juan. Very good. Now we're open
874 for questions. I'll start with the members of the small
875 board team, Steve Becker, Scott Tyler, and Lee Peddicord's
876 online. Steve, you want to start?

877

878 BECKER: Good morning. Steve Becker, NWTRB Board. Thank you,
879 Natalia and Juan, for a very nice overview. I will start
880 with a question that goes back to the early part of the
881 presentation. The 2017 and 2021 request for comments on
882 consent-based siting occurred very early in the process. And
883 presumably, as the process gets further down the road, there
884 will be many, many more stakeholders who have views and

885 ideas to share. Do you envision future comment-seeking
886 exercises on the consent-based siting process?

887

888 SARA EVA: Thank you, Steven. I'll start, and I'll see if
889 Juan has anything to add. So, yes, we really heavily rely on
890 public feedback, because it's impossible to build the
891 process that works for the communities and the public
892 without their input. You'll also have heard in the public
893 comments we received in 2021 that there is comment fatigue.
894 So, that was one of the reasons why we didn't put the
895 consent - the current reviews of consent-based siting
896 process document for comment. However, we are open to any
897 comments, right, and feedback, and we welcome it.

898

899 So, to your answer about the future requests for comments,
900 we might consider it. But right now, we're not sure which
901 form would that take. And yeah. So again, we'll be sensing
902 the - we'll be sensing the temperature in towards if they -
903 either the public is ready to again spend some time to send
904 us comments.

905

906 And also, I would have to add that everybody who sent us
907 comment did it on their own time, right? And one of the
908 feedback we received was that we need to be providing
909 resources for those submitting us feedback to do so. So
910 we're trying to be also mindful of that. Juan, anything to
911 add?

912

913 BECKER: Do you think there may be additional sort of broad
914 efforts to garner comments and feedback down the road?

915

916 SARAIEVA: I would say maybe, because the - we started with
917 requesting the really wide public feedback, right? And
918 again, as we in the beginning. Once we start moving through
919 the different phases, the focus will be shifting towards
920 more heavy communications on - in the particular communities
921 and surrounding jurisdictions, right? We will still be
922 engaging with broader continental United States and above.
923 So, I won't say yes or no. We'll consider it.

924

925 BECKER: Thank you.

926

927 TYLER: Thank you. Scott Tyler, Board member. Thank you,
928 Natalia and Juan. I really appreciate your presentations
929 this morning. I too will sort of start with a question
930 related to the first part of the presentation - so,
931 Natalia's presentation. And one is a specific - it's a two-
932 part question, so it's difficult. One is specific and one is
933 a little vague, which is what I often ask, I guess.

934

935 At what phase in the decision-making process on your slide
936 would this concept of community-based site or operation
937 criteria, for an operating storage facility, when would that
938 be incorporated into the design? What phase of the decision-
939 making process would the communities have the opportunities
940 to have their criteria added? For instance, just thinking,
941 transportation issues, moving a road in a different place.

942

943 And then secondly, the broader question, and this may not
944 have been decided yet, but who will be making those
945 negotiations at DOE? Will it - where in the organizational
946 structure of the department would those negotiations be led
947 by, I guess is my question?

948

949 SARAEVA: I was trying to go back to the slide. Sorry.
950 Think that the at least partial answer to your first
951 question about the communities being able to contribute to
952 the different criterias, right, that starts in the next
953 stage in the next phase, right? So that's where we envision
954 after issuing some preliminary list of siting criteria and
955 assessment criteria, then we'll issue a call for volunteers.
956 And that's where we also hope to issue the Funding
957 Opportunity Announcement, in which the communities will
958 review those criterias. And they can start coming up with
959 additional site-specific criteria important to them. And
960 that might include some cultural considerations, some
961 economic considerations, or anything else. So, that's where
962 it starts.

963

964 And Juan, anything to add to that question?

965

966 URIBE: I guess the only thing I'll add, and being an
967 engineer, I kind of suffer from the same, something ends and
968 something has to start. But I'd also argue that if the

969 question, if I understood it correctly, is that the input
970 from the communities about their values and things like
971 that, we actually specify in the process that these phases
972 occur in series or in parallel. Again, these are just
973 overview guidelines to have a road map or sort of a north
974 that we can all follow.

975

976 But you could argue that the slide that I showed about the
977 tasks that the consortia are going to be doing, you're
978 already starting to map public values. And when you see some
979 of the different projects that the - each awardee is
980 conducting, some of them are more focused on identifying
981 those and mapping those public values. So, you could also
982 argue that it formally starts when we formally start a call
983 for volunteer. But in a way, or more informally, it's
984 already begun.

985

986 TYLER: Okay, thanks.

987

988 SARA EVA: And to answer the decision-making process
989 question. So, the community itself will have to decide how

990 they define community and who is the appropriate decision-
991 maker, right? That's why we specifically didn't provide at
992 this point any specificity who that will be. And if you look
993 at our international partners, in Canada, in the two sites
994 that they pre-finalized, right, in one of the communities,
995 they built a referendum. And in the other community, will be
996 selected local government official. I think it's a mayor. So
997 anyways, that's why we not pre-define who will be making the
998 decisions at the community level.

999

1000 In terms of DOE, we also left that as DOE. Again, it will
1001 depend on many factors. And as we've learned yesterday, it's
1002 a lot depends on what the community is comfortable with,
1003 right? So, we talked about the - having the potential
1004 representations, right, and having those folks who not just
1005 come and say, "Hey, I'm here from the government," but who
1006 engage with the community on a really regular basis, right?
1007 So, I would assume that those leads will be heavily involved
1008 in the negotiation process. But again, who signs the
1009 agreement, that will depend on the legislative requirements
1010 and might require the Secretary of Energy to sign it.

1011

1012 TYLER: Okay, good. Okay, thank you. No, I appreciate that.
1013 I mean, we did hear yesterday that the community engagement
1014 from the process operator is important to have a point of
1015 contact there, so that's good.

1016

1017 SARAeva: Right.

1018

1019 TYLER: Thank you.

1020

1021 BECKER: Steven Becker, Board member. So, the terms
1022 "community" and "communities" have been used a lot in the
1023 discussion this morning. And they appear quite frequently on
1024 the slides. And my sense is that the terms may be being used
1025 in different ways. And I want to try to clarify so that we
1026 can avoid confusion.

1027

1028 So, on the one hand, I heard you say that you are not
1029 seeking volunteer communities. And I'm assuming that that
1030 refers to locations, towns, villages, etc. At the same time,
1031 a number of the slides emphasized that the consortia will be
1032 making extensive outreach and engagement efforts to

1033 communities, and that at one point, you also said that the
1034 consortia are still trying to decide which communities to
1035 reach out to.

1036

1037 In that second use, are you really referring to societal
1038 sectors or stakeholders, as distinct from locations, towns,
1039 and so on? It seems to me there may be some confusion
1040 between the two uses. And I think it's probably important to
1041 clarify it.

1042

1043 URIBE: So, that's a great question, Steve. So, for the most
1044 part, communities are mostly used in the lens of towns,
1045 locations, zip codes. In some cases, though, communities are
1046 more reflective of, or tied, to ethnical routes. So - or -
1047 and so, yes, I recognize the challenge that at some times,
1048 it could mean the different things. But for the most part,
1049 and I think, as is the case reflected in the slides, when
1050 awardees are still trying to down select communities to
1051 engage, it's typically more associated to a zip code or a
1052 physical location - a town, a village, things that you
1053 mentioned.

1054

1055 SARAIEVA: And I would add to that that the definition of
1056 "community" is really hard, right? And it came up a lot in
1057 our discussions. It came up a lot in the public comments.
1058 And there is a reason why we're not pre-defining it. And
1059 actually, in public comments, one of the frequent comments
1060 was that it should be up to the community to define who they
1061 are. But through the consortia work, we're actually
1062 interested to see on those maybe self-definitions and self-
1063 formation. And we'll learn from that and incorporate it into
1064 our thinking about the next phases.

1065

1066 BECKER: So, what I'm not sure I'm clear on is if you're not
1067 at this point seeking volunteer communities, why would you
1068 be trying to identify which zip codes to reach out to? I'm
1069 just not clear on that.

1070

1071 SARAIEVA: We're not identifying the zip codes right now to
1072 reach out.

1073

1074 URIBE: So, the - let me try this a different way. So, the
1075 current stage aims to attract communities that are
1076 interested in learning more about nuclear waste, nuclear -
1077 the management of used nuclear fuel, and potentially
1078 exploring whether a consolidated interim storage facility
1079 might be something that fits into their community long-term
1080 vision, right? And so, to be able to identify those
1081 communities, awardees are identifying communities or areas
1082 of interest that they think or understand could be
1083 interested in engaging and learning about these topics.

1084

1085 Some of the communities are more informed, a little more
1086 proactive, and they actually reach out and say, "I want to
1087 be part of this." Others may not be aware, but they are
1088 interested. And so, part of this initial work is to try to
1089 identify some of these communities that could potentially be
1090 interested, but they don't know yet.

1091

1092 BECKER: Okay. So, if I understand correctly, you're not
1093 seeking communities to volunteer at this point, but you are
1094 seeking communities that have an interest in learning more.

1095

1096 URIBE: Absolutely.

1097

1098 BECKER: Okay.

1099

1100 URIBE: And also, to emphasize that if a community
1101 participates in this first stage, it does not mean that they
1102 are being considered as a host community. And the opposite
1103 is also true. If a community does not participate in this
1104 first stage, and when we do a call for volunteers and that
1105 community raises their hand, they can absolutely be
1106 considered, even if they did not participate in this first
1107 stage.

1108

1109 BECKER: So, judging from a number of my colleagues whose
1110 heads were shaking when I raised the point about some
1111 confusion about the use of the terminology, it might perhaps
1112 be worth revisiting the slides just to make sure that what
1113 you just discussed was really clear in the slides and in the
1114 discussion. Thank you.

1115

1116 SARAIEVA: And also, the learning more is not just for
1117 community; it's also for organization and stakeholders,
1118 right? So, however they define themselves.

1119

1120 TYLER: I'm Scott Tyler, Board. I too had a question on
1121 community, so thank you very much for answering that
1122 clearly. And just as an observation only, the definition of
1123 "communities," based on your consortia groups, many of the
1124 consortia are led by state universities. And so, it would be
1125 possible, at least, again, a personal observation, that
1126 those organizations would also have access to communities
1127 that are larger than individual zip codes, that indeed, at
1128 the state level. So, they too would have connections, and
1129 that might be something for DOE to consider in the kind of
1130 defining communities to your consortia, to give them
1131 guidance as to where to look. Observation.

1132

1133 SARAIEVA: Absolutely. And this is also the reason why we
1134 strived for institutional and geographical diversities. And
1135 some of the awardees decided that they might shift their
1136 focus and engagement more on the local and state government
1137 levels.

1138

1139 CROFF: Thank you. Excuse me. Croff, Board. I've got a
1140 question on your list of the siting consortia. The last
1141 column was titled "States engaged." And I'm not quite sure
1142 what that means. Does it mean a consortium will operate only
1143 within - with those parties, or what does engagement mean?

1144

1145 URIBE: That's a great question. Initially, when we were
1146 looking at the list of the selected entities, we were trying
1147 to look for a way to convey the geographical reach. And
1148 that's where the map that you saw, prior slide, that map
1149 resulted.

1150

1151 So, to be succinct and answer your question, the areas of
1152 engagement simply refers to the location where a primary
1153 awardee is based on, allocation where a partner that is
1154 participating in one of the awards is based on, or
1155 communities that they have identified as places that they
1156 are going to seek communities for engagement in the states
1157 where these communities are located. And so, by default, we
1158 were just treating that as an area of engagement.

1159

1160 CROFF: Okay, thank you.

1161

1162 WOODS: Brian Woods, Board. Again, Natalia and Juan, thank
1163 you so much for your presentation. I do have a question. So,
1164 Juan, you alluded to, when you get to phase two, and you
1165 start getting potential communities that may volunteer,
1166 there may be some changes in looking at value, so it would
1167 be kind of a dynamic process. Have you considered or do you
1168 think there would be value in extending some of these
1169 consortia or having a new set of consortia that could help
1170 you help the DOE through that process? Or is this just
1171 basically 24 months, and then the consortia are finished?

1172

1173 URIBE: That's an excellent question. I would see it as a
1174 little bit of both, and let me explain why. So, this is a
1175 fixed cost cooperative agreement. And so, some of the
1176 consortiums that formed will inevitably part ways after the
1177 project is finished. Some of these consortiums were formed
1178 before this Funding Opportunity Announcement and have other
1179 projects ongoing, so we expect them to still be around after

1180 the funding opportunity period of performance ends. But a
1181 big desire from us is to build that capacity where entities
1182 that are participating in this award make new friends, make
1183 new partnerships that are long-lasting. And so, even if the
1184 primary awardee is different or the name of the project is
1185 different, that some of the capacity that we have built
1186 throughout this Funding Opportunity Announcement remains,
1187 because we deeply need that base, if you will, in moving
1188 forward.

1189

1190 A key aspect to just highlight, again, as Natalia mentioned,
1191 is that we hope to leverage these - the consortia in future
1192 funding activities that are subject to congressional
1193 appropriation. And so, we're somewhat tied to the capacity
1194 to count on them too, and it's tied to the appropriations.

1195

1196 SIU: Okay. We have a comment from Paul Turinsky that Bret
1197 will read.

1198

1199 LESLIE: Bret Leslie, Board staff, asking a question on
1200 behalf of Paul Turinsky. Paul says, "Natalia, can you define

1201 a host community? Is it a city, county parish, state, Tribe,
1202 etc.? State rights is unique to the USA. State historically
1203 has been the greatest point of resistance.”

1204

1205 SARAeva: Thank you. And yes, as we heard yesterday and many
1206 times before, state could be a great point of resistance,
1207 right? So, no, we're not defining the communities right now.
1208 And we seriously considered this matter. And, again, relying
1209 on the public feedback and responding to public feedback, we
1210 actually heard both, that we should be defining it and
1211 should not be defining. But overwhelming feedback was that
1212 we should not be pre-defining it because it's up to
1213 communities to decide themselves who they are. However,
1214 again, our engagement will not be just with the community,
1215 but also Tribes, states, and adjacent jurisdictions.

1216

1217 BECKER: Steve Becker, NWTRB Board. I'd like to return to
1218 the subject of the consortia. So, the consortia will
1219 presumably produce a huge amount of useful information,
1220 documents, and reports. Will all of these be made public?

1221

1222 URIBE: So, the first part is, there's still some internal
1223 debate about what exactly those intermediate deliverables
1224 will be and to what extent it makes sense to make those
1225 public or not, because they're still draft and preliminary.
1226 Part of the balance is in engaging in frank discussions with
1227 the consortia. And sometimes that includes some more raw and
1228 unfiltered material that typically isn't posted publicly
1229 after a level of polishing.

1230

1231 But there is certainly a high degree of a desire to make as
1232 much information publicly available. So, initially, we
1233 envision having overview of each consortia's project. We
1234 initially envision having the report that I mentioned about
1235 the collection of the two-year activities and also distilled
1236 into not just what we heard, but what we're going to do with
1237 what we heard, actionable items, and also ensure that it is
1238 reflected and incorporated into the consent-based siting
1239 process. Because it would be a big missed opportunity to
1240 have, as you mentioned, all that data and wealth of
1241 knowledge, and not leverage that into our consent-based
1242 siting process.

1243

1244 So, we are looking at making - and there's great interest in
1245 making that information publicly. As soon as the cooperative
1246 agreements are finalized, all of the in-depth information
1247 about each project will be made available. So that in and of
1248 itself goes to address part of your question. And so,
1249 intermediate progress reports, I think we can look at ways
1250 to make some of that information public as well.

1251

1252 SARA EVA: I would also say that, like we did a summary of
1253 public analysis. So, we envision internally distilling and
1254 taking a look, taking looks at different angles of the
1255 consortia findings, right? Like social science angle or
1256 technical angle, combination of both. And again, provided
1257 what resources we'll have available then, we envision that
1258 we might publish a summary of our findings, like we did with
1259 public comments.

1260

1261 BECKER: And I'm assuming that the individual reports and
1262 documents that are published will also include the detailed
1263 methodological information about how the data were gathered
1264 and so on.

1265

1266 URIBE: Yes, that's correct. And also, just forgot to
1267 mention that as we go and set about having these further
1268 meetings with the consortia, we also anticipate that each
1269 one of these meetings is going to have a public component as
1270 well. So, not just having access to written reports, as
1271 you're alluding to, but also access to the members of the
1272 consortium themselves, and folks from the department that
1273 are working on that in a public portion of those meetings.

1274

1275 SARAIEVA: And we assume that the knowledge that consortia
1276 member will acquire will be long-lasting in a way that, for
1277 example, we assume - we hope that the, like, university may
1278 use this knowledge for creating the curriculums or some
1279 courses, etc., etc. It's not a requirement, but we hope that
1280 will happen.

1281

1282 BECKER: Thank you.

1283

1284 SIU: So, picking up on that - Nathan Siu, the Board - and
1285 thinking of long-lasting, thinking of the DOE's ultimate

1286 goal of disposal, and recognizing how long it takes to do
1287 these things, to build trust and so forth, is it too early
1288 to be thinking about leveraging what you're doing to think
1289 about consent-based siting for a repository?

1290

1291 SARA EVA: So, right now in the congressional directions,
1292 we're only doing generic research and development activities
1293 in the repository. But as I mentioned, the lessons we learn
1294 from this process definitely will be applicable to siting
1295 future facilities.

1296

1297 SIU: I mean, I could even imagine generic R&D on
1298 applicability in an academic kind of study, what you're
1299 learning. You have 13 consortia, various approaches, various
1300 points of view. And just examining the variants might be
1301 interesting.

1302

1303 ILLANGASEKARE: Yeah. Tissa Illangasekare, Board. Thank you
1304 very much for the presentation. So, I have a question. How
1305 much technical information is used during this knowledge

1306 learning? Do you think the communities will access to
1307 technical information? What level?

1308

1309 SARAEVA: Do you mean this consortia?

1310

1311 ILLANGASEKARE: Not the consortium, but the community, the
1312 community.

1313

1314 SARAEVA: The one that will be engaging this consortia?

1315

1316 ILLANGASEKARE: So, they cannot - some of these issues
1317 cannot be discussed in vacuum. There should be some
1318 technical or scientific information also, is that correct?

1319

1320 URIBE: Yeah. So, the short answer is yes. There will be
1321 technical information available to the consortia. But we are
1322 - available to the communities. But we are - because it's
1323 part of the Funding Opportunity Announcement and the task
1324 that they were assigned to do, in essence, the consortia
1325 themselves is driving the information to the communities.

1326

1327 But we've made accessible things like information about the
1328 reference concept facility, information about
1329 transportation. If they need information, technical
1330 information about the dry storage cask and things like that,
1331 that's certainly available. We're also making available
1332 access to subject matter experts in individual fields to the
1333 communities. So, those are just some examples of things that
1334 we're trying to make available.

1335

1336 Yesterday, Nathan discussed the 3D model so that you can
1337 have an immersive experience. That's just another technical
1338 tool. You'll hear more about this afternoon about other
1339 tools as well. So, the short answer is absolutely yes.
1340 There's a social component, but as we saw yesterday on the
1341 diagram, there's also a technical component, and we're very
1342 much aware of that one.

1343

1344 SARA EVA: And to add to that, that's also a balance about
1345 how to present the technical information, and appreciation
1346 the fact that different members of the society have

1347 different understanding about what the spent nuclear fuel
1348 is, right? Some have zero and some have really advanced. So,
1349 we, in preparing our materials, will have to factor that in.
1350

1351 SIU: Okay. This is a great topic, and I know we have more
1352 questions, but unfortunately, our time's run out. So again,
1353 thank you, Natalia and Juan. We'll go on to our next
1354 speaker, who's Marissa Bell from DOE-NE.

1355

1356 BELL: Okay. Good morning, everybody. I also want to start
1357 again by thanking you for this opportunity to be here. And
1358 particularly around environmental justice. This is
1359 incredibly important to DOE, incredibly important to the
1360 administration. And so, I appreciate the opportunity to
1361 discuss an overview of environmental justice in consent-
1362 based siting.

1363

1364 Just very briefly, so my name is Marissa Bell, and I'm a
1365 social scientist in the consent-based siting team. Thank
1366 you. I'm a social scientist in the consent-based siting
1367 team, and I'm also the environmental justice lead for the

1368 consent-based siting team, as well as the Office of
1369 Integrated Waste Management. So, in that light, it's a
1370 pleasure to be able to discuss environmental justice.

1371

1372 I will add that, so some of the similar questions were asked
1373 of the presentation today as yesterday, so there is some
1374 overlap, for those of you who heard the presentation
1375 yesterday. But for the benefit of new folks in the room, new
1376 faces, and also the benefit of those online that may not
1377 have been in the presentation or heard the presentation
1378 yesterday, I will be going over some things that we went
1379 over yesterday.

1380

1381 So, to begin sort of with the question of what is the
1382 definition of environmental justice that DOE is utilizing?
1383 So, this is a little bit of a recap. But we are focusing and
1384 using the definition provided by the EPA and then updated by
1385 recent executive orders, as recent as April of this year. So
1386 the definition we see is the fair treatment and meaningful
1387 involvement of all people, regardless of race, color,
1388 national origin, or income, Tribal Affiliation or
1389 disability. And this is with respect to the development,

1390 implementation, and enforcement of environmental laws,
1391 regulations, and policies.

1392

1393 So, to sort of pick apart what the framework and the broader
1394 sort of principles that come out of this, so, the first
1395 being distributive justice. And this is around this concept
1396 of fair treatment. So, ensuring that the treatment of
1397 individuals is done equitably, that the benefits will be
1398 shared equitably, that the risks, that no single community
1399 is overburdened with harms without benefits. So, to ensure
1400 sort of fair treatment.

1401

1402 Procedural justice is this concept of - based on this
1403 concept of meaningful involvement. But it involves public
1404 participation. It involves listening. We had a focus
1405 yesterday on listening. And that's incredibly important. And
1406 I was actually reflecting on this a little bit. And one of
1407 the first activities I did when I joined DOE was have a
1408 feedback workshop at the National Environmental Justice
1409 Conference that was essentially a listening session. Let's
1410 talk to environmental justice experts, and let's hear from
1411 people who deal with environmental justice issues on a day-

1412 to-day basis. Broader than consent-based siting, but how can
1413 we sort of feed that back into our process?

1414

1415 And then this final aspect of recognition justice. And this
1416 goes to sort of recognizing that within the United States
1417 and internationally as well, but particularly so,
1418 environmental justice having roots in the civil rights
1419 movement, that certain populations may have been
1420 marginalized in different ways and impacted in different
1421 ways historically. And so, we need to recognize that and
1422 ensure that when we're providing resources, that there are
1423 some, whether it's low-income populations or population of a
1424 particular racial or ethnic background that have
1425 historically been disadvantaged and oppressed in different
1426 ways, that we ensure that we sort of take that into
1427 consideration so we have equity, not just equality.

1428

1429 And then, so as I sort of heard mentioned before, but this
1430 concept of intergenerational justice is not specifically
1431 called out in the definition. But intergenerational justice
1432 is about looking across time, both into the past and looking
1433 at what harms may have been done, perhaps by DOE, by

1434 industry, by federal government, or just in general. Looking
1435 - so, looking at past harms and injustices that may have
1436 occurred, but also thinking about future generations,
1437 specifically ensuring that our burdens are not sort of
1438 kicked down the road and for future generations, or that
1439 something that we do now will negatively impact those future
1440 generations.

1441

1442 So, we'll dive into distributive justice first and the
1443 different ways that we've started to do this, and what we
1444 may have in the future. So, as I mentioned, the most recent
1445 executive order. But prior to that, we have the Justice40
1446 Executive Order that is essentially, in my mind, a tool of
1447 distributive justice. That 40% of the financial benefits,
1448 financial resources that are provided in, say, funding
1449 opportunity announcements or other mechanisms, that they are
1450 provided to communities that may have been disadvantaged or
1451 marginalized in some way.

1452

1453 So, along with this, in terms of looking at the distribution
1454 of potential benefits, but also potential sort of impacts
1455 that may occur, we're conducting various analyses of

1456 communities that may have EJ concerns. And so, I'll talk a
1457 little bit later about how we've been integrating this into
1458 our tools, and sort of what, like geographically, how we can
1459 sort of spatially identify what communities may need
1460 additional resources.

1461

1462 And, as has been mentioned today, this - that we're not
1463 currently looking for volunteers. But in sort of towards a
1464 continuous, in the following phase, that we'll begin to
1465 discuss directly with communities the benefits and the
1466 impacts, and go into not just sort of economic benefits and
1467 other sort of resources provided, but also, precisely to
1468 this early question about what technical information, there
1469 are technical tools and sort of ways that we can look at
1470 dose impacts and things like that to be able to provide a
1471 community with all the knowledge they need, not just social,
1472 but definitely the technical knowledge that they will need
1473 to know to understand how they may be impacted by the
1474 development of a consolidated interim storage facility.

1475

1476 And finally, in terms of sort of co-design and co-
1477 development. And co-design really speaks to the sort of, on

1478 one regard, the potential design of the facility. There are
1479 some things which are non-negotiable, but there are some
1480 things which may or may not be negotiable. We're figuring
1481 that out internally through research to figure out what
1482 parts of the facility may be able to be co-designed with the
1483 community. The co-design also refers to the process itself,
1484 and sort of things like who's going to be making decisions
1485 within DOE, who's going to be making decisions within a
1486 community. There are aspects of the process that can be co-
1487 designed and sort of collaboratively developed with a
1488 community.

1489

1490 And then co-development refers to what could be provided as
1491 a resource that would be developed in conjunction with the
1492 facility. So looking at not just sort of financial benefits,
1493 but what could be - what other types of resources can be
1494 provided, or whether it's a community scale energy facility
1495 or a research facility, research and development park - what
1496 are the different things that a community identifies as
1497 important to their own well-being and their vision of their
1498 sort of growth and future as a community, and how we can aid
1499 that in our process.

1500

1501 So, the following is the sort of procedural justice
1502 elements. So, when - I've mentioned before that when DOE
1503 wants to gain feedback, one of the mechanisms we can use is
1504 a Request for Information, which we heard particularly about
1505 just earlier. And so, we've heard sort of different
1506 responses from this. We were able to sort of analyze these
1507 with the extensive social science team at the labs to sort
1508 of conduct an extensive analysis and bring out themes, and
1509 also tie this into the current literature on sort of public
1510 engagement and social science and siting, and understand
1511 what - how that can be sort of integrated into the process.

1512

1513 So obviously, we heard that the process of consent-based
1514 siting should be adaptive and flexible. And so, like, one
1515 element is ensuring that the comments from the Request for
1516 Information are integrated back into the process, which we
1517 saw. That was earlier. So, I would say that that is a
1518 fundamental way that procedural justice is really embedded
1519 in the foundation of consent-based siting on whole. But as
1520 we move forward, we need to be continuously, and we are open
1521 to comments through - at any time. We received comments

1522 yesterday and will do so today. And so, it's not just the
1523 Board that will be taking those into consideration, but also
1524 on our end of how we can really meaningfully address those
1525 comments and concerns into our process.

1526

1527 This also means that we intend to and have been engaging
1528 with Tribes, with states, with local communities, and with
1529 other stakeholders in industry, private sector, NGOs, and
1530 sort of writ large. And through that, sort of encouraging
1531 involvement in the process, as well as in decision-making.
1532 So, deciding how we make decisions is also integral to that.

1533

1534 And as we move forward, we are committed to removing
1535 barriers to participation. So, not just providing
1536 opportunities, but also making sure that those opportunities
1537 are accessible to all. And so, there are different
1538 mechanisms that we've started to incorporate. And some of
1539 this is from direct feedback. I mentioned yesterday that we
1540 heard from Tribes and from Tribal working groups that not
1541 all Tribes have reliable access to internet. And so, sending
1542 out email blasts may work for some Tribes, but for others,
1543 we need to provide, and we have provided that information,

1544 with physically mailed copies. And when Tribes request
1545 certain printouts and things like that, that we can do that.

1546

1547 We've also translated our materials into several languages,
1548 including Navajo, is one example, and provided American Sign
1549 Language interpretation. And so, those were all - I mean,
1550 some of those were sort of developed internally. But
1551 sometimes those suggestions come from the public.

1552

1553 So, another point we heard from the Request for Information
1554 was the need to provide resources. And again, this is
1555 fundamentally a distributive justice issue of ensuring that
1556 the resources - that not everybody has the time or
1557 inclination or resources to engage. Some people have two,
1558 three jobs. So, making sure that we provide resources to
1559 communities, to Tribes to engage in the process.

1560

1561 And so, one of the ways that we're doing that is through the
1562 Funding Opportunity Announcement for the purpose of building
1563 capacity and mutual learning, and providing provisions to -
1564 for publics and communities and states, Tribes to engage.

1565

1566 So, you've heard a lot about the consortia already this
1567 morning. And so, I probably don't need to go into too much
1568 detail. But what I will say is that fundamentally, I think
1569 environmental justice was foundational to how the Funding
1570 Opportunity Announcement was written. Things like
1571 strengthening engagement. The reason we have that is because
1572 procedural justice is really key to creating a process that
1573 itself is fair and just. And so, in the - sort of in the
1574 writing, and I wasn't involved in the writing of the Funding
1575 Opportunity Announcement. But in terms of looking at sort of
1576 the ways that like, there were specifically called out
1577 questions of how do you intend to work with and engage
1578 historically marginalized communities? How do you intend to
1579 engage with disadvantaged communities? Tribes that have been
1580 historically impacted by the nuclear sector. Specifically
1581 asking the consortia to very concretely outline the ways in
1582 which they're integrating environmental justice principles
1583 into their work.

1584

1585 And part of - to me, part of procedural justice is, I mean,
1586 obviously, there's the sort of - the listening element. And

1587 but this all has to be meaningful. And so, that is based on
1588 the development of relationships that are trust-based. And
1589 we had a great discussion yesterday about trust, and that
1590 DOE recognizes that we're working from a trust deficit. And
1591 so, we have to work extra hard to ensure we develop those
1592 relationships that are based on trust, and that the
1593 consortia are really intended to - not to replace DOE
1594 engagement, certainly not, but to aid us in that development
1595 of trust with communities.

1596

1597 So, I mentioned very briefly sort of ways in which we're
1598 removing barriers to participation. And I think, and perhaps
1599 - so yesterday, one of the questions was - one of the points
1600 was that our lessons didn't call out willingness to - the
1601 importance of listening. But certainly, I think one of the
1602 baselines is that we do have to, at DOE, communicate a
1603 willingness to listen. And that means not just providing
1604 spaces for public participation, but really sort of spending
1605 time to not just do what we're doing today, which is
1606 providing information and resources, but like, really
1607 engaging, and just taking the time to . . .

