

UNITED STATES OF AMERICA
U.S. NUCLEAR REGULATORY COMMISSION

BRIEFING ON SMALL MODULAR REACTORS

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9:00 A.M.

TRANSCRIPT OF PROCEEDINGS

Public Meeting

Before the U.S. Nuclear Regulatory Commission:

Kristine L. Svinicki, Commissioner

George Apostolakis, Commissioner

William D. Magwood, IV, Commissioner

William C. Ostendorff, Commissioner

APPEARANCES

External Panel:

John Kelly
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Department of Energy, Office of Nuclear Energy

Doug Walters
Vice President, Regulatory Affairs,
Nuclear Energy Institute

Jack Bailey
Vice President, Nuclear Generation Development,
Tennessee Valley Authority (TVA)

Christofer Mowry
President, Babcock & Wilcox Nuclear Energy, Inc.,
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NRC Staff:

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Chief, Advanced Reactor Branch 1, NRO

1 PROCEEDINGS

2 COMMISSIONER MAGWOOD: Good morning. For those of you
3 who are confused, I am not Gregory Jaczko.

4 [laughter]

5 COMMISSIONER MAGWOOD: You're not convinced. We are
6 here today to receive an update regarding activities associated with the
7 development and licensing of small modular reactors. With many people in this
8 agency still working hard to provide assistance to our friends in Japan as they
9 continue to deal with events at the Fukushima Dai-ichi Nuclear Plant, it is clearly
10 not business as usual at the NRC. Nevertheless, the usual business must
11 proceed. In that vein, Chairman Jaczko has asked me to preside over today's
12 meeting as he travels to Japan to convey directly to our Japanese colleagues a
13 message of support and cooperation, and to assess the situation there. He's
14 also meeting with NRC's team in Japan, to receive a briefing on their efforts to
15 assist Japan in resolving this crisis, and express our appreciation for the team's
16 hard work and dedication. He's asked me to pass along his regrets that he
17 cannot attend today's Commission meeting.

18 During my time with DOE, we gave considerable thought to the
19 potential benefits of small modular reactors. In concept, SMRs present the
20 opportunity to manufacture nuclear reactors in a factory, rather than constructing
21 them on site. This can entail both economic and safety benefits. These
22 technologies enable us to consider very different models for both industrial
23 deployment and regulatory approval -- models that could prove more efficient,

1 more reliable, and more predictable. However, despite these apparent benefits,
2 bringing these concepts to reality has proven elusive over the decades. As we
3 will hear today, the latest surge of interest in SMRs has garnered significant
4 support from both industry and the federal government, and therefore deserves
5 our full attention. But it also has prompted a series of very challenging questions,
6 which the Commission must grapple with. We therefore look forward to hearing
7 from our DOE colleagues, industry representatives and the staff about their plans
8 and recent progress towards answering these questions. With that, I invite my
9 colleagues to make any opening remarks. All right, very well. So we'll move on
10 to the first witness, and it will be John Kelly from DOE. John, welcome.

11 JOHN KELLY: Four weeks ago, I was here talking about a different
12 program. Certainly much has transpired in the last four weeks that has captured
13 all of our attention, especially in the nuclear community. But today I would like to
14 talk about our SMR program -- proposed program -- and express our continued
15 strong support for continuing to endeavor along a program to deploy SMRs.

16 Over the last several years, the Department has conducted market
17 research into the liability, feasibility, et cetera, of small modular reactors, and on
18 this next slide I indicate some of the -- both the value proposition and the
19 potential markets that have resulted from that study. We see SMRs as having
20 enhanced safety and security attributes; the safety largely due to the lower power
21 levels and the greater ability to rely on passive heat-removal systems. Certainly
22 we expect them to come in at lower cost which makes them more affordable and
23 more feasible for a large number of utilities. Shorter construction schedules are
24 also a potential benefit due to modular construction. Factory fabrication also
25 offers the capability to improve the quality of the product and replicate it in a

1 factory setting. And as electric demand increases incrementally, we expect the
2 SMRs to be able to fill that market. The market space is great, both domestically
3 and internationally. We see a large need over the next several decades to
4 replace fossil-fuel plants, and these small reactors have an opportunity to either
5 replace or repower as we retire those units.

6 Because of lower power levels, air cooling and reduced water
7 usage are potential benefits, which increase the ability to site these reactors,
8 especially in the Western United States, where we have arid climates. The small
9 modular reactors could also be used in non-traditional, non-electrical situations,
10 where processed heat is the primary output from such reactors. And if that were
11 the case, then we'd be looking to co-locate these with industrial applications, and
12 so all of these together are quite a large domestic market. And then there's the
13 international market, where the electrical demands are probably smaller in
14 certain countries, and we see the SMRs as a nice fit in those regions.

15 Let me address some of the things that we've discovered over the
16 past several years. The first has to do with the capital cost of entry for a utility
17 into the large nuclear power plant business. The barrier is high. Typical
18 companies have revenues on the order of \$13 billion -- perhaps \$13 billion in
19 outstanding debt, \$40 billion in total assets, leaving something around \$17 billion
20 in market capitalization. With a cost estimate of 5 to \$10 billion for a new unit,
21 this is a significant part -- fraction of their market capitalization, and makes it a
22 difficult decision. Moody's pointed out a couple years ago that a utility
23 considering this may come down to a bet-the-farm kind of decision, and they
24 strongly encourage that the utilities are consolidated, or at least partnered with

1 larger companies, to get enough market capitalization to lower the risk to the
2 utility. Next slide, please.

3 We've also looked at the situation with coal fired plants in this
4 country. This chart shows -- plots it basically by megawatts and by year put in
5 service -- the coal capacity of the United States. What we see here by the red
6 line is those units under 600 megawatts electric that were put in service before
7 1980. What we're looking at here, then, is, considering a 40 or 50 year lifetime
8 for these plants. Over the next 20 years or so something on the order of 120
9 gigawatts of power will need to be replaced, either with new coal, natural gas, or,
10 in our view, small nuclear reactors. And so we see this opportunity for coal
11 replacement as one of the big drivers for the domestic market for SMRs in the
12 U.S. Next slide.

13 So the other aspect has to do with the construction and fabrication
14 of the units. On the slide here we show the construction activities underway in
15 China for the AP-1000. And it's just meant to indicate the complexity of such an
16 operation. I contrast that with what's envisioned for the small modular reactors,
17 which have already been demonstrated, at least from the naval reactor program,
18 to be able to be factory-fabricated, and then transported on truck to the location --
19 certainly a much simpler construction period. So the SMRs offer this contrast of
20 simplicity versus the complexity of the large units.

21 And then in the next slide, we've also examined the data
22 associated with learning; that is, the cost reduction as we build more units, and
23 how the cost reduces over time. The Navy has extensive experience, as they
24 instituted these types of practices: going to assembly line replication, trying to
25 get to the "nth" of kind, et cetera. The data from that program indicated that

1 there's a factor of 8 reduction in the labor costs as the number of units increased,
2 and we expect, and hope, that such reductions can be also achieved in the SMR
3 program. Next slide, please.

4 So to date, the Department has had numerous design
5 organizations come and talk to us about the SMR designs that they have. We
6 basically have grouped these into two categories. One is near-term designs,
7 which are based on light water reactor technologies, so they're basically using
8 fuel that we're familiar with -- that is less than five percent uranium oxide fuel.
9 There is a regulatory and operating base with light water reactors, and so for this
10 class we expect to be able to deploy within a decade this type of technology --
11 this light water SMR technology. Next slide, please.

12 There's also been a number of other concepts that have been put
13 forward. These are mostly non-light water reactor designs, and they use
14 advanced fuels, advanced concepts, long-lived cores, et cetera -- many
15 important advantages, but we see a significant amount of R&D being needed
16 prior to their deployment. So we put these on a time-horizon in the 15 to 20
17 years out. These longer-term and more advanced designs, may allow the
18 mission space, or the market space for SMRs to expand with time. And that's
19 what we're interested in seeing so that we can get more nuclear power in the
20 market, replacing both electricity and non-electric applications. Next slide.

21 So in this slide, and the next one, I outlined the elements of the
22 program. I think it's very important to point out in the beginning, we're not talking
23 about deploying a few, or even a handful, of SMRs; we need to be thinking of a
24 fleet: hundreds or thousands of small modular reactors. The 150 gigawatts I

1 spoke about earlier, with plants averaging about 100 megawatts, implies a fleet,
2 if we replaced all that, of about a 1,000 small reactors.

3 This program has a new start -- it actually hasn't started yet. It was
4 proposed over a year ago in the President's budget, and we're still waiting on
5 Congress to act on that. But it is structured to accelerate the deployment of the
6 light water reactor technology first. And again, we're looking at trying to do those
7 things necessary to get the first units online within a decade. And then, in
8 addition to the accelerated deployment program, an R&D program to address the
9 needs of the advanced concepts, as well as look at generic issues that affect all
10 SMRs, and use our R&D program to help address that. Next slide, please.

11 So the SMR program is divided into these two main activities. One
12 is the licensing technical support, which will support cost-share with industry,
13 design certification and license activities. We've outlined a program of about 450
14 million over the next five years, and we're hopeful that we'll be able to have two
15 designs -- help two designs get through that process of design certification, first
16 of a kind engineering, and associated licensing activities. The R&D program is at
17 35 million a year, and hopefully we'll be able to sustain that. It's first to conduct
18 the innovative research -- research on innovative concepts -- and to support
19 licensing. The work here will be at the national labs and universities to advance
20 the innovative technologies.

21 We're especially looking at the codes and standards -- national
22 codes and standards that would need to be updated, augmented to support SMR
23 technologies. And we are certainly very interested in continuing to collaborate
24 with NRC on the SMR licensing framework to support SMR commercialization. I
25 should point out than in the NGNP, we laid the pioneering efforts to begin this

1 collaboration on licensing framework. The Department fully contends to continue
2 the work on NGNP, especially in the regulatory framework effort, and we
3 sincerely hope that the Commission will continue to provide the support
4 necessary to establish the regulatory framework for innovative concepts such as
5 NGNP and the SMR program that we're outlining. Next slide, please.

6 So what I've talked about to date has been the technology push --
7 what the Department is doing to develop and push the technology. I should also
8 add that we're also looking at the pull side -- the market side. And we've already
9 done surveys of the electricity needs at our plants -- sorry, at our sites -- as well
10 as at some of the DOE sites, and many of these look very attractive for us in our
11 deployment. So what's shown here is a business case for the Oak Ridge, and I
12 think my colleague, Jack Bailey, will probably speak more to this so I won't, but
13 the department is actively looking at these opportunities where we bring the
14 power purchase agreement -- that is, our instruments to purchase electricity as a
15 means to accelerate deployment. And the final slide.

16 So in our view, small reactors fit very well with the President's view
17 of innovation and competitiveness. These are very innovative designs that can
18 help domestic economy as well as create jobs. And so it is a challenge -- the
19 environmental challenge that we have ahead of us is still there, and SMRs, we
20 believe, can play an important role in meeting that challenge. Thank you very
21 much.

22 COMMISSIONER MAGWOOD: Thank you, John. Mr. Walters?

23 DOUG WALTERS: Thank you, Mr. Chairman. Good morning.

24 Commissioners, thank you for the opportunity to be here today to talk about what
25 NEI and the industry are doing to license and deploy small modular reactors. In

1 May of 2002, the Commission was briefed on new reactor licensing activities,
2 and at the time, Commissioner Dicus served as Chair over that briefing. And in
3 her opening remarks, she said, "This is an area in which the amount of activity
4 has been rapidly increasing. A few years ago the suggestion that new nuclear
5 plants might be built in the near future would likely have been scoffed at.
6 However, the influence of a number of political, economic, and technical factors
7 have served to make the nuclear option attractive again. The industry, with the
8 support of the Department of Energy, is vigorously pursuing technical, financial,
9 and regulatory issues associated with new reactor designs, and the NRC has
10 followed suit."

11 And I thought that kind of describes, maybe, where we are today, in
12 part, with small modular reactors. Clearly, they have captured the interest of the
13 public, members of Congress, energy companies, and other entities. Next slide,
14 please.

15 And John talked about this in his remarks, but there's a number of
16 reasons we believe SMRs are attractive. First, it provides an option to non-
17 nuclear operating companies to have clean, safe, reliable generation at a lower
18 cost and less financial risk. Small modular reactors have a variety of
19 applications. Certainly we talk about them in the context of producing electricity,
20 but as John mentioned, they could be used for industrial applications, such as
21 processing heat for chemical plants, refineries, desalinization plants, and others.

22 Also, there is a sense that some fossil units will be retired in the
23 coming years. You can look at a number of studies. For example, the Energy
24 Information Administration issued its annual outlook for 2011, and they assume 8
25 gigawatts of coal will retire by 2035, regardless of other circumstances or policy.

1 The Brattle Group has looked at the EPA regulations, and in a study they issued
2 in late 2010, they presume that there will be 50,000 megawatts of coal
3 retirements. Now that depends on the retrofits; that could be greater if those
4 retrofits include cooling towers. So regardless of which study you look at, I think
5 it's clear that we will see retirement of fossil units, and small modular reactors are
6 ideally suited to replace those units. Next slide.

7 As licensing any new technology of course is not without its
8 challenges, I think, from our perspective, a stable and predictable regulatory
9 process is always desirable. I think for small modular reactors it's critical. In a
10 minute, I'm going to talk about some of the generic issues that we're looking at,
11 but one of the challenges is: can we address enough generic issues to get that
12 stable, predictable, and efficient regulatory process that we need?

13 Also, it's clear that you could license small modular reactors under
14 the existing framework. The challenge is: How do you demonstrate compliance
15 with the acknowledgement that small reactors are just that -- they're smaller in
16 size, they have a lower power density, they have a lower probability of severe
17 accidents, and they have a smaller off-site dose consequence. So we're looking
18 at how we can meet the current regulations, but recognize that there is a need to
19 be commensurate with the design of the units.

20 With that backdrop, on the next slide I just go through our activities,
21 which for this presentation are focused primarily on the regulatory efforts. We
22 have other activities within NEI looking at working with DOE, and with Congress
23 on budgetary issues. But our goal is to achieve an efficiency of staff --
24 resources, excuse me -- and to maximize those resources through development
25 of generic industry-position papers. And we've been doing that, and working with

1 the NRC staff, and I compliment them for their willingness to work with us to
2 review those documents.

3 We use our typical NEI governance, which is working groups and
4 task forces. We have an SMR licensing task force. We have six vendors, six
5 utilities; we have INL on that group, EPRI and Oglethorp. They develop the
6 consensus positions on a range of issues, and then they submit those to the
7 NRC for interaction, and as I mentioned, we've been meeting regularly with the
8 NRC staff, and that's been very beneficial. We recognize, however, that as we
9 now move forward with these licensing issues; there are going to be policy
10 issues. And in that regard, we have developed a working group that Jack Bailey
11 chairs for us, and again, the makeup is about six vendors, six utilities, we have
12 others, including Mid-America at the executive level to deal with the policy issues
13 that we anticipate will come out of this work.

14 If we go to the next slide, this is a list of the issues that we've got on
15 our plate. It's consistent with the list you should have seen in the SECY-10-
16 0034. On the left-hand side are the papers that have been developed and
17 submitted to the NRC for review. On the right-hand side, in no particular order,
18 are the remaining papers that we expect to complete and submit this year.
19 Obviously, the right-hand column are those issues that are a little more
20 challenging and require a little more work, but we do intend to deal with those
21 issues and get those papers into the NRC for discussion.

22 So let me close with the obvious that small modular reactors, we
23 believe, clearly have a role in the nation's energy portfolio. I think they're an
24 important element, or will be a potentially important element, to an individual
25 company's energy mix, or generation mix. But key to this, at least in our view, is

1 having a stable and predictable regulatory process. And I think, through the
2 coordination we have with the industry, through our working group and task
3 force, and the interactions that we have with the NRC staff, we'll be successful in
4 achieving that goal. Thank you very much.

5 COMMISSIONER MAGWOOD: Thank you, Mr. Walters. Jack.

6 JACK BAILEY: Thank you. It's a pleasure to be able to speak to
7 you this morning. I thought I'd start off with my first slide giving you a perspective
8 on the utilities' desire to achieve a balanced portfolio that gives us cleaner low-
9 cost power, because ultimately, how nuclear fits into anybody's decision, whether
10 small or large, is dependent on the overall business environment, and other
11 needs that it has to meet.

12 TVA spent a considerable amount of time over the last couple
13 years doing a detailed integrated resource plan that involved the public and many
14 stakeholders. And in that process we got almost as many views as there are
15 opinions about how to supply our future energy supply, and after all of that,
16 running multiple cases and scenarios and portfolios, we came down to a nice
17 fact, which was that nuclear was part of most of those portfolios, and it was
18 necessary in order to achieve our overall vision of trying to have a cleaner low-
19 cost power, certainly, in the future; and our goal is by 2020.

20 I guess my contention would be that every utility wants the same
21 desire: to have a cleaner, low-cost portfolio; I don't think that's unique to TVA. I
22 believe they all also want to look at all the alternatives in that portfolio. At the
23 same time, what we're seeing is most utilities are migrating to natural gas for
24 their energy supply right now. But they will say, when they tell you that that that's
25 the bridge to a future portfolio that is more balanced. And when they talk about

1 that future portfolio, they're still saying that nuclear is a part of that. So, go to the
2 next slide.

