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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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613TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

(OPEN)

+ + + + +

THURSDAY

APRIL 10, 2014

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Advisory Committee met at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B1, 11545 Rockville Pike, at 8:30 a.m., John W.
Stetkar, Chairman, presiding.

COMMITTEE MEMBERS:

JOHN W. STETKAR, Chairman

HAROLD B. RAY, Member-at-Large

SANJOY BANERJEE, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

MICHAEL L. CORRADINI, Member

DANA A. POWERS, Member

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1 JOY REMPE, Member
2 PETER RICCARDELLA, Member
3 MICHAEL T. RYAN, Member
4 GORDON R. SKILLMAN, Member

5
6 DESIGNATED FEDERAL OFFICIAL:

7 EDWIN M. HACKETT

8

9 ALSO PRESENT:

10 ROB BECK, Bechtel
11 PATRICIA CAMPBELL, GE Hitachi
12 PETER HASTINGS, B&W mPower
13 DAVE KANUCH, B&W mPower
14 DOUG LEE, B&W mPower
15 ERIC WILLIAMS, B&W mPower

16

17 NRC STAFF:

18 ANNA BRADFORD, NRO
19 HAROLD CHERNOFF, NRR
20 THERESA CLARK, NRO
21 STEPHANIE COFFIN, NRO
22 JOSEPH GIANIOLLI, NRR/DIRS
23 TEKIA GOVAN, NRO
24 A.H. HSIA, NRO
25 RONALDO JENKINS, NRO

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3 HUAN LI, NRO
4 STEWART MAGRUDER, NRO
5 DAVID MISENHIMER, NRO
6 JOHN NAKOSKI, RES
7 THOMAS SCARBROUGH, NRO
8 GEORGE TARTAL, NOR
9 ERIC THOMAS, NRR/DIRS
10 KENNY THOMAS, NSIR
11 JOSEPH WILLIAMS, NRO
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P-R-O-C-E-E-D-I-N-G-S

(8:32 a.m.)

CHAIRMAN STETKAR: The meeting will now come to order.

This is the first day of the 613th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will discuss the following: Economic Simplified Boiling Water Reactors Supplemental Final Safety Evaluation Report, Overview of NRC Operating Experience Program, Overview of the B&W mPower Small Modular Reactor Design, NRC Staff Activities Regarding Small Modular Reactors, the Biennial Review of the NRC Research Program, and Preparation of ACRS Reports.

The session on the ESBWR Supplemental Final Safety Evaluation Report will be closed in order to discuss and protect information designated as proprietary, and the portion of the session on the overview of the B&W mPower small modular reactor design will also be closed to protect proprietary information.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. Christopher Brown is the

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1 Designated Federal Official for the initial portion of
2 the meeting.

3 We have received no written comments or
4 requests to make oral statements from members of the
5 public regarding today's sessions.

6 There will be a phone bridge line. To
7 preclude interruption of the meeting, the phone will
8 be placed in listen-in mode during the presentations
9 and Committee discussion.

10 A transcript of portions of the meeting is
11 being kept, and it is requested that the speakers use
12 the microphones located throughout the room, identify
13 themselves, and speak with sufficient clarity and
14 volume so that they can readily heard.

15 As an item of interest for us today, we
16 would like to announce and congratulate Dr. Dana
17 Powers for being appointed to his sixth term on the
18 Committee.

19 (Applause.)

20 I would like to say we appreciate his sage
21 wisdom, which is something I would like to say.

22 MEMBER POWERS: But you are not going to.

23 (Laughter.)

24 CHAIRMAN STETKAR: But I am not going to
25 say it.

1 (Laughter.)

2 MEMBER POWERS: The words just won't come
3 out, just your internal --

4 CHAIRMAN STETKAR: I'd like to say that.

5 Anyway, we will proceed with ESBWR, and I
6 will turn the meeting over to Dr. Mike Corradini.

7 MEMBER CORRADINI: Okay. Thank you very
8 much, John.

9 Today we are going to have -- our first
10 topic will be essentially the NRC's review of the
11 ESBWR steam dryer. I will note that the meeting is
12 closed to the public, and I assume that that has been
13 checked.

14 CHAIRMAN STETKAR: We're going to have to
15 make sure that we have the bridge line closed. So
16 let's let Chris take care of it.

17 (Whereupon, the proceedings in the
18 foregoing matter entered into Closed Session at 8:35
19 a.m. and returned to Open Session at 10:16 a.m.)

20 CHAIRMAN STETKAR: We are back in session,
21 and we are in open session now.

22 And the next topic on our agenda is NRC
23 Operating Experience Program Overview, and Dick
24 Skillman will lead us through that. So Dick, please?

1 MEMBER SKILLMAN: Mr. Chairman, thank you.
2 Good morning. I would like to introduce this topic as
3 follows. About six or eight months ago, Dennis Bley
4 and I, Dr. Bley and I, were sitting in office cubicles
5 talking about the amount of information that is
6 available, not only to the ACRS staff but to the whole
7 agency relative to operating experience. And as
8 Dennis and I talked about this, we opined, wouldn't it
9 be valuable to let the members of the ACRS know how
10 much effort is invested in this topic and what
11 resources are available.

12 And so this discussion this morning began
13 with that short interaction, and I asked my colleague,
14 Mark Banks, to please help. Mark has corralled a lot
15 of this information and has invited Eric here today.
16 So I welcome Eric Thomas from the Operating Experience
17 Branch. Around this table I am sure there are people
18 who remember AEOD and Carlisle Michaelson and when
19 this began, and here we are I'm going to guess 20
20 years later.

21 And so I would ask you -- so I would like
22 to ask you to take the lead, and this is an
23 opportunity for you to dazzle the ACRS with what
24 you've got there. So please take the lead.

1 MR. THOMAS: Don't set your expectations
2 too, too high there.

3 Well, thank you. And contrary to my
4 hairline, I do not remember the AEOD. I was not part
5 of the agency then, but I have heard a lot about it.

6 Thanks for the introduction, and, again,
7 my name is -- good morning. My name is Eric Thomas.
8 I work for Harold Chernoff in the Operating Experience
9 Branch in NRR. This morning I will be providing you
10 all with an overview of the NRC's reactor operating
11 experience program. I will start with a little bit of
12 background, including a brief history of the program
13 and some of the events and milestones that got us to
14 where we are today.

15 This includes a discussion of how Three
16 Mile Island changed the operating experience
17 landscape, how the agency dealt with operating
18 experience in the two decades that followed, and I
19 will discuss how some of the observations in the
20 Davis-Besse lessons learned task force report and the
21 follow-on reactor operating experience task force
22 report reshaped the NRC's reactor operating experience
23 program into what it is today.

24 I'll show you where the current program
25 fits into the agency's reactor oversight process.

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1 We'll do our basic processes for dealing with reactor
2 operating experience, and the people and programs that
3 we have in place to accomplish our mission.

4 Finally, I'll touch on some of our
5 internal and external interfaces, such as the other
6 NRC staff, the Institute of Nuclear Power Operations,
7 and our international partners.

8 Real quickly, our governing documents,
9 Management Directive 8.7 came about, as well as
10 LIC-401. NRC Office -- or NRR Office Instruction
11 LIC-401 came about as part of the program in the last
12 10 to 12 years. These are our two program documents
13 that govern the NRC's reactor operating experience
14 program. In addition, Inspection Manual Chapter 2523
15 describes how we interact with the reactor oversight
16 process in areas such as developing operating
17 experience smart samples and proposing changes to
18 inspection processes.

19 We'll spend a little bit of time on this
20 slide here -- brief history. In 1978, the GAO found
21 that the NRC had no -- in a GAO report, they found
22 that the NRC had no systematic defined or dedicated
23 program to analyze operational experience and feed
24 this information back to licensees and to the nuclear
25 industry. GAO identified the need for the NRC to

1 establish uniform reporting requirements and a system
2 to promptly identify all safety-related problems from
3 licensee event and other incident reports. That's
4 right from the report.

5 So as we were looking at this, Three Mile
6 Island happened, and it happened before the agency
7 could formally respond to the GAO's audit. Following
8 the accident at Three Mile Island, we formed the
9 Office for Analysis and Evaluation of Operational
10 Data, AEOD. It was created as an independent office
11 reporting directly to the EDO. Their mission was to
12 coordinate operational data collection, systematically
13 analyze and evaluate operational experience, feedback
14 the lessons learned of experience to improve
15 operational safety, assess the effectiveness of the
16 agency-wide program, and act as a focal point for
17 interaction with outside organizations on issues
18 pertaining to operational safety, data analysis, and
19 evaluation.

20 So AEOD was disbanded around the 2000
21 timeframe based on some efficiencies that the agency
22 thought we would gain by taking those functions and
23 spreading them out across the agency to lower our
24 operational overhead and for some other reasons. So
25 basically the PRA, IPE, IPEEE, and generic safety

1 issues programs, along with longer term operating
2 experience evaluation functions, went to the Office of
3 Research.

4 The incident response and investigation
5 function went to the then Incident Response Operations
6 Directorate, which is now expanded into NSIR or the
7 Office of Nuclear Security and Incident Response. And
8 a short-term domestic and foreign operating experience
9 review fell to NRR.

10 After the Davis-Besse vessel head
11 degradation event in 2002, the reactor operating
12 experience task force, which came out of the
13 Davis-Besse lessons learned task force, evaluated the
14 operating experience program and determined, among
15 other things, that the most significant overall
16 program weakness for the agency's operating experience
17 program was the absence of a clear agency vision of
18 how all the operating experience program activities
19 should function together and be integrated with the
20 licensing and inspection program activities.

21 Some of the other insights from the task
22 force which speak to the makeup of our current
23 organization are -- kind of paraphrasing here -- lack
24 of clearinghouse function and routine distribution of
25 operating experience to the NRC technical staff, and

1 also very few operating experience evaluations to
2 identify important lessons learned from the operating
3 experience information.

4 So the task force report went on to define
5 the attributes of an effective operating experience
6 program to include clearly defined and communicated
7 roles and responsibilities; efficient collection,
8 storage, and retrieval of operating experience
9 information; effective screening of operating
10 experience for followup evaluation; timely
11 communication of operating experience to stakeholders
12 for information or evaluation; timely and thorough
13 evaluation of operating experience to identify trends,
14 recurring events, or significant safety issues for
15 appropriate followup; timely decisions on
16 implementation and appropriate followup resulting from
17 the review of operating experience; and periodic
18 assessments of the program.

19 So the current program we have for
20 operating experience, as well as our organizational
21 structure, are based largely on the reactor operating
22 experience task force report and recommendations.

23 One other thing I want to add on, in the
24 last few years since the Office of New Reactors formed
25 and has their own construction experience program, we

1 have teamed up with them and a Center of Expertise to
2 ensure that there is one funnel for operating and
3 construction experience data for the agency, and we
4 don't get stovepiped in that aspect.

5 CHAIRMAN BLEY: Where do you fit in the
6 organization now? You said AEOD reported directly to
7 the EDO I think.

8 MR. THOMAS: The Operating Experience
9 Branch, we have about a dozen people in the branch.
10 We are in NRR, in the Division of Inspections and
11 Regional Support.

12 CHAIRMAN BLEY: Okay.

13 MR. THOMAS: So we sit side by side with
14 the Reactor Inspection Branch, the Performance
15 Assessment Branch.

16 Okay. On this flowchart, I'm trying to
17 show how the operating experience program fits into
18 the agency's reactor oversight process. So here we
19 are down here on the lower left. So basically the way
20 this flowchart is written or put together, across the
21 bottom you can see where daily events from domestic
22 and international reporting systems, as long as -- as
23 well as results from the inspection program and the
24 performance indicator program, and other information

1 feed into or are fed by the operating experience
2 process.

3 At the top of the flowchart you see where
4 results of the operating experience program intersect
5 with other NRC programs and potential internal and
6 external interfaces. And we will go into a little
7 more detail for some of these in later slides.

8 MEMBER SKILLMAN: Eric, before you -- will
9 you discuss international events later?

10 MR. THOMAS: Yes.

11 MEMBER SKILLMAN: Okay. Thank you.

12 MR. THOMAS: Okay. So zooming in a little
13 bit on the previous slide and that operating
14 experience block, this graphic shows how information
15 flows through our current NRR Operating Experience
16 Branch process, or our Center of Expertise, NRR-led
17 process.

18 So beginning on the left-hand side,
19 left-hand column, you see the summary of information
20 that feeds into the program from both internal and
21 external sources. In the middle is the day-to-day
22 work of the operating and construction experience
23 staff.

24 We pulse each source of incoming
25 information on a daily basis, and we use our

1 clearinghouse process to disposition each issue in a
2 consistent manner that ensures all pertinent
3 information is coded and stored, and that more
4 important issues get forwarded to the correct parties
5 around the agency.

6 On the right are the products --

7 CHAIRMAN BLEY: You actually, as reports
8 come in, maybe the -- you're getting -- I don't see
9 them up there, but you are getting the reports from
10 INPO as well as from --

11 MR. THOMAS: That's correct.

12 CHAIRMAN BLEY: -- other places. So if
13 something really hot comes in, you forward it
14 immediately to whatever organization is most --

15 MR. THOMAS: Oh, yes. Yes. If there is
16 -- you know, INPO puts out a variety of different INPO
17 event reports, different levels, and if there is a
18 Level 1, which we may see one every couple of years
19 or, you know, during Fukushima we saw several in rapid
20 succession, those go straight up to our EDO points of
21 contact for distribution according to --

22 CHAIRMAN BLEY: And given you're in NRR --

23 MR. THOMAS: Yes.

1 CHAIRMAN BLEY: -- do you also get
2 materials reports and that kind of stuff? Or is there
3 a parallel organization?

4 MR. THOMAS: There is a parallel
5 organization in NMSS for materials issues.

6 CHAIRMAN BLEY: There is. Okay.

7 MR. THOMAS: Yes.

8 CHAIRMAN STETKAR: Eric, under
9 international, I'm familiar with INES, so I know what
10 that means, the IRS I'm less familiar with. Is that
11 a WANO function? Or what level of -- I guess let me
12 get right to the point. What level of filtration is
13 there in that IRS operating experience?

14 CHAIRMAN BLEY: Before it gets to you.

15 CHAIRMAN STETKAR: Before it gets to you.

16 MR. THOMAS: Before it gets to us, that's
17 an IAEA --

18 CHAIRMAN BLEY: That is -- okay, that's
19 the IAEA. All right.

20 MR. THOMAS: -- that's an IAEA-run
21 database. As for filtration, I don't know of any.
22 I'll defer to Harold here.

23 MR. CHERNOFF: Maybe I can add a little
24 characterization here. That system is an IAEA
25 administered database. It is also shared with NEA

1 through the working group on operating experience.
2 Each country that is a member of IAEA has an IRS
3 national coordinator. I'm the U.S. national
4 coordinator.

5 And essentially what the system captures
6 for our sensibilities, what we're familiar with, are
7 incidents that are reported or identified by
8 countries, regulators, and something akin to our LER,
9 license event report system. However, what I would
10 say is our event reporting goes to a much lower
11 threshold than the international as a whole that gets
12 in the system.

13 There are about 80 reports a year entered
14 in this system.

15 CHAIRMAN STETKAR: Eighty total?

16 MR. CHERNOFF: Eight-zero, that's correct.
17 Eighty reports. So, you know, it's not a huge volume.
18 It's --

19 CHAIRMAN STETKAR: Is it working? I mean,
20 I actually dealt with this --

21 MR. CHERNOFF: Yes.

22 CHAIRMAN STETKAR: -- about a decade ago,
23 and it wasn't really working.

24 MR. CHERNOFF: As far as this is working,
25 for the more significant events it identifies them,

1 and we have meetings twice a year where we go over the
2 specifics of some of the more significant events. And
3 it does a good job of -- you know, I'll give you an
4 example.

5 You guys probably recently heard of the --
6 Tianj and Duhl. I was, you know, sitting in a meeting
7 in Paris when the Belgians came in and said, "Here's
8 what we're doing," and that was before it hit the
9 press, before it hit the public announcements. They
10 had just gotten a call from the operating agent and
11 the regulator said, "Here's what we're doing."

12 So it ends up being a very good way for
13 the regulators to communicate. These are, you know,
14 regulators who are administering these things. On our
15 end, I have a staffer, Dave Garman, who review all of
16 the reports entered into the system, and we put them
17 through our clearinghouse function, which Eric will
18 talk about more. It goes out, and we have -- we
19 review all of our licensee event reports and other
20 incidents for potential incorporation.

21 The U.S. typically is putting in a little
22 over 20 items a year.

23 CHAIRMAN STETKAR: Yes. That's what I was
24 going to ask next. Out of 80, we're about a quarter
25 of them?

1 MR. CHERNOFF: Yes. Yes.

2 CHAIRMAN STETKAR: Okay.

3 MR. CHERNOFF: And what we're trying to do
4 as an organization, through IAEA, is really try to get
5 more participation from some countries. Right now the
6 focus is on China because they're doing all the builds
7 right now. They're doing the vast majority of the
8 builds. So everybody believes that there is -- and,
9 frankly, we've had some good progress in the last year
10 or so in --

11 CHAIRMAN STETKAR: They're builds, but, I
12 mean, they're countries that have a large number and
13 a long history of operating experience. Are they --
14 I won't name any countries, but are they participating
15 very well?

16 MR. CHERNOFF: Everybody is participating.
17 We actually -- one of the things we've established
18 each time is which countries are reporting how much,
19 and every year there seems to be a couple or three
20 countries that don't have anything to report.

21 I would just say on the right side of that
22 statistic are -- in many cases, a lot of the smaller
23 countries only have one or two units, and it shouldn't
24 come as a surprise if they don't have a significant
25 thing to report. But the bigger countries -- Russia

1 is now supporting and reporting more. France has
2 been. Canada, Great Britain, and the U.S., along with
3 France, have been the majority of people providing the
4 reports going in.

5 CHAIRMAN STETKAR: Japan?

6 MR. CHERNOFF: Japan we are working hard
7 with --

8 CHAIRMAN STETKAR: Okay.

9 MR. CHERNOFF: Effort needs to be put
10 there still, though.

11 CHAIRMAN STETKAR: Thanks.

12 MEMBER SKILLMAN: Let me pull a little bit
13 further on this international. To what extent have
14 you been able to mine the WANO operating event
15 database?

16 MR. THOMAS: We don't have direct access
17 to WANO reports. What we do get occasionally is
18 through INPO's relationship with WANO. We will get an
19 international -- you know, international report that
20 is redacted by INPO and put out as an INPO event
21 report. But those are, you know, quite frankly few
22 and far between.

23 MEMBER SKILLMAN: I would just offer,
24 there is a gold mine in that bucket.

1 MR. CHERNOFF: If I could add to that,
2 IAEA signed a memorandum of understanding with WANO
3 just about a year ago, and it provided access for WANO
4 to the IAEA databases with the stated purpose of
5 having reciprocity. We have not yet established the
6 reciprocity part of that.

7 In fact, we were talking at our meeting
8 last month, this is one of the subjects that came up
9 about pushing for that reciprocity because in the U.S.
10 we are -- and Eric is going to talk about it, we are
11 extremely familiar and very thankful for the data in
12 the INPO database, that we have full access to or
13 almost full access to, and we are well aware that the
14 same thing is out there in the WANO space.

15 MEMBER SKILLMAN: Well, here is an
16 interesting twist. For a Part 52 applicant, that
17 applicant has to identify foreign experience. And for
18 the Part 52 applicant, getting that foreign experience
19 is a real task. But I did that for the ABWR, and I
20 got access to the WANO database. And there is
21 information in that WANO database that is threshold
22 TMI 2 stuff that is extremely valuable.

23 And so if your memorandum of understanding
24 would get you access to that, that would be another

1 resource that is presently I think untapped that could
2 be very valuable to the industry and this country.

3 MR. CHERNOFF: Agreed.

4 MEMBER SKILLMAN: Thank you.

5 MR. THOMAS: I think I was on products, so
6 on the right side of this.

7 MEMBER SKILLMAN: Yes. You were on the
8 right-hand side, Eric.

9 MR. THOMAS: So on the right side of the
10 slide here, we have some of our products that are the
11 result of the clearinghouse screening and analysis
12 functions.

13 Okay. So it's a two-team approach with
14 our branch over in NRR and teaming with our partners
15 in NRO and Research. So getting a little bit more
16 specific, the operating experience program uses two
17 teams to work together and complement each other's
18 efforts. The clearinghouse team takes in operating
19 experience information from the various sources on a
20 daily basis, as I said before.

21 It is comprised of staff from NRR, along
22 with the Office of New Reactors, the Office of
23 Research, and the Office of Nuclear Security and
24 Incident Response. The team meets three times per
25 week, and we have -- in the NRR Operating Experience

1 Branch we have staff members assigned to cover each
2 region, and they will enter events and other issues
3 identified for their region into an issue tracking
4 database.

5 Team members from NRO, Research, and NSIR
6 can also enter information into the database and bring
7 it up in front of the clearinghouse. The team makes
8 screening and coding decisions on each database entry
9 and sends relevant entries to our internal
10 stakeholders.

11 We generate -- the clearinghouse team
12 generates most of our OpE communications, which are
13 web postings posted on the internal website, which I
14 will cover in more detail later, as well as issues for
15 resolution, which are sort of on the comparison to a
16 safety evaluation for a potential agency action.

17 And as I said, we code information into
18 this issue tracking database, which also helps our
19 technical review groups, our technical staff, who are
20 interested in operating experience, be able to easily
21 search on their areas of expertise.

22 We also have an analysis team, which
23 evaluates events and inspection results across the
24 industry for short-term trending. When a noteworthy
25 trend is identified, the team will investigate further

1 and fully vet the issue, often resulting in a study or
2 perhaps a management briefing, which can lead to other
3 products.

4 We answer most external information
5 requests coming into the branch, and also the
6 technical review group and INPO liaison functions are
7 a part of the analysis team.

8 MEMBER SKILLMAN: Before you change that
9 slide, is a product out of the clearinghouse team an
10 information bulletin or an advisory to the sites, an
11 IB?

12 MR. THOMAS: It could be. Information
13 Notice.

14 MEMBER SKILLMAN: IN.

15 MR. THOMAS: It could be -- yes, it could
16 be a generic communication. It could be -- and I'll
17 go through these in specifics on a later slide, but
18 there is a variety of different products that we can
19 put out as a result of our clearinghouse and analysis
20 functions.

21 MEMBER SKILLMAN: Okay. Thank you, Eric.

22 CHAIRMAN BLEY: Do you have any direct
23 interaction with the more significant inspection team
24 reports, the AITs and IITs?

1 MR. THOMAS: And, again, this is good
2 segues, but for the reactive inspection process we do
3 play a part. That would cover, you know, special
4 inspections, augmented inspection teams, and the
5 occasional incident investigation team.

6 We generally do not send members out to be
7 part of the inspection team, but we are part of the
8 screening process. When the regions and NRR need to
9 come together for more significant events and
10 determine, you know, should this be an SIT or an AIT
11 or higher, we're part of that decisionmaking process.
12 And then once a team is put out in the field, while
13 the inspection is in process, they normally have an
14 end-of-the day phone call to wrap up what they found
15 that day, you know, an exit meeting, phone call, that
16 kind of stuff.

17 And our person -- you know, say it's
18 Harris plant. You know, so the person that we have in
19 the branch who is covering Region 2 will call into
20 that call on a daily basis to stay apprised of what is
21 going on.

22 MR. CHERNOFF: Eric, I might add in
23 response to that that it's very frequent when those
24 teams are in place that we get specific requests back
25 to us to research, try to find things related to and

1 support the team directly. So there is a day-by-day
2 interaction with our regional point of contact
3 typically with those teams.

4 CHAIRMAN BLEY: You can leave that slide,
5 but on that slide you talked about the analysis team,
6 the analysis work.

7 MR. THOMAS: Yes.

8 CHAIRMAN BLEY: I know you weren't here
9 when AEOD was still in operation, but they used to do
10 lots of different kinds of analyses of operating
11 experience trying to look for trends and characterize
12 situations around the industry. Is that the kind of
13 analysis work you're still doing?

14 MR. THOMAS: That is exactly what we still
15 do.

16 CHAIRMAN BLEY: And to help me find your
17 reports, are they just labeled OpE reports, or is
18 there -- are they NUREGs, or what do you put out?

19 MR. THOMAS: We have had studies that have
20 been put out in different formats. We recently did a
21 study on component aging that was publicly -- we had
22 a publicly available version, and I can, you know,
23 provide that.

1 We have put out other studies in the form
2 of operating experience communications, so a web
3 posting internal --

4 CHAIRMAN BLEY: Ah, okay.

5 MR. THOMAS: -- with, you know, links to
6 the report and the background information. And other
7 topics have been covered as like NRR executive team
8 briefings, and that sort of thing. And there are
9 examples of, you know, things that we have done that
10 have led to other products such as, you know, generic
11 communication or something called an operating
12 experience smart sample where we talk about an
13 enhancement or something we can add in or point the
14 region's focus to a specific issue that deals with the
15 specific inspection procedure that they could look
16 more closely at. And those are also publicly
17 available.

18 MR. NAKOSKI: Eric, if I could add -- I'm
19 John Nakoski. I'm the Branch Chief of the Performance
20 Reliability Branch and Research. We also do part of
21 what AEO used to do like detailed system studies. We
22 haven't done one in a while, but moving forward we are
23 looking at some of the operating experience to
24 formulate a plan to look at electrical system
25 component failures and the impact on safe operation.

1 That study is really just getting
2 underway. Matter of fact, we're meeting internally in
3 my branch to kind of kick that meeting -- that process
4 of. But it just dovetails with what Eric was saying,
5 that function -- a lot of it is done in NRR through
6 this program, but we also in Research have a piece of
7 that.

8 CHAIRMAN BLEY: Okay. Thank you.

9 MR. CHERNOFF: Also, one adder is I
10 believe you guys have access to the Sharepoint sites
11 through --

12 CHAIRMAN BLEY: We have access to some of
13 them.

14 MR. CHERNOFF: Okay. We have put some
15 enhanced easy access tools up there that would allow
16 you guys ready access to all of our products.