1608

1609 Some of the relationships that we've begun to start to
1610 develop, they really start with just having a conversation
1611 where we don't really do much talking. We listen to what
1612 have been the historical positions and start to sort of
1613 recognize those, ask questions to broaden our understanding.
1614 Because we're in a process of - it is mutual learning for a
1615 reason. We are in a process at DOE of learning. And one of
1616 the ways - well, one of the primary ways we can do that is
1617 by listening.

1618

1619 So, second of all, developing partnerships. So, the
1620 consortia is a huge part of this, of developing
1621 partnerships. We heard a little bit yesterday about how we
1622 have - how we're developing and have relationships and
1623 partnerships internationally to learn from others'
1624 experiences. But in terms of, there are other ways that we
1625 can partner. And we'll hear a little bit about this in the
1626 social science. But partnering with, say, minority-serving
1627 institutions, historically Black colleges and universities,
1628 Tribal colleges and universities, or simply an NGO that is
1629 focused on digital engagement and outreach and digital
1630 equity. There are folks out there that we don't need to work

1631 in silos. And it would be disadvantageous to work in silos.

1632 And so, leveraging those partnerships and utilizing those.

1633

1634 Removing barriers to participation involves providing

1635 resources to engage, offering resources to inform. That

1636 includes sort of technical information. And maybe that

1637 technical information needs to be provided. We know it needs

1638 to be provided at different levels. But sometimes we may get

1639 requests for certain information at a certain level, and we

1640 can adapt the information we have to make it accessible.

1641

1642 And actually, so yesterday, I called out one of our interns,

1643 Mahi Bath. And today, I'll actually call out another one of

1644 our interns, a sophomore at Howard University, Zoe Kaufman,

1645 who did an excellent project this summer that started us

1646 thinking about how to engage with communities with low

1647 literacy rates. She focused on the Deep South. And so, we

1648 hope that as she continues her work in the university that

1649 she may continue to help us think about, and that we can

1650 continue this as well with the labs and internally, about

1651 how do we communicate to - we heard yesterday, I can't

1652 remember who it was, but that social scientists like to

1653 complicate things and use jargon. And I'd like to say that's
1654 also true of non-social scientists.

1655

1656 But the point is, is that - and there are terms that I use
1657 that may not be familiar to the experts in the room. So, I
1658 think making sure that our information we provide is
1659 accessible. Not just accessible this way, but accessible in
1660 terms of the language we use.

1661

1662 And so, another way the consortia is helping us, by creating
1663 dialogue, and that we can sort of step into where asked to.
1664 And then finally, strengthening accessibility measures in
1665 different ways.

1666

1667 So, one of these will be sort of how to reach communities
1668 with limited internet access. Talked a little bit about this
1669 yesterday. But there are different ways that communities can
1670 be limited in their access to internet. It doesn't just mean
1671 literally not having the - I mean, it could be not having
1672 the infrastructure. Google Fiber and, I don't know, 200
1673 megabytes or one gig per second. That doesn't exist in my

1674 rural community in upstate New York. But so that is an issue
1675 of what infrastructure is available. But it also may be
1676 affordability and sort of different levels of income
1677 inequality that may result in lack of affordability of
1678 certain internet access.

1679

1680 And, as I mentioned also before, sort of this idea of
1681 digital literacy, that not all folks are - there are
1682 different ways to engage with people through the internet.
1683 And not all - not everyone's on Instagram or Twitter, or
1684 whatever it's called now. So, sort of understanding that
1685 there are other ways to - opportunities for making sure that
1686 we have face-to-face interactions and face-to-face
1687 engagement; expanding event access so that you can call in
1688 instead of needing a computer or a device to Zoom in or
1689 Teams in to a meeting; providing SMS communications;
1690 designing content for mobile devices so that folks who don't
1691 have laptops or don't have that heavy bandwidth
1692 availability, that they can also access the materials.

1693

1694 And alternative engagement strategies that include face-to-
1695 face or partnering with local organizations like libraries

1696 or sort of existing community organizations that we can work
1697 through.

1698

1699 So, I've mentioned before that recognition justice is about
1700 understanding that there are some communities that have been
1701 disadvantaged in some way. So, ensuring that there is equity
1702 in provision of resources, or even accessing - there are, on
1703 various levels of, whether it's income, low-income, or sort
1704 of different racial ethnic backgrounds, there are ways in
1705 which this may not be a priority for all demographics. And
1706 so, one thing we're doing is partnering with minority-
1707 serving institutions to ensure that we understand the needs
1708 of various communities. And this includes sort of a citizen
1709 science project with a historically Black college or
1710 university, and sort of figuring out what are the needs, and
1711 how can we adapt our process, and how can we work with those
1712 institutions to ensure that we have a wider reach.

1713

1714 This includes continuing to develop engagement plans for
1715 underserved communities. We have already started this and
1716 have been engaging with various - I mentioned earlier the
1717 National Environmental Justice Conference. And there are

1718 other sort of areas where we can leverage expertise to
1719 understand how we can do that. And then finally, identifying
1720 communities that may have environmental justice concerns.
1721 And I'll - I have some great visuals that were developed
1722 that I can draw on to really explain that in more depth.

1723

1724 So, Tribal engagement and consultation is something that we
1725 have to consider and really kind of put great importance on,
1726 given the context of Tribes being sovereign nations and
1727 often requiring or requesting consultation that is at a
1728 government-to-government level. We don't necessarily jump
1729 into consultation. If we're requested for consultation, we
1730 obviously will. But it's a relationship. And so, this may
1731 start with sort of - it has already started with engagement
1732 that may lead eventually to consultation.

1733

1734 But through the Request for Information and previous
1735 requests for public comment, and other sort of Tribal
1736 working groups - we have the Nuclear Energy Tribal Working
1737 Group, we have a Transportation Radioactive Materials Tribal
1738 Working Group - we have received a number of recommendations
1739 that we have collated through. And at a fundamental level,

1740 it may be obvious, but just to respect Tribal sovereignty
1741 and really treat Tribes as not just an additional interested
1742 party or stakeholder, but they are sovereign nations within
1743 the United States. That means complying with all laws and
1744 federal trust responsibilities, abiding by a signatory of
1745 the United Nations Declaration of Free, Prior, and Informed
1746 Consent.

1747

1748 And so, part of that is developing trust and relationships
1749 with Tribes. So, we have a trust deficit with the public
1750 writ large in general. But Tribes in particular, we have a
1751 deficit of trust that we have to address. This means also
1752 evaluating impacts on and off reservations. And we're doing
1753 sort of technical analyses to be able to address those.
1754 Incorporating Indigenous knowledge into siting in a way that
1755 is respectful of the Indigenous knowledge and of the
1756 Indigenous knowledge-holders. We've been recommended to
1757 provide resources for participation in the process. And
1758 emergency response education and outreach to be able to
1759 prepare emergency responders for sort of future activities.

1760

1761 We have been recommended to establish a new organization to
1762 manage nuclear waste. We heard that yesterday, and that was
1763 a recommendation from the Blue Ribbon Commission and a
1764 recommendation from several Tribal entities. And finally,
1765 increasing accessibility of material. So this includes, for
1766 example, the request to send out hard copies of information
1767 to Tribes.

1768

1769 Our expert recommendations for Tribal engagement and
1770 consultation strategy. So, we're currently developing our
1771 strategy in order to be really thoughtful and mindful about
1772 how we do this. And some of these may seem obvious. But they
1773 also really need to be - it doesn't hurt to be reminded of
1774 these, that our goal is to understand and respect Tribal
1775 sovereignty, to provide resources to Tribes for
1776 participation and decision-making through the consortia, but
1777 also perhaps in the future through future funding
1778 opportunity and technical resources. Perhaps it might be a
1779 technical resource or a technical assistance in order to be
1780 able to apply for a grant, as one example of a potential
1781 future activity.

1782

1783 Build capacity and internal resources for Tribal engagement.
1784 So, within the consent-based siting and within the Office of
1785 Integrated Management, and the Office of Nuclear Energy, we
1786 have Tribal - we have Tribal liaison and those who have a
1787 focus. But we're trying to sort of increase on the consent-
1788 based siting our sort of knowledge and awareness of Tribal
1789 issues, of Tribal perspectives, so that we can engage in the
1790 most meaningful way. And when it comes to consultation, that
1791 we are fully prepared to do so.

1792

1793 Utilize early and transparent - that's what was. So, I don't
1794 know - didn't get a chance to fix it. But I think it's
1795 actually communications. Utilize early and transparent
1796 communications. But also, that it does involve engagement.
1797 And making sure that's not just communicating to Tribes, but
1798 also understanding what we need, what we need to provide.
1799 And engaging with and through trusted programs.

1800

1801 So, I've mentioned the DOE Office of Indian Energy, the
1802 Environmental Protection Agency Institute for Tribal
1803 Environmental Professionals. There are lots of programs that
1804 have already developed significant trust with Tribes. And we

1805 should be, and we are, working to incorporate and
1806 collaborate with and coordinate with so that we're sort of
1807 doing this in the most holistic and effective way.

1808

1809 So, further on the notion of cross-institutional
1810 coordination, so, how we're leveraging other efforts. We're
1811 sort of working to comply with executive orders such as the
1812 Justice40, and new executive orders that have come out on
1813 environmental justice; engaging within DOE, so intra-agency
1814 collaboration with the Office of Environmental Impact and -
1815 Economic Impact and Diversity, who are focused on energy
1816 justice and environmental justice; the Office of Indian
1817 Energy. And then inter-agency collaboration with
1818 coordination with folks like the NRC, the Nuclear Regulatory
1819 Commission, and the Environmental Protection Agency.

1820

1821 So, and we also make sure that we're aware of and utilizing
1822 the tools that already exist out there. I mentioned
1823 yesterday some things like the Climate and Economic Justice
1824 Screening Tool, or the EPA EJScreen, or other data tools
1825 that can create data layers to kind of have a broader

1826 understanding of environmental justice and the Tribes that
1827 we're engaging with.

1828

1829 So, in terms of our tools. So, we're not just keeping tabs
1830 on what other tools have been developed, but we have our own
1831 tools. So, Curie Resource Management Database, so knowledge
1832 management and making sure that that is attuned to
1833 environmental justice needs. We have various geographic
1834 information system tools, like Land-area Identification
1835 Tagging Exploration, LITE, or the Stakeholder Tool for
1836 Assessing Radioactive Transportation. So, we're just
1837 ensuring that we're using these tools internally to identify
1838 which communities may have EJ concerns and which may need
1839 equitable impacts. And then, but eventually also being able
1840 to have these tools available to the public as well. And
1841 just, we're - ongoing sort of process of iteration to
1842 improve those tools.

1843

1844 So, I mentioned I had some maps that look at different ways
1845 of looking at environmental justice. So, this is one
1846 location. And we can see that sort of, we can look at low-
1847 income. And that doesn't necessarily reflect people of color

1848 or lack of broadband internet access. And so, these
1849 different maps sort of identify different ways that a
1850 community may be disadvantaged. And similarly, we can look
1851 at healthcare coverage, or federal food assistance, or
1852 limited English proficiency. And so, together, we can
1853 collate these and then understand all of the needs of our
1854 communities.

1855

1856 And finally, just to sort of touch on intergenerational
1857 justice again, but in terms of recognizing both past
1858 injustices, rebuilding trust, and thinking about future
1859 generations and ensuring well-being. And we can get to that
1860 a little bit more in the discussion if there's interest. So,
1861 with that, I'll conclude. I appreciate the opportunity.
1862 Environmental justice is incredibly important and
1863 foundational to consent-based siting, and it's exciting to
1864 see where we're going with that. So, thank you very much.

1865

1866 SIU: Thank you, Marissa. I was afraid you weren't going to
1867 make it. Steve.

1868

1869 BECKER: Steve Becker, NWTRB Board. Thank you, Marissa, for
1870 that very nice overview of the principles and components of
1871 environmental justice. In thinking about EJ, sometimes it's
1872 helpful to have practical examples. And I'm wondering if
1873 there are good U.S.-based exemplars or cases where EJ was
1874 effectively integrated, for example, into a siting approach
1875 or some other planning process. And if so, what are those,
1876 and how are they informing your work?

1877

1878 BELL: Yeah, thank you for that question. So, I think - I
1879 mean, one place we turned to, I think, is the Environmental
1880 Protection Agency, because they have - they do have 30 years
1881 of experience in really taking environmental justice
1882 principles. And they've found ways to - so one of the things
1883 about provision of resources, as was recognized with the
1884 consortia, but it's a - it can be burdensome to apply for
1885 large funding opportunities. And so, I think that that's one
1886 example of the way that we've really paid attention to that
1887 and created cooperative agreements so that the consortia can
1888 provide additional resources. And I think that when looking
1889 at the EPA, they've been able to do that really effectively.
1890 So that's one example.

1891

1892 But I think that we're looking forward to sort of future
1893 coordination with them and also internally in order to make
1894 sure that we're sort of utilizing best practices. And so, I
1895 wouldn't say there's one specific example. I would say that
1896 there's a ton of examples. And also, the social science and
1897 the sort of public participation literature, which is part
1898 of science and technology studies, would be, there are very
1899 good examples of ways that deliberative processes have been
1900 including communities, including folks in decision-making,
1901 and also unsuccessful examples as well. So, I think that we
1902 can - and some of those are international examples as well.
1903 So, I think we're sort of triangulating or triaging a number
1904 of different resources to try and sort of find the best
1905 practices from across the board.

1906

1907 BECKER: And you mentioned international examples. Are there
1908 particular examples that have been especially useful or
1909 informative?

1910

1911 BELL: I would say, off the top of my head, there aren't
1912 sort of specific examples. In Europe, there's been a lot of
1913 work on sort of deliberative democracy and sort of the way
1914 that the European Union has sort of found ways of
1915 institutionalizing sort of public participation. So, I think
1916 those are some areas that we can draw from for procedural
1917 justice elements . . . yeah, internationally.

1918

1919 I mean, and looking at sort of Tribal engagements as well, I
1920 would say Canada is - we share a lot of similarities in
1921 terms of Indigenous and Tribal issues, to understand the way
1922 - whether it's the interweaving of Western and Indigenous
1923 and traditional knowledges, or just the sort of recognition
1924 of municipal processes, but having a separate and very sort
1925 of serious engagement with the Tribal Nations, the First
1926 Nations in Canada. So, I think that there are not specifics,
1927 but definitely a range of experiences that we draw from.

1928

1929 BECKER: So, it sounds as though there are pieces to be
1930 drawn upon.

1931

1932 BELL: Yes. Yes.

1933

1934 BECKER: But there isn't really a single good example that
1935 you can look to.

1936

1937 BELL: I think there are many good examples that we can look
1938 to. The - one of the things is that when we think of - and
1939 this is the geographer in me coming. But things are context-
1940 dependent. And so, we can have an amazing example. But
1941 nuclear waste siting is very - has very specific issues.
1942 This is an international process. I myself have done
1943 research on wind energy siting and controversy around that.
1944 There are lessons that we can learn. Procedural justice is
1945 incredibly - we don't even need to go there. But I think
1946 that there are things that we can learn. But we can't just
1947 take, in my view, social scientist speaking, not speaking
1948 for DOE, but we cannot take a single process, even if it was
1949 excellent, an exemplar, and just take it and transport it
1950 and drop it into. And this is what I was interested in for
1951 my dissertation, is looking at how is consent-based siting
1952 unfolding in Canada as opposed to how it might unfold in the
1953 U.S., so.

1954

1955 BECKER: Thank you.

1956

1957 TYLER: Thank you, Marissa. Scott Tyler with the Board. I
1958 want to continue that - some questioning on procedural
1959 justice and maybe drill down a little bit. So, one of the
1960 parts of procedural justice is encouraging involvement in
1961 process and decision-making to make that, to encourage that.
1962 And I guess my question is quite simple, is what tools and
1963 mechanisms do you see, or are you proposing, or do you see
1964 in the future to encourage that? Or what are the mechanisms
1965 you propose to or that DOE proposes to encourage that
1966 engagement, in both decision and - decision-making and
1967 process-making/

1968

1969 BELL: Yeah, thank you for that. I think that I'll start,
1970 and perhaps Natalia can also speak to this on a broader
1971 level. But I think that there are high-level ways that we
1972 can take sort of broader feedback and integrate it, and make
1973 sure that - so like, a Request for Information is one way of
1974 taking those suggestions and then integrating them on our

1975 end. But I think as we start to work with specific
1976 communities, there will be more concrete ways that a
1977 community can - that we can work more closely to figure out
1978 what is it that we need to do, what are the decisions that
1979 we need to make, or what are the decisions that need to be
1980 worked out collaboratively, so on a broader level.

1981

1982 If you're talking about sort of specific mechanisms, I think
1983 that within the environmental justice literature and social
1984 science literature and public engagement, there are specific
1985 tools that we can do that we can utilize sort of to inform a
1986 really deliberative, democratic process in which the public
1987 is actually involved in those decisions.

1988

1989 I'll also add that we're actively - we have research going
1990 on at the labs to look at this idea of co-design not just of
1991 the facility, but to specifically give us recommendations
1992 for how can we make - how can we integrate communities into
1993 designing the process itself. So, this is a sort of
1994 iterative - we have some ideas, but we're certainly working
1995 on a deep dive to understand how we're doing that, how we
1996 can do that, some recommendations from our social scientists

1997 at the labs as well. And Natalia, if there's anything that
1998 you wanted to add.

1999

2000 SARA EVA: You covered it pretty well. I just want to
2001 emphasize the decision-making process will be, especially on
2002 a community level, will depend on from community to
2003 community, right? And while we have some ideas and
2004 developing some ideas about the specific tools, right, and
2005 we are developing some tools that we'll hear later today
2006 about, again, this is just preliminary work. We want to hear
2007 - once we're working with the communities on more place-
2008 based manner, we want to hear from them what they want, what
2009 work from them.

2010

2011 To Marissa's previous point, is providing equity, right? And
2012 the fact, getting into account the accessibility, right? The
2013 digital literacy. And just simply the fact that everybody is
2014 learning and getting information in different ways. Somebody
2015 is more of a listener. Somebody is more of a reader, right?
2016 Somebody is more visual. So, we need to make sure we factor
2017 that into account, right? And that's also a big part of the
2018 equity and environmental justice.

2019

2020 TYLER: Okay. I guess following up, I can see where limited
2021 internet access and others are discouragements or
2022 disincentives to contributing or to engage. But how will you
2023 encourage them to engage? What are the proactive steps one
2024 could take to bring these communities to the table? That
2025 seems to be - I can see removing barriers. That's a good
2026 one. But we need to encourage as well. And any thoughts on
2027 that? I know - again, I know the process is early, so.

2028

2029 BELL: I mean, one start is going out to communities,
2030 because I think, in terms of face-to-face engagement being
2031 important, and that we can have communities involved and
2032 publics involved in sort of webinars and forums like that.
2033 But I think also, we are developing a comprehensive
2034 extensive engagement strategy to be able to go out to and
2035 partner with institutions so that we can gain access.
2036 Because, quite frankly, there are many portions of the
2037 public that likely don't know, or that this isn't on their
2038 radar. So, I would say a second element is making this
2039 relevant to communities, to the public. And there are

2040 various different - different elements will resonate with
2041 different works.

2042

2043 For some, maybe for younger generations, it's more likely to
2044 be climate change. For other generations, it's that we've
2045 benefited from nuclear energy, and we have a role to play as
2046 a nation in terms of dealing with the spent nuclear fuel.
2047 For some, it's energy independence. For some, it may be
2048 coal, energy transitions, and coal development leaving a
2049 community, and they have a need for economic development.
2050 So, I think - I mean, that's a very broad way of answering.
2051 But that's one mechanism that we can do, is make this
2052 relevant to people, and make - sort of encourage interest
2053 that way.

2054

2055 SARA EVA: And just to add to that, they - what consortia is
2056 doing is partially laying the groundwork for future
2057 engagement, because part of it of - the interest comes from
2058 awareness, right? So, the consortia is helping us to build
2059 that awareness.

2060

2061 TYLER: Okay. Thank you.

2062

2063 SIU: Sorry, Steve. I'll jump in.

2064

2065 BECKER: Please do.

2066

2067 SIU: If I could build on Scott's question - Nathan Siu, the
2068 Board - just - we've heard yesterday about how critical
2069 face-to-face engagement was, and you guys obviously, I mean,
2070 you know that. And you also know how intensive that -
2071 resource-intensive that is. So, Marissa, you talked about
2072 developing engagement strategies. Could you enlarge on that
2073 what sorts of things you're thinking about?

2074

2075 BELL: Yeah. I will actually defer that question to Natalia,
2076 because the engagement strategy is at a broader level. I'm
2077 certainly part of it in terms of the environmental justice
2078 aspects, but.

2079

2080 SARA EVA: Thank you. Yes. So, the engagement strategy is
2081 definitely informed by social scientists and engagement
2082 communication experts and many others. But basically, yes,
2083 that's looking at different levels and layers of state,
2084 Tribes, local governments, communities, organizations, and
2085 setting the priorities, right, depending on which phase we
2086 are in. And of course, yes, we've heard loud and clear,
2087 face-to-face is crucial. At the same time, the benefit of
2088 what we now have of the virtual, right, provides
2089 flexibility, or hybrid provides flexibility not just for us,
2090 but also for those who want to engage with us and cannot
2091 spend time coming in person. So, we do envision it will be a
2092 combination of the in-person and virtual as it fits.

2093

2094 SIU: So, does the engagement strategy include as part of
2095 your development, I guess Steve's - this notion of
2096 communities in the broad sense rather than zip codes? Well,
2097 who you're going to talk to, how you're going to talk to
2098 them?

2099

2100 SARA EVA: Right. It's - I mean, it's internal strategies,
2101 right? And again, the bigger focus is on the current phase,

2102 right? But we're looking into next phases, right? And will
2103 be - it will be always living and changing document. It will
2104 be updated as we learn.

2105

2106 BECKER: Steve Becker, Board. So, I'm very interested in the
2107 process of translating principles into practice. And
2108 certainly, one important dimension of that involves training
2109 of staff, everyone who's involved in staffing the consent-
2110 based siting process. How will you go about doing that? For
2111 example, will you provide one case where EJ principles were
2112 not included, and then contrast that with a case where EJ
2113 principles are included, and discuss the implications? I
2114 mean, what kind of approach do you think you would take to
2115 turn these principles into practice, into application, in
2116 terms of how you train staff?

2117

2118 BELL: Yeah, thank you. And how we intend to do that, and I
2119 hope that we're already starting that process, certainly as
2120 a - I mean, we are a small team, but sort of heavily
2121 involved in all aspects of the process. And so, I - and it's
2122 not - it's - I may be the environmental justice lead, but
2123 it's not just me. I think you will hear a little bit later,

2124 Dr. Tran Le will join, and she has a background in sort of
2125 studying diversity and racism sort of from a behavioral
2126 psychology perspective.

2127

2128 And so, but I think I do really like the idea of - we
2129 certainly haven't had a sit-down and sort of, here's a case
2130 study, and here's what they did wrong, and here's what they
2131 could do better. I will actually say, we do have reflective
2132 processes, I mean, every week, where we might identify ways
2133 that we have potentially excluded, or there are various
2134 sensitivities. For example, when we - theoretically,
2135 stakeholders is anybody interested. But Tribes themselves
2136 don't - some Tribes don't like to be referred to as
2137 stakeholders, because they're not just an additional
2138 interested party. They are sovereign governments and needed
2139 to be treated as such.

2140

2141 So, we've had some discussions around that, or we've had
2142 discussions about how do we - like a particular webinar. And
2143 I mean, things like, just, I mean, an example of today, of
2144 like, we don't know who's speaking. We've certainly had
2145 examples of things where we can, in real time, either

2146 correct it, or if we can't immediately correct it, we can
2147 say, hey, let's pull our resources together, because we need
2148 to figure out a different way.

2149

2150 There are different - I talked about different learning
2151 styles. And maybe we need to sort of adapt and - so, yeah.
2152 Adaptation and flexibility is inherent to the process, and
2153 we're doing that consistently on a reflective basis. But I
2154 do appreciate the - like maybe we need to sit down and use
2155 some - it's always valuable to use other examples very
2156 concretely of like, hey, look at what they did, and then,
2157 you know.

2158

2159 SARAVEA: Lessons learned, which we do after every ... very
2160 frequently, and especially after every big event that we
2161 have, it is a huge component to that. And that include
2162 learning from not even from the public that participates,
2163 but also from our own team members. One example is, we
2164 talked about how to better incorporate people with
2165 disabilities, right? And disability doesn't only include
2166 people in wheelchairs, right? Disability has so many layers,
2167 right? And we are improving and getting better ourselves

2168 every day. So, part of it is a training material, but part
2169 of it is ad hoc-based.

2170

2171 BECKER: Thank you.

2172

2173 TYLER: Just to follow up on that, Scott Tyler on the Board.
2174 Possible examples, just as suggestions you might look to,
2175 would be some of the efforts to site low-level radioactive
2176 waste sites in the '80s and '90s under the Nuclear Waste -
2177 under the Low-Level Waste Compact Act. I don't recall the
2178 name of the law. But certainly, and I was familiar with the
2179 siting in California, which was impacting, as I recall,
2180 Native Americans as well as moderate, at least moderate
2181 income communities. And kind of the history of that is
2182 fairly well-documented as to how that site proceeded. So
2183 that might be a useful place to look. And there were several
2184 other low-level waste sites that were proposed. And I don't
2185 think any were built at that time.

2186

2187 BELL: Thank you very much for that suggestion. That did
2188 just remind me that we're currently developing a sort of

2189 lessons learned on the Tribal aspect of looking at monitored
2190 retrievable storage, and Skull Valley Goshute Tribe, and
2191 sort of understanding the different ways that . . . One
2192 concern might be ensuring that we're not sort of taking an
2193 economically disadvantaged area and putting it there
2194 specifically for that reason.

2195

2196 But we also have to recognize that Tribes have not just a
2197 sovereign status, but we need to respect and recognize that
2198 they can also make decisions, and they should be able to
2199 make decisions for ourselves, for themselves and for us, and
2200 that we may not have a right to implement how those
2201 decisions are made, so, yeah. But thank you for that. I'll
2202 be - we'll be following up on that.

2203

2204 SIU: Okay. I think we're at break time. So, thanks again,
2205 Marissa and Natalia. We will reconvene at 10:25.

2206

2207 [BREAK]

2208

2209 SIU: Okay, if we can get started again. Okay, our next
2210 portion, Marissa and Tran Le will be talking, from DOE
2211 Office of Nuclear Energy, talking about incorporating social
2212 science into consent- based siting.

2213

2214 BELL: Thank you very much. I'm sorry for everyone who has
2215 to hear me two presentations in a row, but the topic at hand
2216 now will be how we're incorporating social science and
2217 integrating it into consent base siting and the process and
2218 research and forming the process.

2219

2220 So, I'm one of the three social scientists on our team and
2221 I'll talk a little bit more about our other social
2222 scientists, Vincent Ialenti that isn't with us today, but I
2223 did want to say that yes, joining us virtually is Dr. Tran
2224 Le who's a social and behavioral psychologist leading our
2225 stakeholder tools and engagement metrics and analytics. Very
2226 grateful to have, to have her expertise on the team.

2227

2228 And so, in this presentation we'll be explaining the role of
2229 social sciences in the consent-based siting process,
2230 including how we've integrated both expertise and practices
2231 into the process and doing a deeper dive into some of the

2232 social science research that we are conducting as we speak.
2233 Now while for some social and behavioral science are sort of
2234 seen as distinct and separate, our approach does reference
2235 behavioral science as subset of social science.

2236

2237 So, while we sometimes call out both social and behavioral
2238 science, when we refer to social science alone, we're also
2239 including behavioral science as part of that.

2240

2241 So, facility siting is, as we heard in Bret's wonderful
2242 introduction yesterday, that set up the tone for yesterday
2243 and today, that facility siting is a socio-technical
2244 process. It's a socio-technical challenge. And so it relies
2245 on social and behavioral science at a foundational level,
2246 and to be integrated with the technical side of things.

2247

2248 So, while my focus is social, I think there's a very deep
2249 understanding of the inter-disciplinarity that is needed in
2250 order to integrate those in a way that, you know, the sum of
2251 the whole is greater than its parts and to get us closer to
2252 facility siting.

2253

2254 So that includes integrating social science into designing
2255 and implementing our siting process. Understanding how to
2256 engage and communicate and who to engage with and the
2257 various aspects of that. And to understand the facets of
2258 decision-making, and inform decision-making processes as
2259 they occur in DOE, as they occur in communities.

2260

2261 So, we're drawing from a very wide set of social science
2262 expertise, both at DOE, and broadly at the national
2263 laboratories. So just at DOE, so we, between the three
2264 social scientists, Vincent Ialenti is a cultural
2265 anthropologist. But between the three of us, we really, we
2266 cover anthropology, STS, or Science and Technology Studies,
2267 Geography, Psychology, Behavioral Science, Science
2268 Communication, Risk Communication which includes Risk
2269 Perception.

2270

2271 And then at the labs we have additional sort of STS scholars
2272 and geographers, but we also would include at the labs
2273 political scientists, those who have expertise in economics,
2274 sustainability, sociology, engineering education. And so, we
2275 really draw on a wide set.

2276

2277 And so inter-disciplinarity isn't just in terms of
2278 integrating social and technical sciences but also
2279 integrating, and I will say between the anthropologists,
2280 psychologists, and geographer, we also have very different
2281 ways of looking and sort of utilizing our disciplinary and
2282 interdisciplinary backgrounds.

2283

2284 So, when we talk about the integration of social science one
2285 way is that we have our siting process that is obviously
2286 adaptive and flexible and iterative, but we have these
2287 phases. And it makes sense that at different phases
2288 different social science research needs emerge. And so, one
2289 way of looking at the integration of social science is
2290 looking at what research needs do we have to fulfill
2291 according to the siting process phase.

2292

2293 And so right now for the financial year, we go by the
2294 financial year for activities, but for FY '23 it's October
2295 to October, we have certain activities; we're in the
2296 planning phase for the next year of activities. I'll mainly
2297 be talking about the what we're doing right now.

2298

2299 But another aspect of this sort of iteration is looking at,
2300 at what points can we take either lessons learned from
2301 social science research, what recommendations, what specific
2302 actions. And also, as social scientists on the team, you
2303 know, implementing the siting process, how can we use social
2304 science to inform the siting process? So, it really is and
2305 can be seen in that sort of holistic way and iterative way.
2306

2307 So, in terms of social science research and development, so
2308 this sort of, this describes the phase at which we are at
2309 right now in terms of what the social science research we're
2310 doing at the labs. So, this kind of describes three ... four
2311 sort of general buckets or areas of social science scope for
2312 this year. Now obviously as we continue we will be also
2313 continuing some of these, but we may sort of shift focus
2314 depending on what phase we are at, at that time.

2315

2316 And also, I've got here the arrows to denote that our
2317 activities don't neatly fall into these areas and some
2318 activities will inform different parts of the process. But
2319 so, so first of all we have a sort of broad examination of
2320 looking at what we can learn and what different areas for
2321 what do we need to develop a fair process and a just

2322 process. Then we have understanding stakeholder values and
2323 to build foundations for ... for engagement.