3 So, really, I guess what I would say is that we're trying to build that
4 future portfolio starting today. Others may start a little bit later than TVA, but as
5 we move forward to try to solve this problem of cleaner air, nuclear will be a part
6 of that portfolio, in our view. And even though we will have a mix, as shown on
7 this slide, of increasing gas, decreasing coal, increasing renewables and energy
8 efficiency; nuclear we see is also increasing in terms of its need and capacity
9 within the nation's energy mix. Next slide.

10 So that brings us to the topic today, which is: How do we meet that
11 nuclear need as we go forward? Given that we need to expand our generation,
12 we need to have options for that, and we think both large and small reactors
13 provide options, and that's a good thing for the country. We became interested
14 in light water small modular reactors for a number of reasons. Most of them have
15 been mentioned either by DOE or NEI up until now. I listed several on this and I
16 tried to supplement or amplify some additional ones that they may not have
17 mentioned as much. I think the -- I won't talk about them individually; I'll talk
18 about them as a group. The first one, I think, is important for three reasons; and
19 it says it all in the statement. They are simplified, which means we ought to be
20 able to build them and maintain them with less equipment, less complexity.
21 That's at least one of our goals. They are advanced passive safety systems,
22 which is going to certainly have a benefit in today's environment, as we move
23 forward. And they're light water reactors, and that means it's an existing
24 technology that we know a lot about. We're not trying to introduce something
25 brand new that we can't do. For those reasons it was very important to us, and

1 it's very important to the utilities, to begin with these LWR small modular
2 reactors. And in that regard, I'd say the NRC staff and the Commission got it
3 right when they started two years ago and prioritized the technologies that way,
4 given the proliferation of the small modular reactor designs that were being
5 talked about. And they said, "Look, if we're going to do this, we're going to focus
6 on light water reactors first." And that is the right thing to do.

7 We certainly list some other benefits that deal with the attractive
8 design features, and I think Chris Mowry is going to talk in detail about some of
9 the ones that his design provides. But we also think there's other benefits, and
10 there's some examples here that talk about how to improve quality of
11 construction, which is in the fabrication in a shop environment, that can be
12 replicated, and improvements in the construction schedule overall, which some of
13 those features also allow us to achieve. Next slide, please.

14 Clearly, there's a lot of potential challenges that are out there and
15 some of the issues we've identified on the NEI list of regulatory areas we want to
16 improve upon are only a sampling. There's certainly a lot of issues on the
17 construction side, or the operating side, that we're going to be dealing with as an
18 industry going forward that don't require the Commission involvement.

19 We do, again, thank the NRC staff for early on moving out with their
20 work with the Commission identifying the issues that we thought needed
21 regulatory improvement, or fine-tuning is may be a better way; not all of them
22 require new rules, they may require new interpretations of how to apply the rules
23 for these small modular reactors. We do -- when we look at -- I won't go through
24 all of those. Like I said, they deal with both regulatory changes and industry
25 changes on how we manage and operate our facilities.

1 We are looking at, though -- one of the goals we have is to be able
2 to license a bunch of these once, though, and be able to build them when
3 needed. That's the idea of incrementally adding the power when needed on the
4 grid. And so that may present challenges as we go forward. We haven't gone
5 far enough down the path to know whether it will or won't. But, for example,
6 trying to license six of them at one time, but then waiting a decade before you
7 implement some of the licenses to start construction may present some unique
8 challenges that we haven't thought through from a regulatory point of view. We
9 were thinking about that even on the COLAs that were going to be issued, or the
10 COLs, for the AP-1000, for a while on whether that would present a challenge in
11 terms of how we implement the regulations going forward, I think we'll have some
12 similar questions and issues come up for the small modular reactors.

13 We also believe, though, that there will be some changes, probably
14 on the inspection branch side more than design and safety review, on how do we
15 get maximum credit for, but make sure we do things properly in a factory
16 environment where more things are being built and constructed. It's not new
17 stuff, but it's a lot more than what we've done in the past, and we may want to be
18 able to take credit for preliminary testing or design features that are
19 demonstrated before they get to the site as part of that process, too, although we
20 don't expect to do a lot of that. Next slide, please.

21 Well, in this process, the good news is we've learned a lot from
22 advanced reactors already, and we are committed -- at least TVA is -- on the
23 efforts we're initiating with the teams that we've been working with to
24 standardization of this process, along with how we try to standardize other
25 processes. The designs themselves we're going to want to maintain them the

1 same as we move forward to achieve the benefits of that. For smaller reactors,
2 it's even more important to make sure you maximize those benefits. We are
3 going to be using design-centered working groups in our approach. As we'll talk
4 about in a moment, we're looking at the One Issue One review. We would do
5 that under a Part 50 or a Part 52 license approach. And we are certainly going to
6 deal with design-specific issues through that design-centered working group, but
7 we'll elevate up through NEI generic issues that may apply to multiple designs in
8 the process, so that we can deal with those effectively and in a central way that
9 gets the focus so everybody can get the results and do what they need to
10 appropriately.

11 And finally, the industry teams that we're forming are there to not
12 only support the licensing process, but to try to support the construction and
13 build-an-actual-plant process, and keep it standardized to the extent we can, and
14 use lessons learned, and look at ways to make it more efficient in the process.
15 Next slide, please.

16 All right, so TVA has already been out in the public saying that we
17 plan to implement a Part 50 process if we move forward with our first plant. And
18 again, the good news is the staff and the Commission have been very clear that
19 both processes are certainly allowed under regulations, and there's been a lot of
20 support by the -- what we have, I guess, put forward out in terms of what we
21 would like to see happen. We do recognize that there are benefits and risks in
22 any approach you take. The risk has always been, for why would we move to a
23 Part 52 process, is we didn't want to take all that licensing risk that was at the
24 end of the process. We believe with small modular reactors that are simple, that
25 are based on known technology, those risks are smaller than they would be for a

1 large new design technology. And we do believe that there is more flexibility in
2 doing a first-of-a-kind approach through a Part 50 process, because you can
3 make changes as you're continuing to evolve your design through the design
4 phase, up to a point in that process before you have to lock down for the final
5 operating license decision. So we plan to implement that as Part 50, but we also
6 recognize the benefit of Part 52 for a standard plant design for multiple
7 customers, going to the future.

8 So our main message on this slide, at the last bullet, is that there
9 clearly is going to be a preference for the Part 52 process for licensing multiple
10 units at multiple sites long-term, but we do think first-of-a-kind has benefits by
11 using a Part 50 process. So go to the next slide, please. So we've actually
12 thought through this and tried to lay out how our first project that we're trying to
13 develop at our Clinch River site, as DOE showed on their slide, is trying to be
14 planned and executed.

15 On the top part of this is the 10 CFR Part 50 process, where we
16 would prepare a construction permit and submit it. We can get a preliminary
17 safety analysis report reviewed, and then get some good feedback from the NRC
18 on the basic design and issues associated with the plant. Once we get a safety
19 evaluation report on that design, we would submit a design certification
20 application for the design, and then they would go through the Part 52 process at
21 that point. May actually take the lead on reviewing technical issues under the
22 Part 52 process, and then we would take advantage of that under a One Issue
23 One Review approach, once our operating license was submitted under 10 CFR
24 Part 50. So this is high-level, it lays it out, the overall schedule -- the point is that
25 we have informed the NRC that we do plan to submit that construction permit

1 application in fiscal year 2012, at the end -- that's our target -- and to have a
2 plant actually built and operating by 2020. So this is not something that's a
3 research project at this point. It's a real project that we're developing and moving
4 forward with. And the last slide. So, there have been many articulated reasons
5 on why SMRs are good, and they are potential benefits -- we're trying to realize
6 those. Clearly, we have to do everything we can right now to deal with the
7 regulatory certainty, and processes associated with that, as well as the
8 economics of making a small modular reactor actually work. And both of those
9 are the focus of what we're doing over the next couple of years at TVA, working
10 with the vendor. We certainly appreciate the staff and the Commission's support
11 with the activities so far. The organization of your staff into units that focus on
12 SMRs is a big plus as we move forward, and the openness and responsiveness
13 on them wanting to deal with these issues is also seen as very favorable by the
14 industry. So thank you very much.

15 COMMISSIONER MAGWOOD: Thank you. Mr. Mowry?

16 CHRISTOPHER MOWRY: Thank you. Good morning. It seems
17 my fellow panelists have said almost everything there is to say about the benefits
18 of SMRs. So if you go the first slide here, I'm going to focus my remarks first of
19 all on the robustness of the design of mPower, talk a little bit about the progress
20 we've made in the development program, and then say a few words about our
21 views on continued industry support for the technology. Next slide.

22 As you know, mPower is a 425 megawatt thermal small reactor.
23 And just as a matter of review, the size of the reactor has been defined in order
24 to accommodate the complete factory manufacture and testing of the design.
25 We think that this is a critical feature -- something that's been mentioned here

1 previously on the panel. The other features, of course, of the small reactor, is
2 that it has a small core with only 69 fuel assemblies, and therefore a small source
3 term. But the primary feature of our SMR, of mPower, is really that it's an
4 integral NSSS system, with no large primary system penetrations. And this
5 single feature is what drives the cost and the simplification in the nuclear island,
6 but also drives robustness in the overall design and safety performance of the
7 system. And of course, by an integral NSSS, we mean that the steam generator,
8 the reactor coolant pumps, the control rod drive mechanisms, and the
9 pressurizers -- all distributed components in a typical large reactor -- are integral
10 in one pressure vessel. So with this design, it provides this inherently robust
11 safety performance, because first of all, there's no penetrations below the height
12 of the core, there's a very large reactor coolant inventory compared to the power
13 because of the geometry of our design, and this drives a scenario where you
14 have no core uncover during a design-basis accident, which is obviously a very
15 beneficial feature. We've chosen to maintain standard PWR fuel because of the
16 solid experience base, and also are keeping the design within the five percent
17 enrichment of a standard 17 by 17 fuel assembly.

18 One notable feature of our design is that the service environment of
19 the fuel is significantly less severe than you typically find, both in terms of flow-
20 induced vibration, because of the core flow rate is about half of what's typical for
21 a PWR -- power density is about half of a PWR, and of course you have lower
22 temperatures. This, of course, drives increased margins for plant operations in
23 off-normal conditions.

24 And finally, we've tried to simplify the reactor cycle by driving a
25 four-year interval between refueling, and notably we've taken Boron out of the

1 reactor coolant system for normal reactivity control, and this is another
2 simplification effort -- it takes that whole system out of the nuclear island. So, go
3 to the next slide.

4 Let me transition over to a few comments on the containment of the
5 nuclear island. The key feature for us on the containment is that it is fully
6 embedded underground. And in fact, the entire reactor building is underground
7 except for the top floor, which contains no safety systems. All the water systems
8 that are required for normal operation and accident response -- refueling water
9 storage tank and the ultimate heat sink -- are contained within the reactor
10 building underground, and therefore protected from external events. In addition,
11 the underground containment in reactor building provided very favorable seismic
12 response attenuation, and also dissipation of energy into the soil. The spent fuel
13 pool is also located underground in an auxiliary containment, and it has a very
14 large water volume compared to the amount of the spent fuel that would be
15 stored there. Of course, this helps in extended station blackout response.

16 The overall architecture of our design is driven by an inherently
17 safe system that utilizes passive gravity-powered ECCS. The containment is dry
18 and we're focused on trying to either minimize or eliminate entirely the debris
19 entrainment issue by the way we're designing the systems.

20 Another important point here, especially when you look at our
21 baseline twin pack for the plant layout is that each of the safety-systems is
22 dedicated to an individual reactor. There's no shared safety-systems between
23 the two reactors. And again, the overall containment and nuclear island layout is
24 also focused on improving severe accident response, passive filtering, and we

1 have passive hydrogen recombiners, and we're also looking at some other
2 features.

3 Taken together, these features of our design are really focused on
4 driving toward a 10^{-8} core damage frequency. That's the goal of the program.
5 Next slide.

6 If I step back and look at the overall plant layout. This is an image
7 of our standard, 250 megawatt twin pack. That's what you would get with an air
8 cooled condenser field. If you go to direct water cooling, it would probably be
9 closer to 300 megawatts. The key feature here is that we are driving toward a
10 security-informed plant layout; the key feature is an isolated reactor building with
11 all the non-safety related structures, including the turbine island removed and
12 outside the protected area. And in fact, in our design, there's about 150 yards
13 separation between the reactor building and the turbine island. And this greatly
14 simplifies the overall security requirements for the plant, and this is something
15 we're really focused on in the future.

16 From another design feature perspective, the digital, the I&C
17 system is going to be digital. And right now we're in the final process of defining
18 what the defense-in-depth architecture will look like, whether that's analog or
19 digital has not yet been established.

20 From a construction perspective, the goal is to complete something
21 in the neighborhood of 30 to 36 months, and that is enabled by the basic concept
22 of doing parallel manufacture of the NSSS system, while the civil structural work
23 is going on in the field. And, at the very end of the process, you're shipping the
24 integrated NSSS system to the construction site, and installing it at the end of the

1 process, rather than at the beginning of the process. And that's a fundamental
2 change from the way construction is done with large reactors. Next slide.

3 A few comments on our progress. We are well down the path of
4 design, and we're in prototyping and testing various components, including
5 control rod drive mechanisms. You see a picture here of our full height scale, full
6 scale height integrated test facility that's located in the State of Virginia. That's
7 going to be completed here later this spring, and we're going to begin testing
8 over the summer. And this thing really forms the core of a \$100 million test
9 program that we've committed to, to evaluate all normal and off-normal
10 performance features of our design. Next slide.

11 With more than 300 engineers and designers working on mPower,
12 we've made good progress. And that has enabled us to accelerate the overall
13 process of pre-application licensing. In 2010, we were able to deliver eight
14 licensing topical reports and other submittals, and we're on track to submit at
15 least 12 of those in 2011. So, continued NRC staff support is going to be
16 essential for us to maintain the overall schedule for our lead plant deployment.
17 Next slide.

18 I just want to say a few words here about our initial assessment of
19 the Fukushima event. But really, it's a broader view, and a couple of points about
20 our overall philosophy of safety on SMRs. The basic goal of mPower, from a
21 safety-system performance perspective, is not to have a cliff, in terms of the
22 safety performance. The goal is to have a multi-layered defense that is very
23 robust against all major threats and events that could be postulated here, both
24 design basis, and beyond design basis.

1 So, a few comments in particular. As I mentioned earlier, with
2 regard to earthquakes, the design of mPower, with its deeply embedded reactor
3 building containment, really helps with the seismic response, and the attenuation
4 and dissipation of energy makes it a very robust, inherently robust design from
5 an earthquake perspective.

6 Regarding loss of offsite power, of course, we have a passively
7 safe design that does not require AC power for any design basis safety functions.
8 But in addition to that, we have in our design two back-up diesel generators that
9 can provide the grid-independent AC power capability.

10 Regarding station blackout, the basic design is 72 hour safety-
11 related batteries that support all accident mitigation. But, again, keeping in line
12 with the philosophy of defense-in-depth, we have, behind that, two auxiliary
13 power units that are going to be located in the reactor building, protected; and
14 they are capable of recharging the safety-related batteries, and also providing
15 DC power post-72 hours, to provide the necessary control power and monitoring.
16 And then, behind that, we have long-duration station keeping battery that will
17 provide monitoring capability, remote monitoring capability, and limited control
18 capability to the safe shutdown panel.

19 So you can see here, the philosophy is to have a multi-layered
20 capability to deal with station blackout for an extended period of time. That is
21 coupled with the overall emergency core cooling design that we have. I
22 mentioned earlier, the natural circulation process for ECCS, without the
23 requirement for pumps. And that, coupled with the low power density in the
24 small core, together with a very small break size, maximum break size in the

1 reactor vessel, compared to the reactor inventory, give a very robust
2 performance from an ECCS perspective.

3 Regarding the containment, and containment integrity, and ultimate
4 heat sink, I mentioned earlier the passive hydrogen recombiners. The other point
5 here to look at again is that the ultimate heat sink for mPower is located inside
6 our reactor building, underground, in a shielded location. And it has an extended
7 performance window of up to 14 days without the need for external intervention
8 or make-up. So that gives a nice long window to respond to external threat
9 events.

10 And then, as I mentioned earlier, the spent fuel pool. And, just as a
11 point of reference, after 40 years following a full core offload, you'd be able to
12 survive more than 30 days without the need for make-up in the pool, given the
13 size of that.

14 So the goal here, again, is to have a multi-layered defense with no
15 cliff in the design basis, to mitigate the extreme beyond-design basis challenges.
16 Next slide.

17 Just close with this slide. And we reached out to our consortium
18 members last week. And there's some quotes here that indicate very strong
19 continued support for the benefits that we're trying to achieve with our SMR
20 design. Thank you.

21 COMMISSIONER MAGWOOD: Thank you. Thank all of you for
22 your statements today. Commissioner Ostendorff?

23 COMMISSIONER OSTENDORFF: Thank you, Commissioner,
24 Commissioner Magwood. And I also thank you all for being here; this
25 presentation's really very helpful. I wanted to start out with, maybe, just a

1 somewhat of a high-level question, and give each of you a chance to respond to.
2 Let me set the stage for that. Jack, you, in your presentation, talked about the
3 economy as a scale of SMRs, compared to the existing nuclear reactors in this
4 country. And we recognize there's all types of business market-based decisions,
5 as far as grid demands, alternative sources of capacity, natural gas or others, et
6 cetera.