17 CHAIRMAN BLEY: So that is under the NRR
18 Sharepoint?

19 MR. CHERNOFF: It is actually under
20 NRR/DIRS Sharepoint site, and there is a sub-bullet on
21 operating experience. And we've got some pretty
22 simple to use self-explanatory search tools there.

23 CHAIRMAN BLEY: Yes, I'd like to track
24 that down.

1 MR. THOMAS: Okay. So digging a little
2 more into this -- the clearinghouse function, as I
3 mentioned before, the operating experience
4 clearinghouse meets three days a week. So the team
5 members will go through all of the information from
6 all of those -- the various inputs here on the left
7 side and enter items into issue tracking database,
8 which is an application that we run.

9 They will also enter in -- each individual
10 when they put an issue into the tracking database will
11 enter their screening recommendations prior to the
12 clearinghouse meeting. During the meeting, team
13 members review -- or each member will come up and
14 brief their events. Team members will review each of
15 the items in the issue tracking database, and the
16 clearinghouse chairperson will update the database
17 with final screening decisions and disposition for
18 each issue.

19 The database allows the team to record the
20 disposition of each issue and search for issues by
21 date, subject area, plant, region, and several other
22 criteria.

23 There is hundreds of staff from around the
24 agency that have read-only access to the database, so
25 they can go in and perform searches of all of the

1 items that we are screening, and they can generate
2 reports based on their search results. The capability
3 is useful for groups such as our technical review
4 groups, which use the issue tracking database as one
5 of their information resources.

6 And so in the middle here -- and I'll
7 speak more to these later, but some of our disposition
8 results, you know, we can screen this in per our
9 processes as an issue that needs to be resolved, needs
10 some sort of report, investigation by our team. We
11 can put it out as information internally as an OpE
12 communication or just, you know, mark it as this goes
13 under the, you know, auxiliary feedwater or electrical
14 power distribution technical review group to make sure
15 that they see it when they come back in and search the
16 database.

17 MEMBER SKILLMAN: Eric, please speak a
18 little bit to whether or not, for whatever the issue
19 is, it can be identified as a human factors or human
20 performance as opposed to a widget failure or a pipe
21 leak or a component gizmo failure.

22 MR. THOMAS: Short answer is yes.

23 MEMBER SKILLMAN: Okay.

24 MR. THOMAS: We have a human performance
25 -- it's actually human performance safety culture,

1 because we found we were always tagging things with
2 both, so we combined the two into one of our technical
3 review groups. So when any sort of human performance
4 issue comes before the clearinghouse, you know, it
5 could be, you know, something with RPS, but the reason
6 that the -- you know, some failed in the reactor
7 packing system was something human performance related
8 --

9 MEMBER SKILLMAN: Lack of knowledge,
10 training, that type of thing?

11 MR. THOMAS: Exactly. And that is
12 probably one of our most often tagged references for
13 the issue tracking database is human performance.
14 And, you know, they give us probably one of the better
15 technical review group inputs every year. The team
16 meets and goes through, okay, how are we going to
17 parse through all of this stuff that has been tagged
18 for us and generate some sort of analysis back to the
19 operating experience program?

20 MEMBER SKILLMAN: Okay. One more. Is
21 there a toggle in there for root cause failure?
22 Because the licensees are required to do a root cause,
23 and sometimes those root causes are very good, and
24 sometimes they are not so very good.

1 MR. THOMAS: As far as whether the issue
2 had a root cause report, we don't have a specific
3 toggle in there, but we do have ways of getting at
4 that information. And one of the ways is through our
5 access to the INPO consolidated event system. Another
6 method is through our contacts with the region, you
7 know, directly to the resident inspector, say, "Hey,
8 is there a root cause? Can you send it to us?"
9 Because once that gets put in the corrective action
10 program, it is -- you know, it's available to us.

11 MEMBER SKILLMAN: Thank you. Thanks.

12 CHAIRMAN STETKAR: Eric, I haven't read
13 LIC-401. You say the criteria for screening are
14 listed in there. Can you give us some examples of
15 what those criteria are? Yes, you can.

16 MR. THOMAS: Got my copy right here. I
17 knew there was a reason I had this with me.

18 CHAIRMAN STETKAR: I am trying to get a
19 flavor of what sort of things you look at.

20 MR. THOMAS: Well, basically, we look at
21 -- sort of along the model of doing reactive
22 inspections, we look at deterministic criteria, we
23 look at risk criteria. So if it's got risk numbers
24 that are basically above one E to the minus six, we

1 are going to consider it as something that could be
2 screened in.

3 CHAIRMAN STETKAR: You make the risk
4 determination, or you --

5 MR. THOMAS: No, we don't make the risk
6 determination. We go off -- for example, for an
7 escalated inspection finding, you know, if something
8 is -- an event that resulted in a yellow or red
9 finding, we are probably going to screen it in and at
10 least look into it, you know --

11 CHAIRMAN STETKAR: But I'm more interested
12 in -- you say you get reports daily of things that are
13 happening. So you get a report that today at Plant X,
14 you know, a high pressure injection valve failed to
15 open.

16 MR. THOMAS: Right.

17 CHAIRMAN STETKAR: And you said you meet
18 three times a week.

19 MR. THOMAS: Right.

20 CHAIRMAN STETKAR: You probably don't have
21 an inspection report on that.

22 MR. THOMAS: No. We just have an event
23 notification, and we'll probably code that to the pump
24 and valve technical review group, maybe -- you know,
25 maybe ECCS as well, and let them go back in, and when

1 they say, "Well, what have we seen throughout the year
2 that has to do with HPC," they can search on that.

3 CHAIRMAN STETKAR: Let me try it from the
4 opposite. If something comes in, how does it get
5 screened out of your further consideration? I mean,
6 what -- if it -- you know, basically --

7 MR. THOMAS: Yes, I know, if it doesn't
8 meet the criteria.

9 MR. CHERNOFF: The general principle is
10 things that have -- I will use the phrase "moderate or
11 above safe significance" and some generic
12 applicability. There is a list of, oh, about 20 items
13 in the procedure characterizing it in a little finer
14 detail. I don't know if you --

15 CHAIRMAN STETKAR: We have time here, so
16 --

17 MR. THOMAS: Degradation of important
18 systems, structures, and components that could lead to
19 termination of a loss of safety function. Potential
20 degradation of fission product barriers, potential
21 adverse trend, transients that involve inappropriate
22 operator actions or equipment performance that ended
23 up affecting reactor safety. Those are some of the
24 deterministic keys that we look at.

1 MR. CHERNOFF: It is a pretty
2 comprehensive list, and there is also a -- there is a
3 lot of flexibility in the way it's written, but there
4 is also kind of a mother clause that, you know, if
5 it's something that management of others feel we can
6 also put --

7 CHAIRMAN STETKAR: In some sense, one of
8 the reasons that -- I've got these two points that I'm
9 trying to explore here. And one was the degree of
10 subjectivity that enters into the screening process,
11 because you're probably looking at a fairly large
12 number of events over -- you know, in a continuous
13 process with people who will change over time.

14 And I'm trying to explore a little bit of
15 how much subjectivity there is on screening things in,
16 not that you need -- you do need subjectivity. I'm
17 just trying to understand what -- you know, if today
18 I decide this sounds important to me, I put it in.
19 Tomorrow you might decide that the same thing doesn't
20 sound important to you.

21 MR. CHERNOFF: And the most difficult
22 challenge is -- just as it was stated in the TMI era
23 is finding the significant salient things, but not
24 inundating people with everything else.

25 CHAIRMAN STETKAR: Exactly.

1 MR. THOMAS: I think a good way to answer
2 that question is if you go back to 2005/2006 timeframe
3 when this program in its current form started with
4 this clearinghouse meeting, clearinghouse meetings
5 weren't as well organized as they are now. There
6 wasn't as clear a definition of roles, and we ended up
7 screening a lot of stuff in.

8 I think the first year we put out over 100
9 issues for resolution reports. Did all of those
10 things need to be issues for resolution? No, but I
11 think we were failing safe.

12 Through the years, we have migrated that
13 down to, you know, the 40 to 50 IFRs per year, issues
14 for resolution per year, and today it's maybe a dozen
15 or so. And I think one thing you'll find is an issue
16 for resolution closeout that is done today is a lot
17 better vetted, a lot more detail, a lot more focus on
18 let's get all the different angles on this issue, and
19 let's make sure we have some sort of usable outcome
20 than in the past where it was more of just -- we
21 looked at this, you know, and more often than not we
22 didn't -- we didn't do anything.

23 And at the same time, our other tools have
24 developed better, such as the operating experience
25 communications have become a lot more user-friendly,

1 a lot broader distribution, and a lot more detail in
2 each report. So it -- while issues for resolution are
3 fewer and far between, any gap that could be construed
4 in there is being filled in by a lot of the other
5 stuff that is developed along the way that wasn't as
6 well developed at the beginning of the program.

7 For instance, the database where we put
8 all of our day-to-day information, that didn't come
9 about until the program had been going for five years.
10 So before that it was just -- we had put out a daily
11 email of this is all the stuff we've screened, this is
12 how it was dispositioned, and, you know, we found that
13 corporate knowledge was appropriately two weeks. And
14 after two weeks, I'm sorry, but, you know, my brain is
15 only so big, and it's gone.

16 So we ended up doing a lot of email
17 searching for stuff until finally it was like I'm
18 pretty sure there is something, you know, called a
19 database that would help with this.

20 CHAIRMAN STETKAR: Thanks. That helps a
21 little bit, and I'll go look at those criteria.

22 The last bullet says, "Items screened by
23 the clearinghouse are coded and stored." Do you mean
24 items screened in or --

25 MR. THOMAS: No. I mean everything.

1 CHAIRMAN STETKAR: Everything. Good.
2 good. Because, again part of my concern is if I
3 today, because of whatever coffee I drank this
4 morning, decide that this isn't -- doesn't seem all
5 that important to me, it could obviously be important
6 in terms of long-term trending and things like that.
7 So good.

8 MR. KING: Eric, my name is Mark King. I
9 work in the clearinghouse group, and I think it's
10 important for the ACRS to recognize that we get like
11 three cuts a lot of time on the U.S. events because we
12 get the event notice up front, then we get a detailed
13 LER that often includes risk numbers for us in the LER
14 writeup, and then additionally we get the review of
15 the inspection findings related to that event. So,
16 and those will be colorized with a risk coding as
17 well.

18 CHAIRMAN STETKAR: But if you're getting
19 input from INPO, a lot of those things don't ever rise
20 to the level of an LER or an inspection finding,
21 right?

22 MR. KING: Correct.

23 CHAIRMAN STETKAR: Okay.

24 MR. THOMAS: Any more questions on
25 screening function?

1 (No response.)

2 This sort of -- this is kind of a -- I
3 don't know what the right term is -- preparatory slide
4 for the next one. So in addition to our daily
5 communications with the regions, and pushing the
6 clearinghouse screening results out to the NRC
7 technical staff, our operating experience Center of
8 Expertise uses several methods and media to
9 communicate program results to internal stakeholders.

10 So this graphic here starts with the more
11 routine and less detailed communication methods at the
12 top and works its way down to some of our more
13 involved products. So I'll kind of take a sentence or
14 two to describe each one.

15 At the top you have the periodic operating
16 experience newsletter. This goes to a broad internal
17 audience, goes out about once a month, and contains
18 about normally half-page articles highlighting some of
19 the more noteworthy events and issues from the past 30
20 to 60 days.

21 Operating experience notes respond to --
22 this is a response to the sort of one-time information
23 requests. Often, for instance, the EDO's office, the
24 EDO is going to talk to INPO or something, "Hey, what
25 do you know about this?" And instead of just having

1 all of these one-pagers that people write and then who
2 knows where they end up, we have -- we call them
3 operating experience notes and save them and make sure
4 we can reach back and grab, you know, the one we did
5 three years ago.

6 Technical review group -- annual report is
7 sort of -- is a form of operating experience note.
8 The TRG members review operating experience
9 information throughout the year and submit their team
10 reports. Our staff pulls out the recommendations and
11 accomplishments of the TRGs and publishes them in a
12 newsletter to NRR management, which also goes out to
13 the regions and back to the TRGs as well.

14 Notable operating experience report is a
15 semi-annual operating experience note, and that is
16 where our staff and NRR compiles notable events,
17 issues, and studies, as well as trends from the past
18 six months to provide the region sort of the operating
19 experience landscape when they get together for their
20 mid- and end-of-cycle meetings to discuss plant
21 performance.

22 Periodic management and executive team
23 briefings -- these generally occur once or twice per
24 year. The operating experience analysis team will
25 either be assigned a topic to study or else generate

1 a study based on recent trends and operating
2 experience, and will brief the NRR executive team,
3 along with quite often the region -- regional
4 management is tied into these via GoToMeeting and
5 teleconference. And these are often just for
6 informational purposes. Sometimes there are actions
7 discussed at these briefings.

8 And then finally the issue for -- well,
9 issue for resolution, that is when an event does get
10 screened in per our LIC-401 criteria. We call it a
11 Level 2 screening.

12 The clearinghouse will screen the issue in
13 and assign an issue manager from our ranks who will
14 review the issue, engage technical staff, and make
15 recommendations on potential courses of action for the
16 agency.

17 And then, finally, the operating
18 experience communication, which is perhaps one of our
19 -- I'd say probably one of our most useful, if not our
20 most useful tool, is an internal web posting where an
21 issue or trend is identified by the clearinghouse for
22 additional research and data-gathering.

23 Web postings are helpful because they
24 provide sort of one-stop shopping for the issue, so if
25 there's old generic communications or inspection

1 reports or perhaps a reactive inspection team report
2 that is associated with the issue, we can link all of
3 that information and have it all in one place to
4 describe, you know, how it was first identified and
5 what the end game was if you will. And we can,
6 obviously, go back into the system and modify these as
7 new information becomes available.

8 MR. CHERNOFF: I would like to add to
9 that, Eric. That's the one that I think the regional
10 people find both most useful and they also feed and
11 build it. So our staff will put it together
12 initially, and then as it gets circulated we find, you
13 know, inputs also coming from the regional folks,
14 building that, and then they share -- you know, share
15 that amongst everybody.

16 So it ends up being a pretty good resource
17 for inspection activities and just general awareness
18 of evolving issues. It may eventually become
19 something else, but that's a lot of times the first
20 thing on the street, and then it evolves and grows as
21 the information becomes available.

22 MEMBER SKILLMAN: Let me ask you to just
23 hold your finger at 10 and go back to five for a
24 second. Lower left-hand corner, operating experience
25 block, this is just kind of a general question for you

1 to ponder, and, if you will, give an answer. Do you
2 have a sense that there is a strata of information
3 that is not being reported?

4 I mean, let me tell you why I ask. The
5 toggle to get your attention is an event. The trigger
6 that gets an event report causes some form of
7 emotional excitement at the site, whether it's a pump
8 trip, reactor trip, a failure in a system that is
9 discovered because the system's command -- and the
10 system doesn't respond as expected.

11 There is another layer of information that
12 is at the site that may be applicable to many sites.
13 Here is an example. The older plants are having
14 difficulty getting parts. They are actually
15 rebuilding relays. The relays have phosphor-bronze
16 springs that are part of the contact assembly. And
17 unless those springs contact firmly enough, the
18 connectivity may not be provided.

19 And that can be discovered by an I&C tech
20 who says, "Gee whiz, I bought these new springs, and
21 the springs just don't function the way the old ones
22 did." And so a smart tech will enter that into the
23 corrective action program. It will come up in the
24 discussion at the site.

1 But if it hasn't caused a trip or a
2 transient or an event, that might get noodled away
3 often to the procurement program and never rise to the
4 level of "gee whiz." There could be contraband
5 springs, there could be non-conforming parts that have
6 been advertised as effective but not effective. How
7 does that layer of information find its way up onto
8 your radar screen?

9 MR. THOMAS: That's a good question. You
10 know, we only know what we know is the one answer to
11 that question. But, you know, often when we are
12 sitting around at our analysis team meetings talking
13 -- you know, discussing what to look at or going
14 through the process of putting together a study, we do
15 come up with this, you know, is this just the tip of
16 the iceberg discussion?

17 We have resident inspectors at the site.
18 We do talk to the regions on a daily basis. A lot of
19 the stuff that comes up on those phone calls are below
20 reporting threshold issues. It is the judgment of our
21 person who is covering a region as to whether
22 something below the threshold still merits, you know,
23 an entry into the issue tracking database. So we've
24 got to listen pretty hard.

1 Another way we can get at that sort of
2 information is through the INPO system, the INPO
3 consolidated event system, which is a merging of their
4 plant events database, you know, EPIX and NPRDS
5 systems. So we do get -- you know, if it is an
6 equipment failure issue that is reported by the
7 licensee into ISIS, we can pick it up that way. So
8 we're looking for, you know, relay issues, and we have
9 a couple of key words to go off of. We can formulate
10 a search and pick up those sorts of things.

11 And then, if there is a corresponding
12 corrective action program entry or, you know, root
13 cause sort of thing, that will often be attached as a
14 PDF file to the bottom of the report in ISIS. You
15 know, the thing to be careful with is we can't always
16 -- you know, unless it's something that we find as a
17 regulator, we can't always pivot off the stuff that we
18 pull out of INPO databases and turn it around. You
19 know, there are some limitations on that. We don't
20 take INPO things and --

21 MEMBER SKILLMAN: Fair enough. Thank you.

22 MR. THOMAS: I hope that answers your
23 question.

24 MEMBER SKILLMAN: Good explanation. Thank
25 you. Back to 10.

1 MR. THOMAS: Okay. So going on to 11, so
2 occasionally the branch will generate support products
3 that drive program changes and/or are communicated to
4 an external audience, changes to the reactor oversight
5 process and external communications, examples of these
6 first two bullets that you see on the slide, those are
7 all products that we have published in the last couple
8 of years, whereas, you know, although we haven't used
9 it since reorganizing the operating experience
10 function back in 2005, rulemaking there at the bottom
11 is also an option.

12 So as you can see here, you know, we will
13 -- we interact through inspection manual Chapter 2523
14 with our partners over in the Reactor Inspection
15 Branch and performance assessment. We have done
16 several inspection procedure manual chapter revisions,
17 operating experience, smart sample program. We have
18 had, you know, a couple a year dating back to 2006.
19 We do a lot of -- well, we do quite a few information
20 notices. We did RIC sessions with industry and
21 regional participation the last couple of years. We
22 did not do one this year. And as we mentioned before,
23 some of our studies do become publicly available.

24 CHAIRMAN STETKAR: Eric, again, I'm
25 woefully uneducated about this. What is an operating

1 experience smart sample? Is that just someone who
2 wants to find out all of the items that have been
3 catalogued for a particular piece of equipment, or is
4 it --

5 MR. THOMAS: A smart sample is when we are
6 looking through some of the reported data and we see
7 a trend of -- you know, one of them was on using
8 vendor recommendations. So we see various events,
9 maybe even other findings or reports that point to a
10 lack of the licensee's ability to properly use vendor
11 recommendations and maybe equipment replacement, that
12 kind of thing.

13 CHAIRMAN STETKAR: Okay.

14 MR. THOMAS: And so we say, okay, well,
15 we're seeing a lot of these. Where does the
16 inspection program address this? Which inspection
17 procedure addresses it? And we'll put together
18 basically some temporary inspection guidance to
19 provide to the regions. Now, you may say, well, how
20 is that different from a temporary instruction or
21 temporary inspection, TI?

22 Operating experience smart samples are
23 voluntary. The regions don't have to do them. It's
24 just, hey, you know, here is what we're seeing in the
25 OpE -- operating experience realm. You may want to

1 use this procedure and look for these issues because
2 we've been seeing a lot of them lately.

3 CHAIRMAN STETKAR: You mentioned -- do
4 they typically come out of the regions? I mean, the
5 region has an uneasiness about something and will --

6 MR. THOMAS: It is normally something that
7 we're seeing, because --

8 CHAIRMAN STETKAR: Because you're --

9 MR. THOMAS: Yes. One of the sort of
10 monitors that we follow here is, you know, a resident
11 inspector is worried about his or her site. A
12 division director in the region is worried about their
13 plants.

14 CHAIRMAN STETKAR: Right, right. That's
15 -- okay.

16 MR. THOMAS: We are the place that looks
17 across all four regions and across all 100 plants to
18 see trends.

19 CHAIRMAN STETKAR: Thanks.

20 MR. THOMAS: All right. So I put this one
21 in here just to explain, you know, we do have quite a
22 few internal interfaces that occur regularly. The
23 structure and regularity of these meetings ensures
24 that the right staff members are made aware of
25 relevant operating experience information, and that

1 subject matter experts around the agency get a chance
2 to evaluate and comment on important issues in their
3 field of expertise.

4 So I think I have already mentioned a few
5 times the daily regional calls. That is when a member
6 of our staff in NRR will -- these usually happen in a
7 branch chief's office up in the Division of Operator
8 Reactor Licensing, you know, one floor above us. So
9 they are going to talk to all the plants in their
10 region. The region leads the call. You get a rollup
11 of everything that has happened in the last 24 hours
12 at all their plants.

13 So we get a lot of that lower level stuff
14 comes out of those calls as well as additional
15 discussion on anything that has been reported for
16 plants in that region.

17 I think I have covered the team meetings
18 pretty thoroughly so far. I'll skip over that.

19 The monthly reactor oversight program
20 call, this is led by the Reactor Inspection Branch
21 Chief, and it's an opportunity for first-line managers
22 in headquarters and the region to discuss major issues
23 with the reactor oversight program. We are not always
24 an active participant in this call, but we do send a

1 representative to listen in and provide status of any
2 new information.

3 You know, for instance, if there is a new
4 operating experience smart sample going out, we will
5 get on the call and talk about that. If there has
6 been a higher level INPO report that has come out
7 recently, we will brief that on the call as well.

8 Similarly, the bi-weekly regional
9 management call is at the division director level, so
10 our division director, along with their regional
11 counterparts. And they will discuss a lot of the same
12 issues that are in that monthly ROP call.

13 Major generic communications,
14 cross-regional issues, status of TIs, and task
15 interface agreements, et cetera. And, again, we are
16 mostly listening on that. Occasionally, we will have
17 something to bring up.

18 The reactive inspection process, I think
19 we touched on this a little bit before as well. So
20 normally if the regions will have the lead on
21 initiating what we call a Management Directive 8.3
22 evaluation to determine whether or not they are going
23 to do a followup reactive inspection based on an
24 event.

1 When the risk gets past a certain
2 threshold, and there is a question of whether we need
3 to move up to an augmented inspection team or beyond,
4 then we will have -- we will have some interaction
5 along with operating reactor licensing. The project
6 manager will facilitate a call between our risk
7 analyst here in headquarters to talk to the folks in
8 the region and see, okay, where did these numbers come
9 out, and why? What is the region recommending as far
10 as what level of inspection, what is the
11 justification, and then we will turn around and let
12 folks in NRR know what is going on, so they're
13 apprised of the region's decision.

14 And then significant topics briefing --
15 again, I think I went over those. That is when we
16 have something that is worthy of bringing together the
17 NRR executive team and briefing them on, you know, a
18 particular study or a particular issue.

19 Okay. So external interfaces -- the two
20 major ones are INPO and International. These are the
21 last two things I am going to cover here. So INPO
22 coordination function, this ensures a regular line of
23 communication between NRC staff and our counterparts
24 at INPO. And over the years the relationship has
25 evolved from a very formal relationship with pretty

1 minimum interface to more robust information exchange
2 where staff from each organization -- you know, we
3 feel free to pick up the phone any time and
4 communicate regularly with our counterparts.

5 We maintain an NRC-INPO memorandum of
6 agreement signed by the INPO president and the EDO as
7 a guidance document for interactions between the two
8 organizations. And some of the key aspects of this
9 relationship are a bi-weekly counterpart call between
10 our staff and NRR, the representative from New
11 Reactors, and our INPO counterpart in the events
12 analysis group.

13 We talk about recent significant events,
14 event followup, whether there is an ongoing reactive
15 inspections or related IPO evaluations going on, any
16 upcoming visits or agenda, current topics of interest,
17 and status of any upcoming INPO event reports or NRC
18 generic communications or inspection reports.

19 MEMBER SKILLMAN: Eric, let me ask you a
20 question. My colleagues and I are going to address
21 the issue of subsequent license renewal here in the
22 next 30 days. If one of us, or several of us, got it
23 in our minds to ask your group, passive failure --
24 passive component failure past 120 months, past 10
25 years, could you produce a report for us?

1 CHAIRMAN STETKAR: We have to be careful
2 here because the staff doesn't work for us. We can --

3 MEMBER SKILLMAN: No, I'm -- but I'm
4 asking, if we ask the ACRS staff for that, and they
5 pass that request to you, is that something you could
6 respond to?

7 MR. CHERNOFF: Yes, we could respond to
8 it. I will personally, tongue and check, say assuming
9 you provide the definition of what you are considering
10 a passive failure, because there is great variability
11 from licensee to licensee. At last check about a week
12 ago, the regulations still had a placekeeper from 1968
13 that we were all still working on defining passive
14 failures and --

15 CHAIRMAN STETKAR: A check valve is
16 passive, for example.

17 MR. CHERNOFF: But, no, I mean, going
18 through the right protocol, a report could be
19 generated, but I would just caution we have to make
20 sure -- and there would have to be a lot of work going
21 into putting the box around that report, because it
22 could be a massive amount of data which probably would
23 serve no useful purpose. But we have the databases
24 available to us, and it would be a combination of
25 stuff that we have and probably leveraging off of or

1 even working off of the INPO database, which is more
2 -- much more data on equipment failures. Those are
3 the only ones more related to events.

4 CHAIRMAN STETKAR: And all of us need to
5 be very, very careful with the INPO data.

6 MR. CHERNOFF: Yes. And then we some
7 strictures regarding what we can use that for, and we
8 would want to make sure we stay in compliance with
9 that.

10 CHAIRMAN BLEY: Now, from what they told
11 use earlier, our staff can get onto their Sharepoint
12 site and search for anything to their heart's content.

13 MR. CHERNOFF: Yes. In our NRC databases,
14 yes.

15 CHAIRMAN BLEY: Yes.

16 MR. CHERNOFF: And we have been evolving
17 that and growing that to make it more user-friendly
18 versus the -- a number of years back and up until
19 recently there has been a compilation of different
20 databases from different sources, we are trying to get
21 that all into -- basically using ADAMS as the base
22 tool. We are not quite there yet, but we've got a lot
23 of the products in there, headed that direction, which
24 is the -- ADAMS is not perfect, but it's our
25 officially agency record, and it provides a consistent

1 interface for you to do searches with. But we have
2 tried to make that interface a little bit easier to
3 use than plain vanilla ADAMS.