2324

2325 In the third bucket in the bottom right we have ways that
2326 our social sciences is understanding communication and also
2327 then informing outreach in communication efforts. And
2328 finally, we aim to understand and partner with Tribal
2329 entities for some of the reasons that I described in the
2330 earlier presentation of ensuring that we do that in a, in a,
2331 in the proper way, and respectful of Tribal sovereignty.

2332

2333 So, developing a fair process, I'll outline a couple
2334 different activities that we're doing. So, as I've touched
2335 on I think yesterday and today, there are well-developed
2336 bodies of research that are applicable to consent-based
2337 siting. So early on in the process our social scientists
2338 reviewed and collated various literatures that would be
2339 helpful for our process.

2340

2341 So, one review focused on energy and environmental justice.
2342 So, energy justice which is a subset of environmental
2343 justice. And doing this specifically for spent nuclear fuel
2344 and also energy siting as well and for the purpose of public

2345 engagement. So, we also have a second literature review
2346 developed on public engagement and social science on spent
2347 nuclear fuels. So, looking at things like the science and
2348 technology studies literature that has taken a deep dive
2349 into what it means to have democratic decision making in
2350 contrast to decide, announce, defend approaches that have
2351 historically been relied upon.

2352

2353 And then the third report is currently in development. I
2354 mentioned that this is still in development, but this
2355 literature review on intergenerational justice and how might
2356 we understand and better focused on that. So, it was briefly
2357 touched upon in the environmental justice review, but we
2358 have focused on that, do a deeper dive.

2359

2360 In terms of comment analysis, so I've already mentioned a
2361 little bit, but taking the request for information and the
2362 sort of over, the various responses, 1,600 pages of them.
2363 And looking at what are the, we had our social scientists
2364 analyze what are the themes that come out of that and how
2365 does that relate to the existing literature. So that
2366 analysis, again, available on our website.

2367

2368 And then we've done a longitudinal or we're in the process
2369 of doing longitudinal analyses of public comments over time,
2370 going back to like 2017 and other requests for public
2371 comment. The, and then looking specifically at the Tribal
2372 comments over time and what we can learn. So various
2373 different deep dives into those comments and feedback that
2374 we've been given.

2375

2376 The exemplars which we heard a lot about yesterday. But
2377 essentially studying domestic case studies of successful or
2378 unsuccessful sitings scenarios that were in controversial
2379 context and also looking at international siting processes.
2380 And then environmental justice which I'll gloss over because
2381 we just spent quite a considerable amount of time diving
2382 into, but sort of how do we operationalize executive orders,
2383 how do we understand our communities and demographics with
2384 environmental justice concerns and identifying future needs.

2385

2386 So, a slightly deeper dive into some of the literature that
2387 we've looked at. So, this is an example of one of the
2388 literature reviews that we did on energy siting, public
2389 engagement, and social science. So, there are, this is
2390 actually essentially taken from the table of contents. But

2391 looking at the various kind of bodies of literature out
2392 there that were relevant for this. I thought it would be
2393 quite interesting to exemplify where we're drawing from. So,
2394 looking at sort of literature on infrastructure siting, sort
2395 of looking at LULUs, or Locally Unwanted Land Uses. Or
2396 NIMBY-ism, and Not in My Backyard, or YIMB-ism, Yes in My
2397 Backyard. Those are just some very small snippets into the
2398 wealth of literature on sort of siting infrastructure and
2399 often siting controversial infrastructure as well.

2400

2401 Likewise, the science and technology studies, literature in
2402 particular, has paid close attention to the participatory
2403 turn. So, this is the idea that in contrast to decide,
2404 announce, defend, that really internationally there's been
2405 this move towards participation in infrastructure siting and
2406 this attention to participation in nuclear waste management.
2407 And there are great pieces looking at this in the UK for
2408 example, or sort of Swedish process. So, that's a sort of
2409 well-developed literature.

2410

2411 We also have sort of a collated or collected sort of
2412 different ways of looking at consent. Like there's a recent,
2413 well I'm not sure how recent, what is time? [Chuckles] I

2414 think maybe last year it came out that Seth Touler and Tom
2415 Webler looking at consent across different, different
2416 sectors from medical consent, informed consent, free and
2417 prior informed consent, looking at meanings and
2418 applications.

2419

2420 There's considerable research in risk analysis and risk
2421 perception, understanding what influences how people
2422 perceive risks. And then again in a similar vein, but
2423 slightly different, looking at social acceptance and the
2424 social license to operate, which is an operationalization of
2425 social acceptance. We have work and we'll be continuing to
2426 look at this attention to community benefits and co-
2427 development. So, like looking at bribery versus incentives
2428 versus compensation and how to ensure that we fall in the
2429 incentives and compensation and certainly do not fall in the
2430 bribery.

2431

2432 And finally interdisciplinary collaboration. So, I've
2433 mentioned that even just from the social sciences, but
2434 there's considerable work that looks at how to integrate
2435 social and technical sciences in a way that is beneficial to

2436 the overall programs that they're involved with and how we
2437 can apply some of those lessons to our work.

2438

2439 So, building foundations for engagement. Here we have a
2440 number of activities to understand what publics writ large,
2441 or what specific publics may sort of perceive, or their
2442 perspectives so that we can integrate this into process and
2443 learn from it, learn how to communicate.

2444

2445 So, for broader public perception, we have national surveys
2446 underway, and that are being conducted by the labs and their
2447 partners and contractors. We have social media research to
2448 understand what is happening in the social media sphere. And
2449 then we have some deeper dive work, multi-stakeholder
2450 interviews. So, the request for public information get a
2451 certain subset of the public. And so, the multi-stakeholder
2452 interviews is to go in and to seek broader perspectives of
2453 community level stakeholders that we may or may not have
2454 heard from.

2455

2456 And our current host community's work that I had mentioned
2457 yesterday. So, we're currently have a pilot study underway
2458 to compile knowledge of current host communities of spent

2459 nuclear fuel and DOE facilities. And then citizen science.
2460 So ... so I mentioned earlier, partnering with minority-
2461 serving institutions to develop citizen science to inform ...
2462 inform our process. This is currently under development, so,
2463 details are forthcoming.

2464

2465 And then looking at co-design. So, developing and evaluating
2466 engagement mechanisms to co-design facilities. Another
2467 partnership with a minority-serving institution. And also,
2468 the geospatial analyses that I mentioned before in terms of
2469 creating data layers to understand our communities and the
2470 demographics of those that may be impacted or involved.

2471

2472 In terms of, so those are some examples of sort of informing
2473 foundations for engagement on the R&D side. But the social
2474 scientists were, and social sciences writ large, were very
2475 sort of fundamental in the development of the Funding
2476 Opportunity Announcement and the consortia development. So,
2477 including encouraging awardees to think creatively and
2478 innovatively. And we're very excited that the consortia took
2479 us seriously and are really thinking about very diverse and
2480 innovative ways to engage with communities and to engage
2481 with diverse communities as well.

2482

2483 The theoretical and empirical applications of participatory
2484 democratization of science and technology; defining capacity
2485 building and incentivizing different behavioral strategies
2486 to develop capacity and encourage engagement, referring to a
2487 question earlier.

2488

2489 And contributing to conceptual underpinnings of mutual
2490 learning and facilitation of dialogue to ensure that we're
2491 including diverse expertise. And that includes both sort of
2492 technical, scientific, but also lay expertise. And I
2493 mentioned the inter-disciplinarity, so making sure that,
2494 and that inter-disciplinarity is reflected very well in the
2495 consortia.

2496

2497 We have underway this analysis of intergenerational justice
2498 and intergenerational equity. So, identifying best practices
2499 for understanding these. Identifying mechanisms for
2500 achieving restorative justice while ensuring the well-being
2501 of future generations. And so currently underway are these
2502 guidance and draft recommendation for addressing
2503 intergenerational justice, as well as discussions of an

2504 intergenerational, potential intergenerational council in
2505 response to public feedback.

2506

2507 Informing outreach and communication. So, in addition to
2508 some of the work on understanding sort of public
2509 perspectives and social media, there is some communication
2510 research to analyze public traditional and social media
2511 discourse using natural language processing. So, we now
2512 have, and I say we, like the world, we have algorithms to
2513 sort of quickly analyze data. But we found that that's not
2514 as effective perhaps when looking at nuclear-specific, so we
2515 can code things very specifically for nuclear topics. And
2516 so, there's that work underway.

2517

2518 And then many of the activities I just mentioned then also
2519 inform the development of talking points or ways to address
2520 community concerns or questions, testing of communication
2521 materials. Are they accessible? Are they ... are they sort of
2522 getting - are they getting conveyed in the way that we want
2523 them to be conveyed? And along with that development of
2524 educational resources as part of sort of CURIE resource
2525 management and supporting the consortia and broader
2526 engagement.

2527

2528 In terms of accessibility and outreach, some very specific
2529 ways of looking at best practices for reaching folks with
2530 limited internet access or methods to engage audiences in
2531 different ways. And then finally some work on restorative
2532 justice. So, outreach and education. And one of the
2533 activities that's currently being scoped out, and someone
2534 mentioned yesterday, I had a discussion about, oh, wouldn't
2535 it be fun to do an art showcase?

2536

2537 And I think that in addition to being fun [chuckles] there
2538 are some very real ways that using different methods to
2539 engage with people and having sort of, different things
2540 resonate with different people. And so having sort of that
2541 through the mechanism of art and culture, and some of the
2542 consortia also having activities that are in line with that.
2543 So that's an interesting area to explore that we're
2544 currently exploring.

2545

2546 Social science supporting digital tools. So, in addition to
2547 informing, to having environmental justice practices inform
2548 our digital tools, we've been hard at work at DOE and the
2549 national labs in terms of identifying ways to use sort of

2550 existing social and behavioral science to influence user
2551 experience, for example. Making sure that our, you know,
2552 CURIE resource management debate; debate - there might be
2553 debates going on in the database and from the different
2554 literatures - but ensuring that the database is accessible.
2555 And tagging things in a way that makes them easier to access
2556 and find.

2557

2558 We have our work in the geographic information systems that,
2559 making sure that again user experience that these tools are
2560 available and easier to use, they don't require a steep
2561 learning curve. There are things that we can do to decrease
2562 that learning curve.

2563

2564 And there are story maps being developed with a broad
2565 audience in mind and the story maps are kind of a way of
2566 taking information both technical and social and conveying
2567 it in a way that is more accessible, with sort of imagery
2568 and accessible language and interactive content as well.
2569 Because getting talked at [chuckles] for, for an extensive
2570 period of time isn't always the best way to communicate, but
2571 sometimes having that interactive component is really
2572 valuable.

2573

2574 So, understanding and partnering with Tribal entities. So,
2575 there are various, we're at different stages with different
2576 parts of this work. We have background research. I mentioned
2577 before the analysis of Tribal comments that to understand
2578 what are the issues that currently, you know, at the
2579 forefront of Tribal entities. But we're also doing work to
2580 understand how Tribes have historically been affected by
2581 nuclear facilities and really digging deep into looking
2582 historically at ways, you know.

2583

2584 One example is the Nuclear Waste Negotiator, and I have some
2585 additional resources from Scott earlier in terms of how we
2586 can add to that. But understanding how Tribes have
2587 approached these processes historically, so that we can
2588 understand what are the issues and be able to respond and
2589 engage respectfully in preparation for consultation.

2590

2591 So, then we have some planned activities with Tribal
2592 partners. These are currently in development. We're
2593 currently sort of figuring out the scope precisely, but the
2594 goal of these, so I mentioned before, multi-stakeholder
2595 interviews. And that's really primarily with kind of

2596 community scale stakeholders. But we wanted to do work that
2597 was partnering with a Tribal-serving institution to ensure
2598 that this research was done in a respectful way that really
2599 incorporates the Tribal perspectives into the development of
2600 this research.

2601

2602 And so, parts of it is to have interviews with Tribal
2603 members on reservations to understand what are the concerns;
2604 fill in some of the gaps of like how Tribes have been
2605 historically, and Tribal members have been historically,
2606 impacted. What are the current concerns and what can then
2607 inform our process.

2608

2609 And then we also have work proposed to interview with Tribal
2610 industry experts. So, these would be Tribal members who may
2611 or may not be on or off reservation, but those who also have
2612 a role in the nuclear sector or the rail sector or industry.
2613 And so, these kind of serve as bridging those kind of
2614 different perspectives and to understand how those
2615 perspectives could inform what, the ways that we engage and
2616 inform our decision making process.

2617

2618 And then a final activity is, and again proposed, but
2619 another citizen science project to sort of, with the goal of
2620 education, outreach, and engagement. But this will be
2621 primarily designed by the, well actually all three of these
2622 activities will be designed by the Tribal-serving
2623 institution. And so, we're sort of still kind of developing
2624 the scope of that. Yeah, so that I think concludes the
2625 presentation. I do want to sort of emphasize and perhaps
2626 celebrate and applaud the sort of integration of both social
2627 science practice and social science expertise, both
2628 internally and at DOE and across the labs and taking all of
2629 those lessons learned. I think that ultimately as was
2630 mentioned, nuclear waste siting is a socio-technical
2631 challenge that it really, it requires an integration of the
2632 social perspectives and technical sciences to be integrated
2633 in a way that is collaborative and celebratory of that
2634 inter-disciplinarity to make sure that our process is
2635 enacted in a fair and just way. And so, yeah, thank you.

2636

2637 SIU: Thank you, Marissa. And just for those of you who are
2638 wondering why we had such long discussion on the social
2639 sciences, just remind you. Because as I said at the
2640 beginning, we are charged with performing evaluations of the

2641 technical and scientific validity of DOE activities, and
2642 clearly social science activities fall within that charter.
2643 So thank you again. Steve?

2644

2645 BECKER: I guess by tradition I'll go first.

2646

2647 SIU: A great tradition.

2648

2649 BECKER: I'm Steve Becker on NWTRB Board. So, I was pleased
2650 to hear mention of citizen science as an area of
2651 investigation. I'm wondering, have you looked at the work
2652 that is coming out of Japan in the aftermath of the 2011
2653 crisis at Fukushima Daiichi? There's a lot of new and
2654 innovative work going on, on citizen science, including with
2655 historically underserved communities.

2656

2657 BELL: Thank you very much for that suggestion. I don't
2658 think we have specifically. I think there's sort of a wealth
2659 of literature even just within the U.S., and a lot of it is
2660 sort of still in development. So I think that that's
2661 certainly something and very an exciting avenue to explore,
2662 especially given the sort of, I think citizen science has
2663 multiple roles in terms of informing process and developing

2664 that science. But also in terms of education and outreach,
2665 and getting folks to be engaged and to care about this
2666 process and make it meaningful to them. So, yeah, thank you.
2667

2668 BECKER: I think you'll find it a rich area to explore,
2669 including in such areas as facilitating the development of a
2670 citizen competence in relation to all the different
2671 dimensions associated, for example, with radiation, so.
2672

2673 BELL: Thank you very much.
2674

2675 TYLER: Thank you, Marissa. I just wanted to go back to
2676 something you, in your presentation, on the multi-
2677 stakeholder interviews that you brought up. Can you
2678 elaborate a bit on that activity and how far along that is,
2679 or is that something that the consortia members have been
2680 tasked with doing?
2681

2682 BELL: Thank you. Yes, so the multi-stakeholder interviews
2683 are being conducted by the national labs and they are
2684 underway. So, they've currently finished about 50 interviews
2685 and I think have plans. So, they're roughly halfway through.
2686 And so, we've had an interim report, but in terms of final

2687 recommendations and final results, it's still underway. So,
2688 we don't have those yet.

2689

2690 TYLER: And will that be made public?

2691

2692 BELL: That's a good question. I think, I mean I'll start by
2693 saying it's heavily dependent on sort of what we find. And I
2694 mean I think the goal would ultimately be to potentially
2695 share it with the public. That may be very valuable. But
2696 like with many of our, many of our research products as well
2697 as projects, sort of figuring out how they apply internally,
2698 and then preparing them for release to public it can be, it
2699 takes some time. But that will be considered.

2700

2701 SARAEVA: I would also add that it will depend on the
2702 resources we have available. Because for example, this
2703 summary of public comments that is aligned, went through the
2704 multiple iterations of edits by, to make it. Again, we're
2705 talking about using jargons. Right? And went through
2706 multiple iterations of edits to make sure that it is written
2707 in a language that would be understandable to the majority.
2708 And I myself sometimes find jargon used by social scientists
2709 something that I'm still learning.

2710

2711 TYLER: Okay, all right, thank you.

2712

2713 BELL: And I would add that I think the consortia also have

2714 plans to do interviews and focus groups and similar

2715 activities, but that's certainly not part of the multi-

2716 stakeholder interview effort that is currently underway.

2717 That was sort of a very methodical and communities selected

2718 across, the simulated communities rather, from geographic

2719 regions.

2720

2721 TYLER: Is there a way potentially to inform the consortia

2722 of that program and that plan so that they're not

2723 reinventing the wheel?

2724

2725 BELL: Yes, yes, absolutely.

2726

2727 TYLER: That's planned to be done?

2728

2729 BELL: Yeah. Yeah, no, we're working very hard to make sure

2730 that there's integration of the social science activities

2731 that are happening at the labs in conjunction with

2732 consortia. For example, we have the current host communities

2733 and in the future we're hoping to continue that work and
2734 also on the exemplar's front in other sort of communities.
2735 And so, you know, making sure that, so the consortia are
2736 prioritized and we don't try to do research in the same
2737 community that a consortia is engaging with, and end up with
2738 research fatigue. It's a burden to communities. It can be,
2739 you know, to take their time for these activities.

2740

2741 So that's one way. One, the consortia also, one of the
2742 consortia is planning to develop a literature review of all
2743 the work that's been done. And so, I was like, oh, we have
2744 that at the labs. And so, we're figuring out how we can sort
2745 of share that with them so that again, so that the work that
2746 we're doing is sort of coordinated and integrated and sum of
2747 the whole greater than its parts, to ensure that we're not
2748 duplicating activities.

2749

2750 TYLER: Thank you.

2751

2752 SIU: Speaking of jargon, Nathan Siu, Board I understand the
2753 word interviews, I think. Multi-stakeholder I'm not quite so
2754 sure, because I can interpret that many different ways. Can
2755 you just explain that a little bit more?

2756

2757 BELL: Yeah, absolutely. So, to understand that I might just
2758 give a little bit of context of how this activity even sort
2759 of came to be. So, in the RFI, the Request for Information,
2760 we heard from sort of multiple community members. But we
2761 heard from those very invested in the process already, that
2762 knew that RFIs were a thing, and knew about consent-based
2763 siting. So that's one element.

2764

2765 The other thing is that we know a lot about sort of national
2766 level stakeholders, like sort of NGOs, Non-Governmental
2767 Organizations, or folks that are, you know, industry
2768 institutions like Nuclear Energy Institute and others that
2769 we sort of hear a lot from national level stakeholders.

2770

2771 So, the goal with the multi-stakeholder, the community level
2772 multi-stakeholder interviews, was to essentially get more
2773 perspectives from a variety of community-scale stakeholders.
2774 So, we're not talking at the national level; talking at the
2775 community scale. And then sort of picking, grouping them
2776 into stakeholder groups of like local governments and sort
2777 of planning organizations, first responders, local community

2778 organizations, and local sort of religious community
2779 organizations.

2780

2781 And I think I'm trying to picture the, I'm missing one, but
2782 essentially kind of looking at what different stakeholder
2783 groups, but at a community level. And the reason I kind of
2784 corrected myself and said simulated communities, is because
2785 this research isn't going into one community and saying what
2786 do the first responders and local planners and everybody in
2787 that one location, like a sort of geographic specific
2788 community. We deliberately did it to select from counties
2789 across the United States to simulate a community. But also
2790 get a variety of high income, low income, counties and
2791 various other to kind of simulate and also to avoid the
2792 perception that we're looking at a particular community.
2793 Because we're not at this time.

2794

2795 SIU: Thank you.

2796

2797 BECKER: Steve Becker, Board. I'd like to revisit a question
2798 I asked at a previous meeting. So, it is clearly a good
2799 thing that you are tapping a broad range of social and
2800 behavioral science disciplines from geography to psychology

2801 and that will produce, I think, a wide variety of useful
2802 insights and areas of expertise upon which to draw.

2803

2804 At the same time, some of the cutting edge work in radiation
2805 related risk communication and similar topics has taken
2806 place in other fields. Examples of those fields include
2807 public health, medicine, health physics, and disaster
2808 management. And this makes sense because those are the
2809 fields that deal with radiation, to use your term, writ
2810 large, in a practical way and on a regular basis.

2811

2812 So, if you're not looking at journals such as *British*
2813 *Medical Journal*, *Prehospital and Disaster Medicine*, *American*
2814 *Journal of Public Health*, *Health Physics*, and those sorts of
2815 journals which are typically not indexed in social science
2816 indices, then you could be missing some really critically
2817 important work that is directly relevant to what you're
2818 doing. So, I'd be curious to hear your thoughts about that.

2819

2820 BELL: Yeah, I have two thoughts and then maybe Natalia
2821 would want to jump in. But the first thought is that I think
2822 there are ways to access some of that literature through
2823 sort of, you know, the Society for Risk Analysis for

2824 example, that brings together sort of folks on risk
2825 communication, risk analysis, risk perception from those
2826 different fields. I've been involved in venues such as that
2827 in the past and I think that, and we have folks at the labs
2828 as well. So that's one way that I think that we would be
2829 able to access that, and plan to do so.

2830

2831 And I will also give a shout-out to my colleague, Angelica
2832 Gheen, who is a, who has a background in health physics and
2833 sort of public health, currently doing some research in that
2834 area and so, you know, as an integral part of our team. And
2835 you know, we've had some great discussions around sort of,
2836 my interactions with risk perception, are from sort of
2837 Ragnar Lofstedt and sort of the risk governance. And so had
2838 some great discussions with Angelica about how to make sure
2839 that the health physics aspect is incorporated. And Natalia?

2840

2841 SARA EVA: Just to add, and to the shout-out, Angelica, and
2842 the fact we have, and that's why we have a really diverse
2843 team. Right? So, yes, Angelica's not just an expert in
2844 public health, she's currently also obtaining PhD in Global
2845 Public Health, which becomes really helpful too, also to our
2846 program at different levels. And before joining DOE she was

2847 working in the CDC, so she brings some interesting
2848 perspective from that experience to the table.

2849

2850 And as Marissa mentioned we also have plenty of public
2851 health experts that work on our extended team at the
2852 national labs. I just wanted to reiterate again, this is a
2853 really important consideration. But what we can do, if you
2854 have unlimited resources, the sky is the limit, right? We
2855 have to prioritize what we do based on the resources.

2856

2857 BECKER: So, I'm assuming, given what you said, that the CDC
2858 has spent literally millions of dollars on research that's
2859 directly relevant. I'm assuming that things like that have
2860 been tapped as part of your work?

2861

2862 BELL: And we had some discussions yesterday, actually,
2863 about like even just looking at COVID and the extensive
2864 literature that came out of that. Looking at how that
2865 impacted. I think there's a lot of lessons to be learned
2866 about risk communication, about engagement, about behavior.
2867 And so, I mean, that's just calling out one specific area.
2868 But I think that there's a lot to be learned.

2869

2870 And I also actually want to, yeah, I want to give Tran the
2871 opportunity, particularly because, and I'm not sure what
2872 she'll speak to, but our nuclear energy university programs.
2873 Was specifically asked to focus on other areas that may -
2874 anyways, I'll hand it over to Dr. Tran Le. Can't hear you.

2875

2876 LE: Can you hear me now?

2877

2878 BELL: It's very, very faint. I think we're, I think we're
2879 working on it on our end.

2880

2881 LE: Can you hear me now?

2882

2883 SIU: Barely.

2884

2885 BELL: So we can hear you very, very faintly. Is there
2886 anything we could do to -?

2887

2888 LE: Let me see if it's something on my end.

2889

2890 BELL: We might be able to hear you better now.

2891

2892 LE: Hello?

2893

2894 BELL: Yes.

2895

2896 LE: Can you hear me. Oh yeah, thank you so much. I'm so
2897 sorry for all that trouble. It wasn't a major comment; I
2898 just wanted to speak to the focus on health impacts with
2899 regard to radiation, for instance. And that is something
2900 that we have considered for our story maps that we have in
2901 development, including a current draft on that. So, I can
2902 speak more to that in a couple of minutes in my next
2903 presentation if there's interest on that.

2904

2905 But I just wanted to mention that there is a consideration
2906 that we have with regard to access to technical information
2907 in a way that's digestible, but also appealing to a broad
2908 audience. Thank you.

2909

2910 SIU: Paul Turinsky has a question that Bret Leslie will
2911 read.

2912

2913 LESLIE: Bret Leslie, Board Staff, asking a question for
2914 Paul Turinsky. What formal structure within DOE has been or
2915 will be established to direct the technical, science and

2916 engineering R&D based upon what is learned regarding
2917 concerns from the interactions during the consent-based
2918 siting learning process? Are there examples where this is
2919 already taken place?

2920

2921 BELL: Thank you for that question. That question is
2922 regarding technical science and how -

2923

2924 LESLIE: Well, it's the integration between social and
2925 technical.

2926

2927 BELL: Okay, okay. So, I can start us off. But yeah, so it
2928 requires not just seeing the social and the technical as
2929 separate areas that need to be done in parallel. The key is,
2930 is in integration and coordination and collaboration. One
2931 area we've seen this, for example, is transportation and
2932 having the social scientists involved in contributing to
2933 some of the transportation studies and impact assessments.

2934

2935 And then sort of also having technical scientists and
2936 expertise informing some of the social science research. So,
2937 I think that is already sort of underway. I'm not sure I
2938 could speak to any formal mechanisms, but I think that the

2939 structure and the way the collaborations we have internally
2940 in the Office of Integrated Waste Management [chuckles]
2941 which I'll take that sort of a little bit liberally and not
2942 just the sort of transportation interim storage and
2943 disposal, but sort of the holistic perspective. And that is
2944 also happening at the labs, that sort of integration across
2945 disciplines.

2946

2947 We also, we have in terms of focusing inward, there was a
2948 question about how we're focusing inward. There's actually
2949 considerable attention, both on our side and at the labs, on
2950 organizational culture specific to ensuring that inter-
2951 disciplinaryity is recognized as of value and ensuring that -
2952 so you know, even within the social scientists, social
2953 sciences, we speak different languages.

2954

2955 But often, you know, what we mean by the words that we use
2956 may mean different things. What's a community to a technical
2957 versus social? So, there's already work on sort of having
2958 workshops to understand and to build sort of communication
2959 across disciplines. Which you know, it's challenging. Coming
2960 from a discipline, geography, that you know, soil sciences
2961 and perceptions, like very different, but integration.

2962

2963 It's challenging, but I think that we're paying very close
2964 attention to that and ensuring that we do that both on the
2965 lab side and at DOE. And I'm not sure if Tran or Natalia,
2966 anything to add on that?

2967

2968 LE: I'd love to add something to that, briefly, Marissa. In
2969 that a lot of the products that we're working, for instance
2970 again the IWM story maps is something that is extremely
2971 collaborative. It passes through several subject matter
2972 experts, for instance, depending on the subject of the story
2973 maps.

2974

2975 And so, a lot of our work is heavily reliant on the
2976 expertise of others, as well as also on our team. Because we
2977 want to put our best foot forward in terms of our efforts at
2978 engaging in a meaningful way, not just with the communities,
2979 but also making sure that we put out an honest effort on our
2980 front. And that's certainly something that we are always
2981 considering at every step of the process. Thank you.

2982

2983 SIU: Do we have any other questions? Bret.

2984

2985 LESLIE: Bret Leslie, Board staff. And this is a question
2986 that's been in a couple of the previous presentations. But
2987 consultation with a Tribe is a very formal process. And it's
2988 not, it's separate and distinct from your consent-based
2989 siting process. What is the timelines for that? So, if you
2990 were to look in DOE, for instance, DOE-EM has one with the
2991 Shoshone-Bannock. How long did that take to develop, and how
2992 does that impact and influence? And at what point would that
2993 consultation begin?

2994

2995 Would it begin in your first phase, or is consultation
2996 something that is only done at the end? And if you can
2997 explain a little bit more about that and how you envision
2998 Tribal strategy and consultation process moving forward, how
2999 will you know who to consult, do the consultation with, that
3000 would be very good. Thank you.

3001

3002 BELL: Yeah, thank you very much for that question. So, I
3003 guess the first thing I would just say is I wouldn't see
3004 sort of Tribal engagement as separate and distinct from
3005 consent-based siting. I would, I would say that it is a very
3006 integral part of consent-based siting, although the way that

3007 we engage with Tribes and Tribal entities is going to be
3008 very specific.

3009

3010 But it's also not just engaging with communities and
3011 engaging with Tribes. Every Tribe, you know, has its way of
3012 doing things and we are attentive to that, the kind of
3013 uniqueness of the Tribes. And so, I guess then to sort of
3014 get to the answer of your question, I think that these will
3015 all depend on the Tribe itself.

3016

3017 And so, you know, we're very fortunate to have sort of
3018 Tribal partners at Tribal working groups and subject matter
3019 experts at the lab to have kind of, who are working on
3020 aiding the creation of a Tribal engagement and consultation
3021 strategy.

3022

3023 But to the point of at what point does that happen? So
3024 again, that's going to be very specific to a Tribe. So, for
3025 some we may be engaging with a Tribe over time, and then at
3026 some point either they will request a formal Tribal
3027 consultation. Or, we've been encouraged to just ask, like is
3028 this, is this a Tribal consultation? In which case, we need
3029 to treat it as such. Or is this just a sort of meeting to

3030 sort of get to know the process and what resources we can
3031 provide.

3032

3033 So, I think that, because I had those very same questions,
3034 what is engagement versus consultation. And it depends on
3035 the Tribe and we should be asking questions and letting the
3036 Tribe dictate that process. So yeah, what this means is
3037 that, I mean, one of the recommendations for our strategy as
3038 we develop it is early and ongoing communications and
3039 ongoing engagement.

3040

3041 And so that means doing things, basically starting yesterday
3042 and ensuring that, because sometimes Funding Opportunity
3043 Announcements have a limited time period. So, if we already
3044 have relationships with Tribes and we're already sort of
3045 informing them ahead of time to the extent that we can.

3046

3047 And obviously there are challenges with working within sort
3048 of, you know, federal rules and guidelines and things like
3049 that. But developing relationships, working with trusted
3050 partners, to ensure that that information and that
3051 engagement is happening now so that, so that Tribes and, you
3052 know, communities are not sort of blindsided and you know,

3053 not able to participate in - in Funding Opportunity

3054 Announcements and things, so, yeah.

3055

3056 LESLIE: Bret Leslie, Board staff. I'll kind of follow-up on

3057 the topic that Paul talked about, this overlap between

3058 technical and social. And this has to do with the consent-

3059 based siting process. I know at this point you're engaging

3060 and talking about nuclear waste management and with a

3061 consortium.