7 I wanted to, maybe, put the market side piece over, park it to the
8 side for a moment, and to talk, maybe, just a little bit about the NRC regulatory
9 aspects. And ask a question, and I'll start with John, and maybe go down the line
10 here, to maybe address your perspective, DOE or industry, but for each of you,
11 what you see as the biggest hurdles, or the biggest uncertainties, at this point in
12 time, as far as any regulatory framework issues for the licensing of SMRs.

13 JOHN KELLY: So, from our perspective, the economic issues are
14 two things. One is the capital cost, which we are addressing by smaller size. But
15 the other is the operating cost, which are largely driven by the regulatory
16 requirements. This has to do with staffing, emergency evacuation zone planning,
17 and a whole host of other things related to that. We need, I believe, to be looking
18 at risk-informing the requirements, so that as we move forward we can balance
19 the risk that the plants pose with the appropriate response and resources in
20 terms of human capital and systems so that we can have operating costs that are
21 manageable at the plants.

22 So what we see is that the regulatory framework structure
23 requirements are going to directly influence the operating cost, which will be a
24 large determinant into the economic feasibility of these plants.

25 COMMISSIONER OSTENDORFF: Doug?

1 DOUG WALTERS: Thank you, Commissioner. Yeah, and to just
2 add to what John said, I think, at least from our perspective, if you look at our list,
3 what was on the right hand side are probably the issues that we need to resolve
4 in a way that's commensurate with the design of a plant. Security is one that
5 continually comes up.

6 I don't think that it would be viable for a small reactor to have to
7 implement security the way we implement it today at the 104 operating plants.
8 It's not feasible for them to have whatever number of officers we have, if it's 100,
9 150; that's just not feasible. So alternatively, and I think as Chris mentioned, we
10 can look at what would be, perhaps, an alternative way of meeting some aspects
11 of that regulation through design. That would certainly minimize or reduce the
12 O&M costs that the plant will have.

13 Emergency preparedness is another one. Smaller source term.
14 We're looking at, in our paper, two options: one, what you do inside the existing
15 EPZ, and what you could do to reduce the EPZ. So I think those are two areas
16 that have potentially high impact, in terms of O&M as we go forward, that we
17 need to work with the staff to come up with a way to meet those regulations, but
18 with an alternative means of doing so.

19 COMMISSIONER OSTENDORFF: Let me just -- if I can just put a
20 fine point --

21 DOUG WALTERS: Sure.

22 COMMISSIONER OSTENDORFF: -- on a comment you made on
23 the O&M cost. From the industry perspective, is it fairly clear, or are there big
24 uncertainty bands around the operating costs of an SMR, compared to
25 alternative sources of electrical capacity, such as natural gas? And do you feel

1 like -- is there a range or band of operating cost on an annual basis, for a given
2 megawatt SMR facility, that you feel pretty comfortable looking at from the
3 industry perspective, to make a decision on whether an SMR makes more sense,
4 or does natural gas or coal make more sense?

5 DOUG WALTERS: We have not, at least in our work on the
6 licensing activities, looked at that. I think, maybe Jack and Chris can probably
7 give you a better answer to that. But we are aware that that's a critical
8 component of the business model. And that's why we're working with the staff to
9 understand what compliance means with the existing regulations, and how we
10 can do that in a way that considers, you know, what the O&M costs would be.
11 Now, certainly, we would get that input from our utility members in those groups,
12 but I think they may be in a better position to answer that question than me.

13 COMMISSIONER OSTENDORFF: Jack?

14 JACK BAILEY: Thanks. I'll start with your first question first. They
15 did highlight most of the issues from a regulatory perspective that we're trying to
16 focus on. There are some obvious ones, though, that aren't hard, that people
17 don't often mention that still have to be done. For example, the fees charge on
18 small reactors per unit, the NRC fees, is an issue, but it looks like it'd be an easy
19 issue right now, so people aren't worried about it, it still needs to be processed all
20 the way through to closure, through rulemaking, I believe, in that case, or at least
21 your annual budget rulemaking.

22 On the cost issue, it's never about just operating cost, or just fuel
23 cost, or just construction cost; it's about all those things together. When we do
24 our evaluations of alternatives, we look at the total, all-in cost of everything over

1 a long period of time, or short period of time, depending on what you have to
2 survive with.

3 So we have to, one, manage their capital construction cost within a
4 range that we think is competitive with a larger reactor, when you take into
5 account the length of construction, the length of borrowing money, and all the
6 things that go along with that. But then you have to -- you know you're going to
7 get the advantage of fuel either way because it's the same fuel cost as the larger
8 reactor, or essentially the same, and that's going to be stable, not volatile. So
9 those have benefits even beyond just the cost numbers. And then the operating
10 cost on top of that. I'm sure we can tolerate a cost that's higher than what it is for
11 existing larger reactors and still make these viable alternatives for most utilities,
12 including us. But I don't think there's a magic number. I think you have to look at
13 all those things together.

14 COMMISSIONER OSTENDORFF: Thank you. Chris?

15 CHRISTOFER MOWRY: Yeah. I guess I would just echo the
16 comment made earlier regarding security. You know, we have looked at the
17 entire levelized cost of electricity target that you need to achieve with mPower,
18 and we do believe we have a path forward on the construction, the capital cost
19 side of things. Of course, that needs to be finished up.

20 But the main challenge, in our view, is, and the thing that really
21 drives the operation maintenance cost into the zone that it needs to be in, is
22 security. And that's why I mentioned that our overall plant architecture, plant
23 layout, is what we call a security-informed, or an inherently secure design.
24 Because the current method of -- I'll just call it a brute force method of securing
25 the plant, with hundreds of guards, as it was mentioned earlier, just doesn't work;

1 it's a non-starter. And so we need to have a requirements-based approach that
2 uses technology and the basic architecture of an underground isolated reactor
3 building with all the safety-systems in it to create a situation where we can secure
4 the facility with an appropriate staffing level that meets the overall O&M
5 requirement.

6 I think we've had some good interaction with the staff so far, I
7 believe there's been two meetings. And, so we feel good about the path we're
8 on, but this hasn't finished. And in my view, at the end of the day, this is the thing
9 that's going to make or break the large -- you know, whether SMRs get deployed
10 in large numbers or not is going to come down to O&M. And the biggest variable
11 that we can attack directly, the single biggest one, is the security issue.

12 COMMISSIONER OSTENDORFF: Thank you. I'm going to shift to
13 a different topic here. John, you mentioned in your slides a very helpful example,
14 I think, for many of us, dealing with the Navy industrially-based experience. The
15 learning curves associated with that, and I can recall over about a 25 year period,
16 the Navy built between 55 and 60 Los Angeles Class nuclear attack submarines,
17 and Electric Boat shipyard, Newport News shipyard, were beehives of activity at
18 times in the late 70s, early 80s, building a lot of the SSNs. So that was a very
19 helpful data point you provided.

20 So I want to, kind of, now turn to Chris. B&W's had a long
21 experience working on that Navy side, with the Naval Reactors Program. And
22 could you share with us, just, you know, briefly, any of the key lessons learned
23 that you would hope to leverage from your Navy experience, doing the naval
24 reactors work?

1 CHRISTOFER MOWRY: I don't think there's a huge amount,
2 beyond the high level comment that you made, you know, there's not a lot of,
3 there's really no relationship, on the technology side, to that. But I would say, I
4 would echo the comment that for this thing to reach its long term goal, from an
5 economic perspective, we do need to get into a scenario where you're building
6 more than one reactor every two or three years.

7 Because the core precept here is that, not only the NSSS system,
8 but quite a few of the other systems can be fully built in factories just because
9 the overall plant, the reactor plant, is about an eighth the size of the typical
10 gigawatt class reactor. And so that basic reality enables you to modularize
11 conceptually in a way that's just not feasible with big plants. So you're really
12 trying to shift most of the construction into a manufacturing environment, and of
13 course, the value of that is when you get into an assembly line situation, where
14 you have a reasonable volume going through there. That's when you get a
15 cognitive of scale, good learning with your workforce, and all these "nth" of a kind
16 benefits that you alluded to.

17 COMMISSIONER OSTENDORFF: Thank you. Thank you,
18 Commissioner Magwood.

19 COMMISSIONER MAGWOOD: Thank you. Commissioner
20 Svinicki?

21 COMMISSIONER SVINICKI: Thank you all for being here today.
22 NRC conducted earlier this month, although it seems like a hundred years ago
23 now, its Regulatory Information Conference, and I'm told that the session on
24 small modular reactors was perhaps the most heavily attended, it was beyond
25 standing room only, and that we had to, I believe, turn participants away,

1 because it just was simply not possible to accommodate everyone. So the
2 interest that some of you spoke of in this topic is clearly -- was even
3 demonstrated at our information conference, which is our largest event of the
4 year.

5 So it certainly -- it's good that the Commission is meeting today to
6 once again hear the status of some of the paths that the staff put in place with
7 DOE and others a few years ago, and hearing about what progress we're making
8 on underlying issues, policy issues, issue resolution; so I appreciate the work that
9 all of you are putting in on that.

10 Dr. Kelly, I might turn to you first. And I have some questions here
11 that arose out of your presentations, but if anyone would like to comment -- if I've
12 taken good notes, I'll direct them to the individual that made the comment, but if
13 any of you have a comment to make, please just chime in.

14 Dr. Kelly, one of the areas that you talked about was codes and
15 standards. And I have some interest in this. I think I visited at least a couple of
16 DOE labs where work is going on on building code cases and things for
17 advanced materials that might be used. But my familiarity with this process is
18 that it can take years, if I have this right, to do one code case, or get it all the way
19 through the system. What assessment would you give, generally, of where we
20 are, kind of, as an entire community: industry, DOE labs, NRC, in terms of
21 development of codes and standards? Are we kind of behind where we would
22 optimally be, or are we making good progress there?

23 JOHN KELLY: Well I think the development of codes and
24 standards is a consensus process, so that in itself dictates long periods of time to
25 come to that consensus. From the DOE perspective, we have focused on, in

1 some sense, high temperature materials and other things, where we need to
2 extend their range of applicability to what we see in our advanced reactor
3 program. So that's work that we're doing within the labs.

4 But through the Department of Commerce, the NRC, DOE, there is
5 a nuclear energy codes and standards organization that's trying to oversee what
6 the ASME, IEEE, and ANS are doing in this area. And are soliciting, and then
7 funding proposals with contributions from each of the agencies into that.

8 I think the process will be slow, but I think what we're doing now is
9 trying to prioritize what we think the most important codes and standards are. In
10 a different program, we are looking at the ANS 54.1, 53.1, which are general
11 design criteria, which we see are a very important front-runner for both the NGNP
12 high temperature gas reactor technology and liquid metal reactor technology.
13 Those are moving forward, and I think, once we get those things in place, we can
14 broaden that to the other areas that would need to be adjusted or developed for
15 advanced reactor technology.

16 COMMISSIONER SVINICKI: Thank you. I raised it, of course,
17 because, and I'm sure Mr. Mowry is very familiar with this, but, you know, there's
18 an interest in innovating, but that if your developer has to be balanced against
19 the familiarity of the regulators. So there's that balance that needs to be struck.
20 And I think, if innovative materials are going to be used, or innovative
21 approaches, these underlying codes and standards are an essential component
22 of willingness to innovate, or whether or not there's a good benefit in innovating,
23 if you have to balance that against the regulatory or licensing risk. So I know it
24 seems like a down-in-the-weeds topic, but I think it's actually, you know, at heart
25 it's really essential to our ability to bring forward innovative approaches.

1 Mr. Walters, I might ask you, even though I'm sure everyone sitting
2 there would have an opinion on this. We talk a lot about the policy issues. We
3 have a list of policy issues, I think your presentation had, some of them on one
4 side, had check marks, and I don't think that means fully resolved, I think it
5 means, you know, under development, and the other side is, maybe there's more
6 work to be done. But what's your general assessment of whether or not we're
7 prioritizing those policy issues, or the order in which we tackle those policy
8 issues? Do you think, generally, we're prioritizing them correctly?

9 DOUG WALTERS: Yes, Commissioner, I do. We read thoroughly
10 the SECY paper. We reviewed the list that the staff had put together with our
11 task force, the end users, if you will. And I think generally we're in agreement.
12 But I think that, perhaps, as we move forward, and we develop the papers, those
13 priorities will change. And we're constantly monitoring that ourselves. I think the
14 staff has shown acceptance to modifying the priorities if it's warranted.

15 But I think that, in general, we have the right priority. I do think an
16 example, though, would be security. I mean, we've heard from our membership
17 that that's a critical issue. We agree with that. I don't remember, in the SECY
18 paper, what the schedule is that the staff has outlined to provide you something
19 in that area. But that may be one where, as we assess the paper, and what we
20 need, we would come back to the staff, and maybe ask to accelerate that one.

21 COMMISSIONER SVINICKI: Okay. And I want to use that as a
22 platform for another comment I would make, is that I think there are a lot of
23 moving parts here. I don't know what assessment my colleagues on this side of
24 the table would make, but as I looked at the SECY paper, and a lot of the other
25 underlying documents, I think that we're trying, on a regulatory side, to push

1 forward on a lot of things. I did not have a clear sense, in looking at all of it, of
2 what is being produced when, and when the Commission might need to act. And
3 so, this is my own personal assessment, just in preparing for this meeting, and
4 now hearing these answers.

5 You're mentioning a very practical point, which is, as we explore
6 issues, we might move them up and down in priority. You're also, I think,
7 indicating that the staff is being agile in that regard and I appreciate that. I think
8 that we need to be. But I want to key off another statement, Doug, that I think
9 you made in answering another question. And it was on the topic of security.
10 You said: "meeting regulation through design." And it's a curious phraseology to
11 me, because, when I think about it, if the regulations are truly performance-
12 based, if you simply meet the regulation through your design, I don't know that
13 the regulatory framework itself has to be changed. The compliance is done
14 another way. And if the regulation is written to just have you demonstrate a
15 certain performance, you could do that through design. But I'm also a practical
16 person, so I have a feeling that, when we look at the regulations themselves,
17 there probably are some complications to truly complying through your design.
18 And just, perhaps, that isn't the framework or the prism through which we
19 develop the regulations. And so, as a practical matter, maybe we can't do that.

20 But something that -- codes and standards take a long time. So
21 does rulemaking. And so, if there is kind of a body of issues that, at the end of
22 the day, the NRC staff is going to find it necessary to have some sort of
23 provisional regulation, or have, maybe, a regulation as it exists now, for large
24 light-water reactors, but have provisions to be invoked for small modular, that will
25 take some time to put in place.

1 As an agency, we're continually asked by the Congress about our
2 state of readiness to begin to seriously review and license small modular
3 reactors. And I think if we're getting to a point where we know that there might
4 be a body of rulemaking, and that we need to be thinking about that in our
5 agency planning. So, I think that's, at the heart of some of what I'm asking about
6 policy issues, is that, ultimately, that might ripen into rulemaking that we need to
7 do, that takes time, as a practical matter. So that's something I think I'll also
8 explore with the staff panel.

9 I also, Mr. Bailey, wanted to touch on something that you had
10 talked about, because I'm interested in this issue as well. You talked about
11 taking credit -- well these are my words now, for factory acceptance or other
12 testing because of this manufacturing nature of small modular reactors now. In
13 another meeting the Commission might hold on new reactors, we hear a lot
14 about our ITAAC and other acceptance things that, as the regulator, we're going
15 to have to go through.

16 So I would ask you, Mr. Bailey, what's your sense of the exploration
17 with the NRC staff, of this issue of how might you structure this, given this, you
18 know, offsite manufacturing of small modular reactors? If I am the constructor or
19 the person who's going to operate a small modular reactor, I might do factory
20 acceptance testing, and how do I get the regulator to be a part of that process?
21 Is that yet ripe? Or are we at least talking about it?

22 JACK BAILEY: Yes, as you know, in our assumption letter for the
23 Clinch River Project that we submitted to the NRC, we identified that we want to
24 be able to do the manufacturing inspections in accordance with ways that are
25 very similar to how we do it with existing manufacturing oversight processes. But

1 the staff brought up to us in those interactions, public interaction we had last
2 December, that their inspection criteria and processes may not be aligned fully to
3 doing that as it might be necessary for these integral designs.

4 So the good news is both parties understood that issue very well at
5 that point. I believe the Region inspection branch has an action that they're
6 going to develop time and resources to supporting it and commensurate with the
7 needs on what's happening on the small reactor side. It hasn't gone much
8 beyond that right now. We haven't talked about: Does that mean ITAAC or non-
9 ITAAC type inspections? But the idea is you are putting together a lot more stuff
10 in a final form, and at what point does there have to be an acceptance of
11 whatever's happening by the regulator in that process, too? So it is identified,
12 there have been preliminary discussions between at least our team and the staff,
13 but a lot of work to go there.

14 COMMISSIONER SVINICKI: Okay. Thank you. And Mr. Mowry, I
15 might ask you that you add a list -- a long list in 2011 of topical reports, and other
16 things, that you're submitting. I imagine that you have but perhaps have not
17 shared today another long list of other things that you have under development.
18 On the general issue of when you approach the staff with some of your more
19 innovative aspects -- or things that the staff has not previously licensed -- let me
20 put it that way -- I'm not going to hang the label of innovative on it. What is your
21 sense of the regulatory readiness with which that's received? Is there a lot of --
22 kind of saying, "Well, we've never seen that before, so we're going to have to get
23 back to you?" How would you characterize that?