4 MEMBER SKILLMAN: Thank you.

5 MR. THOMAS: I think I have already
6 touched on the INPO data that's available through the
7 INPO consolidated events system. Again, a combination
8 of the old EPIX and NPRDS, along with plant events
9 database information.

10 So NRC staff have access to reports that
11 plants put into the INPO system, but they are mostly
12 equipment failures. And as I mentioned, often there
13 is links to root cause reports, and there are some
14 very powerful sorting tools on there and ability to
15 find out more information about plant-specific
16 equipment, that kind of stuff.

17 INPO regularly transmits their completed
18 INPO event reports to us. We take those, as Harold
19 said, you know, make sure they're marked "proprietary"
20 and, you know, "do not share or else," and put them
21 into ADAMS as non-publicly available documents. And
22 that is working out really well.

23 And another thing I'll mention about the
24 INPO relationship here in terms of special projects,
25 you know, the fact that we have a good working

1 relationship between the two organizations allows us
2 to find out more about, you know, things that INPO has
3 in the pipeline. And when questions do come up, we
4 have a lot of resources there that we have developed
5 relationships with that we can tap for, hey, who is
6 the person to talk to about this? And we can set up,
7 you know, telecons or meetings or whatnot.

8 And, finally, interaction. The primary
9 focus of NRC's efforts in the international operating
10 experience area is to maintain effective and trusting
11 relationships with foreign regulators. This is
12 especially important and beneficial to the agency when
13 foreign events or issues arise that may have domestic
14 applicability, because this allows the agency
15 operating experience staff to obtain information
16 relatively quickly from reliable sources close to the
17 issue of concern. So similar to having the INPO
18 relationship.

19 Primary vehicle for establishing and
20 maintaining the relationships is the Nuclear Energy
21 Agency, the NEA working group on operating experience,
22 or WGOE. NEA comprises about 30 member countries, any
23 number of which send representatives to semi-annual
24 working group meetings to exchange operating
25 experience information and discuss policy.

1 The IAEA is comprised of over 150 member
2 countries. And as far as from our end in the
3 screening process, we treat international operating
4 experience very similar to domestic information. We
5 evaluate it for safety significance, determine whether
6 it meets any of our screening criteria, and
7 disposition it using the operating experience
8 clearinghouse process.

9 And so this counterpart interaction
10 represents a significant source of international
11 operating experience. But as far as direct exchange
12 of information, the international reporting system for
13 operating experience, or IRS, is our primary source.

14 The database is administered by the IAEA.
15 Every member state can contribute. I think we have
16 discussed a lot of this -- 80 reports per year. We
17 contribute about one quarter. And if you do the math,
18 we've got about one-fifth of the world's plants, so
19 not too far off.

20 So as per U.S. reporting, this includes
21 selected generic communications, licensee event
22 reports of interest, and safety significant inspection
23 reports go into the IRS database. And then, finally,
24 we have got the International Nuclear and Radiological
25 Event Scale, the INES. This is another potential

1 source of international operating experience, but, as
2 you know, very few events met the reporting thresholds
3 for INES. Those are --

4 CHAIRMAN STETKAR: That is just a subset
5 of IRS, basically.

6 MR. THOMAS: Right. Right. And it's, you
7 know, few and far between. So, you know, usually
8 we'll hear about those things through other medium --
9 media as well.

10 CHAIRMAN STETKAR: You said you haven't
11 had too much direct interaction with WANO?

12 MR. THOMAS: Very little. We have --

13 MR. CHERNOFF: It's an area particularly,
14 you know, at International we are trying to grow. For
15 example, we have a workshop in Germany the summer --
16 or September, and it is keyed towards trying to work
17 on performance indicators for operating experience
18 programs, which I think it's really important. And we
19 haven't been smart enough to come up with a good set
20 of them ourselves, but together maybe we can get some
21 good ideas.

22 One of the things we've done is we're --
23 and WANO has been very receptive to, as well as INPO,
24 of having them come and participate in that workshop.
25 So we are trying to build those bridges. I think WANO

1 collectively is maybe where INPO was about 10 years
2 ago with regard to just their comfort level of
3 sharing.

4 CHAIRMAN STETKAR: Yes, okay.

5 MR. CHERNOFF: And so --

6 CHAIRMAN STETKAR: Sharing externally. I
7 think that they do get pretty good cooperation, as
8 best as I can tell, taking snapshots of --

9 MR. CHERNOFF: Within their members, yes.

10 CHAIRMAN STETKAR: Within their members,
11 you know, that degree of communication seems to be
12 pretty good.

13 MR. CHERNOFF: We have made big strides
14 with INPO and the comfort that INPO has sharing with
15 regulators. Now, it's really very good. I spent 20
16 years in industry, and I know what it was, you know,
17 30 years ago. And it's way, way improved from that.

18 WANO I think is a little bit behind in
19 that area, and hopefully with some help from INPO as
20 well we are moving in that -- and we are trying to get
21 involved in some of this international OpE, as well as
22 what wasn't mentioned -- these forms are regulator
23 forms, but at our meetings we actively solicit member
24 countries to bring along owner-operator people.

1 Last year, vice president from PSE&G, we
2 invited him and he gave a really interesting
3 presentation about lessons they have learned from
4 their spent fuel pool handling program, or spent fuel
5 pool cask loading program. So we are -- it is not an
6 exclusive regulatory forum. It is -- regulator forum.
7 It is actually trying
8 to get utility members as well involved.

9 MR. THOMAS: Those are my prepared
10 comments, unless there are further questions.

11 MEMBER SKILLMAN: I would ask the members,
12 any comments or questions for Eric?

13 MEMBER POWERS: Well, I think it seems
14 like there is a wealth of information here from all of
15 the products they have generated. It is still very
16 unclear to me how I get to look at it. And it would
17 be useful if somebody could provide me a child's guide
18 on how to get to examine.

19 MEMBER SKILLMAN: Good question? How can
20 we get this information? How can we get to it, Eric?

21 MR. THOMAS: Well, you know, Harold
22 mentioned protocols. I mean, you know, we can always
23 add Mark or somebody to distribution, and he can parse
24 things out. I'm not sure about direct -- the policy
25 on direct communications between the staff and the

1 ACRS. You know, with access to the NRC internal
2 website you can get to everything, and it's just a
3 matter of having somebody show you how.

4 MR. BANKS: And I can do that.

5 MEMBER SKILLMAN: Well, I would offer this
6 observation. In a week or a month or six months of
7 industry progress, there will be a number of issues
8 that come from the licensees that are of threshold
9 interest to this Committee, that there will be
10 probably three or four that rise to kind of "Ah ha,
11 gee whiz, how about that, that's interesting."

12 I would think that information could be
13 valuable to the members. So you produce INs or the
14 old IBs, the information bulletins or the information
15 notices. I think it would be valuable if the small
16 handful of big hitters that rise above kind of that
17 "gee whiz" level found their way to the membership,
18 simply for notification, because some are plugged into
19 industry, some are plugged into labs and R&D, some are
20 in academia, but every once in a while one of these
21 things pops up and we say, "Boy, that was the very
22 thing we were talking about two weeks ago." How about
23 that? To bring some flesh and life to some of the --
24 some of the things that we deliberate on here.

1 MR. CHERNOFF: Maybe as a first step we
2 can work with Mark with getting -- I don't know if
3 Mark has had an opportunity to look at any of the
4 search tool changes that we have made. Get Mark
5 briefed in on the links and the search tools as a
6 starting point, and I think we would have a couple of
7 suggestions of -- out of our products, maybe the right
8 ones at the level of detail for what you're talking
9 about. I mean, this prompted me -- one other comment
10 I wanted to make is -- and I think it's a good thing
11 that we have done is it was going on, and I think we
12 have tried to include incorporation of non-nuclear
13 industry operating experience as well.

14 So we don't have a huge number of examples
15 where we have done this, but do not be surprised if
16 you are looking through some of our documents and, for
17 example, in one of our periodic operating experience
18 newsletters a little while back we had a discussion of
19 lithium-ion batteries from the 777s, the problems that
20 they were having.

21 So we obviously don't -- we can't have a
22 flood of information from all industries, but we are
23 trying to also be a little bit proactive with regard
24 to thinking outside of just the nuclear utility box

1 for other insights to the kinds of equipment these
2 plants run with and that keep them safe.

3 CHAIRMAN STETKAR: You just reminded me of
4 something. We have kind of touched on this in our
5 Digital I&C Subcommittee where we have asked, you
6 know, how far has the staff probed operating
7 experience, particularly in digital I&C systems. Now,
8 there might not be the integrated protection control
9 systems, but there are several industries who have
10 quite a bit of operating experience. And we get
11 feedback saying, "Well, we have tried to do that, you
12 know, piecemeal. We have tried to do it through Oak
13 Ridge National Laboratory with varying degrees of
14 success." Do you get requests from specific groups
15 within NRR or NRO or RES or, you know, wherever with
16 this kind of queries? You know, coming to you saying,
17 "Hey, do you have this?"

18 Because we've gotten feedback that, "Well,
19 I had Oak Ridge National Laboratory go out and look at
20 the aviation industry or NASA and railroad industry,"
21 and things like that and had not all that much success
22 necessarily.

23 MR. THOMAS: I think Harold mentioned this
24 earlier. You know, as much as we have tried to make
25 our search tools easier for, you know, the members of

1 the agency at large to use, we're the specialists, and
2 one of us can, you know, do in a morning what would
3 take, you know, somebody in the I&C Branch weeks to
4 do. And so --

5 CHAIRMAN STETKAR: But also, are we
6 duplicating things, where some branches are going out
7 and initiating searches for stuff that: a) you might
8 have, or b) you might have better connections than
9 they do. This is something ACRS doesn't get involved
10 in. I was just curious.

11 MR. THOMAS: I can't really give you a
12 good answer for that, because, you know, we don't
13 track every contract that somebody has. You know, we
14 do talk to our counterparts in Research, and, you
15 know, try to keep a handle on what they are doing.

16 But, you know, sometimes it's for a
17 different purpose and, you know, the output that is
18 required may be different for a contract-based study
19 than, you know, what we are going to give you which is
20 more of just, you know, here are all the generic
21 communications from over the years that deal with
22 this, here is all of the licensee event reports.

23 You know, that is more the kind of stuff
24 we are going to do. And if there is any rolled up
25 analysis that we're aware of, we are going to throw

1 that in there as well. But, you know, to answer part
2 of your question, yes, it is something we do
3 routinely.

4 CHAIRMAN STETKAR: Okay.

5 MEMBER SKILLMAN: I would think that there
6 are a couple of areas that are really fruitful for the
7 ACRS. We've gone through the flooding and the seismic
8 issues as a consequence of Fukushima. This past
9 winter, the Alleghany backed up. There was severe
10 flooding north of Pittsburgh. Beaver Valley is just
11 down the river 12 miles. Did Ohio freeze-over flood
12 into Beaver Valley experience -- an incident report on
13 icing or flooding? And that question could be asked
14 of a number of plants in the northeast. Has there
15 been -- have there been some major component issues
16 that have risen, particularly those that threaten
17 electrical power? Those are the types of things that
18 I would think are the types of operating experience
19 events that this Committee would say, "Gee, that's
20 interesting. That's information." That's the kind of
21 threshold I'm talking about.

22 And I'll be happy to work with Mark to
23 maybe find a box that would establish kind of the set
24 of parameters that we bring to --

1 MR. CHERNOFF: We can try some things and
2 then get some feedback on how that is working and
3 adapt to that.

4 MR. THOMAS: And I think we did -- we
5 actually did get a query from -- it was either WGOE or
6 somebody --

7 MR. CHERNOFF: It was ISRM, the French
8 regulators, regarding the -- it's the arctic vortex.

9 MEMBER SKILLMAN: I only ask the question
10 because they had -- they had flooding in Europe that
11 they haven't seen for 40 years. And there have to be
12 some riverine plants in Germany and France, maybe
13 Belgium, that had to start --

14 MR. CHERNOFF: And, actually, about a year
15 ago we brought over Monticello's experience with -- I
16 think you've actually been briefed on that with regard
17 to the plans for building dikes, et cetera. And there
18 was a good exchange from some of the European
19 regulators on their facilities that as a result of
20 that extensive flooding they had, I believe it was
21 last year, and including some interesting
22 modifications that plants have made to deal with
23 things such as gravel and landslides into rivers, and
24 how to sustain water flow to the cooling systems in
25 those conditions.

1 MEMBER SKILLMAN: Great. Members, any
2 other comments or questions?

3 (No response.)

4 Eric, thank you very much.

5 MR. THOMAS: Thank you.

6 MEMBER SKILLMAN: Thank you. Back to you,
7 John.

8 CHAIRMAN STETKAR: Thank you very much,
9 Dick, Eric. And, again, thanks. That was a good
10 overview, good presentation.

11 With that, we will recess until 12:45.

12 (Whereupon, at 11:38 a.m., the proceedings
13 recessed for lunch.)

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1 A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

2 CHAIRMAN STETKAR: We are back in session
3 and we're going to hear about the B&W mPower SMR
4 design and it will be led by Dr. Bley. Dennis.

5 MEMBER BLEY: Thank you, John. We're going
6 to have an information briefing on mPower, and we have
7 the members of the B&W Generation mPower team to brief
8 us on the technology for their integrated pressurized
9 water reactors, the key design features, safety
10 strategies, use of PRA, and an overview of the test
11 program.

12 As we're preparing to review the mPower-
13 specific review standards this will likely help us,
14 although, I'm not sure when we're actually going to be
15 doing that. But parts of this meeting may be closed to
16 protect the information that's proprietary to B&W.

17 Before we go into closed session, I'll ask
18 the NRO Staff and mPower to confirm that only people
19 with due clearance and need to know are in the room.
20 Technicians at the booth will disconnect the telephone
21 bridge line. I have to tell you all this, but you'll
22 know what's coming then, and close the public line and
23 open the closed line if you have people coming in or
24 NRC Staff does. And then we'll open it again at the
25 end. If we ask you questions, if we should stray into

1 an area that's proprietary, feel free to tell us
2 please wait for the closed session. We'll be glad to
3 do that.

4 At this time I invite Ms. Joelle Sterefos,
5 the NRO Project Manager, to introduce the presenters
6 on the briefing.

7 MS. STEREFOS: Thank you very much. Thank
8 for the opportunity to say a few words about the NRC
9 Staff's effort to prepare the anticipate mPower design
10 certification application. My name is Joelle Sterefos,
11 and I'm the Senior Project Manager in the Office of
12 New Reactors responsible for the NRC interaction on
13 the mPower design.

14 During this extensive pre-application
15 period since about 2009, the Staff has focused on
16 developing the infrastructure to review the mPower
17 design cert application in a risk-informed, effective,
18 and efficient manner consistent with NRC regulations.
19 In addition, the Staff used this time to interact with
20 Generation mPower, B&W Nuclear, and Bechtel Power
21 Company to identify any technical issues that were
22 unique to this design that could challenge our
23 schedule planning.

24 Since about 2010, the Staff has been
25 working to develop a risk-informed and integrated

1 review framework for the near-term efforts pertaining
2 to the small modular reactor designs. The effort is
3 outlined in SECY-11-0024 entitled "Use of Risk
4 Insights to Enhance the Safety Focus of Small Modular
5 Reactor Reviews."

6 The paper identified four main aspects of
7 the framework. First, the revision of the standard
8 review plan introduction to address the risk-informed
9 implementation for small modular reactor designs.
10 Second, to develop a detailed review schedule using
11 tools available in NRO, specially the EPM scheduling
12 tools. Third, development of design-specific safety
13 evaluation report templates. And, fourth, the
14 development of an mPower design specific review
15 standard or DSRS that the Staff will have an
16 opportunity to present to the ACRS Future Plant
17 Subcommittee in the near future.

18 Today, Generation mPower, the applicant
19 for the mPower design certification application, is
20 here before the Committee to describe their design and
21 the unique attributes that have informed the
22 development of the Staff's mPower DSRS. With that, let
23 me introduce Peter Hastings, Director of Licensing
24 with Generation mPower.

1 MR. HASTINGS: Thank you, Joelle. I am
2 Peter Hastings, Director of Licensing and Regulatory
3 Affairs for Generation mPower. Joining me at the front
4 today are Jeff Halfinger, JMP's Chief Technology
5 Officer; Doug Lee, our B&W mPower Vice President of
6 Engineering; and Dave Kanuch with mPower Engineering.
7 We also have with us on the side Eric Williams also
8 from mPower, and Ron Beck, the Project Manager for
9 Bechtel. GMP is a partnership between B&W mPower and
10 Bechtel, and GMP is the prospective applicant for the
11 design certification.

12 As has been mentioned before, we'll update
13 the Committee today on the mPower design and safety
14 strategy. Jeff will lead us through that discussion
15 during the open session. We'll follow that with
16 additional details that lend themselves to discussion
17 of proprietary information in the closed session. And
18 as Dennis indicated, if any questions come up that
19 require proprietary answers we'll defer those to the
20 closed session.

21 We've been engaged with the staff for, as
22 Joelle indicated, something like four years, very
23 active pre-application interaction. We think it's been
24 a very positive experience not only for the NRC Staff
25 but also for us. It gives us a lot of insight into

1 what some of the issues are that we will need to be
2 prepared to address in our design certification
3 application. And we're very happy to be here this
4 afternoon to support discussions with the ACRS in
5 preparation for your review of the mPower Design
6 Specific Review Standard. And so that we don't intrude
7 on valuable presentation and Q&A time, without any
8 further ado, I'll turn it over to Jeff.

9 MR. HALFINGER: All right, thank you. The
10 first of the session I'm going to give a very high-
11 level overview of the technology and some of the
12 insights that we've used in the development of the
13 mPower technology. During the closed session, Doug
14 will be giving you a lot more detail in some of those
15 areas and dive a little bit deeper.

16 So, we're going to see if Dave can drive
17 this thing and keep this going. So, the overview today
18 is give you a little description on the module, look
19 at the reactor service building, talk a little bit
20 about the reactor itself and the module components,
21 have a slide on the steam generator design which is
22 based on the B&W once-through steam generator concept
23 that we've been making for years.

24 I don't have a particular slide on PRA.
25 Doug does in his presentation, but suffice it to say

1 for the open session that we are using PRA insights in
2 the development of the mPower design, in a lot of
3 different areas of the design informing the emergency
4 core cooling system, informing the defense-in-depth
5 strategy, informing the relationship of certain values
6 and components within the plant. We've been using PRA
7 insights really from the very beginning.

8 The way we have our system design group
9 arranged, the PRA people actually sit within the
10 system's design organization within B&W, so it's a
11 very interactive discussion between PRA and design.
12 And then I'll give you a very high-level strategy on
13 how we're implementing our safety and defense-in-depth
14 strategy.

15 MEMBER BLEY: Well, since you've told us
16 that about having the PRA team in with the design
17 people, do you also have operators and people who are
18 thinking about human performance integrated, as well?

19 MR. HALFINGER: We do. We have a dedicated
20 human factors engineering group. They're working
21 significantly with the control room layout and those
22 sorts of things, but they're also embedded and
23 integrated within the design team itself, so they're
24 looking at plant layout, they're looking at
25 functionality, they're looking at how do you get to

1 that, what are the radiation doses within the area
2 that we're expecting operators to go to, so that's
3 also integrated in our team.

4 MEMBER BLEY: And you have people who have
5 been licensed operators?

6 MR. HALFINGER: All sorts of levels of
7 licensed operators, SROs, ROs. Okay?

8 MEMBER BLEY: Thank you.

9 MR. HALFINGER: So, we're using everything
10 at our disposal to try to get the best design to be
11 functional for the operators at the end of the day.

12 So, basically, when we talk about mPower,
13 well, what's the difference between mPower? It's a
14 light water reactor design, but we call it an integral
15 reactor, and basically what we did was the lefthand
16 picture on this slide shows the old B&W 177 two-loop
17 clamp, so it has a reactor vessel, two steam
18 generators, pressurizer, four reactor coolant pumps.
19 We basically took all of those components and put them
20 into one vessel, so we have the core, the reactor, the
21 steam generator, the pressurizer and the coolant pumps
22 all contained within one vessel. And what that does is
23 -- the most significant things it does for us is it
24 eliminates all the interloop piping between all the

1 different components which is the source of large
2 break LOCAs at least in analysis space.

3 So, getting into -- I'll show you a little
4 bit more detail on the reactor itself. I think the
5 next slide goes through the -- we take that reactor
6 and we put it into what we call our standard plant
7 which is a two-pack. The white building on the left of
8 this picture is our reactor service building so that's
9 where the two reactors are housed. It also has all of
10 the safety equipment necessary to keep the reactor
11 safe within that building.

12 The tall building to the right of that is
13 the turbine island. That's where the two turbines
14 are. Each reactor feeds it own dependent turbine, one
15 reactor/one turbine. And all the feedwater systems are
16 contained within that building.

17 Separated from the reactor building by a
18 couple of hundred feet which we did primarily for
19 security reasons, but there are a lot of secondary
20 effects that come into play when we did that.
21 Constructability, we can construct the turbine island
22 at the same time we're building the nuclear island.
23 The turbine island becomes a very simple steel metal
24 structure. It's not seismically qualified because it's

1 not relied on for safety, and it's separated
2 significantly from all the safety equipment.

3 In this particular plant, our standard
4 plant has a mechanical draft cooling tower. It's also
5 able to have a plug 'n play air-cooled condenser if a
6 customer desires that. Take a little bit of a hit on
7 efficiency but it's very feasible with the size of
8 reactor that we're dealing with.

9 Outside the main owner-controlled fence
10 area is our administration building, outside
11 warehousing. Our strategy is to bring warehouse
12 trucks, trucks from vendors, deliveries into an
13 outside warehouse. It'll be transferred to a company
14 truck, and then transferred into the secured area.
15 That's a feature we've taken from some of our other
16 secure facilities that we've been dealing with for the
17 last 40 or 50 years. Administration is outside the
18 fence so, basically, the outer fence that you see
19 there is about 36 acres. And that will generate 360
20 megawatts of electricity. Okay? Any questions on the
21 general layout?

22 So, if you look at the reactor service
23 building and you take a cross section basically east
24 to west, this is a cross section of that reactor
25 service building, so --

1 MEMBER CORRADINI: So, we're looking at the
2 same building that was up on the right side. Is that
3 correct?

4 MR. HALFINGER: The left side.

5 MEMBER CORRADINI: I'm sorry, left side.

6 MR. HALFINGER: And it's cut top to bottom
7 there. So, when you look at the site plan, basically
8 what you see is a one-story structure where the
9 reactor service building is. And, basically, from the
10 ground up is one story in the reactor service
11 building. All of the vital equipment for the plant to
12 keep the reactor safe and operating is below grade.
13 Our grade slab is a significant slab that will protect
14 all the components underground.

15 The other two significant features that
16 you can see from this diagram, and you'll see other
17 things when Doug shows you his diagram, which is the
18 same but in a different orientation. Each containment
19 -- each reactor is within its own containment, and
20 each containment structure contains all of the safety
21 equipment necessary to keep that module safe and
22 independent of the other module. So, that's why we go
23 to its own independent turbine so that we don't have
24 interaction between the two modules if we have an

1 upset in one reactor affecting the other one. So, the
2 safety systems are independent between the two.

3 What you see, the blue on top of the
4 containment structure is our passive containment
5 cooling system. It's a tank of water that will absorb
6 the water, the heat coming out of any postulated
7 accident within containment. What you don't see in the
8 picture out of the plain is our refueling water
9 storage tank which is contained within containment.
10 It's primary function, as its name implies is it's for
11 refueling so it will fill the refueling canal, allow
12 us to refuel the reactor. But it's also, therefore,
13 passively cooling the reactor in the event that we
14 need to do that. It's part of our emergency core
15 cooling system.

16 MEMBER BLEY: So, the containment dome is
17 actually the bottom of that tank.

18 MR. HALFINGER: Yes, it's integral to the
19 tank.

20 MEMBER CORRADINI: So, it's a steel shell
21 where that arrow is?

22 MR. HALFINGER: Yes.

23 MEMBER CORRADINI: Okay, thank you.

24 MR. HALFINGER: It's steel shell all the
25 way down around and embedded in the basement.

1 MEMBER REMPE: Where is the control room?

2 MR. HALFINGER: The control room is 60 feet
3 underground. In this view it's into the picture on the
4 other end if you go back one slide, Dave. It's on the
5 north side of the plant on the other end to the right.
6 Keep going, right there. Yes, the other right. About
7 80 feet under grade.

8 MEMBER BLEY: While you're on this picture,
9 where are the two reactors?

10 MR. HALFINGER: You want to point them out,
11 Dave?

12 MR. KANUCH: Yes, the mouse --

13 MR. HALFINGER: You can see a little white
14 disk barely visible right here, and there's one over
15 here.

16 MEMBER BLEY: Oh, yes.

17 MR. HALFINGER: And the idea on that is
18 that the reactor is small enough that we'll be able to
19 bring the reactor in at the end of construction and it
20 will be put down through this disk in the roof.

21 MEMBER BLEY: It's that whole integrated
22 package that --

23 MR. HALFINGER: Probably put it in in
24 multiple pieces, but it's going to -- the intent is

1 that it comes in very late in the construction cycle.
2 Okay? Any more questions on that?

3 MEMBER BANERJEE: So, we are seeing this in
4 different planes, is that it?

5 MR. HALFINGER: Right. So, go back one,
6 Dave. So, what the cut is that you're looking at, I
7 apologize for my back but it's basically right through
8 here looking from this direction back north. So, this
9 is Plant South, this is Plant North. So, we're cutting
10 through the two reactor containment structures and
11 we're looking north.