3062

3063 But in that process, are you talking about the types of

3064 things that people use for siting criteria? Because that's

3065 where the technical meets the social. And I think if you

3066 haven't had that as part, and again, this is me speaking, if

3067 you haven't had that as part of the first phase, then how

3068 can those communities understand when you start to put out

3069 the criteria later whether they even want to volunteer?

3070

3071 BELL: That's a great question, and I think it's more of a

3072 siting process. So, I'll actually ask Natalia, because I

3073 think that that's, there are certain phases where siting

3074 criteria and siting considerations will be discussed sort of

3075 collaboratively, yeah.

3076

3077 SARAEVA: The nexus of social and technical doesn't start
3078 later; it starts now, right? We had this discussion earlier
3079 about providing technical information, but providing it in
3080 the manner that would be understandable given that there's
3081 different levels of understanding of what nuclear fuel is,
3082 right?

3083

3084 So, but in order for us to do so, we also need to listen and
3085 understand what the public and the communities might need,
3086 right? So, you see in our booth we do have some technical
3087 models, visual examples. Tran will talk more about the
3088 technical tools we are developing, right? But again, and
3089 this is the nexus of social versus technical.

3090

3091 And in terms of the criterias, yes, so we've made a decision
3092 not to include them right now on the stage because we will
3093 issue them in the beginning of our earlier phase.

3094

3095 SIU: Do we have any burning questions from the Board? Okay,
3096 with that, thank you very much.

3097

3098 BELL: Thank you very much.

3099

3100 SIU: Your ordeal is over. Okay, our next talk, Dr. Tran Le
3101 and Angelica Gheen and will be talking to us about digital
3102 tools. All yours, Tran.

3103

3104 LE: I don't think it's intentional, but I think that last
3105 question from Bret is actually a wonderful segue into this
3106 discussion here on digital tools for engagement. But before
3107 that, let me introduce myself.

3108

3109 My name is Tran Le and I'm one of three social scientists on
3110 the consent-based siting team here within the DOE. And
3111 Marissa has been exceedingly kind about her introduction of
3112 who we are in terms of this whole, this whole consent-based
3113 siting process here.

3114

3115 But with me today is Angelica Gheen. She is a physical
3116 scientist on our team and she led the discussion yesterday
3117 on the domestic and international exemplars informing our
3118 process. And on behalf, on our behalf, I'll be discussing
3119 the development of digital tools supporting engagement.

3120

3121 Within the context of the consent-based siting process here,
3122 I started this presentation by saying that Bret's question
3123 just now was a great segue into this because I think that
3124 the very essence of these digital tools here that I'll be
3125 discussing is, is in one way, an attempt for us to bridge
3126 the gap between social acceptability and technical
3127 suitability that he mentioned yesterday at the beginning of
3128 this whole meeting.

3129

3130 It's looking at the ways in which these processes really
3131 should be happening at the same time for us to go out and
3132 understand what it means for engaging a diverse, a diverse
3133 audience in this whole conversation. And to really get as
3134 many voices amplified as possible.

3135

3136 And these digital tools that I'll be discussing here, I
3137 think, are, it's not the way, but it is one way that we are
3138 trying to encourage engagement with as diverse of an
3139 audience as possible. So, if I could please trouble someone
3140 with kindly going to the next slide?

3141

3142 Oh, thank you. So these are the main digital tools that I'll
3143 be discussing in our brief, our brief talk right here. There

3144 are three main tools that I'll be discussing here that, in
3145 an essence, directly support the consent-based siting
3146 process, as well as two other IWM tools. These I would
3147 consider to be indirectly supporting the process. And when I
3148 say directly versus indirectly supporting, I don't mean that
3149 any of these tools are better than another; it's just that
3150 the scope of some of these tools, like the START tool or the
3151 Next Generation System Analysis Model or NGSAM, has much
3152 larger applications beyond the consent-based siting process.

3153

3154 But - so these again are the tools that I'll be discussing
3155 today. They include the CURIE tool, which is a public facing
3156 resource portal, as well as the Integrated Waste Management,
3157 or IWM StoryMaps, which we've been alluding to. That is a
3158 digital storytelling tool. As well as the Land
3159 Identification, Tagging and Exploration tool, or the LITE
3160 tool. And again, the START and NGSAM.

3161

3162 But before we go into detail for each of these tools, I just
3163 wanted to take a really quick brief moment to acknowledge
3164 the wonderful team on the federal side, but also at the
3165 national labs who have made these tools possible. As you can
3166 imagine, it takes an enormous amount of effort for the, not

3167 only the creation, but also the implementation and the
3168 upkeep of a lot of these tools.

3169

3170 And with us today are actually some of the individuals who
3171 have played an integral part of the development and also the
3172 implementation of these tools. So that includes Dr. Sara
3173 Hogan on DOE, as well as Robbie Joseph, from Idaho National
3174 Lab. So, without further ado, if I could please go to the
3175 next slide?

3176

3177 So, the first, so the first tool that I'll be discussing
3178 today includes the CURIE tool. So, a lot of people might be
3179 familiar with CURIE, but for those who aren't, I'm going to
3180 give like a really quick brief overview here on CURIE.

3181

3182 So, it was actually initially released in 2013. CURIE is a
3183 public facing resource portal that provides easy access to
3184 documents, data and maps related to nuclear waste
3185 management. So that includes a variety of things such as a
3186 map that includes the different locations of, say, current -
3187 current and operating and not operating facilities.

3188

3189 So, some recent improvements for CURIE since its relaunch in
3190 2022 includes modernization of the user interface. So that's
3191 just a really fancy way of saying that we would like CURIE
3192 to be an accessible resource to as wide a variety of an
3193 audience as possible because CURIE houses quite an enormous
3194 amount of information. But that we recognize that there are
3195 certainly a number of improvements that could be made to
3196 CURIE to make it more accessible, to make it easier to
3197 search for documents.

3198

3199 Other recent improvements to CURIE include an enhancement of
3200 document curation, which Marissa has touched upon briefly in
3201 some of her presentations here, which includes an updated
3202 taxonomy, which is a way for us to tag different subject -
3203 subject tags, a really terrible way to describe it.

3204

3205 But it's essentially allowing us a better way to classify
3206 different documents by, for instance, topics that are
3207 covered in those individual documents. We're also including,
3208 or some of our recent improvements, excuse me, include
3209 improvements to the workflow in terms of how documents are
3210 being uploaded and curated, which includes improvements to
3211 how documents are searched and tagged.

3212

3213 Other improvements include modernization and continuous
3214 improvements to the interactive maps that we have on CURIE.
3215 And as a part of the ongoing improvements, CURIE is going,
3216 is actively providing ongoing development support for
3217 consent-based siting at large, but also specifically with
3218 capacity building with the consent-based siting consortia.

3219

3220 Next slide, please? So, CURIE has a plethora of features
3221 which includes things such as the Spent Nuclear Interactive
3222 Information Map, which I mentioned in the previous slide. It
3223 also has an extensive document library that allows you to
3224 view and upload documents.

3225

3226 You can also view a number of events, including public
3227 meetings and conferences, as well as there are different,
3228 different things that you can do with the authenticated
3229 account, for instance. But a lot of the features here on
3230 CURIE are publicly accessible, even without an account.

3231

3232 With an account, you can have access to things such as a
3233 private community. Within CURIE, we actually have a consent-
3234 based siting resource library which is our most fleshed out

3235 private community just for consortia members. So, with this
3236 resource library, we provide a lot of additional resources
3237 that touch upon some of the questions that were asked, I
3238 can't remember if it was yesterday or today, but access to
3239 subject matter experts, for instance.

3240

3241 The resource library housed within CURIE allows consortia
3242 members, for instance, to submit requests for more
3243 information about, for instance, the reference concept of a
3244 consolidated interim storage facility, as well as access to
3245 other subject matter experts for whichever other topics of
3246 interest consortia members might have.

3247

3248 Again, there are a lot of ongoing efforts to improve the
3249 user experience within CURIE. For one, we are really
3250 committed to enhancing the accessibility, as well as
3251 maturing document management workflow, which is to say, to
3252 make documents easier to upload, but to also share knowledge
3253 in that capacity.

3254

3255 And I briefly mentioned this, but curated content in private
3256 communities in addition to other ongoing efforts here listed
3257 on this slide. And this graphic over here is a snapshot of

3258 that consent-based siting resource library that I mentioned,
3259 which is exclusive to consortia awardees. Next slide,
3260 please?

3261

3262 So, moving on from CURIE, I'd love to move the conversation
3263 to the IWM StoryMaps, StoryMaps that we have in development.
3264 Here. It is an ArcGIS product that enables us to really
3265 provide information in a way that is much more interactive,
3266 rather than, say, scrolling down in endless stream of text.

3267

3268 So, the StoryMaps provides a multi-media user experience
3269 through a guided sequential narrative, in this case, about
3270 Integrated Waste Management. And the thing that's really
3271 unique about the StoryMaps platform is that it's really
3272 ideal for sharing geo-spatial information via interactive
3273 maps and infographics.

3274

3275 The little screenshot that we have, well not so little, I
3276 suppose, the screenshot that we have here on the right is a
3277 working version of the IWM's overview StoryMaps that we have
3278 in development, that we're looking to publish very soon.
3279 This one, for instance, includes a really brief overview of
3280 what integrated waste, what an Integrated Waste Management

3281 system looks like, as well as how the consent-based siting
3282 process fits into this whole management system.

3283

3284 Next slide, please? I think it might have gone - thank you.

3285 With regard to the StoryMaps content, we actually have, I'm

3286 really excited to mention that we have a lot of different

3287 StoryMaps under development right now, one of which I

3288 alluded to earlier in the Q and A on the potential health

3289 impact of a CISF, or Consolidated Interim Storage Facility.

3290

3291 But before that, let me tell you, let me go over a little

3292 bit more about the StoryMaps. So we're really excited about

3293 the StoryMaps because we believe that it will allow for

3294 broad audiences to learn more about various technical topics

3295 related to IWM in a more interactive way.

3296

3297 We had a really drawn out discussion on the best way that we

3298 could relay a lot of this technical information because as

3299 you can imagine, even for us who are well versed in these

3300 conversations, it's sometimes really difficult for us to

3301 have these meaningful conversations when there's just a

3302 difference of understanding for a variety of topics. And so,

3303 you can imagine how inflated the difficulty of relaying that
3304 kind of information could be with regard to IWM.

3305

3306 So for StoryMaps, it appeals to a wide variety of attention
3307 types in that it really relies on a number of tools, is that
3308 the correct way to mention that, but a lot of different - a
3309 lot of different ways for us to convey this information. For
3310 instance, via videos, interactive infographics, as well as
3311 other content in development.

3312

3313 So, as I mentioned before, the IWM StoryMaps will include
3314 content on consent-based siting, on the consent-based siting
3315 process, as well as other topics of interest. So, for
3316 instance, other impacts of the construction and operation of
3317 a consolidated interim storage facility. So that could
3318 include topics for instance, potential radiation from these
3319 facilities, or the transportation, or other things like
3320 visual impact. How would this actually look in my community
3321 for instance, my being a very broad mind. And the, IWM
3322 StoryMaps here is intended to be a resource for the consent-
3323 based siting consortia as well, as they look to engage in
3324 the capacity building stage.

3325

3326 Next slide, please. In addition to CURIE and the StoryMaps,
3327 we also have the LITE tool. So, the LITE tool stands for the
3328 Land Identification - Land Area Identification Tagging
3329 Exploration tool, or LITE for short. And the LITE tool here
3330 provides interested parties with an interactive opportunity
3331 to evaluate interim storage facility and siting from a
3332 spatial perspective which includes things such as potential
3333 impacts. It's kind of hard to see here on this slide, but
3334 there are a variety of data layers for instance that
3335 individuals could pick between in terms of how this map is
3336 displayed. The next slide provides a little bit more details
3337 on how the LITE tool could be used to support the capacity
3338 building stage of consent-based siting and beyond.

3339

3340 Next slide, please. So, the LITE tool could provide unique
3341 considerations for each three phases - excuse me - of the
3342 consent-based siting process. So, for instance in Phase 1,
3343 we imagine that it could provide high-level siting
3344 considerations such as proximity to population centers,
3345 protected areas such as - such as National Parks, excuse me,
3346 and other areas of interest.

3347

3348 For Phase 2 the LITE tool could provide, for instance,
3349 visibility considerations including population distribution
3350 as well as infrastructure constraints and also a variety of
3351 impacts and opportunities. And finally for Phase 3, detailed
3352 siting considerations inform the LITE tool could include
3353 equity and environmental justice concerns, as well as
3354 environmental law.

3355

3356 Next slide, please. But beyond the three tools that I just
3357 discussed here, directly supporting that consent-based
3358 siting process, there are other integrated waste management
3359 tools such as the START tool here. And online here we
3360 actually have Dr. Sara Hogan who is the federal manager
3361 overseeing the START tool.

3362

3363 The START tool is the Office of Integrated Waste
3364 Management's transportation decision support tool. And it
3365 was developed to enable visualization and analysis of
3366 geospatial data that is relevant to the planning and
3367 operating of large scale spent nuclear fuel and high-level
3368 radioactive waste transport as well as storage, or to
3369 storage and/or disposal facilities.

3370

3371 So potential utilizations of the START tool for instance,
3372 within the context of this discussion could include routing
3373 options as well as risk attributes, training preparations
3374 along DOL, or DOE transport routes, as well as
3375 communications, environmental analyses, and also integration
3376 with system analysis such as the NGSAM.

3377

3378 And the START tool here with regard to the consent-based
3379 siting process could really be an integral tool to support
3380 communication information exchange in a way that's more
3381 inclusive and transparent because a lot of people for
3382 instance really like to have visuals when they are engaging
3383 in these conversations. And as you can imagine with
3384 something such as transportation, it's essential that there
3385 is a visual that can be referred to when we're looking at
3386 the different potential routes that spent nuclear fuel could
3387 be moving along.

3388

3389 Next slide, please. A little bit more about the START tool.
3390 So, the START tool here incorporates a variety of geographic
3391 information system, or GIS data layers. And those data
3392 layers here are shown here on this slide. There are a lot of
3393 them. [Chuckles] As a transportation tool, most of the data

3394 layers as you can see here are directly related to
3395 considerations for transportation such as proximity to areas
3396 of interest.

3397

3398 These slides will be for viewing later, but I just wanted to
3399 pause for a quick moment so that you could all take in this
3400 information here, but if I could please go to the next
3401 slide.

3402

3403 IWM tools include the NGSAM. And online here we have Robbie
3404 Joseph who is an expert on that, but to provide a quick
3405 overview of NGSAM. It's an agent-based discrete event
3406 simulation tool which was developed at Argonne National Lab.

3407

3408 So, the NGSAM actually allows analysts to do a number of
3409 different things. But related to consent-based siting it can
3410 generate custom reports, for instance related to storage
3411 facilities and its operations including costs. It can also
3412 analyze a wide range of Integrated Waste Management system
3413 configurations, approaches, and scenarios.

3414

3415 And with relevance to the capacity building stage of the
3416 consent-based siting process, NGSAM can actually answer

3417 questions related to, but are not limited to consolidated or
3418 interim storage ... storage within an IWM system, as well as
3419 impacts of vary ... varying key CISF parameters. As well as
3420 considerations for scenarios in which there are multiple
3421 CISFs within an Integrated Waste Management System.

3422

3423 And directly related to some of the other tools here that I
3424 just previously mentioned, NGSAM analysis can actually
3425 inform IWM StoryMaps content. For instance, another StoryMap
3426 that we have under development looks at the socioeconomic
3427 impacts of a CISF. And it can also aid in the capacity
3428 building activities that are foreseen to be conducted by the
3429 consent-based siting consortia.

3430

3431 Next slide, please? So, we're going to bring this discussion
3432 a little bit more broadly now. We do want to mention that
3433 the development of the digital tools discussed herein is a
3434 highly collaborative process. We are always trying to figure
3435 out ways that we can improve these tools to make them not
3436 only relevant for these ongoing discussions, but to also
3437 make them as, you know, more, as useful as possible in these
3438 conversations.

3439

3440 And so, to that end, we are incorporating lessons learned to
3441 provide value insight for current and future considerations.
3442 So, for instance, some current considerations for
3443 development of these tools includes improvements to existing
3444 tools. For instance, resulting from collaborations within
3445 DOE such as the GIS working group led by Sara, as well as
3446 adapting existing tools like the LITE tool, to meet current
3447 and prospective program needs based on, for instance,
3448 resulting from consent-based siting consortia engagements.

3449

3450 There are also some potential future considerations that we
3451 have in mind for development of these tools. So, for
3452 instance, we are considering things such as international
3453 experiences such as from the Forum on Stakeholder Confidence
3454 on things such as nuclear symbols and visual storytelling.
3455 As well as coordinating with other programs that have
3456 similar digital tools, and incorporating feedback to improve
3457 IWM tools specifically.

3458

3459 Next slide, please? And of particular interest to this
3460 current conversation here is this reoccurring theme and this
3461 reoccurring question about metrics. We have all these great
3462 plans about engaging the public, but the question remains

3463 how will we actually gauge whether or not we are engaging
3464 with the public in a meaningful way? But also, how are some
3465 of these metrics, how are some of these ways that we're
3466 capturing these engagements organically developing based on
3467 interactions that we have.

3468

3469 And so, in this regard, digital tools such as CURIE,
3470 although the original tools themselves were not designed to
3471 expressly promote or track collaboration, for instance,
3472 across the consortia, they certainly can be a part of the
3473 conversation to inform us about the extent or quality of
3474 engagement that we are having with community, broadly
3475 defined.

3476

3477 So, for instance, digital tools such as CURIE could be used
3478 to promote information sharing between DOE, as well as the
3479 consent-based siting consortia members, and vice versa. And
3480 so, we're really excited about the prospect of these tools
3481 being a part of that conversation of engagement,
3482 particularly meaningful engagement. Next slide, please?

3483

3484 And with that, I would like to conclude our presentation.
3485 Thank you so much for your attention. Angelica and I, as

3486 well as our extended team, would be glad to take any
3487 questions related to either the digital tools here, or more
3488 broadly about our efforts in this whole, this whole goal of
3489 engaging people in a meaningful way. Thank you very much. Is
3490 Nathan speaking? I don't think I hear him.

3491

3492 SIU: Well, that makes it complicated.

3493

3494 LE: Oh, we can hear you now. Thank you.

3495

3496 SIU: When I say something negative, then that's what
3497 happens. So, we think about CURIE, and I know that CURIE's
3498 broader than just the consent-based library. But for that
3499 aspect, we're talking about a potentially decades-long
3500 enterprise and we're talking about being an information
3501 resource for this enterprise.

3502

3503 I was wondering your thoughts about the life cycle. I mean,
3504 technology changes, information changes in this obviously
3505 continual effort, but there may be some even major drastic
3506 things you have to think about somewhere down the future,
3507 and it may not be that far off.

3508

3509 LE: That is your question.

3510

3511 SIU: Now we can hear you.

3512

3513 LE: Oh, okay. Am I understanding your question about how,

3514 is this about how CURIE may adapt to changes in how people

3515 are seeking out information, is that correct?

3516

3517 SIU: It could be. I'm thinking more in terms of the

3518 technology of CURIE. I mean, it's got a particular platform,

3519 a particular way of approaching things from a computational

3520 standpoint. And that's all going to change, you can expect,

3521 as time goes by. So, I'm wondering about that aspect of it.

3522 It's not as much a social science other than just to get

3523 thinking about the duration of this enterprise.

3524

3525 LE: I apologize at the time if this seems like a roundabout

3526 way to answer it. But I think a lot of the, we have a

3527 wonderful team of developers who oversee CURIE's

3528 maintenance, as well as improvement. But a lot of, the ideas

3529 that we have for improvement are really limited by the

3530 resources that we have available that we can delegate to the

3531 improvement of CURIE, for instance.

3532

3533 We're definitely going to try our best to ensure that it
3534 remains a resource that is not only reliable, but that it's
3535 something that is user-friendly in that sense. Because a
3536 tool is only as useful as [chuckles] as how easy it is to
3537 actually access and use. And so that's always a
3538 consideration that we have in terms of trying to make sure
3539 that tools such as CURIE, for instance, don't become
3540 obsolete.

3541

3542 And so, the short answer to your question is that it's
3543 really going to be resource-dependent, but that we do have
3544 the manpower, I don't know if there's a better way to say
3545 that, but we do have the team capable of doing that. It's
3546 just a matter of different priorities in terms of
3547 improvements to CURIE, and other tools.

3548

3549 SARAEVA: I would just add to that, and really quickly and
3550 Tran, correct me if I'm wrong. But so, Nathan, you might
3551 remember the previous version of CURIE. It looked different.
3552 But also now it has more, more than look, but it's not only
3553 about the look; it's a balance of access of information,
3554 right? And once we did that, we also migrated to a different

3555 platform that is more modern, right Tran? Yeah, so again,
3556 we're striving to provide an experience, as Tran mentioned,
3557 to the users, but again to the point that Tran made, the
3558 resources also come into play.

3559

3560 SIU: I guess I'm just thinking about future-proofing and
3561 whatever thoughts you might have now that might help. Of
3562 course, there's a dedicated team. Of course, maintenance
3563 occurs. But there are times where things just change
3564 drastically. Natalia, your microphone?

3565

3566 SARAeva: It might not be just CURIE; it might be another
3567 resource that would serve different platform, right? So
3568 that's why, before we had CURIE and we had the NGSAM that
3569 was mentioned, right, at the start. But now we are exploring
3570 additional tools, right? So, it's also part of that, if you
3571 make one tool super complicated, it's also like complicated
3572 to manage it on the back end, but it's also complicated to
3573 navigate it on the front end, right? That's also a question
3574 about integration.

3575

3576 BECKER: Steven Becker, NWTRB Board. Hello? Were on, okay.
3577 So first of all, thank you, Tran and Angelica, for a very

3578 nice tour through the various digital tools for engagement.
3579 How many of these tools, and quite a few of them seem like
3580 they could be very, very useful to people involved in one or
3581 another aspect of consent-based siting. How many of these
3582 tools are kind of intuitive and user-friendly so that a
3583 community group, for example, could just use them right out
3584 of the gate, and how many of them would require some sort of
3585 training? And with respect to the latter, what kinds of
3586 plans are there to provide that kind of training?

3587

3588 LE: Thank you so much for your question. I'm really glad to
3589 say that, oh, I'm really glad to say that a number of our
3590 tools are accessible very easily just from the get-go. So,
3591 for instance, including CURIE, as well as the StoryMaps and
3592 the LITE tools.

3593

3594 And I want to venture to say that the START tool should also
3595 be very intuitive in that capacity, that you know, you
3596 could, for instance in the START tool, the LITE tool, select
3597 data layers of interest, for instance, such as proximity to
3598 interested areas, for instance.

3599

3600 But something like NGSAM is definitely going to require much
3601 more expertise to not only run the analyses, but also to
3602 analyze - to understand the output. And perhaps, not to put
3603 Robbie on the spot here, but perhaps if there's interest in
3604 learning a little bit more about the nuance of NGSAM, he
3605 could provide a little bit more insight on that.

3606

3607 But I want to say that all of the other tools, aside from
3608 NGSAM within this discussion, should be very intuitive in
3609 that sense that you should be able to access and take
3610 advantage of the information that is provided readily,
3611 hopefully readily [chuckles].

3612

3613 TYLER: Scott Tyler with the Board. Thank you for your
3614 presentations, Tran and Angelica. I want to drill down a
3615 little bit more on the LITE tool in particular. Because we
3616 heard yesterday from Piet Zuidema on the Swiss group, they
3617 had developed a very simple interactive mapping system that
3618 looked at multiple GIS layers, but was quite easy to use,
3619 and went down to things like land use and zoning and
3620 presence of water, transportation.

3621

3622 Does the LITE tool go down that deep so that the things that
3623 a community would be interested in, things that they zoomed
3624 in landownership, things like that, is there sufficient
3625 information in LITE to do that? And then secondly, is it
3626 accessible across internet that might be somewhat limited,
3627 as we've heard from some communities?

3628

3629 LE: Accessibility as a result of limited broadband internet
3630 access is definitely something that we're trying to keep as
3631 a central consideration in the development of these tools.

3632 With regard to the LITE tool, myself not having a very
3633 strong background in the development work that goes into
3634 that tool, I want to venture and say that I believe it might
3635 take quite a bit of bandwidth to load just because of the
3636 amount of data layer, layers, that are part of the LITE
3637 tool.

3638

3639 Which is in reference to the first part of your question, is
3640 that yes, I do believe that there are a lot of data layers
3641 that could provide a lot of insight to a lot of the
3642 considerations that you mentioned just know. But that yes, I
3643 believe that if we are going to look at it through the lens

3644 of accessibility, that limited broadband internet access
3645 might be a barrier to that part of information sharing.

3646

3647 TYLER: Okay, thank you. I guess, maybe again, just as an
3648 observation it might be valuable to begin to consider some
3649 kind of a tool that was very easily portable, that would
3650 have the key factors that communities, small communities at
3651 the county scale might be interested in that maybe could
3652 come back from some of the consortia information as well.
3653 What are the key factors that they look at? Thank you.

3654

3655 LE: Wonderful consideration. Just kidding. I was going to
3656 say that in terms of increasing accessibility as possible, I
3657 could see us potentially gathering information from
3658 interested conversation partners about data layers that they
3659 may be interested in, in like a general geographic region
3660 that they may be interested in.

3661

3662 And I don't see why we couldn't just capture those screen
3663 shots ahead of time and provide them, say for instance, as
3664 print handouts potentially as part of like a town hall
3665 meeting or other engagements. So, thank you so much for that

3666 consideration, and sorry, I didn't mean to interrupt. I
3667 believe it was Nathan?

3668

3669 SIU: No, I interrupted you, so no apologies. So, I can
3670 imagine that, I'm talking StoryMaps now. I can imagine that
3671 it takes a lot of effort to create the StoryMap. It's not
3672 just the, getting the information, but figuring out how to
3673 get it, make it a nice polished official document. How to
3674 tell the story in a way that appeals to the audiences you're
3675 thinking of.

3676

3677 So, I imagine there's a prioritization process that you go
3678 through to select topics, because as you say, you have
3679 limited resources. One way of looking at prioritization
3680 might be to address things that you know right now some
3681 folks are interested in.

3682

3683 So, for example, the Board gets comments, public comments
3684 during this meeting and there are some continuing themes to
3685 these comments. And it seems to me a possible way to try to
3686 communicate to the stakeholder. That's, I'm sorry, that
3687 sounds like a suggestion.

3688

3689 LE: Actually, it's a really great consideration because the
3690 current StoryMaps we have under development were inspired in
3691 part from the public comments from the Request for
3692 Information from 2017, as well as 2021. As well as building
3693 off of conversations that we've had with people who have
3694 been comfortable with voicing their, voicing their opinions
3695 about this, this really complex conversation that we're
3696 having here.

3697

3698 And I actually reviewed some of those, Angelica and I
3699 actually reviewed some of those public comments even from
3700 yesterday's workshop. And we're real excited to see that,
3701 for instance, there were some public comments on interest in
3702 learning more about radiation, for instance. That actually
3703 is a current draft StoryMap that we're reviewing internally
3704 right now. So, thank you.

3705

3706 WOODS: Brian Woods, Board. Tran, Angelica, thanks again for
3707 the presentation, it was great. I was curious, for the
3708 StoryMaps especially, a two-part question, is this, is
3709 StoryMaps pretty much just a web-based type of access and if
3710 it is, have you thought about other ways to reach people,

3711 like apps, putting it into an app or like a You Tube channel
3712 or something like that?

3713

3714 LE: I'm also very excited to say that these are digital
3715 tools that we have in development, but we do actually have
3716 other tools in development in response to the recognition
3717 that there are different learning styles, for instance. To
3718 your first question, yes, the StoryMaps is a digital
3719 resource for information sharing. And really that's a very
3720 fancy way of saying that it is a website that's going to
3721 communicate a lot of information, technical information, in
3722 a way that's digestible, but also interactive.

3723

3724 Interactive, not in a sense that people can give us live
3725 feedback, but interactive in the sense that there will be
3726 things such as videos. There will be things such as like an
3727 interactive game, for instance, where interested audiences,
3728 audience members, for instance, could see what potential
3729 impact a consolidated interim storage facility might have on
3730 a hypothetical town, visually, as well as economically.

3731

3732 But in terms of other tools that we have in development that
3733 could be used in person, we have, for instance, virtual

3734 reality work that has been showcased at some of our public
3735 meetings. So, for instance, a VR experience on a reference
3736 concept of a consolidated interim storage facility. So
3737 that's just like a very generic facility with no specific
3738 geographic land base. It's just like what the facility could
3739 look like.

3740

3741 And at the risk of sounding like we're [chuckles]
3742 advertising more work, I think it's an amazing product that
3743 has come out of a lot of concerted efforts in trying to be
3744 really mindful about the different ways that we could really
3745 facilitate meaningful engagement.

3746

3747 GHEEN: I'll add to that, that is has been a point of
3748 conversation in developing the digital tools. And as we go
3749 forward to continually developing these tools, that access
3750 to the broadband internet needed to run them or to a
3751 computer to run them is an access and inequality issue.

3752

3753 And a lot of these tools, we would like to make sure that
3754 they can be accessed via mobile phone or mobile device,
3755 which can help kind of level that playing field a little
3756 bit. So, these are continuous conversations that we have,

3757 like how can we make sure that these are as accessible as
3758 possible, not just the material being understandable and
3759 usable, but actually accessing the tool, making sure that
3760 that is looked through, through an equity lens.

3761

3762 SARAEVA: I will just add to this, to what Tran and Angelica
3763 said. Again, these digital tools such as set of toolkits in
3764 a broader look at that physical thing. And Tran mentioned
3765 the virtual reality. And for those of you who are here in
3766 person, you can actually experience it - it's in the back of
3767 the room.

3768

3769 But we also recognize the fact that, for example, virtual
3770 reality doesn't work for everybody, right? And people
3771 sometimes experience physical discomfort, right, like
3772 dizziness or headache from wearing those goggles. So that's
3773 why we developed the same concept, but as a video. So yeah,
3774 we are trying to take different considerations, many, many
3775 layers into account and make accessibility possible.

3776

3777 LE: They are available in the room, but that's also an
3778 additional tool of engagement that we have developed.

3779

3780 BECKER: Thank you Nathan. Steve Becker, NWTRB Board. So in
3781 an earlier presentation Marissa mentioned the document that
3782 had been translated into Navajo, I believe. And obviously
3783 that sort of thing is very important. If we're going to see
3784 a process that is fully inclusive, it will need to have
3785 materials in a variety of different languages.

3786

3787 Is CURIE, the way it is currently set up, searchable for
3788 materials in a particular language? So, for example, if
3789 somebody wanted to pull everything that was in Spanish,
3790 could that be done? Or is there a discrete section, for
3791 example, where someone could go and find all the materials
3792 in Navajo? How will CURIE be usable in relation to these
3793 multiple languages that need to be included in an effective
3794 consent-based siting process? Tran, we can't hear you yet.
3795 Start over again, please?