24 CHRISTOFER MOWRY: Actually, to date I think we're very, very
25 pleased with the responsiveness of the staff and their willingness to engage.

1 We've had excellent interaction so far. So I would just say that so far it's been
2 very, very positive, and we've had all the resources that we've needed to
3 proceed with the reviews on the schedule that we've hoped for. So thank you,
4 that's gone very well.

5 I'd also just like to add -- go back to what Jack said on the
6 manufacturing. You know, we obviously manufacture steam generators today.
7 And in fact, the largest steam generators are larger than the mPower module.
8 And while it is more complex, the mPower integral PWR, I would say it's not
9 qualitatively more complex if you remove the fuel from the discussion. And so, I
10 think what we're looking for here is more of an incremental approach to this
11 whole thing, rather than some significant qualitative shift toward a manufacturing
12 license, or something like that. We see this as being more inside that same box
13 that a large, complicated steam generator sits in, in terms of what types of
14 reviews and support we would need to license the overall power plant.

15 COMMISSIONER SVINICKI: That's an interesting analogy. I
16 appreciate you mentioning that. And with your indulgence, Mr. Acting Chairman,
17 I just have to comment for the record on the wonderful taste in watches that Dr.
18 Kelly has. I'm assuming the 'M' does not stand for MIT, where he also got his
19 PhD. but it stands for Michigan Wolverines, so I appreciate that. Thank you.

20 [laughter]

21 COMMISSIONER MAGWOOD: Which goes to show that no one is
22 perfect.

23 [laughter]

24 COMMISSIONER MAGWOOD: Commissioner Apostolakis?

1 COMMISSIONER APOSTOLAKIS: Thank you, Commissioner
2 Magwood. I'll start with Mr. Mowry. On your slide eight, you have a comparison
3 between your design and, maybe, the Fukushima design, and how unofficial I
4 guess, is what you're doing, as compared to that. But of course, at Fukushima,
5 we had an event that was, I would say, incredible, highly improbable, and created
6 a lot of problems with the infrastructure, as we know, and defeated a lot of the
7 safety systems, electric power, and so on. I'm not going to ask you to speculate
8 what kind of event could happen to your reactor, because if we could figure it out
9 we would design against it, or we would do something, anyway. But suppose
10 something like that happens, and the fact that your reactor is underground,
11 wouldn't that impede any efforts from the outside to intervene, and maybe cool
12 the reactor like they're having now -- in Fukushima, the problem is the lack of
13 infrastructure and the damage that the tsunami did. But the reactor is above
14 ground. In your case, it's underground. So how would that affect similar efforts?

15 CHRISTOFER MOWRY: Well, as you pointed out, I think we still
16 need to wait for all the details to emerge, here, before we can definitively talk
17 about that. But just two observations: First of all, the damage, at least the
18 apparent damage, to the reactor and the supportive infrastructure was, at least in
19 part, caused by an external event, i.e. the tsunami, and therefore, by definition,
20 having an underground reactor and containment building, and all the safety
21 systems, at least qualitatively would cause one to think that there would be less
22 exposure to some kind of external event.

23 The other observation I would make is that there seemed to be
24 quite a challenge, post-event, in making up water to the reactor spent fuel pool.
25 That's because, in that design, the reactor and the spent fuel pool are high and

1 your water source is low. And if you think about mPower, it's exactly the
2 opposite. The spent fuel pool and the reactor are essentially at the lowest point,
3 and the water sources are high. And since we're a passively safe, inherently
4 safe design, you don't need pumps; and the combination of that and the
5 geometry really create a scenario where it's easier to get water into the places
6 that you want, rather than hard.

7 COMMISSIONER APOSTOLAKIS: So I guess what you're saying
8 is that there are no downsides to burying the reactor. That's okay. You can say
9 that. Mr. Bailey, just a point of a clarification: If I look at your slide eight as well,
10 with a timeline, Part 50 and Part 52; am I to understand that the first-of-a-kind
11 reactor would be licensed under Part 50, and that what you have here, the lines
12 underneath on Part 52, will be the design certifications for the future -- second-of-
13 a-kind and beyond: Is that correct?

14 JACK BAILEY: Yes. That's the plan right now.

15 COMMISSIONER APOSTOLAKIS: So for the first-of-a-kind, you
16 will never switch to Part 52.

17 JACK BAILEY: That's correct.

18 COMMISSIONER APOSTOLAKIS: So you will never submit a
19 PRA?

20 JACK BAILEY: We would have a -- no, we will. We have indicated
21 that we will maintain the licensing requirements, even under Part 50, consistent
22 with the requirements under Part 52 -- because we're doing the one design, one
23 review -- so we want to make sure that we meet all the requirements there. The
24 issue of Part 50 gives us the flexibility to do a two-part with the construction
25 permit followed by the operating license, and still make changes to the plant after

1 the construction permits are issued a little bit more efficiently as we learn and
2 improve or have engineering changes. But we are going to still have a PRA.

3 COMMISSIONER APOSTOLAKIS: Okay. Good. Good. That
4 clears it up. Thank you. Mr. Walters, you had the whole list of issues there on
5 which you plan to submit white papers. One of them is defense-in-depth. What
6 does that mean? And does it mean you're going to list the defense-in-depth
7 measures, like Mr. Mowry did with his comparison with Fukushima? Or is there
8 something you think more fundamental? Do we have to reconsider that concept
9 when we come to small reactors? Or is it premature to ask?

10 DOUG WALTERS: Or is it what? I'm sorry?

11 COMMISSIONER APOSTOLAKIS: Premature to ask the question.

12 DOUG WALTERS: Well, we haven't scoped that paper yet. It's on
13 our list. So I'm not sure I can give you a satisfactory answer. But I think that,
14 conceptually, it would be to look at, again, recognizing the size and the
15 differences between a small reactor and a large light water reactor, and try to
16 understand what defense-in-depth measures would look like, if that's the right
17 way to say it. I mean, we know what they are for large reactors. Do we need
18 those same kinds of things to the same depth for small reactors? That's the
19 concept that at least I have.

20 COMMISSIONER APOSTOLAKIS: But the main philosophy of
21 having compensatory measures and barriers -- that's still the same. The
22 question is how you implement it.

23 DOUG WALTERS: That's right.

24 COMMISSIONER APOSTOLAKIS: Okay. Now, speaking of those
25 issues, and the special attention on security, and so on, it seems to me that the

1 whole decision-making process, both on your side and our side, would benefit by
2 having a level three PRA. Now, why would that be so? Well, you're talking
3 about different EPZ. I would like to see the consequence curves from the PRA.
4 Security even -- you might be able to say a few things. I know that we have not
5 risk-informed the security requirements yet, but someone has to start. And the
6 other thing is that, of course, the level three PRAs that are out there are the
7 reactor safety study, and NUREG-1150, now that we are doing the SORCA
8 studies, and so on. But all these are for large reactors and, either directly or
9 indirectly, they have affected the mindset both of the staff and the industry. And I
10 know the industry is kind of cool to the idea of a level 3 PRA for existing reactors,
11 but it seems to me that for the smaller ones, you want to shake that mindset a
12 little bit and make people start thinking differently about defense-in-depth, or
13 other issues, security, evacuation plans, when people should stay indoors or
14 should be evacuated, and all that. And I for one would feel much better informed
15 in making decisions along these lines if I see a PRA level three, a good level
16 three PRA. So I wonder how you feel about that. Well, you don't have to feel
17 anything, but --

18 [laughter]

19 COMMISSIONER APOSTOLAKIS: I know you can't commit right
20 now.

21 DOUG WALTERS: I think you characterized our view
22 appropriately.

23 JOHN KELLY: From the DOE's perspective, the information that
24 we could get from a level three PRA would really inform any kind of decision with
25 respect to siting, emergency zone requirements, plants, et cetera. The issue

1 we'll have is cart before the horse, a little bit, in can you do a level three PRA
2 before you have your design complete? And so this is an integration issue. How
3 we do design and PRA concurrently so those insights are transmitted as we go
4 forward.

5 Now, again, we're thinking of a fleet, here. And from my
6 perspective, and the Department's perspective, the first units may take
7 conservative engineering approaches in order to get those units through a
8 demonstrated regulatory process. So even what Mr. Bailey's talked about taking
9 the Part 50 rather than embarking on a Part 52 for the first -- is, in their view, a
10 little conservative approach in order to get that first unit going. Then the question
11 is, as we move to the fleet how can we better inform that with more studies once
12 we have designs and better information? So I see this as moving forward,
13 getting a first -- going through the regulatory process, exposing all of these
14 issues, and then doing the technical studies that are going to be needed to fully
15 inform the better regulatory framework that we need for fleet deployment.

16 COMMISSIONER APOSTOLAKIS: Well, yeah. And I appreciate
17 those comments. But we are using incomplete PRAs already in design
18 certification, and we're fully aware of it, the staff is fully aware of it, the ACRS,
19 everybody on the Commission, so it's not like it's going to be a new issue. The
20 other thing that is a counter-argument to what you said is that once something is
21 accepted, it's very difficult to remove it. I'll give you an example: safety-related
22 equipment. That was done 40 years ago and now people are really scared to
23 touch it. It's all over the regulations; we can't do anything about it, and so on. So
24 I would be a little bit cautious to say let's have the first one licensed, because you

1 may agree to certain things that you may regret later, and they will not be easy to
2 remove, or soften, so to speak. So there are both sides to the argument.

3 And finally, a question for you, John. You mentioned the NNGP.
4 What's going on there? I don't hear anything. On the one hand, the industry is
5 not willing to help you. On the other hand, the law is the law, right? It's in the
6 Energy Act of 2005. So are you going ahead with it?

7 JOHN KELLY: Well, this was a decision year whether to move
8 ahead. And we're still slated to make a decision in the later part of this fiscal
9 year as to whether we proceed to Phase II, which is the design and full licensing
10 activities for that program. Today we are in the midst of conducting a review by
11 the Nuclear Energy Advisory Committee, which was stipulated by the Energy
12 Policy Act, so that review is in progress, and that review will help inform the
13 Secretary's decision. We're continuing our R&D program, which is largely
14 geared toward qualifying fuel and materials which have both, let's say, safety
15 implications, as well as production capabilities. So those types of programs we
16 see continuing, because they'll help inform both aspects.

17 In addition, I think the thing that had been missing until recently is
18 the formation of a public-private partnership. So if we're going to move forward,
19 the Department's not going to do this on our own; we're really looking for a
20 public-private partnership to take this on. And so we've initiated those efforts to
21 establish -- we've issued a request for information in February. We've gotten
22 responses; we're drafting an agreement process to basically solicit some industry
23 partnerships that would be willing to work with us. If these things can all come
24 together then I think -- and proceed forward. The rate that we proceed forward

1 will depend on appropriations, though, and I think we all need to keep that in
2 mind.

3 COMMISSIONER APOSTOLAKIS: Thank you. Thank you.

4 Commissioner Magwood?

5 COMMISSIONER MAGWOOD: Thank you. Just a few questions.

6 As I indicated when I opened the session, this conversation about small reactors
7 has kind of come and gone a lot over the years. This time does seem to be a bit
8 different because there does seem to be a broader base of support and interest
9 in this. But, you know, I do, with baseball season getting started, and being a
10 lifelong Pittsburgh Pirates fan, I understand the meaning of hope.

11 [laughter]

12 So I appreciate that you're very hopeful that this time it will be
13 successful. But the questions that my colleagues are asking are -- sort of point
14 towards the complexity of these issues as we go forward. And one sort of
15 overwhelming question that, I think, reflects a lot of this, is one that I've had for
16 quite some time. I thought this was a good time to ask it. And that is, when you
17 look at the reactors we have in operation today, we have reactors at about 500
18 megawatts, we have reactors that are over 1,100 megawatts, we have everything
19 in between. If someone brought us an application to build a 1,500 megawatts
20 reactor, and wanted to use Part 50, we would do it. So we treat a very wide
21 range of reactors -- are they bowling again upstairs?

22 [laughter]

23 We treat a very large range of reactors the same. And I think the
24 basic question I have is: Why are these different? I've heard, and I recognize,
25 particularly in the case of mPower, there's some very specific design features

1 that you would point to, but as a class, why are smaller reactors different? Why
2 is a 125 megawatt reactor inherently different from a 500 megawatt reactor? And
3 why does that call for a different EPZ, and a different security structure, and a
4 different -- when you get to issues like fee, and Price Anderson, those are
5 administrative issues, and it makes sense that those would be different. But from
6 a nuclear safety perspective, why are these really different? I'll just sort of throw
7 that open. Maybe -- it looks like -- Chris, you want to jump into that?

8 CHRISTOFER MOWRY: That is an excellent question. Our view
9 is that, first of all, I don't think that -- it's not, in the context of this discussion, I'm
10 not sure that it's proper to view all SMRs in the same class. And going back to
11 the beginning to your comment about hope, I think what's really important here,
12 for this to be successful, is that we don't create a bridge too far. And so therefore
13 the focus on the first SMRs being light water technology is appropriate. And I
14 would take a step further in that we need to be very careful about the amount of
15 rulemaking we're trying to achieve in terms of deployment here. And so it's
16 incumbent upon us, as a designer, to be very careful to try to keep the basic
17 design of this plant in a box that can be licensed, generally speaking, within the
18 current regulatory framework, so that you don't create a scenario that makes it
19 just unachievable, or unrealistic, to get from where we are today to where we're
20 going. And so I view those reactors -- those SMRs -- that fit inside that box as
21 the reactors that ought to be focused on initially in order to be successful as a
22 broader class. There are some areas where we would look for change, but they
23 have to be very limited, and we need to be very careful about which areas we go
24 after in terms of rulemaking or regulatory changes. The security area is not an
25 area where we see new rulemaking being required, but more a matter of how we

1 meet existing requirements. So I think there's a spectrum of designs out there,
2 and for mPower, given the schedule we're focused on, it's really important to stay
3 inside the box as much as possible within the existing regulatory framework.

4 COMMISSIONER MAGWOOD: Let me reinterpret what you just
5 said, to make sure I understand what you said, because I think I agree with what
6 you're saying is that, at least in the specific case of mPower, you are not arguing
7 that it is a dramatic change from the regulatory approach we've had in the past.
8 But because of the specific features of mPower, you plan to argue for flexibility
9 on a variety of issues. Is that a fair way of saying it?

10 CHRISTOFER MOWRY: Yeah. And again, I would use the
11 security example. It's more a matter of how we meet existing requirements than
12 whether or not the requirements themselves need to be changed. And again, if
13 you think about the fact that we're designing this plant today instead of 50 years
14 ago when there was a totally different set of security requirements, we have an
15 opportunity to design in security, rather than putting in security on an existing
16 facility that may not have been optimized from a security perspective. So it's not
17 about changing the regulation, but it's about designing into the system in a more
18 efficient, optimal manner the way to achieve the existing requirements. And that
19 ought to be the primary goal, and once you've gotten as far as you can go with
20 that, then you need to step back and say, "Do we need to make any other
21 changes?" I can say right now, we're hopeful that we can achieve what we need
22 within the existing regulatory framework.

23 COMMISSIONER MAGWOOD: Jack, did you want to weigh in?

24 JACK BAILEY: I was going to add just a couple comments. Your
25 question from the standpoint of, "Is there anything inherently different about

1 these than there would be a large reactor, or a larger one?" -- clearly, on the side
2 of the culture it takes to operate these plants safely, the oversight that we need in
3 some areas to ensure that's done properly, it doesn't matter if you're generating
4 power with nuclear, you're going to have to have that in place to do it well and do
5 it consistently over a long period of time. So we don't think there are shortcuts or
6 differences in how that has to be done. We think operating these things well, and
7 safely, and with a focus on the plant's risk are all important -- I use that "risk" in a
8 broad sense, not in a narrow PRA sense.

9 We do believe, though, that those rules and regulations were
10 derived over time without a real focus on what the end criteria might be that they
11 were trying to protect from or against. A good example is on the emergency
12 planning there's a lot of interpretations of what the ultimate goal is, and how
13 many people we're trying to protect over what kind of range, or whatever the
14 case may be. If we just define that, the question, some of these smaller reactors
15 probably have less of an impact than larger reactors. So it is a legitimate way to
16 look at -- not from a standpoint that you have to have a different regulation, but
17 do you have a regulation that's clear on what the ultimate result needs to be, and
18 can someone demonstrate through their design-specific technology that they
19 meet it or not. So that's probably where the focus needs to be.

20 DOUG WALTERS: Yeah, I would just add that from our
21 perspective, it's like Chris said, we're looking at the existing regulatory
22 framework, and I think the Commission and the staff have always shown a
23 willingness to exercise flexibility where it's justified. I think we have a number of
24 examples of that. So when you talk security or EP, we're looking at the existing
25 framework and then asking ourselves, "Is there another way to meet the intent of

1 the regulation, recognizing some of the unique features of small reactor
2 designs?” and then working through that with the staff. I think we have
3 experience with that, and I do think, at some point -- when you get so many
4 modules, what makes them different? I don't know. I think that's a valid
5 question. But with what we're dealing with today and deploying the reactors we
6 want to deploy, we're just looking for alternative ways of meeting the regulation
7 recognizing the design features of those units.