12 MEMBER BANERJEE: And what's that higher
13 building?

14 MR. HALFINGER: This one?

15 MEMBER BANERJEE: No, on the -- that part,
16 yes.

17 MR. HALFINGER: This is shipping and
18 receiving, and the rad waste services building part of
19 the plant.

20 MEMBER BANERJEE: Okay, thank you.

21 MR. HALFINGER: Okay, Dave.

22 MR. KANUCH: Yes. So, here's the disk,
23 Jeff.

24 MR. HALFINGER: Yes, so I showed you that
25 white disk. This is the white disk that you saw in the

1 other picture and it's in parallel with the disk
2 that's in the grade slab which goes right through the
3 top of the dome and be able to put the reactor right
4 into the containment structure.

5 The other significant thing on this view,
6 the top level doesn't contain any equipment that's
7 necessary to keep the reactor safe in a design basis
8 accident. And the other significant thing is a spent
9 fuel pool is located between the two containment
10 structures so it's a shared pool between the two
11 modules.

12 MEMBER SKILLMAN: Jeff, what is the yellow
13 disk that is the lower left image that we -- right
14 there. What is that?

15 MR. HALFINGER: That's a good question.

16 MEMBER SKILLMAN: The yellow disk.

17 MR. HASTINGS: That could be the RCI heat
18 exchanger cut away.

19 MR. HALFINGER: Yes. It's where they took
20 the cut, so that's part of the reactor coolant
21 inventory purification system. It's a high-pressure
22 heat exchanger.

23 MEMBER SKILLMAN: Thank you.

24 MEMBER RICCARDELLA: What's the vessel
25 diameter?

1 MR. HALFINGER: Reactor vessel or --

2 MEMBER RICCARDELLA: Reactor.

3 MR. HALFINGER: About 13 feet in diameter
4 at the flange.

5 MEMBER REMPE: When you're building this
6 thing, you mentioned you put the vessel in, how do you
7 put the dome -- is the dome not fully constructed? Is
8 one piece that's lowered like you see in a big
9 containment, or how is this done?

10 MR. HALFINGER: During construction the
11 expectation is the two white disks that you see are
12 concrete plugs, so they're removable. We'll take them
13 out. And then there's going to be a hole in the top of
14 the containment structure during construction that
15 we'll be able to put the reactor down through the
16 hole.

17 MEMBER REMPE: And then you finish the dome
18 off.

19 MR. HALFINGER: And then we just --

20 MEMBER REMPE: Okay.

21 MR. HALFINGER: We weld that pancake on the
22 top which is open to the structure because of the way
23 that you see the passive containment tank on the top
24 doesn't go all the way to the center, so it actually
25 has a 15 or 18 foot blank area in the top where we

1 don't have any water, so we can put our -- finish the
2 containment construction.

3 And then 50 years from now when we need to
4 do a steam generator replacement we would just do that
5 process in reverse. We cut that dome out of the top of
6 containment, lift the reactor right out the top.

7 MEMBER CORRADINI: Probably this is for
8 closed session, but you have design details such that
9 the free volume of containment per kilowatt or
10 megawatt is known at this point, or is it still being
11 evaluated?

12 MR. HALFINGER: It's known.

13 MEMBER CORRADINI: Okay. Thank you.

14 MEMBER BROWN: I'm going to ask this. You
15 say that's a slice right through when you look at that
16 picture, but yet it looks like on your previous view
17 that there's nothing in between those two reactors,
18 and there's no projection up above the roof level in
19 that previous view. It's almost like a courtyard in
20 between.

21 MR. HALFINGER: Yes.

22 MEMBER CORRADINI: Charlie is wondering why
23 there's no courtyard in your cartoon.

1 MEMBER BROWN: No. Go across this way as
2 you showed top to bottom, right. No, you're still in
3 the wrong place. Right there is what he showed us.

4 MEMBER SKILLMAN: That's where he said a
5 slice --

6 MEMBER BROWN: And it's all hollow in
7 between, and yet that's not what your other picture
8 shows.

9 MR. HALFINGER: This is showing that hump
10 in the -- right here is the raised area in the roof,
11 so when we go to the next page what you see on the
12 right-hand side this level, and this level back here.
13 This level in the middle is actually raised up by 12
14 or 15 feet.

15 MEMBER BROWN: Just didn't look like it in
16 the picture.

17 MR. HALFINGER: Right there is a --

18 MEMBER SKILLMAN: There's a shadow, so the
19 black is the shadow and the sun is on the far end of
20 the --

21 MR. HALFINGER: Correct.

22 MR. KANUCH: That's right.

23 (Simultaneous speaking.)

24 MEMBER BROWN: No, that's actually raised
25 up. That thing is the black --

1 PARTICIPANT: Is the shadow.

2 MEMBER BROWN: Is the shadow.

3 PARTICIPANT: A raised shadow with the sun
4 on the other side.

5 MR. HALFINGER: What you're seeing with the
6 raised area here, you can see the offset in the side
7 wall. This roof level is the same all the way back
8 here.

9 MEMBER BROWN: Oh, okay. The sun is on the
10 upper lefthand corner.

11 MR. HALFINGER: Correct. The cut, this is
12 that raised portion that's --

13 (Simultaneous speaking.)

14 MEMBER BROWN: Sorry, had to ask.

15 (Off the record comments.)

16 MEMBER RAY: Carry on.

17 MR. HALFINGER: So, we'll take a note that
18 we'll actually show the sun going across --

19 MEMBER REMPE: That would help.

20 MEMBER CORRADINI: Oh, please don't.

21 MR. HALFINGER: Okay. So, if we go to the
22 next slide, this is the breakaway of the reactor
23 itself. The picture on the far left is the assembled
24 reactor vessel. If we start over there at the very
25 bottom of that vessel is the reactor core, the nuclear

1 core. Above that is what we call the upper internal
2 structure which has the control rod drive mechanism
3 and guide frames for the control rod controls
4 themselves. Above that is the steam generator, and
5 then above that is the pressurizer, and that's where
6 our reactor coolant pumps are located.

7 So, we go to the right, the breakdown is
8 basically what I just said. So, the core and the core
9 form are in the bottom, 69 assemblies, fuel assemblies
10 in the core. The upper internal structure sits on top
11 of the core. All the control rods are contained and
12 the mechanisms are contained within that upper
13 internal structure, so when we do a refueling that
14 whole structure gets lifted out as one lift.

15 And then to the right of that, the steam
16 generator, again it's a once-through steam generator,
17 very conventional with the exception it has a 3-foot
18 diameter vessel inside of it so that we have the
19 primary coolant flowing up through the steam
20 generator, turns in the pump plenums and then gets
21 pushed down inside the tubes of the steam generator.

22 MEMBER CORRADINI: So, if there were a leg,
23 the pumps are on the hot leg.

24 MR. HALFINGER: That's correct.

25 MR. LEE: They are on the hot side.

1 MR. HALFINGER: The pumps are on the hot
2 side of the steam generator.

3 MEMBER CORRADINI: I'm sorry?

4 MR. LEE: They are in the core outlet.

5 MEMBER CORRADINI: Core outlet. Okay.

6 MR. LEE: Yes, sir.

7 MR. HALFINGER: There's eight reactor
8 coolant pumps sitting around the pressurizer. They are
9 not centrifugal, they're not your father's reactor
10 coolant pumps. They're vertical flow -- the word's
11 gone. Can rotor pumps.

12 MR. LEE: They're can rotor pumps, they're
13 very much like the impeller system on your outboard
14 motor for your boat where they actually receive a
15 radial input flow and then accelerate that flow
16 through more like a propeller than centrifugal
17 impeller. Okay? There's a lot of operating experience
18 with this pump in other applications, so this is not
19 really a first of a kind design for this pump.

20 MR. HALFINGER: And no pump seals.

21 MR. LEE: And no seals.

22 MR. HALFINGER: No shaft seals on it.

23 MEMBER SKILLMAN: What is not indicated
24 here is the umbilical for the control rod drives for
25 the power for the rad coolant pump motors. Where might

1 we find that if it had been provided on this image,
2 please?

3 MR. HALFINGER: The motor power is -- for
4 the reactor coolant pumps is provided directly to the
5 motors on top of the reactor vessel. The power for the
6 control rod drive mechanisms comes through that flange
7 on the upper internals. You see the flange, there's
8 going to be power penetrations that come through that
9 location and they're permanently affixed to the upper
10 internals. So, there'll be a --

11 MR. LEE: So, we need a disconnect there to
12 disconnect both power and signal from internal, inside
13 the reactor. And we're developing those penetrations
14 now.

15 MEMBER CORRADINI: So, the electrical
16 connections come in radially at that flange ring.

17 MR. LEE: Yes.

18 MR. HALFINGER: That's correct.

19 MR. LEE: Yes. We have to be able to pull
20 the mechanisms out, so we have to be able to
21 disconnect them at that ring. And, of course, the
22 lower vessel stays in place, stays situ for refueling.

23 MEMBER SKILLMAN: You said 69 fuel
24 assemblies. Are these 8-foot long assemblies? These
25 are 8? No, these are not 12-footers, these are --

1 MR. LEE: Little under, they're like two
2 meters but yes, on the order of 8-feet.

3 MEMBER SKILLMAN: Okay.

4 MR. LEE: So, almost half-size.

5 MEMBER SKILLMAN: Okay, thank you.

6 MR. HALFINGER: Okay? Next slide is just
7 the detail on the steam generator. As I said, it's a
8 very conventional once-through steam generator with
9 tubesheet top and bottom, tube support plates,
10 broached tube support plates like the way that B&W
11 fabricates them. We have one steam inlet, or feedwater
12 inlet, one steam outlet that goes over to the turbine.
13 It's an integral economizer so that the feedwater
14 comes in, it goes down the steam generator, goes into
15 the tube water, flows around the outside of the tubes
16 up through the steam generator, down the gap between
17 the tube bundle and the outer shell, and then out the
18 steam outlet.

19 MEMBER SKILLMAN: A question please about
20 the direction of forces. Where is the vertical mass
21 supported, and what grows up from that location, and
22 what grows down from that location, please?

23 MR. HALFINGER: Okay. If you go back one
24 slide, the support for the reactor -- basically, this
25 is where the reactor is going to be --

1 COURT REPORTER: You need to project your
2 voice this way.

3 MR. HALFINGER: Sorry. The support for the
4 reactor is going to be just at the mid flange, so from
5 this point down in grows down, from this point up it
6 grows up. That's the only support, other than seismic
7 supports that we're going to have to have, and we're
8 still figuring that part out, but -- so, it's
9 basically not quite in the middle of the reactor. It's
10 at 30-feet, probably, from the bottom up to here, 50-
11 feet from there to the top.

12 MEMBER SKILLMAN: So, when this plant goes
13 from cold shutdown to operating temperature the upper
14 portion grows an inch and a half, two inches, a number
15 like that?

16 MR. LEE: Almost three.

17 MR. HALFINGER: Three inches.

18 MEMBER SKILLMAN: And downward an inch and
19 a half or so?

20 MR. LEE: Almost three.

21 MEMBER SKILLMAN: Oh, really.

22 MR. HALFINGER: Two, two and a half.

23 MEMBER SKILLMAN: So, three up and two
24 down.

25 MR. LEE: Something like that, yes.

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1 MEMBER SKILLMAN: Okay, thank you.

2 MEMBER BROWN: We know that because in our
3 integrated system test facility we supported it in
4 precisely the same location and we've actually
5 measured the growth both vertically upward and
6 vertically downward, and we have a comparable leg so
7 -- and it's an alpha delta T calculation.

8 MEMBER SKILLMAN: Thank you, Doug. Okay,
9 got it.

10 MR. HALFINGER: Okay? So, defense-in-depth
11 for mPower is different than what you're normally used
12 to thinking about. The way we're doing our strategy
13 for safety is to have a very robust defense-in-depth
14 strategy, but we put a lot of systems in front of the
15 one that we're really counting on, so we have active
16 systems like our auxiliary condenser systems, CNX that
17 provides high-pressure decay heat if we need to in the
18 event of loss of feedwater or station blackout
19 conditions.

20 We also have a reactor coolant inventory
21 purification system that can provide high pressure and
22 low pressure decay heat. If the auxiliary condenser
23 system isn't available to us, we can go right to RCI.
24 We like to use CNX first, then go to RCI for low
25 pressure.

1 MEMBER BLEY: And either one is fully
2 capable of --

3 MR. HALFINGER: Either one is fully
4 capable. But they're active systems. Well, CNX really
5 isn't an active system. It does have natural
6 circulation through an air-cooled condenser. It's
7 battery powered for the fan. The reactor coolant
8 inventory purification system requires AC power either
9 from normal house loads or from the diesel generators.
10 So, we rely on those, they're robust systems. We rely
11 on those. We want them to come in in the event that
12 we need to do something or act because of an incident
13 that's going on. But if they're not available, if we
14 have a full station blackout and the diesels don't
15 start, our emergency core cooling system is fully
16 passive. It relies on natural circulation, gravity
17 feeds, depressurization of the primary system, those
18 sorts of things, all run on batteries, so we don't
19 rely on AC power for our emergency core cooling
20 system. So, the only credited system in our whole
21 plant that we use in Chapter 15 is the emergency core
22 cooling system. All the other systems we assume aren't
23 available. We want them to be available. We want to
24 use them, and that's what gets us our very favorable
25 core damage frequencies in PRA space.

1 The integral design --

2 MEMBER RICCARDELLA: How long do the
3 batteries last then?

4 MR. HALFINGER: The batteries last at least
5 72 hours.

6 MEMBER BANERJEE: Where are they located?

7 MR. HALFINGER: They're in the reactor
8 service building under grade, basically what we call
9 the annex. If I showed you a cross section of the
10 reactor service building in the north-south direction
11 looking east or west, the annex is on the north end of
12 the building, and it doesn't go as deep as the
13 reactors go so it's in like a shallower but still
14 underground part of the building.

15 MEMBER BLEY: After you've established
16 natural circulation do you still need the batteries
17 for it to continue to work, so it's just a change --

18 MR. HALFINGER: The only thing we need the
19 batteries for is to change position on the valves to
20 get the whole system --

21 MEMBER BLEY: You do that up front, so you
22 really don't need them for 72 hours.

23 MR. HALFINGER: No, we don't need them past
24 the first 45 minutes or hour. And I think we'll -- are
25 we showing the video in the closed session?

1 MR. LEE: We will show that.

2 MR. HALFINGER: So, the closed session
3 we'll show you exactly how that works.

4 MEMBER BANERJEE: Okay.

5 MR. HALFINGER: It's really pretty cool.
6 The other thing --

7 MEMBER BANERJEE: So, what's the elevation
8 difference cold and hot in this system on the average,
9 roughly?

10 MR. HALFINGER: Probably 40 feet.

11 MEMBER BANERJEE: Forty feet.

12 MR. HALFINGER: Would be my guess from the
13 hot part of the center of the core to the center of
14 the steam generator, the thermal centers.

15 MEMBER BANERJEE: And do you take into
16 account two-phase flow for the natural circulation, or
17 is it all single phase?

18 MR. HALFINGER: We assume that it does turn
19 into two-phase flow.

20 MR. HALFINGER: Okay.

21 PARTICIPANT: The core boils.

22 MEMBER BANERJEE: So you take that into
23 account to establish your natural --

24 MR. HALFINGER: Absolutely.

25 MEMBER BANERJEE: -- circulation.

1 MR. HALFINGER: Absolutely.

2 MEMBER BANERJEE: All right.

3 MR. HALFINGER: So, the other part of the
4 safety system is the integral design itself. I showed
5 you what the integral reactor looks like versus a two-
6 loop plant, so a lot of the things, the features of
7 the integral reactor for mPower, we don't have inner
8 loop piping, the large diameter piping. We don't have
9 any of that, so all of our transients are very slow
10 and very drawn out. We have low power density. We have
11 large thermal center so we can get natural circulation
12 set up very easily. We have low pressure drop through
13 the core and through the system so we can get natural
14 circulation set up. So, all this are features that
15 were specifically put into mPower to be able to
16 support the defense-in-depth strategy that we talk
17 about. So, that's all I had on the overview, pretty
18 high level, much more interesting when Doug tells you
19 what he's going to tell you.

20 MEMBER BANERJEE: We're still in open
21 session. Right?

22 MEMBER BLEY: We're still open, yes.

23 MR. HALFINGER: You can grill him in a
24 minute.

1 MEMBER BLEY: Anything more from us? Are
2 you ready to go into closed session now, or not yet?

3 MR. HALFINGER: I am.

4 PARTICIPANT: We are, yes.

5 MEMBER BLEY: You are.

6 PARTICIPANT: Let me make sure that --

7 MEMBER BLEY: Maitri, yes. Have you looked
8 around?

9 MEMBER SKILLMAN: Jeff, what is the
10 horsepower of the electrical and pump motors, please?

11 MR. HALFINGER: They're 500 kilowatts.

12 MEMBER SKILLMAN: Each?

13 MR. HALFINGER: Each.

14 MEMBER SKILLMAN: Thank you.

15 MR. HALFINGER: It's not a little pump.

16 (Off the record comments.)

17 MEMBER BANERJEE: What's the refueling
18 frequency here?

19 MR. HALFINGER: Four years.

20 MEMBER CORRADINI: That's still at 5
21 percent enrichment.

22 MR. HALFINGER: Yes.

23 MEMBER BANERJEE: And you change out what,
24 half the core?

25 MR. HALFINGER: Full core.

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1 MEMBER BANERJEE: Full core.

2 (Off the record comments.)

3 MEMBER BLEY: I think your folks and our's
4 are checking in.

5 MEMBER BANERJEE: Single pass core.

6 MR. HALFINGER: Single pass? Yes.

7 (Whereupon, the proceedings went off the
8 record at 1:20 p.m. and went back on the record at
9 3:00 p.m.)

10 CHAIRMAN STETKAR: We are back in session,
11 and Dr. Bley will lead us through the next
12 presentation.

13 MEMBER BLEY: Why, thank you, Mr. Chairman.
14 I'm just going to turn it over to Stu Magruder and
15 they're going to tell us about the Staff activities on
16 the small modular reactors, and what's going on. Stu.

17 MR. MAGRUDER: Thank you, Dr. Bley. It's
18 been a couple of years since we've talked to the
19 Committee about our activities, and in spite of what
20 you may hear, a lot of activity has been going on with
21 the staff. You just heard a good presentation from
22 Generation mPower about their activities. We talked
23 about all the other designs.

24 Joining me is Anna Bradford. She's also a
25 Branch Chief from the Division of Advanced Reactors

1 and Rulemaking at NRO. The activity has picked up so
2 much over the last couple of years that we formed a
3 second branch, so we actually split the designs. I
4 have the mPower and Holtec designs, and Anna has
5 NuScale and Westinghouse, and the other non-light
6 water reactor designs which we'll talk about a little
7 bit.

8 MEMBER POWERS: Who got first pick, by the
9 way?

10 MR. MAGRUDER: It was a mutual decision.

11 PARTICIPANT: We're on the record.

12 MEMBER POWERS: Just checking.

13 MR. MAGRUDER: There's pluses and minuses
14 for all the designs. So, the discussion topics here,
15 first I want to provide a little bit of a historical
16 context for the Advanced Reactor program at NRO, give
17 you an idea of how we've evolved over the years. Then
18 we'll go through -- I'll go through the projects at
19 very high level, but we can answer a few questions,
20 but if you start probing too deep we'll show our
21 ignorance on these designs. And then I'll turn it over
22 to Anna and she can talk about the rest of the topics
23 here, including some of the key policy and technical
24 issues that we have been working on.

1 So, back in 2008, NRO formed what was then
2 called the Advanced Reactor program. There was only a
3 handful of people. It included Project Managers and
4 technical staff, and the main focus of that group was
5 NGNP, the Next Generation Nuclear Plant, which was a
6 DOE proposal for a high-temperature gas reactor. Our
7 focus was really working with the Office of Research
8 on activities, working with DOE. We developed the
9 licensing process for NGNP.

10 The NuScale design was just in its
11 infancy. It was kind of evolving from the DOE program,
12 and we were just beginning to think about some of the
13 policy and technical issues that we were facing.

14 MEMBER BLEY: Is the fuels research still
15 going on for the NGNP out at Idaho?

16 MR. MAGRUDER: Yes. Do you want to --

17 MS. BRADFORD: Yes, it is.

18 MR. MAGRUDER: Yes, they've actually been
19 fairly successful, I think.

20 MEMBER BLEY: Yes, the last we heard. It's
21 been a while since we heard from them.

22 MR. MAGRUDER: Correct. Yes.

23 MEMBER BLEY: I didn't know if they still
24 had funding that was moving them forward.

25 MS. BRADFORD: Yes.

1 MR. MAGRUDER: And I think because it's
2 been successful, some of the other vendors are looking
3 at that trisofuel and thinking about using it in other
4 designs. And we can talk about that.

5 MEMBER BLEY: Okay, yes. Thanks.

6 MR. MAGRUDER: So, we started meeting with
7 the industry. NEI formed an SMR working group and
8 other groups, and we looked at some of the generic
9 topics that would be unique to SMR designs. And we
10 discovered that our ideas of what the issues were and
11 the industry's idea of the issues were very similar.
12 And as many of you know, we sent up a paper to the
13 Commission listing a whole bunch of issues, that was
14 SECY-10-0034, and we've been working through those
15 issues steadily.

16 So, now in 2014 we now have a division in
17 NRO, the Advanced Reactor program, it's the Division
18 of Advanced Reactors and Rulemaking. Advanced Reactors
19 are two branches within the division, and we also have
20 a policy rulemaking branch, and we also have planning
21 optimization branch which is planning and scheduling
22 and IT people in NRO. But the focus for most of our
23 work right now is on the light water SMR designs that
24 we'll talk about here.

1 There is increasing interest in other non-
2 light water reactors. We still have information on the
3 GE Prism design and the Toshiba 4S design, but we
4 haven't really engaged them much, but there is --
5 there are other vendors that are contacting us about
6 their designs, and we'll talk about them a little bit
7 in the future when we are doing some activities. But
8 our resources for non-light water reactor work is
9 pretty minimal.

10 We've also had a lot of interactions in
11 the last several years with international regulators.
12 Other countries around the world are either developing
13 SMR's technologies or are thinking about implementing
14 SMR technologies, and through the IAEA we've formed a
15 group of SMR regulators to get together occasionally
16 to talk about some of the common issues. And I think
17 we'll talk some more about this. There's a slide later
18 on that.

19 And, finally, we have developed papers and
20 positions on the majority of the policy issues that
21 we've identified. We think we have a path forward. The
22 message really is that the Staff is ready to review
23 SMR designs. We're ready to license them.

24 There may be some issues that the
25 applicants or the designers may want to push the

1 boundaries a little bit more, and we will have to
2 discuss more with them on those issues. But if
3 somebody were to submit a design certification to us
4 today, we could review that.

5 MEMBER REMPE: Can I ask a question that's
6 a little -- on the previous slide that's a little off
7 topic that I just was curious about? Is there some
8 sort of U.S. Government requirement that if the U.S.,
9 someone in the U.S., a vendor or not a vendor that's
10 trying to be a vendor decides to develop a design and
11 export it, is there any sort of requirement for export
12 control they come to NRC for review? There is?

13 MR. MAGRUDER: Yes. Mike can answer better.

14 MR. MAFIELD: It's a part of 810 process.

15 MR. MAGRUDER: Right. The DOE -- is it 10
16 CFR 810?

17 MR. MAFIELD: 10 CFR Part 810.

18 MR. MAGRUDER: Right.

19 MEMBER REMPE: So, there is a requirement
20 that before a U.S. technologies exported --

21 MR. MAFIELD: It's export technology
22 control.

23 MEMBER REMPE: But there is a vendor right
24 now, or an organization that's trying to market to
25 China, and how does that work?

1 MEMBER CORRADINI: But I don't think -- I
2 think Mike's answer, though, was not certified.

3 MEMBER REMPE: No, this is not a -- they
4 just decide I'm going to take this technology that was
5 developed in the U.S. and they go overseas and sell,
6 it's --

7 MR. MAFIELD: They may be facing criminal
8 action. If they haven't gone through the 810 process,
9 they may have a serious problem.

10 MEMBER REMPE: And part of that 18 process,
11 810 --

12 MR. MAFIELD: 810.

13 MEMBER REMPE: -- process is to come
14 through NRC?

15 MR. MAFIELD: No, no, it's an interagency
16 process that I think DOE actually manages.

17 MEMBER CORRADINI: And it wouldn't require
18 certification.

19 MEMBER REMPE: No, there's just --

20 MR. MAFIELD: No, it's technology export.

21 MEMBER REMPE: But there's nothing that
22 comes to NRC --

23 MR. MAFIELD: No, we're part of that but we
24 don't -- we're part of that export control. We can
25 talk about it --

1 MEMBER REMPE: I'm just curious because
2 there is an example right now you're aware of, and I
3 just was curious.

4 MR. MAFIELD: We're part of that export
5 control process but we're only one part.

6 MEMBER REMPE: Okay.

7 MR. MAGRUDER: Yes, there's coordination
8 between Department of State, Department of Commerce,
9 NMSA, DOE all get involved in that --

10 MEMBER REMPE: Okay.

11 MEMBER POWERS: You don't take
12 import/export control training at Idaho?

13 MEMBER REMPE: Yes, we do. And I always
14 have everything export controlled but there's just an
15 example I'm curious about.

16 MEMBER POWERS: It's locked down just like
17 they say. There's certain government agencies
18 responsible. Each category at NRC has a particular
19 area of responsibility.

20 MR. MAGRUDER: Correct.

21 MEMBER POWERS: And the penalties are
22 horrible.

23 MEMBER BLEY: And it's not just hardware.
24 I mean, it's paper studies. We've had to go through
25 that, as well.

1 MR. MAFIELD: Including people who wish to
2 work overseas have to go through that process.

3 MR. MAGRUDER: Yes. Our Office of
4 International Programs has a group that focuses on
5 that.

6 MEMBER SKILLMAN: Stu, I'm Dick Skillman.
7 Let me ask you a question, please. You said you could
8 respond to a design cert application. Would it make a
9 difference to you whether that application came in
10 under Part 50 or under Part 52?