3796

3797 LE: I'll start my response with an apology that I don't
3798 know the answer to that off the top of my head. I do think
3799 that we have documents in CURIE who are, that are in a
3800 different language. But in terms of, in terms of being able
3801 to search them by language and things like that, I'm afraid
3802 I don't know, but I'd be happy to get back on that.

3803

3804 SARAEVA: And I would add to that that myself also, don't
3805 know the answer to that question. However, we - so the new
3806 version of CURIE we started developing it just last calendar
3807 year, right? So, we are moving in phases on development. And
3808 the bigger focus was also enabling this, the different
3809 communities. So, for example, the consortia can use it for
3810 their needs, right? So speaking about the priorities, but
3811 you bring a super important point.

3812

3813 GHEEN: And part of our future development priorities are
3814 making sure that CURIE is as usable and searchable as easily
3815 as possible. So that is on our docket, so we can make sure
3816 that we bring up language accessibility as one of our
3817 priorities for tagging in the future.

3818

3819 BECKER: Thank you.

3820

3821 TYLER: Scott Tyler, the Board. Just one small question. You
3822 mentioned just at the end of your presentation, Tran, that
3823 CURIE could be used for tracking the consortia
3824 collaborations and hits and things like that. Is that active

3825 and a part of CURIE now, or will it, does it need to be
3826 included? Do you have that capacity?

3827

3828 LE: I may defer this question to him, as he was closely
3829 involved in the development of the resource library for use
3830 of the consortia. But based on what I do know, I want to say
3831 that we have the capability of tracking, for instance, user
3832 activity and things like that. But that I'm not aware that
3833 this is currently something that we are doing right now just
3834 because, for instance, the contractual agreements are still
3835 going through for the consortia awardees.

3836

3837 And I would imagine that there are intricacies about
3838 tracking, tracking or consortia collaboration, for instance,
3839 in that capacity. But if Juan has anything to add to that,
3840 I'm so sorry for putting you on the spot, Juan.

3841

3842 SARAeva: I'll just add that this is part of the community
3843 that is being developed. And yeah, there's a lot already
3844 built into that.

3845

3846 TYLER: So, the plans are to use it for, as a metric?

3847

3848 SARAeva: This is a plan to have it as a resource available
3849 to consortia where we can, in addition to exchanging emails,
3850 have the information, in one place, right. Because we all
3851 know we live in a busy world and there are so many emails
3852 and sometimes it's hard to search through them. Right?
3853 There's different features available through that, like for
3854 example, ask DOE questions. There's an option to ask a
3855 question by email, but through the system. Right. Yeah, so
3856 it's available for consortia use, but it's community. It
3857 means that it's not available to the public; it's available
3858 to consortia members. There's also library of the
3859 information building to that and we do our best to you. And
3860 using our knowledge management experts to build the taxonomy
3861 and different texts to that system.

3862

3863 TYLER: Okay, thank you.

3864

3865 LE: Could I add something to that, that point that we were
3866 talking about in terms of engagement? To Natalia's point,
3867 Scott, is that CURIE, in essence, is a tool that we think
3868 could facilitate collaboration engagement, broadly speaking,
3869 either between consortia members or other members of the
3870 public. But we are currently exploring different ways that

3871 we could organically, when I say organically, I mean, in a
3872 non-intrusive way, gauge collaboration, for instance,
3873 between consortia members in terms of how or the extent or
3874 perhaps even the quality of interactions that they have
3875 amongst themselves, or with others.

3876

3877 But I just want to preface and say that that is still
3878 preliminary considerations that we have. And that we don't
3879 have any concrete plans right now, but it is something that
3880 we're acutely aware of in terms of better understanding the
3881 extent and quality of engagements.

3882

3883 TYLER: Okay, let me just follow-up then, just quickly. Does
3884 it - it has, does it have capacities like a slack channel or
3885 something like that where people can - no, it doesn't not.
3886 Okay. Alright, thanks.

3887

3888 BECKER: Steve Becker, NWTRB Board. In Melissa Bell's
3889 discussion of environmental justice, she focused on various
3890 facets of that. And one of them was inter-generational
3891 justice. And as part of that discussion, there was some
3892 thought given to the idea of engaging young people in the
3893 process and perhaps even at some point having an advisory

3894 board of some sort made up of young people. To what extent
3895 does CURIE include materials and resources that are
3896 appropriate, if you will, for young people and that are
3897 aimed at engaging young people? And are there plans to
3898 include such materials in relation to consent-based siting?
3899

3900 LE: I'll take it, to answer that question. But thank you so
3901 much, Steve. So, the topic of inter-generational justice is,
3902 I think, a really multi-faceted and interesting one. Because
3903 while I think it would be great if CURIE could play a part
3904 in bridging the gap of engagement between age groups, for
3905 instance, I would say that a lot of the documents that are
3906 publicly available on CURIE are more technical.
3907

3908 And so, to, towards younger audiences, I would imagine that
3909 it might be hard to digest some of that information. Not
3910 only among young, young groups, but I think even in
3911 different age groups, if there's like a gap in expertise. I
3912 think that it would be, it would be difficult, but not
3913 impossible, to digest some of that information.
3914

3915 But in light of that, that's one thing that we considered
3916 when we are, when we developed, when we first proposed and

3917 are also into the development of the StoryMaps is that this
3918 resource might be a little bit more friendly for, not only
3919 younger audiences, but maybe to more lay audiences.

3920

3921 Lay in that, you know, they may not know the intricacies of
3922 radiation dosage, for instance. So, towards your question,
3923 Steve, I think the StoryMaps might be a little bit better at
3924 engaging more diverse audiences with regard to age, for
3925 instance, but also across different levels of expertise, for
3926 instance.

3927

3928 SARA EVA: And I would encourage you to think about CURIE as
3929 a library. So, all ages go to the library, but they pick
3930 their books age appropriate or interest appropriate to them,
3931 so.

3932

3933 BECKER: Thank you.

3934

3935 ILLANGASEKARE: Tissa Illangasekare, Board. Thank you very
3936 much for your presentations. So, these are very general
3937 question. I know these models are user friendly, but can you
3938 simulate or do you have plans to allow discourse to develop
3939 to the point that you can simulate what if scenarios?

3940

3941 LE: I wanted to chime in, but I'm very excited to say that
3942 there are [chuckles], we do have in development a StoryMap
3943 that allows for that kind of interactive engagement for
3944 hypothetical scenarios for a CISF, but it's in development.

3945

3946 ILLANGASEKARE: Second question, is a general question also.
3947 Your START has systems tools, we talk about this is a
3948 general question. Have you thought about in your thinking
3949 that bringing science and technology together in decision-
3950 making, social science, some systems analysis type of
3951 thinking going into your future thinking in this future area
3952 of bringing in the digital tools for systems analysis to
3953 bring the science and technology together?

3954

3955 LE: On the spot - I may defer that question to either
3956 Robbie or Sara as it relates to the START tool or systems
3957 analysis. But I want to say that broadly, that that is
3958 definitely a consideration that we have in terms of cross-
3959 collaboration between teams and efforts.

3960

3961 Because at the end of the day, we're all working towards a
3962 large over-arching mission. But in terms of providing a very

3963 in-depth answer to that, I may refer it to another expert
3964 here in this room, virtual or otherwise.

3965

3966 SARAEVA: Well, we bring you Robbie and Sara on, they will
3967 add that. You know, different tools serve different purpose,
3968 right, and just system analysis tool and the START for
3969 transportation. There are the tools, and more related to
3970 consent-based siting. But it's integrated base management,
3971 so we all part of one puzzle. The all tools serve different
3972 purposes, but yes, we are integrating them.

3973

3974 HOGAN: I can start us off. Can we hear me in the room?

3975

3976 SARAEVA: Yes.

3977

3978 HOGAN: Okay, excellent. Hello, I'm Sara Hogan, I'm the
3979 Federal Manager for START. So, I will feed off of what Tran
3980 and Natalie already had said, and then I can kind of hand it
3981 off to Robbie to talk a bit more about NGSAM and the system
3982 analyses that we're completing.

3983

3984 So, START is really at the heart a routing tool. However, we
3985 have been thinking more about how we can collaborate with

3986 the consent-based siting team. And I have also taken the
3987 initiative to kind of have a joint meeting of the three GIS
3988 tools, so we can kind of understand how we can best utilize
3989 each of these tools in order to answer questions that
3990 perhaps consortia members or other stakeholders, Tribes,
3991 states, everyone we work with, would like to understand.

3992

3993 Even START, we also were present at the National
3994 Environmental Justice conference that Marissa had talked
3995 about previously. Thinking of how we can frame START also to
3996 utilize some of the data that we have in this tool to answer
3997 questions that we think might be asked by members of the
3998 public or consortia, such as what does a footprint look like
3999 on a map of a future facility, possibly, or what sort of
4000 land cover might be in the area of my vicinity within,
4001 nearby my community.

4002

4003 Questions like that. So, putting visuals, again, to some of
4004 these more social science context questions has been
4005 something that we're thinking about also on the more
4006 technical cross-cutting side of our office as well. Thank
4007 you. I'll let Robbie talk a bit more about systems
4008 integration if he wants to as well. Robbie was here - I'm

4009 not sure where he is, but I can talk about that a little
4010 bit, too, if we'd like.

4011

4012 So, also on the NGSAM side of system analyses kind of
4013 questions, asking about how different processes having
4014 multiple facilities or how fuel might be moved in the
4015 context of routing and transportation side of things. We
4016 also work closely with the NGSAM team, my developers and my
4017 team, on START as well to understand exactly how the
4018 transportation fits into that system analyses as well.

4019

4020 So how long might transportation take, what type of
4021 transportation is best, things like that. So, we are
4022 integrating among all these tools as well.

4023

4024 SIU: I think we've run out of time, so again, thank you,
4025 Tran, Sarah, Angelica, Natalia. I'm glad you guys addressed
4026 a lot of the questions that we raised and we have food for
4027 thought. At this point we'll start our public comment
4028 session. Again, this is, we'll talk, we'll have people in
4029 the room to give comments. This is not question and answer
4030 as was similar to our other board meetings. I'll start with

4031 the people in the order they signed up. So first, Tami
4032 Thatcher.

4033

4034 THATCHER: Hello. Again, I'm Tami Thatcher. I live in Idaho
4035 Falls. The whole concept of consortia has been new to me and
4036 so I was nice - it was nice to see a list of the members so
4037 far DOE has selected for the consortia. A criteria for
4038 selecting the members, I don't know what that is. It would
4039 be interesting to know what that is.

4040

4041 We have for-profit companies, which want to make a quick
4042 buck, and take the money and go, where they tend to go out
4043 of business in the nuclear industry. We have not-profits
4044 that are long-term nuclear, all things nuclear promoters.
4045 They're uncritical proponents of nuclear.

4046

4047 And we have a very large list of higher education. Higher
4048 education, in this country in these technical areas seeks
4049 Department of Energy funding, seeks military funding, and
4050 has a very chilling effect on any professors who do not toe
4051 in line with the story that they tell. They are very
4052 limited. In fact, they will be, they lose their jobs if they
4053 happen to say the wrong thing.

4054

4055 Higher education does not present omniscient to protect the
4056 public in a safety health impact, or the public's taxpayer
4057 liabilities. They do not have a stated mission in that
4058 regard. They tend to seek short-term contracts and research
4059 and funding and money, and it has a chilling effect on
4060 honesty.

4061

4062 So, this consortia is very interesting, and it's kind of
4063 like having a nuclear waste negotiator that's got a massive
4064 unidentifiable spies out there working. So, if you saw
4065 Stallings, who was a Nuclear Waste Negotiator, coming at
4066 you, you knew what he, what his job was. You knew what his
4067 role was. And communities could either invite him in and
4068 talk to him, or they could shut the door before he got
4069 there.

4070

4071 So now we have a consortia reaching out tendrils, very
4072 interesting. DOE has admitted that the consortia members
4073 will have access to DOE experts that the public won't have.
4074 And they will have access to unfiltered information which
4075 the public won't have. And we don't even know how these
4076 consortia members are selected or vetted.

4077

4078 They have no accountability, they have no role to protect
4079 people now or in future generations, let alone their
4080 economic interests. So that's deeply concerning to me.

4081

4082 The digital tools, I love digital tools. The consortia is
4083 going to have exclusive access to many of the tools. And
4084 some of these tools sound pretty interesting, but where's
4085 the radiological dispersion tool for various advanced fuels?

4086

4087 Where's the economics tool for the economic impact? You have
4088 not even figured out what the cost of a repository is going
4089 to be. And right now, you can't collect money for a
4090 repository because you have no program for disposal nuclear
4091 waste, and the money you've collected so far wouldn't even
4092 pay to repackage the fuel we already have.

4093

4094 So, I think that's pretty interesting. Now one of the good
4095 questions about looking at case studies and how do we find
4096 good case examples to look at what DOE is doing and trying
4097 to meet its objective. Its objective is to find communities
4098 that will allow temporary interim spent fuel above ground
4099 and to allow permanent disposal.

4100

4101 That's DOE's objective. DOE wants to prevent, to present
4102 storylines that will be effective in achieving its
4103 objective. It will have tools in seeing what limited
4104 storylines will be effective at convincing people that this
4105 is a good idea. I think the best lesson to look at would be
4106 look back to the 17 and 18 hundreds and look at the nice
4107 people the government sent out to negotiate with Indian
4108 Tribes.

4109

4110 And they signed contracts, and a lot of times those
4111 contracts were reneged on. And those negotiators often
4112 negotiated in good faith, but they didn't even know the way
4113 things were really going to go down. I think that would be a
4114 very appropriate lesson, since they're targeting poor
4115 communities, and saying gee, we'll give you money. You can
4116 sign up for funding opportunities, funding opportunities.

4117

4118 We'll pay you for your internet, we'll do all these things.
4119 You know, there's another word for that, and it's called
4120 bribes. You know, I have no problem with the government
4121 providing funding for improved internet access. But the
4122 Department of Energy is the very last agency on earth that

4123 should be deciding who gets that funding because it's
4124 nothing but a bribe.

4125

4126 We'll give you funding for internet if you'll let us come in
4127 and give you the selected story, the limited story, the
4128 distorted story, to convince you that it would be a really
4129 great idea to sell out your homeland and sell out your
4130 future generations, because we're not going to really give
4131 you the full story. My comment for now, thank you.

4132

4133 SIU: Next, Mahmud Farooque from Arizona State.

4134

4135 FAROOQUE: Mahmud Farooque, Arizona State School for Future
4136 Innovation Society and Consortia for Science Policy and
4137 Outcomes. And I also manage a national network of
4138 universities, science museums and non-partisan think tank to
4139 engage citizens in science policy decision making. And as
4140 full disclosure, we are also part one of the 13 consortia
4141 awardee.

4142

4143 My comment today is based on our experience in 2016 in
4144 engaging with the CBS process with the Department of Energy.
4145 And I based my comments based on two particular data point.

4146 One is a paper my co-author, Jen Richter, had written on our
4147 experiences of that process. And the other is a National
4148 Science Foundation funded study that looked at three
4149 engagement projects we had done with NASA, NOAA and
4150 Department of Energy.

4151

4152 And based on that study, there were eight take-away points
4153 that made a project successful or not. The DOE project was
4154 not successful because we didn't get to complete because of
4155 the change in the administration priorities. So, we were
4156 two-thirds of the way done. And of the eight things that
4157 they, that the NSF study found, the four things that were
4158 DOE has done commendable improvements on.

4159

4160 One, is the organizational culture. The DOE that we are
4161 experiencing dealing with now is much more open,
4162 collaborative, and actually listening. And we see that
4163 reflected in the comments we presented at RFI and the action
4164 that DOE has taken.

4165

4166 Just for a data point, you know, there is no public record
4167 of our previous work other than the paper we have written.
4168 On the other hand, the NSF study, no DOE official will go on

4169 the record for interviews where that wasn't the case with
4170 the other agencies. So, we are finding a very different DOE.

4171

4172 And the second point is how the grants and awards are
4173 constructed. So, DOE, one of the difference we saw was
4174 cooperative agreement versus grants or contracts. And DOE's
4175 doing that. And not only that, but they have also made it
4176 easy for people to apply. So only the institution with
4177 university sector are not because it was just in the
4178 narrative and a spreadsheet, and that's all they needed. So,
4179 we commend those effort.

4180

4181 The other thing that where DOE has improved dramatically is
4182 last time there was no social scientists on the team and
4183 this time it is. It made a big difference in the other two
4184 projects to have the insider who can connect, make the
4185 internal connections, the interpretations, and also absorb
4186 the capacity of interacting with other social scientists
4187 outside.

4188

4189 Now the areas where their skill requires improvements, one
4190 is, that has been brought up, one is the link to decision
4191 making. The integration of the technical and the societal.

4192 It makes a difference in engagement if people know exactly
4193 what they're contributing to. And that has been brought up.
4194 And I want to say that also was a finding from our study.

4195

4196 The second thing is, top cover. I don't know to what extent
4197 that exists for this effort, but it was lacking last time
4198 and that created a lot of problems. Political priority is
4199 obviously that's outside of the control. The other thing is
4200 administrative rules. And this may still be a stumbling
4201 block. Because this is outside of DOD, like DOE, which is
4202 the Paperwork Reduction Act, designed to reduce public
4203 burden. But actually when you're trying to do social science
4204 and trying to collect public opinion, that requires a whole
4205 OMB process and that stopped us in our tracks. So, thank you
4206 for the comments. And I also want to thank the Board and DOE
4207 for the opportunity. This was a tremendous learning
4208 opportunity for us. Thank you.

4209

4210 SIU: Thank you. You left a large gap. Did you want to be
4211 the last or you just happened to be assigned there? Please
4212 go up.

4213

4214 ZUIDEMA: My name is Piet Zuidema. I was Director for
4215 Science and Technology in NAGRA. NAGRA is the organization
4216 in Switzerland that is responsible for implementing disposal
4217 facilities. And actually, very recently we went to decide on
4218 the site where we want to go.

4219

4220 I was invited here to share some experiences in Switzerland
4221 and Bret asked me if I want to make some comments on what we
4222 heard too this morning. I have come to do so. So, I should
4223 make a big caveat. I do not fully understand how the U.S.
4224 operates. Anyway.

4225

4226 I think siting a consolidated interim storage facility
4227 requires that we heard very much this morning, acceptance by
4228 the community. But looking at Switzerland, that would also
4229 need the support by the state. Community alone would not be
4230 enough in Switzerland. It would be need the support by the
4231 state. And the state would also be in charge to help the
4232 community and to make sure that the neighbors and all others
4233 are fully aware and that they get the help by the state to
4234 assess what the meaning is of that facility for the state,
4235 for the neighbors, and for the community itself. So this is
4236 the decision.

4237

4238 Then equally or probably even more important, it is that the
4239 state and the communities know that what they do is for the
4240 benefit of the whole of the U.S. And in Switzerland you
4241 would need some highly respected recognized very senior
4242 person that goes there and tells these people we are very
4243 grateful that you do this. Because these people do that not
4244 for their fun, they do it for the U.S., and I think that was
4245 in Switzerland very important. Okay, so that was an
4246 introduction.

4247

4248 The second thing, what the idea of is to consort here,
4249 sounded to me very promising. First of all I think it's nice
4250 that you have people in charge the universities that I hope
4251 at least are trustworthy partners and I think that's very
4252 important. And that they are connected in their state to all
4253 these people that they really can make the connections to
4254 all of them and to them, also to the communities to really
4255 find out what siting of a facility means to these
4256 communities.

4257

4258 Swiss experience shows that sometimes for these communities
4259 they have only a vague idea of what it is. And so, I think

4260 it's very important first of all how they perceive that and
4261 if that perception is correct. And if not, that they get the
4262 material to get the correct perception. And then to check if
4263 what they perceive or what they should perceive, if that is
4264 in agreement or in conflict with their values. And if it is
4265 in conflict with their values, what can be done to overcome
4266 these hurdles?

4267

4268 And finally, I think what I really liked in the
4269 presentations by DOE was this idea about co-development. And
4270 I think these consortia could really help to develop some
4271 ideas. What could be something done to arrive at the
4272 sustainable situation? You know, when the interim storage
4273 facilities are gone that they have something that is on the
4274 long run valuable for them. So that's the second comment.

4275

4276 And the third one is more about the social science and the
4277 things you heard today. I think this is very important, but
4278 I think what you should not forget, at least for Swiss
4279 standards, it's you that have to go to the communities and
4280 it's not the communities that you should ask to come to you.

4281

4282 And that means with all what you have presented now, you
4283 will have a huge burden of work. You have pointed out so
4284 many things that you want to discuss with these communities
4285 and hopefully you will have a range of communities. And so I
4286 think you should think about how you will handle that,
4287 especially with your rather ambitious time plans. You know,
4288 how will you be able to have all these discussions with
4289 these people?

4290

4291 I just can say in Swiss case, it's not that you go one time
4292 to the communities; you go there five or ten times. And they
4293 want to discuss, et cetera. And in that sense I think I
4294 really like that you start to develop the digital tools
4295 because it's very helpful to get the message across. But my
4296 message is, get prepared for the huge workload that is in
4297 front of you. Thank you.

4298

4299 SIU: Thank you, Pete. I have one more request for a public
4300 comment from Mayor Rebecca Casper. But before that, anybody
4301 else wish to make a comment, do you want to raise your hand?
4302 Great. So, Mayor Casper first.

4303

4304 CASPER: Thank you. My name is Rebecca Casper and I do serve
4305 as Mayor of the City of Idaho Falls. And I welcome you to
4306 the city, and I'm grateful that you're having your meetings
4307 here. And I hope that your travels are uneventful and that
4308 you can get back home safely.

4309

4310 I am also a social scientist. I have a PhD in Political
4311 Science, and have been listening with interest to this
4312 morning. And finally, I'm a woman of color, so all of this
4313 means that I have no interest in not being heard. And so I
4314 appreciate a chance to share a couple of thoughts I've had
4315 as I've been listening this morning.

4316

4317 I have, well no, I have an observation and that is that the
4318 concerns about involvement and engagement when it comes to
4319 siting nuclear waste are not unique to the conversation
4320 about nuclear waste. This siting inertia that we're
4321 experiencing in this country right now plays out in
4322 everything from power lines to highways to you know, where
4323 we put public infrastructure of any kind. Parks, parking
4324 lots - it's there is always somebody who has a perspective
4325 that's different from what is perceived to be in the public
4326 interest. And so, managing that is tricky.

4327

4328 And I'm concerned that we not overcorrect, and invent ways
4329 of engaging that go so far that we end up with engagement
4330 inertia almost. And so let me just say the thorough
4331 discussion today in some ways I kept hearing things that
4332 possibly will result in us reaching down to sub-community
4333 levels in ways that may supplant local governments.

4334

4335 And from my limited, albeit limited perspective, both the
4336 WIPP and Yucca Mountain lessons will give to us maybe, they
4337 paint not a picture of a failure to engage the public,
4338 failure to engage sub-community levels, so much as they
4339 result from the failure of states to engage meaningfully
4340 with their own cities and counties.

4341

4342 The City of Carlsbad, Eddy and Lee Counties in New Mexico,
4343 have perspectives that differ from the state capitol's
4344 perspective and that has created some of that siting angst
4345 that we hear about. That's a result of federalism. Eddy -
4346 excuse me, Nye County and to a certain extent Clark County
4347 have leadership that doesn't necessarily agree with Carson
4348 City and you end up again with problems that are not about
4349 engaging the public so much as they're about engaging, or

4350 not engaging but solving for federalism. And that's a tough
4351 one because federalism is one of our founding principles in
4352 this country.

4353

4354 But rather than address these issues, I guess I worry that
4355 we are then starting to say well let's just start reaching
4356 down to find more creative ways to engage the public. And
4357 today's presentations seemed to ignore cities and counties.
4358 I mean we did talk about local government. That was a
4359 category, however.

4360

4361 But I will tell you that first responders and local
4362 planners, they work for cities and they work for counties.
4363 They are not institutions in and of themselves. And I think
4364 that as this community leader, I would have no business
4365 coming before DOE and federal government and participating
4366 in a siting process if I had not already inquired of these
4367 professionals who work for the city, and had not already
4368 engaged with citizen groups. And so, good leaders do these
4369 things intuitively and they take the pulse of their
4370 community before they step up and raise their hand for
4371 something like this.

4372

4373 And so, I guess better than DOE creating an extra
4374 institutional set of processes that could circumvent elected
4375 leaders, it might be, and I guess I would just point out
4376 that these elected leaders, we are elected through a
4377 democratic processes. And I even heard the phrase,
4378 democratic processes, today. We don't need to reinvent
4379 democracy through consent-based siting.

4380

4381 And so, I guess what would be better would be to maybe
4382 create a checklist that we have to use to make sure that
4383 we're having the, we're engaging key populations to make
4384 sure we are considering key perspectives, that we're having
4385 the necessary conversations. Or maybe instead of a
4386 checklist, a toolkit for how to perform the necessary
4387 outreach if we think that local communities, cities, and
4388 counties are somehow not doing an effective job at that.

4389

4390 But for DOE to reinvent representation is to me expensive,
4391 and would result - will result in maybe a fantastic consent-
4392 based siting - consent-based siting process for nuclear
4393 waste, but it won't necessarily leave behind a strengthened,
4394 informed community, set of community leaders. And it will

4395 not leave the institutions of our government structure, it
4396 won't leave those strengthened.

4397

4398 So, unless you think that I'm only standing up here to be
4399 defensive or critical, I want to offer a couple of
4400 compliments. I first want to applaud the work presented
4401 today. I'm grateful for it. The work of the consortium
4402 promises to, I guess, well excuse me - it promises huge
4403 progress with respect to informing the public and in
4404 creating that education that often results in smoother, that
4405 education is what greases the wheels of making good quality
4406 decisions. And I think the consortium can lead to that.

4407

4408 I also want to say that the tools presented by the last
4409 panel, in particular the GIS mapping and the storytelling
4410 features, are really powerful. Well, CURIE too. Really
4411 powerful in terms of educating citizens and prompting
4412 informed dialogue.

4413

4414 I would also point out that relatively few small cities,
4415 rural communities and for sure, can afford to hire GIS
4416 professionals who can do those kinds of things. The few GIS
4417 professionals that I have in my city don't have time to

4418 figure out how to tell stories; don't have time to just
4419 randomly decide to map for something that isn't needed in
4420 the course of everyday work.

4421 And so all of this would be extra from everyday work and so
4422 it's wonderful that DOE is looking at taking care of some of
4423 those things that local communities simply can't afford to
4424 do.

4425

4426 So overall I don't want to appear to be negative. I'm
4427 grateful that engineers and scientists are acknowledging the
4428 vital role that the social sciences play in encouraging an
4429 informed dialogue and we want to have that informed dialogue
4430 with the right citizens. And that is the key to getting this
4431 right.

4432

4433 I have one quick observation and that is that the
4434 significant - what did I write here? The significant body of
4435 work and effort could be applied, or all of this work should
4436 be applied after we have maybe our semifinalists. Because to
4437 do this for every community that simply raises his hand and
4438 says I'm thinking about this, they're the ones who need the
4439 checklist and they need to do their internal work and make
4440 sure they qualify before we invest what's going to turn out

4441 to be millions of dollars it seems like in terms of
4442 encouraging the right dialogue.

4443

4444 So, I just want to just put in a plug for, well that the
4445 next iteration of consent-based siting not supplant existing
4446 institutions. Democratically elected leaders need to do
4447 their job. So, thank you for that.

4448

4449 SIU: Thank you, Mayor. And last, not least, Professor
4450 Araujo - I'm sorry, I can't pronounce it. You'll say it.

4451

4452 ARAUJO: That's fine. My name is Kathy Araujo, I direct the
4453 CAES Energy Policy Institute that's based at Boise State
4454 University. I'm also on faculty there. I am the Professor of
4455 Sustainable Energy Systems Innovation and Policy. And more
4456 direct to today's conversation, I'm here with members of our
4457 team, which are in conversation with the Department of
4458 Energy to stand up one of the thirteen consortia.

4459

4460 So first I want to recognize the former commenters as well
4461 as the presenters. This is clearly a very important
4462 conversation that we need to advance. I will say that we are
4463 at a pivotal time in history. We clearly have a lot of

4464 experience and certainly concern around this subject. And I
4465 would like to assure people that there are those out there,
4466 including our team members, who deeply care about this
4467 subject and doing it right, recognizing all the flaws and
4468 lessons that are out there.

4469

4470 So, to keep it brief, I will just simply say that we are
4471 approaching this with a problem solving approach and it
4472 would be good for all to keep in mind and to keep an open
4473 mind really about the mutual learning and listening that
4474 we've been hearing about for the past two days. Thanks.

4475

4476 SIU: Thank you. Okay. We're a tad bit late, but I think
4477 that's okay. If I could ask you to take a lunch break just
4478 slightly shorter than the hour, and come back at the
4479 scheduled time of 1:40 pm.

4480

4481 [BREAK]

4482

4483 SIU: Okay everybody, thanks for coming back from lunch.
4484 We're going to start the afternoon session with a
4485 presentation on DOE's research and development activities on

4486 high burnup spent nuclear fuel. Ned Larson, DOE-NE, Scott
4487 Sanborn, Sandia, and John Bignell, Sandia. Thank you, guys.

4488

4489 LARSON: Thank you. What I want to do is just introduce the
4490 project a little bit. In 2013 we put the project in motion,
4491 the high burnup demo. We put the contracts in place with the
4492 Electric Power Research Institute so that we could look
4493 inside a cask for the first time and understand how it's
4494 behaving as we move forward.

4495

4496 We are asking our casks to store things longer than we had
4497 originally anticipated and we believe that they will do that
4498 - do that well. We believe that the cask will perform
4499 nicely. But we had no data. And we just needed more than to
4500 say, Ned said it would be okay. We actually need the data to
4501 go in and look at it, and to make sure that it was
4502 performing correctly.

4503

4504 And so we kicked the project off and started measuring it.
4505 When we started doing the modeling and everything else, we
4506 determined that it would be a little bit cooler than what we
4507 had originally hoped for, inside. The temperature wouldn't
4508 be as high. Because the NRC said we could load at 400 C; we

4509 hoped that it would be at 350 C when we loaded it; and we
4510 would be able to see or not see hydride reorientation in the
4511 cladding itself, that being that the hydrides are concentric
4512 around the outside of the cladding. But if you have
4513 reorientation sometimes it can go like a spoke instead and
4514 cause problems for our cladding.

4515

4516 We looked at it carefully. I considered because it wasn't
4517 going to be as hot, we looked at it carefully, I consulted
4518 with Bill Boyle my supervisor, our labs. We almost canceled
4519 it. But we decided we have never looked inside, so let's go
4520 ahead and do it. And when we did, what we have learned, and
4521 these, Scott is going to talk about the first part of it
4522 which is the testing at room temperature.