8 COMMISSIONER MAGWOOD: John, did you want to weigh in?

9 JOHN KELLY: From our perspective, and this is actually from a
10 safety perspective, a lot of the things we worry about are meeting design-based
11 requirements, or severe accident, and trying to understand that. And by going to
12 a lower power-to-volume ratio, which these plants do, we get into physics
13 regimes where we have much better understanding of the physics and how
14 passive systems can remove the heat, as opposed to complex engineered
15 systems, where their ability to perform their functions seems to leave a lot of
16 questions. So by moving into a physics regime where things are better
17 understood, uncertainties are less, we can have higher confidence that the
18 system can withstand design-based and beyond design-based types of events.

19 COMMISSIONER MAGWOOD: Thank you. Appreciate that. To
20 some degree I wonder if the exercise we're going through -- the staff -- which
21 we'll talk about in a few minutes, to deal with these policy issues one by one, I
22 actually begin to wonder, given your answers, whether it's really a worthwhile
23 exercise, or does it make more sense for us to wait for the mPower application,
24 or other applications, come in, and deal with them on a design-by-design basis. I
25 mean, I really have to wonder that at this point. Jack.

1 JACK BAILEY: I think we have to do a little bit of both, and that's
2 kind of why we started down that path. I believe the interactions between us and
3 the staff are helpful in understanding some of those design-specific things we
4 need to address, and on the other hand it also helps us put a spotlight on where
5 are the policy or regularly weaknesses that need the most work. So I don't think
6 it's one of waiting for either one; I think it's working together in parallel like we
7 have been doing.

8 COMMISSIONER MAGWOOD: Jack, since you have the
9 microphone, let me ask you another question. You said something a few
10 minutes ago that I thought was interesting. You said that the nuclear safety
11 culture required to operate these small reactors is the same culture you would
12 need to operate larger reactors. And I think several members of this panel had
13 already indicated that for all this to make sense, basically, we have to see these
14 systems deployed by the hundreds or thousands. And I think some of the
15 examples that were in Chris's presentation pointed toward utilities that are not
16 currently nuclear operators. So if the thought is -- is there a little bit of
17 inconsistency there somewhere? We're spreading these technologies to
18 companies that do not have nuclear operating experience, but yet we have to
19 maintain the same culture. How do you see that?

20 JACK BAILEY: That's a great question. We don't think we're being
21 inconsistent. I think the challenge is, for these small reactors, if we're going to
22 deploy them to a lot of companies, for example, that have not run nuclear plants
23 in the past, you either have to find a larger company that does operate plants
24 already, and they expand their skills as an operating role for other smaller
25 utilities, or one of the things we've been looking at, how we could do longer term,

1 as we evolve, is how do you form an operating company for maybe these non-
2 profit G&T companies for example, that hires the right people, trains the right
3 people, established the right standards, all those things that go along with
4 companies that have that experience today and they operate those plants for a
5 group of customers that are like their own, non-profit, in that mode. So there's a
6 number of avenues out there that already exist where you can leverage the
7 experience and culture that has been developed over the last couple decades to
8 get where we are today. You can't let that go away, and you can't allow it to not
9 be done without some sort of process that ensures that takes place going
10 forward.

11 COMMISSIONER MAGWOOD: Thank you. One quick question
12 for you, Jack, before we let this panel go, and that's on your slide eight, which
13 Commissioner Apostolakis already pointed to at one point. You show the
14 relationship between Part 50 and Part 52 processes. Where in that process do
15 you see the design being fixed?

16 JACK BAILEY: We show -- this is slide eight in my package, but
17 most people don't have it in front of them again -- but what we did lay out is a
18 process where the construction permit is being reviewed and issued, then
19 operating license is submitted, and then the design certification parallel under
20 Part 52 is submitted during the construction permit approval phase. But you can
21 see that in about -- actually a few years before we finish our operating license,
22 the design certification scope needs to lock down in order to meet a schedule to
23 issue a design certification. That's an issue that's not locked in stone; it will float
24 depending on a number of these things, but it is going to be earlier. We originally
25 thought at one time we might be able to complete all of our design, all the way

1 through operating license phase, before we had to lock down a design
2 certification. In order to meet the needs of future customers as early as possible,
3 we will have to lock it down earlier than that. We think we can identify most of
4 those issues because most of the engineering will be complete. It's not like we
5 built plants in the old days and we engineered them as we were doing it.

6 We do expect to have most of the engineering complete by the time
7 we start construction. So there's going to be a few things that we learn as we
8 start to implement those things in the plant. But we don't expect major changes
9 after that point, so we think we can lock it down where it says the design
10 certification scope freeze on that bottom line under Part 52.

11 COMMISSIONER MAGWOOD: So there will still be some design
12 work going on after the DCA is submitted?

13 JACK BAILEY: Could be. If that were to happen, we have a
14 couple processes we've talked about. One you could, in a future combined
15 operating license application, use that as a difference from the DSA that they
16 would have to be justified or reviewed separately. And then a future update of a
17 DCA that could incorporate any of those that have been coming through, not only
18 from the Part 50 process, but under future Part 52 processes.

19 COMMISSIONER MAGWOOD: Thank you very much. Any other
20 questions from this side of the table? Thank you. Appreciate it. All right, we'll
21 take a 10 minute break.

22 [break]

23 COMMISSIONER MAGWOOD: All right, we'll start the next panel.
24 We have Mike Johnson today. I understand the EDO is testifying this morning,

1 so Michael, I appreciate you coming by to give us a staff briefing. The floor is
2 yours. Please.

3 MICHAEL JOHNSON: Thank you. Good morning,
4 Commissioners. Today we plan to discuss our progress in preparing for the
5 potential licensing and oversight of small modular reactors. As you will
6 appreciate, like many areas in the new reactor program, this area continues to
7 experience a significant amount of change. But despite that change, I think, as
8 you'll hear, and in fact as you heard in the previous panel, we continue to make
9 considerable progress in trying to place the NRC in the best position to be ready
10 to review applications when they arrive. Mike Mayfield, who is the director of the
11 Advanced Reactor Program in NRO, is going to provide a sense of where we are
12 with respect to those overall activities related to our preparations. Of course, our
13 licensing process is a key area that we focused on in terms of being ready, and
14 as a result, in fact, of Commission direction, we've looked at and developed a
15 plan to risk-inform our small modular reactor reviews. Stew Magruder, who was
16 the chief of the Advanced Reactor Branch 2, will provide an overview of that
17 process, and, in fact, we're going to talk in a little detail and give you an example
18 of how we would implement that particular process. That paper is before the
19 Commission awaiting Commission decision. And finally, we are also, of course,
20 working on addressing the policy issues, the technical issues, Bill Reckley, who
21 is the chief of Advanced Reactor Branch 1 -- well, previously, I should say, was
22 the director of Advanced Reactor Branch 1; he's now supporting the risk task
23 force to support the Commission direction -- will give an update on the policy
24 issues. He's going to talk a little bit about the plan and the schedules, to address
25 some of the questions that I heard in the first panel.

1 In addition, we're going to provide a little additional detail on several
2 selected policy issues, and tell you where we are in terms of moving those issues
3 forward, also. So with that, I'll turn it over to Mike Mayfield.

4 MICHAEL MAYFIELD: Thank you, Michael. Good morning,
5 Commissioners. My role today is to give you a broad overview of where we are
6 with the Advanced Reactor Program, and we'll leave the heavy lifting to Bill and
7 Stew. I should point out to you that there's a hint there as to where your
8 questions should go when we get to that part of the briefing. We stood up the
9 Advanced Reactor Program in January of 2009. We had a staff of five and a
10 lone secretary. We had a loosely-defined program that was based on the next-
11 generation nuclear plant program. Advanced reactors, up to that point, had
12 largely been an activity in the Office of Nuclear Regulatory Research, with some
13 dabbling interest from the licensing program.

14 In the intervening two years, we have moved from that largely
15 research-focused activity to a licensing program with very strong Research
16 support. I've noted to the staff, and I believe to the Commission, previously, we
17 will not be successful without strong support from Research. It's just that simple.
18 However, we do have a licensing focus today.

19 We have matured as a program. We're fully engaged with partners
20 in other key offices, starting with Research, certainly, including the Office of the
21 General Counsel. A lot of discussion this morning on security, we have NSIR
22 fully engaged with us. The Office of International Programs has proven to be an
23 interesting partner office, because of so much interest in the small reactors
24 overseas. We, of course, are engaged with the ACRS, and we have had a

1 number of meetings with them, with several more planned over the course of the
2 summer.

3 We're developing relationships with Region II, as we've started
4 looking at construction inspection. There was some discussion this morning
5 about TVA and B&W's interest in factory inspection. So, Stew will talk a bit about
6 the work we're doing with Region II on construction inspection. We've had some
7 early discussions with NMSS regarding fuel fabrication, principally for the
8 advanced designs, liquid metal designs, not so much for the small PWRs. But
9 we are having that, anticipate further discussion with that office regarding waste
10 storage and transportation for the future.

11 The Advanced Reactor Program staff has grown from those five
12 brave souls to a staff of 28. We have full engagement with the technical divisions
13 in the Office of New Reactors. So we actually have something on the order of 60
14 people engaged in looking at advanced reactors, and, principally, the small
15 PWRs and NGNP.

16 We have previously reported on our progress to address
17 infrastructure and the key policy issues. And, as Mike noted, Bill Reckley's going
18 to talk about that in some detail. One of the earlier questions had to do with, do
19 you deal with those issues separately, or should you deal with them, somehow,
20 in a combined fashion. And I think we are of a mind that you have to look at both
21 aspects of it. I think Bill will discuss where we are on those in some more detail.
22 And, as Mike noted, Stew's going to talk about preparations for the small PWRs
23 and the risk-informing activities. I believe both of these areas are making
24 excellent progress, and I hope, by the end of our briefing, you'll agree with me.

1 The greatest challenge with the small PWRs is the rapidly evolving
2 nature of that market area. NuScale, as you know, had been one of our early
3 movers, and they have recently asked the staff to suspend pre-application
4 activities because of their financial difficulties. Over the last year, TVA has
5 announced plans, as you heard this morning, to submit a construction permit for
6 up to six of the mPower modules on the Clinch River site. The Department of
7 Defense has prepared a report looking at the viability of small modular reactors
8 to power key military installations. There was a favorable finding in that report.
9 The domestic industry in this area continues to evolve, with Westinghouse and
10 Holtec both announcing plans to submit design certification applications for small
11 modular reactors.

12 Commissioner Svinicki, I think you have evolved your phrasing over
13 time, and the last I heard was we needed to be “adroit.” I would characterize it
14 somewhat differently. We can't be slow off the mark. This is a rapidly evolving,
15 rapidly changing area, and we need to be able to move and move to that quickly.

16 NGNP is an area that is moving forward, as John Kelly described
17 this morning. The staff is paying attention to it, is moving forward at a deliberate
18 and careful pace, and our activities in advanced reactors, as well as the
19 Research activities, are maintaining awareness of the DOE activities, and are
20 pacing them.

21 Fast reactors is an engineer's dream. They're innovative, great
22 science, there are great challenges for fix-it kind of folks. However, we have to
23 be careful to not get captured by the science, and stay focused on deployment
24 time schedules. John Kelly talked about 15 to 20 year deployments; that's
25 consistent with what we're also hearing from IAEA. So our challenge is to be

1 ready when those designs come in, but to not go beyond maintaining awareness
2 of the technologies, and developments in those technologies.

3 Go to the next slide, please.

4 That's the right one. I don't intend to go through this in any detail,
5 rather, I shared it to point out that this work is real. It is on our table. It is coming
6 forward. It has schedules from the vendors, it has schedules from at least one of
7 the utilities, and we're working hard to make sure we're prepared for it. With that,
8 I'll turn the presentation over to Stew Magruder.

9 STEWART MAGRUDER: Thank you, Mike. Good morning,
10 Commissioners. I'd like to start off our presentation with three brief topics. First,
11 I'll provide a status of the pre-application activities between the staff and the first
12 vendors, the integral PWR vendors. Second, I'll provide an update on the staff's
13 preparations for what you heard this morning from Mr. Bailey about TVA's
14 applications for some mPower reactors at the Clinch River site in Tennessee.
15 And then, as Mike mentioned, I'll talk on some key points from a recent SECY
16 paper on risk-informing our SMR reviews. So, next slide, please.

17 I'll start with NuScale. The staff has been engaged in pre-
18 application activities with NuScale since 2008. They've made several
19 presentations to the staff on their design, and they've submitted several reports
20 detailing specific aspects of their design. In particular, the staff has had
21 discussions with them regarding their human factors engineering program, their
22 plan for performing safety analyses, and their Quality Assurance Program. In
23 addition, the staff recently conducted an audit of their PRA at their offices in
24 Corvallis, Oregon.

1 However, as Mike mentioned, on March 18 this year, NuScale
2 informed the staff that, due to financial difficulties, they were requesting a
3 suspension of pre-application activities, and unfortunately we've commenced an
4 early shutdown of our activities associated with NuScale.

5 As you heard earlier from Mr. Mowry, regarding mPower, the staff
6 has been working with B&W, or Generation mPower now, since 2009. They also
7 have made several presentations to the staff, and submitted several reports,
8 including a design overview, a critical heat flux test plan, and their Quality
9 Assurance Program. The staff has recently had discussions with them regarding
10 their physical security design approach, and their core nuclear design codes and
11 methods.

12 Both NuScale and Generation mPower have been active
13 participants in the NEI SMR Task Force that Mr. Walters mentioned earlier, and
14 have been attending the generic topic public meetings that the staff has been
15 having regularly since last summer. Next slide, please.

16 With regard to our interactions with TVA and their proposal, as Mr.
17 Bailey mentioned, TVA did provide their key licensing assumptions to the staff in
18 the fall, and the staff responded in a letter dated January 31 to six assumptions
19 from TVA. I want to talk a little bit about our reaction to that. I guess the first one
20 is coordinating the Part 50 and the Part 52 reviews will be a challenge for TVA
21 and for Generation mPower. The staff supports the one design, one review
22 concept, and notes that TVA and Generation mPower must work closely to
23 coordinate the reviews to take advantage of this process. In our letter we note,
24 for example, that the Part 52 design certification document must not contain
25 information that conflicts with that contained in the Part 50 construction permit, or

1 operating license applications. We also note that, if TVA introduces changes to
2 the Clinch River site-specific design basis information that affect the design
3 certification application they will cause uncertainties in the review timeline.

4 Next, in light of the currently proposed methods of manufacture and
5 construction of mPower modules, the staff recognizes that the NRC programs
6 and implementing procedures would need to be reevaluated and enhanced to
7 provide effective oversight of the assembled components and systems prior to
8 final installation at the construction site.

9 In addition, due to the increase in activities that are expected to be
10 performed at the vendor site, the number and comprehensiveness of the staff's
11 inspections would need to be reassessed. The staff has begun discussing with
12 TVA how they plan to identify and resolve gaps that exist between regulatory
13 guidance associated with Part 50 licensing of a new nuclear facility, and the
14 regulatory requirements found in Part 52.

15 The staff expects to continue discussions with TVA regarding the
16 gap analysis that they call the Regulatory Framework Document. This should
17 help us reach agreement on the key issues associated with review and
18 construction permit application. Several public meetings are planned over the
19 next several months on this topic, and initial discussions have been promising,
20 with TVA. Next slide.

21 The final topic is the risk-informed review guidance here. On
22 February 18 of this year, the staff issued SECY-11-0024. This paper provides
23 our response to the SRM issued last August on the use of risk-insights to
24 enhance the safety focus of SMR reviews. In accordance with the SRM, the staff
25 has developed a framework for iPWR reviews, or integral PWR reviews. This

1 framework builds off the work that the staff did for the passive large light-water
2 reactor design reviews, that is, the AP1000 and the ESBWR reviews. The
3 framework is consistent with current regulations and should enhance the
4 efficiency of the iPWR reviews.

5 I'll provide an overview of the framework and discuss an example of
6 how it could be implemented in my next few slides, but before I get to that, I'd like
7 to point out that we also discuss in the paper our plan for developing, over the
8 longer-term, a new risk-informed and performance-based regulatory structure for
9 licensing more advanced reactor designs, that is, the high temperature gas
10 reactors or liquid metal reactors. This plan involves a pilot study with the iPWR
11 applicants, continuing discussion with NGNP, and limited interactions with liquid
12 metal reactor designs. Of course, this effort will be coordinated with a task force
13 that's chartered by the Chairman's February 11 Tasking Memorandum. Next
14 slide, please.

15 As I've noted, the iPWR review framework is consistent with
16 regulatory requirements and Commission policy statements. It uses the current
17 non-safety-related determination and the current system structures and
18 components, or SSC risk significance determination. The framework is more
19 risk-informed in that it provides a graded approach for the review of SSCs, with
20 the most detailed in-depth review conducted for SSCs determined to be both
21 safety-related and risk significant, and a progressively less detailed review
22 applied to SSCs determined to be nonsafety-related or non-risk significant.

23 The framework should enhance the efficiency of the SSC review
24 process by increasing the integration of performance-based requirements into
25 the SSC review process. This integration is possible for most SSCs because

1 some acceptance criteria in the Standard Review Plan, or SRP, match up with
2 certain program requirements. Examples of program requirements would be
3 reliability assurance program, initial test program, and technical specifications.

4 The staff has discussed this framework with NEI and the advanced
5 reactor vendors have received positive feedback. We all see the potential to
6 improve both the organization and content of submittals from applicants and the
7 effectiveness of the staff's review. Next slide, please.

8 Here, as Mike mentioned, I want to talk a little bit about an
9 example, how this process would work. And I'll focus on the Station Service
10 Water System, here. This system, for these designs, is assumed to be a non-
11 safety-related system that is risk significant. So if you follow the framework
12 process, this would come out to be a B1 system.