11 MR. MAGRUDER: No, it wouldn't. We're in
12 the process of -- well, let me see. No, I don't think
13 it would. We're in the process of actually developing
14 a Commission paper which we'll brief the Committee on
15 soon. I think --

16 PARTICIPANT: Next month, or two months.

17 MR. MAGRUDER: Two months. In June,
18 actually. Where we've actually analyzed the
19 difference between the requirements in Part 52 and
20 Part 50. And, of course, I mean not of course, there
21 are things that we've included in Part 52 that we did
22 not go back and implement in Part 50. Mainly, it was
23 PRAs, severe accident requirements, things like that.
24 So, we think that if we made some fairly
25 straightforward changes to Part 50 and got Commission

1 buy-in that the decisions they made with regard to
2 Part 52 also apply to the Part 50 licensing process,
3 we could review an application under Part 50.

4 MEMBER SKILLMAN: Thank you.

5 MR. MAGRUDER: Okay. As I mentioned
6 earlier, mPower was in just prior to this discussion
7 to give a detailed presentation on their design, so I
8 won't talk a lot about that except to give you an idea
9 of what our Staff activities have been.

10 The first bullet is our best guess about
11 when they will actually come in with an application.
12 As many of you know, there's a lot of uncertainty
13 about the B&W support for the mPower design now and
14 the funding is a question. But based on statements
15 from the B&W President, we expect the design
16 certification will come in in early 2015. And that's
17 what the Staff is --

18 MEMBER BANERJEE: When was that statement
19 made, before or after the last uncertainty of funding.

20 MR. MAGRUDER: That statement was made on
21 actually a shareholders' quarterly briefing with Wall
22 Street reporters about a month and a half ago.

23 We've had a lot of technical meetings with
24 mPower, more than 50 meetings is accurate here. We
25 have approved their Quality Assurance program, or a

1 previous version of their Quality Assurance program I
2 should say in the Instrument Set Point Methodology
3 topical report, and we've got another -- actually a
4 couple of topical reports under review. Core nuclear
5 design methods is the most active one right now.

6 So, we are also developing a design-
7 specific review standard for mPower that is -- you can
8 think of it as a tailored standard review plan for the
9 mPower design. That's really been the focus of most of
10 our meetings over the last several years, is gathering
11 information about the design and updating the review
12 guidance for the Staff.

13 We published a draft version of that for
14 use and comment in May of 2013. That included almost
15 all the sections. There were a few sections that
16 mPower still held as proprietary because they had not
17 gotten their patents on that information yet. They did
18 receive the patents last fall. The Staff has worked
19 with them and we've gotten -- we're about ready to
20 actually publish the draft versions of those remaining
21 DSRS sections.

22 As I said, we published the draft in May
23 of last year for public comment. We got almost 2,000
24 comments on the DSRS. Staff has done a tremendous job,
25 all the disciplines in NRO and NSIR, and NRR now have

1 kind of weighed in, answered the public comments, and
2 we're in the process of getting those revisions and
3 the public comment resolution reviewed by management
4 in the Agency and our Office of General Counsel. And
5 we will be coming hopefully soon to Dr. Bley's
6 Subcommittee and talk more about the DSRS.

7 MEMBER BLEY: We look forward to that, yes.

8 MR. MAGRUDER: Chapter 7 has been
9 completely rewritten for the mPower review, and we
10 continue to have meetings on that topic. Okay, next
11 slide, please.

12 MEMBER BROWN: A question.

13 MR. MAGRUDER: Yes, sir?

14 MEMBER BROWN: If you've completely
15 rewritten it since the last time we looked at it --

16 MR. MAGRUDER: No, not since the last time
17 you looked at it, sir. Since --

18 MEMBER BROWN: Okay.

19 MR. MAGRUDER: It's rewritten from the SRP
20 Chapter 7.

21 MEMBER BROWN: Okay. All right. I was just
22 about to have a heart attack.

23 MR. MAGRUDER: No, no, no. Sorry about
24 that. It's consistent with what you've seen before.

25 MEMBER BROWN: Thank you very much.

1 MR. MAGRUDER: And I'm sure it reflects
2 your comments.

3 MEMBER BROWN: I just blanched.

4 MR. MAGRUDER: Yes.

5 MEMBER CORRADINI: They would never go
6 against what you --

7 MEMBER BANERJEE: You can't blanch.

8 MEMBER BROWN: Pardon?

9 MR. MAGRUDER: So, we do have active
10 discussions with a potential applicant for a Part 50
11 construction permit, and that's TVA. They're proposing
12 to build four mPower units, that's two packs at the
13 Clinch River site which is adjacent to Oak Ridge
14 National Laboratories in Tennessee. They were -- TVA
15 was part of the mPower America team that was awarded
16 money from DOE. The idea is to demonstrate that you
17 can build and operate SMRs in the United States, and
18 the award was based on having these units operating by
19 2022. So, that's what TVA is basing their schedule on.

20 We've had several meetings with them.
21 We've had several staff down at the site. TVA has done
22 a lot of site prep work and work to prepare their
23 environmental report. Things are going well. These are
24 some of the topics that they want to talk about with
25 the Staff in the near future.

1 And we were also developing guidance,
2 since it's been many years since we've reviewed a
3 construction permit application, we need to update our
4 Staff guidance on how to do that, so that's a big
5 effort that we're starting on now.

6 Okay. The Holtec design is, I would say,
7 in a conceptual stage still. We've had a couple very
8 high-level meetings with Holtec, and as you can see,
9 they've done some drop-ins with the Commissioners.
10 They initially told us that they would come in towards
11 the end of calendar year 2016, but in their most
12 recent response they said they're reevaluating that
13 schedule, so we don't have a firm date for Holtec and
14 their design certification application.

15 We are reviewing their QA topical now, and
16 actually are almost finished with that. That's a key
17 part of any application, is making sure the Quality
18 Assurance program is of high quality.

19 So, this is a very high-level idea of the
20 Holtec design. It's a very thin pressure vessel. The
21 core is obviously down at the very bottom. The steam
22 generator is attached by flange to the reactor vessel
23 so it's not truly integral design; however, they -- I
24 mean there's no piping in this design. This is totally
25 natural circulation. There are no pumps in the design.

1 It's also below grade similar to the mPower design
2 that we were looking at earlier today.

3 Holtec has partnered with PSE&G in New
4 Jersey, and they've got many engineers from PSE&G
5 working with them on the design, which is encouraging
6 for us. They've also just recently announced that
7 they're planning to build an integral test facility
8 similar to what you heard from mPower today up in
9 Camden, New Jersey.

10 NuScale, I would say besides mPower,
11 NuScale is the most active vendor that we've been
12 dealing with. They recently announced that they are
13 flipping their application date from the summer of
14 2015 to the summer of 2016. They also got awarded
15 money from the Department of Energy in the second
16 funding opportunity.

17 We're doing a DSRS also for NuScale, and
18 that, as you might imagine, is building off what we've
19 done for the mPower DSRS. Many of the sections are
20 similar, and the Staff is kind of going through that
21 more quickly than the mPower DSRS.

22 You can see the testing that they're doing
23 out at Oregon State University where they have a one-
24 third scale test facility out there. They've also done
25 critical heat flux testing at Stern Labs in Canada,

1 and they did some interesting tests. They have a --
2 they're proposing a helical coil steam generator as
3 opposed to a straight tube steam generator, and they
4 did some testing at SIET in Italy in the fall which we
5 observed that went very well, actually.

6 They're also doing testing of fuel designs
7 in South Korea. They haven't confirmed, I don't think
8 they've confirmed that they'll use KEPCO as a vendor,
9 but they've done testing in South Korea with their
10 fuel.

11 Some of the challenges of NuScale design
12 we've talked about before, but this concept, and maybe
13 go to the next slide, show you the cutaway view here.
14 This is, essentially, the reactor building for
15 NuScale. It's a big submerged pool of water where all
16 the reactors and the containment vessels are
17 underwater. Nominally in their design they're going to
18 have 12 reactors in this pool. This shows six of them
19 here. And one of the challenges there, they're
20 proposing to have fewer control room operators than
21 our requirements would have since they're going to be
22 operating 12 units from one control room, so that's a
23 challenge that we're looking at now. They have a full-
24 scale control room mock up in Corvallis. The Staff has
25 been out to look at it and are interacting with them

1 on how they're going to actually -- how many operators
2 they actually will need.

3 This is also a total natural circulation
4 reactor, no reactor coolant pumps.

5 MEMBER BLEY: Are their plants also
6 completely separate from each other?

7 MR. MAGRUDER: Yes, they are, separate
8 safety systems, separate turbine generators, that's
9 for each reactor. These are much smaller. These are
10 only 45 megawatt electric per reactor. Again, this
11 uses standard PWR fuel, just shorter fuel similar to
12 mPower.

13 MEMBER BANERJEE: You have six modules.
14 Right? Is that it?

15 MR. MAGRUDER: This is half of the pool.

16 MEMBER BLEY: Twelve.

17 MR. MAGRUDER: Right. This is just showing
18 six.

19 MEMBER BANERJEE: So, when you say 45
20 megawatt net power per module, what do you mean? With
21 12 modules they --

22 (Simultaneous speaking.)

23 MR. MAGRUDER: Yes, so a little over 500
24 megawatt for all 12 units. But their plan is to refuel

1 these every two years so that they would essentially
2 have about 500 megawatts on line all the time.

3 MEMBER RICCARDELLA: They refuel each unit
4 individually?

5 MR. MAGRUDER: Individually, yes. Yes, they
6 would move to the other end of the pool there where
7 they've got a spent fuel pool and refueling
8 capability. So, theoretically, once they get all 12
9 units operating, they're refueling about every two
10 months, so they would have a permanent staff there
11 that does refueling.

12 MEMBER BROWN: So, they can pull one out
13 while all the rest of them are still operating at
14 power.

15 MS. BRADFORD: That's their proposal.

16 MR. MAGRUDER: That's their proposal, yes.

17 MEMBER BROWN: Disconnecting the steam
18 lines.

19 MR. MAGRUDER: Yes. They have an instrument
20 that while they move it --

21 MEMBER RICCARDELLA: Each one has its own
22 containment?

23 MR. MAGRUDER: Yes.

24 MEMBER RICCARDELLA: Each one of those
25 things you're showing there is a containment?

1 MR. MAGRUDER: Yes. It's kind of like a
2 thermos, actually, because you've got the reactor
3 vessel and then a small air space, and then the
4 containment vessel.

5 MEMBER BANERJEE: And the steam generator?

6 MR. MAGRUDER: Inside the reactor vessel.
7 Two steam generators.

8 Westinghouse SMR, Westinghouse came late
9 to the game and focused a lot of attention on their
10 SMR design. They were trying to utilize a lot of the
11 lessons they learned from the AP1000 design. This
12 would also be a passive design, single unit, a little
13 bit larger than mPower. But after DOE made the second
14 funding opportunity announcement and Westinghouse did
15 not receive funding, they made a corporate decision to
16 slow down significantly on their SMR work. So, we
17 really haven't had much interaction with them other
18 than to kind of finish up the work that we started on
19 their LOCA PIRT topical. We're still doing a little
20 bit of work on that.

21 They were also partnered with Ameren
22 Missouri to build these units at the Callaway site,
23 but Ameren has kind of backed off, also, and haven't
24 decided which technology they're going to use.

1 Okay. This is a cutaway view of the
2 Westinghouse design. It's kind of a hybrid, I guess.
3 I mean, it's a dry containment but it's small
4 containment. Again, the vessel is kind of tall and
5 thin like the other vessels, they're once-through
6 steam generator, but that's just a very high-level
7 view of that design.

8 MEMBER RICCARDELLA: Pumps or natural circ?

9 MR. MAGRUDER: Pumps.

10 MEMBER RICCARDELLA: Pumps.

11 MR. MAGRUDER: Reactor coolant pumps, yes.
12 They're mid-flange there as opposed to mPower which
13 are on the top of the vessel.

14 MEMBER RICCARDELLA: Oh, I see.

15 MS. BRADFORD: Yes.

16 MR. MAGRUDER: Thanks. Okay. Anna.

17 MS. BRADFORD: Okay, thank you. So,
18 everything Stu has been talking about have been the
19 light water designs that we've been interacting with.
20 We've been trying to do some strategic thinking about
21 non-light water designs. There's a lot of interest in
22 them internationally, a little bit of interest here
23 domestically. We've received letters from two non-
24 light water vendors. They're proprietary so I can't
25 really go into the details, but at the very kind of

1 beginning stages of thinking about what they might
2 want to do.

3 One that's not proprietary I can talk
4 about for a minute is X Energy. It's 100 megawatt
5 thermal SMR pebble bed HDGR that they're thinking
6 about, but that's several years in the future before
7 they come to us for a license. But we wanted to sit
8 back and think well, how would we handle that if
9 someone came in the door? You asked if we could handle
10 an application under 50 or 52, and we thought could we
11 handle an application or either of those for a non-
12 light water design, because I'm sure you all know
13 those regulations are really geared towards our light
14 water experience. So, I think what we concluded was we
15 could do it, but it would be messy, and it would take
16 a long time.

17 And one thing we heard in our
18 communications with the Department of Energy, who they
19 often talk to the non-light water vendors and industry
20 as a whole, was that they thought there needed to be
21 better regulatory framework for non-light water
22 applications. So, we talked to DOE and we came up with
23 something that we're calling a two-phase strategy.

24 The first phase, DOE is taking the lead.
25 They're in the middle of that right now. They started

1 about the beginning of this year/end of last year.
2 What they're doing is they're taking all of their
3 technical expertise, they're looking at all of our old
4 documents that are publicly available, they're talking
5 to vendors, they're using the National Labs to look at
6 the general design criteria in Appendix A of Part 50.
7 Those are mostly also geared to light water reactors.
8 It says in the introductory text at the beginning
9 something about these are for light water reactors but
10 they could provide guidance for non-light water
11 designs. So, what do we really need to do if we wanted
12 to apply these to a non-light water design? DOE is
13 doing that part right now.

14 They're actually having a two-day meeting
15 next week with industry to talk about this. What does
16 industry think we would need to do with GDCs? So, if
17 a GDC has water in it, and your coolant is not water,
18 maybe that's clearly a problem, maybe you just need to
19 take out the word "water," maybe you want to make it
20 more generic so it's any type of coolant. They're
21 thinking through those things.

22 MEMBER CORRADINI: So, the meeting next
23 week is for what then?

24 MS. BRADFORD: DOE.

25 MEMBER CORRADINI: That part I got.

1 MS. BRADFORD: It's DOE's meeting with --
2 they have invited representatives of industry that
3 they have contact with.

4 MEMBER CORRADINI: That might be interested
5 in pursuing non-LWR --

6 MS. BRADFORD: Yes.

7 MEMBER CORRADINI: -- SMRs.

8 MS. BRADFORD: Yes. So, what they're going
9 to give us hopefully, they're planning by the end of
10 this year, is some kind of report where they, I think
11 what they're thinking is would go through the GDCs,
12 talk about how they would recommend that they be
13 revised, and the basis for it.

14 MEMBER BLEY: I'm just --

15 MEMBER CORRADINI: I --

16 MEMBER BLEY: I'm sorry, Mike.

17 MEMBER CORRADINI: No, you go.

18 MEMBER BLEY: I've seen another group do
19 that.

20 MS. BRADFORD: Yes.

21 MEMBER BLEY: And what they did was
22 identified all the things that don't apply.

23 MS. BRADFORD: Right.

1 MEMBER BLEY: But they didn't investigate
2 what else you might need. Now, the work you're doing
3 on the design-specific guidance --

4 MS. BRADFORD: Yes.

5 MEMBER BLEY: -- is doing that. Is DOE up
6 to speed on that side of it, what you've been doing,
7 and the kind of things to think about to make sure you
8 don't just strike things, but you add in the new
9 regulations?

10 MS. BRADFORD: We have been, I would say,
11 observing this phase one.

12 MEMBER BLEY: Okay, so you've been
13 involved.

14 MS. BRADFORD: And we've tried to make
15 points like that. Like, okay, so maybe some don't
16 apply, but maybe there's whole new ones that you need
17 to create because of some new system, or some new --
18 so they definitely have that as sort of a box they
19 need to think about and check.

20 MEMBER CORRADINI: So, just to follow on,
21 I guess I'm -- since we just finished with NGNP --

22 MS. BRADFORD: Yes.

23 MEMBER CORRADINI: So, is there something,
24 lessons learned there that you're going to tell DOE so
25 they don't march up that same path? I'm still

1 struggling with we've already did this, or tried this,
2 and there was a, I guess the word I would come up with
3 is misunderstanding, different expectations. And
4 before this gets too far, are those expectations clear
5 between NRC and DOE so they don't develop other
6 expectations?

7 MS. BRADFORD: My one response would be,
8 again, that we've interacted with them significantly
9 on NGNP where we can on this phase one. And that this
10 is broader than just HDGRs. They're thinking about
11 fast reactors. They're trying to make it technology
12 neutral where they can.

13 MEMBER CORRADINI: Oh, so that leads me to
14 the other thing. So, where does the NUREG that was
15 never issued but was in draft form, NUREG --

16 (Simultaneous speaking.)

17 MEMBER CORRADINI: It was? Thank you very
18 much. No, it's out.

19 MS. BRADFORD: It was issued.

20 MEMBER CORRADINI: It was issued, but it
21 was never used.

22 MEMBER BANERJEE: Always ask that question.

23 MS. BRADFORD: That is a framework as
24 opposed to the details of how you would implement it.
25 So, you might be able to build off some of the things

1 in there if they're applicable, but it's not going to
2 tell you how to implement that.

3 MEMBER CORRADINI: The only reason I'm
4 asking all this is -- so, let me just cut to the --
5 where I sense there was a misunderstanding. And I'm
6 sure Mr. Mafield will correct me.

7 MR. MAFIELD: Never.

8 MEMBER CORRADINI: My impression was when
9 we had the meeting, and I can't remember if it was a
10 year ago, six months ago, or whatever when we had
11 this, Dennis -- it was a Subcommittee meeting, I
12 think, Dennis ran, is that DOE came in with the
13 impression that they could get to essentially an end
14 state that didn't require a prototype, and from the
15 other side of the NRC, I got the definite impression
16 that to really get something clear on what were the
17 regulatory requirements, a prototype was probably
18 necessary. And I never sensed that DOE -- I never
19 sensed the two parties really -- I sensed that we
20 walked away from the meeting like this instead of like
21 they were facing--

22 MEMBER BLEY: DOE had argued they couldn't
23 get industry support for the prototype, so they
24 couldn't do it. That's my memory.

25 MR. MAFIELD: If I could --

1 MEMBER BLEY: Well, that was based on 50-50
2 cost sharing.

3 MS. BRADFORD: Yes, they couldn't get a
4 cost share partner.

5 MR. MAFIELD: But let's -- we've got to be
6 a little careful in --

7 MEMBER CORRADINI: That's why I want --

8 MR. MAFIELD: You've got to be a little
9 careful about mixing in NGNP and the attempts to push
10 forward that as a licensing strategy. And we'll be
11 happy to come back, and we can bring in John Kelly and
12 Tom O'Connor and have a great debate, but it won't
13 move the ball forward much.

14 MEMBER CORRADINI: Okay.

15 MR. MAFIELD: So, the conversation we had
16 -- that Tom Cavern and I had, Anna was involved was
17 wait a minute, let's take a step back. With NGNP we
18 were trying to take a great huge bit out of the apple.
19 And, once again, tried to take a great huge bit out of
20 the apple and it wasn't working all that well. Let us
21 take a step back and think smaller. Let's think about
22 general design criteria. Right? Some of the specific
23 things that people that might actually design
24 something, some guidelines, criteria to follow through
25 on. So, we met with John Kelly and his staff and

1 talked about the notion of how can you go forward for
2 general design criteria? What makes sense, of the ones
3 that exist, what of them make sense, what of them
4 don't make sense? There's a lot of activity with A&S,
5 as you well know, on the four different technologies,
6 four different standards, a lot of interest in sodium.
7 Right, wrong, or indifferent there's a lot of interest
8 in sodium technology. So, let's look at sodium
9 technology, what can we do as sort of the immediate
10 case? What of the GDC apply, what don't apply, and
11 what new ones, either new or modified ones do you
12 need? So, we had some discussion around that as a
13 general framework.

14 At that point, NRC stepped back and went
15 to an observer status. So, on the going in side there
16 was a lot of discussion between Staff, including
17 lawyers on both sides, to make sure that we didn't get
18 into a conflict of interest situation. So, those
19 legalistic boundaries were drawn. NRC stepped back,
20 and we've been observing what the Department and their
21 contractors are doing in developing an appropriate set
22 of proposed general design criteria.

23 Those will, at some point, come to the
24 Staff for us to then pick that up and look at what we
25 can or can't do, and then make proposals to the

1 Commission through a normal regulatory rulemaking
2 process.

3 MEMBER CORRADINI: If I might just clarify
4 one thing, though, Mike. That all sounds good, but
5 what I was -- so that must be the going in plan by
6 DOE, which we could have people, but you probably will
7 clarify it. Since Fort St. Vrain had been empirically
8 licensed, and Clinch River was empirically licensed,
9 and Prism got close, that means there is a process
10 already. That means that DOE would want to modify that
11 process on how they engage the NRC for these advanced
12 reactors. Is that --

13 MR. MAFIELD: Yes. But what we were trying
14 to start with rather than reinvent a whole set of
15 regulations, let's start small. Let's go to something,
16 and as a small step, something that we can hopefully
17 come to agreement on.

18 MEMBER CORRADINI: Okay.

19 MR. MAFIELD: That gives a designer some
20 basic ground rules to start working from, rather than
21 reinvent the whole process in one fell swoop which has
22 been sort of an abysmal failure on a number of tries,
23 but start small. Let's then step through this and gain
24 agreement at each step so that we're not debating NGNP
25 all over again.

1 MEMBER CORRADINI: Okay, fine. Thank you.

2 MR. MAFIELD: Now, the other thing I will
3 tell you is that stemming largely from the discussions
4 with the Department and with Idaho about the NGNP and
5 the degree of what's risk-informed, what's an
6 appropriate level of defense-in-depth, what was the
7 terrible event that the Committee put a label to,
8 Gargantuan event.

9 MS. BRADFORD: Godzilla event.

10 MR. MAFIELD: Godzilla event, so let's try
11 and not go down that path again. Let's --

12 (Simultaneous speaking.)

13 MR. MAFIELD: It was pretty clear where
14 that term came from, I just couldn't come up with it.
15 But let's take this a step at a time, rather than get
16 into this. And we want to build on the work that's
17 going on, Commission-directed work looking at
18 Recommendation 1 from the Near-Term Task Force, what's
19 going to come out of that. Then let's look at the Risk
20 Management Task Force, what activities are going to
21 come out of that, and start building on those things
22 rather than reinvented specific to any given project.
23 Let's build on the Commission-mandated activities as
24 they evolve. So, we're trying to build a structure
25 rather than bringing the whole thing in at one fell

1 swoop, build a structure. The piece that Anna is
2 talking about, now that I've side brained her
3 presentation, the piece that Anna is talking about is
4 one small step down that path.

5 MEMBER RAY: Well, at the same time, keep
6 the Hill from writing another 2005 EPA, until all
7 that's--

8 MR. MAFIELD: I have relatively little
9 ability to influence my own staff, much less the Hill.

10 MEMBER RAY: I understand, but my point in
11 making that comment was everything was being driven
12 really, including the 50-50 cost sharing, the Part 52
13 and all of that stuff is completely unrealistic, but
14 it was being driven out of that -- the requirements of
15 the EPA.

16 MEMBER CORRADINI: You mean EPAct.

17 MEMBER RAY: I'm talking about the Energy
18 Policy Act of 2005.

19 MEMBER CORRADINI: Okay. I wasn't sure what
20 EPA you were talking about?

21 MEMBER RAY: That's what I was talking
22 about. And the decision, while it got floored I'll
23 say, the TVA decision to go with Part 50 was part of
24 a debate that I was involved in, and I think is a
25 right decision. Now, that's not what we're talking

1 about right now because it's light water reactor, but
2 that's got to be part of the mix, as well. And the
3 whole idea of industry cost-sharing and so on was
4 based on a premise that it's not viable. So, anyway,
5 I agree with you, but I just wanted to add those
6 comments.

7 MEMBER REMPE: While you derail, is this
8 all coming from the SMR program at DOE, just like NGNP
9 you guys covered through DOE. And is that what this
10 is, only it's the SMR project, so you actually bill
11 DOE back for phase two?

12 MS. BRADFORD: No, we do not.

13 MEMBER REMPE: So, this is coming --

14 MS. BRADFORD: This is our own activity,
15 yes. It's not a fund reimbursable type of thing.

16 MEMBER REMPE: Okay.

17 MR. MAGRUDER: But it's still under John
18 Kelly. Right?

19 MS. BRADFORD: Right. It's the same group,
20 but not the same financial setup.

21 MEMBER REMPE: But they pay for the DOE,
22 and you'll pay for the NRC.

23 MS. BRADFORD: Yes. Right.

24 MEMBER REMPE: That's interesting.

1 MS. BRADFORD: So, I feel like I should
2 hurry up and get off this slide, but --

3 PARTICIPANT: No, phase two.

4 MS. BRADFORD: Phase two. Like I think I
5 said, they'll be giving us their deliverable towards
6 the end of this year. We will take that, evaluate it
7 with our technical staff. I'm sure we'll have some
8 interactions with DOE to discuss what they've given
9 us, and why they did what they did. And then we'll
10 have to decide our next step. And we haven't decided
11 for sure what that is yet, is it a guidance document,
12 standard review plan? You know, the biggest step of
13 all would be a rule. I don't know if we're there, but
14 we'll take that and think about it, and decide what to
15 do next.

16 MEMBER BLEY: Mike probably answered this
17 for me, but I'm going to ask it anyway. Back when you
18 published the new introduction to the review plan, you
19 had a plan laid out in there that there would kind of
20 be two tracks. There would be a track, I think it
21 sounded like the phase one you talked about, and
22 something that smelled a lot like the technology
23 neutral framework as a development but for a specific
24 plant. And then we saw somewhere that that part went
25 away.

1 MS. BRADFORD: Yes.

2 MEMBER BLEY: That's completely off the
3 table now. Right?

4 MS. BRADFORD: I think you're referring to,
5 we sent a memo up to the Commission earlier this year
6 saying that we weren't going to do the pilot study for
7 the technology neutral framework on a plant.