4523

4524 John is going to talk about the second part which is testing
4525 at a higher - a higher temperature because we felt like we
4526 needed to heat it to understand how it would still perform
4527 at the higher temperatures if it were in the cask at that
4528 temperature.

4529

4530 And so as we looked at it we decided to go ahead and do it
4531 so we could see inside. What we found is that the casks are

4532 cooler than what we anticipated. We believe the probability
4533 of hydride reorientation is actually quite low because of
4534 the temperature inside the cask.

4535

4536 And so what we believe that means, is that all the casks
4537 that have been loaded to date will not have a problem
4538 because of thermal issues and that, is a very important
4539 thing to learn. And so, we believe that is the case. At this
4540 point I'm going to turn the time to John, or to Scott excuse
4541 me, and he's going to start talking about some of the data
4542 that we picked up, and what it means and how we've
4543 interpreted it. Scott?

4544

4545 SANBORN: Thanks for that introduction, Ned. Yeah, as Ned
4546 mentioned, John and I will be presenting on the sibling pin
4547 test campaign. So, I'll jump into my first slide here. I
4548 want to acknowledge the labs that are actually doing the
4549 work on the sibling pin test campaign, so Argonne National
4550 Laboratory, Oak Ridge National Laboratory, and Pacific
4551 Northwest National Laboratory. They're the ones actually
4552 doing the testing and the analysis of the sibling pins.

4553

4554 Obviously, DOE, Office of Nuclear Energy, who is our
4555 sponsor. And Ned Larson for his guidance in the spent fuel
4556 and waste science and technology storage and transportation
4557 program as a whole. EPRI, the Electric Power Research
4558 Institute; Westinghouse, Framatome, and Dominion Energy for
4559 their collaboration. And of course, the U.S. NRC for their
4560 helpful technical exchanges.

4561

4562 So just to provide a little context of why are we doing what
4563 we're doing with these sibling pins. I want to back up a few
4564 steps and introduce our gap analyses. Some of you may be
4565 familiar with this but not everyone might not have seen
4566 these before.

4567

4568 And really after the suspension of Yucca Mountain, DOE
4569 needed to determine what the potential concerns were if we
4570 were storing spent nuclear fuel longer, longer than
4571 originally anticipated and then needed to subsequently
4572 transport them. So, we wanted to understand where those
4573 technical gaps might be.

4574

4575 And the first one was drafted up in 2012 and there have been
4576 different iterations and updates throughout every couple of

4577 years. The most recent version is not a full gap analysis,
4578 but is a five year R&D plan. It was finished in 2020. And
4579 not only do these identify the gaps, but it also identifies
4580 which ones we think are the higher priority.

4581

4582 You know, we can't tackle everything all at once, so we want
4583 to start with what we think are the most important technical
4584 gaps and priorities so we can make informed decisions and
4585 support the technical basis for extended storage and
4586 subsequent transportation.

4587

4588 This is a little bit of an eye chart and I don't intend to
4589 go through the whole thing. But I did want to share it with
4590 you all today because this is from our five-year R&D plan.
4591 And this sort of pulls together all the highest profile gaps
4592 and activities that we are doing in the storage and
4593 transportation program.

4594

4595 So, the demo cask and sibling pins, we'll talk about that in
4596 detail today, but we're also doing work on thermal profiles,
4597 stress profiles, understanding stress corrosion cracking in
4598 welded canisters, drying issues, monitoring.

4599

4600 And then we do have plans in the future to get other types
4601 of fuel to evaluate, so ATF fuel and boiling water reactor
4602 fuel. And then integral fuel burnable absorber type fuel.
4603 While we think PWR is bounding for some of those cases, we
4604 certainly need some data to show that.

4605

4606 So, Ned mentioned the demo project, the high burnup spent
4607 fuel data project, or demo project. It's got a few names.
4608 This, as I showed on the last slide, is a high priority
4609 activity. It was initially identified in the 2012 gap
4610 assessment as such and it still is in the latest version.
4611 And it's a collaborative effort between DOE and EPRI to
4612 understand the performance of high burnup fuel in a typical
4613 dry storage configuration.

4614

4615 What the demo project is, it consists of this demo cask.
4616 It's a TN-32B dry storage cask. And that was loaded with 32
4617 high burnup pressurized water reactor fuel assemblies in
4618 2017, placed in dry storage, and it should stay in dry
4619 storage for approximately ten years. And then in the future
4620 we'll reopen it and the fuel will be inspected.

4621

4622 I have a picture of the demo cask there at the North Anna
4623 Nuclear Power Plant on the independent spent fuel storage
4624 installation there. It's a modified cask, so we did need to
4625 have thermocouples coming out of there and a way to collect
4626 that data.

4627

4628 So, temperatures were monitored and recorded during the
4629 drying process and continue to be monitored while the cask
4630 is in storage. And I will say, as Ned alluded to, while the
4631 limit from NRC is 400 degrees C, our models were saying it
4632 was less for this canister cask. And in reality, it was even
4633 less than what the modeling was saying. The maximum
4634 temperature during drying was something around 237 degrees
4635 C.

4636

4637 So, that's the overall demo cask, but what is the sibling
4638 pin, or sister rod test campaign? It's got a couple of
4639 names. But that - the sibling pin test campaign is a DOE
4640 funded research activity that's part of the high burnup
4641 spent fuel data project. And the sibling pin campaign is
4642 focused on generating characterization, material property,
4643 and performance data for high burnup fuel rods.

4644

4645 It consists of doing both non-destructive evaluation and
4646 evaluation and destructive evaluations of fuel rods at Oak
4647 Ridge, PNNL, and Argonne National Laboratories. We've got 25
4648 high burnup fuel rods and they were selected because they
4649 had similar characteristics and histories that closely match
4650 those that were used in the demo cask.

4651

4652 So, we've got four different alloys that we're using M5,
4653 ZIRLO, ZIRC-4 and low tin ZIRC-4. Most of the rods are ZIRLO
4654 and M5 and they have a range of burnups, as you can see
4655 there in the table.

4656

4657 Okay, so what was the original? The original goals of the
4658 sibling pin test campaign, or the original objectives was to
4659 generate baseline data, comparison data, corresponding to
4660 the condition of the rods being loaded into dry storage. So,
4661 this is after radiation and after pool storage, but before
4662 dry storage.

4663

4664 And then the second goal was to generate post-drying, we're
4665 calling t0 prime data, comparison data corresponding to the
4666 condition of the rods after they have undergone drying,
4667 helium backfill and placement on the storage pad.

4668

4669 And then the third goal was also to consider other potential
4670 cask designs and conditions. So, while we only have one
4671 cask, we want to consider potential conditions for other dry
4672 cask storage systems with different thermal profiles,
4673 histories or fuel rod properties. And also, think about
4674 what, at the time we thought there would be a surge of
4675 renewals of storage licenses, and there could be potential
4676 ability to get some data that could help those out as well.

4677

4678 Okay, so after we came up with the objectives in 2018, we
4679 needed to come up with a test plan. It's a big and complex
4680 test plan. So, then we also wrote a shorter visualization
4681 memo that describes the activities we were doing.

4682

4683 I'm not going to read every word on here, but essentially we
4684 have rods that we were going to heat treat and rods that we
4685 were not going to heat treat. Take those and do some initial
4686 tests on them at room temperature, things like measuring
4687 internal pressure, gas communication, hydrogen content and
4688 do some initial ring compression testing.

4689

4690 Once those initial tests were done then there we do some
4691 additional tests at 200 C, because the idea is when you do
4692 transport these, there's some non-room temperature in place
4693 inside the cask and then also do some additional room
4694 temperature tests. So, these are mechanical tests,
4695 destructive mechanical tests. So, you know, tension, four
4696 point bend, fatigue type testing.

4697

4698 Okay, so what is the status relative to our initial test
4699 plan? Well, I mean right away, non-destructive examinations
4700 of the 25 sibling pin fuel rods. They were completed in 2018
4701 by Oak Ridge. The heat treatment that we put them under,
4702 that was - that was designed intentionally to increase the
4703 potential for a radial hydride formation, but at the same
4704 time, we wanted to stay under the peak cladding temperature
4705 of the NRC recommended value of 400 degrees C.

4706

4707 This temperature treatment was restricted at the peak for 8
4708 hours and the idea there is we wanted to limit annealing of
4709 any irradiation damage. So, the longer we would hold it at
4710 that peak temperature the greater annealing effect you would
4711 have.

4712

4713 And so, one thing I will point out is obviously 400 degrees
4714 C is higher than the actual conditions that were measured in
4715 the demo cask, right, so the sibling pins are undergoing a
4716 higher temperature heat treatment. And the current status
4717 is, Phase I is, testing is ongoing but largely complete.
4718 This is the same chart with several checkmarks of, green is
4719 totally completed, but yellow is in progress. But even if it
4720 says in progress we've still done quite a bit of those
4721 tensile tests, burst test, four point bend test, micro
4722 hardness, et cetera. Fatigue testing, capturing particle
4723 release.

4724

4725 So, there's quite a bit of work that's been done. It's very
4726 close to being finished and so we need to start thinking
4727 about Phase II. But before we go into the Phase II planning,
4728 I do want to talk a little bit about Phase I. I'm calling
4729 these high-level select lesson learns because we have so
4730 much data that we got out of Phase I. We could have a whole
4731 day presenting all of that data, so we tried to down select
4732 to something that maybe would be the most important and most
4733 useful to share today.

4734

4735 One is, what we learned is the heat treatment of the fuel
4736 rods at 400 degrees C for 8 hours can affect fuel rod
4737 performance. And generally what we saw was yield strength,
4738 ultimate strength, and Young's modulus decrease, while the
4739 ductility increases. But this effect is alloy-dependent so,
4740 it's - it depends on which specific alloy you're looking at
4741 to see how big those effects are and if the ductility
4742 increases. The other is, the heat treated - treatment
4743 resulted in minor radial hydride reorientation and appeared
4744 not to degrade that performance.

4745

4746 I will show three subsequent slides to this that sort of
4747 highlight some of these results. So don't forget about the
4748 heat treatment one, the first one there. The second big
4749 lesson, select lesson learned is, the end of life rod
4750 internal pressures were lower than we initially used. And
4751 remember, we said we did some initial testing and initial
4752 ring compression testing, indicating that the hoop stresses
4753 may actually be too low to cause damaging radial hydrides.

4754

4755 And the third high-level select lesson learned I wanted to
4756 share today was, the fatigue cycles that we observed during
4757 our multi-modal transportation test. So, this is a

4758 transportation test we did a few years ago that looked at
4759 heavy haul truck, barge, and rail, where we had surrogate
4760 assemblies inside a cask. And those assemblies were
4761 instrumented to capture accelerations in strains so we can
4762 measure those fatigue cycles. Everything we've seen in that
4763 is well below the region where we would expect fig --
4764 fatigue damage to start accumulating.

4765

4766 Okay, so back to the first high-level lesson learned, and I
4767 want to thank Brady Hanson of PNNL for this slide. This is a
4768 slide that he put together as part of a bigger package for
4769 our annual meeting we had in June, but I think it's an
4770 illustrative example of some of the effects we see.

4771

4772 So you can see the baseline rods there are those top curves
4773 and they have higher yield stress and a higher ultimate
4774 stress. But if you look at the heat treatment rods, you can
4775 see the effect there, reducing the strength and impacting
4776 the, in this particular case there was no significant
4777 reduction in Young's modulus, but in other cases you
4778 definitely see that.

4779

4780 So, just wanted to point out, there's a change in the
4781 mechanical properties based on the heat treatment but it is
4782 alloy-dependent.

4783

4784 Remember my second lesson learned, high-level lesson
4785 learned, was around rod internal pressures. And so here you
4786 can see all the red squares and circles. I should say this
4787 is a slide provided by Mike Malone of Argonne National
4788 Laboratories. And again, it was originally presented at our
4789 annual meeting along with some other data but I think it's a
4790 useful set of data.

4791

4792 Everything that's the red filled circles and the red filled
4793 squares are the new data we have from the sibling pin test
4794 campaign. And what we found was, almost all the data fell
4795 exactly where we expected. And so the rod internal
4796 pressures, while initially we thought they were going to be
4797 higher, they actually fell right in line with where we
4798 expected. And the two outlier ones we have, those are
4799 actually four cycle. They've gone through four cycles,
4800 operation cycles, in the reactor.

4801 So, we do expect a little bit higher internal pressures
4802 there.

4803 And of course, with lower internal pressures then you expect
4804 you have lower hoop stresses.

4805

4806 Now this slide is from Rose Montgomery in Oak Ridge National
4807 Laboratory. It's, there's a lot of information on here, but
4808 I think that a couple of things that I wanted to point out.
4809 One is, if you look at those orange and yellowish squares,
4810 you'll actually find that they're a little bit lower than
4811 the prior data.

4812

4813 So let me try and point those out. So those squares that
4814 kind of follow that line here and that is actually an effect
4815 of some localized strain in the cladding between the two
4816 pellets. So, there is a little bit of impact of the fuel
4817 there.

4818

4819 But the other major thing we noticed is actually, it
4820 probably doesn't make a difference because we're still
4821 several orders of magnitude greater than where we expect the
4822 ranges for transportation testing. So that blue square in
4823 the corner there, those are, that sort of bounds the strain
4824 amplitudes and the fatigue cycles that we saw in the multi-
4825 modal transportation test. So even though there is some

4826 effect of having the fuel and the localized strain, it's not
4827 enough to make an impact.

4828

4829 So, I have a few more high-level lessons learned, that I did
4830 want to mention because I do think they're important to
4831 share in this forum. I don't have additional slides to cover
4832 that data, but I did want to mention, you know one thing
4833 that we saw with all the tests we did was when we had fueled
4834 ring compression tests. So this is when you cut a slice of
4835 the fuel rod and you push on it from the top. So it's a
4836 circle, basically you're collapsing kind of like a pinch
4837 load.

4838

4839 We found that they had large load bearing capacity,
4840 independent of hydride reorientation. So pinching loads,
4841 which was something we thought might have been a concern
4842 earlier, probably not as big a concern.

4843

4844 We found that the outer diameter oxide layer thickness, the
4845 total hydrogen content and the hydride density and length,
4846 they generally increase as you go from the bottom of the rod
4847 towards the top of the rod. Now there's a little bit of a,
4848 it's not monotonic and there's a little bit of effect that

4849 it goes down. And of course, the degree to which those
4850 increase depend on the alloy and their histories, but
4851 generally those go up from the bottom to the top.

4852

4853 And then the last select lesson learned I wanted to add or
4854 mention would be the fission gas appears to move more easily
4855 through heat treated rods. So, the heat treatment process is
4856 most likely opening up more pathways in the internal fuel
4857 for gasses to move through. And now I'll turn it over to
4858 John to talk about the Phase II test plan.

4859

4860 BIGNELL: All right, thank you, Scott. As Scott mentioned,
4861 the Phase I testing is currently ongoing but is largely
4862 complete, and for that reason we've begun planning for Phase
4863 II testing. That planning has really started in earnest in
4864 this FY, so about a year ago.

4865

4866 As part of that planning earlier this year a draft Phase II
4867 test plan was created. That draft plan describes the Phase
4868 II test priorities and the reasoning behind their
4869 prioritization, as well as outlines a high-level plan for
4870 Phase II testing.

4871

4872 So, the draft test plan has been shared with internal and
4873 external stakeholders, with the request that they review it
4874 and provide comments back to us on that test plan. Recently
4875 we received comments from those reviewers, and are currently
4876 in the process of considering those comments in development
4877 of the final test plan to be released later this year.

4878

4879 Based on the final test plan, each laboratory that is
4880 involved in doing the testing will develop their own
4881 detailed plan describing the specific subsets of tests that
4882 they will be performing and those should be available later
4883 in the FY, this upcoming FY.

4884

4885 So, priorities for Phase II testing, listed in the draft
4886 test plan are based on several contributions. First,
4887 previously identified gaps and their importance, as well as
4888 a reassessment of those gaps and their importance based on
4889 lessons learned from Phase I testing. I'm sorry, this sounds
4890 very loud to me up here; is it loud? No? Good, okay, thank
4891 you. I hear a little feedback too as well - so, as well as
4892 lessons learned from Phase I testing to date.

4893

4894 Also, priorities are based on the assessment of Phase I
4895 accomplishments against original objectives of the sibling
4896 pin test campaign and the high burnup demonstration project
4897 which it is a part of.

4898

4899 Additionally, input from external stakeholders has bene
4900 solicited and received, and has been considered in the
4901 prioritization. Specifically, feedback was requested in the
4902 survey that was distributed at the Electric Power Research
4903 Institute, Extended Storage Collaboration Program, or ESCP
4904 program meeting held at the end of last calendar year, as
4905 well as in a technical exchange with staff members from the
4906 Nuclear Regulatory Commission.

4907

4908 In the coming slides I will discuss each of these in a
4909 little more detail. So as Scott mentioned, in 2012 the
4910 initial gap assessment was completed and that guided the
4911 initial DOE research and development plans. Within that
4912 initial gap assessment, the high burnup spent fuel
4913 demonstration project was identified as a high priority
4914 activity and out of that activity was born the sibling pin
4915 test campaign.

4916

4917 The specific tests within that test campaign were largely
4918 driven by the objectives of the high burnup spent fuel data
4919 project, but also were based on the gaps that had been
4920 identified, specifically the cladding and fuel specific
4921 gaps.

4922

4923 So, in 2017 a reassessment of the cladding and fuel specific
4924 gaps produced the following prioritization of those gaps.

4925 That assessment identified as high priority the hydride
4926 reorientation and radial hydride induced embrittlement gap.

4927 As medium priority, the delayed hydride cracking gap; and as
4928 low priority the creep radiation damage annealing and
4929 oxidation gaps.

4930

4931 The high prioritization of the hydride reorientation and
4932 radial hydride induced embrittlement gap motivated the
4933 design of the heat treatment for Phase I testing, which
4934 Scott pointed out was designed to encourage radial hydride
4935 formation while limiting annealing.

4936

4937 Data obtained from the Phase I testing have resulted in a
4938 reassessment of the importance of the 2017 gaps. Most
4939 notably, the gaps related to hydride reorientation and

4940 radial hydride induced embrittlement, radiation damage
4941 annealing, and creep. And so, I'll discuss each of those in
4942 a little more detail as well next.

4943

4944 So previously the radiation damage annealing and creep gaps
4945 were given a low priority. Results from Phase I testing
4946 indicate they should have higher priorities. Comparison of
4947 cladding yield and ultimate strengths derived from Phase I
4948 testing, sorry, Phase I tension and bending tests of both
4949 baseline and heat treated cladding and fuel rod samples
4950 showed larger than anticipated reductions in those values as
4951 a result of the heat treatment, as illustrated by Scott
4952 earlier, for ZIRLO cladding.

4953

4954 Because the Nuclear Regulatory Commission accepts the use of
4955 yield failure criterion for demonstration of performance, a
4956 fuel performance for licensing purposes of transportation
4957 and storage casks, this reduced yield strength may have
4958 significant implications for licensing of current and future
4959 systems. Therefore, understanding the effects of time at
4960 temperature on yield strength for a range of relevant times
4961 and temperatures is important.

4962

4963 In addition - in addition, because the NRC allows for
4964 alternate means for demonstration of performance as long as
4965 that alternate means is justified, the effects of annealing
4966 on the full range of cladding and fuel rod performance is
4967 also of utmost importance.

4968

4969 So, while annealing usually is accompanied by increases in
4970 ductility that can mean a reduced risk of cladding failure,
4971 the reduced material strengths can facilitate creep - can
4972 facilitate creep. So also understanding the effects of
4973 annealing on creep behavior is important. So, for these
4974 reasons an increased emphasis on quantifying the effects of
4975 annealing, including its effects on creep behavior, is
4976 appropriate for Phase 2 testing.

4977

4978 So, previously the hydride reorientation and radial hydride
4979 embrittlement gap was given a high priority. Results from
4980 Phase I testing, as Scott alluded to, indicate it should
4981 have a lower priority. Rod internal pressures measured
4982 during Phase I testing indicate that significant cladding
4983 degradation due to radial hydride precipitation during
4984 cooling from the heat treatment at 400 degrees C is
4985 unlikely.

4986

4987 As Scott said, the measured pressures generated by those,
4988 excuse me, in the measured pressures, generate cladding hoop
4989 stresses that are insufficient to generate radial hydrides
4990 that produce significant degradation in performance. This is
4991 demonstrated by the defueled ring compression tests that
4992 were completed as a part of Phase I. And also, in addition,
4993 fueled ring compression tests completed as part of Phase I
4994 demonstrate that fuel pellets constrain the deformation of
4995 the cladding under pinch loadings, which significantly
4996 increases the load necessary to cause cladding failure which
4997 further reduces or alleviates concerns surrounding failure
4998 due to radial hydrides.

4999

5000 So, for these reasons, a reduced emphasis on quantifying
5001 hydride reorientation and radial hydride induced
5002 embrittlement is appropriate in Phase II testing.

5003

5004 So, it's worth noting here as well, that Phase II testing
5005 will include limited ring compression - ring compression
5006 testing to address the hydride embrittlement gap as a
5007 closeout activity, looking at a bounding set of conditions
5008 not yet considered in sibling pins testing.

5009

5010 So, looking at the objectives of the high burnup spent fuel
5011 data project, as well as the objectives of the sibling pin
5012 test campaign, those can be summarized and distilled down to
5013 the objectives that are listed here in this table. The first
5014 objective comes from, is an overarching objective, and comes
5015 from the high burnup spent fuel data project. It is to
5016 provide data to DOE that is needed to make informed
5017 decisions on waste management issues.

5018

5019 The remaining three objectives come straight from the
5020 sibling pin test campaign. Scott went over most of these
5021 already. The second objective is to establish baseline or
5022 what we refer to as t0 characteristics and properties of the
5023 fuel rods going into the demo cask.

5024

5025 The third objective is to generate the t0 prime data, what
5026 we refer to as t0 prime data, that enables the prediction of
5027 the effects of drying on mechanical properties and fuel rod
5028 performance for the fuel rods in the demo cask as well as
5029 for fuel rods in other current and future systems.

5030

5031 And finally, the fourth objective is to provide data to
5032 support licensing and relicensing of new and existing dry
5033 storage and transportation casks.

5034

5035 So, an assessment of these objectives shows that only
5036 objective two can be considered complete. This is because
5037 Phase I testing has gathered a significant amount of the
5038 baseline or t0 data. Objectives 1, 3, and 4 are considered
5039 incomplete at this time. This is because the Phase I heat
5040 treatment is insufficient to address the range of
5041 temperatures and exposure durations anticipated for current
5042 and future systems. Really, we need data covering a wider
5043 range of temperatures and a wider range of durations.

5044

5045 Also, specifically objective 4 is considered incomplete
5046 because creep was not addressed in Phase I. Creep data to
5047 support near term licensing and relicensing of new and
5048 existing systems are needed.

5049

5050 So, input from external stakeholders was solicited and
5051 considered in the Phase II prioritization. One such
5052 solicitation for feedback was a survey that was distributed
5053 to attendees of the Electrical Power Research Institute's

5054 Extended Storage Collaboration Program, the 2023 winter
5055 meeting soliciting feedback on the preliminary Phase II
5056 testing details.

5057

5058 Fifteen people responded to that survey. Five of those were
5059 from industry, two were consulting engineers, and eight were
5060 from research or national labs institutions. I'll point out
5061 too that responses from members of the sibling pin's team
5062 were removed from any of this information here.

5063

5064 Responses to the survey indicated a desire for testing at
5065 peak clad temperatures above the NRC guidance limit of 400
5066 C. This was to address off-normal conditions, as well as to
5067 support industry initiatives to possibly move to a higher
5068 peak cladding temperature limit.

5069

5070 A desire for testing at peak cladding temperatures at and
5071 below the current NRC guidance limit of 400 C was also
5072 expressed. This was to cover current and future systems that
5073 are designed to satisfy the current guidance limit, where
5074 thermal analysis conservatisms have been removed. And some
5075 of the discussion from Ned and Scott talked about that, how
5076 the temperatures in the demo cask were quite a bit lower

5077 than anticipated, originally anticipated based on thermal
5078 modeling.

5079

5080 Also, the survey indicated a desire for data to support
5081 tollgate assessments under the Nuclear Regulatory Commission
5082 approved Aging Management Plans. So, this is specifically
5083 related to creep behavior of fuel rods and cladding.

5084

5085 External stakeholder input was also received from the
5086 Nuclear Regulatory Commission. In January of 2023, members
5087 of the sibling pin program participated in a technical
5088 exchange with staff from the Nuclear Regulatory Commission
5089 to discuss technical results from Phase I testing that were
5090 relevant to the Phase II test planning.

5091

5092 Observation from members of the sibling pin team following
5093 that technical exchange were that a preference was expressed
5094 for expanding the dataset for temperatures at and below the
5095 current NRC recommended limit of 400 C, but there was some
5096 interest expressed in investigating temperatures above 400
5097 C.

5098

5099 And interest was also expressed in obtaining creep data in
5100 the near term, particularly for M5 cladding, as that's a -
5101 data does not exist or is incomplete. Interest was expressed
5102 in fatigue and static bend testing on aggressively
5103 conditioned rods like those described in NUREG-2224 to
5104 provide bounding data. And interest was expressed in further
5105 investigating the effects of thermal cycling on cladding
5106 ductility.

5107

5108 So, taken altogether, the initial gaps and their priorities,
5109 the reassessment of those gaps, and their prioritization
5110 based on the Phase I testing, an assessment of the original
5111 objectives of the high burnup fuel data project and the
5112 sibling pin test campaign, and feedback from external
5113 stakeholders, the draft priorities for Phase II testing are
5114 as shown here.

5115

5116 Those priorities with respect to annealing are to obtain
5117 data to characterize the effects of annealing on high burnup
5118 cladding material properties and fuel rod performance for
5119 temperatures and exposure times anticipated for future and
5120 current systems.

5121

5122 With respect to creep, is to obtain data to characterize the
5123 creep behavior of baseline high burnup cladding material and
5124 fuel rods for temperatures and internal pressures
5125 representative of and/or bounding of those anticipated for
5126 current and future systems.

5127

5128 With respect to the effects of annealing on creep behavior,
5129 it's to obtain data to characterize the creep behavior of
5130 annealed high burnup cladding material and fuel rods for
5131 creep temperatures and internal pressures representative of
5132 and/or bounding of those anticipated for current and future
5133 systems.

5134

5135 And with respect to hydride reorientation and radial hydride
5136 induced embrittlement, complete a limited testing to close
5137 out work on hydride embrittlement by obtaining data to
5138 characterize the low temperature ductility of high hydrogen
5139 content M5 and ZIRLO cladding materials following their
5140 exposure to a bounding radial hydride treatment.

5141

5142 In response to external stakeholder input, obtain data to
5143 characterize the low temperature ductility of high hydrogen
5144 content M5 and ZIRLO cladding materials following their

5145 exposure to thermal cycling. And finally, obtain data to
5146 characterize the fatigue and bend performance of
5147 aggressively conditioned M5 and ZIRLO fuel rods.

5148

5149 So shown here is the visualization of the draft Phase II
5150 testing. Shaded in the - shading in the figure indicates the
5151 approximate percentage of each sibling pin fuel rod assigned
5152 to each draft Phase II priority, organized first by
5153 laboratory, then by testing phase, and then by cladding
5154 type.

5155

5156 So, if you look in the figure, the gray shading indicates
5157 the approximate percentage of rods utilized in Phase I
5158 testing. The blue shading indicates the approximate
5159 percentage of rods that will be used to address annealing.
5160 The light blue indicating annealing studies on cladding only
5161 material. The intermediate darkness blue indicating
5162 annealing studies on fuel rod, fueled rods. And the dark
5163 blue indicating annealing studies and its effect on fuel rod
5164 creep.

5165

5166 The green shading indicates studies looking at creep
5167 behavior. Light green indicating creep of baseline cladding

5168 only and dark green indicating creep behavior studies of
5169 baseline fuel rods. And then the pink indicates radial
5170 hydride embrittlement studies.

5171

5172 So, in general characterization methods in Phase II will
5173 mimic those employed in Phase I. So that includes many of
5174 the tests that Scott had talked about, metallographic
5175 measurements, hydrogen content, microhardness, axial
5176 tension, four-point bend, fatigue, gas communication, rod
5177 internal pressure measurements, particle release, et cetera.

5178

5179 As was true with the Phase I testing, Oak Ridge National
5180 Laboratory will focus on, largely focus on fueled testing,
5181 so, fuel rods, whereas Pacific Northwest National Laboratory
5182 and Argonne National Laboratory will focus on defueled
5183 cladding.

5184

5185 So that finishes - concludes my presentation. Thank you for
5186 your time and we'll take questions. Actually, I can leave
5187 that up there if people want to refer to that. Thank you.

5188

5189 SIU: Okay, thanks. Our small **B**oard team on this topic is
5190 Allen Croft, Brian Woods, and virtually we have Lee

5191 Peddicord and Paul Turinsky. So, we'll start with questions
5192 from the small Board team. Brian?

5193

5194 WOODS: Hey, first of all, well, Brian Woods, Board. And
5195 Ned, Scott, and John, thanks so much for your presentation.
5196 I am curious, very early on in your presentation I think Ned
5197 you talked about the initial modeling that you did that
5198 showed that the temperature in the demo cask wouldn't get
5199 below 350 degrees. I'm kind of curious, was that like a zero
5200 D model? Or was it a 3 D model? I mean, what was the
5201 features of that model that you all used to get that
5202 temperature?

5203

5204 SANBORN: So, I'm not exactly familiar with the exact model,
5205 but I know there were several. So, I don't know who did that
5206 model, but I will say it was on par with what they do for
5207 license applications. I think Brady's - okay.

5208

5209 LESLIE: Identify yourself.

5210

5211 HANSON: Brady Hanson, Pacific Northwest National Lab. So
5212 that modeling was done at PNNL using both the Star CCM Plus
5213 and the Cobra SFS models. So, taking into account

5214 everything. And like Scott said, we modeled after taking on
5215 a lot of conservatisms, we got down to around 270. The
5216 actual temperature was 237. So, still a little conservative.
5217

5218 WOODS: Thank you. That's a good - so, one real quick follow
5219 up question then. So, for the actual experiments in the demo
5220 cask, how many thermocouples are in there? Is there, yeah,
5221 what does the instrumentation plan look like in there?
5222

5223 SANBORN: I can check the number. I think it was something
5224 like there were 18.
5225

5226 WOODS: So, 18, so are they all in the cask space or were
5227 there any on the clad at all, or so all in the cask space?
5228

5229 BIGNELL: There are none on the clads as far as I know. And
5230 Brady is raising his hand back there. They're on the guide -
5231

5232 HANSON: Brady Hanson again. So, there are seven lances,
5233 each one of them is in a guide tube of an assembly. So not
5234 touching cladding or anything. And each lance has nine
5235 thermocouples located axially along.
5236

5237 WOODS: Thank you.

5238

5239 CROFF: Croff, Board. A specific question. In the Phase I
5240 delayed hydride cracking was shown as a medium priority and
5241 I didn't see where it went in Phase II. Is it out of the
5242 picture or buried in something else or what?