13 For this system, SRP Section 9.2.1 identifies several acceptance
14 criteria that are design-related, and several that are performance-based. One of
15 the design-related acceptance criteria refers to the requirements in general
16 design criteria, or GDC 2, for protection against natural phenomena. This
17 acceptance criterion would require technical analysis and evaluation to verify
18 that, for example, the system adequately addresses seismic design standards.
19 This review is the same as would be done under the current process.

20 Another example of a design-related acceptance criterion is GDC 4,
21 for environmental and dynamic effects. In contrast, the acceptance criteria
22 related to GDC 45 for inspections and GDC 46 for testing may be satisfied by
23 specific performance-based activities, for example, testing or monitoring within
24 some programmatic requirements. For example, combination of initial plant
25 testing, reliability assurance program, and ITAAC. No credit for these activities is

1 given in the current process, however, in the new framework, the reviewer may
2 be able to gain efficiency by relying on these performance-based activities as an
3 alternative to detailed technical analysis and evaluation.

4 This completes my presentation. Bill Reckley will now talk about
5 the issues.

6 WILLIAM RECKLEY: Good morning, Commissioners. I'll be
7 addressing the identification and resolution of technical and policy issues
8 associated with the licensing and the deployment of small modular reactors.
9 Next slide, please. Thank you.

10 The staff described some of the potential policy, and licensing, and
11 key technical issues facing small modular reactors in SECY-10-0034, dated
12 March 28, 2010. Since the issuance of that paper, there have been several
13 issues that staff, upon further examination, have either resolved or concluded
14 that the issue is not really likely to be a significant policy issue for small modular
15 reactors.

16 So the first issue that I'll address is the annual fees. This is one
17 that the Chairman took a particular interest in and encouraged us to try to resolve
18 quickly, so there was a memorandum from the Chief Financial Officer dated
19 February 7, 2011, which laid out the staff's plans to issue, through a future
20 proposed rulemaking, a variable annual fee structure for new reactors which
21 would, in fact, lower, under the proposal, if it went all the way through, lower the
22 cost of the annual fee for smaller reactors.

23 The staff evaluated several issues in SECY-10-0034, and
24 determined that, although we think there may be implementation challenges for
25 the staff, they don't elevate to the point of being policy decisions for the

1 Commission. We're going to describe these in a paper that should be coming to
2 the Commission within the next month or so. And they include -- the issues
3 include the use of the prototype licensing provisions of 10 CFR 50.43(e), the use
4 of operational programs, how they're used and what are the operational
5 programs for SMRs, and requirements related to decommissioning funding.

6 The staff will be providing the Commission with a separate SECY
7 paper on the structure of the licensing for multi-module facilities, consistent with a
8 white paper we received from NGENP, Next Generation Nuclear Plant Program,
9 and also the Nuclear Energy Institute. The staff will adopt the -- will prepare our
10 guidance on the assumption that there will be one license issued for each
11 module. That's consistent with our current practice of one license per unit. As is
12 the current practice for multi-unit larger facilities, we would expect that the
13 applications for a multi-module facility would be done under one application, one
14 licensing proceeding, and one hearing. Next slide, please.

15 Stew previously discussed our activities related to the development
16 of a risk-informed licensing review approach, an issue that is both a technical
17 challenge and a likely policy issue, and one that really, as Commissioner
18 Magwood mentioned, this one is one that really ties all of these policy issues
19 together, is the analysis of off-site dose consequences for the smaller designs,
20 for both design basis events and beyond-design basis events. This issue has
21 long been discussed for HTGRs, liquid metal reactor designs. Those reactors
22 that use different fuel forms, different coolant, different boundaries, and such that
23 it was apparent that we were going to need to do something different because
24 the traditional source term model developed for light-water reactors simply didn't
25 apply.

1 However, in the case of the small modular reactors, there's also
2 some questions as to whether the inherent features, some that Dr. Kelly
3 mentioned, and others have mentioned, about the inherent features, the
4 increased thermal capacity of the system, the lower power densities of the cores.
5 If those inherent features could translate into relief on the operational side, lower
6 staffing, possible enhancements to emergency planning requirements; and so
7 that would have to translate, then, into some differences in how we do the source
8 term calculations and the offsite dose consequence analysis.

9 So the staff is continuing its evaluations in this area with both
10 NGNP and the light-water SMR vendors, and plan to provide the Commission
11 with a Commission paper later this year, to describe our plans for that one.

12 I list two items on this slide that are currently being evaluated to see
13 where the staff's going to go in terms of providing the Commission with possible
14 approaches, and these are for the liability insurance for small modular reactors,
15 as addressed by the Price-Anderson Act and the related NRC regulations. At
16 this time, the Nuclear Energy Institute, through their task force, is working with
17 the vendors, the electric utilities, energy companies, and American nuclear
18 insurers, to assess this issue, and we expect to receive a paper in the relatively
19 near future from the industry.

20 After seeing where the industry is, the staff will assess and then
21 determine if there is a policy issue that needs Commission approval. And if it is,
22 we would submit a paper; if there's not, we will inform the Commission of where
23 our evaluation and that of the industry turned out.

24 Another issue that we're looking at to decide how to proceed, but
25 we're still in the information collection mode, is the possible use of Subpart F to

1 Part 52, which is for manufacturing licenses. Through discussions we've had,
2 and as Mr. Mowry mentioned, it's fairly clear we don't need to do this in order to
3 go forward with small modular reactors, but we want to continue to evaluate it to
4 determine if it makes sense and if, perhaps, the manufacturing license provisions
5 could provide us a more efficient way of going forward, although, perhaps, again
6 not necessarily a provision that we actually need to go forward.

7 I'll take a few minutes and talk in detail about three of the issues
8 that have been discussed a couple of times today already. And these are the
9 issues that tend to come to the top of the list in terms of people's priorities, which
10 are staffing, security, and emergency planning. Go to the next slide, please.

11 The first issue relates to control room staffing. The staff considered
12 several approaches for proposals to revise the staffing requirements for small
13 modular reactors. The current regulations defined in 10 CFR 50.54(m) were
14 established for large light-water reactors, and they were developed to address
15 the industry as it stood at that time. So a limited number of operating units and
16 limited combination of the number of control rooms. Some of the proposals from
17 small modular reactors are for fewer licensed operators per unit than currently
18 exists for the large unit.

19 And looking at this issue, the staff determined that the most likely
20 avenue for going forward is to use an existing process, which is task analysis.
21 And in this process, the applicant and staff, through oversight, would look at the
22 various tasks that need to be performed by a licensed operator in response to
23 normal operation, transient operation, accident, severe accident, what
24 combination of things, if you're going to talk about, as NuScale had, at one point,

1 proposed multiple modules per operator, then you would have to bring in what
2 was going on with the other modules, as one might be in transient condition.
3 So, basically, just to assess those tasks and see how many operating staff are
4 needed to address the various conditions and events that would be ongoing.
5 There is existing guidance for the staff in this arena, it's NUREG-0711. Going
6 forward, at least in the short term, applicants would use the exemption process.
7 So if this turned out that we agreed that there could be fewer staff, it might be
8 something we'd want to codify at some point in the future. But, at least for
9 immediate licensing issues, we could use the exemption process, and we have
10 guidance for evaluating such exemption requests in NUREG-1791.

11 The resolution of this issue will depend on a number of things: the
12 ability to -- the evolution of the designs, obviously, our ability and the applicant's
13 ability to simulate events, and simulate control rooms, and the demands on the
14 operators.

15 A related issue, looking past just the number of licensed operators,
16 is the total number of plant staffing for small modular reactors. And this would go
17 to both the operating staff, emergency response staff, fire brigades, security staff.
18 And just to put all of that together into what is the total staffing requirements.
19 And this is expected to be addressed in an NEI paper in the near future, as Doug
20 Walters mentioned.

21 The staff expects to provide a SECY paper later this year that
22 basically defines this approach, and then follow it up probably in Fiscal 2012 with
23 a subsequent paper that would address any policy issues once we've had a
24 chance to explore that approach and interact with stakeholders. Next slide,
25 please.

1 Another issue and one that was discussed a fair amount this
2 morning already, that's mentioned for small modular reactors, is physical security
3 requirements and how the plant designs might lessen the dependence on
4 operating protections, namely guards. We're currently discussing the design
5 approaches with specific plant designers, primarily Generation mPower at this
6 point. And we're fairly encouraged with those early interactions, and how that
7 company and others that we're talking to are trying to incorporate security into
8 the design of the facility, as, actually, the agency encouraged them to in the most
9 recent revision to the Advanced Reactor Policy Statement.

10 We are going to continue those discussions as the designs mature.
11 We are also going to undertake, internally, a process that we have in the
12 Advanced Reactor Program, issue identification and resolution process, where
13 we bring in a number of experts and just do a systematic look to make sure we've
14 identified all the issues and revised our resolution plan as needed. Next slide,
15 please.

16 The staff expects to provide a SECY paper in early Fiscal 2012 that
17 describes our assessment and, if necessary, describes an approach that we
18 would then use to develop recommendations to the Commission on policy
19 issues. But it's been previously talked -- we're not clear yet that there actually
20 are policy issues. Part 73 for security is a fairly performance-based rule, as it
21 stands, and so just the design features may provide a way to comply with
22 existing requirements without actually having to revise the regulations.

23 The last issue I'll talk about is emergency planning. The staff is
24 assessing previous evaluations, the requirements of other federal agencies, and
25 the interactions that we've had with Next Generation Nuclear Plant Program and

1 Nuclear Energy Institute. And we'll be providing a paper to the Commission in
2 the next few months that basically describes the various approaches that have
3 been proposed, and then details the staff's plans to start interacting with
4 stakeholders about these alternatives and soliciting views from states, locals, and
5 other key stakeholders.

6 A key consideration for all the alternatives and a common theme of
7 the alternatives that had been proposed to the staff or were developed by the
8 staff internally is the comparison of off-site dose consequences to protective
9 action guidelines. These are the EPA PAG's for the consideration of evacuation
10 or other protective actions. It's realized here, and this goes back to some other
11 issues, such as source term, that the increased reliance on calculated doses to,
12 and a comparison of those doses to the protective action guidelines is going to
13 mean that the NRC will have to prepare guidance and provide applicants with
14 clear direction on how to do off-site dose consequence or at least what the staff
15 would consider to be an acceptable means to do off-site dose consequence
16 analysis, in terms of what events have to be considered, how to model the
17 source term, and how to model the boundaries. This might be a vehicle for
18 introducing level three PRA's as opposed to going through a single conservative
19 way of doing PRA's or dose consequence by bringing in a multiple set of events.
20 And this is consistent with the NGNP white paper on mechanistic source term.
21 Next slide, please.

22 We're currently discussing this issue with various internal and
23 external stakeholders and, as I mentioned, will be providing both a short-term
24 Commission paper describing the approach and our interactions and then we
25 fully expect that there'll be a longer term paper, probably in Fiscal 2012 where

1 we'll actually have to lay out policy and make recommendations to the
2 Commission. Next slide, please.

3 This slide just basically provides a discussion of the short-term
4 papers that we expect to be providing to the Commission. This set of papers,
5 generally, even for those policy issues that are remaining unresolved -- the first
6 papers will lay out the staff's plans in terms of what approach we're considering
7 and how we expect to engage stakeholders, and then they'll be followed up with
8 papers probably in Fiscal 2012 that would actually make recommendations to the
9 Commission on the actual resolution of each of the policy issues. Next slide,
10 please.

11 This slide is the same set of issues, but it attempts to lay out our
12 resolution of them in comparison to the actual application schedules. It's our goal
13 to resolve all the issues before an application, such that when an applicant
14 provides their application, there is no big issue yet to be resolved that they have
15 to basically take their best shot at, only to determine after the application is in-
16 house whether the staff's going to be amenable to the proposal.

17 So, you can see, most of these we do try to have resolution before
18 the applications are planned. However, the actual implementation of these,
19 which might be the issuance of formal guidance, or some other vehicle, could go
20 into the application period. While not optimal, it's probably the best that we can
21 do, and it's not inconsistent where we stood with new reactors before the
22 applications came in 2008. Next slide, please.

23 In addition to the resolution of the policy issues I just discussed, the
24 staff has, as Mike mentioned earlier, continued to interact with D.O.E. on the next
25 generation nuclear plant program, which is a prototype for a high-temperature

1 gas reactor. We're reviewing numerous white papers submitted by the NNGP,
2 and some of those white papers have actually formed the first step in our plans
3 for the generic policy issues that I just discussed. In regards to NNGP, we're
4 following the activities of the Nuclear Energy Advisory Council and we will
5 respond, as Mike said, to whatever Secretarial decision comes out later this year.

6 The staff is having limited interactions on other reactor
7 technologies, primarily fast reactors, through occasional interactions with
8 vendors, attendance to technical meetings and so forth, and also in our
9 interactions with international bodies through IAEA or several bilateral or trilateral
10 arrangements for other countries that are pursuing fast reactor technologies.

11 And lastly, we are in the midst of preparing our own internal
12 procedures and guidance, some of which do mention, in terms of how we take
13 the risk-informed approach and build it into our existing review methodologies.
14 So with that, I'll turn it back to Mike.

15 MICHAEL JOHNSON: Last slide, summary slide please, and I'll go
16 really quickly. We are focused -- continue to focus on developing the regulatory
17 framework in resolving policy issues, as we've discussed for integral Ps and
18 NNGP. That includes continued engagement with applicants, potential
19 applicants, and external stakeholders. With that, that concludes the staff's
20 presentation. We're ready for questions.

21 COMMISSIONER MAGWOOD: Thank you. Very informative.
22 We'll start the questions with Commissioner Ostendorff.

23 COMMISSIONER OSTENDORFF: Thank you. Well first, thank
24 you all for your presentations. Again, very helpful. This is one of the first issues,
25 I think, that Commissioner Magwood, Commissioner Apostolakis and I heard

1 about when we joined the commission last April, the SECY-10-0034 and some of
2 the key issues there. Mike, we're not going to let you get off the hook there. I
3 know you wanted Stew and Bill to answer the questions, but we're -- you'd feel
4 left out if we didn't give you at least one, so I'll give you at least one.

5 MICHAEL MAYFIELD: All right.

6 COMMISSIONER OSTENDORFF: Looking at Bill's slides 20 and
7 21, with the summary policy issues and the potential SMR license application
8 pieces. I go back almost a year, where we're talking about the three big issues
9 being control room staffing, security, emergency planning considerations, and I
10 recognize there are dates here for various papers coming to the Commission.
11 And I know that you addressed, I believe, in your remarks today that it's a hybrid
12 approach, you're dealing with some issues generically but also some issues that
13 cannot be dealt with, until you receive an actual application, and so I think we all
14 appreciate the quandary or the challenge of "Is it the chicken or the egg or the
15 egg or the chicken?" kind of approach here. But just, big picture, if you step back
16 from your senior position, look at where the progresses have been made in the
17 last year and the readiness of your team to receive and act upon actual license
18 applications, what's your comfort level?

19 MICHAEL MAYFIELD: I'm actually fairly comfortable, because
20 we've done enough work and had enough engagement with the vendors that we
21 can identify a path forward. So it's -- it might not be the optimum path, but we
22 can identify a path forward to licensing the plants doing the design cert reviews,
23 or in the case of TVA and mPower, the Part 50 application. So I am personally
24 quite comfortable we can move these forward and pursue the technical reviews
25 and the licensing reviews. We would like to be able to continue the dialogue and

1 bring that to conclusion with the industry, and then the staff could be fully
2 informed and can share that back with the Commission -- where the stakeholders
3 are and where the staff is. That's the optimum approach. Push comes to shove,
4 we can step forward and license these plants.

5 COMMISSIONER OSTENDORFF: Just to kind of follow up with
6 that, and I know that the Commissioners have all, I think, been very supportive in
7 providing the resources you need -- that doesn't mean that sometimes we
8 couldn't improve upon that. Are you satisfied with the level of resources you
9 have at the staff level to deal with these efforts?

10 MICHAEL MAYFIELD: Well, I'm not so foolhardy as to tell you that
11 I need a lot more -- being serious about it. We, as we prepared the 12 budget
12 and are formulating 13, I believe we're about where we need to be. No
13 bureaucrat's ever going to tell you, "I've got enough." But the fact is we have the
14 resources we need to prosecute the program.

15 COMMISSIONER OSTENDORFF: Thank you. I'm going to ask this
16 question. Stew and then Bill, please feel free to chime in -- or Mike Johnson,
17 however you want to -- but one of the notions that does come up -- come out in
18 both the previous panel as well as in your presentations, has been the
19 emergency planning aspect, and we know that the Office of Resource has been
20 working on the SORCA study effort for some time, and Commissioner Magwood
21 had mentioned the off-site dose calculations, and they came up in several of your
22 comments today. Just curious as to what you see is the relationship or nexus
23 between the Office of Research's SORCA efforts in perhaps looking at the EPZ
24 planning considerations for SMR's?

1 STEWART MAGRUDER: Well, we're certainly aware of where the
2 Office of Research is going, I think that they haven't published a final report yet.
3 But we have had discussions with them about that, and I think it's probably too
4 early to say exactly how it would impact them. But I do know that the first plants
5 that I have not talked about doing significant changes to their emergency
6 planning requirements, simply because of the timing of the situation. But I could
7 see -- we're hoping that we'll be able to use the information that is being
8 developed by the study to inform our future discussions on the policy issue.