8 MEMBER BLEY: Right.

9 MS. BRADFORD: So, yes, you're right about
10 that.

11 CHAIRMAN STETKAR: Why? I mean, I read the
12 memo but --

13 MS. BRADFORD: Yes, a few different
14 reasons. One was we didn't have anybody jumping up and
15 down to participate in that with us. And then some of
16 the schedules started slipping out, so it became
17 harder for us to do that, as well as everything else
18 we needed to do with the resources that we had.

19 CHAIRMAN STETKAR: We've learned a lot
20 about the real benefits of earlier piloting processes
21 before you get into real world constraints on
22 schedules and budgets for licensing issues, or many
23 things. And this seems to be heading down that -- the
24 path that we know doesn't work.

1 MEMBER CORRADINI: I mean, the only reason
2 I guess I started this is that what worries me is, I
3 mean, I understand where Mike is coming from and the
4 plan that you guys are kind of standing back and
5 watching them, but if they get too far down a path
6 that their expectation doesn't meet your expectation,
7 I just see this all happening again.

8 MR. MAFIELD: If I could, one, I'm not
9 bashful. And, two, we are watching --

10 MEMBER CORRADINI: I knew that part. That
11 was an obvious one.

12 MR. MAFIELD: We do attend their meetings
13 and their video sessions, so we are staying pretty
14 well engaged with what they're doing. And if we start
15 seeing difficulties, Dr. Kelly and I will have a chat.
16 But so far, so far Staff feels like the path they're
17 on makes sense. We've got some issues that we're going
18 to talk with them about.

19 MEMBER CORRADINI: Okay.

20 MR. MAFIELD: But it -- I am sensitive to
21 your point about if you just sit back and let others
22 go to develop their own notions, then at the end of
23 the day you start having difficulties. That's not what
24 -- that's exactly what we're trying to avoid here, at

1 the same time being sensitive to and respectful of the
2 conflict of interest issues.

3 MEMBER CORRADINI: Okay.

4 MR. MAFIELD: Because if you get crossways
5 of that, you just damn the whole activity from the
6 getgo. If I could come back to the pilot project, we
7 weren't objecting to doing a pilot project. The
8 original plan for that pilot project was to take 1860
9 essentially out for a test drive on high temperature
10 gas.

11 MEMBER CORRADINI: Right.

12 MR. MAFIELD: That project went away. Then
13 we were looking at well, can we make some progress by
14 looking at one of the small PWRs. As Anna pointed out,
15 those schedules started drifting out further, and
16 further, and further, and how much progress were we
17 really going to be able to make given budget
18 constraints and timing constraints, just the real
19 world of where I have to live. And at some point we
20 said, you know, enough is enough. Let's take a step
21 back, table this until we get something that's moved
22 far enough along where we could actually try it.

23 MEMBER CORRADINI: Okay, so it's not --

24 MR. MAFIELD: It's not completely dead, but
25 it's on near -- sort of long-term life support. I

1 don't want to suggest to you it's going to happen any
2 time soon.

3 MEMBER CORRADINI: Yes, okay.

4 MR. MAFIELD: But it wasn't something where
5 we said it's a bad idea, it's just not now.

6 MEMBER RAY: Before you move on, let me
7 just make one other unrelated comment, because I make
8 it down at Forrestal all the time, which is when
9 people say why do this at all, keep in mind that most
10 non-LWR reactors are high temperature, which has the
11 really big advantage of not being water consumption
12 requirements as much. And having gone through a lot of
13 siting efforts in my life in the west, that's a big,
14 big deal. Okay? If you're not going to -- if you're
15 west of the Mississippi River and you're going to
16 consume water in a new power plant, you are in big
17 trouble. So, like I say, people tend to forget why are
18 we doing this? That's one reason to keep on your list
19 that really important, because you're not going to put
20 a light water reactor, I don't think, very far west of
21 the Mississippi River ever, notwithstanding what my
22 former chairman friend who was trying to do that said.
23 It's just not going to happen. Anyway, for what it's
24 worth, that's --

1 MS. BRADFORD: Thank you. Okay, completely
2 different topic. SMR review schedules, and now we're
3 here back to talking about the light water designs
4 that Stu went over. We challenged ourselves to look at
5 what's the best schedule we could achieve once an
6 application comes through the door, and we're going to
7 start the review. We looked at past review schedules
8 for the large light water reactors, we've looked at a
9 certain number of assumptions. For example, we would
10 have a DSRS in place before the application came in,
11 the policy issues would be resolved, the applicant
12 would answer RAIs in about 30 days or so. And what we
13 came up with is that we think under an ideal case we
14 could finish our review within 39 months. And I'll
15 show you the breakdown of that on the next slide. And,
16 of course, we're not going to compromise safety or our
17 technical review to achieve that, but we did want to
18 challenge ourselves to see what we could do.

19 This is the breakdown of that 39-month
20 schedule. This is the normal six phases we thought
21 about. We stepped back and thought could we do less
22 phases, could we do four phases? We actually came and
23 talked to some ACRS staff about what if we only came
24 to ACRS for one review instead of two, and that didn't
25 go very well, so we went back to the six phases, which

1 I think actually we all agree works better with the
2 two reviews.

3 So, it starts with the acceptance review
4 which doesn't count as part of the 39 months, but
5 assuming we accept it at the end of that two months,
6 phase one and two is the duration basically of the
7 technical review, so 18 months for the staff to do
8 that, RAIs and the preliminary SER.

9 Then phase three is coming to the ACRS. As
10 you can see there's some overlap there because I think
11 we're thinking in real life we could start sending you
12 some sections even though we're not completely done
13 with phase two. Then we would prepare the advanced
14 SER, come back to the ACRS in phase five, and then in
15 phase six prepare the final SER. And this is, again,
16 the ideal case. Everything is, except that one phase,
17 is exactly one after the other, everything has gone
18 smoothly, there's no major design changes by the
19 applicant, there's no major things discovered in the
20 RAI responses. There's a lot that goes into this.

21 MEMBER POWERS: We have been doing
22 certifications for light water reactors in phase 3 in
23 a piecemeal fashion. Chapters are reviewed when they
24 become available.

25 MS. BRADFORD: Yes.

1 MEMBER POWERS: And sometimes those
2 chapters come in and it does take some Dramamine to
3 survive the change in subjects. Now, if you were to do
4 that with a wholly new technology and, indeed, with
5 modified regulatory considerations, you think the ACRS
6 would really accept a piecemeal review?

7 MS. BRADFORD: Well, I think there's pros
8 and cons to both sides. I think there's some
9 disadvantage to --

10 MEMBER POWERS: That's not what I asked
11 you. I asked you if the ACRS would accept a piecemeal
12 review?

13 MS. BRADFORD: Oh, I think we would ask the
14 ACRS if you would accept a piecemeal review.

15 (Simultaneous speaking.)

16 MEMBER POWERS: I guarantee you you would
17 get one vote that said not just no, but hell no.

18 MS. BRADFORD: Yes.

19 MEMBER POWERS: That I would want to look
20 at -- I mean, even if it comes in under the same
21 ground rules that there are open items, then I would
22 want to look at the length and the breadth, because by
23 and large Staff does a very good job on the things
24 they do. And we read these things, at least I read
25 them not for what's there but what's not there. And

1 ask me to look at the Quality Review Plan before I
2 have seen the hardware probably is not going to make
3 me a very good reviewer.

4 MS. BRADFORD: I think we would have to, in
5 conjunction with the ACRS, think about if we did it
6 piecemeal, the best way to group things. Because, yes,
7 absolutely some things should come together so you can
8 see the whole picture. But there may be some that we
9 finished early and maybe aren't as crucial to seeing
10 the big picture that we could send early. And this is
11 definitely something we can talk to the ACRS about in
12 terms of staggering reviews or not.

13 MR. MAGRUDER: Yes. I would say that we are
14 very conscious of -- one of the things, I think one of
15 the big lessons learned was that the reviews were too
16 compartmentalized and stove piped, and we're going to
17 try very hard for these SMR reviews to get more
18 interaction between the Staff, and to share and take
19 a more holistic view of the design.

20 We already have the advantage of looking
21 at the risk insights earlier than we have for other
22 designs which will help with the review. So, I agree
23 it's much easier to look at it all --

24 MEMBER POWERS: I don't think the 50.52
25 debate is nearly as big as the problem that you have

1 on 10 CFR Part 100 on these plants. I mean, I may be
2 just asking too much to say okay, you're going to get
3 this piecemeal over six months. The first place, I
4 don't think we've done a piecemeal certification over
5 six months. I don't think it's physically possible.

6 MEMBER BROWN: Well, we haven't even gotten
7 I&C architecture --

8 (Simultaneous speaking.)

9 MEMBER BROWN: -- requirements in six
10 months. I mean, we spent two years trying to get the
11 ESBWR and AP1000 to --

12 MS. BRADFORD: That will be another --

13 MEMBER BROWN: Part of the protestations
14 from our chairman of that particular one, that one was
15 ugly at first, and then they finally gave us an
16 AP1000. It took a while.

17 MS. BRADFORD: That's one advantage, also.

18 MEMBER BROWN: EPR has not even come
19 through it yet.

20 MS. BRADFORD: Yes, to --

21 MEMBER BROWN: Am I correct? We haven't
22 gotten a response on the last -- excuse me.

23 MS. BRADFORD: That's okay.

24 MEMBER BROWN: No, no, no, it's not okay.
25 Excuse me. Go ahead.

1 MS. BRADFORD: I was going to say that's
2 one advantage to coming to you with DSRS sections.
3 Like Stu's group is coming to you with that Chapter 7
4 I&C, so that will give you some -- at least this won't
5 be hitting you completely out of the --

6 MEMBER BROWN: Yes, as long as the Staff
7 agrees to put in the stuff we want so that the vendor
8 comes --

9 MS. BRADFORD: Maybe that was a bad
10 example.

11 MEMBER POWERS: I mean, what's interesting
12 on this is that we try to -- what we've been asking
13 for is less.

14 MEMBER BROWN: Oh, yes. I don't need as
15 much as long as we comply with the --

16 MEMBER POWERS: We've been asking for less
17 and can't get it.

18 MS. BRADFORD: Okay, thank you. As Stu, I
19 think, mentioned there are some key technical and
20 policy issues that we've been working on since at
21 least 2010 when we wrote that one big SECY paper that
22 kind of consolidated all of our thoughts. This is some
23 of them, both technical and policy.

24 Emergency preparedness for SMRs is one.
25 They are interested in perhaps justifying a smaller

1 emergency planning zone based on their smaller core,
2 so smaller source term. They to do mechanistic source
3 term maybe, where they actually look at what's
4 released, so they haven't given us any specifics on
5 this. We don't have any numbers in front of us, but we
6 know this is something they're thinking about. We did
7 get a paper from NEI that was the industry's --

8 MEMBER POWERS: When they say mechanistic
9 source term are they talking like the DOE White Paper
10 on mechanistic source term which had absolutely
11 nothing to do with mechanisms or source terms that I
12 can tell?

13 MR. MAGRUDER: Everybody, as you know,
14 everybody has a slightly different definition of
15 mechanistic source term. And I would say their
16 approach, at least to mPower and NuScale so far are
17 kind of more traditional. They want to take advantage
18 of some of the technology. I mean, mPower mentioned
19 earlier today some of the things they want to take
20 advantage of.

21 MEMBER POWERS: I mean, they should take
22 advantage of all the technology they can, but on the
23 other hand the idea that you would come in with a
24 mechanistic source term and no experimental data
25 puzzles me some.

1 MS. BRADFORD: I do know that DOE is
2 working with EPRI to do some of those studies, try to
3 get some information. When those are supposed to be
4 done, and if they support these schedules I'm not
5 sure.

6 MEMBER POWERS: Well, I have, for instance,
7 seen people proposing to do experiments in support of
8 some of these reactors that look like they're escapees
9 from about 1982. I mean, they don't do -- take
10 advantage of the fact that a lot of water has gone
11 through the turbine since 1982, and that we understand
12 things better.

13 MR. MAGRUDER: Yes, we look forward to more
14 discussions with that. I think there's a lot that
15 could be done.

16 MEMBER POWERS: Well, I mean, I think
17 they're particularly easy -- I mean, with these kinds
18 of plants the experiments are much easier to do in a
19 fairly prototypic fashion than they are for a 1500
20 megawatt electrical plant because everything is
21 smaller.

22 MR. MAGRUDER: Right.

23 MEMBER POWERS: Everything is shorter.

24 MS. BRADFORD: So, like I said, NEI
25 submitted an industry paper to us on EP just this past

1 December. We had a public meeting with them this past
2 Tuesday to talk about that, so they talked us through
3 their methodology and their approaches, and our Staff
4 asked a lot of questions. And we're thinking about
5 what our path forward is going to be for that.

6 Staffing is another issue. Stu mentioned
7 the control room staffing in terms of the number of
8 modules that are controlled from the control room, and
9 how many operators do they need to have in there.

10 Another aspect of staffing is maybe the
11 security staffing. If they try to say our design is so
12 safe even from a security viewpoint that we don't need
13 as many guards that a normal large light would have,
14 they might come in propose something different.

15 Deeply embedded structures, I think you
16 heard from mPower on that today, and I think that's an
17 issue for pretty much all four of the designs that Stu
18 talked about. All of them are below grade.

19 Digital I&C --

20 MEMBER POWERS: Before you jump off, and
21 disconnected from any of the designs you're looking
22 at, just out of my own personal area, have you ever
23 given thought to deeply underground units? That is, I
24 mean, these are below grade. I'm talking about

1 something that's 500 feet below the surface of the
2 earth.

3 MR. MAGRUDER: I don't think we've --

4 MS. BRADFORD: I don't think so.

5 MR. MAGRUDER: I don't think we've ever had
6 any proposals for that.

7 MS. BRADFORD: No. I think the most we've
8 heard discussed, at least for these discussions are
9 about 100 feet, 120 feet, something like that, 80.

10 MR. MAGRUDER: Did hear a proposal to have
11 something offshore. There are system designs that are
12 proposing to put the whole reactor under water.

13 MEMBER POWERS: But it just strikes me
14 that, you know, we looked at underground siting back
15 in around '74 or '75, but there what they did was they
16 took an existing design and just stuck it in a big
17 cave underground, and they were looking do you get any
18 advantages on safety on that. They weren't even
19 considering security. But I'm disappointed that no one
20 has ever looked at how you would redesign a reactor
21 that was very deeply underground, and now we have both
22 safety and security, aircraft impact kinds of issues
23 that might shift the balance. When we looked at just
24 taking from the surface and putting it underground, it
25 was a wash. What you lost on the cod you got back on

1 the mackerel, you know. It was just a wash. It may not
2 be a wash now to go deeply underground.

3 MS. BRADFORD: Okay. The next item that
4 we've been thinking about, and we know that vendors
5 have been thinking about is digital I&C. And there's
6 not necessarily something unique here for SMRs, but
7 just the fact that it can be a challenge for all the
8 reviews we perform.

9 ASME code applicability, we've encouraged
10 the vendors, and they are interacting with ASME to see
11 if they want to do something different, is the code --
12 are they going to be able to fit within the code
13 sections that we've already approved and already used.
14 Do they need to be working with ASME to develop
15 something new? For example, if they're not going to
16 inspect something for two years and the code says you
17 should inspect it twice a year, what's their path to
18 success going to be there? So, they're working on
19 that, is our understanding.

20 And piping design, mostly because of
21 design maturity, you know, do they have the piping
22 design, and are they going to want to use DAC, Design
23 Acceptance Criteria for that? And there's been some
24 conversations going back and forth. I don't know that
25 we have resolution from the two main people we've been

1 talking about, mPower and NuScale, on whether they
2 want to use DAC or not.

3 International interface on SMR, Stu
4 mentioned there are several countries involved or
5 interested in SMR licensing, so Stu has actually taken
6 the lead in proposing a forum just for the regulators,
7 not the vendors or the promoters, but the regulators
8 for SMRs in different countries. And the goal there is
9 to just identify and talk about key regulatory
10 challenges and benefit from each other's experiences
11 and insights. And that's just getting off the ground
12 this year. The pilot is proposed to go for two years.
13 You can see the list of countries there that are
14 interested, and those meetings -- there's been two
15 meetings, or one meeting so far over in Vienna?

16 MR. MAGRUDER: Yes, just one.

17 MS. BRADFORD: One.

18 MEMBER POWERS: If I go back to your first
19 -- previous slide on your list of issues, you did not
20 have neutronics on that. And, yet, neutronics -- I
21 mean, I have no idea how you do a neutronic analysis
22 on a pebble bed reactor. I mean, that seems to be
23 completely beyond my ability to comprehend, but I
24 think you have similar issues on any of these high
25 temperature hot or fast designs.

1 MS. BRADFORD: We should -- the title on
2 this is not quite complete. We should have said a
3 partial list for light water SMRs.

4 MR. MAGRUDER: Yes.

5 MS. BRADFORD: If this was for non-light
6 water it would be much longer.

7 MEMBER POWERS: Just neutronics alone, I
8 mean, we just -- I mean, if you call up and say give
9 me the cross sections for use in some of these
10 reactors, I think you'd get a dotted line.

11 MS. BRADFORD: Okay.

12 MEMBER POWERS: I mean, they say well, this
13 is where we think it is. You can't prove it. So, what
14 do you do in those circumstances? I don't have cross
15 sections, you say vendor, that's fine, but give me a
16 cross section set that's agreed and approved?

17 MS. BRADFORD: I can tell you that for non-
18 light water reactors, we're trying to stay engaged
19 with the international community that might have more
20 experience in these things than we do, so the
21 Generation IV international forum and INPRO over at
22 IAEA, we're trying to stay plugged into that and the
23 discussions that they're having, and benefit from
24 their experience.

1 MEMBER POWERS: Don't you run into a
2 problem that international sources for cross sections
3 haven't got a clue what NQA-1 is?

4 MS. BRADFORD: Yes, I don't want to imply
5 that we could just take that data and use it. We would
6 need to do our own checks on it. Definitely. But we're
7 not close to that for the non-light water design.

8 MEMBER BLEY: I hate to interrupt the
9 interesting discussion but I think we need to finish
10 up.

11 MS. BRADFORD: Yes, I'm almost done. I'm
12 almost done.

13 MEMBER BLEY: Yes, two slides. Right?

14 MS. BRADFORD: So, overall, just readiness.
15 We've been getting ready for a few years. We think
16 we're very close to being ready, if not all ready.
17 We've looked at lessons learned from the large light
18 water reactor licensing experience and taken that, and
19 tried to improve what we would do for an SMR license
20 review.

21 We're developing the DSRs and we've made
22 significant progress on those. And the industry seems
23 to be embracing those and supporting those. And we're
24 holding extensive pre-application meetings with the
25 applicants to develop the DSRs, as well as just become

1 familiar with their design so that we already are up
2 and running if and when an application comes in the
3 door.

4 This is just an example of all the papers
5 we've put up since that original 2010 paper with the
6 consolidation of issues. 2011 was very busy for us. We
7 talked about a wide range of issues there. We sent up
8 memos recently providing the status of things. We're
9 working on a SECY paper right now that will look at
10 our overall readiness to license SMR. It's on
11 concurrence. I'm sure that you guys will see a copy of
12 that.

13 So just in summary, we're committed to
14 insuring that we are ready to review these if an
15 application should come in the door, and we encourage
16 engagement from all the applicants, as well as all
17 stakeholders. We think that's critical throughout the
18 process for success for all of us. Thank you.

19 MEMBER BLEY: Thank you very much. Anything
20 else from the Committee? We look forward to seeing you
21 in a couple of months on the DSRs, but thank you very
22 much for bringing us to speed here. Mr. Chairman.

23 CHAIRMAN STETKAR: Thank you. The next
24 topic we have is the research report. We're off the
25 record. Right? And we will be off the record, so we

1 are actually adjourned for the day as far as the
2 record is concerned.

3 (Whereupon, the proceedings went off the
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NRC Operating Experience Program

Eric Thomas
Operating Experience Branch, NRR/DIRS
ACRS Briefing
April 10, 2014

Topics

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 - Communication, Evaluations, Products
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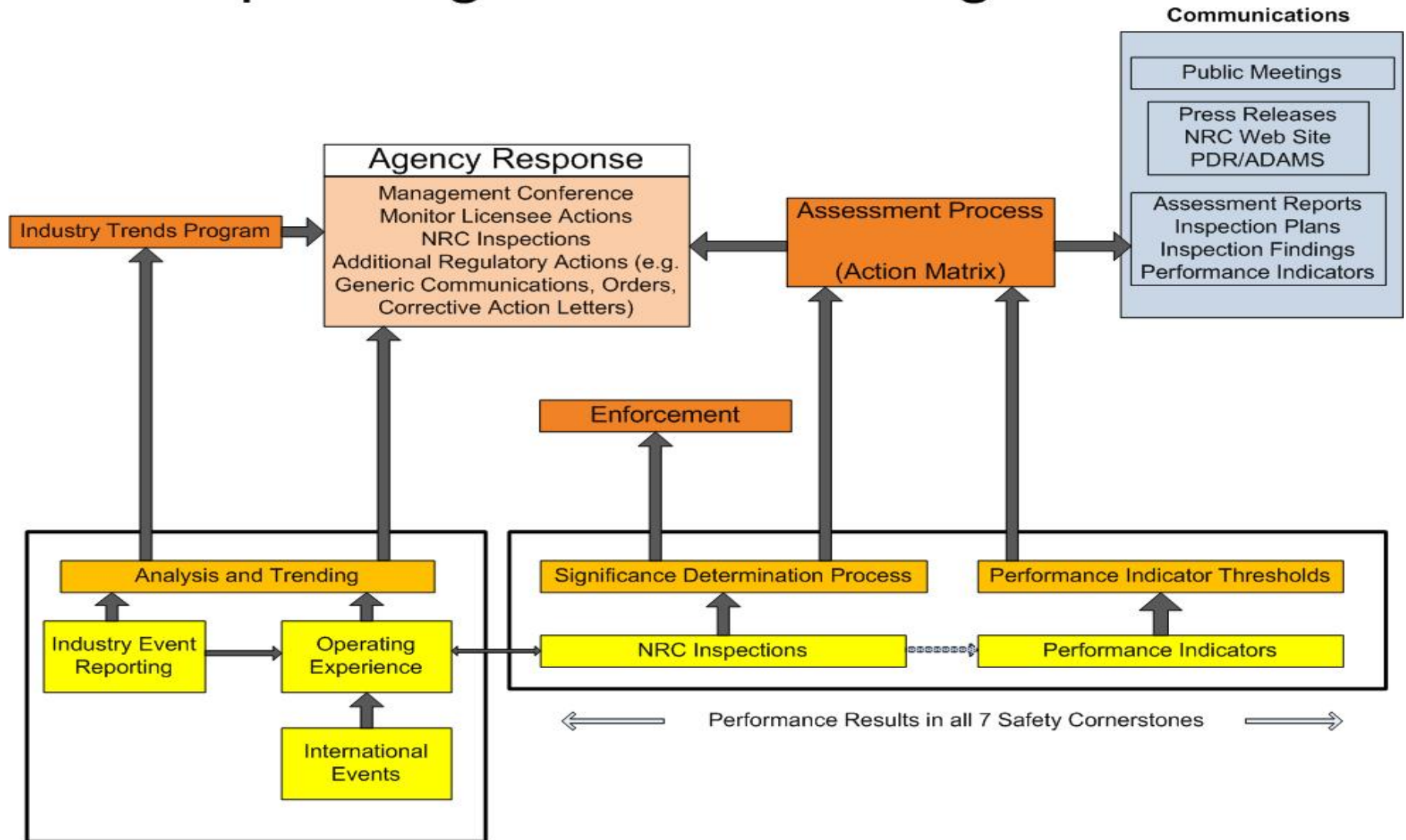
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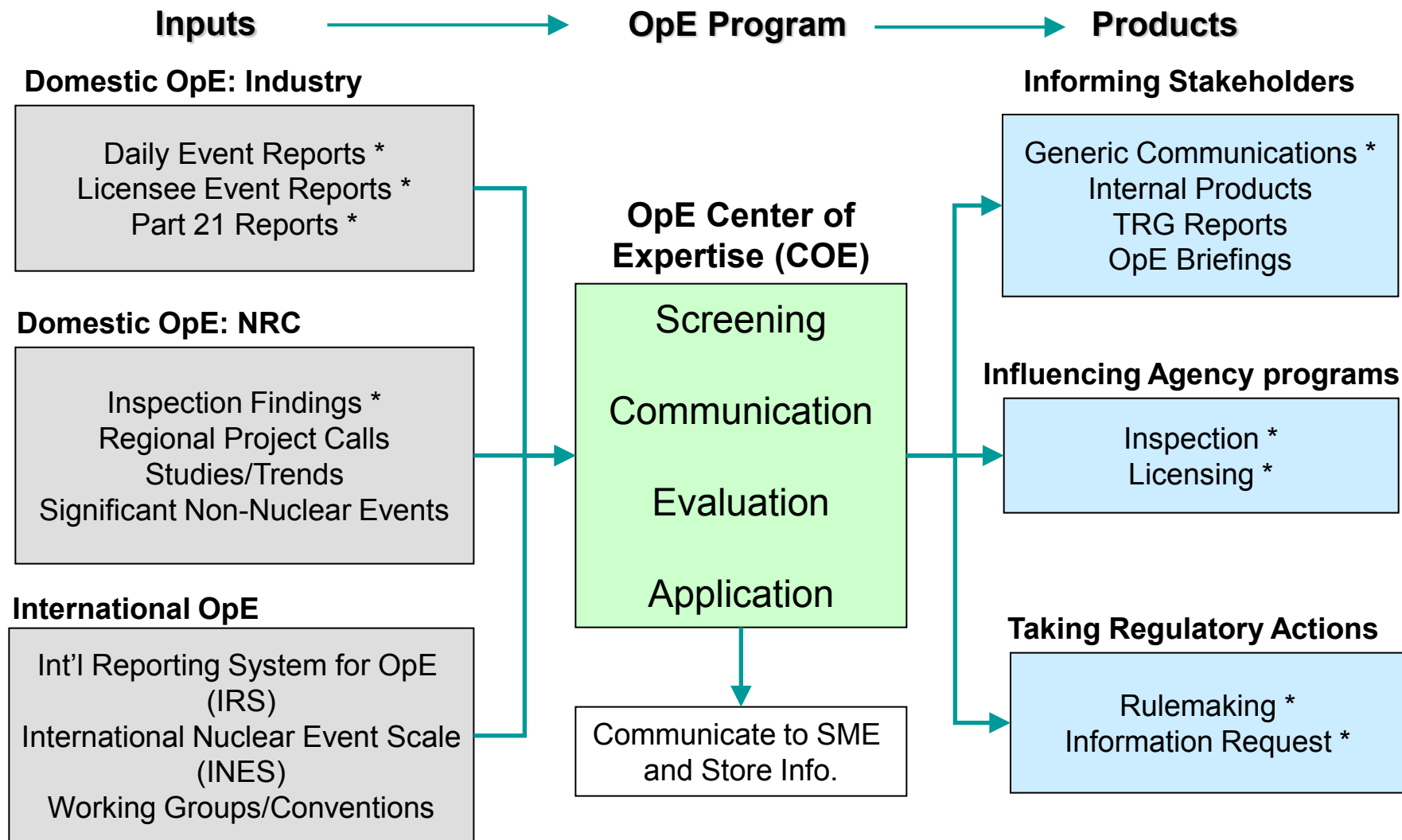
- ***Management Directive 8.7***, “Reactor Operating Experience Program”
- ***NRR/NRO Office Instruction LIC-401/REG-112***, “NRR-NRO Reactor Operating Experience Program”
- ***Inspection Manual Chapter 2523***, “NRC Application of the Reactor Operating Experience Program in NRC Oversight Processes”