5243

5244 BIGNELL: So, I didn't speak to that because it didn't have
5245 a direct relevance on Phase II. You are correct, it was
5246 listed as medium. I don't believe that is thought to be a
5247 medium or a high priority any longer. I strayed away from
5248 speaking about every single gap because the test plan is
5249 focused on the Phase II testing specifically. I know when an
5250 update to the gap analysis or gap assessment is completed
5251 that will be discussed. But yes, it is no longer thought to
5252 be a priority.

5253

5254 LARSON: Our current gap analysis is five years old and
5255 we're updating it. It'll be updated in '24 as well as the
5256 Phase II and Phase I.

5257

5258 SIU: Okay. Dan.

5259

5260 OGG: Dan Ogg, Executive Director for the Board. This might
5261 be a question for Brady Hanson. But in my understanding
5262 regarding the creep topic, is that there's a fair body of
5263 documentation that the NRC essentially - essentially saying
5264 that creep is not a significant issue to be considered. So,
5265 I'm curious now, is to what has changed and what has brought
5266 the issue of creep back into consideration?

5267

5268 LARSON: Let Brady handle it.

5269

5270 HANSON: Brady Hanson again. So, I mean it's two things.
5271 It's with the annealing like Scott and John both said, when
5272 you have annealed you have increased your ductility. And so,
5273 there's the thought that by doing so we can now facilitate
5274 creep that we otherwise wouldn't have had.

5275

5276 The second thing goes into as they said the aging management
5277 plans and this idea of tollgates. So, some of the utilities
5278 in their license applications to NRC directly referenced the
5279 demo project and the demo cask. And as part of that they
5280 said that's how they would address what few questions
5281 remained on creep. That's in there for ten years. So, we're

5282 addressing it with the sibling pin testing since we can go
5283 to higher temperatures.

5284

5285 BIGNELL: Yeah, I would just add to that. Sorry to cut you
5286 off there. I would just add to that that that is why I
5287 included the terminology 'in the near term.' There is some
5288 desire to have data before we open up the cask and get any
5289 additional data that we might find there. Plus, the cask
5290 temperatures are lower than were originally planned for. So,
5291 it's anticipated there wouldn't be, it'd be difficult to see
5292 or measure any creep data there directly.

5293

5294 OGG: All right, thank you.

5295

5296 SIU: Bret?

5297

5298 LESLIE: Bret Leslie, Board staff, but this is a comment
5299 from Paul Turinsky. Given the wide range of fuel operating
5300 conditions in the core, and the range of fuel designs,
5301 cladding types, pellet doping, backfill pressures, grid
5302 spacer designs, what is the approach being used to assure
5303 that the performance during transportation and possible re-
5304 packagings of these fuels is satisfactory?

5305

5306 LARSON: I mean, Paul's exactly right. There's a lot of
5307 fuels out there. There's a lot of the cladding out there.
5308 There's a lot of assemblies. There's just a lot. We did the
5309 MMTT. We gathered all the data. We measured all the data
5310 over and over. And what we believe is we calibrated all our
5311 models against it.

5312

5313 We know where our models are right now. And so, we believe
5314 that we have the data to not only show where we currently
5315 are, but we have the data to model a lot of the different
5316 various casks that we have, I mean assemblies, fuel rods,
5317 excuse me. That we can model it now with the other data that
5318 we're picking up from Phase I and Phase II. Cause we know
5319 the shock and vibration very well.

5320

5321 LESLIE: Bret Leslie, Board staff. Again, a follow-up
5322 question from Paul. If the spent nuclear fuel needs to be
5323 repackaged so that individual fuel assemblies need to be
5324 handled, are there new stresses versus transportation or a
5325 30-centimeter canister drop stresses, that need to be
5326 addressed? I'm thinking of the guide tubes.

5327

5328 LARSON: Right now, I mean I'm being asked to speculate and
5329 predict the future. I give that a big we don't know yet. We
5330 haven't tested that yet, but we are still gathering data. As
5331 we gather more data we may need to do that in the future or
5332 maybe we'll have another way to answer it. But right now, we
5333 don't have the data to say one way or the other.

5334

5335 LESLIE: Bret Leslie, Board staff. Now speaking for Dr. Lee
5336 Peddicord. Based on the modeling now, taking out
5337 conservatisms, what are predictions of temperatures for
5338 other existing storage casks? Are temperatures generally
5339 around the 275 degree Fahrenheit region?

5340

5341 LARSON: We believe that our cask was actually, remember
5342 when we loaded it we did our modeling and it said it was
5343 going to be in the 270 range. That was after we went in even
5344 and picked that whole, there was a whole row where we tried
5345 to zone load the cask with the hotter materials, as hot as
5346 we could possibly get it.

5347

5348 We couldn't get it hotter because we had trouble with the
5349 neutron shields and so we couldn't go higher. We couldn't
5350 put more hot, more higher temperature rods inside the cask.

5351 So we believe that the cask we loaded was one of the higher
5352 temperature casks that has been loaded to date. And I won't
5353 say the highest, don't get me wrong because some of the
5354 utilities used to load with some new stuff.

5355

5356 But we believe that it represents kind of the upper bound
5357 for the most part. But we still have to do more testing,
5358 more laboratory testing under Phase I and Phase II. Phase II
5359 will be incredibly enlightening when we start heating those
5360 up to see how those rods behave under the increased
5361 temperatures.

5362

5363 BIGNELL: Okay, here we go. I would add also, that, so
5364 looking back at the original objectives of the sibling pin
5365 test campaign, there's specific language in there saying,
5366 you know, let's look at properties that are applicable to
5367 the demo casks specifically, but also language saying you
5368 need to consider for other systems as well as future
5369 systems.

5370

5371 So, with that in mind, there is a general understanding
5372 within the nuclear community and industry specifically that
5373 these conservatisms exist in their thermal models. And there

5374 is plans to take advantage or remove some of those
5375 conservatisms to load higher heat loads into future casks,
5376 for instance, or have designs that have higher heat loads.
5377

5378 And that was actually some of the responses we saw to the
5379 survey that we shared at the EPRI ESCP meeting is feedback
5380 along those specific lines. That it was understood that
5381 those conservatisms exist and they would act to remove
5382 those.

5383

5384 So, the planning for Phase II is specifically aligned with
5385 looking at temperatures on the lower end, that are nearer to
5386 what we currently see in the demo cask, although probably
5387 not all the way down to that level. As well as the range of
5388 temperatures that span between say 300 and 400 degrees
5389 Celsius for those future systems, if they start to approach
5390 the current regulatory guidance limit.

5391

5392 SANBORN: And I will just add, from the thermal modeling
5393 perspective we have a set of research and development
5394 activities that are geared towards improving that and
5395 reducing the uncertainty. We did an international round
5396 robin on thermal modeling of the high burnup demo cask and

5397 people realized where those conservatisms are. We had a
5398 horizontal simulator to get those actual temperatures. So,
5399 we're continuing to improve our thermal modeling capability
5400 as well in other research areas because we recognize that
5401 that's an important set of activities.

5402

5403 CROFF: Croff, Board. I'd like to elaborate or follow on I
5404 guess to Paul Turinsky's first question. Up to this point in
5405 the program it's been largely experiment and data driven.
5406 What I thought I heard you say is on a going forward basis
5407 you think you have enough data to benchmark the models so
5408 you can use some kind of a combination of experiment and
5409 modeling to handle all these parametric variations. Is that
5410 fair?

5411

5412 LARSON: That is true. In the past we have still used models
5413 but we were benchmarking them for the most part. And we were
5414 using them to predict, for instance, the temperature inside
5415 that cask. That's why we decided to put that ring of really
5416 high fresh fuel in that thing because the modeling told us
5417 it would be so cold. But we have been benchmarking,
5418 documenting, benchmarking, to the point where our confidence
5419 in the models is increasing and we believe it gives us a

5420 little more flexibility as we analyze more and more
5421 situations.

5422

5423 CROFF: Thanks.

5424

5425 SANBORN: Yeah. Just to add to that, our modeling
5426 capabilities are increasing. We have benchmarked them in
5427 certain areas, and we understand behaviors and we can extend
5428 them to different systems and whatnot. But there are some
5429 areas where we want to collect more data still. For example,
5430 we think BWR cladding is bounded, but we want to get some
5431 data to prove that.

5432

5433 So, ATF is going to be new, so it'd be good to get some data
5434 on how that behaves as well, right, because there's lots of
5435 different designs. So, we're growing more confident in our
5436 modeling, we can rely on it a lot more, but there's still a
5437 need to collect experimental data for sure.

5438

5439 CROFF: Thanks.

5440

5441 BALLINGER: This is Ron Ballinger, Board member. These tests
5442 are expensive. These rods are very valuable. Going forward

5443 with higher burnup and increased enrichment, that's where
5444 the industry's going. The one percent strain limit, which is
5445 a sort of who knows where the heck it came from, but it's
5446 there. I believe you're going find that correlating hydrogen
5447 content with ultimate tensile strength is going to become
5448 very important.

5449

5450 Have you guys thought about, you've got all these tests that
5451 you're going to do already, about including measuring
5452 hydrogen concentration and getting that kind of data because
5453 you're kind of 80 percent there, with the rods that you
5454 already have. Just a thought.

5455

5456 LARSON: Brady, you have? Brady is doing - doing the work at
5457 PNNL and he's doing our testing now, so I thought he would
5458 have the experience.

5459

5460 HANSON: Brady Hanson. Thanks Ron, you're absolutely right.
5461 So, at all the labs we are measuring the hydrogen content of
5462 the samples right next to the ones that we're testing, so we
5463 know what they are. I guess I'll give a spoiler alert. In
5464 the upcoming PNNL report, we've been testing one of the four
5465 cycle rods that Scott showed you that had higher pressure.

5466 Because it was four cycle, ZIRC-4 has a lot of hydrogen in
5467 it and you are absolutely correct that the hydrogen is
5468 controlling everything for when it fails, sometimes before.
5469

5470 BALLINGER: I was - nobody uses ZIRC Alloy-4 anymore except
5471 in storage.

5472

5473 HANSON: Correct.

5474

5475 BALLINGER: But I was thinking more about M5 and ZIRLO and
5476 optimized ZIRLO and other things like that.

5477

5478 HANSON: Yeah, so far, they're low enough in hydrogen
5479 content that it's not an issue. You're right. As we go to
5480 higher burnup, if they don't use the chrome coating, you
5481 have the chance that you could have more, and it will
5482 matter.

5483

5484 LESLIE: Bret Leslie, Board staff and I'll kind of put on my
5485 hat from the morning session. Can you define what is a gap?
5486 Does that mean there's no information and what is an R&D
5487 gap? Ned?

5488

5489 LARSON: Sure. What a gap is, it's an area where, I won't
5490 say it's, we're flatfooted, and we don't know anything.
5491 Sometimes it's areas that we need, we wish we had more data.
5492 We have our theories, but we just need more data to do that.
5493 In some areas it is where we don't have any data, or even
5494 any theories. And so it's areas where we need testing, we
5495 need actual data to fill in that knowledge. Sometimes it's
5496 even confirmatory, if you're with me. But it's to increase
5497 that knowledge base in that specific area so that we can
5498 share that data with anybody, Nuclear Regulatory Commission,
5499 the Board, anybody that is able to look at the gap, look at
5500 the data and say yep, it meets our needs.

5501

5502 LESLIE: Thank you, Ned.

5503

5504 SIU: Any other questions from the Board?

5505

5506 LARSON: Okay, we got two minutes to spare.

5507

5508 SIU: Absolutely, you guys are great. Okay, we'll move on to
5509 the next topic, which surprisingly enough, Ned Larson is
5510 still there and Brady Hanson from Pacific Northwest National
5511 Laboratory talking to about advanced reactor fuels.

5512

5513 LARSON: There we go, thanks. What I'm going to talk about
5514 is that there's been a lot of work, a lot of discussion
5515 about advanced reactors, what we're doing with advanced
5516 reactors, how we're going to deal with them in the future.
5517 This is a disclaimer, you've seen it before. You'll see it
5518 again. It basically says anything that I say will not pre-
5519 empt anything that's in the standard contract. That's
5520 straightforward enough.

5521

5522 As we look forward to it, as we move forward, we're looking
5523 at a lot of advanced reactors. Last year there were half a
5524 dozen reports produced, NARUC, Academy of Science, I can't
5525 even remember all of them at this point. But they, one
5526 report even predicted that there would be 20 to 30 new
5527 reactor designs coming out for advanced reactors that we
5528 would be working with and producing.

5529

5530 If that is the case, I don't know. We'll soon, we'll see,
5531 we'll find out. But even with the advanced reactors that are
5532 moving along well, there's some questions that we have,
5533 because they vary in size, they vary in power, levels and

5534 forms of the fuel that they use, which causes problems on
5535 the back end that we have to understand.

5536

5537 The expected spent nuclear fuel may differ significantly
5538 between these and the reactors that are coming online as
5539 they apply to storage transportation and disposal. It also
5540 presents a challenge for our R&D program.

5541

5542 The Nuclear Waste Policy Act in 1982 basically assigned
5543 responsibility for SNF and high-level radioactive waste to
5544 the Department of Energy. With that assignment, DOE has the
5545 responsibility in developing the capabilities to dispose of
5546 these materials as we go down the road.

5547

5548 In the Nuclear Waste Policy Act, the act also requires that
5549 as anybody approaches the NRC to get a license, such person,
5550 the number (i) there, such person has entered into a
5551 contract with the Secretary, I mean the Secretary of Energy,
5552 under this section, or the Secretary affirms in writing that
5553 such a person is actively and in good faith negotiating with
5554 the Secretary for a contract under this section.

5555

5556 Meaning that before anybody approaches the NRC for a
5557 license, they can discuss, of course, with the NRC. They
5558 either have to have a contract with the DOE or a letter from
5559 the DOE acknowledging that we are at least in negotiations
5560 for a contract with that company.

5561

5562 So far, these are documents that you can find on the NRC
5563 website that shows that they still are asking for this. They
5564 are very much aware of that requirement. You can see that
5565 Kairos received theirs, Abilene Christian, they asked for it
5566 there. They said we haven't seen that letter or we haven't
5567 seen that proof; could you send it to us and let us know
5568 where we are. And I'll talk about that a little bit later.

5569

5570 The DOE has two areas that we're working on. One is a non-
5571 proprietary publicly available report. This evaluates the
5572 different spent fuel that comes out of these different
5573 reactors. And then there's another one where we're doing,
5574 and that is the one on the left there. And then there's
5575 another one that will be proprietary and will not be
5576 distributed in the public and this is a report with
5577 proprietary data from the various reactors that we're

5578 working with. And I'll get into that, why it's proprietary
5579 and why it will not be released to the public at all.

5580

5581 In the public one, this is what it will look like. We have a
5582 draft. In 2022 Congress directed us, they gave us a little
5583 bit of money to do it and directed us to do a report that
5584 evaluates the impacts of some of the new reactors on the
5585 disposal stream.

5586

5587 DOE has been working with this for years. DOE has a lot of
5588 fuel here at Idaho that we have developed over the years.
5589 It's a small amount of fuel relative to the commercial fuel
5590 that's available. But we do have some, a lot of experience
5591 in some of these fuels, for instance, the TRISO fuel - yeah,
5592 we understand that fuel. We've seen it before. We'll see it
5593 again.

5594

5595 The metallic Na-bonded sodium bonded fuels, we've seen that
5596 too. We understand what that is. The Oak Ridge molten salt,
5597 and of course the light water reactors. We understand that
5598 also. And so those are things that we have seen before, but
5599 in some of the designs that are coming out, there's some

5600 fuels that we have not seen. And so we're trying to make
5601 sure that we gather the data, understand those.

5602

5603 Some of the concerns that we have, we want to understand the
5604 degradation rate and the constraints that we have as we
5605 store the fuel and dispose the fuel, as we transport the
5606 fuel, the criticality. It's a big issue for us. How it
5607 behaves. The thermal output per package is another one that
5608 we want to understand because its impacts on the cladding
5609 and the behavior of the cladding, like we just talked about,
5610 as well as secondary waste streams from operation and
5611 treatment.

5612

5613 But then we want to know, the next step is how will it
5614 affect disposal? How will these new fuels make an impact on
5615 what we do and when we actually dispose the materials?

5616

5617 The changes that we're looking at, especially to know and
5618 understand are the changes in radionuclide inventory, the
5619 changes in volumes of waste, are we producing higher
5620 volumes, smaller volumes? How is the reactor doing, what is
5621 it doing? Changes in thermal power of the waste, changes in

5622 durability of the waste and the waste streams that come out
5623 of it.

5624

5625 For each case, we want to know how do they change the
5626 repository safety and how do they change the repository cost
5627 and efficiency. Those are the two ultimate questions that we
5628 want to answer, to know and understand with the data that
5629 we're collecting.

5630

5631 On the proprietary reports, this is the first report that we
5632 have done on the proprietary report. The other thing I would
5633 note on the other one is, as we do those - as we work on
5634 those questions, we will be publishing and finishing this
5635 report in the not too distant future and we will be sharing
5636 it with others. So we're hoping, I don't know, hopefully
5637 around before Christmastime, before the end of the year we
5638 hope to be able to share this public report.

5639

5640 Again, it's non-proprietary. It's produced using data that
5641 is currently available in the public domain. A lot of
5642 website materials, things of that nature.

5643

5644 This is the picture of what we anticipate. This is what, the
5645 picture of the X-Energy one. We finished our first report on
5646 that project. As we look at this, there's a lot of things
5647 that we know and understand, a lot of things we don't. In
5648 order to do this, we created what we call the BEMAR team,
5649 the Back End Management of Advanced Reactors.

5650

5651 The hardest thing we've done so far is come up with the
5652 acronym for that thing, because we are good for error on
5653 what we could call it. One of the suggestions was COWARD,
5654 and then we're going to - that's a non-starter, so we stuck
5655 with BEMAR. Who doesn't like a good BEMAR? What can we say?

5656

5657 But anyway, so, we ended up with BEMAR. Finally came to
5658 closure on that. But what we're doing there is to implement
5659 a systems engineering approach where it's not just nuclear
5660 or whatever. We have incorporated specialties and
5661 specialists from a large number of fields, technical fields,
5662 to evaluate the data.

5663

5664 We're collecting the data from the advanced reactor
5665 companies, the vendors, whoever it is that wants a license
5666 from the NRC. We are working with them to gather that data

5667 right now. What we do is we fill out a spreadsheet and send
5668 it to them, and ask them to complete it for us.

5669

5670 The goal is to make a technical assessment of the
5671 feasibility for the storage, transportation, and disposal
5672 for the advanced reactors. And if we can, if we have enough
5673 data, then we would like to even make a cost estimate for
5674 the disposal of those materials. We'll see. We don't have
5675 that data yet. We haven't got to that point in our work, but
5676 we hope to do it in the not too distant future.

5677

5678 The BEMAR team is working to fully understand what we are
5679 being asked to receive from these manufacturers, owners,
5680 whoever. General Counsel, Department of Energy has the lead
5681 on this. Office of Nuclear Energy, Office of Clean Air
5682 Demonstration, as well as specialists from five national
5683 labs.

5684

5685 One of the things we have is we, there were several people
5686 that we asked to join this committee and some volunteered.
5687 We currently have about 30 individuals on our team. That's
5688 both a blessing and a problem, I'll just say it and we'll
5689 get into that a little bit more. But we are currently

5690 working to review the issue of the appropriate mechanism for
5691 the different type advance reactors for SNF.

5692

5693 The membership, the core group of our team, is right there.
5694 Myself and Jorge Narvaez are the co-leaders. There's just
5695 some of the specialties you see listed there and that
5696 doesn't even include everybody. There's a lot of specialties
5697 that we have on this team because of the number of
5698 specialties it takes to evaluate whether or not a site is
5699 safe or not and whether it can be used.

5700

5701 The companies that we have worked with so far are there on
5702 the screen. We have made contact with them, we are working
5703 with them now and trading data and trading information with
5704 them right now.

5705

5706 The data collection, we're collecting data from the advance
5707 reactors that the willing, with all the vendors who are
5708 willing to work with us. We hope to make a first round
5709 through all of the companies that would like the letter from
5710 DOE. We hope to do it in a year, maybe. I would hope that we
5711 could get through at least by next year at this time.

5712

5713 The data collected will not only help us understand the
5714 fresh field, but also this stuff coming out of the radiated
5715 fuel. The types of data that we're collecting are physical
5716 characteristics. Chemical composition, radiological
5717 inventory, and the operations and waste.

5718

5719 For the physical characteristics we're looking at the size,
5720 weight, shape, mass, density, all of those things - just
5721 physical things - so that we know and understand what they
5722 have. For the chemical composition we want to know if things
5723 like the initial enrichment, the fuel cladding that they'll
5724 use, associated hardware, as well as discharge burnup, the
5725 radiological. We want to understand the isotopic - isotopic
5726 composition for everything, the beginning through the end.

5727

5728 Long lived fission products, the operations and waste. We
5729 want to know the number of assemblies that they anticipate
5730 to have in their core, the inventory that they'll have, the
5731 irradiation with time, the decay of heat, canister design,
5732 reactor configuration, those type things.

5733

5734 As you can see, a lot of this is proprietary data and it's
5735 very important that we treat it correctly. What our goal is,

5736 when we're done, is we expect that we can tell General
5737 Counsel how much SNF we will have when we take these things
5738 from the vendors, and SNF and high-level waste.

5739

5740 We want to be able to tell Counsel the impact on the
5741 storage, transportation, and disposal that these fuels will
5742 have on those three activities. How it expects the standard
5743 contract, the contract that we have with Vogtle is radically
5744 different than the standard contract we have with some of
5745 the older ones that were done previous to, I believe is,
5746 well I'll just say previous, because they were signed at
5747 different times.

5748

5749 We want a rough order of magnitude, is what we originally
5750 would like to land on. The report is all export controlled.
5751 It's all proprietary. That's why we can't release it to the
5752 public because it's proprietary. A lot of these things are
5753 done under patents, they're done under new ideas. And it is
5754 their business so to speak and we're not there to influence
5755 business one way or the other; we're just there to gather
5756 data.

5757

5758 As far as the preliminary assessment, we want to know post-
5759 closure safety. The general concepts. We don't have a
5760 reactor that we can do, or excuse me a repository that we
5761 can do that analysis. And so right now we're using mostly
5762 simplified analyses on different rock types. And we're using
5763 personal opinions from a lot of our specialists because we
5764 don't have the data nor the time to do a detailed analysis
5765 for every one of these reactors at this point.

5766

5767 As we go further down the road we anticipate that that's
5768 where we will be, but right now that just doesn't exist and
5769 that'll have to come in the future. This is not a design
5770 review by the DOE. We are not there to tell them their
5771 design is good or bad or anything else. We're just there to
5772 collect the data. We are not negotiating with the utilities.
5773 The BEMAR team is a technical team that only sticks with the
5774 data and information that they have for their reactor. We'll
5775 get to the other parts later.

5776

5777 Non-disclosure agreements in order to get the data. Because
5778 we're doing this on the Nuclear Waste Policy Act, we don't
5779 believe that we need an NDA with our - with these companies
5780 yet. The vendor data is business sensitive and export

5781 controlled. We are currently classifying everything. The
5782 government used to have Official Use Only classification;
5783 they have changed that within the last year or two and they
5784 call it Controlled Unclassified Information, CUI.

5785

5786 All this data is CUI. And so, if anybody tried to get it
5787 under Freedom of Information Act, it's not going to happen
5788 because we're - it will be proprietary under CUI and that's
5789 one of the exemptions for the FOIA requests.

5790

5791 The vendor data evolves with times. Some of our reactor
5792 people, they're well along the road to get their reactor up
5793 and running. And they've done a lot of work, and they have a
5794 lot of designs, and they have a lot of people working for
5795 them really hard. And some of them are a little bit past
5796 the press release that they released a while back. So we
5797 have a long list of people who have moved along well, and
5798 some people are just starting into the process.

5799

5800 And even that, those that are moving along, their data
5801 continues to evolve, and their designs continue to evolve.
5802 And so, we have to stay in close contact with them so that
5803 when their data does change and it isn't the same as what we

5804 evaluated, then we have to make sure that we grab that data,
5805 include it in our reports as we move forward in the next
5806 series of evaluations.

5807

5808 The current size of the IPT is 30 members. Have you ever
5809 tried to manage 30 members of national labs in a discussion?

5810 It can be exhausting. And so, we're looking at reducing the
5811 size of it right now, but we're looking at maybe moving on
5812 to where we will have people come and go with the core team.
5813 But some of them have the expertise that we need; we just
5814 don't need it all the time for everything that we're doing.

5815

5816 There's a lot of moving parts. It is hard keeping up with
5817 all the data that's coming in and now we're meeting with
5818 them personally. We're writing questions to the labs or to
5819 the companies. They're writing answers to the companies. And
5820 like I say, and it's just managing all the records has been
5821 a challenge for us and we continue to do that.

5822

5823 We have everything on a SharePoint site that is encrypted
5824 and protected and so we believe that our ability to meet the
5825 CUI requirements is working well.

5826

5827 We're moving forward in good faith, but it is not believed
5828 that all the reactors, possible reactors, will be
5829 constructed. We believe that some will fall out, and some
5830 will continue. We don't know which ones will fall out. We
5831 don't know. So, we're treating everybody the same at this
5832 point. When they drop out it'll be their decision not ours.
5833 And so, we're working with that and we'll see what happens
5834 as we go down the road.

5835

5836 Our first report, again, was sent to General Counsel on the
5837 25th of April. We'll send them another copy. We sent them
5838 another copy at the end of July. We'll continue to update
5839 those reports. We believe that they're live, they're live
5840 reports, and that we will be updating and updating
5841 periodically and making sure that the design changes and the
5842 new information that come out will be incorporated into the
5843 design. And that's where we are at this point. I guess I'll
5844 let Brady take the wheel and we'll ask all the questions
5845 later.

5846

5847 HANSON: All right, thank you, Ned. I'll be building on a
5848 lot of what Ned said, what Scott and John said earlier. So,
5849 we've seen that sibling pins were started to be analyzed in

5850 2016. We've done a lot of great work. But you saw John say,
5851 we're now moving into Phase 2, that's going to take another
5852 two to three years. You saw Scott say that we're very
5853 interested in looking at BWR cladding. The Board has made
5854 that recommendation. We agree with the Board that that is
5855 something that needs to be done.

5856

5857 IFBA rods, because they have higher pressure, we may need to
5858 look at them. That's a long way of saying that what I'm
5859 going to present, there are other things in the line
5860 beforehand that are going to take time, that are going to
5861 take significant budget. So what I'm presenting is a longer-
5862 term, multi-year process. But because as Ned just said, we
5863 don't have the advance reactors yet. I don't have any other
5864 fuel to test.

5865

5866 And even if they were operating, we want to test their final
5867 product, not after first cycle or very low burnup. We want
5868 to see what it's going to be when we get it.

5869

5870 The same disclaimer as Ned said. Standard contract rules.

5871

5872 So, a little bit of history. In FY '21, the program put out
5873 a very high-level gap analysis on accident tolerant fuel and
5874 advanced fuels. Basically, says we're going - if it looks
5875 like a fuel rod, an LWR fuel rod, we're going to test it
5876 like one. If it looks different like TRISO, well, we got to
5877 figure out what to do.

5878

5879 The middle report, Ned just gave details on that. That was
5880 led by Sandia. We expect it to get through DOE review, and
5881 as Ned said, be released by the end of the calendar year.
5882 That one was on disposition strategies.

5883

5884 One of the main points for me that came out of that, that's
5885 important, is as we go forward trying to look at gaps,
5886 where's data missing, what do we need to do, you have to
5887 know what requirement you're trying to meet. So, the
5888 regulations are in place, for example, the one that says,
5889 you know, you need to prevent or minimize gross rupture of
5890 cladding.

5891

5892 How does NRC go about that? With guidance that says don't
5893 have a peak clad temperature above 400 degrees C, but that
5894 applies to ZIRC Alloy. Does it apply to the carbon in a

5895 TRISO particle or to the HT9 in a metal fuel cladding? We
5896 don't know. So, there's a lot of questions that need to be
5897 answered before we can, you know, finalize things.

5898

5899 I want to focus on the third report. So, in FY '22, under
5900 the appropriations process, Congress directed our program to
5901 look at advanced reactor backend and specifically said we
5902 want you to look at TRISO and metallic fuel reactors.

5903

5904 So, with the funding set aside for that, a team at Idaho
5905 National Lab led by Gordon Petersen in the audience here,
5906 and Ian Durell, I see him, led this. We had five labs broken
5907 into four teams, one that looked at TRISO, one that looked
5908 at metallic, one that looked at molten salt, and one that
5909 looked at what we called conduct of operations.

5910

5911 And these sub-reports all put together and Gordon and his
5912 team have the wonderful job of trying to put that all
5913 together in a very large report. But it's very comprehensive
5914 and serves a good basis for where we're going. Because it
5915 shows the history, like Ned talked about. It shows the
5916 designs of the reactors, what we know about their fuels so
5917 far.

5918

5919 And so that's going to form a good basis for where we're
5920 moving next. So, we want to look at accident tolerant fuels.
5921 Those, at first glance you say hey, maybe that's fairly easy
5922 to do. Everyone wants to put chrome on their cladding. Well,
5923 each of the vendors applies it differently. The substrate,
5924 i.e., the cladding underneath it is different. Is it M5, is
5925 it ZIRC Alloy, is it ZIRC-2? So, when you test one, it
5926 doesn't necessarily mean that you understand how the other
5927 two are going to behave.

5928

5929 The industry as a whole wants to move to higher burnup using
5930 higher enrichment, whether you want to call that Low
5931 Enrichment Uranium plus, LEU Plus, above 5, up to about 10%.
5932 There's of course the HALEU, the High Assay Low Enriched,
5933 that goes up to 20% which is more for the advanced reactors.

5934

5935 We want to look at all of those reactors. Like Ned said,
5936 there's a whole lot of them and they don't agree with each
5937 other for certain things. If you look at X-Energy's TRISO
5938 pebble, it's not the same as a Kairos pebble, which is not
5939 the same as the pebble that goes into some of the micro
5940 reactors.

5941

5942 So, it's definitely not a one size fit all, very complex.

5943 So, on the storage and transportation side, you heard Scott

5944 and John talk about the gap analysis that was done. We plan

5945 on doing the exact same thing. Going through, looking at

5946 cross-cutting gaps, focusing then on the fuel and cladding.

5947

5948 On the disposal side, going to follow the international

5949 process using features, events, and processes. Specifically

5950 looking at the spent fuel and waste forms, the lifetime, the

5951 potential for in-package criticality, which when you use

5952 HALEU fuel, is a lot more important than it has been in the

5953 past.