9 COMMISSIONER OSTENDORFF: But do you see that your team
10 will need to do a separate kind of analysis, de novo on EPZ considerations, or
11 will it be able to borrow in large part from the body of work that you expect to
12 come out of the Office of Research in this area?

13 STEWART MAGRUDER: Well, I think as had been mentioned,
14 certainly the iPWR designs have similar -- they use the same fuel, essentially,
15 but there's obviously there's a much smaller source term. So I think that the
16 technology aspects -- you know, the same light water reactor fuel, obviously we'll
17 be able to learn something from that—but beyond that, I--

18 COMMISSIONER OSTENDORFF: You don't think the fact, I
19 guess, you know, I apologize that I didn't mention this, but the underground
20 nature of this -- would seem to have some significant or potentially significant
21 implications on that -- didn't know how that might play into this --

22 STEWART MAGRUDER: --Yes, we've had preliminary discussions
23 with the vendors about what we call a mechanistic source term or looking at
24 different release paths, and I think that there's a possibility of taking advantage of

1 that, but we have to do a lot more work obviously, and they'd have to do a lot
2 more testing to verify things.

3 COMMISSIONER OSTENDORFF: Okay. Bill, let me ask you a
4 question. Did you want to add anything to that, I'm sorry if you -- feel free if you'd
5 like to.

6 WILLIAM RECKLEY: Well, just basically reaffirm what Stew said.
7 We have talked to the Office of Research about SORCA and its possible
8 implication for SMR's, and we'll be informed by it. It was too late to really change
9 SORCA to bring in another plant design to evaluate. However, we've gone as far
10 as to make sure we're using some of the same vendors in terms of Sandia
11 National labs to do some of our work, and they're very familiar with the SORCA
12 work. So, while not totally integrated, we are trying to build off of one to inform
13 the other.

14 COMMISSIONER OSTENDORFF: Okay. Mike, do you want to
15 add something --

16 MICHAEL JOHNSON: -- I just wanted to -- we have the Office of
17 Research here. I wanted them to weigh in from their perspective.

18 JENNIFER UHL: Hi. My name is Jennifer Uhl. I'm the deputy
19 director for the Office of Research. And I'd like to just highlight that SORCA is a
20 method. Essentially, it's doing a quick level three PRA to some extent. It's not a
21 full level three PRA. It is giving you a consequence of the more probable severe
22 accidents. So, from that standpoint, if this were to be used by NRO or the
23 licensees it could be a tool that helps to bring into better or clear relief what the
24 potential consequences would be. Now, we did SORCA analyses for two plants,
25 Peach Bottom, which is a Mark 1 BWR, and Surrey, and so the answers are very

1 site-specific because of the fact that it is going out to consequences. So, things
2 like external event hazard and the plant's response is a very site-specific issue.
3 So, again, the information that we can draw from SORCA that we think is generic
4 is that the plants -- or the evolution of severe accidents -- are longer than what
5 we previously anticipated, and the source terms are likely smaller. We think that
6 would be a generic finding. But to determine the actual consequences of two
7 certain severe accident scenarios, you would have to do a plant-specific analysis.

8 COMMISSIONER OSTENDORFF: I understand that this --
9 Jennifer that's very helpful -- at a very high level, is the methodology to your
10 knowledge -- is the methodology that's been employed so far in the SORCA
11 study for those two specific plants -- are those general principles or
12 methodologies? Do you see those as being applicable to, in some form or
13 fashion, to looking at SMR issues?

14 JENNIFERE UHL: Yes, yes they could be applied.

15 COMMISSIONER OSTENDORFF: Okay. Thank you. Bill, I
16 wanted to ask you a question about control room staffing. You made a couple of
17 comments that got my attention. Not from the standpoint that I disagree with
18 anything you said, but just -- having operated submarine reactors for many years,
19 I'm very interested in how you look at meters and dials on the steam plant control
20 panel or the reactor plant control panel, electric plant control panel, et cetera.
21 and during the casualty or transient responses, you commented about your use
22 of the task analysis approach to sorting out the required staffing from an
23 operating standpoint during transients or casualty situations, and separate issues
24 are security and fire brigade requirements.

1 But with respect to the operating piece, I just -- if you could maybe
2 talk a little bit more, I'm trying to visualize my experience at sea, looking at how
3 one operator or two operators might handle more than one reactor plant and
4 recognizing also that some of the time responses required for operator reaction is
5 -- as Chris Mowry indicated in his slides, there's a lot more time before you have
6 to do something under certain casualty scenarios because the lower power and -
7 - can you talk a little bit about that cross-unit look a little bit?

8 WILLIAM RECKLEY: A little bit. [laughs] In that we have probably
9 more questions than answers at this point too. But the point would be to look,
10 let's say, you have an example where an operator is going to be assigned to
11 more than one module. You're going to have to go through a set of things to
12 define the assumptions. Transients on all modules, transient on one module,
13 orderly shutdown of another -- again, so I don't have all the answers to that. But
14 once you define what that operator is going to be required to do, then you're in a
15 situation where modeling the transient response or the other actions that they
16 have to take in the time they're afforded by the specific plant designs would put
17 the applicant and the NRC in the position to say, "Is it reasonable for an operator
18 to do that?" And then you'll have to define things like, "What if they have to
19 operate from outside the control room?" And so you lay out all of those
20 questions, and in the end you'll decide whether -- is it reasonable that one
21 operator might be able to do more than one module or not? So I don't -- Stew,
22 based on your interactions, do you --

23 STEWART MAGRUDER: -- Yeah, I just want to point out that we
24 have, like Bill said, we have many more questions probably than answers right
25 now. But one of the things that the vendors recognize right away is that we need

1 to build high-fidelity simulators for their facilities, and NuScale was in the process
2 of doing that, actually, a full 12-module control room. And we were very
3 interested in observing the scenarios they run there and determining whether it's
4 feasible to even approach that.

5 MICHAEL MAYFIELD: If I could--one thing to not lose sight of is
6 the vendor that needed the most relief on control room staffing was NuScale.
7 So, depending on how they do or don't move forward will put more or less
8 emphasis on timely resolution of this issue.

9 COMMISSIONER OSTENDORFF: Thanks, Mike. This is an area
10 of personal interest to me. I look forward to seeing the paper come to the
11 Commission, and thank you all for being here today. Thank you, Commissioner
12 Magwood.

13 COMMISSIONER MAGWOOD: Thank you. Commissioner
14 Svinicki.

15 COMMISSIONER SVINICKI: I want to thank you for your
16 presentations as well. I think you've also done a particularly skillful job of --
17 having heard the previous panel, you've tried to work in some responses to
18 issues that were raised and touched upon. Something that I had raised with the
19 previous panel was the list of policy issues and how we will get to closure and
20 different issues will have different paths to closure. And I had mentioned
21 rulemaking and that that can be a longer process. So I think now that I have a
22 much better understanding of the staff's thinking there. I know that when we talk
23 about the policy issues -- Bill, you presented some of the various vehicles and
24 mechanisms -- some time frames, and you highlighted I think three specific
25 areas, and one of the statements that you had make is that we're not sure we'll

1 find policy issues for the Commission. And, now Mr. Mayfield was commenting
2 that I may or may not have a Word-A-Day calendar, and that I enjoy the beauty
3 of language and using different words, but another thing that people know about
4 me, or complain about me, is that I think history can be so useful in trying to sort
5 out issues because there is generally somebody else who faced something
6 similar historically. So Bill, we were really thinking along the same lines today. I
7 looked at you at one point and you were making the statement, this is not very
8 different from where we stood with new reactors before those applications came
9 in, so I was really getting to that point in listening to the first panel, and then this
10 panel, and having looked at the history of when the NRC predicted that they
11 would face a large wave of new reactor applications.

12 When you look at the history of how did the agency prepare itself
13 for that my interpretation of that history is that there was a strong engagement
14 between the staff and the Commission, and when I look at the voting records,
15 and the papers that the staff sent up, the tremendous input that they received
16 early from the Commission and I think it might have helped the agency be more
17 ready, sooner because the staff didn't have to go off and pursue things that
18 ultimately the Commission was not going to endorse. And I think that it may be
19 that that is a useful paradigm for where we stand today; so Bill when you make
20 the statement, "We're not sure that we will find policy issues," if you do find them
21 I predict that someone might suggest to you that they're not policy issues so I'm
22 sure you'll be challenged in that way.

23 But just as a personal appeal I would say I think the history
24 demonstrates that the engagement of the Commission is important. I think it can
25 eliminate things that are not going to be productive and I don't know -- I can't give

1 you a recipe for the right prescription of saying, you know, here is where it's too
2 early to approach the Commission or the Commission might choke off something
3 that would be productive versus if we approached the Commission at this point
4 then the Commission can help us narrow a range of options. So you know, my
5 personal view --- think expansively about what policy issues are, don't get too far
6 down a road if it looks like you might be sent down another road eventually. So
7 thus endeth the sermon on policy issues coming to the Commission.

8 I actually have some specific questions; I raised with the first panel
9 this notion of the manufacturing orientation here and the way with the large lights
10 it's going to be a different paradigm for a small modular. How would you
11 characterize where we are in terms of flushing out that issue?

12 STEWART MAGRUDER: I'll take that since it was in my slide and
13 you guys can jump in when you need to. We've had good initial discussions with
14 TVA and Generation mPower about their proposed approach for manufacturing
15 and then construction of their facilities. And then when we were preparing our
16 response to their assumptions letter, we talked extensively with our construction
17 inspection people here at headquarters and also the inspectors in Region II. And
18 I think we can say that the scope of the inspections that we'll do will be about the
19 same, but where we do the inspections will probably change, and the timing of
20 the inspections will probably change, and we're still kind of exploring that.

21 COMMISSIONER SVINICKI: Is there anything that you've been
22 confronted with so far that you just looked at it and said, "We just -- there's no
23 way we can think of to accommodate that within our regulatory system?" Or is it
24 just a matter of how you'll achieve it?

1 STEWART MAGRUDER: So far we haven't seen any show
2 stoppers. At least I haven't. I think it's just a matter of how we do it and when we
3 do it.

4 MICHAEL JOHNSON: I clicked the button, he gave the exact right
5 answer I think --- we think all of these issues are solvable we just need to figure
6 out how we're going to do it and we are already beginning to learn lessons based
7 on what we're seeing in terms of fabrication for the large light water reactors, for
8 example, for the modules.

9 COMMISSIONER SVINICKI: Would that be like the modules?
10 Okay, I was going to ask about that.

11 MICHAEL JOHNSON: So we think we can get there it's just a
12 matter of timing.

13 COMMISSIONER SVINICKI: Okay. All right. Great. There was
14 brief mention of the congressionally mandated report regarding using nuclear
15 power small modular reactors at defense installations. Beyond engaging and
16 providing feedback to that have you had any other substantive engagement with
17 any of the military services or with DOD on interest or --- I know that report was
18 congressionally mandated so I won't even necessarily put the motivation for that
19 on them or do you think it is really the vendors that are having more engagement
20 with military?

21 MICHAEL MAYFIELD: Yes and no. And I sat on a steering
22 committee along with Dick Black from DOE that looked at the formation of that
23 report. The Services were all represented and were actively engaged. There
24 was a lot of dialogue about should DOD try and, particularly Army, try to
25 reinstitute their independent licensing capability. Representatives from the

1 Secretary's office said that was just a non-starter. So there is active interest from
2 the Services and there was active interest in approaching NRC and licensing
3 those facilities.

4 They've been looking carefully at the business model that would be
5 used and I know Dick Black from DOE, again, has had a lot of dialogue with
6 various components of the military on that so I believe there is active interest
7 from certainly Air Force, Army, to a degree Navy, of course, deals with their own
8 issues, but certainly from Air Force and Army there appeared to be active interest
9 from the Services and there was active interest out of the Secretary's office. We
10 know that DARPA has had and continues to pursue activities looking at small
11 nuclear units for forward deployment and we've had some dialogue --- early
12 dialogue with them. So this seems to be more driven by the Services than by the
13 vendors, although the vendors obviously have an active interest and have been
14 consulted and have dialogue.

15 COMMISSIONER SVINICKI: Beyond that report, are there any ---
16 is there continued engagement between NRC and any of these folks or are you
17 just going to see what kind of materializes from there?

18 MICHAEL MAYFIELD: Right now, in terms of --- we've had
19 sporadic engagement with Air Force, they -- the DARPA we had our first meeting
20 with them in the last month, we're by and large maintaining contact but waiting to
21 see. I know DOE has had more active and more recent engagement with them --
22 - with the Services.

23 COMMISSIONER SVINICKI: And my last question is that when I
24 think about the Office of New Reactors as a whole I see that in working on the
25 large lights as a class or maybe the design centers, there's the real opportunity

1 for cross fertilization and synergy both on the process side and substantively on
2 issues. For the advanced reactors group, is there going to be enough --- kind of
3 as a class -- within the class of technologies is there going to be so much
4 dissimilarity that you're really not going to have the potential to kind of cross
5 fertilize and have benefit or even to tap into NRO as a whole?

6 MICHAEL MAYFIELD: For the --- and this gets important to
7 segregate the technologies -- for the small PWRs I think there will be extensive
8 cross fertilization. I think that, certainly, for mPower we were seeing enough
9 similarities with NuScale that we knew we'd be able to work across those and
10 draw on the technical reviewers and engineering system, the human factors
11 folks. So we knew for those designs we would be able to have that kind of cross
12 fertilization. When you move to NGNP it's less clear to me. The technology is
13 enough different, there will be enough similar interest in control room issues,
14 digital I&C issues, beyond that it gets to be more problematic. For the liquid
15 metal cooled, that again, the technology there is enough different that once you
16 go beyond basic engineering, basic system features, there's not a lot of
17 opportunity for the kind of cross fertilization we've seen with the large lights.

18 COMMISSIONER SVINICKI: Okay, that's helpful.

19 MICHAEL JOHNSON: Just to add, that degree of cross fertilization
20 actually helps us as we try to plan budgets in 2012 and 2013 where we're relying
21 on that cross fertilization in working on the integral PWRs to maintain a stable
22 workforce in NRO and in addition to that when we go to oversight we see
23 opportunities for, again, extensive cross fertilization, particularly with the integral
24 PWR. So that's an important question.

25 COMMISSIONER SVINICKI: Okay, thank you. Thank you.

1 COMMISSIONER MAGWOOD: Commissioner Apostolakis.

2 COMMISSIONER APOSTOLAKIS: Thank you. The scheme
3 you're proposing to risk inform the review process relies on the classification of
4 system structures and components; safety related and risk significant. Which is
5 the same that was developed by this agency in handling special treatment
6 requirements. greater quality assurance. So some of the history of that, I think
7 Commissioner Svinicki is right the history is always a good teacher. I remember
8 during the reviews, you know, when the staff was preparing 50.69, the industry
9 complained that the classification of SSC's as safety-related or non-safety-
10 related had a lot of arbitrariness in it, and in fact, when we did risk calculations, a
11 small percentage of safety-related components, six, seven percent, turned out to
12 be risk significant. So that was one flaw of the system.

13 And the second flaw was that there were some risk significant
14 SSCs that were not safety-related. So the question then arose at the time, why
15 do we need to perpetuate this safety-related concept? And the answer was,
16 "Well, you know, it's embedded in the regulations, it's all over the place. If you
17 ask us to change this, it would be a revolution, and nobody wants to have
18 revolutions in the regulatory system."

19 The question now is, why perpetuate that system? When you
20 decide that something is risk significant, you don't rely only on PRAs. You have
21 an expert panel that takes into consideration a lot of the defense-in-depth
22 requirements, and classifies them as risk significant.

23 Now, we were told by the earlier panel that, for the first reactor,
24 they would like to go through Part 50, which unfortunately a downside is that now
25 you're going to have, again, safety-related SSCs. And then, again, you're going

1 to have the problem of having this classification that is not really very good, and
2 we all agree is not very good, and yet we have to have it.

3 So I'm wondering whether we should think a little bit about it, and
4 maybe have only risk significant and non-risk significant system structures and
5 components. And just as the previous panel pointed out that they want, for
6 example, to be innovative in certain areas and use this idea of security by design,
7 maybe we can also consider, you know, through the Part 50 deliberations, the
8 idea of not really classifying things as safety-related or non-safety-related, and
9 regret it later. Any comments?

10 [laughter]

11 STEWART MAGRUDER: I'll take a shot at it. And I share your
12 frustration with the older safety-related/non-safety-related classification, because
13 I agree. For existing reactors, there are a lot of --

14 COMMISSIONER APOSTOLAKIS: Excuse me; we have had to
15 live with that.

16 STEWART MAGRUDER: Right, right. I will say, for the new
17 designs, we may have the opportunity to start with a clean sheet of paper. And
18 there are much fewer safety-related components because of the way they're
19 designed, I mean they're passive systems; they don't need safety-related
20 electrical distribution systems as current plants do, and things, other examples,
21 obviously.

22 For the iPWRs, as you've heard earlier, the deployment schedule is
23 near term, and so they're definitely interested in conforming with existing
24 regulations and working through the system quickly. For the more advanced
25 reactor designs --

1 COMMISSIONER APOSTOLAKIS: But that's what I'm challenging
2 Stewart. I'm not sure that this is a -- I mean. For existing reactors, I understand
3 it. The classification has been there for decades, they don't want to change it.
4 But in this particular case, it seems to me, instead of having a group of people
5 deciding that something is safety-related, they can go straight to the risk
6 significant. I mean the deviation is not significant. Now, Bill, you mentioned that
7 we're going to have another SECY sometime with a final approach to all of these
8 issues. So maybe you guys can think about it a little bit before that final thing
9 comes out. I know you cannot commit now. Nobody commits to anything in a
10 public meeting.