A Brief History

- 1978 – GAO Report under consideration at the time of the TMI accident
- AEOD – Created in 1979...eliminated in 2000
 - Critical functions consolidated into other offices
- Davis Besse Lessons Learned (2003-2004)
 - Need for a better-defined operating experience program.
 - Need a focal point for coordination of screening and information management
 - Need an Analysis function to identify recurring events/assess effectiveness of past regulatory actions
- Center of Expertise – Combined operating reactor and new reactor functions

NRC Operating Reactor Oversight





* = Publicly Available on the NRC Web Page

Two Team Approach

- **Clearinghouse Team**

- “Center of Expertise” approach
- Daily interface with regions
- Screen all events/issues that meet thresholds
- Database stores all screening/coding info
- Communicates OpE to technical staff/management

- **Analysis Team**

- Longer-term, programmatic focus
- Looks for trends in events, industry data, inspection results
- Interface with INPO
- Interface with NRC Technical Review Groups (TRGs)

Screening Function (Clearinghouse Team)

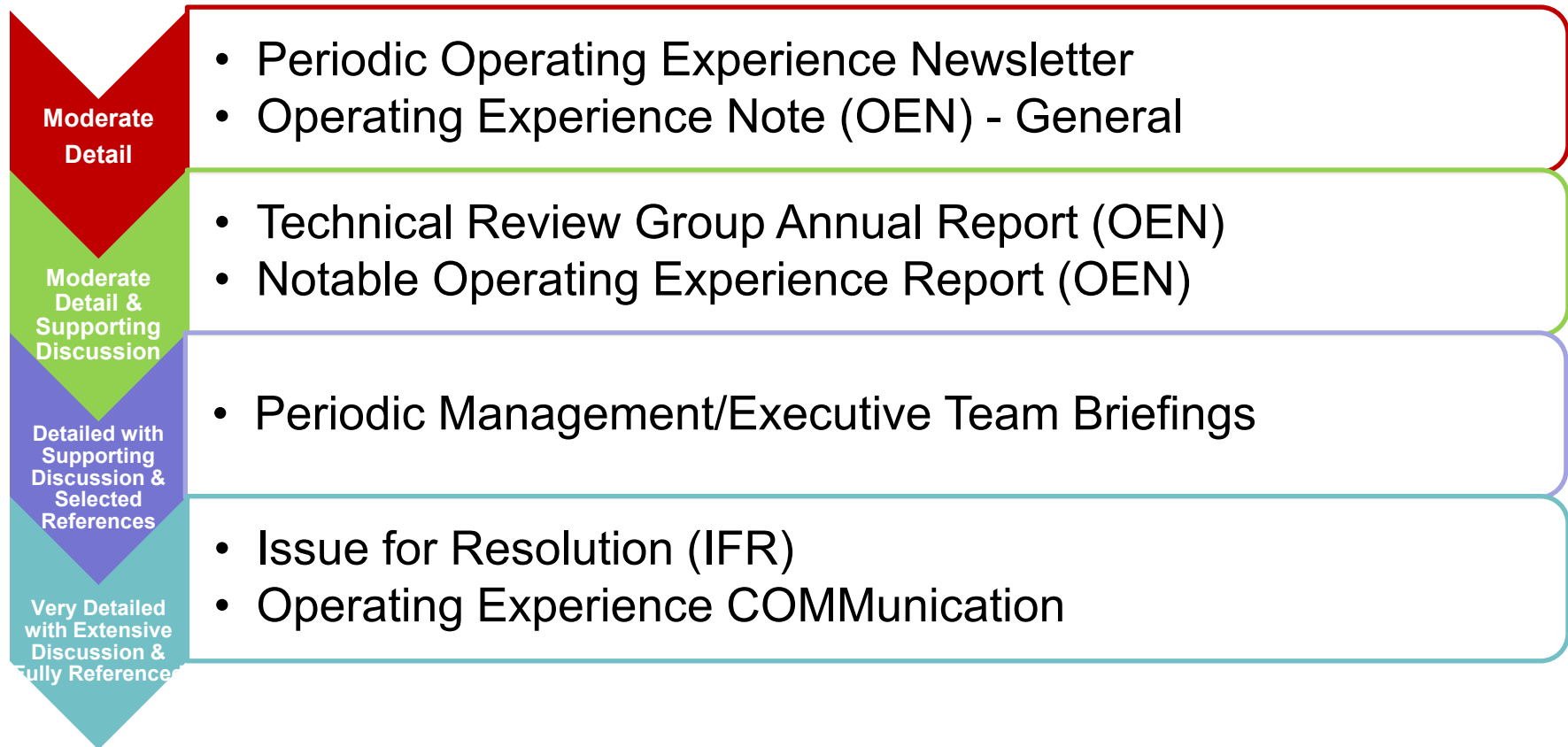
- Criteria listed in LIC-401, “NRR-NRO Reactor Operating Experience Program”
- Tiered response/disposition
 - Formal screen in → Issue for Resolution
 - Staff follow-up and summary → OpE COMMunication
 - Email issue → Technical Review Group
 - Information only → No Action
- Items screened by the Clearinghouse are coded and stored in the Issue Tracking Database



Communication Function (internal)

- Can apply to:
 - Daily screening results
 - In-depth studies/analyses
 - Response to management requests
- Several different means of Communication (see following slide)

Operating Experience Internal Communication Options



Additional OpE Products

- Changes to the Reactor Oversight Process
 - Inspection Procedure/Manual Chapter revision
 - Operating Experience Smart Sample
- External Communication
 - Generic Communication
 - RIC Session
 - Publication of an OpE Study/Analysis
- Rulemaking

Staff (Internal) Interfaces

- Daily interface with each Region
- Team meetings
 - Clearinghouse - 3x/week. Regular communication with Technical Review Groups
 - Analysis Team – weekly
- Monthly ROP call (regional/HQ branch chiefs)
- Bi-weekly regional management call
- Reactive Inspection Process
- Significant Topic Briefs (1-2 per year)



- INPO's Events Analysis Division
 - Operating Experience
 - Event Follow up
 - Data Analysis
- Additional Interfaces
 - NRC/INPO Memorandum of Agreement
 - Document sharing
 - Special Projects

International Activities

- Relationship focused
 - NEA's Working Group on Operating Experience (WGOE)
 - National Coordinator for IAEA's International Reporting System
- International OpE is handled similarly to domestic OpE
- Sources
 - Colleague interaction
 - IRS - International Reporting System for Operating Experience (similar to LERs)
 - INES - International Nuclear and Radiological Event Scale



Questions & Comments

generation

mPower

ACRS Presentation – Design Overview

(Public Presentation)

April 10, 2014

This material is based upon work supported by the Department of Energy under Award Number DE-NE0000583.

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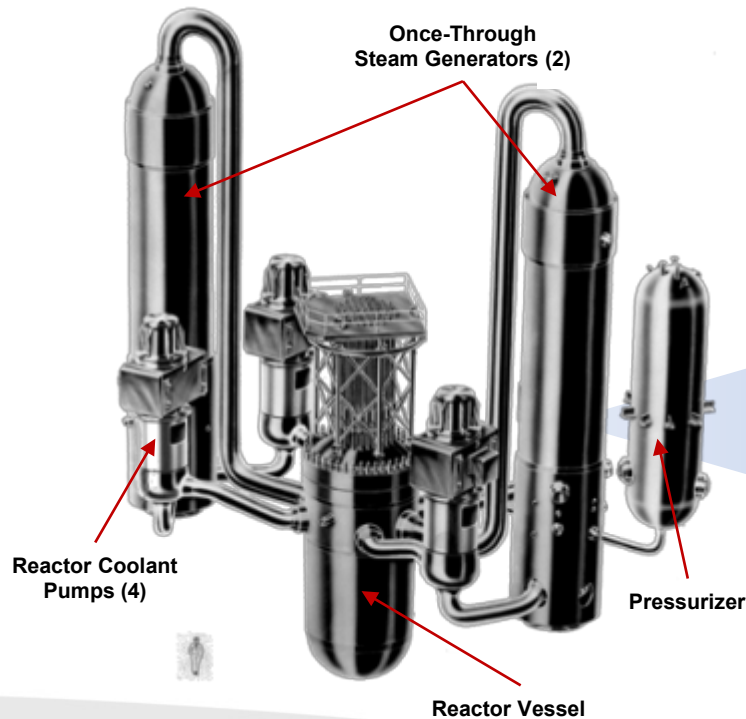
© 2014 Generation mPower LLC. ALL RIGHTS RESERVED. This document is the property of Generation mPower LLC ("GmP").

This is a pre-application document and includes preliminary B&W mPower reactor design or design supporting information and is subject to further internal review, revision, or verification.

- Plant Overview:
 - What is a mPower SMR?
 - 2-Unit Plant
 - Cross Section of Reactor Services Building
 - Reactor Component Breakdown
 - Steam Generator
- Unique “Defense in Depth” and Safety Strategies

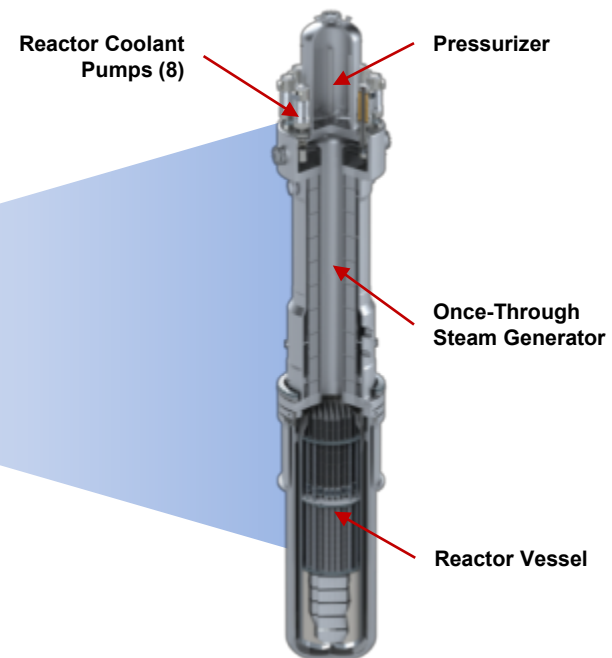
What is a mPower Small Modular Reactor (SMR)?

Traditional 1000 MWe+ PWR



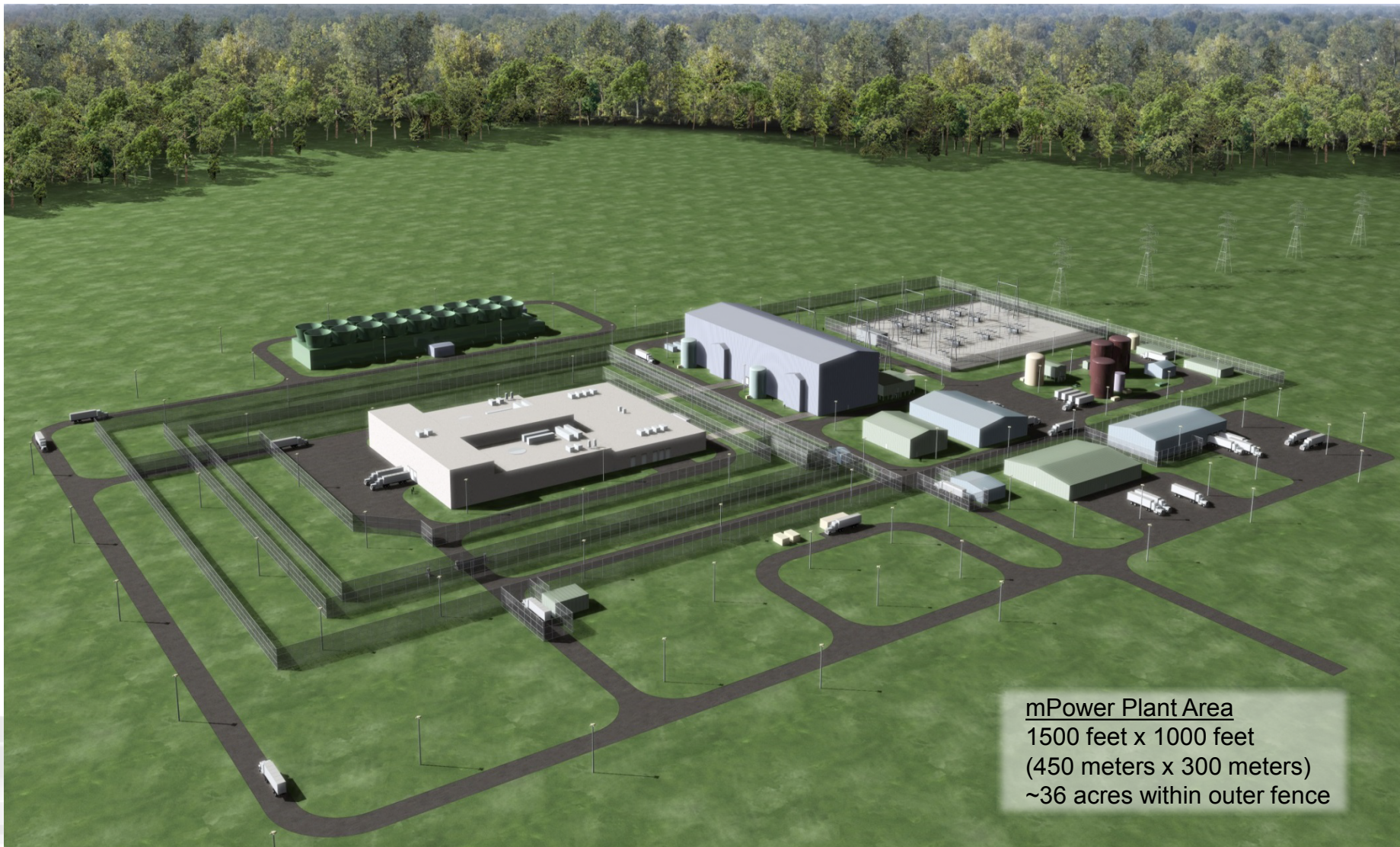
Integral PWR Small Modular Reactor

B&W mPower™



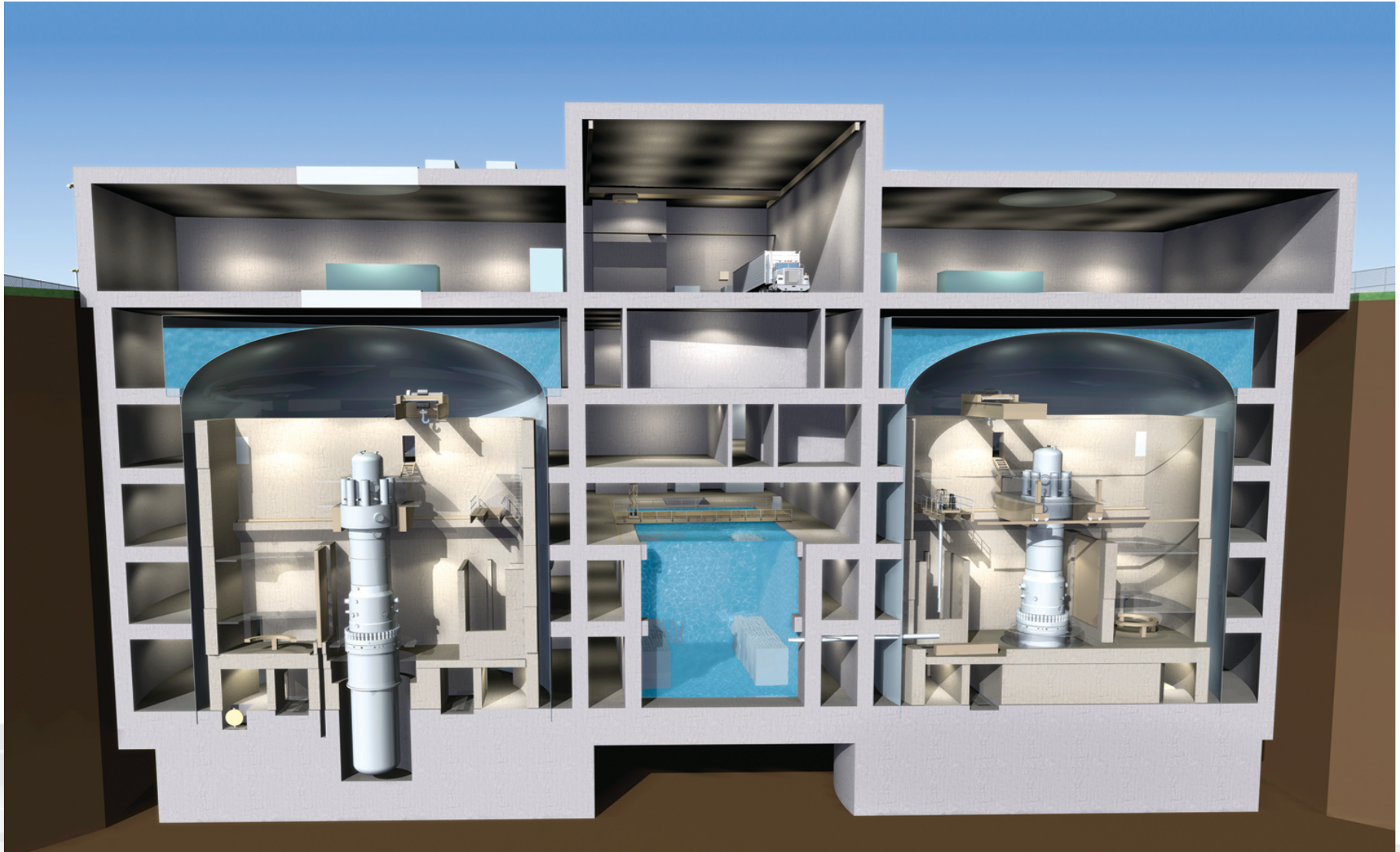
Proven technology, better architecture

Generation mPower 2-Unit Plant

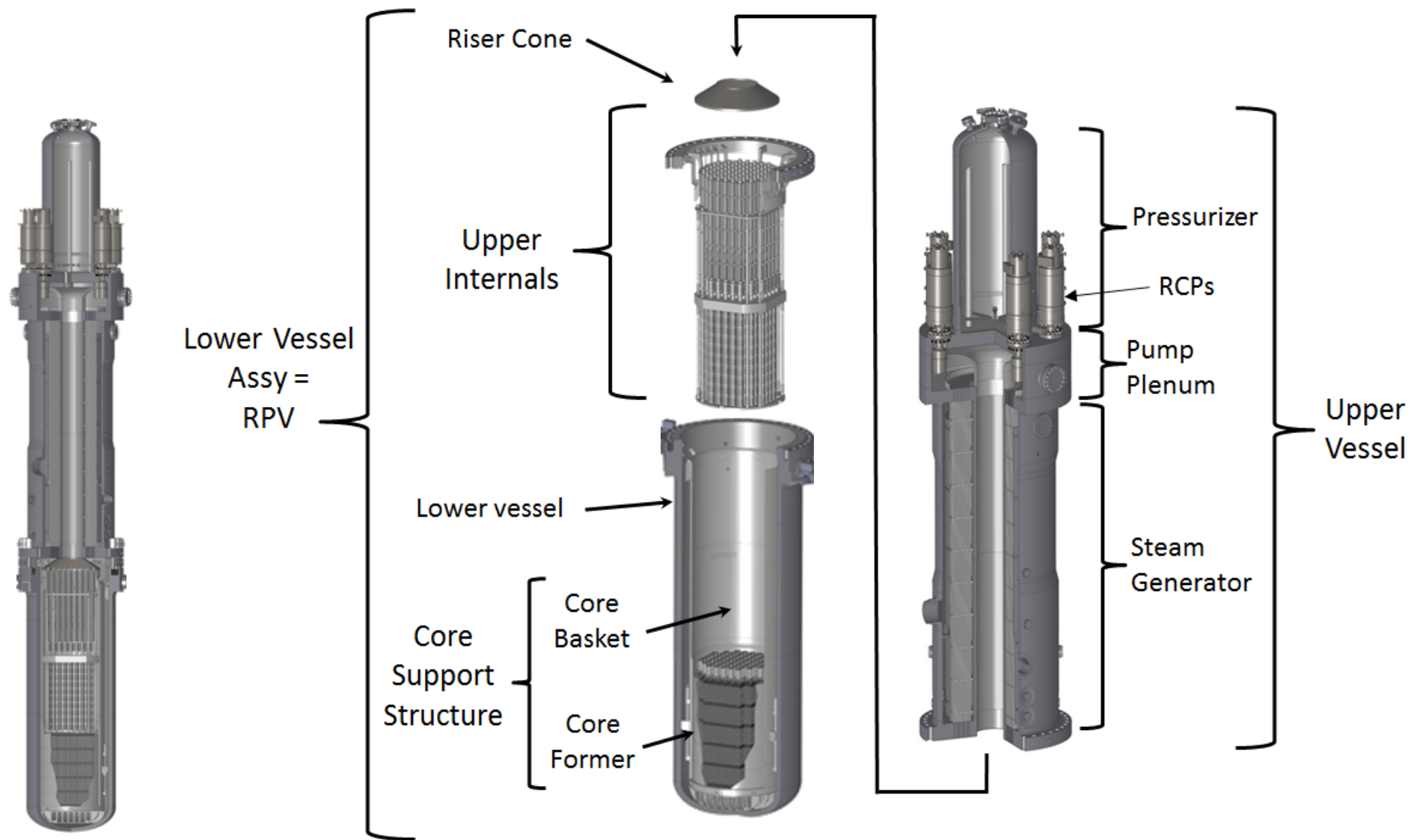


mPower Plant Area
1500 feet x 1000 feet
(450 meters x 300 meters)
~36 acres within outer fence

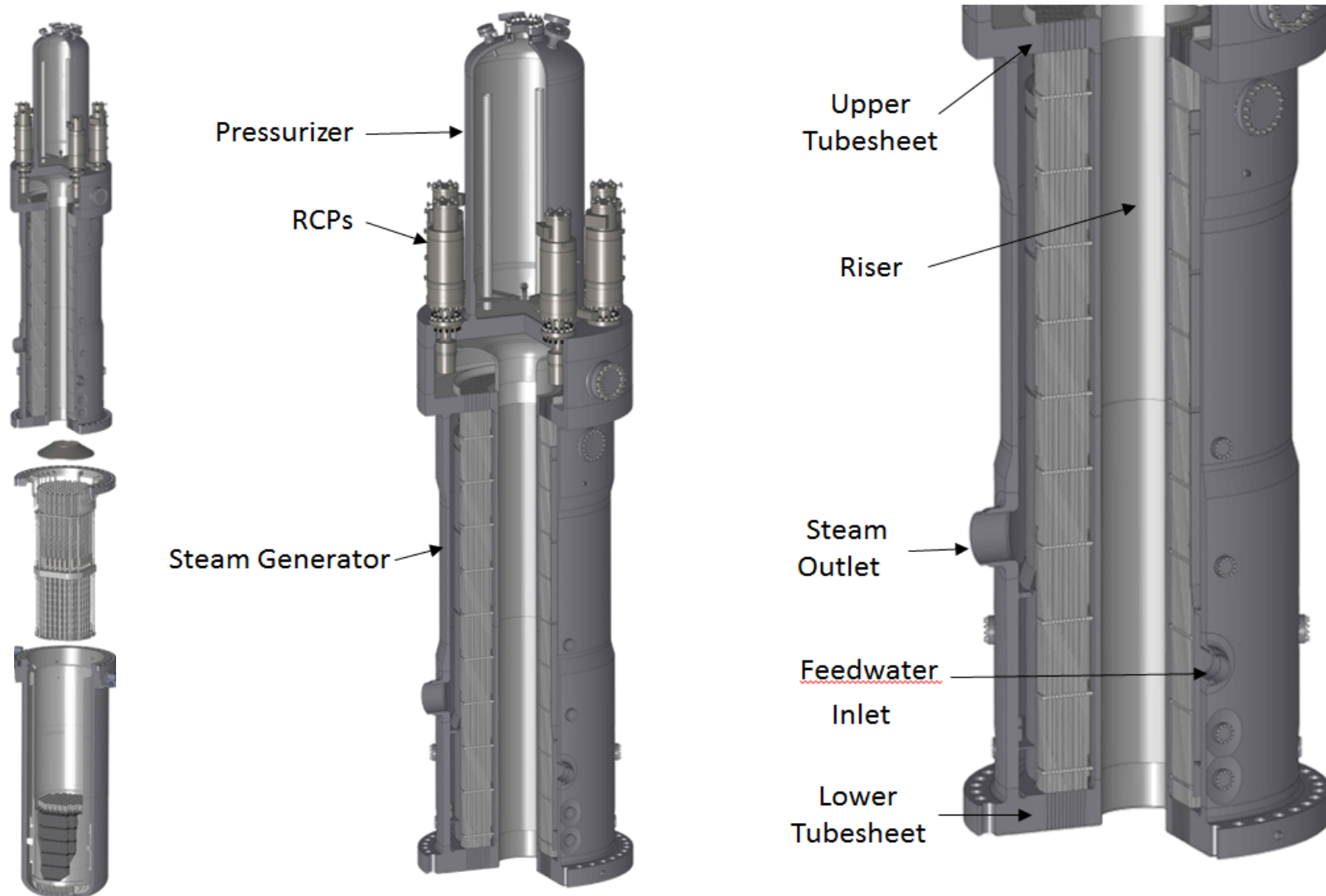
Cross Section of RSB



Reactor Component Breakdown



Steam Generator



Unique “Defense in Depth” and Safety Strategies

Design prevents core uncover during all credible events

- Diverse non-safety systems provide first defense beyond normal operations
 - Auxiliary Condenser System (CNX) – Provides HP Decay Heat Removal during LOFW and SBO events
 - Rx Coolant Inventory and Purification System (RCI) – Provides HP and Low Pressure Decay Heat Removal during LOFW events and Inventory Control during small breaks
- Simple passive safety systems protect from low probability, design basis and beyond-design-basis events
 - Emergency Core Cooling System (ECC) – Provides safety related RCS Depressurization, Decay Heat Removal, Core Cooling Injection, and Long Term Core Cooling
- Integral design eliminates many Design Basis Events and postulated accidents
- Inherent features protect reactor and containment for “non-credible” events



NRC Staff Activities Regarding Small Modular Reactors

Stewart Magruder, Chief, SMR Licensing Branch 1

Anna Bradford, Chief, SMR Licensing Branch 2

Division of Advanced Reactors and Rulemaking, NRO

April 10, 2014

Discussion Topics

- Historical Context
- Overview of Small Modular Reactor (SMR) Projects
 - ⊕ mPower
 - ⊕ Clinch River
 - ⊕ Holtec
 - ⊕ NuScale
 - ⊕ Westinghouse
- Licensing Strategy for Non-LWR Reactors
- SMRs Key Technical/Policy Issues
- International Interface on SMRs
- Staff Readiness to Review SMR Applications
- Summary

2008 – Advanced Reactor Program

- Focus was on NGNP
- NuScale was in its infancy
- Staff and industry were beginning to think about policy and technical issues
 - Initial planning for SECY-10-0034
 - “Potential Policy, Licensing, and Key Technical Issues for Small Modular Nuclear Reactor Designs” March 28, 2010

2014 – Division of Advanced Reactors and Rulemaking

- NGNP is on hold
- Focus is on light water SMRs
- Increasing interest in other non-light water reactors
- Increasing interactions with international regulators
- Staff positions on most policy issues

B&W mPower™ Design

- Design Certification application expected early CY 2015
- Extensive pre-application interaction on design since 2009
- More than 50 meetings during pre-application
- Staff has approved “quality assurance program” and “instrument set-point methodology” Topical Reports
- “Core nuclear design methods” Topical Report is under review



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Conceptual drawing of an underground containment structure housing two B&W mPower reactor modules.