5954

5955 Waste package materials, you'll see a lot of the FEPs deal

5956 with that. One of the reasons is if we go on the assumption

5957 that we do direct disposal of canisters, since we now have

5958 over 4,000 of them, those canisters didn't have the long-

5959 lived neutron poisons like we had designed for Yucca

5960 Mountain, so the waste pack FEPs become more important.

5961

5962 But as Ned alluded to, the red box is really the most

5963 important. We are lacking publicly available information. It

5964 just isn't out there yet. And even what little that is out
5965 there, one vendor's design for their demonstration reactor
5966 isn't the same as what they're going to do when they
5967 commercialize it.

5968

5969 So again, just want to emphasize. This is a multi-year
5970 process to come up with this, these analyses. Ned talked
5971 about how important radionuclide inventory is. Obviously the
5972 higher you go on burnup, the more radionuclide inventory you
5973 have, roughly directly linear depending on the isotope
5974 you're looking at.

5975

5976 But it's important to know that right now in LWRs, the
5977 average assembly burnup coming out is 45 to 47. It's really
5978 not all that high. One of the reasons is when you are on the
5979 cycle lengths that we are, and you try to flatten the power,
5980 you pull out some assemblies early.

5981

5982 Industry is very interested in being able to go to higher
5983 burnup, up to 75 initially using 5 to 8% enriched. And then
5984 when you look at the XE-100, gee, they want to go to 168. So
5985 you're now talking, you know, three, four times the burnups
5986 that we're at now.

5987

5988 If you look at Fort St. Vrain, the typical core average was
5989 only around 39 to 40. So the TRISO that we will be dealing
5990 with in the future is going to look a lot different than
5991 what it did in the past.

5992

5993 For the Sodium metallic fuel reactor, for their Type 1B,
5994 that they call it, they want to go to 150 gigawatt days.
5995 Well, that's a metallic fuel with only minimal amount of
5996 alloy and agents in it. So, the closest analog is Hanford N-
5997 Reactor fuel. Professor Ballinger did a lot of work on that.

5998

5999 But comparing 150 gigawatt-day to something that's less than
6000 3 gigawatt-day doesn't necessarily track very well. So
6001 again, large gaps to look at.

6002

6003 Through an enrichment and obviously fast versus thermal
6004 spectrum will definitely matter. Thermal is very important,
6005 as Ned said. It dictates corrosion rates, oxidation,
6006 dissolution, stress corrosion cracking, creep. You need to
6007 understand your thermal well.

6008

6009 For repository, the thermal density really kind of dictates
6010 the size of your repository. How close can I put packages to
6011 one another? There's all kinds of different temperature
6012 limits we have to pay attention to. But long story short,
6013 the thermal density is going to be roughly proportional to
6014 your uranium density because that's where all the fissions
6015 are happening.

6016

6017 And if you look at it, you know, a TRISO pebble has pretty
6018 small amount of uranium for every cubic centimeter. If you
6019 look at a light water reactor, there's 9 grams of uranium
6020 per CC. You go to metal, you're up to 19. So already you can
6021 stop and sit there and go, each one of these is going to be
6022 very different in its thermal performance. Obviously it
6023 depends on how many assemblies or particles you put in each
6024 canister, how big the canister is.

6025

6026 But you're also interested in temperatures. We typically
6027 don't do a annealing of radiation damage unless your
6028 temperature is higher than it was in the reactor. That
6029 definitely happens with light water reactor fuels, depending
6030 on length of time for cooling for advanced reactors. It may

6031 or may not be higher. Most likely it will be cooler because
6032 those reactors run so hot.

6033

6034 We're interested in chemical characteristics. The best
6035 example is metallic sodium. We really don't like having that
6036 around because if it's exposed to humidity or water, it can
6037 react violently. You can see the figure on the right, that's
6038 what U 10% zirconium alloy looks like after it's been
6039 burned. You see the very large pores from the gas.

6040

6041 Metallic fuel doesn't like and does not hold fission -
6042 fission gas very well. That's why you have to have very
6043 large plenums associated with metallic fuel.

6044

6045 For a repository, we know that metallic fuel, we studied N-
6046 Reactor fuel, reacts very quickly. We called it
6047 instantaneous at Yucca Mountain purely because the time step
6048 for the TSPA was 100 years. This reacted within 100 years,
6049 therefore it's instantaneous.

6050

6051 However, if you use an alloy, if you put zirconium in with
6052 the uranium, we don't have the 10%, but we do for 20, it is

6053 6 orders of magnitude smaller. So, it makes a difference
6054 which one you're using.

6055

6056 So, we get into some of the cross-cutting gaps. We've
6057 already discussed thermal somewhat. Stress profiles, you've
6058 heard Ned and others talk about the multi-modal
6059 transportation test. We know for LWR fuels that the shocks
6060 and vibrations are equivalent to an angry wasp hitting a
6061 rod. That's literally what it came out to. We found out that
6062 fatigue is next to nothing.

6063

6064 But with these new fuels, if I have two pebbles sitting next
6065 to each other and they're just vibrating, am I rubbing off
6066 and generating dust which may contain Carbon 14 and Tritium?
6067 In the metallic fuels, they don't have grid spacers; they
6068 have wire wrapping around them to do the separation to allow
6069 the coolant to flow through. But with those wires sitting
6070 there, do they rub? Can I fret through my cladding?

6071

6072 The same thing with the accident tolerant fuels with the
6073 chrome coating on it. If rubbing causes me to fret through
6074 and I'm now exposing the cladding underneath, do I have

6075 accelerated corrosion, like pit corrosion, because of the
6076 narrow area that I'm looking at?

6077

6078 For 30-centimeter drop, same type of thing. We know that for
6079 LWRs, we can slightly bend grid spacers. With TRISO fuels,
6080 what if I fracture the silicon carbide layer? We know it's
6081 fairly brittle to start with. If I fracture, now suddenly I
6082 can expose the fuel underneath.

6083

6084 With the wire wrapped fuel, again, does that serve as a
6085 pinch point? And I want to be clear - none of these are ones
6086 where we've said yes, these will happen. These are all just
6087 questions. That's why you do a gap analysis. What's in the
6088 literature, what analyses can we do to say are they or are
6089 they not a problem.

6090 If they are, as Ned said, now we have to have a modeling and
6091 testing program to answer that and that's what the gaps are
6092 for.

6093

6094 For drying, TRISO fuel is always dry coming out of the XE-
6095 100. Why would I ever want to put it in water? So now I need
6096 to worry about a surface facility. If I have to repackage it

6097 or something goes wrong, do I or do I not want to do it in a
6098 pool or in a hot cell?

6099

6100 The same thing with sodium bonded fuel. You know, they
6101 remove the sodium before it, the external sodium, before it
6102 goes into a package, but what if a rod fails during storage
6103 and transportation, and now I have to put it in a pool?

6104 Again, not a very good idea. So these are the types of
6105 things we have to look at.

6106

6107 Fuel gaps, I believe someone on the Board brought up fuel
6108 fragmentation as an issue. Obviously when you go to high
6109 burnup in accident scenarios in an LWR, you can have
6110 fragmentation and dispersion. We're going to much higher
6111 burnups than we have before. Is this or is this not an
6112 issue?

6113

6114 Swelling that can cause very localized stresses on your
6115 cladding and cause it to fail. Is that an issue or not? You
6116 look at things such as having more alpha. We know from what
6117 the French have studied for their repository program that
6118 MOX fuel is far different than even high burnup LWR uranium

6119 oxide fuel because of all that extra alpha in it that can
6120 lead to pressurization over time.

6121

6122 Well, now if you go to much higher burnups, like we're
6123 talking about, does that become an issue, especially with
6124 the higher actinides that get produced?

6125

6126 Fission product attack on cladding. We have the picture in
6127 the middle showing various kinds on TRISO. Again, if I'm
6128 going to three, four times the burnup I had before, I have a
6129 lot more fission products. Do I need to worry about this
6130 kind of attack more than I did in the past?

6131

6132 Oxidation is going to depend on what your form is. Metal
6133 will go faster than an oxide. How exactly does the uranium
6134 carbo-oxide that people want to use for TRISO, how does that
6135 behave? What's the effect of very high burnup? Do I get
6136 enough pores that increase my surface area so much?

6137

6138 All kinds of questions. Again, we don't know the answer.
6139 That's the reason for doing a gap analysis. When you look at
6140 cladding, the obvious question is, well, what do you mean by
6141 cladding? It's very clear for a light water reactor fuel. Am

6142 I going to call each separate layer in my TRISO particle
6143 cladding, or am I only going to count the silicon carbide?

6144

6145 When you look at metal fatigue, we were worried about it
6146 initially for the LWR fuels, mostly from diurnal and
6147 seasonal changes causing temperature fluctuation. But now
6148 with the metallic fuels where the fuel portion is very small
6149 and I have this very large plenum that doesn't have fuel in
6150 it, so it's going to be a lot cooler. My temperature profile
6151 is going to look a whole lot different. A lot of questions
6152 that we need to ask ourselves.

6153

6154 I did just want point out to this report that came out
6155 literally just three weeks ago, NUREG-CR written by folks
6156 here at Idaho looking at all the fine, the U-10 Zirc and HT9
6157 cladding up to 10 atom percent burnup. And notice that what
6158 it says is if you go beyond that, you have to do additional
6159 monitoring, surveillance and testing.

6160

6161 Well, the proposed advanced reactors are going to go above
6162 10%. So obviously it says you're missing data, as Ned said.
6163 There's some out there, but we need more in order to
6164 understand how it will really behave.

6165

6166 Switching then to disposal. We look at features, events, and
6167 processes. If you look at this list, now this is a list of
6168 what was included in the Yucca Mountain FEPs analyses for
6169 license application, and you see an awful lot of them have
6170 to do with canister corrosion, one on waste form degradation
6171 and obviously that's terribly important and its importance
6172 will depend on which geologic media you're in.

6173

6174 But again, the package becomes more important when, at least
6175 what we put in the license application for Yucca Mountain,
6176 we had a specific design. It had long-term neutron poisons
6177 in it to mitigate potential criticality concerns.

6178

6179 If I do direct disposal, I no longer have that. And so
6180 worrying about how quickly the canister corrodes to not only
6181 expose your potential source term, but for potential
6182 criticality becomes an issue.

6183

6184 The top three are still ones that were included in the Yucca
6185 Mountain LA, but the bottom are ones that were excluded for
6186 various reasons from Yucca Mountain. But again, now if I'm
6187 going to much higher burnup, anywhere from 50% higher to 100

6188 times higher, depending on what you're comparing against,
6189 alpha recoil.

6190

6191 Again, if I have a lot more, higher actinides, I'll have a
6192 lot more alpha. What is that impact going to be?

6193 Pyrophoricity, yeah, if I have - if I have to dispose of
6194 metallic sodium, that's an issue. Even metallic uranium, we
6195 know that if it reacts with water, it can pick up hydrogen.
6196 You make uranium hydrides, they react more violently than
6197 the uranium metal alone, so it becomes a real issue.

6198

6199 So - actually went faster than I thought I would. Ned, you
6200 lost the bet. So the summary is, we are initiating this
6201 based on the reports that we've done over the last few
6202 years. It's going to be detailed. We're going to look at
6203 accident tolerant fuels at high burnup, high enrichment.
6204 We'll look at advanced reactors.

6205

6206 We haven't decided well, do we need to do a separate gap
6207 analyses for each one of those or do we do just one giant
6208 one? That's still to be determined. But again, it's a very
6209 complex undertaking because there is no one size fits all.
6210 It's very different fuel, very different cladding.

6211

6212 Like I say, none of the vendors, you know, are using the
6213 same thing. At least right now we're all using UO₂ fuel, so
6214 that makes it pretty easy. It will be a multi-year effort.
6215 Exactly how long, we don't know. We'll know better when we
6216 get into it.

6217

6218 And again, the disposal folks are especially concerned about
6219 post-closure criticality. If I have more actinide, higher
6220 actinides, if I have more residual U-235, the potential for
6221 post-closure criticality increases significantly.

6222

6223 And then lastly, there is a committee within the EPRI ESCP
6224 program. Right now, Sven Bader from Orano runs it. We are
6225 tied in with them. There is talk about that group working on
6226 the gap analysis for advanced reactor fuels as well.

6227 Different group looking at accident tolerant fuels. So, we
6228 are very well tied in with industry and what's going on.

6229

6230 I do have a slide of references, so you can look up to see
6231 where all the neat pictures and numbers came from. And with
6232 that, 36 seconds early for your questions. Thank you.

6233

6234 SIU: Thanks Ned and Brady. Our small Board team for this
6235 particular topic is Ron Ballinger and Lee Peddicord. So Ron,
6236 if you want to start questions.

6237

6238 BALLINGER: Okay. I'll be dead, you'll be dead, Ned will be
6239 dead and half the people in this room will probably be dead
6240 by the time we build one of these advanced reactors.

6241

6242 LARSON: We don't determine that, but some are saying as
6243 early as mid-'30s. I'll take you out to lunch when it all
6244 happens. I'll fly back and take you out to lunch.

6245

6246 BALLINGER: We'll, I'll buy the '30, but not the first two
6247 digits [chuckles]. But anyway, what I'm trying to get at is
6248 we're going to be using light water reactors for a much, for
6249 a very long time.

6250

6251 LARSON: Yes.

6252

6253 BALLINGER: And so, the programs that you're involved with,
6254 the resource allocation part, probably should be thought of
6255 a little bit carefully. Can't really say too much - too much

6256 more because I don't, we can't make recommendations, and I
6257 don't know the answer, actually.

6258

6259 LARSON: No, your point is well taken in that right now the
6260 most expensive things we're doing are in the hot cells, all
6261 those things are expensive, the course. The data we're doing
6262 here would, nothing has been in a lab nor do we expect
6263 anything to go into a lab for ten years maybe, earliest. And
6264 so, the professional time we can manage, if you're with me,
6265 but you're right, we can't throw too much money at it.
6266 You're exactly correct, but it has to be managed correctly.

6267

6268 BALLINGER: Another one is, is Abilene Christian University
6269 a 103 or 104 reactor, going to be? Will they have to have
6270 the standard contract? I was there.

6271

6272 LARSON: We don't know yet. We're still collecting data. We
6273 haven't seen all of their data yet and I can't talk about
6274 what we know and what we don't know with those guys, but
6275 we're still working with them right now.

6276

6277 HANSON: But if you want the department -

6278

6279 LARSON: To take the fuel.

6280

6281 HANSON: You have to have a contract.

6282

6283 BALLINGER: Oh, okay. Because it's going to be licensed as a

6284 non-commercial reactor, not a -

6285

6286 LARSON: As a non-electricity?

6287

6288 BALLINGER: Yeah, not generating electricity.

6289

6290 LARSON: Yeah, yeah, yeah. No, and there's even, I'll just

6291 say we're even discussing how would they participate in the

6292 waste fund if they're not generating any electricity.

6293

6294 BALLINGER: Yeah.

6295

6296 LARSON: Those are some of the things that we're working on.

6297

6298 BALLINGER: Thanks.

6299

6300 LESLIE: Bret Leslie, Board staff for Dr. Paul Turinsky. How

6301 is DOE going to gather in time so as to not delay initial

6302 test fuel irradiation, the required technical information to
6303 make an informed decision of whether the spent fuel is
6304 technically acceptable for disposal?

6305

6306 LARSON: Can you read that again?

6307

6308 LESLIE: Absolutely. How is DOE going to gather in time, so
6309 as not to delay initial fuel test irradiation the required
6310 technical information to make an informed decision of
6311 whether the spent fuel is technically acceptable for
6312 disposal?

6313

6314 HANSON: So, I think the answer to that, like Ned said, on
6315 BEMAR we at least are able to have direct discussions with
6316 the vendors. All of that data is UCI, so we can't share it
6317 in forums like this. But the point is well taken. I mean,
6318 you know, we're having discussions that include General
6319 Counsel of okay, what does it mean when you have a sodium
6320 bonded fuel?

6321

6322 Nobody wants a pyrophoric material. I don't like it in
6323 storage. We definitely don't want it in a repository,
6324 especially if that repository is in a saturated environment.

6325 It will see water. So, it's really up to General Counsel to
6326 decide, you know, as Ned said, we're making technical
6327 recommendations, but General Counsel has to decide okay, if
6328 there's no metallic sodium, whose job is it to remove it?
6329

6330 LARSON: Yeah, we haven't gone into, made decisions on
6331 whether we'll accept it, whether the department will do any
6332 treatment, whether the companies will do any treatment. None
6333 of those decisions has been made yet and we're still looking
6334 at the fuel as it comes in.

6335

6336 One of the things I'd like to stress a little bit, and that
6337 is we only have to be in negotiations with these companies.
6338 So we don't believe we're on the critical path for them.
6339 Because once we're in negotiations, they can still
6340 interacting with the Department of, the Nuclear Regulatory
6341 Commission, excuse me. And they can still work with them
6342 while we continue to work on the contract itself.

6343

6344 But as long as we're in negotiations, which after we do
6345 these reports we anticipate we will be sending those
6346 letters, we believe we're not on the critical path for them.
6347

6348 LESLIE: Ned, thanks. I think that's probably enough because
6349 I haven't gotten another email from Paul. [Chuckles] However
6350 -

6351

6352 LARSON: Understood.

6353

6354 LESLIE: The small board team member has a couple of
6355 questions. So, this, again, this is Bret Leslie, Board
6356 staff. I'm putting my hat on as Lee Peddicord, and this one
6357 is for Brady. Brady listed a lot, a lot of issues, how will
6358 you prioritize? Also, Ned and Brady said they want to work
6359 on the fuels that will not, that will not first cycle, but
6360 those are a long way away. Where do you start now?

6361

6362 HANSON: So, in terms of prioritization, I go along with
6363 what Ned said. We need to see which reactors actually mature
6364 and move forward. Right now, as I stated, we're under the
6365 assumption that the two reactors that are officially funded
6366 under the advanced reactor demonstration program, as
6367 demonstrations, not as risk reduction.

6368

6369 We're assuming that those two will be the ones moving
6370 forward first and therefore, that's what has our attention.

6371 But I'll go back to what Professor Ballinger said. We've got
6372 an awful lot to do to still close out the current fuels,
6373 current light water reactors. There are licensing actions
6374 dealing with storage license renewals, potential
6375 transportation. So those definitely take priority.

6376

6377 LESLIE: Bret Leslie, Board staff. Again, this is for Dr. -
6378 Board Member Lee Peddicord and this is for Ned. Ned talked
6379 about the evolution of the standard contract and that Vogtle
6380 3 is different than earlier versions. Do you envision the
6381 need for further changes in the standard contract for
6382 advanced fuels and the new reactors?

6383

6384 LARSON: He's asking me to speculate and predict a future,
6385 which is always difficult. But where we are right now is
6386 when we gather the data and we write our reports and share
6387 it with counsel. Counsel will be the one that actually makes
6388 that decision. We will make a recommendation, I'll just be
6389 candid, but it will be them that actually makes the decision
6390 on how that is done. And so, it's hard to say right now. I
6391 believe, me personally I believe that there may be some
6392 changes depending on the reactor that we're dealing with and

6393 the type of fuel, but I don't know that yet until we get all
6394 the data.

6395

6396 BALLINGER: I had a question, it really wasn't for you, it's
6397 for the Board. And that is, I'm not sure we can handle CUI.

6398

6399 LARSON: We don't believe so right now. We believe that is
6400 locked in the department. We talked to counsel, we didn't
6401 ask them about the Board, but we did ask them about the NRC,
6402 and the answer was no.

6403

6404 BALLINGER: Well, I know the NRC can handle CUI.

6405

6406 LARSON: And so, I don't know. We can ask counsel, it's
6407 their call, but right now we are not sharing it with anyone.

6408

6409 BALLINGER: So that means for us to get access, the Board to
6410 get access, that would have to change.

6411

6412 LARSON: I believe so.

6413

6414 SIU: Scott?

6415

6416 TYLER: Thanks. Scott Tyler, Board member. I just want to
6417 maybe blink the previous presentations to this one, with
6418 respect to thermal management and thermal modeling. So given
6419 the experiences you had so far with modeling the
6420 demonstration casks and temperatures, what are the things
6421 that are going to be needed to be looking at temperatures
6422 for these new fuels in casks with respect - my interest is
6423 what are the temperatures we might see in a repository
6424 environment on the canisters? Are there some things that the
6425 modeling community for thermal modeling will need to be
6426 looking at that's different than they're already looking at?
6427

6428 HANSON: I'll think you'll need to refine things, but the
6429 physics are pretty well understood. You either conduction or
6430 you have convection going on. I did want to expand a little
6431 bit, so thank you for the question Scott. One thing, on our
6432 side of the program you know, we take great pride in the
6433 multi-modal transportation test. We think that was really
6434 groundbreaking and made a big difference in how NRC views
6435 transportation. It's basically a no never-mind now.
6436
6437 Our sibling program, the integrated waste management, they
6438 actually have the very nice database that's called UNF-

6439 ST&DARDS. That, what's really nice about it is they go
6440 through and they take the GC8 59 database, so basically
6441 every five years the utilities have to fill out and say what
6442 assemblies they have, where are they.

6443

6444 If they're loaded in dry storage, we actually know what the
6445 loading pattern is. And the same team that did all the
6446 thermal analysis for the demo cask and lots of others, built
6447 the templates, if you will, to feed into UNF-ST&DARDS.

6448

6449 So now it can go through and calculate when loaded and at
6450 any future time what are the temperatures. It mostly focuses
6451 on fuel, but I think it could be expanded to look at
6452 canister temperatures as well and then be able to say okay,
6453 yeah, if 300 years from now it's in a repository, what
6454 temperature would it be? So, I think it's a great tool.

6455

6456 LARSON: Let me just make one clarification, if I may. When
6457 Brady says transportation is a no never-mind, that's in
6458 relation to shock and vibration only, not to stakeholder
6459 involvement and not to any of the other stuff.

6460

6461 HANSON: Yeah, sorry.

6462

6463 LARSON: We're just talking shock and vibration there.

6464

6465 TYLER: Thank you.

6466

6467 LESLIE: Bret Leslie, Board Staff, and I'll put on my
6468 features, events, and processes hat from the Yucca Mountain
6469 days. The international database, NEA, really was, the
6470 database was developed with light water reactors in mind.
6471 And I'm not sure NEA has thought about whether there are any
6472 new FEPs for advanced reactors. And what I heard you guys
6473 is, or Brady say, was you're kind of reliant on the current
6474 database. Are there any new features, events, and processes
6475 that need to be considered? And you don't have to have the
6476 answer yet, but have you just assumed that the list is
6477 complete?

6478

6479 HANSON: No. I know the folks at Sandia have really been
6480 thinking about that. I know our lead guy who's been worried
6481 about FEPs for a number of years, Jeff Freeze is retiring
6482 next month, so we've got to pass the torch to someone there.
6483 But I think we're very open-minded in, as you said,

6484 realizing that the paradigm has shifted, and we need to look
6485 are there other things to add.

6486

6487 LESLIE: So, a follow-up, which was - and again, I know you
6488 were involved in Yucca, and so you have your mindset like
6489 that in terms of how you looked at these features, events,
6490 and processes. So, there were a number that were excluded at
6491 Yucca Mountain because it was unsaturated, and therefore gas
6492 generation wasn't an issue.

6493

6494 Well, in fact gas generation's extremely important in
6495 disposal programs in argillite and in crystalline rock. And
6496 yet in your slide of things to be worried, gas generation
6497 wasn't on it. So, was that an incomplete list, or just
6498 examples?

6499

6500 HANSON: That was just examples, yes.

6501

6502 LESLIE: Thank you.

6503

6504 LARSON: Next time you see it, it'll be on. [Chuckles]

6505

6506 SIU: Okay, do we have any other questions from the Board or
6507 its staff? With that, thank you very much, Brady. You guys
6508 are even further ahead of schedule. More time for public
6509 comment. At this point we have one person signed up for
6510 public comment in the audience. Is there anybody else? One?
6511 That would be two people. And we have plenty of time. Okay,
6512 just as a reminder, the recording for this meeting will be
6513 available on our website September 4th and transcript it will
6514 be available October 30th. Comments that we hear from the -
6515 online comments will be posted later today, early tomorrow.
6516

6517 LESLIE: Probably early tomorrow.

6518

6519 SIU: Probably early tomorrow. So first, Tami?

6520

6521 THATCHER: Hello again, Tami Thatcher. I'm from Idaho Falls,
6522 Idaho. I appreciated the last three presentations. I was
6523 disappointed that the last presentation didn't have a paper
6524 copy. It had quite a bit of detail and there was no paper
6525 copy available. Just to point that out.

6526

6527 We've still got the slide up here. This one just says clean,
6528 reliable, nuclear. But a lot of DOE's, and this isn't maybe

6529 a DOE slide, but a lot of DOE's information tends to say
6530 clean, reliable, safe, affordable.

6531

6532 The last three presentations have pointed out that NRC
6533 licensing was conducted for high burnup fuel with
6534 information gaps. So, they were guessing it would be
6535 alright. Gaps were identified long ago. We were pointed out
6536 that 2013 gaps were identified, and they're still working on
6537 those gaps.

6538

6539 So, NRC licensing for fuel storage and transportation and
6540 disposal was based on best guesses, lacking test data. These
6541 gaps are prioritized based on significance and they're
6542 significant gaps. They're not just oh, this would be nice to
6543 have.

6544

6545 What's the tensile strength of the fuel? Don't you think you
6546 need to know that if you're going to know how that fuel
6547 behaves in a transportation accident, for example? So, gaps
6548 for existing licensed fuel still not addressed.

6549

6550 So now we come along, we have 30, 40 new advanced reactor
6551 concepts. They all require specific analysis. And you're

6552 getting an idea of how complicated it is, each fuel and not
6553 just its prototype fuel which is going to be different from
6554 the actual commercialized fuel. Not the demonstration fuel.
6555 We only want to look at that. We'll look at your later fuel.
6556 So, let's put it off. Oh, we're having trouble getting the
6557 uncontrolled information. Controlled, whatever, information,
6558 CUI, whatever. We don't have the information, it's
6559 proprietary.

6560

6561 How can we possibly even guess hardly how this fuel is going
6562 to perform in fuel storage, in transportation, and in
6563 disposal? By the way, the Department of Energy is giving
6564 billions of dollars to these nuclear builders to build these
6565 new reactors, and then it says, but this information is
6566 proprietary and it's a lot of work and we're not going to be
6567 looking at their fuel after they just have a prototype;
6568 we're going to wait until it's built, we have fuel. Then
6569 we'll consider the gaps and start looking at it and maybe
6570 that'll take a few more decades. And of course, you know it
6571 all ties into the repository which we don't have. So what's
6572 the hurry, anyway?

6573

6574 Allison McFarland has worked for the NRC, was a specialist
6575 on studying geology and Yucca Mountain. And she has pointed
6576 out that a lot of these small modular reactors, some of
6577 which are considered advanced reactors, are going to require
6578 2 to 30 times as much space in a repository than
6579 conventional light water fuel.

6580

6581 And so now I have to wonder, when DOE says nuclear is
6582 affordable, and they have never analyzed these things, and
6583 they have no idea what it's going to take to dispose of this
6584 fuel, I have to wonder how they claim it's affordable?

6585

6586 You know, we have Fort St. Vrain fuel in Idaho, some in
6587 Colorado - or I think we have some in Idaho and some in
6588 Colorado. In Colorado they spend \$8 million dollars a year
6589 just storing that fuel from that financially failed project
6590 that ran for about ten years. So, I have to understand, I
6591 have to wonder, you know, what truth in advertising, doesn't
6592 that matter?

6593

6594 When DOE says this is affordable, and they admit they have
6595 no idea what disposal is going to cost? They don't know what
6596 reprocessing is going to cost. They don't know how many

6597 times they're going to have to repackage the fuel. They
6598 don't know how much money it's going to take to design each
6599 facility to repackage each different type of fuel. How on
6600 Earth are they claiming it's affordable? And we won't even
6601 get started on safety. Thank you.

6602

6603 SIU: Thank you. Would you come up please, your name and
6604 affiliation?

6605

6606 FORD: Hello. Thank you so much for having, giving me the
6607 opportunity to speak. My name is Leigh Ford. I work with
6608 Snake River Alliance. We're based in Boise, Idaho. I was
6609 born in Idaho Falls. Both my grandfathers worked at Idaho
6610 National Lab. I moved to Boise when I was young.

6611

6612 So, I, just a couple of lessons that most of our parents
6613 probably taught us, and my parents taught me is that, before
6614 you get a new toy, you need to clean up your mess. And I,
6615 the last couple of days, I've, you know, and for the years
6616 I've worked with Snake River Alliance, nuclear waste is a
6617 problem that we have and it's a very complicated problem.
6618 And I feel very strongly that we need to clean up this mess
6619 before we start talking about these new clean reactors.

6620 Nuclear waste is not clean. And so, the word 'clean' really
6621 doesn't mean anything to me anymore, to tell you the truth.

6622

6623 Another lesson my parents and most of our parents told us is
6624 that, you know, when you're wrong you admit it and you
6625 apologize. And that's something that I think our Swedish and
6626 Swiss people that we invited here gave us some very valuable
6627 lessons.

6628

6629 If DOE wants to build trust with us, they're going to need
6630 to admit to the past mistakes and apologize. And I don't
6631 know how we're going to do that with the indigenous people.
6632 Our situation is different here and in Canada. This is
6633 colonized land and we have a lot of reparation to do.

6634

6635 Further, I heard the DOE say that women are more cautious.
6636 And I also heard the DOE say that a lot of the - a lot of
6637 the problems that people have is that they don't, is that
6638 it's an emotional reaction to waste and that it's fear.

6639

6640 Not - withholding documents and lying and not admitting to
6641 wrongs, that creates - that creates mistrust and so, that
6642 needs to be dealt with. So, when women come forward and

6643 we're told that we're just emotional or we're fear-based,
6644 that doesn't develop trust. That doesn't foster an open
6645 communication.

6646

6647 And if you want to hear from women and people that aren't
6648 technologically, you know, have a technological background,
6649 then I think to be dismissive of our concerns is not going
6650 to be building in trust.

6651

6652 I am happy to hear that environmental justice is at the
6653 forefront of DOE's considerations. I think indigenous
6654 peoples of this country have been telling us that we need to
6655 look seven generations into the future. And now we've come
6656 up with a word for it and I'm glad that it's being
6657 considered. And I hope that with administration changes that
6658 that is still a focus.

6659

6660 But my main point is today that we need to clean up the
6661 waste before we start talking about creating new waste and
6662 with fuel by the way that we don't even have. We were buying
6663 from Russia. So, that's all I have; thank you so much for
6664 this meeting. Thank you for inviting me, and thank you for
6665 the opportunity to comment.

6666

6667 SIU: Thank you. Again, last call for comments? Okay. With
6668 that we have a lot to think about as a Board and we will be
6669 discussing this in our next business meeting, which is
6670 tomorrow. So, with that I guess we can call it a day. And
6671 thanks to our crew for excellent support. I'm sorry? We'll
6672 talk about that. [Applause]