11 MICHAEL JOHNSON: Yeah, I think that the essence of Stew's
12 comment is exactly right. I think there is some nervousness on the part of
13 applicants that we get through all of this, that we're going to go through, with
14 respect to the policy, and our licensing approach, and so on and so forth. So
15 that, for example, an application that shows up in 2012 that we do an adequacy
16 and completeness review on, we're able to accept and begin working on. So,
17 while there's great interest in making sure that we make our review more
18 efficient, more risk-informed, I think there also is a sense of nervousness about
19 us not playing around with that too long. And that, I think, is the balance that
20 we're trying to strike.

21 COMMISSIONER APOSTOLAKIS: And I appreciate that. I really
22 appreciate that. But maybe what, first of all, they are still here, so I'm not just
23 addressing you.

24 [laughter]

1 Maybe you can give them an option. And if they decide to go with
2 it, that's great. In other words, you can show that you're willing to entertain such
3 a concept, but you are also willing to go with a traditional one. So I don't think
4 there's anything wrong with that. But I'm not sure that people in the new designs
5 are very familiar with the complaints of the people who are running plants. And
6 they see how expensive this classification has been for them, safety-related
7 systems.

8 Now, another thing. I mean, as I was reading 10, what is it, 0024; it
9 occurred to me that you could do that for large reactors, too, I mean there is
10 nothing there that says this is unique to small reactors, correct?

11 MICHAEL JOHNSON: Correct, correct.

12 COMMISSIONER APOSTOLAKIS: Well, why don't you?

13 MICHAEL JOHNSON: Well, in fact, one of the things that we're
14 planning to do is, after we've gotten through this process, gotten Commission buy
15 in with respect to where we're headed, wrap that up, and then look at large light
16 water reactors, along with all the other things that we committed to do in terms of
17 lessons learned from the first time through, and perhaps make those changes.

18 COMMISSIONER APOSTOLAKIS: Very good, very good. Now,
19 again, the way I understand the system you're proposing, what you're saying is
20 that, for some non-safety-related system structures and components that are not
21 risk significant, or maybe they are, but they're not safety-related, because that's
22 really the heart of the matter here. You're saying there is duplication, that you
23 are reviewing the analysis that supports that particular component. But then also
24 there are performance-based requirements later, and there are some
25 redundancies there, and you're willing to suppress the evaluation of the analysis

1 in favor of the performance-based requirements. And that's really the only
2 change you're making, is that correct?

3 STEWART MAGRUDER: That's the major change, yes. Well,
4 aside from the risk categorization --

5 COMMISSIONER APOSTOLAKIS: No, no, that, I understand that.
6 So, the fact that these reactors -- yes, Bill?

7 WILLIAM RECKLEY: Well, I'd just clarify; one additional point is
8 the plant designs themselves will introduce differences in how we do the reviews.
9 The fact that the integral PWRs have no large bore piping changes dramatically
10 how we do the licensing, and you won't see mention of that in SECY-11-0024,
11 but it's implicit in the review method that the plant designs, some of the inherent
12 features they're introducing, the lower power densities, all of those things they're
13 introducing will translate into changes in how we approach the review. That's
14 somewhat in addition to actually doing this addition of a risk-informed approach,
15 where we try to modify our review, taking more advantage of some of the
16 programmatic performance-based elements.

17 COMMISSIONER APOSTOLAKIS: But, again, we agree that this
18 is the essence of the change. In addition --

19 WILLIAM RECKLEY: Yes.

20 COMMISSIONER APOSTOLAKIS: -- to the risk classification,
21 okay. You are not really revising the evaluation of analysis or anything. These
22 are the existing guidelines. And finally, again, do you see any downsides to the
23 fact that these reactors are below grade?

24 MICHAEL MAYFIELD: I mean, it's, I don't know that it's a
25 downside, but when talking with Scott Flanders for the sighting reviews, you

1 begin to have a shift in emphasis, from meteorology to hydrology. So there will
2 be, it's not so much different as a change in emphasis in what gets reviewed, in
3 doing the sighting reviews.

4 COMMISSIONER APOSTOLAKIS: How about severe accident
5 management?

6 MICHAEL MAYFIELD: I think that's an area where we have yet to
7 get to. I think it's a fair question. It's just, maybe six-eight months ahead of
8 where we are with these. I think Chris Mowry talked about a number of issues
9 with the mPower design, things that we're going to have to take a step back and
10 look at.

11 COMMISSIONER APOSTOLAKIS: The final cheap shot. Do you
12 think that a level three PRA would be useful?

13 MICHAEL JOHNSON: Of course, Commissioner.

14 MICHAEL MAYFIELD: Great answer.

15 COMMISSIONER APOSTOLAKIS: Thank you very much.
16 Commissioner Magwood?

17 COMMISSIONER MAGWOOD: Let's see, I've developed a long
18 list of questions, but I also recognize that I'm the only thing standing between
19 everyone in this room and lunch, so I'll try to keep it relatively brief. Let me
20 piggyback on some of Commissioner Apostolakis' comments, because I had the
21 same observations. And I appreciate your answer that there really isn't anything
22 that you're talking about doing, in terms of performance-based approaches, that
23 you can't do with larger plants.

24 But, just sort of a more general observation, sort of growing out of
25 the conversation I had with the previous panel, it seems to me that there's almost

1 nothing that we're talking about that can't be taken back and looked at in terms of
2 large plants, including whatever conversation you want to have on security, or
3 emergency planning, or anything else. I mean, all that can really be applied to
4 anything. Is there anything I'm missing with that?

5 MICHAEL JOHNSON: No, I think, in general, the answer that you
6 got from the earlier panel is true. And the premise of your question is correct.
7 Having said that, I think it is -- we do need to look at these individual designs,
8 and how they meet our current requirements, and where they're different, think
9 through what that means in terms of what we do in terms of providing guidance
10 about how those requirements are met or, in fact, raising to the Commission and
11 suggesting changes, new policies, or whatever, to address those.

12 COMMISSIONER MAGWOOD: This sort of feeds my
13 preconceived impressions that we really actually don't have classes of reactors;
14 we have individual designs that we have to look at as individual designs. And we
15 pretend that they're classes, but really they aren't, so it's kind of my cheap shot.

16 One, another cheap shot: you know, it occurs to me that listening
17 to the other panel, that the industry envisions there being hundreds if not
18 thousands of these reactors deployed. And I can't help but note that we have
19 4,000 staff and 100 power reactors. That's like 40 people per reactor, then. So if
20 we go to thousands of new reactors, how many NRC people will it take to monitor
21 thousands of these small reactors all over the country?

22 Feel free to answer that.

23 [laughter]

24 MICHAEL JOHNSON: I don't think I have an answer. We would
25 need to grow considerably.

1 COMMISSIONER MAGWOOD: Thank you. I think that's true, and
2 I don't know if I -- I'm sure we haven't given that much thought to that. I don't
3 know if you have, Mike, but...

4 MICHAEL MAYFIELD: Specific thoughts, I, none of us can give
5 you numbers, obviously. But I think if you were really going to go to a fleet
6 concept, you can't stay with the existing paradigm. You're going to have to look
7 at this differently. And so I think, if you really started going to that anticipation,
8 John Kelly's fleets of reactors, you can't stay with where we are. So you're going
9 to have to do this smarter. That's a nice thing to say, but the Commission, the
10 staff would have to look at this differently. You just can't do it the same way.

11 MICHAEL JOHNSON: At one point we had, Commissioner, a
12 notion that there would be an issue about NRC, for example, oversight, you
13 know, policy issue related to how we would oversee, a number of resident
14 inspectors, for example, for Small Modular Reactors. You know, the kind of thing
15 that we're going to look at operator staffing, would be, maybe the analogous thing
16 that we would do for NRC workload, job task analysis, and then sort of overlaying
17 on that, what are the Commission's policies with respect to, for example, resident
18 inspector staffing and those kinds of things, to get to the answer to the question
19 that you're really raising, that I answered really tersely about, that we would grow
20 considerably if those were the numbers. I think it would be a significant growth,
21 but we would need to go about it in a systematic way in terms of understanding
22 where that growth would need to happen to support licensing and oversight.

23 COMMISSIONER MAGWOOD: Okay. I appreciate that. I think
24 Commissioner Ostendorff had a dialogue with you about the resources, and I
25 appreciated the bureaucratic response to that. But I did note that you made a

1 point of saying that we will not solve, or answer all of the questions, before
2 designs are submitted. Is that a resource issue? Is that simply having enough
3 people to do the work? Or is there some pacing activity that simply won't get
4 done, no matter how many people you throw at it at this point?

5 MICHAEL MAYFIELD: It is, I believe, largely a pacing issue with
6 the industry, and the degree to which they can put all of the issues on the table in
7 advance of submitting the design cert application. There are some things you
8 just can't get to until you actually have the meat of the application and the details
9 of the design. We're trying to limit that, but I can't, in good conscience, tell you --
10 I don't think any of us can tell you, "We can solve all of this before they bring in
11 the design."

12 So there will be some set of issues. I think it was Bill alluded to the
13 issue identification and ranking projects that we've put in place, it's a pert-like
14 process to systematically look at the issues that we've already identified. Is there
15 some aspect we've missed? But then, to look more broadly, is there an issue we
16 just haven't thought about yet? And so we're doing those kinds of things to flesh
17 out as much as we can, collectively, the staff can think about. But there's only so
18 much you can do until you have, as I say, the meat of the design.

19 COMMISSIONER MAGWOOD: I can't remember if this goes to
20 Stewart or Bill, but we had a long conversation about security during the
21 presentation, and I wonder, one aspect about security that we haven't talked
22 about isn't the orientation of the physical plant, but it's where the plant is, and
23 what's around it. And we're used to having large central stations where we can
24 put a big fence around it, and there's, of course, already thousands of people
25 involved. And we're now talking about a different model, with these -- if you have

1 a twin pack replacing a small coal plant in some Nebraska cornfield, that's a
2 different security situation than anything we're facing today. And I wonder, is that
3 something that you've started to think about?

4 WILLIAM RECKLEY: Well, I think that, again, as Mr. Mowry
5 mentioned, 40 acres being basically the footprint, and within that 40 acres of
6 being able to lay out your fences, and your building arrangements, and your
7 reactor building to provide the necessary means to detect an intruder, to delay an
8 intruder, and ultimately to respond. So you can't say that a particular site might
9 not raise particular issues, and that site may need, then, to compensate, maybe,
10 with something another site didn't need to have, an additional bullet-resistant
11 enclosure, an additional number of guards from one site to another, as you
12 analyze the impact of the site.

13 But, in general, the feeling is that, by, again, doing security by
14 design, you're able to build that in, and so now you have to try to compensate for
15 weaknesses in detection based on where the buildings already are. And you
16 only have a number of ways you can do that, whereas they're able to now
17 consider, in order to detect, where do I put my buildings? And so that's, you
18 know, that's the fundamental difference.

19 MICHAEL MAYFIELD: Going to your notion of general location, the
20 cornfield in Nebraska, whatever. That also goes to EP. So there are a couple of
21 these things where we're going to have to get into it some more with NSIR, some
22 more with the vendors and the utilities, and then reach out to other -- FEMA and
23 other stakeholders, to get to the heart of what's different, and how should the
24 staff and other agencies' posture change. Should it change? So I think there are
25 a number of these things that, as we start planting these, that the fleet, in a lot of

1 different regions, different kinds of locales than we're used to dealing with, we're
2 going to have to be adroit, and Commissioner, I do enjoy the differences in
3 language, as a matter of fact.

4 We're going to have to be able to deal with that. And to be able to
5 figure out how to make the regulations do what we need them to do to assure
6 public health and safety without it being an undue burden.

7 COMMISSIONER MAGWOOD: Well, thank all of you. One final
8 point, thinking of the previous panel. Commissioner Svinicki mentioned some -- I
9 guess you -- I can't remember which verb you used that particular time, but there
10 were some fuzzies as to what the actual scheduled work was going to be, and
11 what the milestones were going to be to get us to the conclusion of these issues.
12 And I have the same feeling that we should have a little bit more fidelity in the
13 schedule. It may be something that we could perhaps get -- I don't know if others
14 have, you know, have any views about the schedule. But I think it'd be good to
15 have the, maybe the meeting SRM reflect that, I don't know if others have a --

16 COMMISSIONER OSTENDORFF: Commissioner Magwood, I
17 concur in your comment. I'd also associate myself with Commissioner Svinicki's
18 comments at the beginning of her Q and A where it is not clear to me what are
19 the issues to bring back to the Commission. And I just know, I heard the first
20 panel, heard this panel, on this topic and it just seems like, Commissioner
21 Magwood on your comment about are there things that are outside the purview
22 of our experience with the existing reactor fleet that can't be resolved, and I think
23 the answer you got was no. But it still seems like there's some fuzziness or
24 potential gray areas here, and so I just would like to join myself with your
25 comments, both of you, on the need to come back to the Commission, earlier

1 with -- at least telling us about a particular hurdle or hiccup. And Mike you kind of
2 referred to some of those in your last comments a few minutes ago.

3 MICHAEL JOHNSON: Can I just?

4 COMMISSIONER OSTENDORFF: Yes.

5 MICHAEL JOHNSON: I also listened to the comment and wrote a
6 note to be -- to try to respond to the variety of additional information for the
7 Commission on schedule and we'll do that. I want to tell you our approach for
8 the papers is, even in the event we figure out that we don't think we have a policy
9 issue, our plan would be to provide an Information Paper to the Commission so
10 you know the basis for that discussion. So that's why you see some of the
11 interim milestones on a number of these issues where we're just talking about
12 the approach that the staff was going to use and in fact, how we're proceeding so
13 that you're informed as we go forward. And again, we'll communicate with
14 respect to firm deadlines on issues as we move forward so you know when
15 you're going to get those products and get the policy issues that you need to
16 react to in order to be able to give the staff direction.

17 COMMISSIONER SVINICKI: And I think some of the distinction I
18 was trying to make and its really my personal perspective from reading a lot of
19 the voting papers and voting records of what came to the Commission when the
20 wave of new reactor applications was anticipated but had not yet materialized is,
21 I would characterize the difference as sending up Notation Vote papers to the
22 Commission with the presumption that you will get Commission buy in some
23 fashion and the contrast being perhaps a posture that says, "I will just send a
24 wave of things to the Commission and make them sort through a lot of
25 information about what is a policy issue and what isn't. When the staff -- in my

1 experience when the staff is presenting a policy issue to the Commission, it is
2 done differently than when you are merely giving a status update and so, the
3 Commission -- if things are not presented to us as a policy matter, we are
4 deprived in my view, of the staff's expert framing of the issue, delineation of what
5 the policy options might, and so I understand that it's become a bit fashionable to
6 send things to the Commission as Information Papers, but we then, I think suffer
7 a real deficiency of having the benefit of the way the staff is able to expertly put
8 policy issues in front of the Commission, I was trying to contrast the history a little
9 bit and I just offer that perspective to my colleagues.

10 COMMISSIONER MAGWOOD: Any other comments?

11 COMMISSIONER OSTENDORFF: If I can just look at slide 20 --
12 I'm just going to identify three papers but to illustrate I think Commissioner
13 Svinicki's point here. Emergency planning scheduled for mid-third quarter, fiscal
14 year 2011, control room staffing late-third quarter fiscal year 2011, and physical
15 security, first quarter of fiscal year 2012. I looked at the three topical areas there;
16 I can't imagine those not having integrated effects, one on the other topic. And
17 that all assumes that there's a nexus, there's a connection between how many
18 people you have on site, how many people are involved in emergency planning
19 in the security, and so they are not in isolation, they are in a broader context, part
20 of a more holistic framework that does necessarily have in most cases, policy
21 implications.

22 MICHAEL JOHNSON: That is true and we're working those in an
23 integrated way and you'll see that. Just on the emergency planning paper for
24 example, we want to get -- we want to tell the Commission how we're
25 proceeding, what our plans would be. We recognize that we won't have the full

1 vetting of the issue, full preparation of all of the options, and a recommended
2 option to the Commission on that timeframe, so the Information Paper is intended
3 to get that information in front of the Commission and we'll follow that up, once
4 we've had a chance to interact more fully with applicants and external
5 stakeholders, an options paper that is typical of what you would expect in terms
6 of a fully fleshed out, well-rounded set of options, and a sound staff
7 recommendation with respect to our approach -- proposed approach.

8 COMMISSIONER SVINICKI: Okay, thank you for recognizing that
9 difference.

10 COMMISSIONER APOSTOLAKIS: Well, I'll just repeat that this is
11 an excellent opportunity to revisit this issue of safety-related components and I
12 would urge both the staff and the industry to not just go ahead and classify SSC
13 as safety-related and all safety-related just because that's what Part 50 says,
14 thank you.

15 COMMISSIONER MAGWOOD: You know it also just occurred to
16 me this may also be a good opportunity to think about level 3 PRA.

17 [laughter]

18 COMMISSIONER MAGWOOD: It just came to me.

19 [laughter]

20 COMMISSIONER MAGWOOD: We stand adjourned; thank you

21 [Whereupon, the proceedings were concluded]