B&W mPower™ Design (Cont'd)

- B&W mPower Design-Specific Review Standard (DSRS)
 - ✦ Developed in response to Commission direction to risk-inform infrastructure for small modular reactor reviews
 - ✦ FRNs for public comment published in May 2013, and expected in April 2014
 - ✦ Received nearly 2,000 comments from stakeholders (including NEI, IAEA, Generation mPower, and NuScale) responding to the FRN
 - ✦ Chapter 7, I&C, discussed with ACRS sub- and full-Committees in late 2012, early 2013, and planned for May 2014
 - ✦ Remaining mPower DSRS sections will be discussed with the ACRS Future Plant Designs subcommittee in May and August 2014



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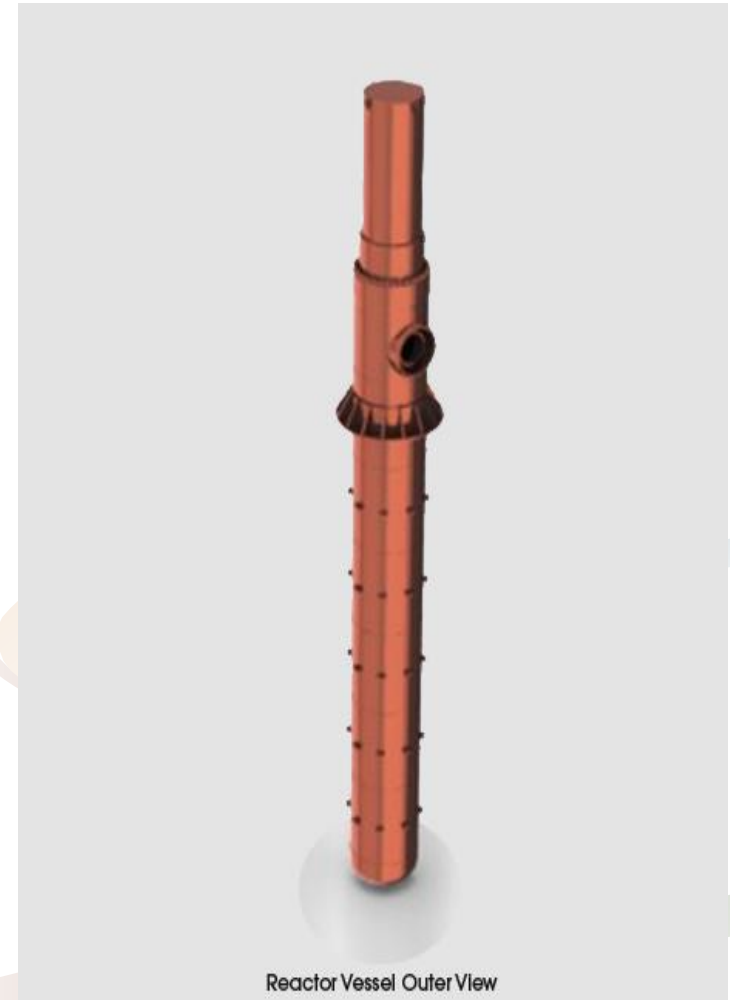
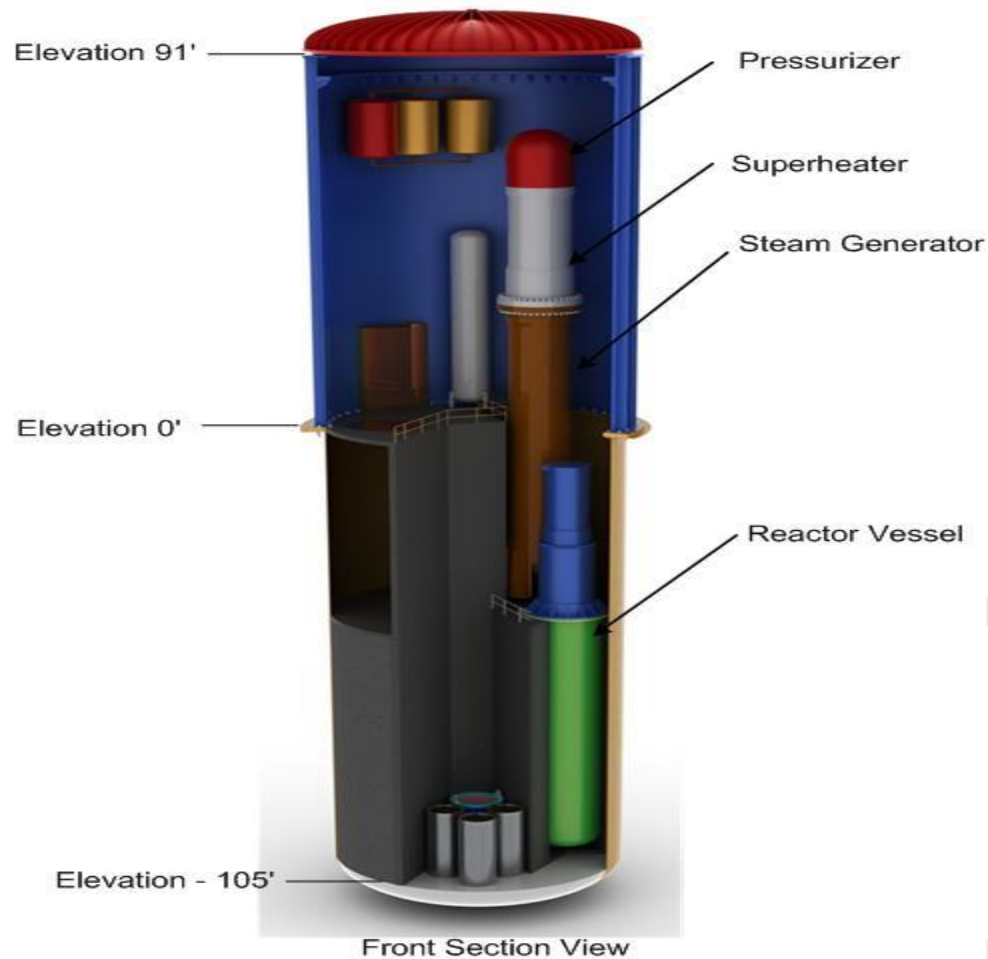
Clinch River Construction Permit

- A Construction Permit application is expected in 2015, under 10 CFR Part 50
- DOE cost-sharing through partnership with Bechtel and Generation mPower
- Pre-application topics
 - ⊕ Flooding and groundwater analysis
 - ⊕ Geology, seismology, and geotechnical
 - ⊕ Emergency planning
 - ⊕ Environmental issues
- Guidance development

Holtec SMR-160

- Holtec plans to apply for a Design Certification
- In its response to NRC RIS, Holtec informed the staff that they are reevaluating the initial submittal date of 4th quarter CY2016
- Recent and Ongoing Interactions
 - ✦ Drop in with Chairman Macfarlane, Commissioners Svinicki and Ostendorff, and NRO Management on September 9, 2013
 - ✦ Quality Assurance Topical Report accepted for review in August 2013 and the staff's Draft SER is expected in April 2014

Holtec SMR-160 (Cont'd)



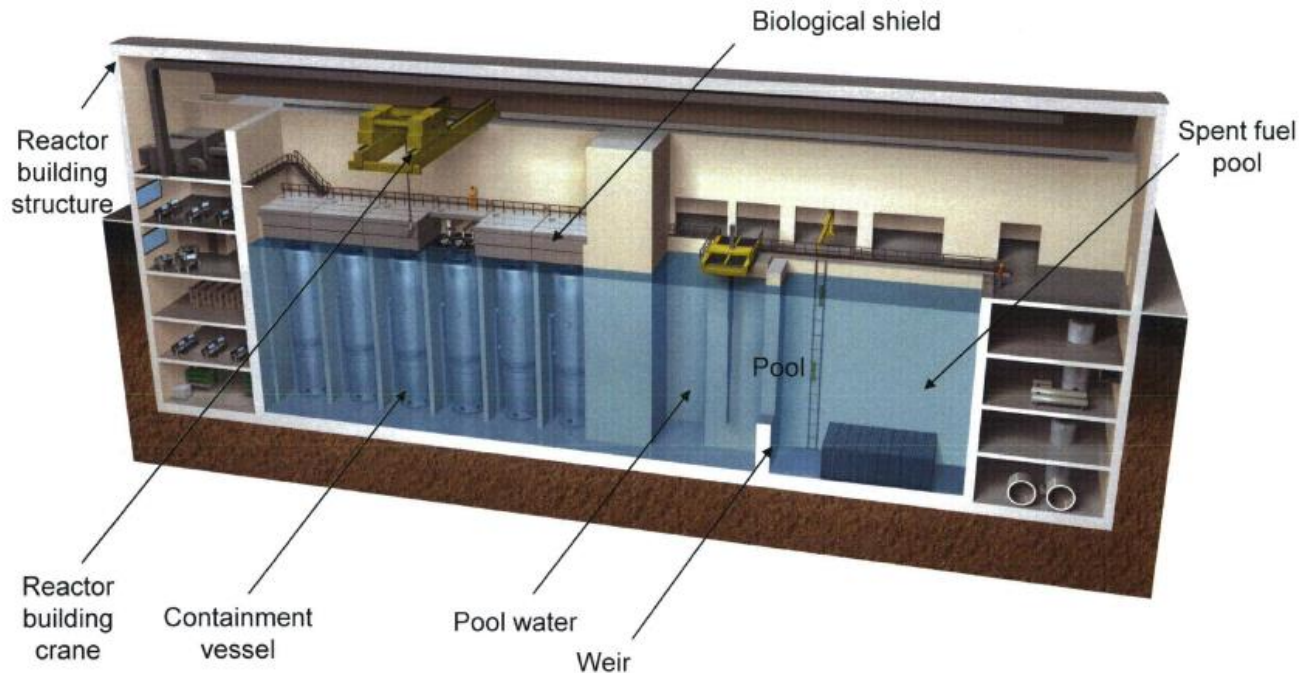
NuScale Power, LLC

- **Design Certification application is scheduled for submittal in the second half of CY2016**
- **About 140 DSRs and 100 SRPs for NuScale**
 - ✦ About 98% of completed mPower DSRs applicable to NuScale with little or no change
 - ✦ Technical Branches have commenced preparation of NuScale DSRs
 - ✦ Final DSR drafts scheduled to be issued for public comment in June 2015
- **Ongoing and upcoming system testing**
 - ✦ Thermal hydraulic testing to resume at NuScale's 1/3-scale test facility at Oregon State University in 3rd quarter of CY14
 - ✦ Critical Heat Flux testing at Stern Labs in Canada - ongoing
 - ✦ Helical Coil Steam Generator testing at SIET Labs in Italy – ongoing (1st test completed in December 2013)
 - ✦ Fuel assembly testing at KEPCO Nuclear Fuel in South Korea – late 2014
- **Challenges**
 - ✦ Control Room and Plant Staffing
 - ✦ No Class 1E power (AC or DC) needed except DC for Control Room indications
 - ✦ EPZ boundary (size)

NuScale Power Inc. (Cont'd)

Reactor Building

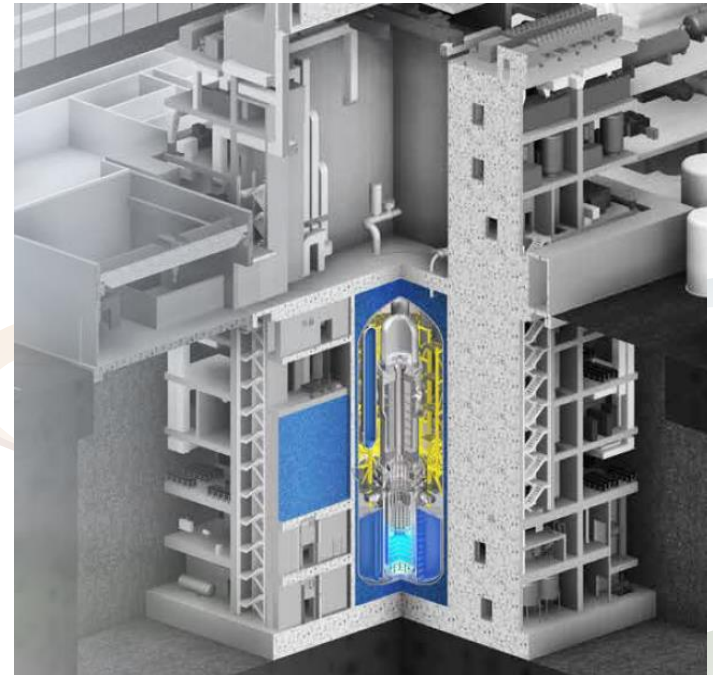
Reactor building houses reactor modules, spent fuel pool, and reactor pool



- Each module installed in own isolated bay – up to 12 modules
- Natural circulation – normal and post accident (no reactor coolant pumps; no emergency core cooling pumps)
- 37 standard 17x17 PWR fuel assemblies (half height)
- Internal helical steam generator and pressurizer
- 45MWe net power/module

Westinghouse Small Modular Reactor

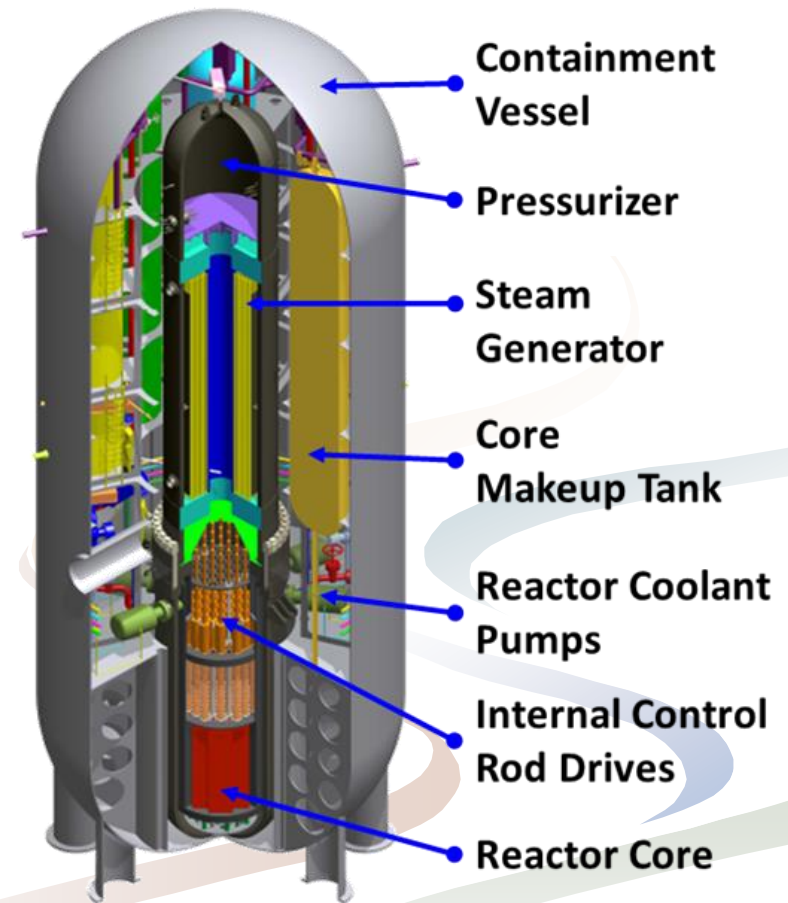
- A Design Certification application date will be communicated in the future
- SRP approach, no DSRS
- Ameren Missouri continues to pursue opportunities that would support the submission of an RCOL for multiple SMRs at the Callaway Site. Submittal date will be communicated in the future
- Staff issued draft SER for the SBLOCA PIRT Topical Report in March 2014
- A pre-application readiness review for the DCA acceptance will be scheduled in the future



Westinghouse Small Modular Reactor (Cont'd)

Specifications

- Output: 800 MWt (>225 MWe)
- Core Design: 89 17x17 FAs, 8 ft, <5% w/o
- Reactor Coolant: Soluble Boron, 8 RCP
- RV Size: 11.5 ft OD, 81 ft tall
- Pressurizer: Integral to RV
- Steam Generator: Once-through, straight tube
- Containment size: 32 ft OD by 89 ft tall, underground
- Construction: modular
- Passive safety systems



Licensing Strategy for Non-LWR Reactors

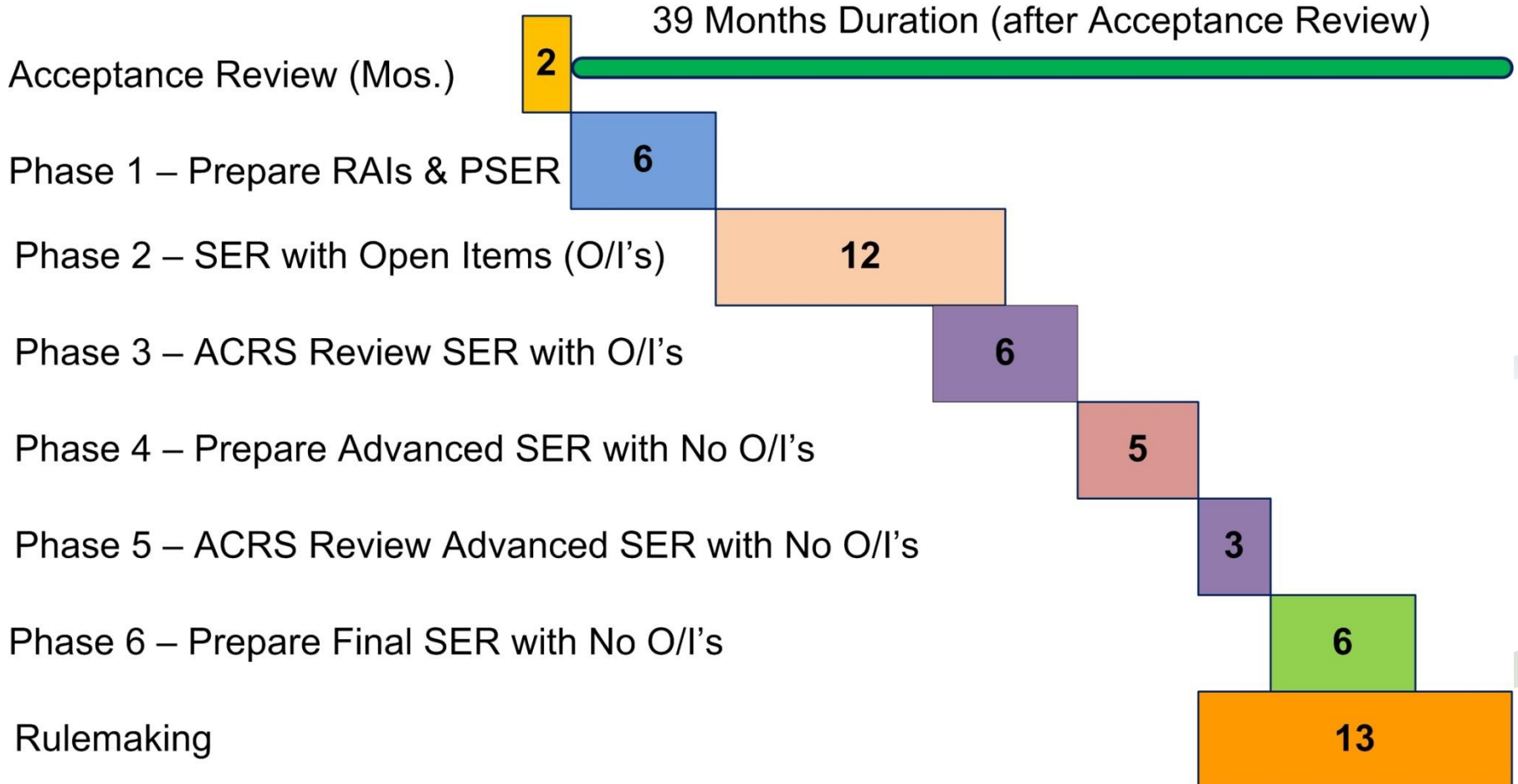
- Challenge: Appendix A, GDC, are specific to LWRs
- NRC and DOE agreed on a 2-phase licensing strategy
- Phase 1 – DOE
 - Expertise applied to research, analysis, evaluation, documentation
 - Deliverables – technical reports to NRC
- Phase 2 – NRC
 - Initiate regulatory development process
 - Issue regulatory documentation (e.g., ISG, SRP, regulatory guide, rule)

SMR Review Schedules

- Design Certification reviews may be shorter for SMRs
 - ✦ Potentially 39 months
- Requires discipline from applicant and staff
- Safety remains the top priority and will not be compromised to achieve review schedule

Baseline SMR DC Review – Ideal Scenario

Baseline SMR Design Certification Review Schedule



SMRs Key Technical/Policy Issues

- Emergency Preparedness for SMRs
- Staffing
- Deeply embedded structures
- Digital I&C
- ASME Code applicability
- Piping Design

International Interface on SMRs

- Several countries involved or interested in SMR licensing have proposed to pilot a forum for regulators
 - ✦ The goal would be to identify and address common key regulatory challenges
 - ✦ The pilot is proposed to be for a 2-year period
 - ✦ Participating countries include: Argentina, Canada, China, Finland, France, Germany, India, Japan, Korea, Russia, South Africa, UK, and the US
- Staying engaged with INPRO and GIF regarding advancements in standards for non light-water SMRs

Staff Readiness Activities to Conduct the Review of SMR Applications

- Staff is refining internal and external guidance documents to incorporate lessons learned from the review of large LWR licensing applications
- Staff is developing DSRSs and the implementation of a risk-informed, integrated review framework for SMRs.
- Staff is holding extensive pre-application meetings with potential applicants to identify licensing issues early and to develop strategies to address them.

SMR Papers/Memos

- **SECY-10-0034:** Potential Policy, Licensing, and Key Technical Issues for Small Modular Nuclear Reactor Designs
- **SECY-11-0024:** Use of Risk Insights to Enhance the Safety Focus of Small Modular Reactor Reviews
- **SECY-11-0079:** License Structure for Multi-module Facilities Related to Small Modular Nuclear Power Reactors
- **SECY-11-0098:** Operator Staffing for Small or Multi-module Nuclear Power Plant Facilities
- **SECY-11-0112:** Staff Assessment of Selected Small Modular Reactor Issues Identified in SECY-10-0034
- **SECY-11-0152:** Development of an Emergency Planning and Preparedness Framework for Small Modular Reactors
- **SECY-11-0178:** Insurance and Liability Regulatory Requirements for Small Modular Reactor Facilities
- **SECY-11-0181:** Decommissioning Funding Assurance for Small Modular Nuclear Reactors
- **SECY-11-0184:** Security Regulatory Framework for Certifying, Approving, and Licensing Small Modular Nuclear Reactors
- **Commission Memo:** Status of Staff Activities to Address Mechanistic Source Term Methodology (12/29/11)
- **Commission Memo:** Staff Assessment of the Manufacturing License Requirements Issue for Small Modular Reactors (3/27/13)
- **Commission Memo:** Current Status of the Source Term and Emergency Preparedness Policy Issues for Small Modular Reactors (5/30/13)
- **Commission Memo:** Update Regarding Recommendations for Use of Risk Insights for Small Modular Reactor Reviews (1/30/14)

Summary

- NRC is committed to ensuring that policies, requirements, and internal and external guidance are in place to support review of SMRs
- Engagement from potential applicants and stakeholders throughout the process is critical